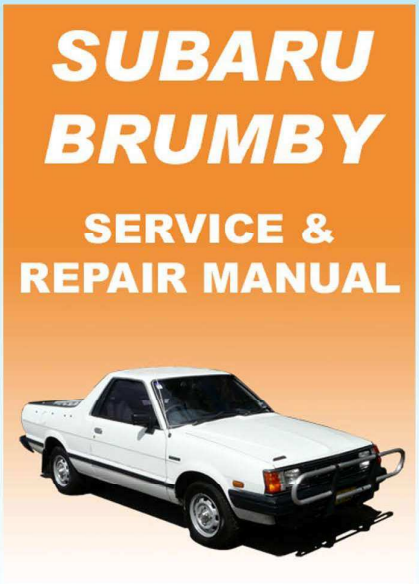
SUBARU

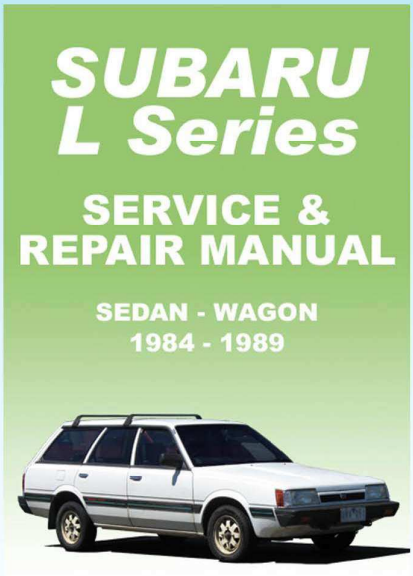
1979-1989

2WD - 4WD

SEDANS - WAGONS
COUPES - UTILITY







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INTRODUCTION

This workshop manual has been researched and written by automotive engineers for the practically-minded car owner who wishes to maintain his vehicle in a safe, reliable and serviceable condition and, at the same time, reduce running and maintenance costs.

A vehicle of the type covered by this manual was taken into our workshop where the repair methods described were proven in practice. To ensure that the reader can readily identify the components and operations described in the text, detailed photographs and illustrations were produced during the workshop research for inclusion throughout this manual.

Each section contains step by step procedures for the removal and installation of components and, where applicable, detailed instructions for their testing, overhaul and adjustment. For the technically minded, comprehensive specifications are given at the beginning of each section.

The importance of regular lubrication and maintenance is stressed in an easy to follow service schedule. Performing services at the intervals specified also gives the opportunity of identifying any minor faults before they get worse. A cracked fan belt, deteriorated water hose or faulty tyre is better dealt with in the convenience of your own garage rather than risk an expensive and inconvenient breakdown.

Particular emphasis is also placed on the value of trouble shooting as the identification of the trouble source can often be more of a problem than the cure. If used correctly, the information included on the majority of trouble causes and remedies should greatly assist in the saving of the time and possible unnecessary expenditure.

This manual will bring within the scope of many readers numerous tasks on the vehicle which can be tackled with confidence. The cost of the manual may well be recovered on the first occasion it is put to use, and the personal satisfaction of a job well done is the inevitable bonus.

Inexperienced operators should not attempt to carry out a particular service operation before completely reading the appropriate section, or other sections which may be referred to, in the manual.

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1. TOOLS AND EQUIPMENT

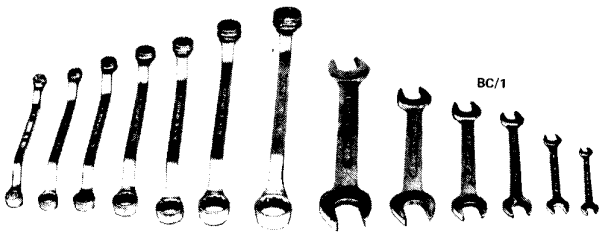
When servicing the modern motor vehicle, special tools are sometimes essential for overhaul and adjustment procedures on certain components. These special tools can be expensive and often require specialised knowledge to operate them, in which case it is more practical to take the vehicle or component to your authorised dealer for repair. Where possible the use of special tools is avoided in this manual and basic or substitute tools, which are described in the text, are used instead. Should it not be practical to carry out an operation without special equipment, then the reader is advised of this at the commencement of the operation.

To successfully carry out any form of mechanical repair work, adequate hand tools are essential. Do not be tempted to make do with old spanners, screwdrivers etc, that do not correctly fit the hardware on the vehicle, nor use new spanners of the wrong system such as A.F. on metric nuts and bolts. Besides damaging the hardware and/or 'rounding' the bolt heads and nuts, many a knuckle has been skinned by using inferior or incorrect tools.

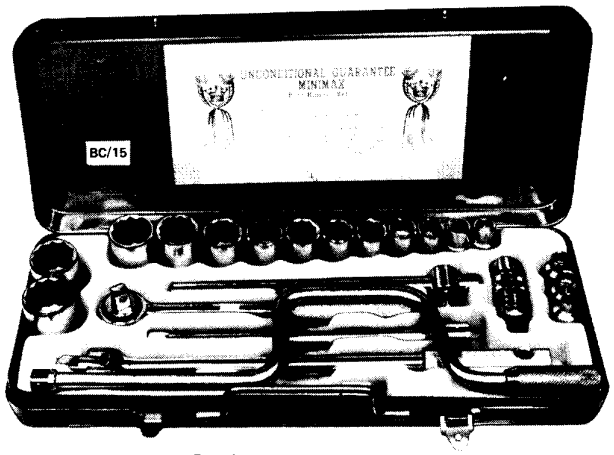
The following list of basic tools, miscellaneous equipment and stores are suggested as being the initial requirements to enable the maintenance and repair work described in this manual to be carried out.

BASIC TOOL KIT

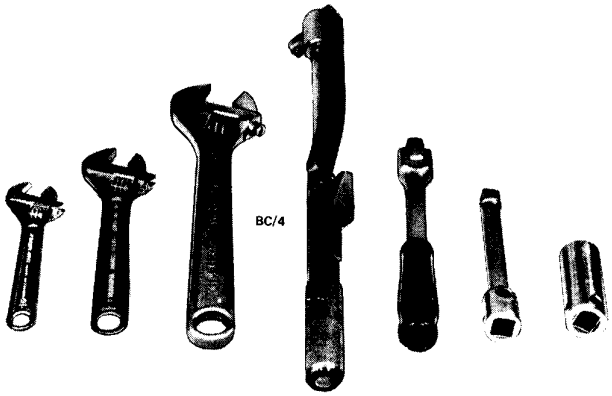
1 Set of open ended spanners.
1 Set of ring spanners.
1 Set of socket spanners.
1 Set of adjustable spanners.
1 Spark plug spanner.
1 Torque wrench.
Assorted bladed screwdrivers.
Assorted Philips screwdrivers.
1 Pair of ordinary pliers.
1 Pair of multigrip pliers.
1 Pair of vice grip pliers.
1 Pair of long nose pliers.
2 Pairs of circlip pliers.
1 Engineers hammer.
1 Set of pin punches.
1 Set of feeler gauges.
1 Set of magneto spanners.
1 Points file.



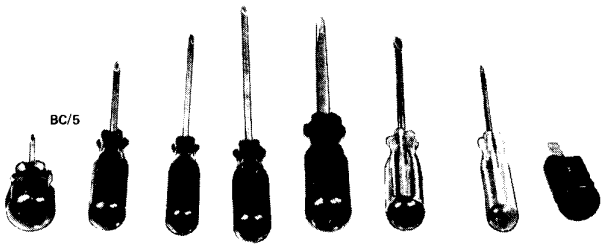
Ring and open ended spanners.



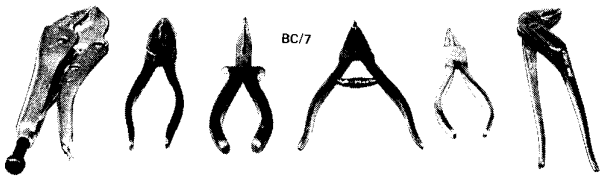
Socket spanner set.



Adjustable spanners, torque wrench and spark plug socket spanner with socket extension and swivel bar.

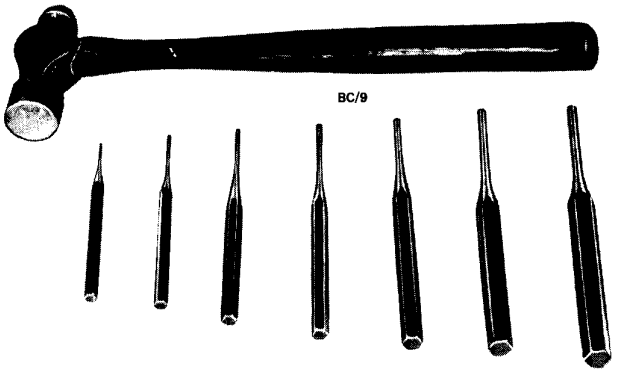


Assorted Philips and bladed screwdrivers.

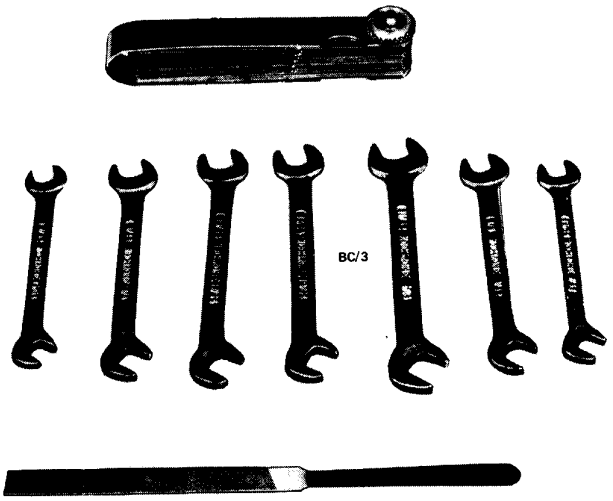


Vice grip pliers, ordinary pliers, long nose pliers, circlip pliers (expanding type), circlip pliers (contracting type) and multigrip pliers.

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Engineers ball pein hammer and pin punch set.



Points file, magneto spanners and feeler gauge set.

TOOL SELECTION AND CARE

As sensible selection of tools can greatly influence the ease and quality of work performed by the operator, it is good advice to purchase the highest quality of tools that can be afforded. Tools which bear the makers name are usually the best. The cheaper case hardened variety of tools should be avoided as once the case hardening is worn through it will be found that the tools are no longer serviceable. Hand tools with joints such as adjustable spanners and pliers should have no appreciable slack in the joints. There is nothing more annoying than to set a crescent spanner to a given nut and find that the jaw dimensions keep altering.

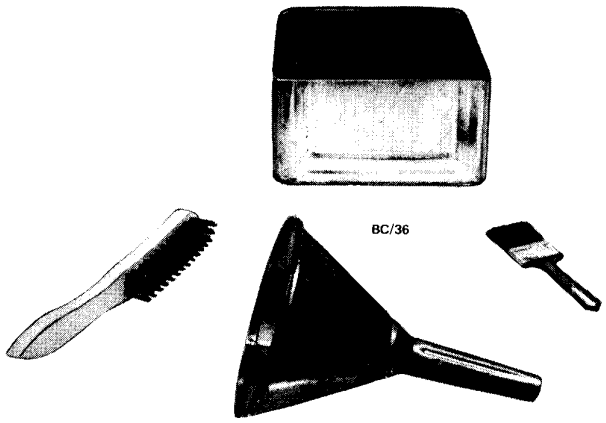
To ensure that all hand tools see out a normal working life tool care is also very important. After each job undertaken, all tools should be thoroughly washed in kerosene or some other type of cleaning agent and then wiped dry with a clean cloth.

When cleaning the tools ensure that all grit is removed, especially from the joints in pliers and adjustable spanners. If the tools are to be stored for any length of time it is also good policy to wipe them over with an oily cloth. Feeler gauges should be given particular attention and must be kept scrupulously clean at all times as grit on the blades will cause damage to the blades and inaccuracy when measuring. To prevent the feeler gauge blades from rusting and pitting through moisture the blades should be wiped over with an oily cloth after each use.

To prevent hand tools and other equipment from becoming mislayed and to ensure uncluttered working surroundings all hand tools should be stored in either a tool box or on a shadow board. If it is not intended to transport the tools then the latter method is recommended for the 'do-it-yourself' mechanic. Besides having all tools within easy reach, a visible check can be made of the shadow board at any time to see if any tools are missing.

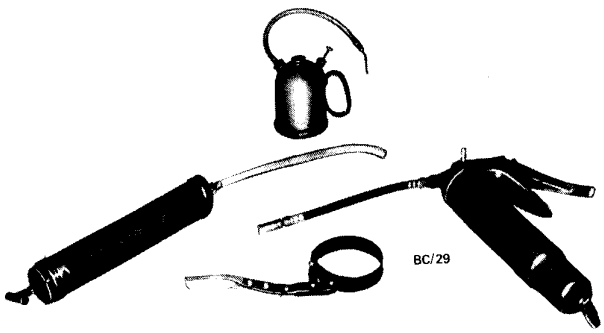
MISCELLANEOUS EQUIPMENT AND STORES

1 Hydraulic jack.
1 Set of car ramps.
1 Set of chassis stands.
1 Hand grease gun with flexible attachment.
1 Oil can.
1 Oil gun.
1 Filter removing tool.
1 Oil recepticle and parts washing tin.
1 Funnel.
1 Wire brush.
1 Parts washing brush.
1 Tin of brake fluid.
1 Tin of engine oil.
1 Tin of transmission oil.
1 Tin of rear axle oil.
1 Tin of chassis grease.
1 Test lamp.
1 Dwell/Tach meter.
1 Timing light.
1 Ohmmeter.

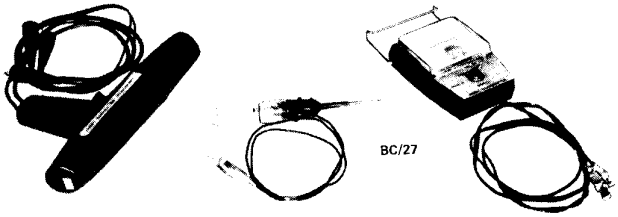


Wire brush, funnel and parts washing tin and brush.

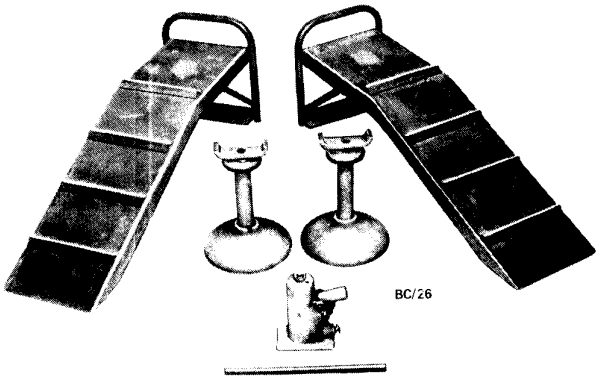
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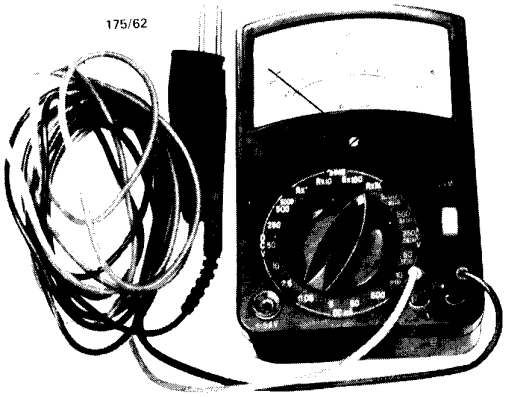
Oil gun, grease gun, oil can and filter removal tool.



Timing light, test lamp and dwell/tach meter.



Car ramps, chassis stands and hydraulic jack.



Ohmmeter (multimeter). An instrument for measuring electrical resistance.



Oils and greases are available in handy pack size for do-it-yourself lube jobs.

2. SAFETY

Never work *under* a vehicle which is supported only by the vehicle jack, bricks or similar materials as these are seldom stable. Always support the vehicle on chassis stands or use car ramps. Even in an emergency try to avoid jacking up the vehicle on soft or uneven ground.

When lifting either end of the vehicle ensure that the wheels remaining on the ground are fully chocked in both directions.

Avoid spilling oil or water around or under the working area, apart from the mess, you can easily lose your footing when exerting pressure on a particularly stubborn component.

When power tools are used make sure they are correctly fused and earthed with all connections and plugs tight and effectively insulated.

Always check that equipment being used for the lifting of heavy components such as engine and/or transmission is not exceeding its capacity and that ropes and slings are correctly secured and of adequate strength.

Every precaution should be taken when working on brake assemblies to avoid inhaling the brake dust which results from wear of the friction material. DO NOT attempt to remove dust by air pressure or vigorous brushing. A vacuum cleaner of either the domestic, or battery operated type designed for vehicles, with hose attachment is the most conveniently safe method of brake dust removal.

For the safety of the vehicle always disconnect the battery when carrying out any operation to the electrical or fuel systems. However, a battery should NOT be disconnected on a vehicle fitted with an alternator *when the engine is running*, or the alternator will be damaged.

The information in this manual is derived from the latest models available for our workshop research, and from other available sources at the time of writing. Any subsequent modifications will need to be taken into consideration by the operator.

While every precaution is taken to ensure the accuracy of the contents, onus can not be accepted for any misinterpretation of the described repair operations or for any errors or ommissions inadvertently made, or for any injury or damage no matter how caused.

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SPECIFICATIONS

CAPACITY AND GRADE

Engine:	
Lubricant	SF 20W/50
Sump capacity —	
1979–1981 1600 cc models	3.5 litres
1979–1987 1800 cc models	4.0 litres
Cooling system capacity:	
1979–1981 1600 cc models	5.3 litres
1979–1987 1800 cc models	5.5 litres
Manual transaxle two wheel drive models:	
Lubricant	SAE 80W–90
Capacity —	
1979–1984 models	2.7 litres
1985–1987 Sedan and Station Wagon models	2.6 litres
Manual transaxle four wheel drive models:	
Lubricant	SAE 80W–90
Capacity —	
1979–1984 and Utility models	3.0 litres
1985–1987 Sedan and Station Wagon models	3.3 litres
Automatic transaxle two wheel drive models, transmission:	
Lubricant	Dexron II
Capacity 1983–1984 models —	
Dry refill	5.6–6.0 litres
Capacity 1985–1987 models —	
Dry refill	6.0–6.4 litres
Automatic transaxle four wheel drive models, transmission:	
Lubricant	Dexron II
Capacity 1983–1984 models —	
Dry refill	6.0–6.4 litres
Capacity 1985–1987 models —	
Dry refill	6.8–7.2 litres
Automatic transaxle, differential:	
Lubricant	SAE 80W–90
Capacity	1.1–1.3 litres
Rear axle four wheel drive models:	
Lubricant	SAE 80W–90
Capacity	0.8 litres
Steering gear:	
Lubricant —	
Manual steering	Subaru steering grease
Power steering	Dexron II
Brake fluid type	Dot 3 or 4
Fuel tank capacity:	
1979–1982 Sedan	50 litres
1979–1982 Station Wagon and Utility	45 litres
1983–1984 Sedan and Coupe	60 litres
1983–1984 Station Wagon and Utility	55 litres
1985–1987 Sedan and Station Wagon	60 litres
1985–1987 Utility	55 litres

NOTE: Lubricant capacities shown are approximate only. The correct lubricant level should be checked at the filler plug or dipstick.

1. HOW TO GREASE AND OIL CHANGE

TOOLS, STORES AND EQUIPMENT REQUIRED

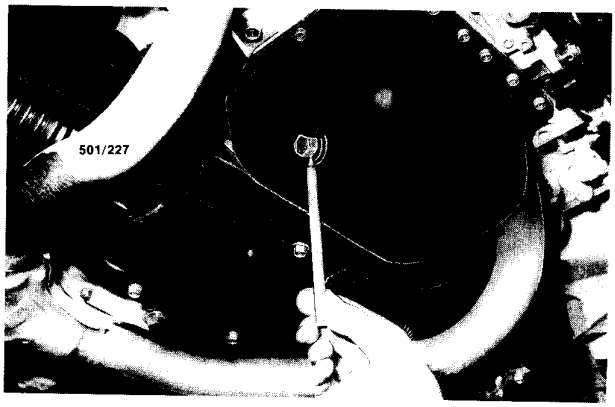
1 Set of ring spanners.
1 Adjustable spanner.
1 Hydraulic jack.
1 Set of car ramps.
1 Set of chassis stands.
1 Oil can.
1 Oil gun.
1 Filter removal tool.
1 Oil drain tin.
1 Parts washing tin.
1 Funnel.
1 Wire brush.
1 Parts washing brush.
1 Tin of brake fluid.
1 Tin of engine oil.
1 Tin of transmission oil.
1 Tin of front differential oil (automatic transaxle vehicles only).
1 Tin of rear differential oil (four wheel drive vehicles only).

NOTE: All lubricant capacities and grades for the various assemblies can be obtained by referring to the Specifications in this section.

TO DO THE JOB

(1) Remove the spare tyre from the engine compartment to allow access to the transaxle dipstick(s).

(2) Run the front of the vehicle onto the car ramps, stop the engine, apply the handbrake and chock the front wheels.



Location of the engine sump drain plug, sump guard removed, 1986 model shown.

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(3) Raise the rear of the vehicle with the jack and place chassis stands under the rear jacking points.

NOTE: It is best if the vehicle is kept as level as possible to avoid false readings when checking the lubricant levels.

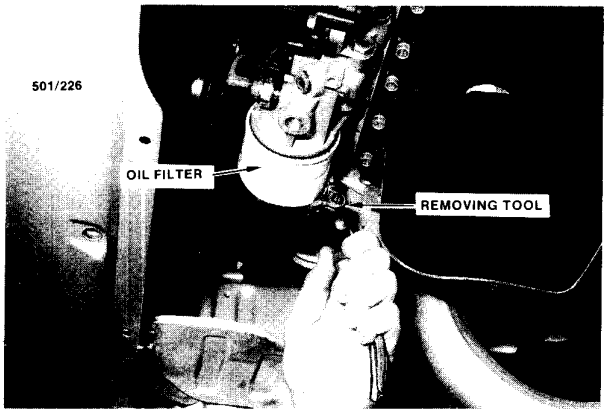
(4) Using a wire brush and a cloth, clean around the engine sump drain plug, transmission dipstick(s) and the rear axle filler plug on four wheel drive vehicles.

(5) Place a drain tin under the engine sump, remove the sump drain plug with the appropriate size ring spanner and allow the sump to completely drain.

NOTE: It is best to drain the engine sump with the oil at operating temperature. However if the oil is hot take care to avoid scalding.

When the sump has completely drained, instal and securely tighten the sump drain plug. Wipe around the plug after installing.

NOTE: Before installing the sump drain plug check the plug sealing gasket to ensure that it is serviceable.



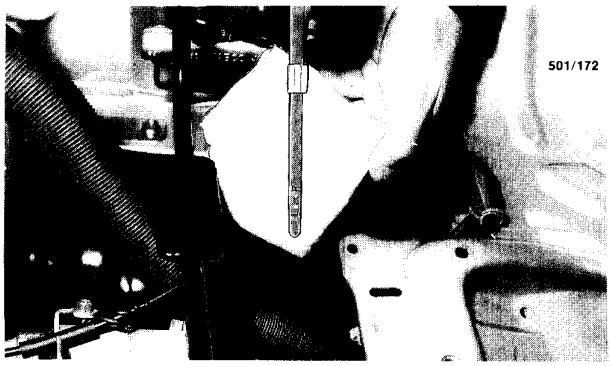
Method of removing the engine oil filter, 1986 model shown.

(6) Remove the oil filter with the removal tool and allow the residual engine oil to drain into the drain tin. Smear oil onto the sealing gasket of the new filter and tighten the filter by hand as per the tightening instructions supplied with the new filter.

IMPORTANT: Before installing the new filter ensure that the sealing gasket from the old filter has not come away from the old filter and adhered itself to the filter sealing seat on the engine.

(7) On manual transaxle models, remove the dipstick and check that the oil level is between the upper and lower marks on the dipstick.

If the oil level is low use the oil gun or a funnel to fill the transaxle to the correct level with the specified oil. Recheck the oil level and replace the dipstick.



Check the manual transaxle oil level using the dipstick, 1986 model shown.

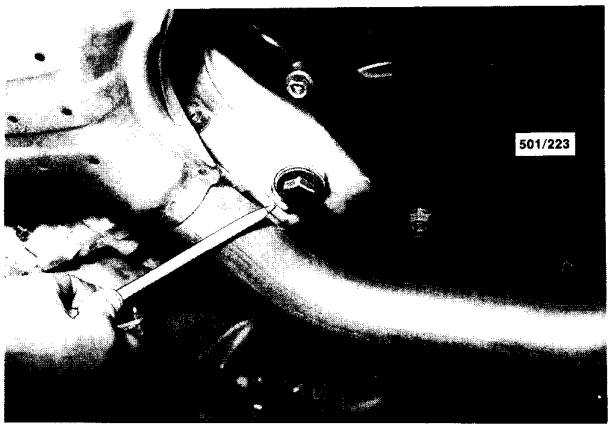
(8) On automatic transaxle models, remove the differential dipstick and check that the oil level is between the upper and lower marks on the dipstick. If the oil level is low use the oil gun or a funnel to fill the differential to the correct level with the specified oil, recheck the oil level and replace the dipstick.

Refer to the Automatic Transaxle section for the correct procedure to check and top up the automatic transmission fluid level.

(9) Remove the level plug from the rear axle on four wheel drive models. Use a finger or a bent piece of wire to check the oil level. The correct level is when the oil is level with the bottom of the plug hole.

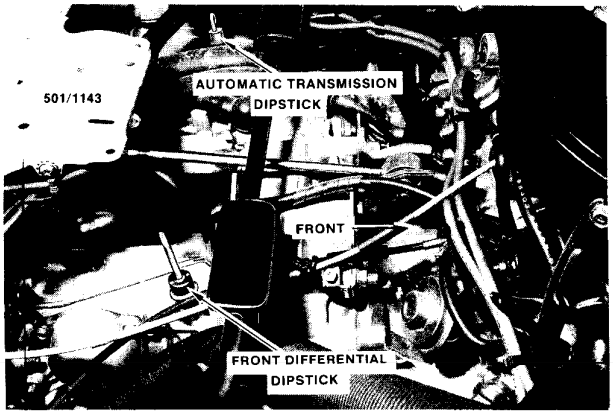
If the oil level is low use the oil gun to fill the rear axle to the correct level with the specified oil. When satisfied that the level is correct instal and firmly tighten the plugs. Wipe around the plugs with a cloth after installing them.

(10) Using the funnel, fill the engine with the specified amount and grade of engine oil and start and run the engine for a few minutes. Ensure that the oil pressure warning lamp goes out. Stop the engine, wait for a few minutes and check the oil level on the dipstick. If necessary add oil to bring the level to the full mark on the dipstick.

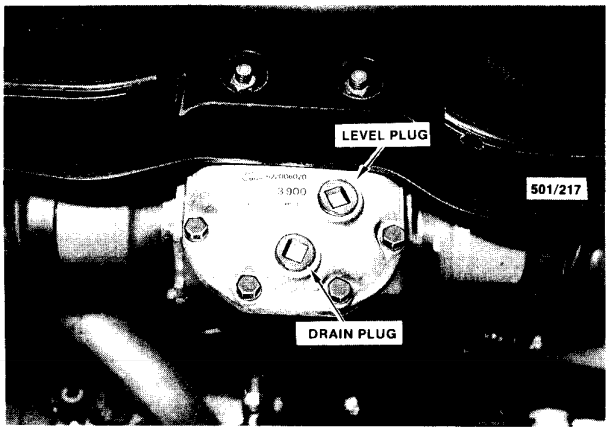


Location of the manual transaxle drain plug, 1986 model shown.

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View of the automatic transaxle dipstick and front differential dipstick. Spare tyre removed, 1986 model shown.



Location of the rear axle oil level checking and drain plugs, four wheel drive models.

NOTE: To prevent overfilling initially, it is good policy not to pour all of the specified amount of the oil into the engine in one go as sometimes the amounts specified are only approximate. It is best to hold back at least half a litre and top up to the full mark on the dipstick after the engine has been run for a few minutes.

(11) Check thoroughly for oil leaks at the engine sump plug and engine oil filter if a new filter was fitted.

(12) Referring to the Service Schedule, lubricate and check all other items which coincide with the grease and oil change intervals.

(13) Lower the vehicle to the ground, instal the spare wheel, road test and check for oil leaks.

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2. SERVICE SCHEDULE

JOB	daily or 1,000 km	THOUSAND KILOMETRES										
		10	20	25	30	40	50	60	70	75	80	90	100
ENGINE													
(1) Check the oil level on the dipstick each time the fuel tank is topped up or every 1,000 km. Top up as necessary with the correct grade of engine oil.	●												
(2) Drain and refill the engine sump and renew the oil filter every 10,000 km or six months.		●	●		●	●	●	●	●		●	●	●
NOTE: When driving under severe or dusty conditions it is recommended that the engine oil and filter are changed more frequently.													
(3) Check and if necessary adjust the valve clearance on OHV engines every 20,000 km or 12 months.			●			●		●			●		●
(4) Check and if necessary adjust the camshaft drive belt tension on OHC engines every 25,000 km or 12 months.				●			●			●			●
(5) Renew the camshaft drive belts on OHC engines every 100,000 km or 48 months.													●
COOLING SYSTEM													
(1) Check the coolant level in the radiator or coolant reservoir daily or every 1,000 km.	●												
NOTE: If the engine is at normal operating temperature use care when removing the radiator cap to avoid scalding.													
(2) Drain, flush and refill the cooling system every:													
(a) 40,000 km or 24 months on 1979–1984 and Utility models.						●					●		
(b) 50,000 km or 24 months on 1985–1987 models.							●						●
(3) Check the radiator hoses, heater hoses and drive belts every 20,000 km or 12 months.			●			●		●			●		●
FUEL SYSTEM													
(1) Inspect the air cleaner element and the PCV filter, if applicable, every:													
(a) 20,000 km or 12 months on 1979–1984 and Utility models.			●			●		●			●		●
(b) 25,000 km or 12 months on 1985–1987 models.				●			●			●			●
(2) Renew the air cleaner element and the PCV filter, if applicable, every:													
(a) 40,000 km or 24 months on 1979–1984 and Utility models.						●					●		

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JOB	daily or 1,000 km	THOUSAND KILOMETRES											
		10	20	25	30	40	50	60	70	75	80	90	100
(b) 50,000 km or 24 months on 1985–1987 models.							●						●
NOTE: Do not wash the viscous paper type element in solvent or blow it out with compressed air.													
(3) Renew the fuel filter and inspect all hoses and connections every:													
(a) 20,000 km or 12 months on 1979–1984 and Utility models.			●			●		●			●		●
(b) 50,000 km or 24 months on 1985–1987 models.							●						●
(4) Adjust the engine idle speed and mixture, if applicable, every:													
(a) 20,000 km or 12 months on 1979–1984 and Utility models.			●			●		●			●		●
(b) 25,000 km or 12 months on 1985–1987 models.				●			●			●			●
(5) Check the operation of the manual or automatic choke and adjust or lubricate as necessary every:													
(a) 20,000 km or 12 months on 1979–1984 and Utility models.			●			●		●			●		●
(b) 25,000 km or 12 months on 1985–1987 models.				●			●			●			●
MANUAL TRANSAXLE AND CLUTCH													
(1) Check the oil level every 20,000 km or 12 months and top up as necessary.			●			●		●			●		●
(2) Drain and refill the transaxle oil every:													
(a) 40,000 km or 24 months on 1979–1984 and Utility models.						●					●		
(b) 50,000 km or 24 months on 1985–1987 models.							●						●
(3) Check the clutch cable and, if applicable the hill holder adjustment every 25,000 km or 12 months.				●			●			●			●
(4) Inspect the Constant Velocity (CV) joint boots for damage and security every 10,000 km or 6 months. Renew the boots or joints as necessary.		●	●		●	●	●	●	●		●	●	●
AUTOMATIC TRANSAXLE													
(1) Check the oil level in both the transmission and the front differential every 10,000 km or 6 months. The transmission check should be performed after a run with the transmission at operating temperature and the selector lever in the Park or Neutral position and the engine running.		●	●		●	●	●	●	●		●	●	●
(2) Drain and refill both the transmission and differential oil every:													
(a) 40,000 km or 24 months on 1979–1984 and Utility models.						●					●		

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JOB	daily or 1,000 km	THOUSAND KILOMETRES											
		10	20	25	30	40	50	60	70	75	80	90	100
(b) 50,000 km or 24 months on 1985–1987 models.							●						●
NOTE: When the vehicle is subjected to extreme or severe conditions, it is advisable to change the automatic transaxle oils more frequently.													
REAR AXLE													
(1) On four wheel drive vehicles check the rear axle oil level every 20,000 km or 12 months and top up as necessary.			●			●		●			●		●
(2) On four wheel drive vehicles renew the rear axle oil every:													
(a) 40,000 km or 24 months 1979–1984 and Utility models.						●					●		
(b) 50,000 km or 24 months 1985–1987 models.							●						●
(3) On four wheel drive vehicles inspect the CV joint boots for damage every 10,000 km or 6 months. Renew the boots or joints as necessary.		●	●		●	●	●	●	●		●	●	●
(4) Dismantle, inspect and repack the rear hub bearings every:													
(a) 40,000 km or 24 months on 1979–1984 and Utility models.						●					●		
(b) 100,000 km or 48 months 1985–1987 models.													●
NOTE: Inspect the rear hub bearings and CV joint boots more often in vehicles that are driven through mud or water.													
STEERING GEAR													
(1) Check the level of the fluid in the power steering reservoir every 1,000 km or when the engine oil is checked.	●												
(2) Inspect the steering gear and linkages for security, damage, wear or leaks every 10,000 km or 6 months.		●	●		●	●	●	●	●		●	●	●
(3) Check and adjust the steering gear every 25,000 km or 12 months.				●			●			●			●
FRONT SUSPENSION													
(1) Dismantle and grease the front hub bearings every:													
(a) 40,000 km or 24 months on 1979–1984 and Utility models.						●					●		
(b) 100,000 km or 48 months on 1985–1987 models.													●
(2) Inspect the suspension ball joints boots for damage every 10,000 km or 6 months.		●	●		●	●	●	●	●		●	●	●
NOTE: Inspect the front hub bearings and ball joints more often in vehicles that are driven through mud or water.													
(3) Check the wheel alignment every 20,000 km or 12 months.			●			●		●			●		●

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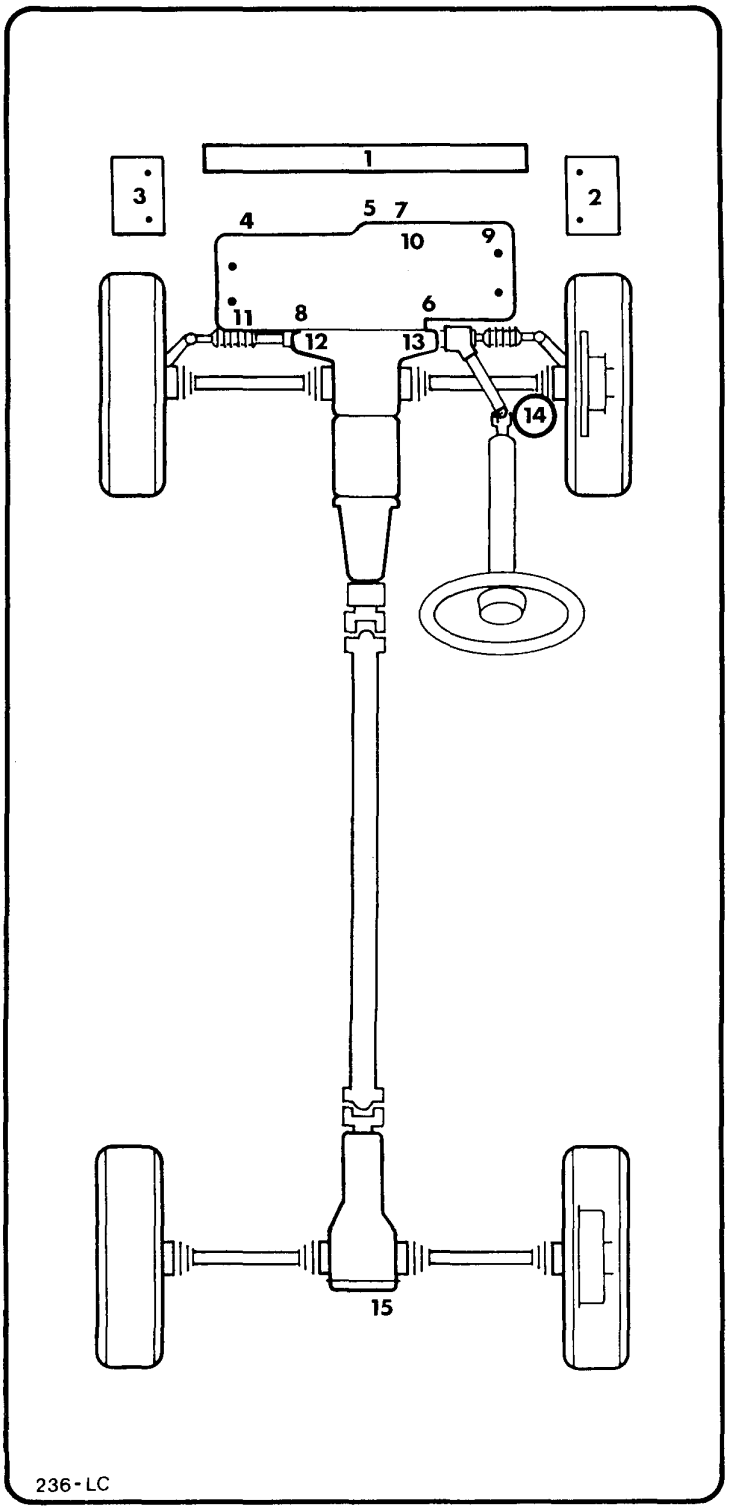
JOB	daily or 1,000 km	THOUSAND KILOMETRES											
		10	20	25	30	40	50	60	70	75	80	90	100
BRAKE SYSTEM													
(1) Check the level of fluid in the master cylinder visually each time the fuel tank is topped up or every 1,000 km. Top up as necessary using the correct brake fluid.	●												
NOTE: If constant topping up of the master cylinder is required the entire braking system should be checked for leaks.													
(2) Renew the brake fluid in the entire system every:													
(a) 20,000 km or 12 months on 1979–1984 and Utility models.			●			●		●			●		●
(b) 50,000 km or 24 months on 1985–1987 models.							●						●
(3) Inspect the disc pads for wear every 10,000 km or six months. Inspect the calipers for leakage.		●	●		●	●	●	●	●		●	●	●
(4) Inspect the rear brake shoe linings and drums for wear every 40,000 km or 24 months. Inspect the rear wheel cylinders for leakage.						●					●		
(5) Inspect the servo hose and check valve and all hydraulic brake lines for damage and chafing, paying particular attention to the flexible hoses every 20,000 km or 12 months.			●			●		●			●		●
NOTE: The servo unit check valve is incorporated in the hose on some models.													
(6) Overhaul the calipers and wheel cylinders on 1979–1984 and Utility models every 40,000 km or 24 months.						●					●		
(7) Check and adjust the operation of the footbrake and handbrake every 20,000 km or 12 months.			●			●		●			●		●
ELECTRICAL SYSTEM													
(1) Check and top up the battery electrolyte, if applicable, with distilled water as required or at least monthly, never allow the electrolyte level to fall below the plates.													
NOTE: On some models, the battery is maintenance free, requiring only the terminals to be kept corrosion free.													
(2) Renew the spark plugs every:													
(a) 20,000 km or 12 months on 1979–1984 and Utility models.			●			●		●			●		●
(b) 25,000 km or 12 months on 1985–1987 models.				●			●			●			●
(3) Inspect the distributor points, if applicable, for burning or pitting and lubricate the distributor cam every 10,000 km or 6 months. If the points are burned or pitted, the condenser and points should be renewed.		●	●		●	●	●	●	●		●	●	●
(4) Inspect the distributor cap, the rotor and the high tension leads for signs of deterioration or cracks every 20,000 km or 12 months.			●			●		●			●		●

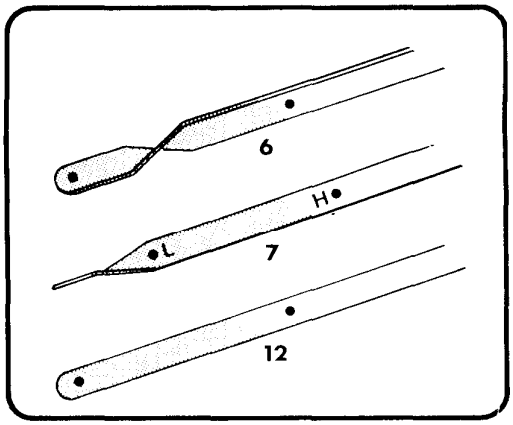
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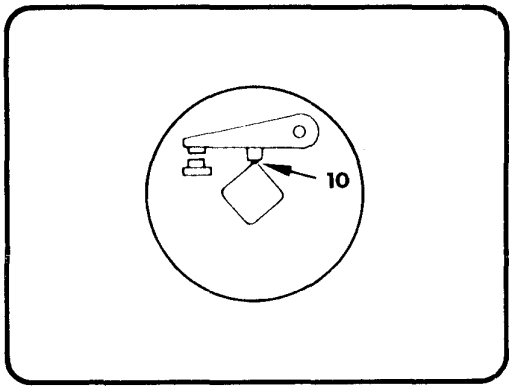
JOB	daily or 1,000 km	THOUSAND KILOMETRES										
		10	20	25	30	40	50	60	70	75	80	90	100
(5) Renew the distributor points and condenser, if applicable, every 20,000 km or 12 months.			●			●		●			●		●
(6) Check and adjust the ignition timing every:													
(a) 20,000 km or 12 months on 1979–1984 and Utility models.			●			●		●			●		●
(b) 25,000 or 12 months on 1985–1987 models.				●			●			●			●
(7) Check all electrical equipment including lamps, headlamp aim, horn and windscreen wipers every 20,000 km or 12 months.			●			●		●			●		●
BODY													
(1) Check and lubricate the following components every 20,000 km or 12 months with dry lubricant: Door locks and strikers, bonnet catch, luggage compartment lid or tailgate lock and striker. Lubricate with a few drops of engine oil: Door hinges, throttle cable and handbrake cable.			●			●		●			●		●
(2) Check all body and chassis nuts and bolts for security every 20,000 km or 12 months.			●			●		●			●		●
EMISSION CONTROL													
(1) Renew the PCV valve every:													
(a) 40,000 km or 24 months on 1979–1984 and Utility models.						●					●		
(b) 50,000 km or 24 months on 1985–1987 models.							●						●
(2) Inspect the operation of the EGR system, if applicable, every 20,000 km or 12 months.			●			●		●			●		●
(3) Check the charcoal canister, if applicable, and all emission control lines and hoses for signs of deterioration every 40,000 km or 24 months.						●					●		
(4) Renew the charcoal canister every 100,000 km on 1987 models.													●
WHEELS AND TYRES													
(1) At least once a fortnight check and adjust the tyre pressures when the tyres are cold. Frequent loss of pressure should be investigated and leakage rectified.													
NOTE: The recommended tyre pressures and the sizes of tyres which may be installed to the vehicle are printed on a decal positioned on the drivers door jam.													
(2) Inspect the tyres regularly for damage and abnormal wear. Any abnormal wear may be due to one or more of the faults shown in the illustrations in Tyre Wear Trouble Shooting in the Wheels and Tyres section.													

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3. LUBRICATON CHART





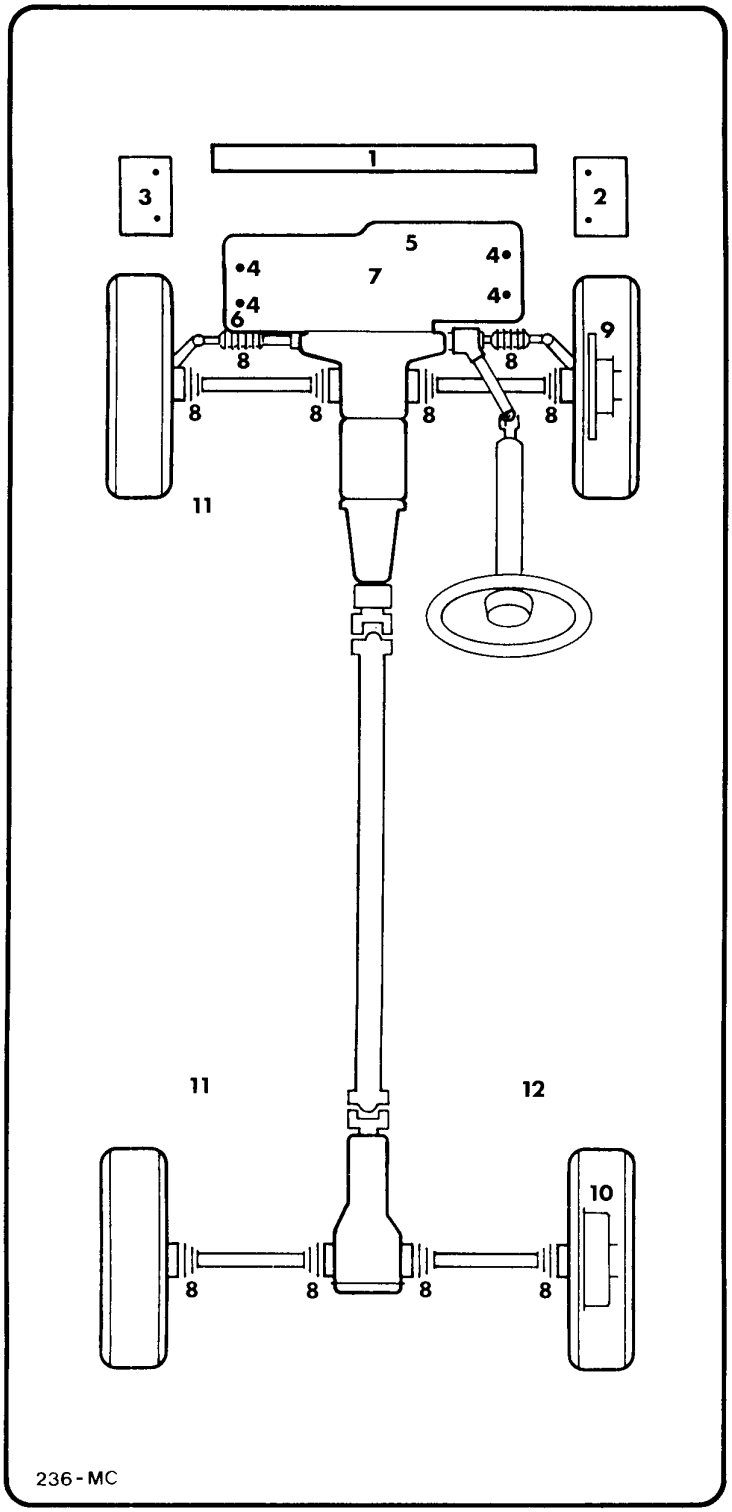


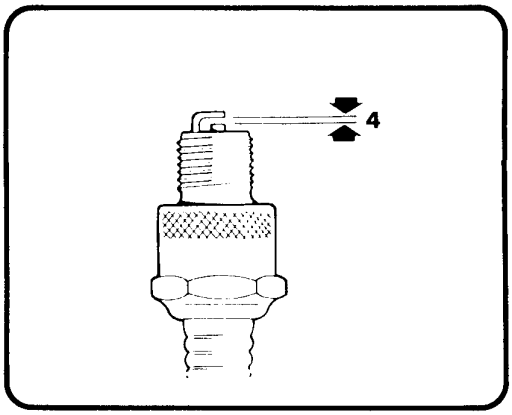
LUBRICATION KEY

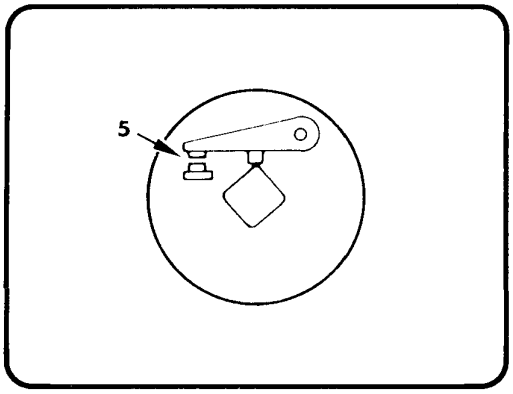
1. Radiator
2. Battery 1979–1984 and Utility models
3. Battery 1985–1987 models
4. Oil filter 1979–1984 and Utility models
5. Oil filter 1985–1987 models
6. Engine oil dipstick 1979–1984 and Utility models
7. Engine oil dipstick 1985–1987 models
8. Oil filler cap 1979–1984 and Utility models
9. Oil filler cap 1985–1987 models
10. Distributor cam lobe lubrication point 1979–1984 and Utility models
11. Distributor 1985–1987 models
12. Automatic transaxle, transmission dipstick
13. Manual transaxle and front differential dipstick
14. Brake master cylinder
15. Rear axle level plug

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4. MAINTENANCE CHART







MAINTENANCE KEY

1. Radiator
2. Battery 1979–1984 and Utility models
3. Battery 1985–1987 models
4. Spark plugs and plug gap measuring point
5. Distributor contact breaker gap 1979–1984 and Utility models
6. Distributor 1985–1987 models
7. Carburettor and air cleaner assembly
8. C.V. joint and steering boot checking points
9. Front brakes and hub bearings
10. Rear brakes and hub bearings
11. Fuel filter 1979–1984 and Utility models
12. Fuel filter 1985–1987 models

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SPECIFICATIONS

Refer to the tyre placard on the vehicle for tyre pressures and tyre sizes. Refer to local regulations regarding maximum wheel width and offset if fitting non standard wheels.

Wheel nut tightening torque . . . . . 98 Nm

1. HOW TO CHANGE A ROAD WHEEL

(1) Ensure that the vehicle is on level, firm ground and clear from any passing traffic.

(2) If necessary switch on the hazard flashers.

(3) Place the transmission in the P (Park) position on automatic transaxle models or reverse gear on manual transaxle models.

(4) Firmly apply the handbrake.

(5) Open the bonnet and remove the T bolt retaining the spare wheel to the carrier.

NOTE: If the vehicle has been in use prior to changing the wheel, the spare wheel may be quite hot, therefore use care when removing the T bolt and the spare wheel.



The spare wheel is located in the engine compartment. Take care when removing the T bolt and the spare wheel as they may be quite hot if the vehicle has been in use.

(6) Lift the spare wheel from the carrier and out of the engine compartment.

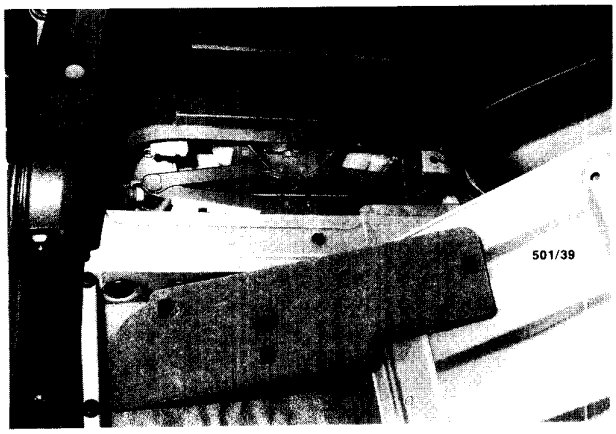
(7) On 1979–1984 and Utility models, remove the jack and jack handle from their mounting brackets in the engine compartment. Remove the wheel spanner from the tool kit in the luggage compartment.

On 1985–1987 models, remove the jack, jack handle and wheel spanner from their positions in the luggage compartment.

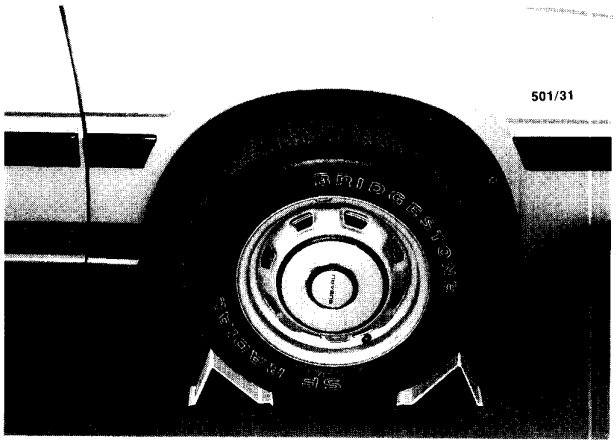
(8) Where fitted, remove the hub cap by engaging a screwdriver with one of the slots at the outer edge of the hub cap and prising it from the wheel.



View showing the location of the jack and jack handle, 1983 model shown.

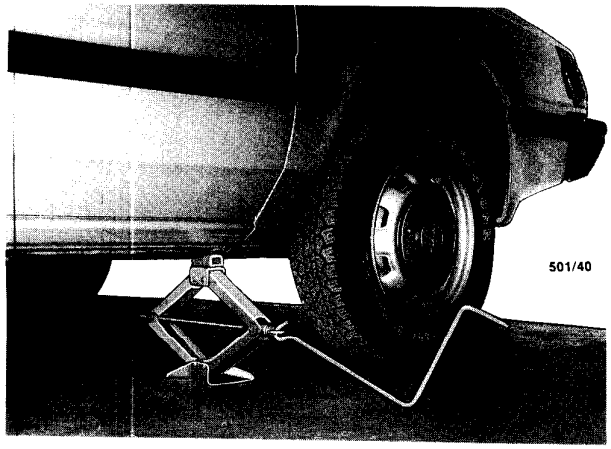


View of the jack and handle storage location, 1985–1987 Station Wagon.



Chock the front and rear of the wheel diagonally opposite the wheel being changed.

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View of the jack installed to the front jacking point.

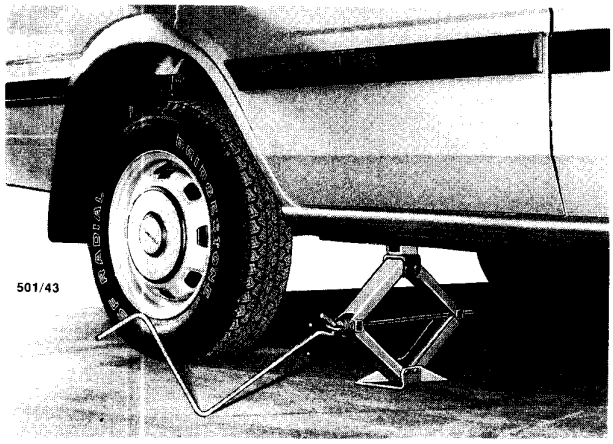
(9) Chock the road wheel diagonally opposite to the road wheel being removed. Ensure that the road wheel is chocked at the front and rear.

(10) Instal the wheel spanner to a road wheel nut in such a manner that the bar end of the spanner is horizontal and on the left hand side of the road wheel nut. Apply pressure to the end of the wheel spanner in an anti-clockwise direction and slacken the road wheel nut approximately half a turn. Carry out the above procedure on the remaining wheel nuts.

(11) Instal the jack to the relevant jacking point under the body sill panel, ensuring that the edge of the body sill panel fits into the jackhead slot.

(12) Fit the jack handle to the screw mechanism on the jack. Rotate the jack handle in a clockwise direction and slightly raise the vehicle. Check that the jack is still positioned correctly on the jacking point.

(13) Raise the vehicle so that the road wheel and tyre clears the ground. Allow enough clearance between the tyre and the ground for the spare road wheel to be installed.



View of the jack installed to the rear jacking point.

NOTE: Under no circumstance get under the vehicle whilst the jack is the only means of support.

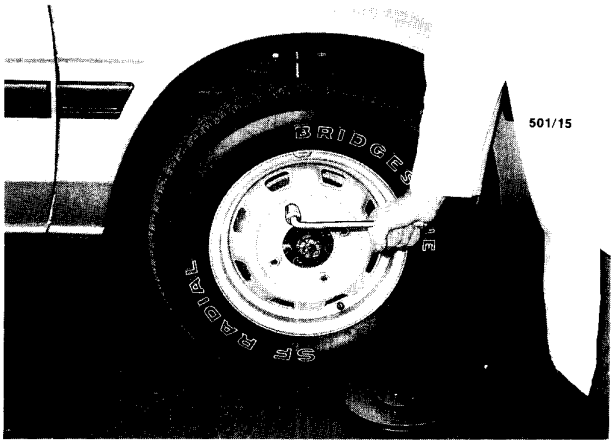
(14) Unscrew the road wheel nuts and remove the road wheel. Where fitted remove the cap from the centre of the road wheel and attach it to the spare road wheel.

(15) Fit the spare road wheel to the wheel hub and loosely instal the road wheel nuts. Where applicable, ensure that the taper on the wheel nuts faces towards the road wheel.

(16) Using the wheel spanner, tighten the road wheel nuts as much as possible.

(17) Lower the vehicle to the ground, by rotating the jack handle anti-clockwise and remove the jack from under the vehicle.

(18) Using the wheel spanner tighten the road wheel nuts in a diagonal sequence. It will be necessary to repeat the above procedure several times until the road wheel nuts are securely tightened.



Tighten the wheel nuts in a diagonal sequence.

(19) Remove the chocks from the road wheel.

(20) Instal the jack, jack handle and wheel spanner to their respective mounting brackets. Rotate the jack handle adaptor on the jack to secure it in the mounting bracket.

(21) Instal the defective road wheel to the carrier and tighten the T bolt securely.

(22) On 1985–1986 models fitted with small hub cap, place the hub cap on the wheel and rotate it in a clockwise direction until it locks into place.

On 1985–1987 models fitted with full wheel covers, locate the hole in the cover with the tyre valve stem and bump the cover onto the wheel.

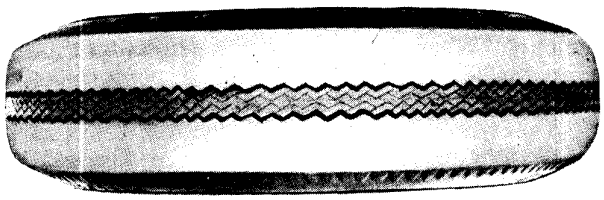
NOTE: Repair the defective road wheel as soon as possible and check the tyre pressure on the road wheel just installed.

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2. TYRE WEAR TROUBLE SHOOTING

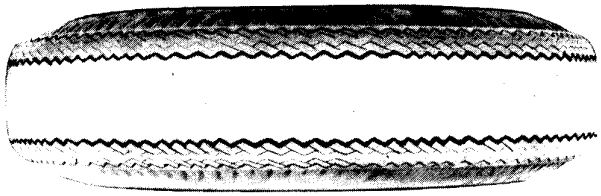
ABNORMAL WEAR ON BOTH SIDES OF TREAD

(1) Under inflation of tyres: Check and inflate to recommended pressures.
(2) Overloading: Reduce maximum loading.



ABNORMAL WEAR IN CENTRE OF TREAD

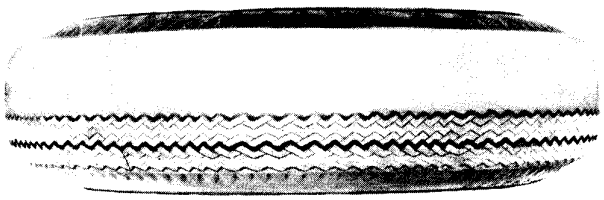
(1) Over inflation of tyres: Check and reduce to recommended pressure.



ABNORMAL WEAR ON INSIDE OF TREAD

Front Tyres

(1) Insufficient camber angle: Check front end alignment.
(2) Sagging front coil springs: Check and renew faulty springs.
(3) Loose or worn front hub bearings: Check and renew front hub bearings.
(4) Loose or worn suspension components: Check and renew faulty components.
(5) Bent steering knuckle: Check and renew steering knuckle.
(6) Incorrect ground clearance: Adjust ground clearance.



Rear Tyres

(1) Bent stub axle/suspension control arm: Check and renew stub axle/control arm.
(2) Loose or worn suspension components: Check and renew faulty components as necessary.
(3) Loose or worn rear hub bearings: Check and renew hub bearings.
(4) Incorrect ground clearance: Adjust ground clearance.

ABNORMAL WEAR ON OUTSIDE OF TREAD

Front Tyres

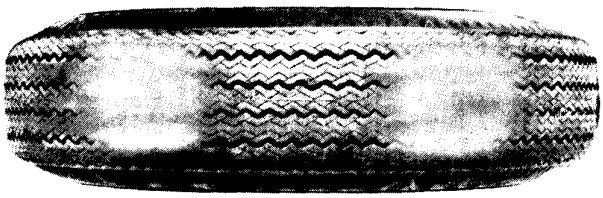
(1) Excessive camber angle: Check front end alignment.
(2) Incorrect coil springs fitted: Check and instal recommended replacement springs.
(3) Excessive speed when cornering: Revise driving habits.
(4) Incorrect ground clearance: Adjust ground clearance.

Rear Tyres

(1) Loose or worn suspension components: Check and renew faulty components as necessary.
(2) Bent stub axle/suspension control arm: Check and renew stub axle/control arm.
(3) Incorrect ground clearance: Adjust ground clearance.

SPOTTY OR IRREGULAR WEAR

(1) Static or dynamic unbalance of wheel and tyre assembly: Check and balance wheel and tyre assembly.
(2) Lateral run out of wheel: Check and true up or renew wheel.
(3) Excessive play in hub bearings: Check and adjust or renew hub bearings.
(4) Excessive play in front suspension ball joints: Check and renew ball joints.



LIGHTLY WORN SPOTS AT CENTRE OF TREAD

(1) Static unbalance of wheel and tyre assembly: Check and balance wheel and tyre assembly.
(2) Radial run out (eccentricity) of wheel: Check and renew wheel.

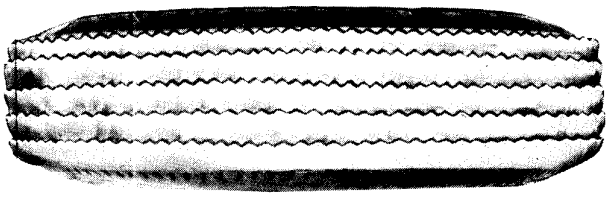
FLAT SPOTS AT CENTRE OF TREAD

(1) Repeated severe brake application: Revise driving habits.
(2) Lack of tyre rotation: Periodically rotate wheel and tyre assemblies.

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HEEL AND TOE WEAR (SAWTOOTH EFFECT)

(1) Overloading: Revise maximum loading.
(2) High speed driving: Avoid as far as possible.
(3) Excessive braking: Revise driving habits.



FEATHERED EDGE ON SIDE OF TREAD

Front Tyres

(1) Sharp inside edge, excessive toe in: Check and adjust wheel alignment.

(2) One tyre sharp inside edge, other tyre sharp outside edge: Check for bent steering knuckle and renew.

Rear Tyres

(1) Loose or worn suspension components: Check and renew faulty components as necessary.

(2) Stub axle bent/suspension control arm: Check and renew stub axle/control arm.

3. CARE AND MAINTENANCE

Steel Wheels

Steel wheels should be regularly cleaned of all foreign matter, such as dirt and mud. If foreign matter is allowed to build up it will affect the balance of the wheel and may cause vibrations and uneven tyre wear. If the paint has been chipped or scratched it should be touched up as soon as possible to prevent rust.

Any minor damage to the wheel rim can usually be removed using a suitable hammer after the wheel has been removed from the vehicle. However any major rim damage or buckling of the wheel will necessitate renewing the wheel. It is good policy to occasionally remove the wheels from the vehicle and inspect them for damage, cracks or corrosion.

Alloy Wheels

Alloy wheels should be regularly cleaned of all foreign matter, such as dirt and mud. If foreign matter is allowed to build up it will affect the balance of the wheel and may cause vibrations and uneven tyre wear. Alloy wheels are particularly susceptible to corrosion damage particularly if exposed to salt water.

Alloy wheels being relatively soft in comparison to steel are easily scuffed, however this will not affect the serviceability of the wheel. Where heavy damage has been sustained to the wheel it should be renewed. Buckling or cracking of an alloy wheel cannot be repaired.

Tyres

The depth of the tyre tread grooves should never be allowed to be less than 1.5 mm before the tyres are renewed. The tyres should also be renewed when any damage, whether it be internal or external, is evident. Minor punctures or leaks should be properly repaired. Refer the tyre to a tyre specialist if there is any doubt about the serviceability of the tyre.

The tread, tread grooves and sidewalls should be regularly inspected for foreign matter, i.e.: nails, stones etc. Where foreign matter is detected it should be removed from the tyre and if necessary the puncture repaired.

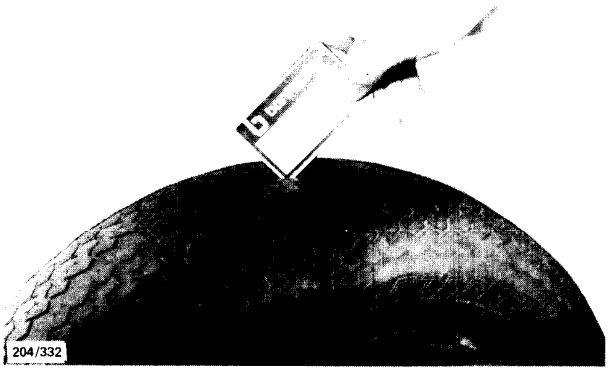
The tyre valves should always have the caps installed, be regularly cleaned of dirt or dust and be inspected for wear, leaks or damage every time the tyre pressures are checked.

Regularly inspect the tread of the tyres for signs of uneven wear, if uneven wear is apparent refer to the heading Tyre Wear Trouble Shooting in this section for possible causes and cures. If the uneven tyre wear is noticed early enough, the cause correctly identified and the necessary cure carried out, the life of the tyre should be extended.

To preserve tyre life it is good policy to periodically have the front wheels balanced and the front end alignment checked on a reliable wheel alignment machine.

The air pressure in the tyre is probably the single most important aspect of tyre care, too little or too much pressure in the tyre can cause rapid wear or complete failure through overheating. Where possible the tyre pressures should be checked and adjusted when the tyres are cold.

As a rule, different tyre types, tread patterns or sizes should never be used in the vehicle at one time. All the tyres on the vehicle, including the spare, should be a matched set to prevent the vehicle behaving erratically under certain conditions. Under no circumstances mix radial ply and conventional ply tyres.



The white edge of a Bankcard can be used to gauge the tread depth of the tyre. The width of the edge of the Bankcard is the same as the minimum legal trend depth.

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1. TUNE-UP SPECIFICATIONS

Firing order	1-3-2-4
Spark plug type	NGK BP6ES
Spark plug gap	0.7–0.9 mm
Spark plug tightening torque	24 Nm
Breaker point distributor, 1979–1984 and Utility models:	
Breaker point gap	0.45–0.55 mm
Dwell angle	49–55 deg
Ignition timing	8±2 deg btdc
Idle speed	800±50 rpm
Valve clearances, 1979–1984 and Utility models (cold):	
Inlet	0.23–0.27 mm
Exhaust	0.33–0.37 mm
Drive belt deflection	See text
Compression pressures at 350 rpm:	
1979–1984 and Utility models —	
1600 cc (ohv)	1078 kPa
1800 cc (ohv)	1128 kPa
1985 Sedan and Station Wagon models —	
1800 cc (ohc)	1108 kPa
1986–1987 Sedan and Station Wagon models —	
1800 cc (ohc)	1079 kPa

* Use specifications on emission control label inside the engine compartment if different to above.

2. TUNE-UP OPERATIONS

TO ADJUST DRIVE BELTS

It is essential that all belts be adjusted to prevent slip but without imposing excessively upon the component bearings, particularly the alternator or water pump bearings.

The drive belts should be adjusted using the following procedure:

(1) Using the finger and thumb pressure push firmly on the belt concerned in the middle of the longest run to assess deflection.

(2) Drive belts with a longest run of less than 300 mm should have a deflection of between 3 and 6 mm, whereas drive belts with a longest run of more than 300 mm should have a deflection of between 3 and 13 mm.

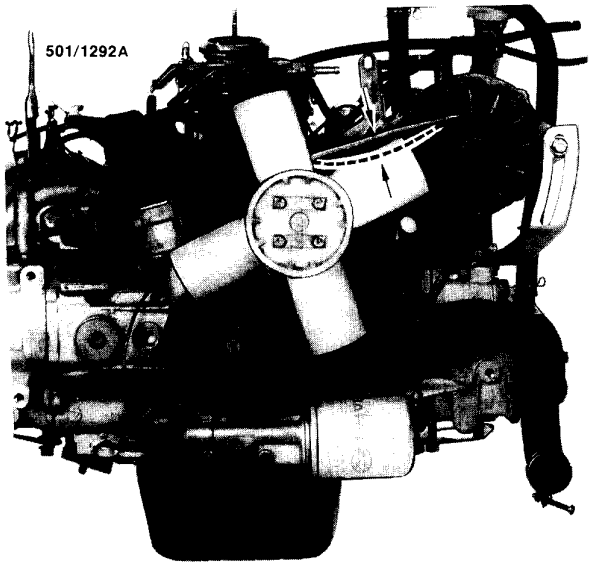
1979–1984 and Utility Models Without Power Steering

(1) Loosen the alternator mounting and adjusting bolts.

(2) Using a suitable lever and prying on the alternator, carefully move the alternator out to adjust the drive belt.

(3) Tighten the adjusting bolt and check the drive belt deflection as previously described. Readjust the drive belt if necessary.

(4) When the drive belt deflection is correct, tighten the adjusting and mounting bolts securely.



Drive belt deflection measuring point, 1979-1984 and Utility models without power steering.

1979–1984 and Utility Models With Power Steering

(1) Adjust the alternator drive belt as described for models without power steering.

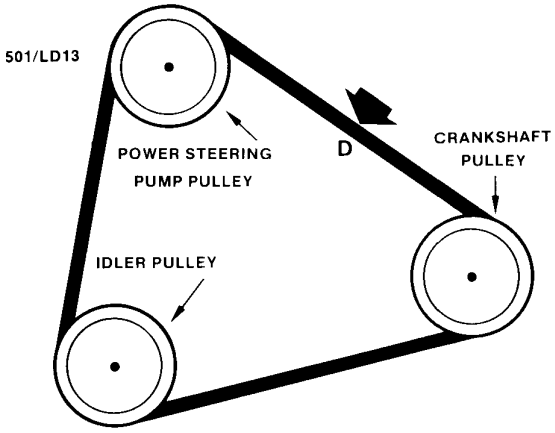
(2) To adjust the power steering drive belt, remove the dust cover from the idler pulley and loosen the idler pulley retaining nut.

(3) Working under the vehicle, rotate the adjusting bolt to move the idler pulley and tension the drive belt.

(4) Check that the drive belt deflection is correct, tighten the idler pulley retaining bolt securely and instal the dust cover to the idler pulley.

1985–1987 Sedan and Station Wagon Models Without Power Steering or Air Conditioning

(1) Loosen the alternator mounting and adjusting bolts.



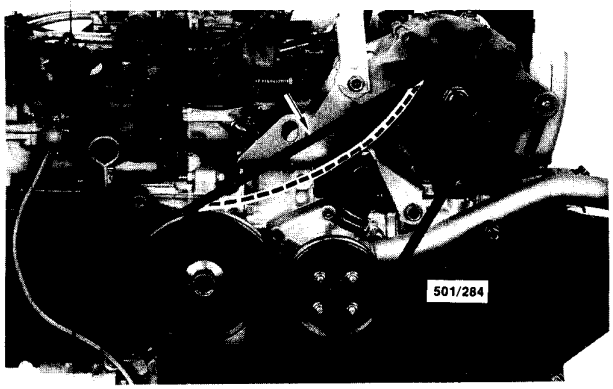
D = Power steering drive belt measuring point, 1979–1984 and Utility models.

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(2) Using a suitable lever and prying on the alternator, carefully move the alternator out to adjust the drive belt.

(3) Tighten the adjusting bolt and check the drive belt deflection as previously described. Readjust the drive belt if necessary.

(4) When the drive belt deflection is correct, tighten the adjusting and mounting bolts securely.



Drive belt deflection measuring point 1985-1987 Sedan and Station Wagon models.

1985–1987 Sedan and Station Wagon Models With Power Steering

(1) Adjust the drive belts as described for models without power steering.

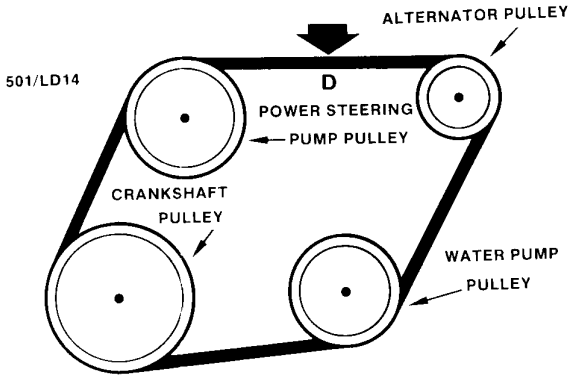
(2) When checking the drive belt deflection, ensure that both belts have equal deflection. Renew the belts as a pair if equal deflection cannot be achieved.

1985–1987 Sedan and Station Wagon Models With Air Conditioning

(1) Adjust the alternator drive belt as described for models without power steering or air conditioning.

(2) To adjust the air conditioning compressor drive belt, loosen the idler pulley retaining bolts and pry the idler pulley out to adjust the drive belt deflection.

(3) Tighten the idler pulley retaining bolts and check that the drive belt deflection is correct. Readjust the drive belt if necessary.



D = drive belt deflection measuring point, 1985-1987 Sedan and Station Wagon models with power steering.

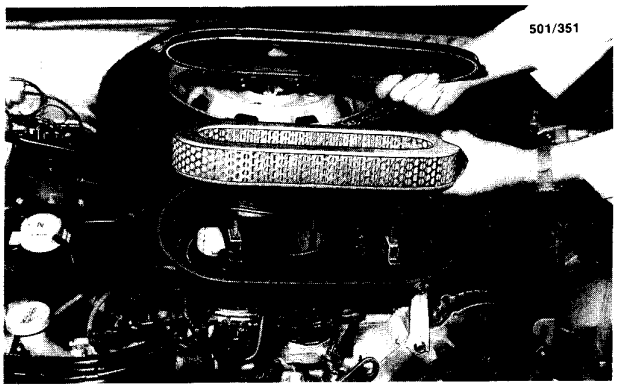
1985–1987 Sedan and Station Wagon Models With Air Conditioning and Power Steering

Adjust the drive belts as described for models with air conditioning.

TO SERVICE AIR CLEANER

The air cleaner is equipped with a viscous paper type element. The element should be regularly inspected, it should be renewed at the recommended intervals. Refer to the Lubrication and Maintenance section for the correct intervals. The distance is only a guide for normal operating conditions and should be reduced accordingly if the vehicle is operating under extremely dusty conditions.

NOTE: Paper air cleaner elements should not be washed in petrol or any other type of cleaning solvent. If the element has been washed in solvent or has become oil soaked it should be renewed.



The air cleaner element should be renewed at the recommended intervals.

(1) Remove the wing nuts retaining the air cleaner top cover to the air cleaner body and remove the top cover.

(2) Remove the element from the air cleaner body. Inspect the element and renew it if its serviceability is in doubt.

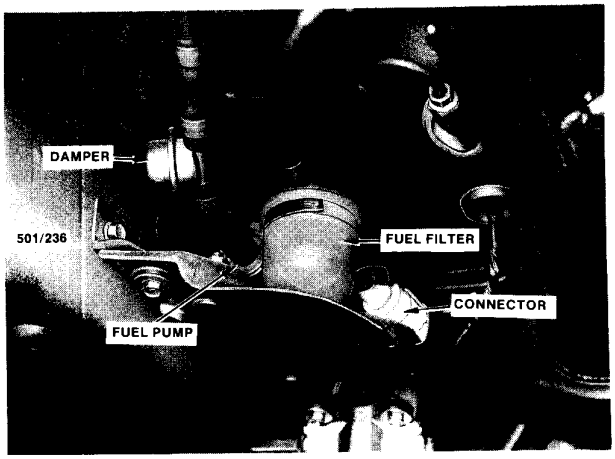
(3) Clean the body and top cover and inspect the positive crankcase ventilation (PCV) filter. Renew the PCV filter if its serviceability is in doubt.

Installation is a reversal of the removal procedure.

TO CHECK AND RENEW FUEL FILTER

The fuel filter is located either in the engine compartment or under the vehicle to the left or right of the fuel tank.

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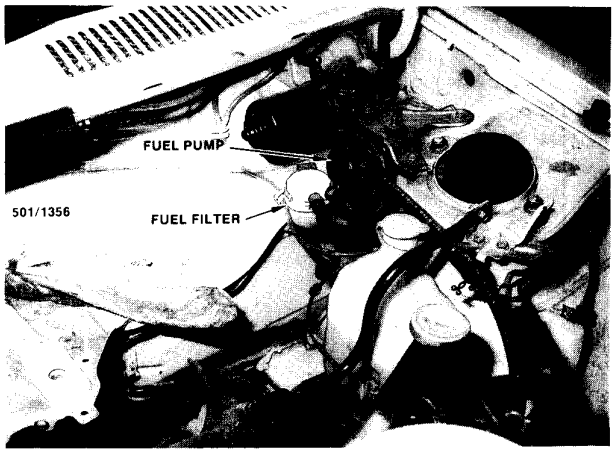
Underbody view of fuel pump and fuel filter, 1986 model shown.

(1) If necessary, raise the rear of the vehicle and support it on chassis stands.

(2) Inspect the fuel filter for any signs of dirt or water. If dirt or water are evident in the filter, renew it as follows.

(3) Remove the filter from the retaining clip and clamp closed the fuel hose leading from the fuel tank using a brake hose clamp.

Ensure that the hose is not damaged when clamping closed.



Engine compartment view of fuel pump and fuel filter, 1983 model shown.

(4) Place a suitable container under each hose in turn, squeeze the tangs on the fuel hose clamp to open the clamp and withdraw the fuel hose from the filter. Drain the fuel from the hoses into the container.

(5) Push the hoses onto the new filter and secure them with the hose clamps.

(6) Remove the brake hose clamp and instal the filter to the retaining clip.

(7) Run the engine and check for fuel leaks.

TO SERVICE CONTACT BREAKER POINTS

(1) Remove the distributor cap and rotor arm. Secure the distributor cap to one side.

(2) Loosen the screw retaining the wiring terminals to the insulator block and withdraw the contact breaker point lead from the insulator block.

(3) Remove the screws retaining the contact breaker points to the breaker plate and withdraw the points from the distributor.

(4) Inspect the contact breaker points and if they are not badly pitted, clean and reface them on a smooth oil stone or with a points file. Wash the contact breaker points in clean solvent to remove all traces of oil and dirt.

NOTE: New contact breaker points should be washed in solvent to remove the anti-corrosive dressing, and thoroughly dried before installing.

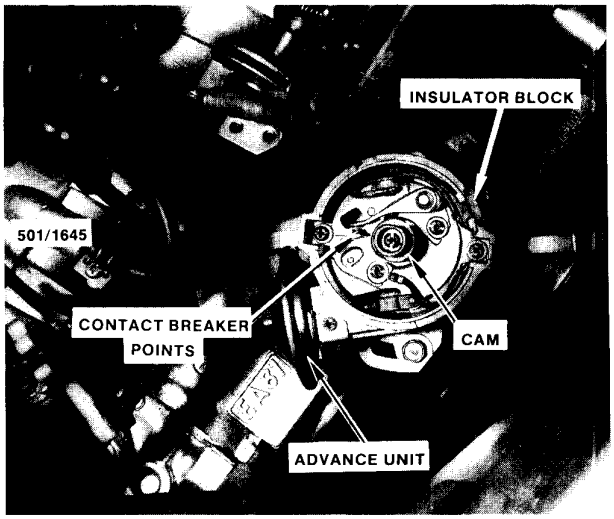
(5) To instal the contact breaker points reverse the removal procedure.

(6) Turn the engine clockwise as viewed from the front until the rubbing block of the moving contact is on the highest point of a cam lobe.

(7) Slightly loosen the fixed contact plate retaining screws and using a suitable screwdriver, move the contact plate in the necessary direction until a clean feeler gauge blade of the specified thickness is a neat sliding fit in the point gap. Tighten the contact plate retaining screws and again check the fit of the feeler gauge blade between the contact points.

(8) Sparingly lubricate the cam and contact breaker point spindle with engine oil and instal the rotor arm and the distributor cap.

(9) Check and adjust the distributor dwell angle and the ignition timing as described under To Adjust Dwell Angle and Ignition Timing.



Installed view of the distributor with cap and rotor arm removed.

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TO SERVICE HIGH TENSION LEADS

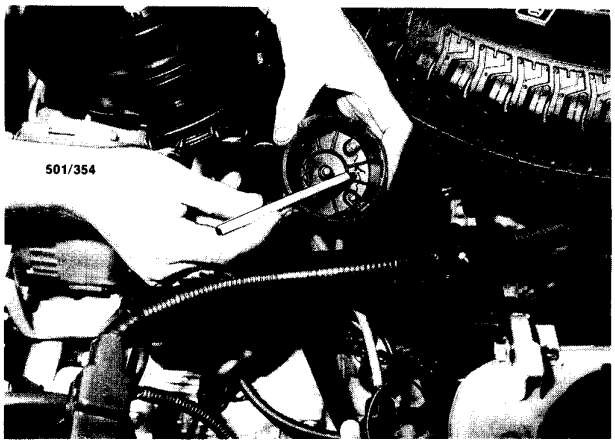
Check the cables for perishing or cracking and renew as required. Never attempt to repair defective carbon impregnated core cables.



Check the high tension terminals for corrosion and burning.

The cables may be carefully cleaned, using a cloth moistened with kerosene, then wiping completely dry.

Also check the distributor cap for cracks or tracking between the high tension terminals on both the inside and outside of the cap. Renew the cap if cracks or tracking are evident.



Check the distributor cap for cracks and tracking.

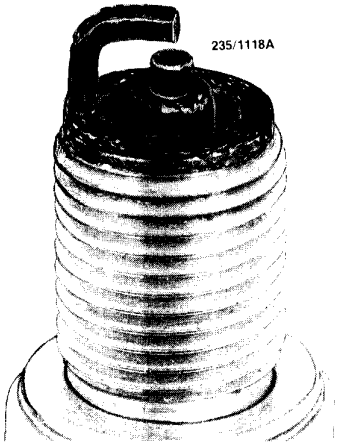
Check the carbon brush in the centre of the distributor cap for evidence of arcing and renew as necessary.

NOTE: Care must be exercised when removing the cables from the spark plugs to ensure that the cables are not damaged by stretching. Always remove the cable from the spark plug by pulling on the rubber insulator.

TO SERVICE SPARK PLUGS

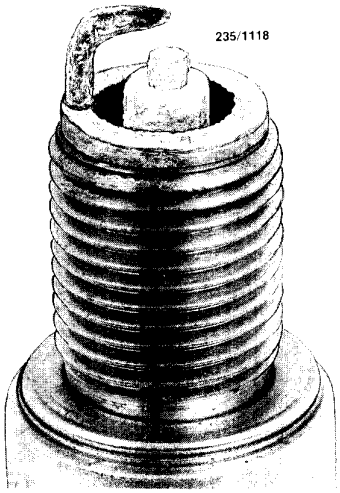
The spark plugs should be removed for inspection, cleaning and resetting at the recommended intervals.

Before removing the spark plugs ensure that the area around the plugs is clean to prevent foreign matter entering the cylinders when the plugs are removed.



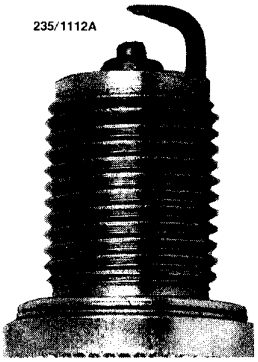
Black damp deposits can be caused by excessive oil consumption or incorrect plug type. Spark plugs in this condition are usually not firing.

Spark plugs removed from an engine in good condition operating under normal conditions should have a light powdery deposit ranging in colour from light brown to greyish tan. After considerable service the electrodes will show signs of wear or normal burning. Spark plugs showing a thick black oily deposit indicate an engine in poor mechanical condition or possibly that a plug with too low a heat range has been fitted.



Spark plug with burnt electrodes and white blistered appearance, possibly due to incorrect plug type, loose plug or motor running too hot.

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When plug electrodes are eroded to this degree the spark plug can be considered worn out and should be replaced using a plug of the recommended heat range.

Spark plugs showing a white or yellowish deposit indicate sustained high speed driving or possibly that plugs of too high heat range have been fitted, particularly when these deposits are accompanied by blistering of the porcelain and burning of the electrodes.

If the heat range is correct, clean the plugs on a sand blasting machine and blow clean with compressed air.

Ensure that all trace of abrasive grit is removed from the well in the plug body.

Carefully open the electrodes and lightly file the electrodes flat with a points file.

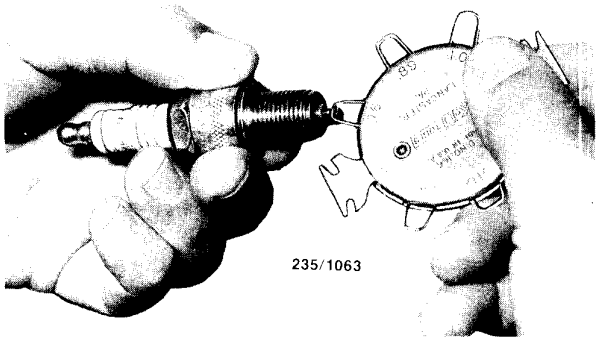


Lightly file the plug electrodes flat with a points file.

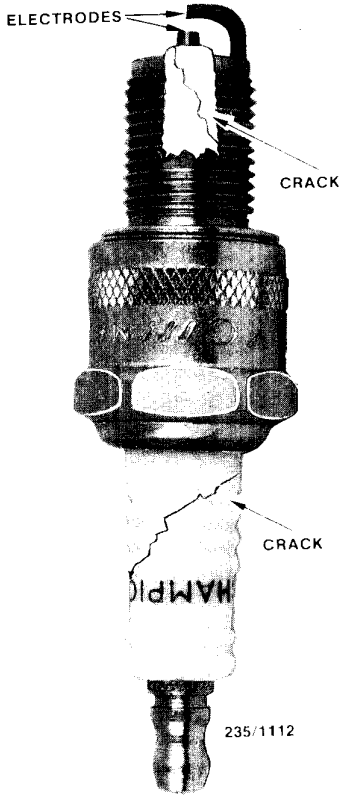
Check the gaps between the electrodes preferably with clean wire gauges. If wire gauges are unavailable then use clean feeler gauges. If necessary move the earth electrode towards or away from the centre electrode to obtain the correct gap. Never attempt to move the centre electrode otherwise damage to the porcelain insulator will result.

Clean the spark plug threads, screw the plugs into the cylinder head finger tight then use a tension wrench to tighten the plugs to the specified torque.

NOTE: If a torque wrench is unavailable extreme care must be taken when tightening the spark plugs as overtightening may lead to stripping of the thread from the cylinder head. If new plugs are tightened with the fingers and then taken up an additional ¼ of a turn with a spanner they will be quite tight enough. Wherever possible instal new gaskets to spark plugs that are going back into service.



Checking spark plug electrode gap with wire gauge.



Cutaway view of spark plug showing crack in the insulator nose which can be caused by exerting pressure against the centre electrodes when adjusting the gap. Other crack shown on the insulator is caused by tilting the plug spanner.

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TO ADJUST VALVE CLEARANCES

On OHC engines (1985–1987 Sedan and Station Wagon models) the valves are operated by hydraulic tappets and are therefore non-adjustable.

On OHV engines (1979–1984 and Utility models) proceed as follows.

(1) Ensure that the engine is cold.

(2) Disconnect the PCV hoses from the rocker covers.

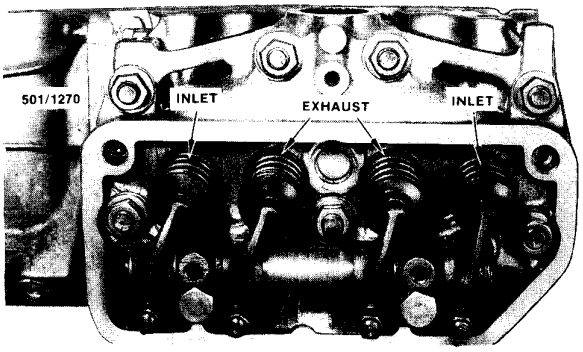
(3) Remove the bolts retaining the rocker covers to the cylinder heads, remove the rocker covers from the engine and discard the rocker cover gaskets.

(4) Remove the distributor cap and secure it to one side.

(5) Remove the timing access plug from the flywheel housing and rotate the engine in the normal direction of rotation until the distributor rotor is pointing to the position of the number one spark plug lead in the distributor cap and the timing mark on the flywheel is at tdc. This will bring number one cylinder to tdc on the compression stroke.

(6) Insert a feeler gauge of the specified thickness between the rocker and valve stem of either valve of number one cylinder. The feeler should be a light sliding fit between the adjusting screw and the valve stem.

NOTE: The arrangement of the valves in both cylinder heads are; inlet, exhaust, exhaust, inlet, as viewed from the front of the engine.



View showing the valve arrangement, OHV engines.

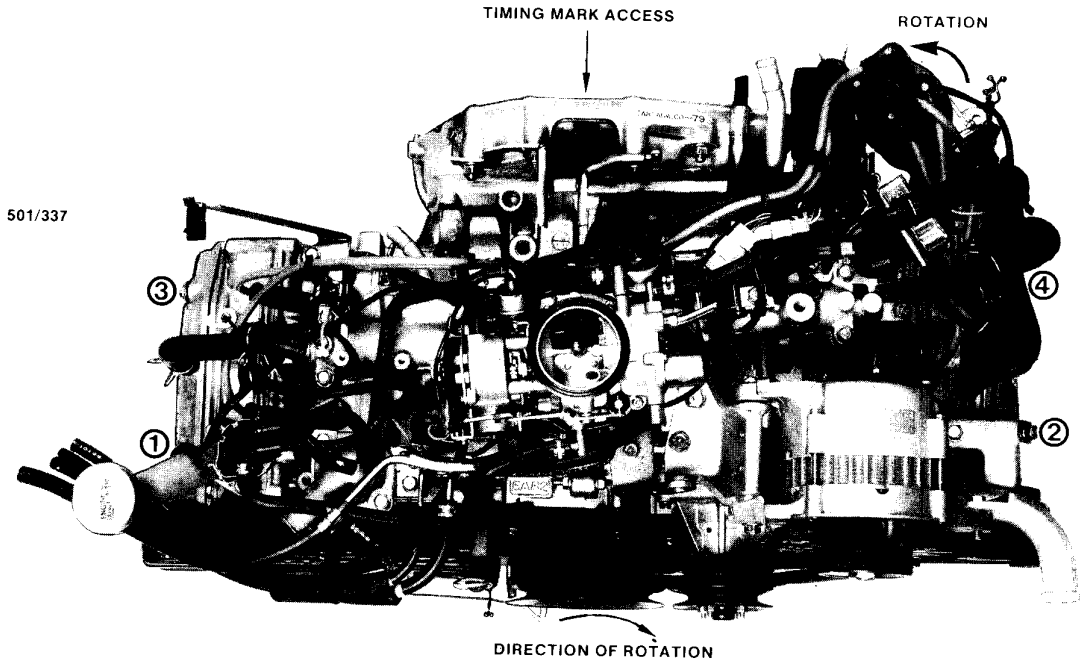
(7) If necessary, hold the adjusting screw with a suitable spanner and loosen the locknut sufficiently to allow adjustment of the adjusting screw to be made.

(8) With the feeler gauge in position, tighten the adjusting screw until the feeler gauge is a light sliding fit between the adjusting screw and the valve stem.

(9) Hold the adjusting screw and tighten the locknut securely.

(10) Check the valve clearance after tightening the locknut and readjust the clearance if necessary, making allowances for any alteration to the final clearance caused by tightening the locknut.

If the final clearance is too tight, set the adjusting screw to provide a looser fit of the feeler gauge when moving the adjusting screw and a firmer fit if the final clearance is too loose.



Top view of the engine showing the cylinder numbering sequence and the direction of rotation of the distributor and engine, 1986 model shown.

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(11) Repeat steps (6) to (10) for the remaining valve of number one cylinder.

(12) Rotate the engine in the normal direction of rotation until the distributor rotor is pointing to the position of number three spark plug lead in the distributor cap and the contact breaker points are just beginning to open. This will bring number three cylinder to tdc on the compression stroke.

(13) Repeat the adjustment procedure for both valves of number three cylinder.

(14) Rotate the engine to bring number two cylinder to tdc on the compression stroke as described for number three cylinder and repeat the adjustment procedure for both valves of number two cylinder.

(15) Rotate the engine to bring number four cylinder to tdc on the compression stroke as previously described and repeat the adjustment procedure for both valves of number four cylinder.

(16) With all valve clearances correctly adjusted, instal the rocker cover to the engine using a new gasket and tighten the retaining bolts securely.

(17) Instal the PCV hoses to the rocker covers, the distributor cap to the distributor and the timing access plug to the flywheel housing.

(18) Start and run the engine and check for oil leaks.

TO TEST COMPRESSION

It is advisable on vehicles equipped with adjustable tappets (1979–1984 and Utility models), to check and adjust the valve clearances prior to carrying out a compression test as insufficient clearances may show the same symptoms as burnt valves. On unleaded petrol models, remove the Ignition Coil/Fuel fuse from the fuse box to prevent excess fuel being drawn into the engine and possibly damaging the catalytic converter.

(1) With the engine at operating temperature, disconnect the high tension leads from the spark plugs.

(2) Ensure that the area around each spark plugs is clean to prevent foreign matter entering the cylinders and then remove the spark plugs.

(3) Isolate the ignition by removing the low tension lead from the coil positive terminal.

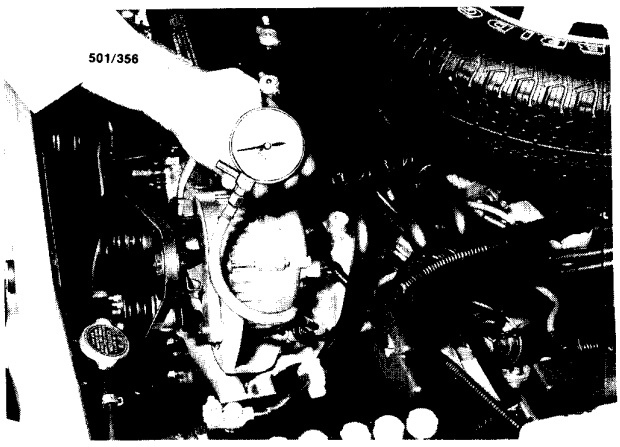
(4) Apply a compression gauge to number one spark plug hole according to the manufacturers instructions of the instrument being used.

(5) Have an assistant fully open the throttle and operate the starter switch to rotate the engine. Observe the compression gauge and stop the engine when the gauge has reached the highest reading.

(6) Record the reading and then check the compression of the remaining cylinders in the same manner.

(7) Compare all readings taken. Variation between cylinders should not exceed 10%.

(8) If a low reading is taken on one or more cylinders the trouble may be isolated as follows:



Checking the cylinder compression using a compression gauge.

(a) Inject a small amount of engine oil into the spark plug hole of the cylinder concerned ensuring that the oil is evenly distributed within the cylinder.

(b) Repeat the compression test on the cylinder concerned.

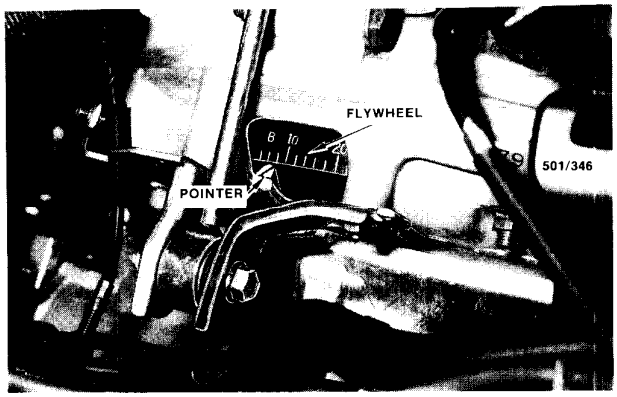
A substantial increase of compression pressure indicates faulty or worn piston rings, pistons or cylinder. No increase of compression pressure indicates burnt, obstructed or sticking valves, or a leaking or blown head gasket.

TO ADJUST DWELL ANGLE AND IGNITION TIMING

NOTE: On electronic ignition systems the dwell angle is electronically controlled and pre-set and cannot be adjusted.

A tachometer suitable for conventional ignition systems may not operate when connected to electronic ignition systems.

Ensure that the timing light connected to electronic ignition systems does not produce transient voltages that could damage semi conductors.



The timing marks are located on the flywheel and flywheel housing, 1986 model shown.

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(1) Connect a suitable tachometer, timing light and where applicable a dwell meter to the engine according to the meter manufacturers instructions. Start the engine and bring it to normal operating temperature.

(2) Adjust the engine idle speed to Specifications. Disconnect and plug the distributor vacuum line.

(3) Where applicable check the dwell angle (see Specifications). Adjust by increasing the contact breaker point gap to decrease dwell or decreasing the point gap to increase dwell. The engine will have to be stopped and the distributor cap and rotor arm removed to carry out this operation.

(4) After setting the dwell angle at idle speed increase the engine speed to 1500 rpm. Slowly lower the engine rpm back to the idle rpm and at the same time observe the dwell meter. Dwell angle variation should not exceed two degrees.

Excessive variation in dwell angle indicates worn components within the distributor in which case the distributor should be removed for overhaul (see Electrical System section).

(5) Remove the timing access plug from the flywheel housing and with the engine running at the specified idle speed and the distributor vacuum line disconnected, aim the timing light beam to the graduated marks on the timing scale.

(6) Correct timing is achieved when the mark on the flywheel is adjacent to the specified timing mark on the timing scale.

(7) Adjust the timing position by loosening the distributor retaining nut and by turning the distributor slowly in the required direction.

(8) After the correct timing position has been determined make sure the distributor to engine retaining nut is firmly tightened.

(9) Reconnect the vacuum advance line to the distributor and adjust the engine idle speed to Specifications. (See to Adjust Idle Speed and Mixture).

(10) Switch off the engine, remove the test instruments and reconnect all disconnected wiring.

TO ADJUST IDLE SPEED AND MIXTURE

NOTE: Before finally adjusting the idle speed and mixture setting ensure that the following conditions are met:

The air cleaner element is clean and installed.

The ignition timing is correctly set.

The fuel float level is correct and the choke is fully open.

(1) Connect a suitable tachometer to the engine following the manufacturers instructions.

(2) Start and run the engine until it reaches normal operating temperature.

(3) Adjust the throttle stop screw as required to obtain the specified idle speed. See Specifications.

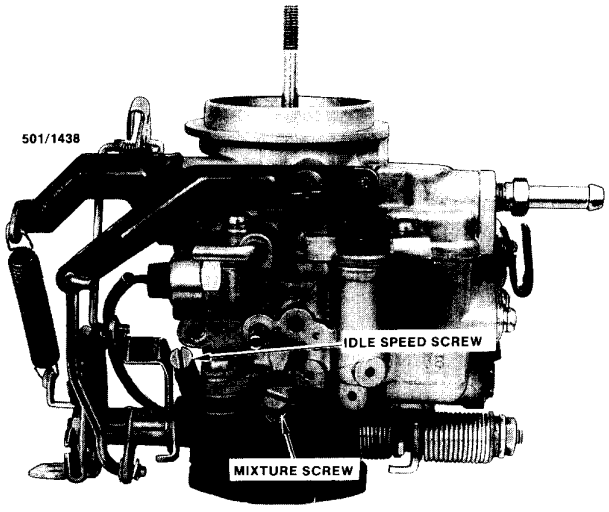
(4) On 1979–1984 and Utility models, if the engine does not idle smoothly at the specified rpm, the idle mixture may be adjusted temporarily as follows:

(a) Adjust the throttle stop screw to give an idle speed of approximately 800 rpm.

(b) Turn the idle mixture screw in clockwise until the engine slows and begins to falter, then turn the mixture screw slowly anti-clockwise until the engine runs smoothly again, but does not lose speed or hunt.

(c) Readjust the throttle stop screw to obtain the correct idle speed. See Specifications.

NOTE: The above mentioned procedure to adjust the idle mixture is only a temporary measure. Final mixture adjustment must be made using a gas analyser.



Side view of 1983 carburettor showing idle speed screw and mixture screw.

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CAUTION: To prevent severe electrical shock, extreme care must be taken when working on or near the electronic ignition system as dangerous high tension voltages are produced in both the primary and secondary circuits. See text for precautionary notes.

This section deals with the common causes of engines failure to start, as inevitably there will come a time when every driver will experience this problem and will therefore, need to call upon his own resources to rectify the trouble. Roadside breakdowns other than engine failure can be indentified by reference to the Trouble Shooting section on the particular component affected.

1. TROUBLE SHOOTING

Trouble shooting is only a process of elimination and provided the procedure is carried out correctly and systematically an accurate diagnosis of the trouble can be made in the minimum amount of time.

For an internal combustion engine to run there are three basic requirements, these are ignition, fuel and compression. There are other factors of course but as a rule an engine's failure to start can be attributed to a fault in one of these three systems.

Reports from field engineers of motoring organisations prove that the biggest percentage of engine breakdowns are in the order of ignition or electrical failure first, followed by fuel, with mechanical or compression failure the least common.

Should the engine fail to start, first check that there is adequate fuel in the tank and if so, carry out the following checking procedures in the order described.

SERVICE PRECAUTIONS FOR UNLEADED PETROL MODELS

The catalytic converter fitted to unleaded petrol models is susceptible to damage due to overheating and excess fuel contamination, therefore the following precautions should be observed if the vehicle is running abnormally or fails to start.

Do not push or tow start the vehicle.

Do not prime the carburettor by pouring fuel down the carburettor throat.

Do not allow the ignition system to be disconnected while the vehicle is in motion and the transaxle is in gear, i.e. do not switch off the ignition, do not drive the vehicle if an intermittant fault is evident in the ignition system.

Do not allow the engine to idle with any ignition high tension leads disconnected.

Do not allow the engine to idle for prolonged periods if the engine is misfiring or idling roughly.

Refer to the Emission Control section for further information.

2. TO CHECK IGNITION AND ELECTRICAL SYSTEMS

(1) Switch on the ignition and check for warning lamp illumination on the dashboard.

(2) Operate the starter and check that the starter rotates the engine at a steady speed.

(3) Switch on the headlamps and check for good light intensity.

Should the lamps not illuminate or the starter motor not turn the engine, carry out the following steps.

(a) Remove the battery terminals and clean both terminals and posts. Refit the terminals and where applicable tighten firmly but not excessively.

(b) Check that the earth lead from the battery to the engine or body frame is not broken and that the connections are clean and secure.

(c) Check that the lead from the battery to the starter motor or starter solenoid is intact and has a clean and secure connection.

(d) Where necessary carry out repairs to (b) and (c).

Again carry out the check procedure, should the starter motor still not operate, or the lamps not illuminate, then one or more of the following faults may be the cause:

No starter motor operation or lamps: Battery flat or defective.

Lamps illuminate but no starter operation: Starter motor drive jammed in mesh with flywheel ring gear. Starter motor or solenoid defective, ignition switch faulty.

Lamps dim and starter operation sluggish: Discharged battery or fault in starter motor. Battery flat due to broken fan belt or defective alternator. Faulty battery due to cell breakdown.

If the battery and starter motor operation proves satisfactory but the engine still fails to start, continue as follows:

(1) Open the electrode gap on an old serviceable spark plug to 6 mm. Securely earth the body of this spark plug using a jumper lead or by tying the plug to an earthed engine component. Remove a spark plug lead and connect it to the test plug.

NOTE: When working on or near electronic ignition systems care should be taken as high voltages are present in the primary and secondary circuits which could result in severe electrical shocks.

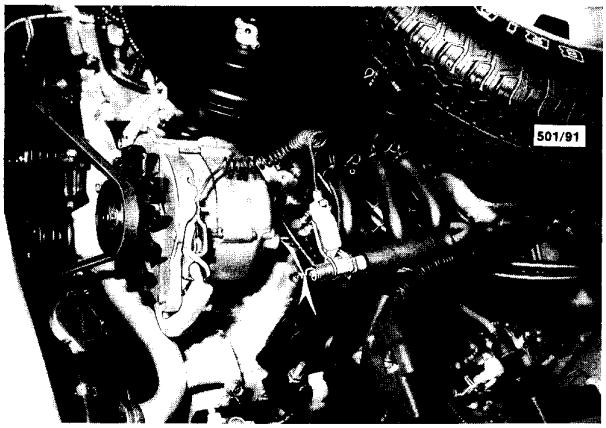
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The ignition switch should be turned off before removing or refitting any electrical connections, otherwise damage to the ignition system as well as severe electrical shock could result.

When the distributor cap is removed ensure that the distributor cap clips are clear of the distributor otherwise serious damage to the distributor could result if the starter is operated.

(2) Have an assistant operate the starter motor.

(3) Check that a spark, if any, jumps the gap on the test spark plug. If there is no spark, carry on with point (4). If the spark is satisfactory proceed to point (5).



Securely earth the body of a test spark plug to check for spark at the spark plug leads and the coil lead.

(4) Disconnect the coil lead from the distributor cap and connect it to the test spark plug. Carry out the check procedure previously described for the spark plugs leads in points (2) to (3). If there is a strong blue spark then the fault lies within the distributor cap, rotor arm or spark plug leads.

Should there be no spark on both or either tests, turn the ignition off then carry out the following checks:

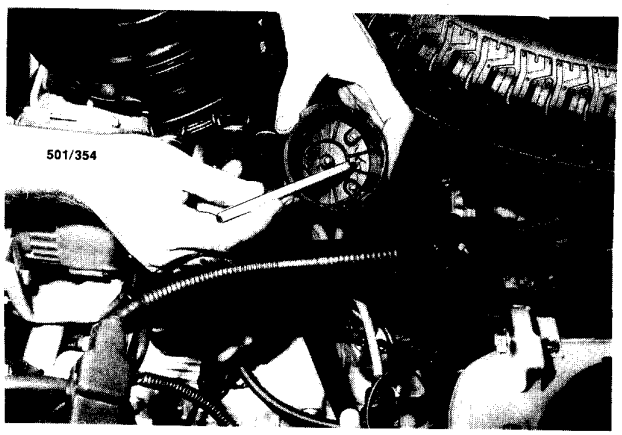
(a) Check the spark plug leads to ensure that they are prefectly dry and that the insulation is not cracked.

(b) Check the distributor cap to ensure that it is dry and clean. Examine both inside and outside of the cap for cracks or tracking, particularly between the spark plug segments in the cap.

(c) Check the rotor arm for cracks, deposits and burning on the metal arm.

(d) Ensure that the spark plug leads and the coil lead have dry, clean and secure connections on the distributor cap.

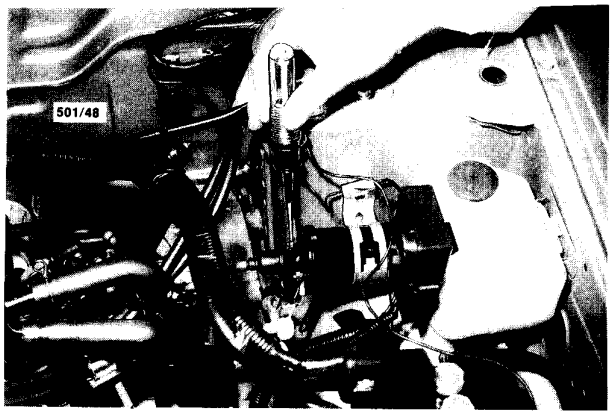
(e) Check that the carbon brush in the centre of the distributor cap interior face is clean and dry and ensure that the carbon brush moves freely in and out of its locating hole.



Check the distributor cap for cracks and tracking.

(f) Check that the low tension wires on the ignition coil are intact and have clean and secure connections.

(g) Check that low tension current is reaching the ignition coil when the ignition is switched On. Use a test lamp between the coil low tension terminals and a good earth. Where applicable, ensure that the breaker points are open or insulated when making the test. Should the test lamp light on the ignition switch (+) side of the coil but fail to light on the distributor (−) side of the coil, then it is possible that the coil primary circuit is faulty. Remove and test the coil or replace with a known serviceable unit.



Check the power at the coil positive terminal with a test lamp.

(h) Ensure that the low tension leads in the distributor and the earth wire are intact, clean and secure.

NOTE: No further tests are recommended for electronic ignition systems. Should there still be no spark, the electronic control unit or pick up may be considered faulty. It is adviseable to have the ignition system checked by an automotive electrician having the appropriate test equipment.

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Check, and if necessary, clean and adjust the contact breaker points, see appropriate heading in the Engine Tune-up section.

Again carry out the check procedure, should there still be no spark or a weak or yellow spark, then one or more of the following faults may be the cause:

Defective coil, capacitor or high tension leads. If the contact points check showed severe burning or pitting of the point faces then this would indicate a possible capacitor failure. Renew the capacitor and breaker points.

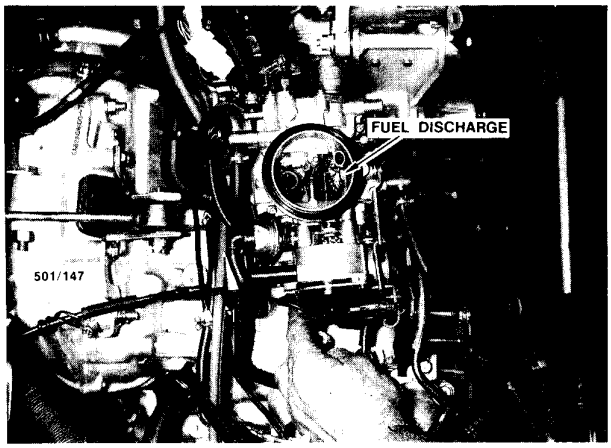
(5) If the above checks prove the spark to be satisfactory but the engine still fails to start, remove all spark plugs and check their condition and electrode gap against the information given in the Engine Tune-up section under the appropriate heading.

3. TO CHECK FUEL SYSTEM

(1) Assuming that the fuel tank does contain a quantity of clean fuel the first test is to determine if there is fuel in the carburettor float chamber. To do this, first remove the air cleaner from the carburettor and with the choke valve open look down the carburettor throat. While looking down the carburettor throat, open and close the throttle several times by actuating the throttle linkage by hand. If squirts of fuel are seen to discharge from the accelerator pump discharge nozzle it is an indication that the carburettor float chamber is full of fuel and that the fuel system is functioning OK.

NOTE: Do not operate the throttle linkage excessively, as excess fuel may damage the catalytic converter on unleaded petrol models.

If on the other hand no fuel was being discharged from the accelerator pump nozzle then proceed as follows:



Checking for discharge of fuel at the carburettor accelerator pump nozzle.



Check for fuel flow at the carburettor supply line.

(2) Disconnect the low tension wire at the + coil terminal to prevent the engine from possibly starting during the next part of the test.

(3) Disconnect the fuel supply line at the carburettor and position the end in a suitable container. Have an assistant turn the ignition switch to the On position or on 1986–1987 models, operate the starter and note if fuel is being discharged into the container. Proceed to point (7) if fuel flow is satisfactory, if not continue with points (4) to (6).

(4) Working in the engine compartment on 1979–1984 models and under the rear of the vehicle on 1985–1987 and some Utility models, disconnect the fuel supply line from the tank to the inlet side of the pump.

(5) Remove the fuel tank filler cap and have an assistant listen at the tank filler aperture. Blow down through the fuel line towards the tank and provided the line is clear, air bubbles will be heard in the tank.

(6) Reconnect the fuel pipe to the pump and again check for fuel delivery from the fuel pump.

If there is no delivery of fuel to the carburettor side of the fuel pump then one or more of the following faults may be the cause:

No air bubbles heard on tank test: Pipe obstructed or fractured. Fuel line filter blocked.

Air bubbles heard in tank but no delivery from the fuel pump: Faulty fuel pump.

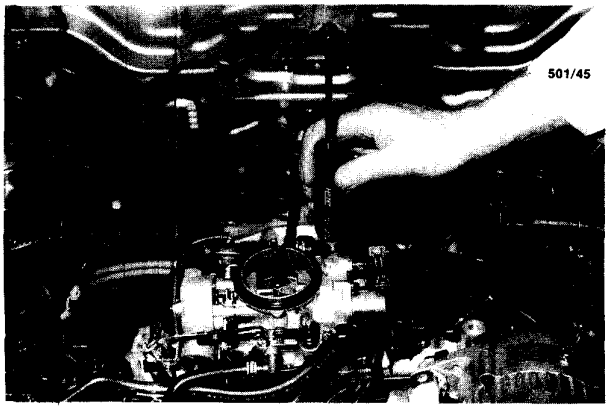
Refer to the appropriate heading in the Fuel System section for fuel pump test procedure.

(7) Should there be a satisfactory supply of fuel at the carburettor end of the fuel pipe but the engine will still not start, carry out the following additional procedure.

(a) First check that flooding is not the cause due to excessive use of choke and/or accelerator when attempting to start the engine.

(b) Remove the spark plugs and check for petrol saturation of the electrodes, if evident thoroughly clean and dry before replacement.

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Float bowl flooding can sometimes be rectified by tapping in the vicinity of the needle valve and seat.

(c) If flooding persists, check the float and the needle valve for sticking and also ensure that the float is not punctured allowing it to fill with fuel.

(d) Check the air filter for choked filter element.

If flooding is not the cause and there is an adequate supply of fuel to the carburettor, one or more of the following faults may be the cause:

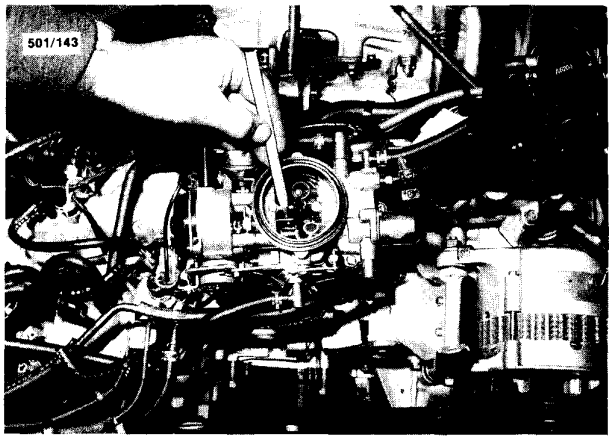
Where fitted, blocked carburettor gauze filter.

Stuck or obstructed needle valve.

Choke valve not operating correctly.

Air leaks around the inlet manifold or carburettor mounting flanges because of distortion or defective gaskets.

Fractured hose or lose connections between the brake vacuum unit and the inlet manifold.



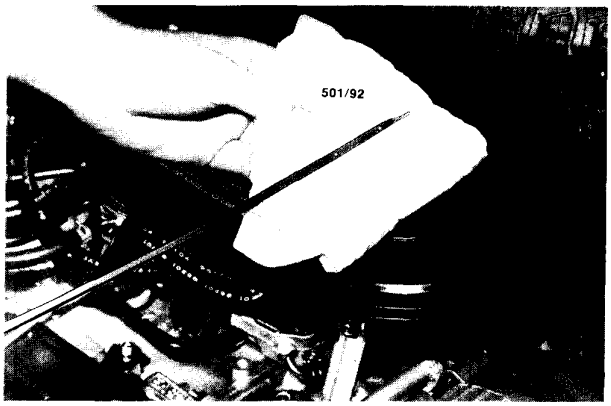
When the engine is at operating temperature, the choke valve should be fully open.

4. TO CHECK MECHANICAL SYSTEM

The following check procedure assumes that the starter motor will rotate the engine, if not, press in the clutch to disengage the engine from the transmission in case the fault lies within the transmission. If the starter will still not rotate the engine it will be necessary to remove the starter motor and attempt to turn the engine over manually. This will establish whether the fault lies with the starter motor which could be jammed or defective, or the engine which could be seized or have broken internal components such as connecting rods, pistons and crankshaft etc. If the starter motor is not at fault and the engine will not rotate manually then refer to the heading Engine Mechanical Trouble Shooting in the Engine section for the possible causes.

It should be noted that the only way that compression can be accurately tested is by means of a compression gauge. The crude method described in the following check procedure is only intended to give a rule of thumb indication when checking for causes of engine breakdown.

(1) Remove the radiator cap and check for loss of water from the radiator. If so, check carefully for any indication of external leakage and remove the engine oil dipstick and check for emulsification of the oil; when water mixes with oil it will turn creamy and the oil level will also have increased. If the oil is emulsified the following checks are not required.



Check the oil for correct level and dilution on the dipstick.

(2) Isolate the ignition by disconnecting the lead from the top of the coil. Remove each of the spark plugs in turn and firmly block the spark plug hole in the cylinder head with the pad of the thumb or finger. Have an assistant fully open the throttle and operate the starter switch to rotate the engine, check that the compression is strong enough to force past the finger sealing the plug hole and also examine the finger and the spark plug previously removed for indications of water.

NOTE: On unleaded petrol models, remove the Ignition Coil/Fuel fuse from the fuse box to prevent excess fuel being drawn into the engine and possibly damaging the catalytic converter.

If the above checks show a loss of water and this is evident in the engine oil or on the finger or spark plug,

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then one or more of the following faults may be the cause:

Blown cylinder head gasket.

Cracked cylinder or cylinder head.

Warped cylinder head or cylinder block faces.

If the crude compression check showed any weak, lack of or inconsistent compressions, then any of the above faults could also be the cause plus the following:

Broken piston(s).

Burnt or broken valves.

Provided the previous checks do not indicate an internal leakage of water continue with the following:

(3) Remove the distributor cap and, with an assistant operating the starter switch, check that the rotor arm rotates as the engine turns over.

(4) Remove the rocker covers and, again with an assistant operating the starter switch, check that all the valves open and close as the engine turns over.

If the rotor arm or the valves do not operate with engine rotation then one of the following faults may be the cause:

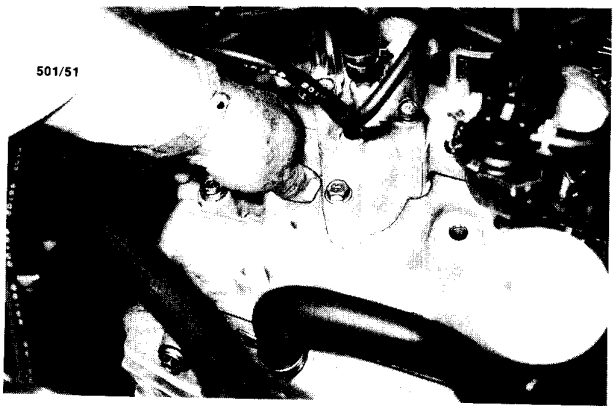
Rotor arm does not turn but valves operate: Distributor drive shaft broken or drive gear stripped.

Rotor arm turns but valves do not operate, OHV engines: Broken or stripped timing gear.

Valves operate on one side of the engine only, OHC engines: Broken timing belt.

Provided all the previous checks have been carried out correctly and the operator is quite satisfied that none of the components are at fault then all that remains is for the ignition and the valve timing to be checked. It should be noted however, that if loss of timing proves to be the fault then the cause for this occurring must be sought, if, the vehicle has started and run satisfactorily up to the point of engine failure.

NOTE: In order to check the ignition and valve timing it will be necessary to remove the distributor cap and the left hand rocker cover and turn the engine clockwise via the crankshaft pulley until No 1 piston is at tdc on the compression stroke. In this position the valves of No 4 cylinder should be 'rocking' and the distributor rotor should be pointing to the No. 1 high tension lead segment in the distributor cap. The cylinders are numbered No 1 — right hand front, No 2 left hand front, No 3 right hand rear, No 4 left hand rear.



Check for compression by placing a thumb over the spark plug hole and have an assistant operate the starter.

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SPECIFICATIONS

Coolant:	
Capacity —	
1800 cc engine	5.5 litres
1600 cc engine	5.3 litres
Type	Ethylene glycol
Water pump type	Centrifugal impeller
Thermostat:	
Type	Wax pellet
Opening temperature —	
1979–1981 models	88 deg C
1982–1984 and Utility models	86.5–89.5 deg C
1985–1987 Sedan and Station Wagon models	83.5–86.5 deg C
Fully open temperature —	
1979–1982 models	101 deg C
1983–1984 and Utility models	100 deg C
1985–1987 Sedan and Station Wagon models	98 deg C
Thermoswitch operating temperature:	
1979–1984 and Utility models	92–100 deg C
1985 Sedan and Station Wagon models	96–101 deg C
1986–1987 Sedan and Station Wagon models	89–94 deg C
Radiator cap opening pressure	78–98 kPa
Radiator type	Crossflow, corrugated fin

1. COOLING SYSTEM TROUBLE SHOOTING

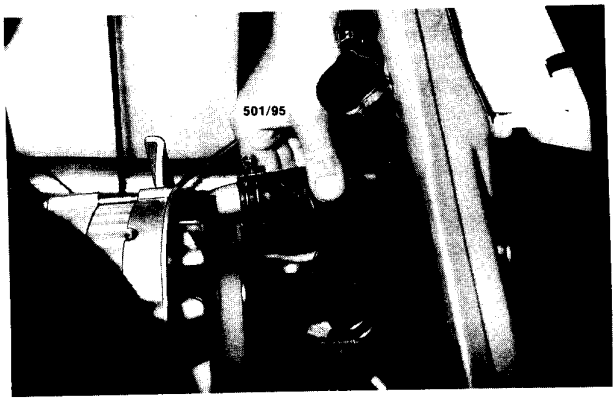
COOLANT LEAKAGE — EXTERNAL

(1) Loose hose clips or faulty hoses: Tighten hose clips or renew faulty hoses.

(2) Leaking radiator core or tanks: Repair or renew radiator.

(3) Worn or damaged water pump seal assembly: Repair or renew water pump assembly.

(4) Worn or damaged water pump bearing assembly: Repair or renew water pump assembly.



Checking for cracked or damaged radiator hoses.

(5) Loose or damaged coolant drain plugs: Inspect the coolant drain plugs and sealing washers for corrosion and damage. Renew plugs and washers as necessary. Apply suitable sealant to the plugs and tighten the plugs securely.

(6) External crack in the cylinder block or the cylinder head: Renew the faulty components.

(7) Leaks at thermostat cover, water pump or inlet manifold joint gaskets: Renew gaskets as required.

(8) Leaking heater core or valve: Repair or renew faulty components.

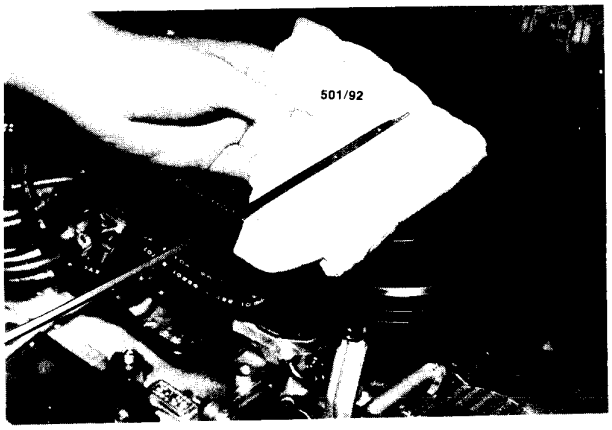
NOTE: Check the cooling system for external leakage by running the engine to operating temperature over a dry floor and checking for leak source. Also check the vehicle interior below the heater unit for moisture.

COOLANT LEAKAGE — INTERNAL

(1) Cylinder head gasket leak due to warped cylinder head or cylinder block gasket faces: Reface cylinder head or cylinder block and renew the cylinder head gasket.

(2) Crack in cylinder head or cylinder block: Renew faulty components.

NOTE: Check the engine for internal leakage by withdrawing the dipstick and inspecting for emulsified oil. Run the engine and check for excessive steam at the exhaust pipe which would indicate water leakage into the combustion chamber. Check the compressions as described in the Engine Tune-up section to locate a leaking cylinder head gasket.



Check the oil for correct level and dilution on the dipstick.

ENGINE OVERHEATING

(1) Radiator cap defective: Renew radiator cap.

(2) Insufficient coolant: Replenish the coolant, check the cooling system for leaks and repair as necessary.

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(3) Obstructed air passage through the radiator core: Blow out the obstruction by applying air or water pressure from the rear to the front of the radiator.

(4) Incorrect ignition timing: Check and adjust the ignition timing as described in the Engine Tune-up section.

(5) Incorrect valve timing: Check and reset the valve timing.

(6) Water pump drive belt loose, broken or contaminated by oil: Adjust or renew the water pump drive belt.

(7) Faulty thermostat: Check and renew the thermostat.

(8) Restricted exhaust system: Remove the restrictions or renew the restricted components.

(9) Faulty water pump: Repair or renew the water pump.

(10) Engine tight after overhaul: Check and if not unduly tight, stop the engine and allow it to cool.

(11) Poor coolant circulation: Check and rectify as under Coolant Circulation Faulty.

(12) Lean fuel mixture: Check the fuel system as described in the Fuel System section and rectify as necessary.

(13) Low engine oil level: Stop the engine immediately and replenish the oil in the sump to the correct level.

(14) Incorrectly adjusted or dragging brakes: Check and rectify by adjustment or renewal of components as described in the Brakes section.

(15) Slipping clutch: Rectify as described in the Clutch section.

(16) Faulty thermoswitch or electric cooling fan: Check and renew thermoswitch or electric cooling fan.

(17) Incorrect grade or quantity of transaxle lubricant: Drain and refill the transaxle with the correct grade and quantity of lubricant.

(18) Blown cylinder head gasket: Check and rectify as under Coolant Leakage — Internal.

NOTE: Engine overheating is indicated by an excessive rise in temperature shown by the temperature gauge. Overheating is usually accompanied by steam emitting from the engine compartment and loss of engine power. A blown cylinder head gasket is indicated by bubbles in the radiator coolant when the engine is running.

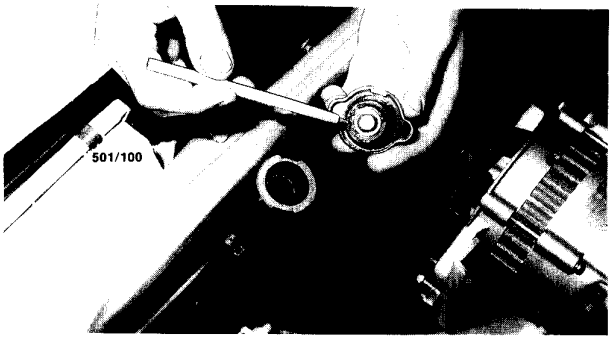
COOLANT CIRCULATION FAULTY

(1) Insufficient coolant in system: Replenish coolant and check for leaks.

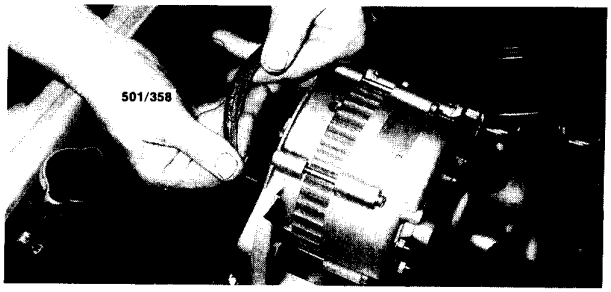
(2) Partial blockage of the radiator core tubes: Reverse flush or renew the radiator core.

(3) Sludge deposits in engine water passages: Clean and reverse flush the engine cylinder block.

(4) Water pump drive belt broken or slipping: Renew or adjust water pump drive belt.



Renew the radiator cap if the sealing rubber is suspected of leakage.



Checking the drive belt for wear and deterioration.

(5) Faulty thermostat: Check and renew thermostat.

(6) Collapsing lower radiator hose: Check and renew lower radiator hose, check radiator core tubes for blockage and rectify as necessary.

(7) Faulty water pump: Repair or renew the water pump.

NOTE: This condition is best checked by removing the radiator cap and running the engine until it reaches the normal operating temperature. Check for water turbulence in the radiator. A normal system should show turbulence at part throttle. As most adverse conditions can be caused by more than one fault, diagnosis can only be made after checking the items by process of elimination in the order shown. If blocked radiator core tubes are detected, it is recommended that the radiator be taken to a reliable radiator specialist for repair.

2. DESCRIPTION

The cooling system is of the forced circulation type with a belt driven water pump providing circulation and an electric fan and cross flow type radiator providing cooling.

The 1979–1984 and Utility models with four wheel drive have an additional engine driven fan, which is replaced by an electric fan when the vehicle is equipped with air conditioning.

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The 1985–1987 Sedan and Station Wagon models with four wheel drive and equipped with air conditioning, have an additional engine driven fan mounted on the front of the air conditioning compressor drive pulley. Drive to the cooling fan is via a viscous coupling.

The cooling system us pressurised in order to raise the boiling point of the coolant within the system and so increase the efficiency of the engine.

On 1985–1987 Sedan and Station Wagon models, the radiator tanks are manufactured in a resin material to reduce weight. A drain tap is installed to the bottom of the right hand radiator tank, drain plugs are installed in the cylinder heads and the engine block to facilitate coolant drainage. On automatic transaxle models the left hand radiator tank also houses the transaxle oil cooler.

On 1985–1987 Sedan and Station Wagon models, the radiator overflow hose is connected to a reserve tank which is mounted on the left hand inner fender panel. The radiator cap has a seal between the top of the cap and the upper surface of the radiator filler neck to prevent coolant overflow at this point when the radiator cap pressure valve opens and to direct the overflowing coolant into the reserve tank.

When the engine is stopped and the temperature of the coolant falls, the radiator cap vacuum valve opens and allows the excess coolant in the reserve tank to be drawn back into the radiator, eliminating the need for frequent topping up of the coolant.

Temperature within the cooling system is controlled by a thermostat located in the inlet manifold water outlet elbow.

The function of the thermostat is to prevent the circulation of the coolant through the radiator until the engine has reached operating temperature. This restricted circulation allows the engine to warm up more quickly improving driveability and fuel economy.

The coolant is also circulated through the inlet manifold to preheat the fuel and air mixture as it flows through the manifold passages.

The water pump, driven by a 'V' belt from the crankshaft pulley, is of the centrifugal impeller type. The body of the water pump is made from an aluminium alloy to assist in engine weight reduction and contains a pre-lubricated double row ball bearing and a spring loaded seal assembly. A drain hole, located between the seal and the bearing, prevents bearing lubricant contamination if coolant leaks past the seal.

The electric cooling fan is mounted on the rear of the radiator and its operation is regulated by a thermoswitch located in the right hand radiator tank.

Due to the aluminium alloy construction of the engine blocks and cylinder heads it is imperative that the cooling system is filled with soft, demineralised water and anti-corrosive, anti-freeze (Ethylene glycol) mixed to the proportion required to avoid freezing at the lowest expected ambient operating temperature, whilst retaining satisfactory cooling characteristics.

When working on the cooling system, to avoid accidental scalding, exercise caution when releasing the radiator cap of an engine that is at normal operating temperature.

3. RADIATOR

TO CHECK COOLANT LEVEL

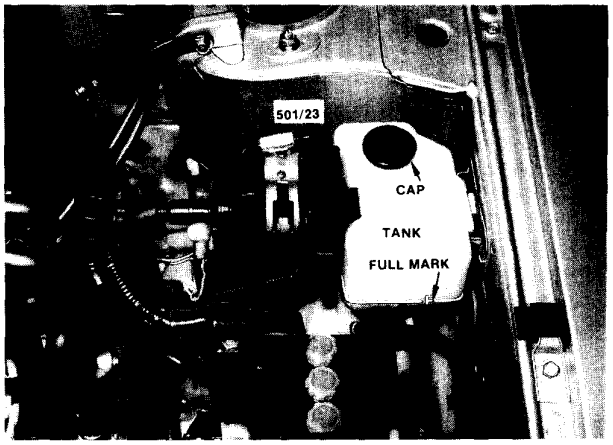
1985–1987 Sedan and Station Wagon Models

(1) With the engine cool, check the level of the coolant in the reserve tank.

If the level in the reserve tank is towards the Low mark add coolant to bring the level to the Full mark.

If the reserve tank is empty remove the radiator cap and fill the radiator with coolant. Replace the radiator cap securely and fill the reserve tank to the Full mark.

(2) Run the engine and check the cooling system for leaks, rectify leaks as necessary.



Installed view of the coolant reserve tank.

1979–1984 and Utility Models

(1) Allow the engine to cool until the radiator cap can be safely removed.

(2) Remove the radiator cap and check that the coolant is level with the plate which is visible through the radiator filler neck.

(3) If necessary, add coolant to restore the level to the plate.

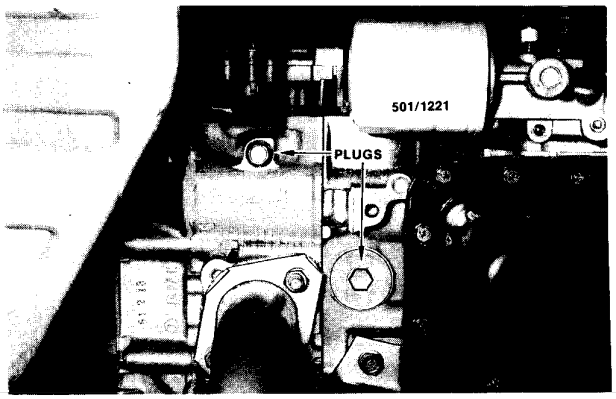
(4) Run the engine and check the cooling system for leaks, rectify leaks as necessary.

TO DRAIN AND REFILL

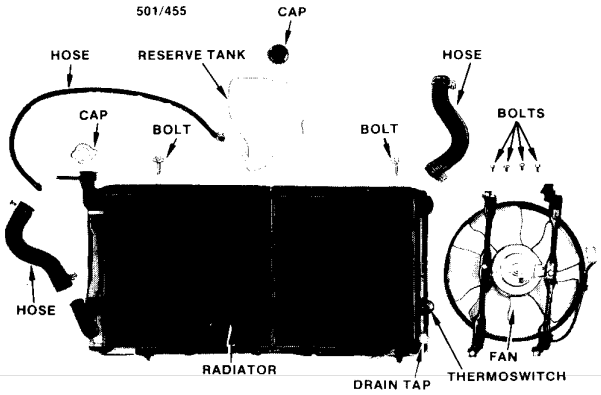
(1) Position a suitable drain tin under the radiator drain tap, loosen the tap and drain the coolant into the drain tin. Remove the radiator cap to avoid surges from the drain tap.

(2) Remove the drain plugs from the cylinder

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Installed view of the coolant drain plugs, 1986 model shown. An identical plug is installed in the cylinder head on the opposite side of the engine.



View of the radiator and associated components removed from the vehicle, 1986 model shown.

heads and drain the coolant from the engine cylinder blocks.

(3) Instal the drain plugs and radiator drain tap and tighten them securely.

(4) Slowly fill the radiator with clean water adding Ethylene glycol conditioner as necessary. Where installed, fill the reserve tank to the Full mark and replace the radiator cap securely.

(5) Start and run the engine at a fast idle speed with the heater temperature control in the Hot position until the normal operating temperature is reached. Check the system for leaks.

(6) Stop the engine and allow the coolant temperature to fall sufficiently to remove the radiator cap with safety.

(7) If necessary, add coolant until the radiator is full or to the level plate, as applicable.

(8) If necessary, where installed, fill the reserve tank to the Full mark.

(9) Instal the radiator cap and the reserve tank cap, where installed.

TO REMOVE

(1) Disconnect the negative battery terminal.

(2) Position a suitable clean drain tin under the radiator drain tap, loosen the tap and drain the coolant into the drain tin. Remove the radiator cap to avoid surges during draining.

(3) Loosen the hose clips and disconnect the upper and lower radiator hoses from the radiator.

(4) On automatic transaxle models, position a drain tin under the left hand radiator tank and disconnect the hoses from the oil cooler in the left hand radiator tank. Collect the spilt oil in the drain tin.

(5) Disconnect the wiring connectors from the cooling fan and the thermoswitch.

(6) Remove the retaining bolts from the top rear of the radiator.

(7) Carefully lift the radiator and cooling fan assembly from the engine compartment. Plug the inlet and outlet fittings and fill the radiator with clean water.

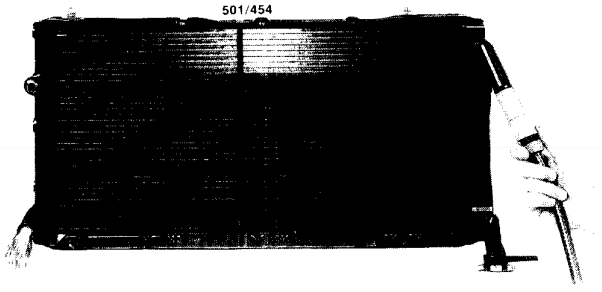
NOTE: When a radiator that has been in use for some time is removed from the vehicle to enable repairs to be carried out to the engine, it should not be allowed to stand empty for any length of time. The radiator should be immersed in a tank of fresh water or otherwise kept full. Failure to observe this precaution may result in overheating when the engine is put back into service. This caused by internal deposits in the radiator drying and flaking and so obstructing the circulation of the coolant in the system.

TO FLUSH AND CLEAN

(1) With the radiator removed as previously described instal the radiator cap securely and carefully invert the radiator.

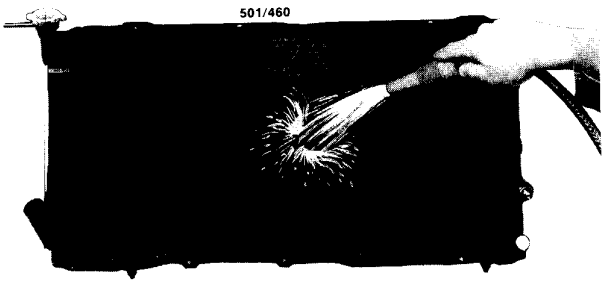
(2) Insert a hose in the radiator outlet fitting and reverse flush the radiator until the water flowing from the radiator inlet fitting is clean.

(3) Apply a stream of water or compressed air to the radiator core from the rear to the front. Maintain the procedure until all dirt and foreign matter is removed from the radiator core.



Reverse flush the radiator using water pressure.

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Clean obstructions from the radiator core using water pressure.

NOTE: If excessive back pressure or diminished flow indicates severely blocked radiator core tubes, which cannot be cleared by reverse flushing, it is recommended that the radiator be taken to a reliable radiator specialist for repair.

TO INSTAL

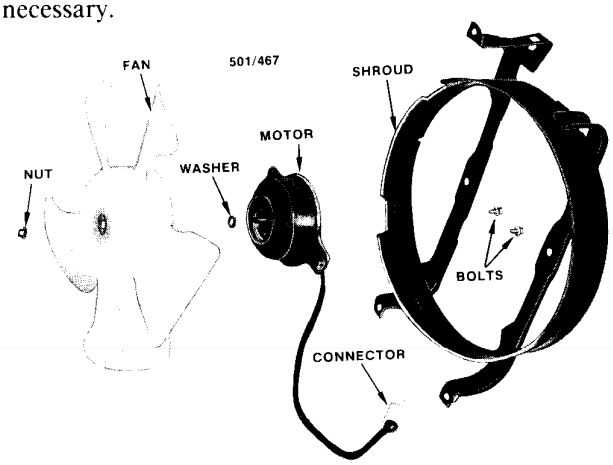
(1) Working inside the engine compartment, position the radiator in the front panel opening ensuring that the tapered rubber mounts are correctly seated in the body panel. Instal and securely tighten the retaining bolts at the top rear of the radiator.

(2) Connect the upper and lower radiator hoses to the radiator and tighten the hose clips securely.

(3) On automatic transaxle models connect the hoses to the oil cooler in the left hand radiator tank.

(4) Slowly fill the radiator with clean water adding conditioner as necessary. Where installed, fill the reserve tank to the Full mark and replace the radiator cap securely.

(5) Start and run the engine at a fast idle speed with the heater temperature control in the Hot position until the normal operating temperature is reached. Check the system for leaks and rectify as necessary.



Dismantled view of the cooling fan removed from the vehicle.

(6) Stop the engine and allow the coolant temperature to fall sufficiently to remove the radiator cap with safety.

(7) If necessary, add coolant until the radiator is full or to the level plate, as applicable.

(8) If necessary, where installed, fill the reserve tank to the Full mark.

(9) Instal the radiator cap and where installed, the reserve tank cap securely.

(10) On automatic transaxle models check and, if necessary, top up the transaxle oil to the correct level on the dipstick. Refer to the automatic Transaxle section for the correct procedure.

4. COOLING FAN AND THERMOSWITCH

Special Equipment Required:
To Test Fan Motor — Ammeter
To Test Thermoswitch — Thermometer

TO TEST FAN MOTOR ON VEHICLE

(1) Disconnect the negative battery terminal.

(2) Disconnect the fan motor wiring connector from the engine compartment wiring loom.

(3) Using suitable jumper leads connect 12 volts to the fan motor wiring connector with an ammeter in series and note the ammeter reading after one minute of starting the motor from cold.

(4) The motor should run smoothly with the ammeter reading approximately 10 amps.

(5) If the fan motor does not run smoothly or the current draw is excessive, the fan motor will have to be renewed.

TO REMOVE AND INSTAL FAN MOTOR

(1) Disconnect the negative battery terminal.

(2) Disconnect the fan motor wiring connector from the engine compartment wiring loom.

(3) Support the fan shroud and remove the bolts retaining the fan shroud to the radiator.

(4) Remove the fan, fan motor and shroud as an assembly from the vehicle.

(5) Remove the nut retaining the fan to the motor shaft.

(6) Remove the fan and the washer behind the fan from the motor shaft.

(7) Remove the bolts retaining the fan motor to the fan shroud and remove the fan motor from the shroud.

Installation is a reversal of the removal procedure with attention to the following point:

Ensure that the spacer washer is installed to the motor shaft before installing the fan.

TO REMOVE AND INSTAL THERMOSWITCH

(1) Disconnect the negative battery terminal.

(2) Drain the radiator as previously described.

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(3) Disconnect the wire connector from the thermoswitch terminals.

(4) Remove the thermoswitch and washer from the radiator side tank.

Installation is a reversal of the removal procedure.

TO TEST THERMOSWITCH

(1) Remove the thermoswitch from the radiator as previously described.

(2) Suspend and immerse the lower half of the switch, together with a reliable thermometer in a vessel of cold water, ensuring that neither the switch nor the thermometer is touching the sides or bottom of the vessel.

(3) The continuity test is done with an ohmmeter or multimeter. Connect one lead or prod to the switch positive terminal and the second lead or prod to the negative terminal or body of the switch on 1979–1984 and Utility models.

(4) Progressively heat the water in the vessel and as the water heats, note the temperature reading on the thermometer when continuity is indicated on the ohmmeter.

(5) Continuity should occur when the water temperature is within the specified range.

(6) A switch with opening temperatures outside the specified range should be renewed.

5. THERMOSTAT

Special Equipment Required:
To Check — Thermometer

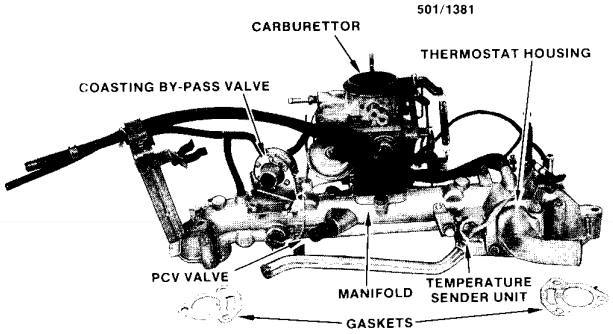
TO REMOVE AND INSTAL

(1) Drain the cooling system as previously described.

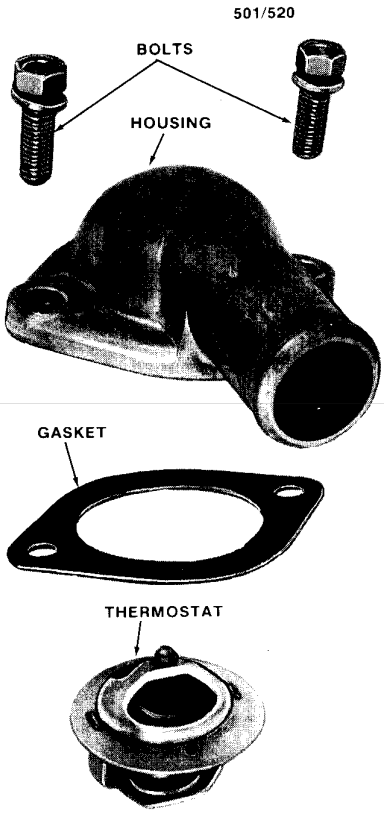
(2) Disconnect and remove the upper radiator hose.

(3) Remove the thermostat housing retaining bolts and remove the thermostat housing and gasket. Discard the gasket.

(4) Withdraw the thermostat from the inlet manifold.



View of the inlet manifold showing the location of the thermostat, 1983 model shown.



View of the thermostat removed from the vehicle, 1986 model shown.

NOTE: A visual examination of the thermostat will often determine its serviceability and obviate the necessity for testing. For instance, a thermostat with its valve fully open when removed from a cold engine is obviously faulty and should be discarded and a new unit installed.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the gasket surfaces are perfectly clean and instal a new thermostat housing gasket.

(2) Fill the cooling system as previously described.

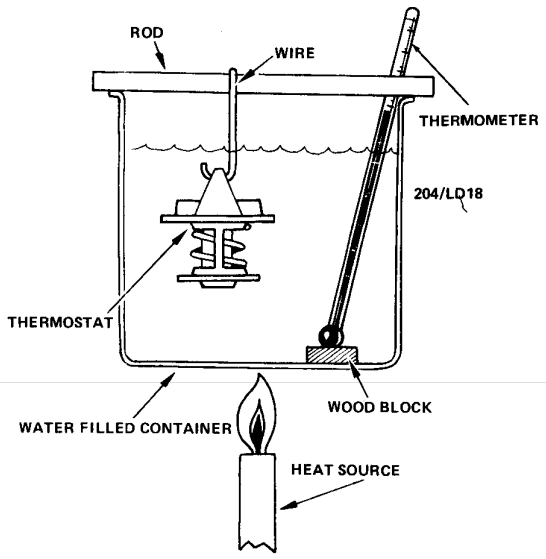
(3) Run the engine and check for coolant leaks. Rectify leaks as necessary.

TO CHECK

(1) Check that the thermostat is closed when cold.

(2) Suspend and immerse the thermostat together with a reliable thermometer in a vessel of cold water, ensuring that neither the thermostat nor the thermometer are touching the sides or bottom of the vessel.

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Line drawing showing the correct method used to test a thermostat.

(3) Progressively heat the water noting the temperature reading on the thermometer as the thermostat valve commences to open and when it is fully open.

See Specifications for opening and fully open temperatures.

A thermostat which is not opening and is not fully open at the specified temperatures should be renewed.

6. WATER PUMP

TO REMOVE AND INSTAL

(1) Drain the cooling system as previously described.

(2) Disconnect the lower radiator hose from the lower water pipe or the water pump on 1979–1984 and Utility models.

(3) On 1985–1987 Sedan and Station Wagon models, remove the lower water pipe retaining bolts and slide the lower water pipe out of the water pump. Discard the 'O' ring.

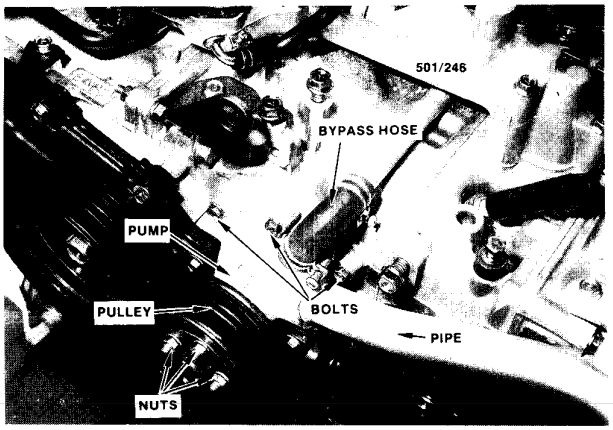
(4) Loosen the hose clip and disconnect the bypass hose from the water pump.

(5) On 1985–1987 Sedan and Station Wagon models, remove the water pump pulley retaining nuts.

(6) Loosen the alternator mounting and adjusting bolts and push the alternator towards the engine to relieve the tension on the water pump drive belt.

(7) Remove the water pump drive belt and on 1985–1987 Sedan and Station Wagon models, the water pump pulley.

(8) On 1985–1987 Sedan and Station Wagon models, remove the centre drive belt cover as described in the Engine section.



Installed view of the water pump, 1986 model shown.

(9) Remove the water pump to engine block retaining bolts and withdraw the water pump from the engine.

(10) Turn the water pump shaft by hand and check the bearing for roughness or looseness in the pump body. Check the seal for leaks and the impeller and pump body for wear and damage.

NOTE: It is economically unsound to overhaul the water pump. Therefore, if the water pump is unserviceable it is recommended that a new or rebuilt water pump is installed.

Installation is a reversal of the removal procedure with attention to the following points:

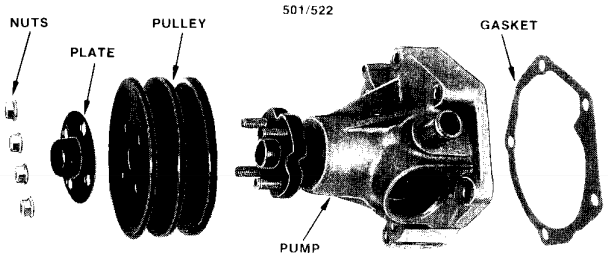
(1) Renew the water pump gasket and where fitted, the water pipe 'O' ring. Check the bypass hose and the lower radiator hose for deterioration and renew as necessary.

Where applicable, align the marks on the radiator hoses with those on the thermostat housing and water pump.

(2) Ensure that the water pump drain hole is free from obstructions.

(3) Fill the cooling system as previously described.

(4) Run the engine and check for coolant leaks. Rectify leaks as necessary.



Dismantled view of the water pump removed from the vehicle, 1986 model shown.

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7. WATER PUMP DRIVE BELT

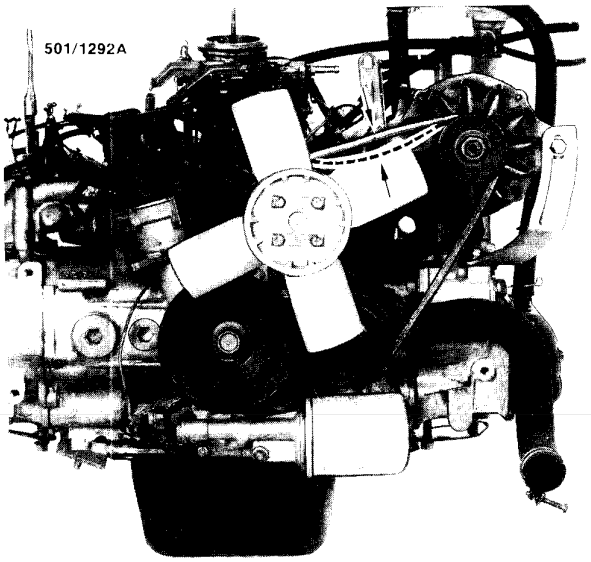
TO RENEW

(1) Loosen the alternator mounting and adjusting bolts and push the alternator towards the engine to relieve the tension on the water pump drive belt.

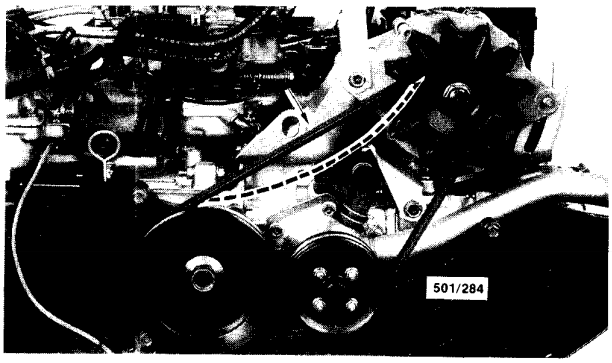
(2) Manoeuvre the old belt from the alternator pulley, the water pump pulley, where fitted the engine driven fan pulley and the crankshaft pulley and remove the old belt from the engine.

(3) Manoeuvre the new belt onto the crankshaft pulley, where fitted the engine driven fan pulley, the water pump pulley and run the belt onto the alternator pulley.

(4) The belt tension should be adjusted using the procedure described in the Engine Tune-up section.



View of the 1979–1984 and Utility model water pump drive belt, showing the point at which the drive belt deflection is measured.



View of the 1985–1987 Sedan and Station Wagon water pump drive belt showing the point at which the drive belt deflection is measured, 1986 model shown.

8. HEATER ASSEMBLY

HEATER UNIT

To Remove and Instal 1985–1987 Sedan and Station Wagon Models

(1) Disconnect the negative battery terminal.

(2) Remove the self tapping screws from the bottom of the right hand side dashboard lower trim panel under the steering column.

(3) Release the screws from the centre of the plastic plugs at each end of the right hand side dashboard lower trim panel and ease the plastic plugs out of the bottom of the dashboard.

(4) Where necessary, lower the trim panel and remove the clip securing the trim panel to the steering column.

(5) Disconnect the ventilation tube from the duct on the trim panel and withdraw the right hand side dashboard lower trim panel from the vehicle.

(6) Remove the screws securing the fuse box to the dashboard and carefully suspend the fuse box on the wiring loom.

(7) Disconnect the ventilation cable from the clip at the rear, right hand side of the dashboard.

(8) Disconnect the ventilation cable from the ventilation control lever on the side of the dashboard.

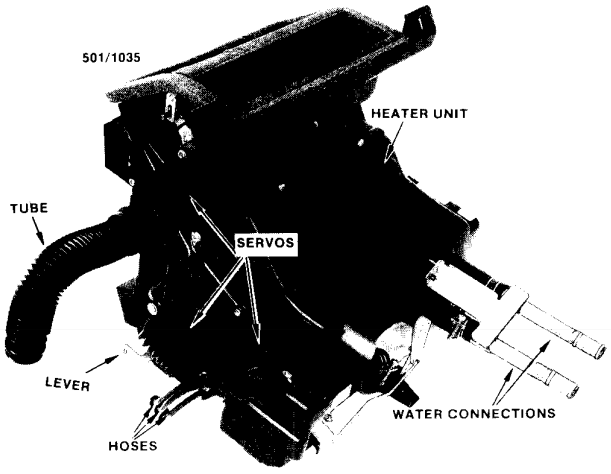
(9) Disconnect the heater cable from the clip on the right hand side of the heater unit and disconnect the heater cable from the heater unit lever.

(10) Disconnect the vacuum hoses at the triple connector and the hose from the recirculation mode vacuum servo.

(11) Disconnect the wiring harness on the right hand side of the bulkhead and remove the relays from the dashboard bracket.

(12) Remove the steering column as described in the Steering section.

(13) Pulling on the outer cable, disconnect the speedometer cable from the speedometer head.



Heater assembly removed from the vehicle, 1986 model shown.

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(14) Remove the retaining screws from the centre console forward upper section and remove the centre console forward upper section from the vehicle.

(15) Release the screws from the centre of the plastic plugs at each end and the side of the left hand dashboard lower trim panel and remove the left hand dashboard lower trim panel from the vehicle.

(16) Remove the glovebox door hinge retaining screws, depress the glovebox door lock release buttons and withdraw the glovebox assembly from the dashboard.

(17) Disconnect the heater blower motor vacuum hose at the pipe connection near the rear top of the glovebox frame.

(18) Disconnect the wiring harness on the left hand side adjacent to the bulkhead.

(19) Pulling on the bottom edge, release the clips securing the bottom of the rectangular cover to the lower left hand edge of the dashboard, lever the cover back to release the clip securing the top of the cover and remove the cover from the dashboard.

(20) Using a suitable screwdriver, prise the covers out of the upper left hand side, upper middle and upper right hand side of the dashboard.

(21) Pull back the floor mat and disconnect the earth wire from the floor panel. Remove the bolts, washers and spacers retaining the dashboard to the vehicle body, lift and move the dashboard rearwards to gain access to the radio aerial wire.

(22) Disconnect the radio aerial wire from the rear of the dashboard and manoeuvre the dashboard from the vehicle.

(23) Drain the coolant from the radiator as previously described.

(24) Working inside the engine compartment, disconnect the hose clips and heater hoses from the fittings on the bulkhead. Plug the hoses and fittings to prevent the entry of dirt.

(25) Remove the centre console as described in the Body section.

(26) Disconnect the heater duct from the heater unit and manoeuvre the heater duct from the vehicle.

(27) Remove the retaining nuts and remove the dashboard centre support bracket from the vehicle.

(28) Remove the heater unit retaining bolts and slide the heater unit rearwards to release the heater hose fittings from the bulkhead seals and lift the heater unit out of the vehicle.

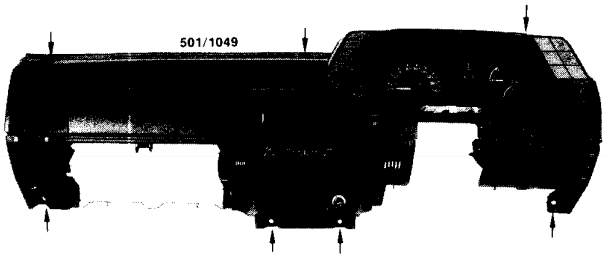
Installation is a reversal of the removal procedure with attention to the following points:

(1) The heater hoses must be pushed 20–25 mm onto the heater unit hose fittings before tightening the hose clips.

(2) The vacuum hoses must be pushed a minimum of 8 mm onto the pipe or hose fitting.

(3) Tighten the heater unit retaining bolts to a torque of 9 Nm.

(4) Refill the cooling system with the specified coolant as previously described.



View of the dashboard removed from the vehicle. Arrows indicate the position of the retaining screws, 1986 model shown.

To Remove and Instal 1979–1984 and Utility Models

(1) Disconnect the negative battery terminal.

(2) Remove the retaining screws and withdraw the right hand side dashboard lower trim panel from under the steering column.

(3) Remove the retaining screws and nuts and withdraw the parcel shelf from under the left hand side of the dashboard.

(4) Remove the centre console as described in the Body section.

(5) Remove the steering column as described in the Steering section.

(6) Remove the retaining screws from the bottom of the glove box door.

(7) Rotate the glove box door upwards and detach the door stay from the glove box.

(8) Remove the retaining screws from the top of the glove box.

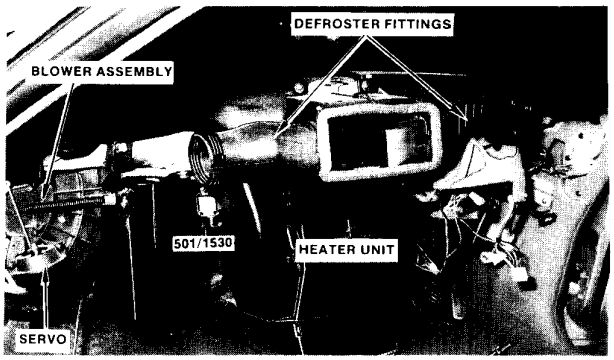
(9) Detach the vacuum hose clamp from the bottom of the glove box.

(10) Pull the glove box partially out of the dashboard and disconnect the glove box lamp and switch wiring.

(11) Withdraw the glove box from the vehicle.

(12) Withdraw the right hand side defroster duct to gain access, suitably mark and disconnect the vacuum hoses from the heater control.

(13) Where fitted, disconnect the choke cable from the carburettor and pull the cable through the bulkhead into the vehicle.



Installed view of the heater unit, 1983 air-conditioned model shown.

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(14) Disconnect the speedometer cable and the dashboard wiring connectors as described in the Electrical section.

(15) Suitably mark and disconnect the control cables from the heater unit.

(16) Remove the retaining nut from the right hand side dashboard mounting bracket.

(17) Remove the retaining nuts from the mounting brackets at the right and left hand sides of the dashboard.

(18) Detach the retaining clips and withdraw the demister grille strips from the top of the dashboard.

(19) Remove the retaining bolts from the top of the dashboard adjacent to the windscreen.

(20) Disconnect the ventilation tubes from both sides of the dashboard and manoeuvre the dashboard from the vehicle.

(21) Drain the coolant from the radiator as previously described.

(22) Working inside the engine compartment, release the hose clips and heater hoses from the heater fittings at the bulkhead. Plug the hoses and heater pipes to prevent entry of dirt.

(23) Detach the defroster fittings from the sides of the heater unit.

(24) Remove the heater unit mounting bolts, lift the heater unit slightly, slide the heater unit rearwards, carefully pulling the hoses through the bulkhead and withdraw the heater unit from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points.

(1) Tighten the mounting hardware securely.

(2) Refill the cooling system with the specified coolant as previously described.

(3) Check the cooling system for leaks and the heater unit for correct operation.

HEATER BLOWER MOTOR

To Remove and Instal

The procedure to remove and instal the heater blower motor is fully detailed in the Electrical System section.

HEATER CONTROLS

To Remove and Instal 1985–1987 Sedan and Station Wagon Models

(1) Remove the instrument cluster surround as detailed in the Electrical System section.

(2) Remove the retaining screws, suitably mark and disconnect the vacuum hoses from the vacuum control unit.

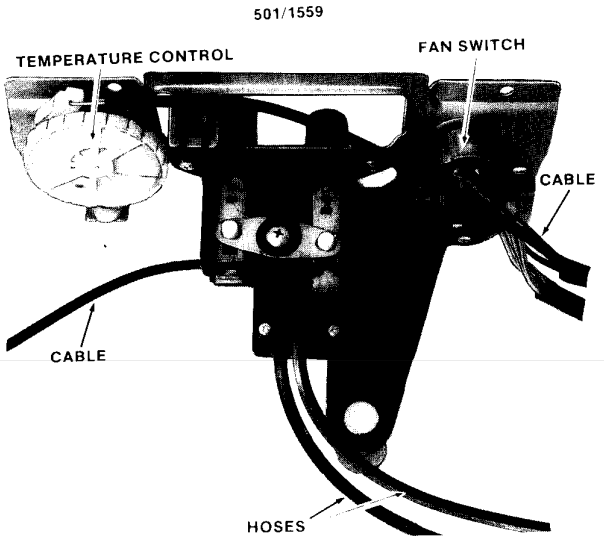
(3) Slide the vacuum control unit out of the instrument cluster surround and disconnect the heater control cable from the heater control lever.

(4) Remove the retaining screws and separate the heater temperature control assembly from the vacuum control unit.

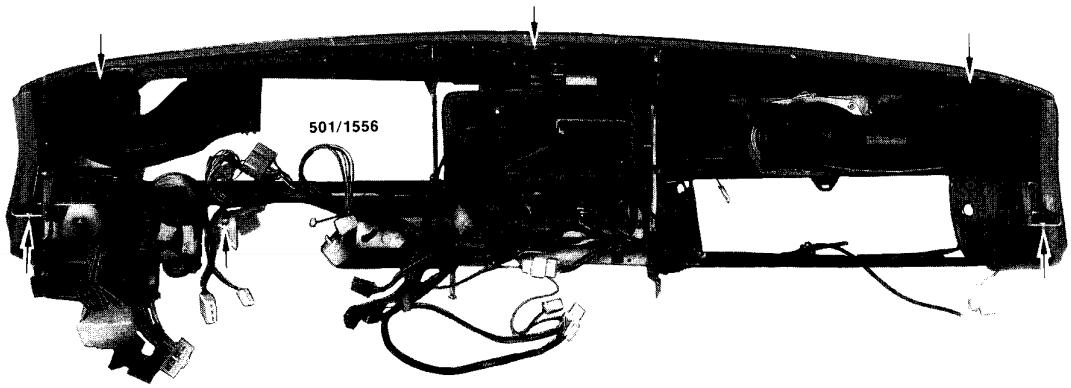
Installation is a reversal of the removal procedure with attention to the following points:

(1) Connect the vacuum hoses to the positions marked prior to disconnection.

(2) Tighten the retaining screws securely.



View of the heater controls removed from the vehicle, 1983 model shown.



Rear view of the dashboard removed from the vehicle. Arrows indicate the position of the retaining screws and nuts, 1983 model shown.

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To Remove and Instal 1979–1984 and Utility Models

(1) Disconnect the negative battery terminal.

(2) Remove the centre console as described in the Body section.

(3) Prise the knobs off the fan switch and temperature control.

(4) Remove the nuts located under the knobs previously removed.

(5) Remove the retaining screws and withdraw the heater control cover from the dashboard.

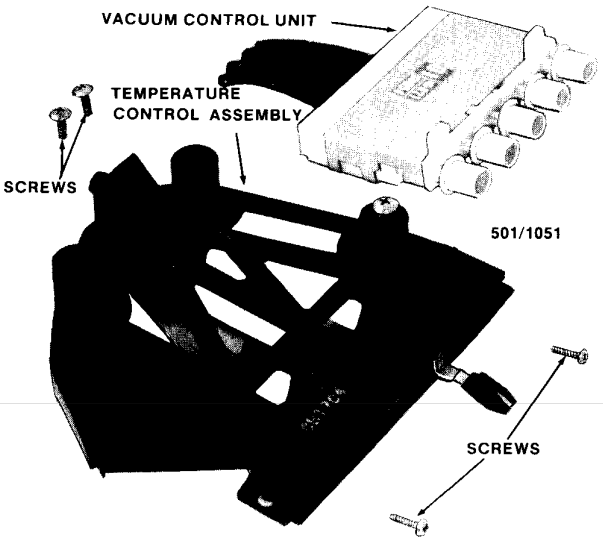
(6) Suitably mark and disconnect the temperature and mode control cables from the heater unit.

(7) Remove the retaining screws from the heater control assembly, suitably mark and disconnect the wiring and vacuum hoses from the heater control assembly and withdraw the heater control assembly from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Connect the wiring and vacuum hoses to the positions marked prior to disconnection.

(2) Tighten the retaining screws securely.



View of heater controls removed from the vehicle, 1986 model shown.

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FUEL SYSTEM

SPECIFICATIONS

CARBURETTOR

Make ..... Hitachi
Type ..... Twin throat, downdraught
Models:
1600 cc engine ..... DCJ 306-22
1800 cc OHV engine ..... DCP 306-51A, DCJ 306-22, DCM 306-3, DCM 306-8, DCX 328-501, DCX 328-502, DCX 328-503, DCX 328-504, DCX 328-505, DCX 328-506, DCX 328-507, DCX 328-508
1800 cc OHC engine ..... DCX 328-551, DCX 328-552, DCZ 328-551, DCZ 328-552 DCZ 328-561, DCZ 328-562
Choke operation:
1600 cc engine models ..... Automatic
1800 cc OHV engine models —
DCJ 306-22, DCP 306-51A ..... Automatic
All other carburettor models ..... Manual
1800 cc OHC engine models —
DCX 328-551, DCX 328-552 ..... Manual
DCZ 328-551, DCZ 328-552
DCZ 328-561, DCZ 328-562 ..... Automatic
Secondary throttle operation:
1600 cc engine ..... Counter weight
1800 cc OHV engine —
DCJ 306-22 ..... Counter weight
All other carburettor models ..... Vacuum diaphragm
1800 cc OHC engine ..... Vacuum diaphragm
*Float level:
DCJ 306-22, DCP 306-51A
DCM 306-3, DCM 306-8 ..... 10.5 mm
DCZ 328-561, DCZ 328–562 ... 12.3–13.3 mm
All other carburettor models .... 11.5–12.5 mm
*Needle valve clearance:
DCJ 306-22, DCP 306-51A
DCM 306-3, DCM 306-8 ..... 1.3–1.7 mm
All other carburettor models ..... 1.5–1.9 mm
Float drop DCX 328-551, DCX 328-552, DCZ 328-551, DCZ 328-552, DCZ 328-561, DCZ 328-562 models only ..... 46–48 mm
*Throttle interlock adjustment clearance:
DCJ 306-22, DCP 306-51A, DCM 306-3, DCM 306-8 ..... 6.0 mm
DCZ 328-551, DCZ 328-552, DCZ 328-561, DCZ 328-562 ..... 6.89 mm
All other carburettor models ..... 6.4 mm
*Fast idle clearance:
1979–1982 models —
DCJ 306-22, DCP 306-51A ..... 1.05 mm
DCM 306-3, DCM 306-8 ..... 1.42 mm
1983 model —
DCX 328-501, DCX 328-502, DCX 328-503, DCX 328-504, DCX 328-505, DCX 328-506 ..... 1.54 mm
1984 and later Utility models —
DCX 328-502, DCX 328-503, DCX 328-504, DCX 328-506, DCX 328-507, DZX 328-508 ..... 1.65 mm
1985 Sedan and Station Wagon models —
DCX 328-551, DCX 328-552 ..... 1.65 mm
1986 Sedan and Station Wagon models —
DCZ 328-551 ..... 1.34 mm
DCZ 328-552 ..... 1.45 mm
1987 Sedan and Station Wagon models —
DCZ 328-561 ..... 1.45 mm
DCZ 328-562 ..... 1.34 mm
*Choke unloader clearance:
DCJ 306-22, DCP 306-51A ..... 1.7 mm
DCX 328-551, DCX 328-552 ..... 2.0 mm
DCZ 328-551, DCZ 328-552
DCZ 328-561, DCZ 328-562 ..... 2.27 mm

*Refer to the heading Adjustments in the text for more information on these components.

FUEL PUMP

Type:
1979–1983 models ..... Electromagnetic diaphragm type
1984–1987 models ..... Electromagnetic plunger type
Delivery pressure:
1979–1982 models ..... 12.4–17.9 kPa
1983–1984 models —
Utility ..... 9.0–13.8 kPa
All other ..... 12.4–17.9 kPa
1985–1987 models ..... 17.9–22.8 kPa
*Delivery volume:
1979–1984 models 25//hour
1985–1987 models 38//hour

*The fuel pump must be removed from the vehicle for this test.

FUEL FILTER

Type ..... Disposable, inline

1. FUEL SYSTEM TROUBLE SHOOTING

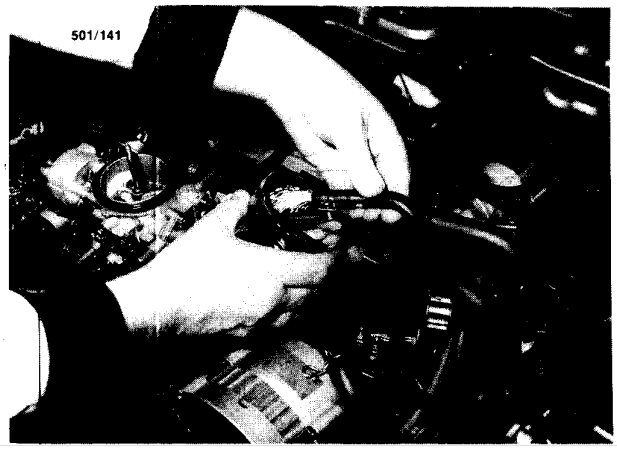
ENGINE WILL NOT START

(1) Lack of fuel in float chamber: Check for fuel pump delivery, sticking needle valve or blocked fuel filter.

(2) Engine flooded with fuel when cold, by excessive use of throttle pedal: Hold throttle pedal flat until engine starts and revise starting procedure.

(3) Engine flooded when hot as in (2) above:

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Check for fuel flow at the carburettor supply line.

Hold throttle pedal flat until engine starts. Also check that the automatic choke, if fitted, is fully open.

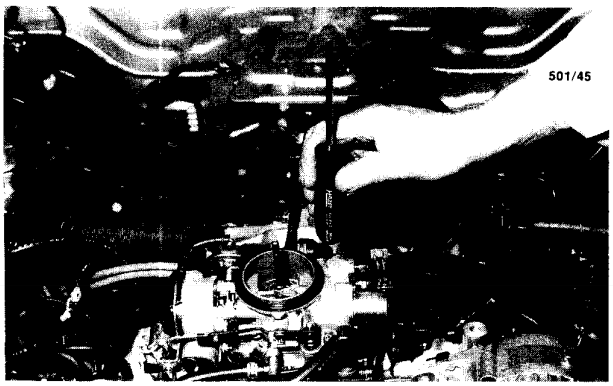
(4) Bowl vent valve, if fitted, malfunctioning: Test bowl vent valve as described later in this section and renew if necessary.

NOTE: On 1979-1984 models, check for a lack of fuel in the float chamber by removing the air cleaner assembly and inspecting the sight glass. A sticking needle valve may sometimes be freed by tapping lightly around the vicinity of the needle valve with a screwdriver handle or similar tool. Check for faulty fuel delivery by disconnecting the fuel supply line at the carburettor and cranking the engine. Engine flooding is indicated by a heavy petrol smell and fuel leaks at the throttle shaft.

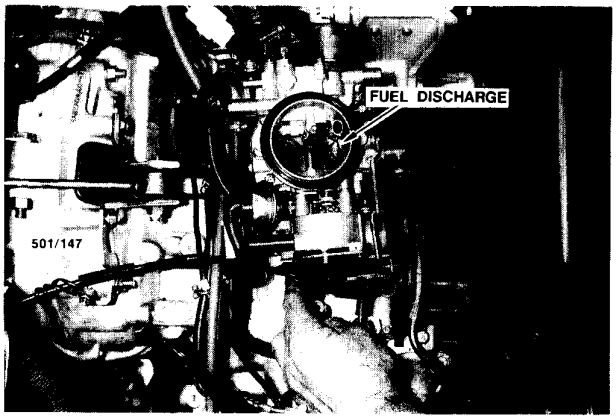
ENGINE STALLS AT IDLE SPEED

(1) Choke system faulty: Refer to the heading Adjustments and check the choke operation and fast idle adjustment, if applicable.

(2) Incorrect idle speed or mixture control screw adjustment: Check and adjust control screws.



Float bowl flooding can sometimes be rectified by tapping in the vicinity of the needle valve and seat.



Check for discharge of fuel at the accelerator pump discharge nozzle.

(3) Carburettor float chamber flooding: Check for sticking needle valve or faulty float. Clean and blow out carburettor.

(4) Carburettor starved of fuel: Check for fuel delivery at needle valve. Clean and blow out carburettor. Check fuel pump and fuel filter.

(5) Blocked slow jet or air bleed: Clean and blow out the carburettor.

(6) Carburettor to inlet manifold nuts loose: Tighten the nuts and check for air leaks.

(7) Leaking carburettor or inlet manifold gaskets: Check and renew faulty gaskets.

(8) Inoperative idle cut solenoid: Check solenoid, electrical connections, and fuses.

NOTE: Check this condition by a process of elimination in the fault order given. Only remove and dismantle the carburettor as a last resort. Air leaks at the manifold can be checked by running engine oil around the suspect joints whilst the engine is running.

FLAT SPOT ON ACCELERATION

(1) Blocked accelerator pump discharge nozzle or sticking check valve: Clean and blow out carburettor as described under the appropriate heading.

(2) Faulty accelerator pump linkage: Check and repair pump linkage.

NOTE: Check the pump circuit by removing the air cleaner and actuating the throttle linkage by hand. A squirt of fuel should be seen in the carburettor throttle bore. On unleaded petrol models do not squirt excessive amounts of fuel into the inlet manifold because raw fuel can damage the catalytic convertor.

ENGINE MISFIRES OR CUTS OUT AT HIGH SPEED

(1) Obstruction in main power jets: Dismantle carburettor and blow out jets.

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(2) Low fuel level in float chamber or float chamber starved of fuel: Check float level settings, check fuel pump suction and delivery hoses.

(3) Failure of fuel pump to deliver sufficient fuel: Renew the fuel pump.

(4) Blockage or restrictions in fuel lines: Disconnect and blow out fuel lines: Visually check for kinking of rubber hoses. Renew parts as necessary.

(5) Evaporative control system malfunctioning: Blow out the lines and check the charcoal canister as described in the Emission Control section.

(6) Restrictions in the inline or needle valve fuel filters: Renew the inline filter or clean the needle valve filter.

(7) Air leak between fuel pump and tank: Rectify air leak.

(8) Air leak between carburettor main body assemblies: Check and renew gaskets and tighten securing screws.

(9) Water in carburettor: Drain and clean fuel system.

NOTE: Check possible faults by process of elimination in fault order given. Check the fuel pump delivery pressure as outlined under the heading Fuel Pump. Check for water in the float chamber and low float level by removing the top cover. Carburettor removal and dismantling procedure is fully outlined in this section.

EXCESSIVE FUEL CONSUMPTION

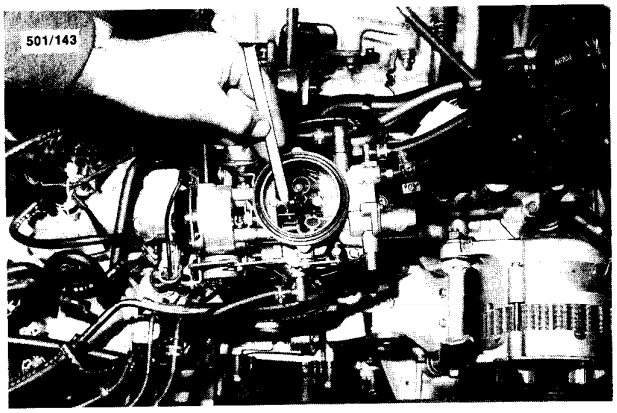
(1) Fuel level too high: Check and adjust fuel level.

(2) Choke valve partially closed: Check and rectify choke operation.

(3) Air cleaner element dirty or damaged: Renew the air cleaner element.

(4) Leaks between fuel pump and carburettor: Check and rectify leaks.

(5) Worn or damaged main jets: Check and renew faulty components.



When the engine is at operating temperature, the choke valve should be fully open.

(6) Excessive use of accelerator pump: Revise driving habits.

(7) Automatic choke incorrectly set, if applicable: Check and adjust operation of automatic choke if necessary.

NOTE: Most common causes for excessive fuel consumption are a blocked air cleaner element, which can be removed and checked visually, and external fuel leakage from system components which can also be checked visually. Choke setting and operation of the choke should also be held suspect as a likely trouble source.

2. AIR CLEANER

DESCRIPTION

The air cleaner assemblies for all models are basically of the same design. The air cleaner assembly consists of a main body, a top cover, a paper type element and, on 1985–1987 Sedan and Station Wagon models, a snorkle assembly.

On 1979–1985 models, hot air to the air cleaner is controlled by a manual control valve. On 1986–1987 models, hot air to the air cleaner is controlled by a vacuum motor and thermostatic valve. Some models are equipped with hot idle compensators to reduce emissions and improve performance when engine compartment temperatures are high. 1986–1987 models are equipped with a small flapper valve at one end of the air cleaner for the positive crankcase ventilation (PCV) circuit.

TO REMOVE AND INSTAL

(1) Remove the bolts retaining the air cleaner body to the air cleaner brackets.

(2) Disconnect the snorkle from the air cleaner main body, if applicable.

(3) Remove the centre wing nut retaining the top cover to the main body.

(4) Disconnect all hoses to the air cleaner.

NOTE: Suitably mark the location of all hoses installed to the air cleaner to aid assembly.

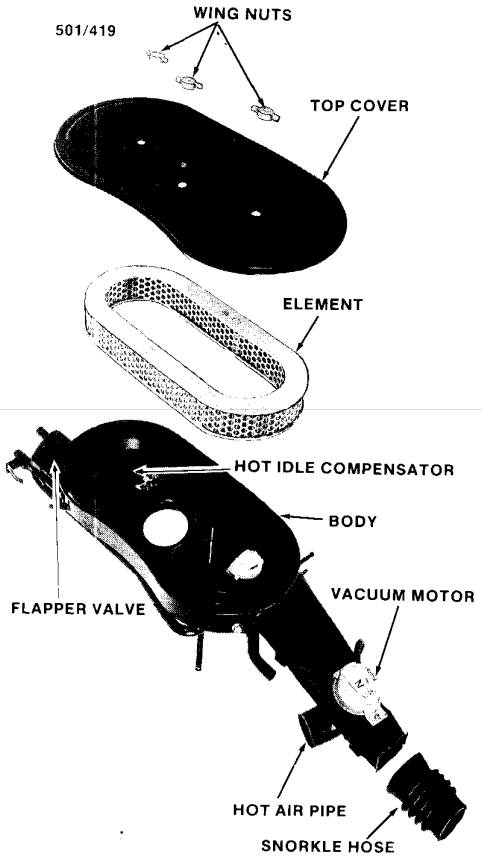
(5) Disconnect the hot air pipe and lift the air cleaner assembly from the carburettor.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the sealing gasket on the carburettor is in good condition. Renew the gasket if necessary.

(2) Ensure that all hoses are connected to the air cleaner correctly. If doubt exists to the correct installed position of a hose refer to the schematic hose layouts in the Emission Control section.

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Dismantled view of the air cleaner assembly, 1986 model shown.

3. CARBURETTOR

DESCRIPTION

The carburettors fitted to Subaru vehicles covered in this manual are all of similar construction. Various changes have been made to the basic carburettor design to adapt to changing needs of the engine and emission control regulations.

The carburettors are split up into two separate types for easy identification purposes, these being models with a sight glass, fitted to overhead valve (OHV) engines and models without a sight glass, fitted to overhead camshaft (OHC) engines.

Carburettors fitted to both OHV and OHC engines may have either an automatic or a manual choke system.

Each carburettor has a model number stamped on the float bowl portion of the main body. These numbers have been listed along with their various engine designations in Specifications and they should be quoted when ordering gasket and overhaul kits.

As it is not practical to show illustrations of every carburettor variant available, two typical types only have been shown, that is a model fitted to OHV engines and a model fitted to OHC engines. When overhauling or adjusting a Subaru Carburettor always check the relevant Specifications to ensure that the correct procedure is being used.

All carburettors are of the twin throat down-draught type, so constructed that only the primary system is operating when the engine is running under a light load.

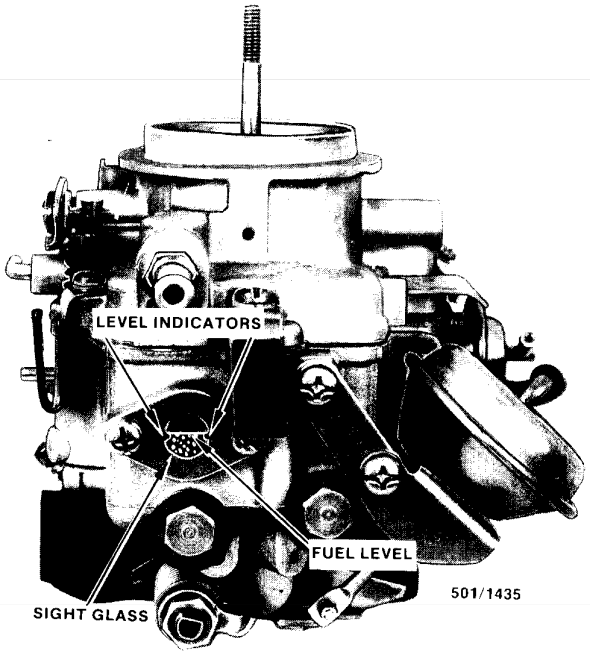
The primary system also provides an adequate mixture for starting when the choke is closed, and is directly activated by the throttle cable.

The secondary system is mostly operated by a vacuum diaphragm however, some early model carburettors use a counterweight.

The secondary throttle valve is kept shut by an interlock mechanism until the primary throttle valve opens 47–50 degrees, depending on model, thereby unlocking the mechanism permitting either venturi vacuum or the counterweight to open the secondary throttle.

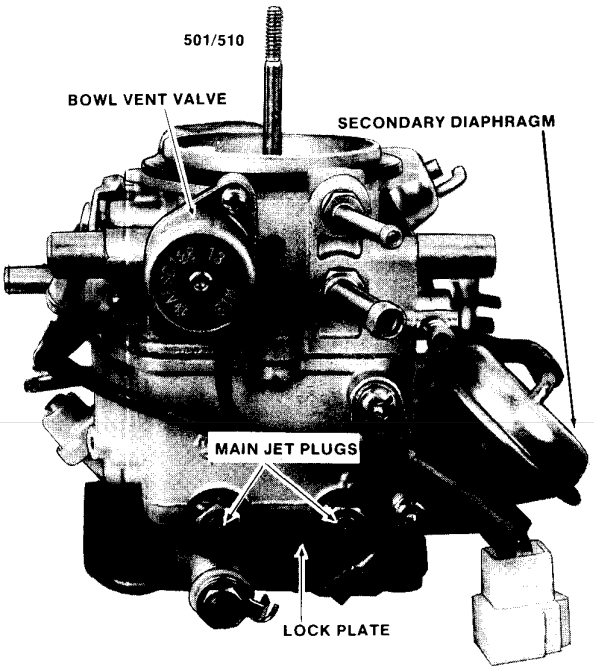
An idle cut-off solenoid valve, operated by the ignition switch, provides an instant fuel cut-off when the engine is switched off to prevent the engine 'running on'.

A mechanically operated accelerator pump provides extra fuel during acceleration by means of a plunger, to prevent flat spots during acceleration.



Side view of the OHV engine carburettor showing the sight glass and fuel level indicators, DCX 328 501 carburettor shown.

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Side view of the OHC engine type carburettor, DCZ 328 551 carburettor shown.

A bowl vent valve has been included in all carburettors from 1984 to reduce the amount of petrol vapours evaporating to the atmosphere when the vehicle is parked.

The automatic choke system utilises on electrically heated bi-metal coil which can be adjusted to suit conditions.

The manual choke system on some models has a semi-automatic facility built into the choke cable which holds the choke cable where it is set until the engine reaches a predetermined temperature.

TO REMOVE AND INSTAL

Due to the different vehicle types and equipment fitted it is not practicable to describe every step when disconnecting various items such as emission control hoses or electrical wiring, therefore it may be necessary to suitably tag any items during removal which may cause confusion during the installation process. Further information regarding the particular components can be obtained by referring to the appropriate sections of the manual.

(1) Disconnect the negative battery terminal.

(2) Remove the air cleaner. Refer to the heading Air Cleaner, if necessary.

(3) Drain the cooling system to a level below the inlet manifold so that coolant will not spill when the carburettor is removed. Refer to the Cooling System section, if necessary.

(4) Loosen the throttle cable adjusting nuts sufficiently so that the cable can be manoeuvred from its mounting bracket and disconnected from the carburettor throttle linkage.

(5) On models with a manual choke, loosen the choke cable retaining screw and disconnect the choke cable from the carburettor.

(6) Mark the fuel hose(s) with suitable quick drying paint and disconnect the fuel supply and, if fitted, the fuel return hoses from the carburettor.

(7) Disconnect the carburettor wiring connector.

(8) Suitably mark and disconnect the carburettor vacuum hoses.

(9) Remove the carburettor mounting nuts and lift the carburettor from the inlet manifold. Discard the gaskets either side of the spacer block.

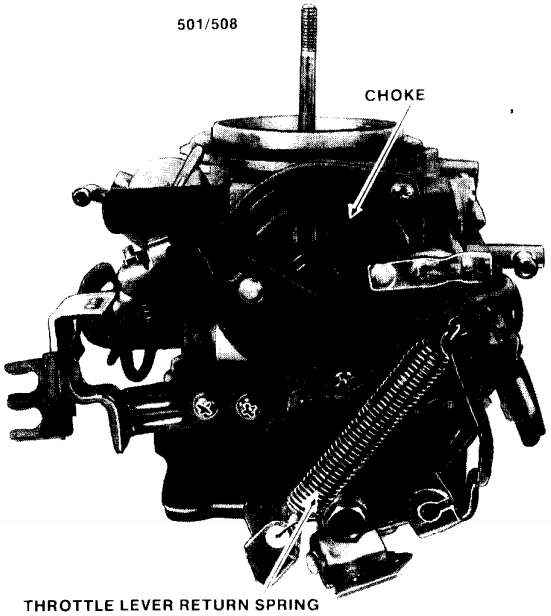
NOTE: It is always good practice to lay a piece of lint free cloth over the inlet manifold induction orifice. Extensive engine damage may be sustained if objects are accidently dropped into the inlet manifold.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Use new gaskets either side of the carburettor spacer block. If necessary carefully scrape the gasket surfaces clean, making sure that no foreign matter is dropped into the inlet manifold.

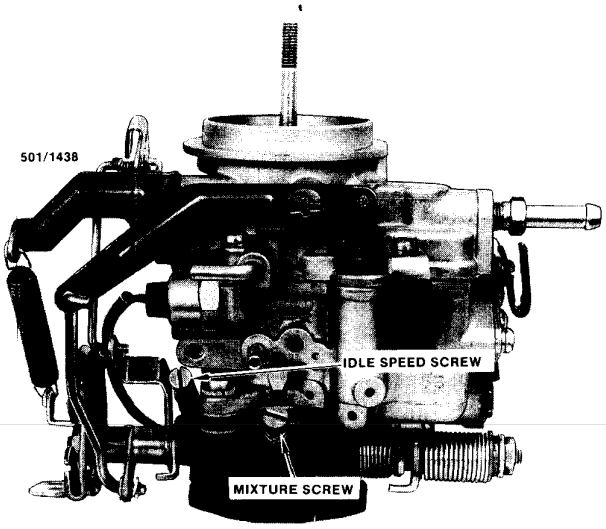
(2) Refill the cooling system as necessary.

(3) Adjust the throttle cable when the carburettor is installed ensuring that when the throttle pedal is pressed fully that the primary throttle valve is fully open. When the throttle pedal is released there should be a small amount of cable freeplay. Adjust as necessary.



Automatic choke side view of OHC engine carburettor, DCZ 328 551 carburettor shown.

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Side view of the OHC engine carburettor showing idle speed screw and mixture screw, DCX 328 501 carburettor shown.

(4) On models with a manual choke ensure that when the choke knob is pulled completely out, the choke valve is fully closed and that when the choke knob is pushed completely in, the choke valve is fully open. Adjust as necessary.

(5) Check the carburettor for water, fuel and vacuum leaks and adjust the idling speed to the specified rpm after warm up. Refer to the Engine Tune-up section, if necessary.

TO SERVICE

When overhauling the carburettor several items of importance should be observed to ensure a thorough job.

(1) All components should be carefully cleaned although not all components may be cleaned with solvent, these include the diaphragm and solenoid assemblies.

(2) Use air pressure only to clean the various orifices and channels.

(3) Renew faulty components.

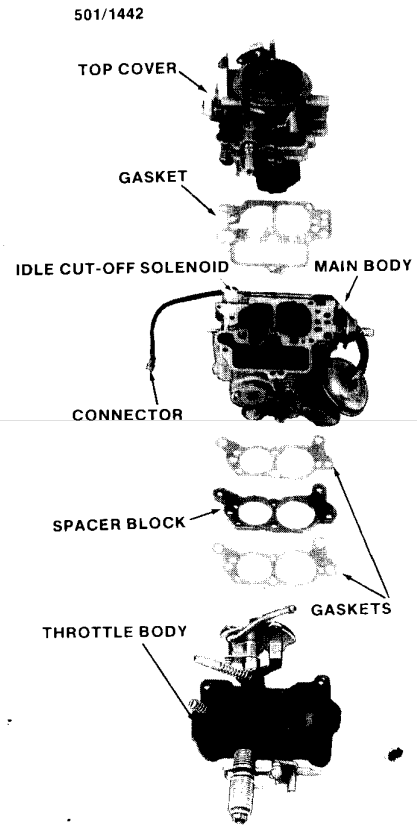
When checking components removed from the carburettor it is at times difficult to be sure whether they are satisfactory for further service. It is therefore recommended that in such cases new components be installed.

(4) Always use a new gasket kit when overhauling the carburettor.

(5) Always use the correct size screwdrivers and spanners to prevent damage to the jets and screw heads.

TO DISMANTLE

(1) Remove the carburettor from the vehicle as previously described.



Dismantled view of OHV engine carburettor, DCX 328 '501 carburettor shown.

NOTE: Keep each section of the carburettor separate and as far as possible in the order of removal. This will assist in assembly.

(2) Disconnect the throttle return spring.

(3) Remove the accelerator pump actuating lever screw and washer. Note the installed position of the return spring, if fitted. Disconnect the actuating lever from the connecting rod. On some models a spring clip may have to be removed first.

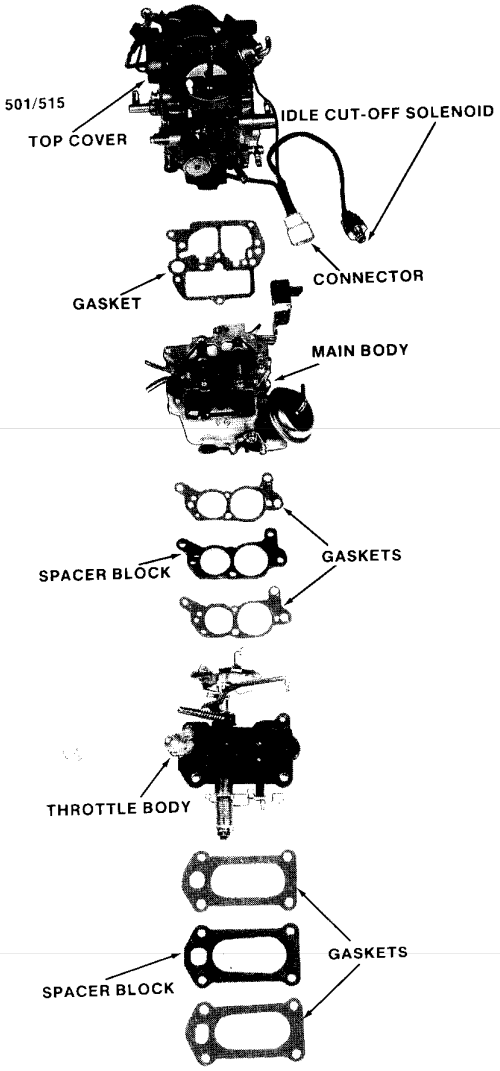
(4) Remove the fast idle connecting rod split pin and washer and disconnect the connecting rod from the choke lever. Be careful not to lose the small spring that is fitted to some models. If necessary, the connecting rod can be disconnected from the throttle lever on some models.

(5) Remove the top cover to main body retaining screws, noting the positions of the wiring brackets as an aid to assembly. Remove the choke cable bracket, if fitted.

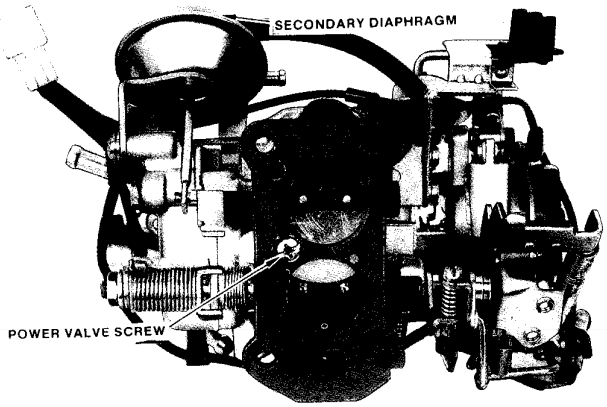
NOTE: If necessary carefully use an impact screw driver to loosen the top cover retaining screws.

(6) Lift the top cover from the main body and discard the gasket.

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Dismantled view of OHC engine carburettor, DCZ 328 551 carburettor shown.



Underside view of OHC engine carburettor showing the power valve screw, DCZ 328 551 carburettor shown.

(7) Remove the accelerator pump check ball, spring and weight from the main body.

(8) If necessary remove the idle cut-off solenoid from the main body. Some models do not have a separate connector for the idle cut-off solenoid so it will be necessary to loosen the solenoid gradually while turning the top cover to prevent the wiring becoming excessively twisted. Remove the idle cut-off solenoid plunger and spring from the main body.

(9) Disconnect the vacuum hose from the secondary throttle vacuum unit.

(10) If applicable, remove the snap ring and disconnect the secondary throttle vacuum unit link from the secondary throttle lever.

(11) Turn the carburettor upside down, note the position and remove the power valve screw and washer from the throttle body. Do not damage the vacuum passage in this screw.

(12) With the carburettor the right way up, remove the screws retaining the main body to the throttle body.

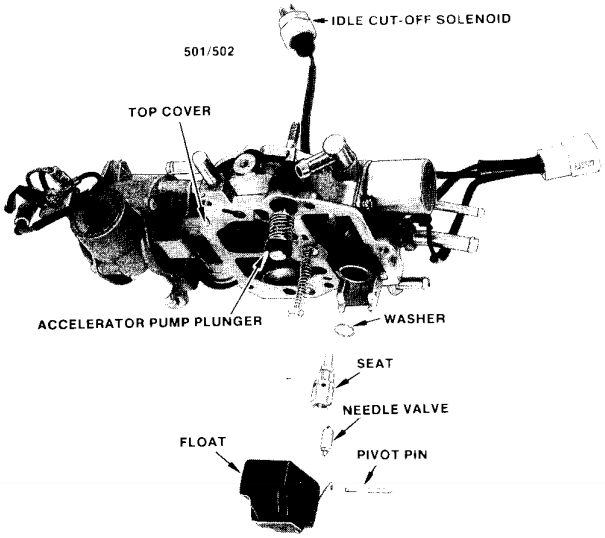
(13) Separate the main body from the throttle body. Discard the gaskets either side of the spacer block.

(14) The carburettor is now dismantled into its three major sub assemblies, these being the top cover, the main body and the throttle body.

Proceed as necessary in dismantling by referring to the individual following service procedures.

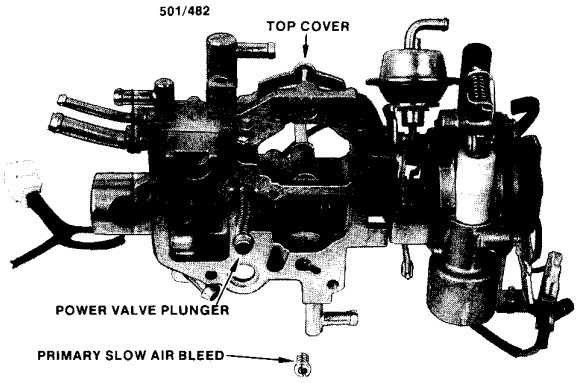
TO SERVICE TOP COVER

(1) Remove the accelerator pump plunger and the dust boot from the top cover. Inspect the plunger for wear and damage and renew the plunger assembly where necessary.



View of the float and the needle and seat removed from the OHC engine top cover, DCZ 328 551 carburettor shown.

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Primary slow air bleed removed from OHC engine top cover, DCZ 328 551 carburettor shown.

(2) Remove the float pivot pin, and withdraw the float and needle valve.

(3) Remove the needle valve seat assembly using a screwdriver and clean out the filter with compressed air. Be careful not to lose the washer.

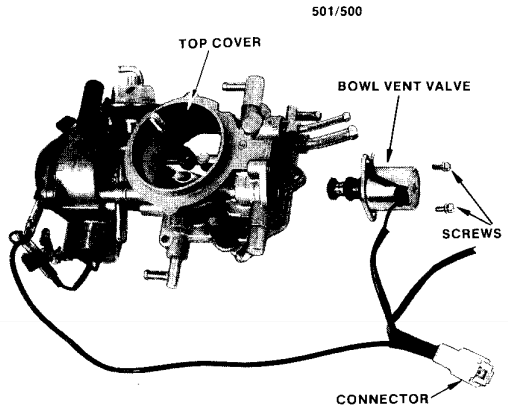
(4) Remove the spring clip retaining the needle to the float and inspect the sealing surface of the needle and seat for any signs of wear, scoring or pitting. Renew the needle and seat as an assembly if necessary.

(5) Check the float for signs of obvious damage. Renew the float, where necessary.

(6) Using a suitable screwdriver remove the primary slow air bleed.

(7) If applicable remove the bowl vent valve retaining screws and remove the bowl vent valve. Discard the 'O' rings.

NOTE: The bowl vent valve can be tested using jumper leads by connecting the power wire of the valve to the positive terminal of a 12 volt battery and the negative wire of the valve to the negative terminal of the same battery. The plunger should move freely. Replace the bowl vent valve, if necessary.



Bowl vent valve removed from OHC engine top cover, DCZ 328 551 carburettor shown.

(8) Thoroughly clean the top cover in a suitable solvent.

(9) Instal the needle valve seat using a new seat washer. Clip the needle valve and clip assembly onto the float.

(10) Instal the float and needle valve assembly to the top cover and insert the float pivot pin. Check and if necessary adjust the float level as described later in this section.

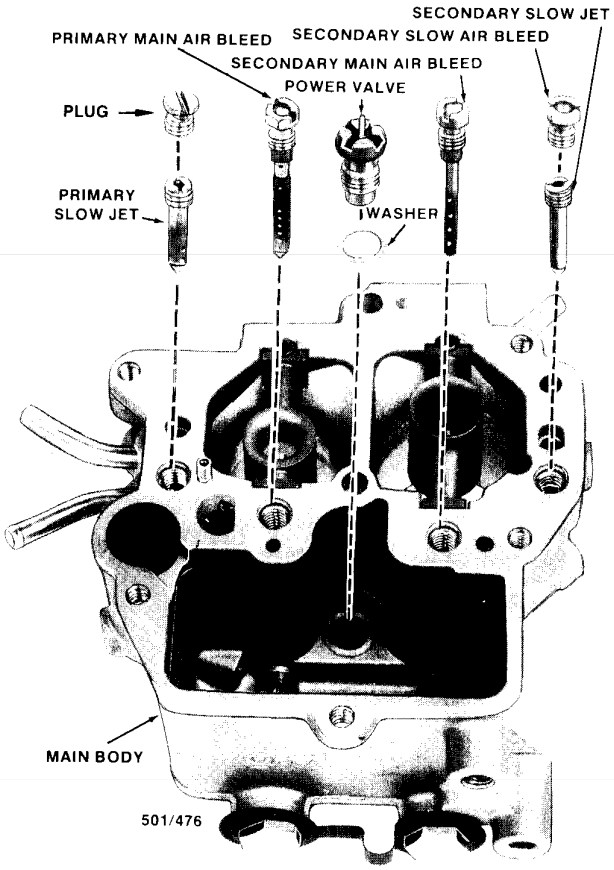
(11) Instal the accelerator pump plunger and the dust boot to the top cover.

NOTE: Do not remove the power valve piston or the choke valve from the top cover. If they are excessively worn or damaged, the top cover assembly should be renewed. Any binding or sticking linkages should be freed to ensure correct operation.

TO SERVICE MAIN BODY

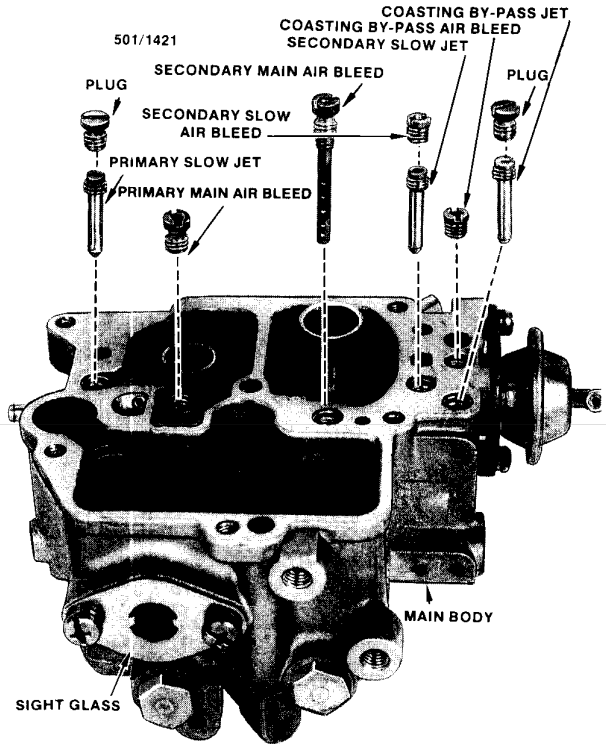
(1) Using suitable screwdrivers, remove the primary and secondary main air bleeds from the main body.

(2) Remove the plug and the primary slow jet from the installed position beside the primary barrel.



View of the jets removed from OHC engine main body, DCZ 328 551 carburettor shown.

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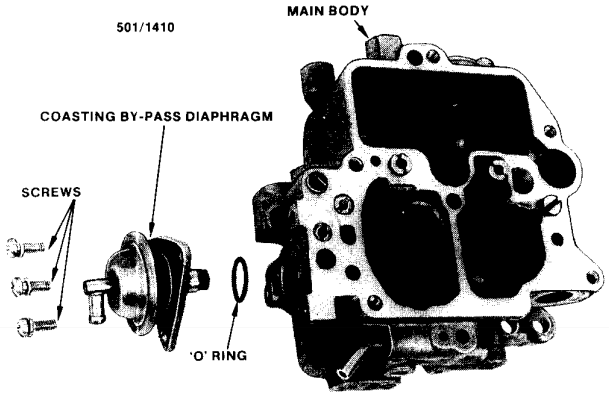


View of the jets removed from OHV engine main body, DCX 328 501 carburettor shown.

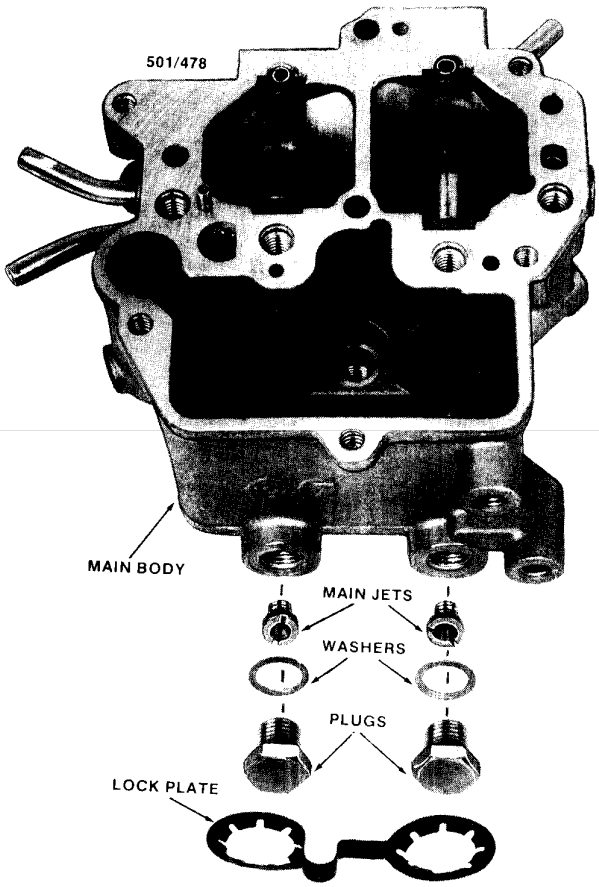
(3) Remove the secondary slow jet air bleed and jet from the installed position beside the secondary barrel.

(4) If applicable, remove the coasting by-pass plug, jet and air bleed from their installed positions adjacent to the coasting by-pass diaphragm. Remove the screws and remove the coasting by pass diaphragm. Discard the 'O' ring.

(5) Prise off the lock plate, if applicable and remove the primary and secondary main jet plugs and washers. Remove the main jets.



View of the coasting by-pass diaphragm removed from the OHV engine main body, DCX 328 501 carburettor shown.



Main jets removed from OHC engine main body, DCZ 328 551 carburettor shown.

NOTE: The jets in the primary and secondary circuits must not be interchanged or poor performance and/or economy will result.

(6) Remove the power valve and sealing washer from the float chamber.

(7) Remove the secondary throttle diaphragm assembly.

(8) If not previously removed, remove the idle cut-off solenoid and sealing washer from the main body.

(9) Using a 12 volt battery check the operation of the idle cut off solenoid by holding the body of the solenoid to the negative (−) battery post and connecting the wire to the positive (+) post. The plunger should now be pulled in. If necessary, renew the solenoid.

(10) Clean each jet thoroughly in a suitable solvent and blow out with compressed air. Do not clean out any jet with wire or a drill bit as damage could result.

(11) Thoroughly clean the main body in a suitable solvent and blow dry with compressed air.

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(12) Using a hand vacuum pump or similar equipment, test the secondary throttle diaphragm assembly, if fitted, to ensure that it is not siezed or damaged. Renew the secondary throttle diaphragm if necessary.

(13) Using feeler gauges and a straight edge check the top and the bottom surfaces of the main body for distortion. Where distortion is excessive the main body should be renewed.

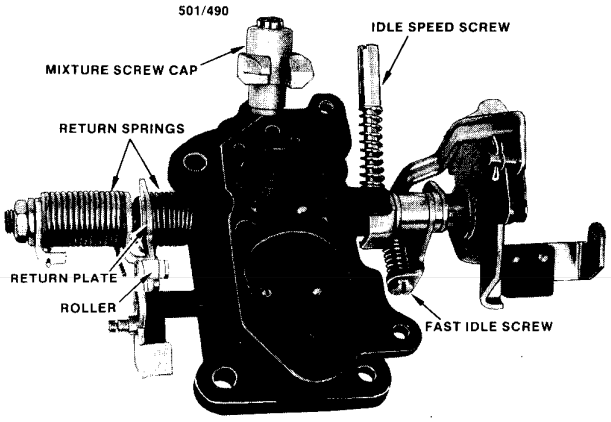
(14) Renew any jet which is obviously worn and instal the jets to their respective positions using new gaskets where necessary.

Assembly is a reversal of the dismantling procedure.

TO SERVICE THROTTLE BODY

Due to the close tolerance used by the manufacturer it would be impossible to reproduce the fit of the valve shafts in the throttle body. For this reason if any damage or wear is apparent in the throttle valves or shafts the complete throttle body should be renewed.

Servicing of the throttle body consists of cleaning the body in a suitable solvent and blowing dry with compressed air.



View of the OHC engine throttle body, DCZ 328-551 carburettor shown.

The primary and secondary throttle return springs should be checked to ensure that they are not damaged or broken. Renew the springs if necessary.

The mixture screw should not be removed or adjusted as this will disturb the idle mixture which is set to comply with the emission control regulations. The external levers and linkages should be checked for ease of movement and any sticking of the linkage should be rectified.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Using new gaskets either side of the spacer block, assemble the throttle body to the main body and securely tighten the retaining screws. Ensure that the hollow power valve screw is installed in its original position as noted on dismantling.

(2) Ensure that the accelerator pump weight, ball and spring are correctly installed and instal a new top cover gasket.

NOTE: The accelerator pump spring has a close wound end which must push on the accelerator pump ball.

(3) Instal the idle cut-off plunger, spring and solenoid using a new sealing washer. Ensure that the idle cut-off solenoid wire is not twisted.

(4) Assemble the top cover to the main body, correctly position the brackets, instal and securely tighten the retaining screws.

(5) Instal the accelerator pump actuating lever screw and washers and if applicable, the return spring and the spring clip.

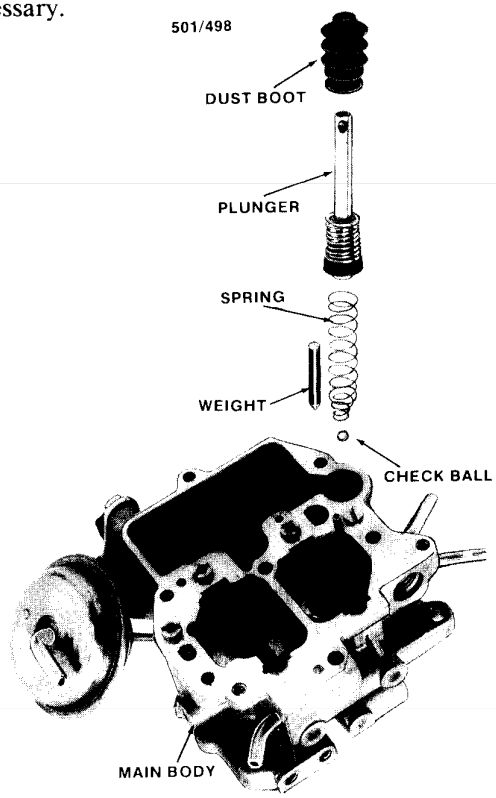
(6) Instal the washer and a new split pin in the fast idle connecting rod to retain it to the choke lever.

(7) Connect the throttle return spring.

(8) Check the operation of all linkages and adjust if necessary before installing the carburettor.

(9) Instal the carburettor to the engine, as previously described.

(10) Start the engine and check the choke operation. Check for any fuel leaks. Rectify leaks as necessary.



Dismantled view of OHC engine accelerator pump components, DCZ 328 551 carburettor shown.

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ADJUSTMENTS

Refer to the Engine Tune-up section for the correct procedure to adjust the idle speed and mixture settings.

TO ADJUST FLOAT LEVEL

(1) With the top cover removed from the carburettor, invert the top cover and allow the float seat tab to just rest against the needle valve stem by holding it lightly with a finger.

NOTE: Do not allow the weight of the float to compress the spring loaded needle valve stem or false float level will be obtained.

(2) Ensuring that the top cover gasket is removed measure the distance from the upper edge of the float to the carburettor top cover gasket face and compare this figure with Specifications. If adjustment is required, bend the float seat tab gently with a pair of long nosed pliers until the desired measurement is obtained.

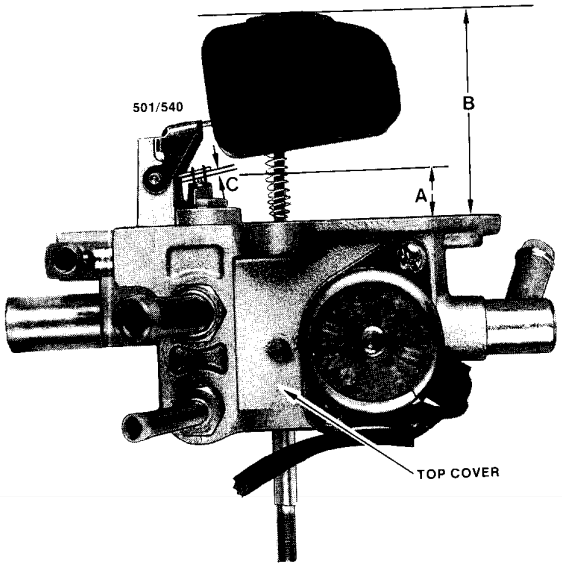
(3) Remove the spring clip retaining the needle valve stem to the float.

(4) With the top cover still inverted raise the float with the fingers until the float stopper tab contacts it stop.

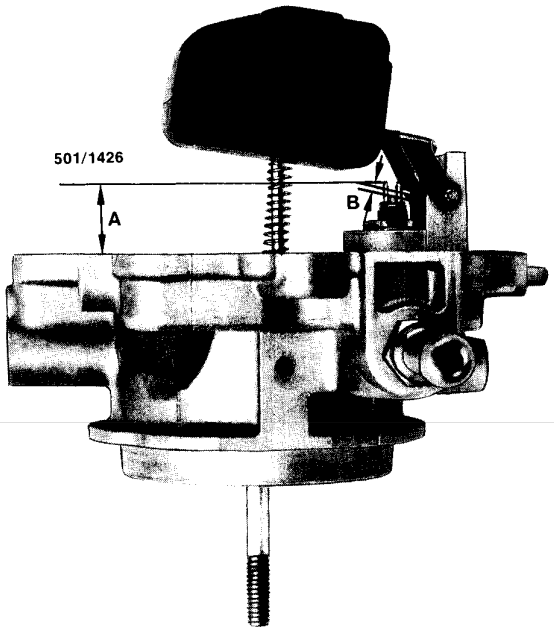
(5) Measure the distance between the needle valve stem and the float seat tab, refer to Specifications for the correct needle valve clearance.

If adjustment is required, gently bend the float stopper tab with a pair of long nosed pliers until the desired measurement is obtained.

(6) Instal the spring clip retaining the needle valve stem to the float.



Dimensions for checking OHC engine float level (A), float drop (B) and needle clearance (C), DCZ 328 551 carburettor shown.



Dimensions for checking OHV engine float level (A) and needle valve clearance (B), DCX 328 501 carburettor shown.

(7) Measure the float drop clearance, if required, using the following procedure:

(a) With the top cover still inverted raise the float with the fingers again until the float stopper contacts its stop.

(b) Measure the distance from the lower edge of the float to the carburettor top cover gasket face and compare this figure with Specifications.

(c) If adjustment is required gently bend the float stopper tab with a pair of long nosed pliers until the desired measurement is obtained.

NOTE: Only a small adjustment, if any, in step (c) should be needed. If a large adjustment is required the float lever is bent. Straighten the lever and start at step (1) again.

To Adjust Throttle Interlock

(1) With the carburettor removed from the vehicle hold the secondary throttle valve in the fully closed position.

(2) Slowly open the primary throttle valve until the return plate is just about to move away from the secondary throttle lever roller.

(3) At this point the specified clearance should exist between the edge of the throttle valve and the inner wall of the primary throttle bore. This is easily measured by using a drill or gap gauge.

(4) To adjust bend the lug on the lever that operates the return plate.

(5) Instal the carburettor as previously described.

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To Adjust Fast Idle Speed

(1) With the carburettor removed from the vehicle hold the choke valve closed. Open the throttle lever fully and allow it to close. The throttle valve will lock just before it closes fully.

(2) At this point the specified clearance should exist between the edge of the throttle valve and the inner wall of the primary throttle bore. This is easily measured by using a drill or gap gauge.

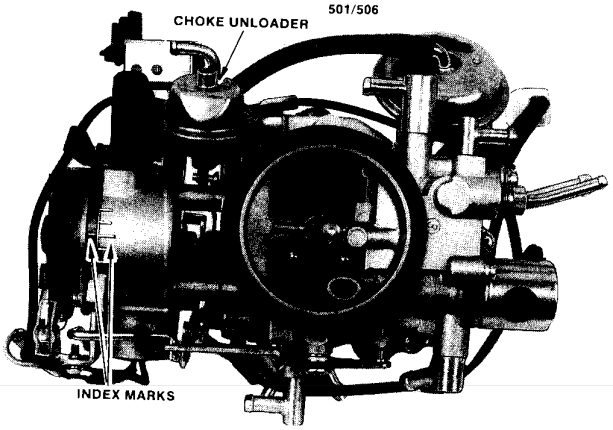
(3) To adjust turn the fast idle screw in the required direction.

(4) Instal the carburettor as previously described.

To Adjust Choke Unloader Clearance, Automatic Choke Models

(1) Remove the air cleaner as described previously and ensure the engine is cool.

(2) Close the choke valve and open and close the throttle lever. Ensure that the choke valve remains closed.



Top view of OHC engine carburettor showing the automatic choke index marks, DCZ 328 551 carburettor shown.

(3) Connect a suitable hand vacuum pump to the choke unloader diaphragm. Continue to apply vacuum pressure until the choke unloader link is drawn as far as it will go towards the diaphragm.

(4) Measure the clearance between the edge of the choke valve and the inner wall of the primary bore while holding the choke valve lightly against the unloader with a finger. This is easily measured by using a drill or gap gauge.

(5) Compare the clearance with Specifications and adjust by bending the pawl at the tip of the choke breaker link if necessary.

TO CHECK AUTOMATIC CHOKE OPERATION

(1) Allow the car to stand for a period of time so that the engine is cold.

(2) Remove the air cleaner as described previously, fully open the throttle and check that the choke valve is fully closed.

NOTE: If the choke valve does not close check the choke valve shaft for binding or seizure.

(3) Instal the air cleaner assembly, start and run the engine until it reaches normal operating temperature. Remove the air cleaner assembly and check that the choke valve is fully open.

(4) If the choke valve is not fully open, connect a voltmeter or test lamp between the choke power supply, at the partially exposed soldered connection on the automatic choke cover and suitable earth.

(5) With the ignition on and the engine stopped, there should be no voltage at the power supply. With the engine running a reading of 12 volts should be indicated on the voltmeter or the test lamp should light. If no current is evident there is a fault in the engine revolution switch, on 1986–1987 models only or the electrical harness. Check these possibilities referring to the Fuel Pump heading that follows for more information on the engine revolution switch. Renew the engine revolution switch if necessary.

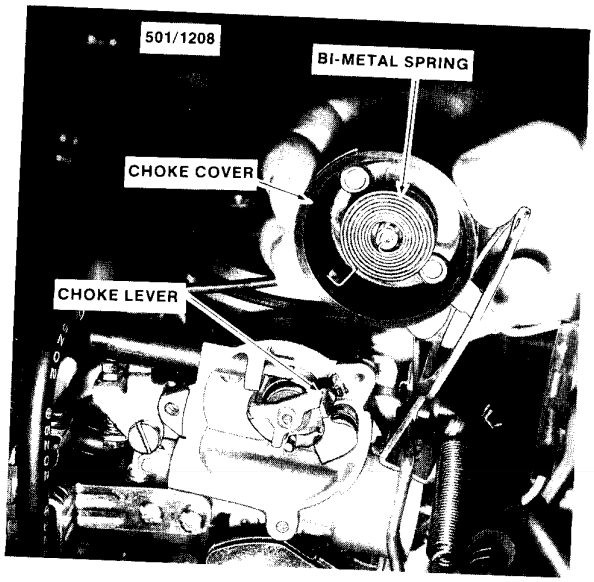
TO RENEW AUTOMATIC CHOKE COVER

(1) Remove the air cleaner assembly as described previously.

(2) Disconnect the carburettor wiring connector and using a suitable tool manoeuvre the choke wire from the connecter. Disconnect the other choke cover wire from the wax element wire connector.

(3) Note the relationship of the choke cover to the choke housing index marks.

(4) Remove the screws and retaining ring attaching the choke cover and remove the choke cover from the carburettor.



Side view of OHC engine carburettor with the automatic choke cover removed, DCZ 328 551 carburettor shown.

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(5) Instal a new choke cover ensuring that the bi-metal spring engages with the choke lever. Reconnect the wiring connectors.

(6) Rotate the cover until the marks noted previously are aligned. The choke valve, with the engine cold, should now be closed.

(7) Instal the air cleaner assembly and road test the vehicle under cold, warm and hot engine temperatures. If necessary adjust the operation of the choke by turning the cover one way or the other.

4. ELECTROMAGNETIC PLUNGER FUEL PUMP

Special Equipment Required:
To Test Pump — Pressure gauge, suitable graduated cylinder
To Test Pump Circuit — Multimeter

DESCRIPTION

The electromagnetic plunger type fuel pump is located under the rear floor on the drivers side of 1984 to 1987 vehicles. The fuel pump is rubber mounted to a support bracket to reduce noise and vibration. The support bracket also incorporates a mounting for the fuel filter.

On 1986–1987 models the fuel pump will only run when the engine is cranking or running. This function is controlled by the engine revolution sensor mounted in the drivers side kickpanel. The engine revolution sensor also controls the power to the automatic choke. A damper is placed in the discharge line from the fuel pump on some models to reduce pulsations within the system.

The fuel pump is non adjustable and non repairable and must be renewed as a unit when found to be defective.

TO TEST PUMP

If the fuel pump is thought to be defective because of insufficient fuel supply to the carburettor, carry out the following tests before removing the fuel pump from the vehicle:

(1) Check the fuel filter and fuel lines for blockage. Ensure that there is fuel in the fuel tank.

(2) Remove the air cleaner as previously described and disconnect the fuel supply hose from the carburettor float chamber connection.

NOTE: Have an old piece of rag ready to soak up any petrol that may spill from the carburettor.

(3) Connect a suitable pressure gauge to the fuel supply hose.

(4) Start the engine and check the reading on the gauge ensuring that the system is clear of trapped air. Compare the reading on the gauge with Specifications.

NOTE: The engine will only run for a short time on the fuel that is in the float chamber.

(5) If the pressure reading is correct, stop the engine, remove the gauge and reconnect the fuel supply hose to the carburettor.

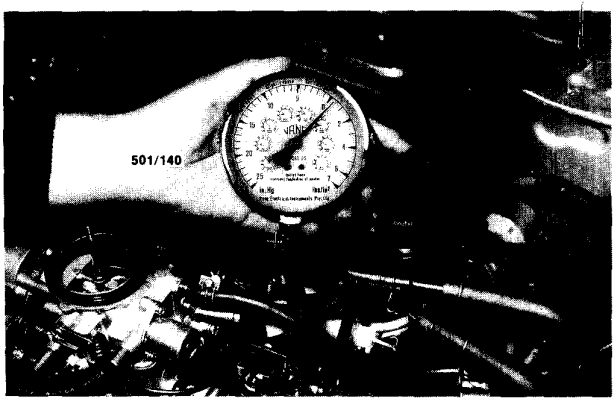
(6) If the pressure is low or the fuel pump is not working at all, test the voltage available at the fuel pump as follows:

(a) Raise the rear of the vehicle and support it on chassis stands.

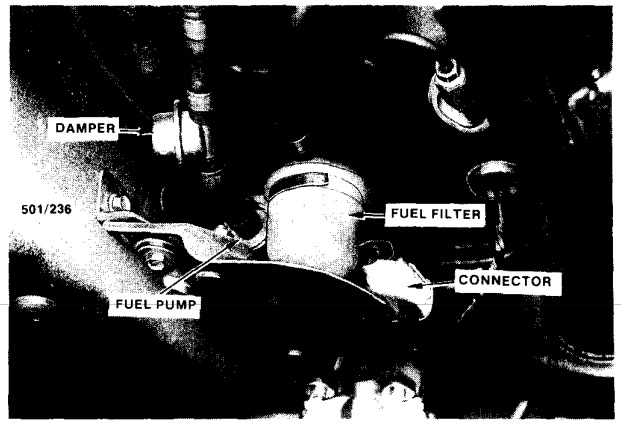
(b) Disconnect the fuel pump wiring connector from the fuel pump.

(c) Connect the leads of a suitable multimeter to the disconnected fuel pump wiring connector. Connect the negative probe of the multimeter to the terminal connected to the plain black wire and the positive probe of the multimeter to the terminal connected to the blue wire or the black wire with a white trace, depending on model.

(d) Have an assistant start the engine. The multimeter should indicate battery cranking voltage while the engine is cranking. When the engine starts, the multimeter should indicate battery voltage.



Testing fuel pump delivery pressure using a suitable gauge.



Underbody view of fuel pump and fuel filter, 1986 model shown.

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NOTE: The engine will only run for a short time on the fuel that is in the float chamber.

(e) If the correct voltage is available at the fuel pump test the fuel pump delivery volume using the procedure described in step (7).

(f) If no voltage or a low voltage is present check the fuel pump wiring and retest. On 1986–1987 models check the engine revolution sensor by substituting a known serviceable unit and retest. Repair or renew the components as necessary.

(7) Test the fuel pump delivery volume using the following procedure:

(a) Remove the fuel pump from the vehicle as described under the heading To Remove and Instal.

(b) Disconnect the short hose between the fuel filter and the suction pipe of the fuel pump and connect a length of suitable hose to the suction pipe. Place the other end of this hose in a drum containing at least five litres of fuel.

NOTE: When conducting tests on the fuel pump take particular care not to ignite the fuel with sparks or hot components. Always have a suitable fire extinguisher nearby in case of a fire.

(c) Connect another length of hose to the discharge pipe of the fuel pump and place the end of this hose in a graduated cylinder of not less than 5 litre capacity.

(d) Using jumper leads connected to a 12 volt battery, connect the positive jumper lead to the terminal of the fuel pump that was previously connected to the blue wire, or the black wire with the white trace, when the pump was installed on the vehicle. Connect the negative jumper lead to the other fuel pump terminal.

(e) Allow the pump to run for exactly five minutes then disconnect the negative jumper lead from the battery.

(f) Check the amount of fuel in the graduated cylinder at the completion of this test. There should be 3.17 litres in the graduated cylinder if the fuel pump is operating correctly.

Renew the fuel pump if necessary.

TO REMOVE AND INSTAL

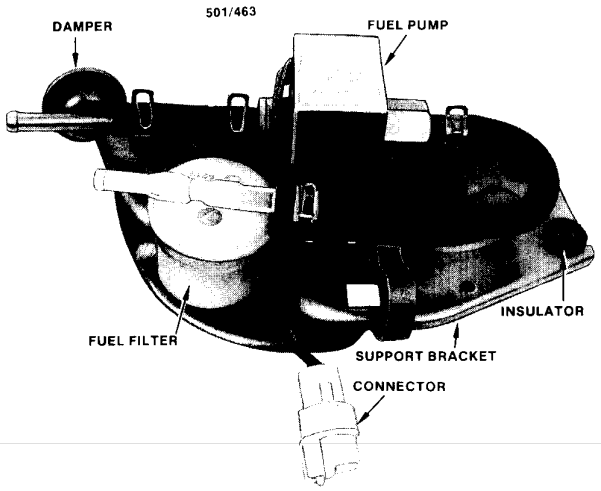
(1) Disconnect the negative battery terminal.

(2) Raise the rear of the vehicle and support it on chassis stands.

(3) Remove the bolts retaining the fuel pump support bracket to the vehicle chassis.

(4) Disconnect the fuel pump wiring connector from the fuel pump.

(5) Suitably mark and disconnect the suction hose to the fuel filter and the discharge hose from the fuel pump. Block the fuel hoses to prevent the loss of fuel and the entry of dirt.



View of the electromagnetic plunger type fuel pump and associated components.

(6) Withdraw the fuel pump and support bracket assembly from the vehicle.

(7) If necessary remove the nuts, washers and insulators securing the fuel pump to the support plate, disconnect the fuel hoses and withdraw the pump assembly.

Installation is a reversal of the removal procedure with attention to the following points:

(1) If the fuel pump was removed from its support plate ensure that the rubber insulators are in good condition before tightening the retaining nuts securely. Renew the insulators if necessary.

(2) When connecting the fuel hoses ensure that they are correctly connected. If the hoses are kinked fuel flow will be restricted.

(3) Ensure that the rubber insulators between the support plate and the chassis are in good condition before securely tightening the retaining bolts. Renew the insulators if necessary.

5. ELECTROMAGNETIC DIAPHRAGM FUEL PUMP

Special Equipment Required:

To Test Pump — Pressure gauge, suitable graduated cylinder

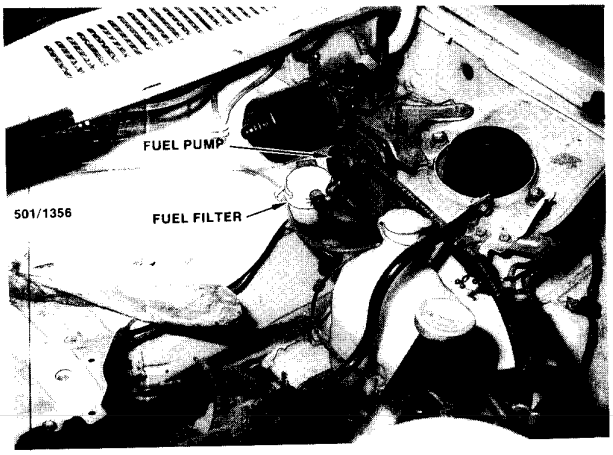
To Test Pump Circuit — Multimeter

DESCRIPTION

The electromagnetic diaphragm fuel pump is located in the engine compartment adjacent to the left hand suspension tower on 1979 to 1983 vehicles. The pump is rubber mounted to a support bracket to reduce noise and vibration. The fuel pump is electrically connected to the ignition switch so that it only operates when the ignition is switched on.

The fuel pump is non adjustable and non repair able and must be renewed as a unit when found to be defective.

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Installed view of the diaphragm fuel pump and filter.

TO TEST PUMP

If the fuel pump is thought to be defective because of insufficient fuel supply to the carburettor, carry out the following tests before removing the fuel pump from the vehicle:

(1) Check the fuel filter and fuel lines for blockage. Ensure that there is fuel in the fuel tank.

(2) Remove the air cleaner as previously described and disconnect the fuel supply hose from the carburettor float chamber connection.

NOTE: Have an old piece of rag ready to soak up any petrol that may spill from the carburettor.

(3) Connect a suitable pressure gauge to the fuel supply hose.

(4) Switch the ignition on and check the reading on the gauge ensuring that the system is clear of trapped air. Compare the reading on the gauge with Specifications.

(5) If the pressure reading is correct, switch the ignition off, remove the gauge and reconnect the fuel supply hose to the carburettor.

(6) If the pressure reading is low or the fuel pump is not working at all, test the voltage available at the fuel pump as follows:

(a) Disconnect the fuel pump wiring connector from the fuel pump.

(b) Connect the leads of a suitable multimeter to the disconnected fuel pump wiring connector. Connect the negative probe of the multimeter to the terminal connected to the plain black wire. Connect the positive probe of the multimeter to the terminal connected to the black wire with the white trace.

(c) Switch the ignition on and note the reading on the multimeter. If the multimeter indicates approximately battery voltage, test the fuel pump delivery volume using the procedure described in step (7).

(d) If the multimeter indicates less than battery voltage check the wiring to the fuel pump, the ignition switch and all connectors. Renew or repair any components as necessary.

(7) Test the fuel pump delivery volume using the following procedure:

(a) Disconnect the fuel suction hose from the fuel pump and connect a length of suitable hose to the suction pipe. Place the other end of this hose in a drum containing at least five litres of fuel.

NOTE: The drum should be as close to the fuel pump as possible.

(b) Connect another length of hose to the discharge pipe of the fuel pump and place the end of this hose in a graduated cylinder of not less than 5 litre capacity.

NOTE: When conducting tests on the fuel pump take particular care not to ignite the fuel with sparks or hot components. Always have a suitable fire extinguisher nearby in case of a fire.

(c) Switch the ignition switch on and allow the fuel pump to run for exactly five minutes.

(d) Switch the ignition switch off and check the amount of fuel in the graduated cylinder. There should be 2.08 litres of fuel in the graduated cylinder if the fuel pump is operating correctly.

Renew the fuel pump if necessary.

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Suitably mark and disconnect the suction and delivery hoses from the fuel pump. Plug the hoses to prevent the entry of dirt and the loss of fuel.

(3) Disconnect the fuel pump wiring connector from the fuel pump.

(4) Remove the bolts retaining the fuel pump support bracket to the left hand suspension tower and withdraw the fuel pump and support bracket from the engine compartment.

(5) If necessary, remove the nuts retaining the fuel pump to the support bracket and separate the fuel pump from the support bracket.

Installation is a reversal of the removal procedure with attention to the following points:

(1) If necessary, renew the fuel pump mounting rubbers and cushion rubber before installing the support bracket to the vehicle.

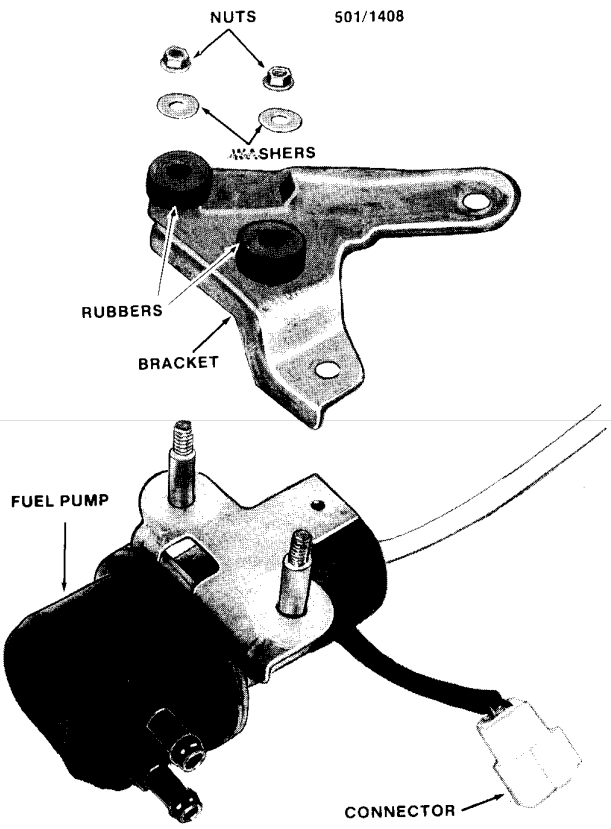
NOTE: If it is difficult to instal new rubbers, wet the rubbers with a solution of soap and water.

(2) Ensure that the breather tube on the fuel pump enters the body aperture.

(3) Instal the fuel pump suction and delivery hoses to the positions marked on removal.

(4) Ensure that the earth lead from the body is installed under one of the support bracket mounting bolts.

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View of the diaphragm fuel pump and support bracket removed from the vehicle.

6. FUEL FILTER

The fuel filter is an inline paper element type and is installed between the fuel tank and the carburettor in the fuel delivery line. The filter is situated under the rear of the vehicle on either the left or right hand side or in the engine compartment, depending on the vehicle model. The filter should be periodically renewed as described in the Engine Tune-up section.

7. FUEL TANK

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Raise the rear of the vehicle and support it on chassis stands. To gain access, remove the right hand side rear wheel.

(3) Remove the fuel filler cap.

(4) Remove the fuel tank drain plug and drain the fuel tank contents into a suitably sized container. If the vehicle is not fitted with a drain plug, siphon the contents via the fuel filler neck.

NOTE: When the fuel tank has drained instal and securely tighten the drain plug.

(5) Disconnect the fuel sender unit wiring at the connector on 1979–1984 and all Utility models.

(6) Remove the rear differential on four wheel drive models as described in the Rear Axle section.

(7) Remove the nuts and bolts retaining the fuel pipe protector to the chassis and withdraw the protector from the vehicle.

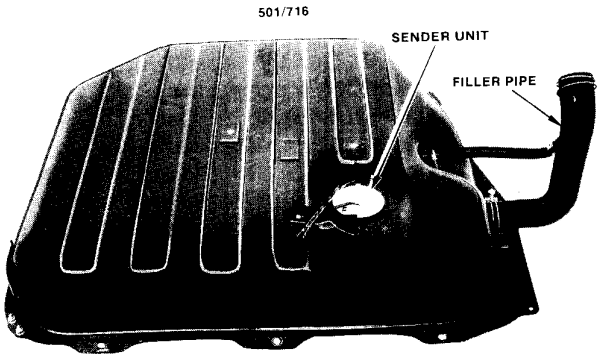
(8) Loosen the clamp and disconnect the fuel filler hose from the fuel filler pipe.

(9) Loosen the clamp and disconnect the air vent hose from either the fuel filler pipe or the air vent pipe depending on the model.

(10) Suitably mark and disconnect all accessible hoses from the fuel tank.

(11) With the aid of an assistant to support the fuel tank, remove the fuel tank mounting bolts.

(12) On 1979–1984 and all Utility models, carefully manoeuvre the fuel tank from underneath the vehicle.



Fuel tank removed from the vehicle, 1986 Station Wagon model shown.

(13) On 1985–1987 Sedan and Station Wagon models, lower the rear of the fuel tank approximately 10 cm and disconnect the fuel sender unit wiring at the connector. Suitably mark and disconnect the two evaporation hoses from the fuel tank, if applicable, and manoeuvre the fuel tank from the vehicle.

(14) If necessary, remove the nuts retaining the fuel sender unit to the fuel tank. Withdraw the fuel sender unit being careful not to bend the float rod. Discard the gasket.

Installation is a reversal of the removal procedure with attention to the following points:

(1) If the fuel sender unit was removed from the fuel tank, instal the fuel sender unit using a new gasket and tighten the retaining nuts progressively in a diagonal sequence.

(2) Instal all hoses to the fuel tank ensuring that they are correctly positioned and retained with hose clamp.

(3) Before finally tightening the fuel tank mounting bolts ensure that no hoses or electrical wires are caught between the fuel tank and the vehicle body.

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8. THROTTLE CABLE

TO REMOVE AND INSTAL

(1) Working in the engine compartment, remove the air cleaner assembly as previously described.

(2) Loosen the throttle cable adjusting nuts and disconnect the outer cable from the cable support bracket.

(3) Turn the carburettor throttle lever and release the inner cable end from its slot.

(4) Working inside the passenger compartment release the inner cable from the throttle pedal using the following procedure:

(a) On 1979–1984 and all Utility models, pull the inner cable until slack exists then turn the cable end around until it can be slid from the slot in the end of the throttle pedal arm.

(b) On 1985–1987 Sedan and Station Wagon models, pull the inner cable until slack exists then prise the plastic grommet out of the hole in the end of the throttle pedal arm. Pull the cable through the now exposed slot in the throttle pedal arm.

(5) Working in the engine compartment carefully prise the outer throttle cable grommet through the bulkhead and withdraw the throttle cable from the bulkhead.

Installation is a reversal of the removal procedure with attention to the following point:

Ensure that the grommets and cable ends are correctly seated prior to adjusting the throttle cable as described later in this section.

TO ADJUST

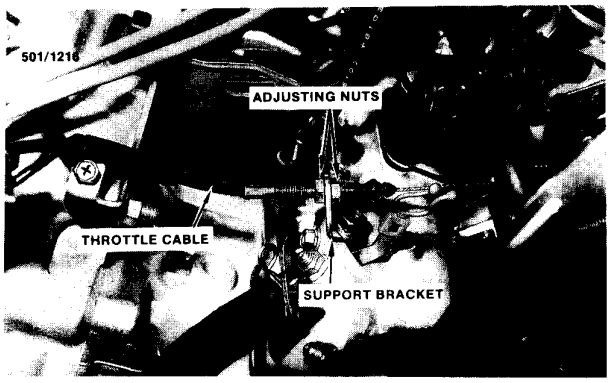
(1) Remove the air cleaner assembly from the vehicle as previously described.

(2) With the aid of an assistant, depress the throttle pedal fully and check that the primary throttle valve is opening fully.

NOTE: The secondary throttle valve may not open in this test because it is operated by either a counter weight or a vacuum diaphragm.

(3) If necessary adjust the outer cable using the adjusting nuts provided.

(4) Release the throttle pedal. When correctly adjusted there should be some free play at the throttle pedal.



View showing the throttle cable adjusting nuts, 1986 model shown.

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SPECIFICATIONS

Type	Single, dry plate
Operation	Cable
Pressure plate	Diaphragm
Spigot bearing	Prelubricated ball bearing
Release bearing	Prelubricated
Clutch driven plate diameter:	
1979–1987 two wheel drive models	200 mm
1979–1984 four wheel drive and Utility models	200 mm
1985–1987 four wheel drive Sedan and Station Wagon models	225 mm
Clutch driven plate maximum runout:	
200 mm diameter plate	0.7 mm at 95 mm radius
225 mm diameter plate	0.7 mm at 107 mm radius
Minimum amount of friction material	0.3 mm above the rivet
Free play at clutch release lever:	
1979–1987 two wheel drive models	2.0–3.0 mm
1979–1984 four wheel drive and Utility models	2.0–3.0 mm
1985–1987 four wheel drive Sedan and Station Wagon models	3.0–4.0 mm
Free play at clutch pedal:	
1979–1984 and Utility models	13.0–20.0 mm
1985–1987 Sedan and Station Wagon models	10.0–20.0 mm

TORQUE WRENCH SETTINGS

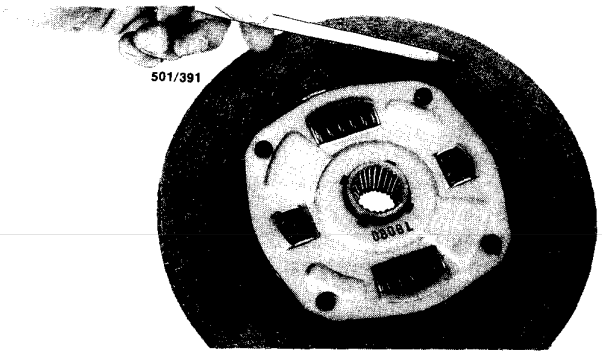
Pressure plate to flywheel bolts	17 Nm

1. CLUTCH TROUBLE SHOOTING

CLUTCH SLIPPING

(1) Weak or broken pressure plate diaphragm spring Check and renew pressure plate assembly.

(2) Worn driven plate facings: Check and renew clutch driven plate.



Renew the clutch driven plate if the friction material is worn down, or is within 0.3 mm of the rivets.

(3) Worn or scored flywheel face: Check and renew flywheel and ring gear.

(4) Worn or scored pressure plate face: Check and renew pressure plate assembly.

(5) Insufficient pedal free travel: Check and adjust pedal free travel.

(6) Pedal and cable operation fouling: Check and repair, or renew as necessary.

(7) Release bearing insecure in lever: Check and repair, or renew as necessary.

NOTE: In most cases clutch slippage is first evident by a marked increase in engine revs for no apparent reason when pulling up a steep hill. The clutch condition can be positively diagnosed as follows: With the handbrake firmly applied and with the road wheels chocked, place the transmission in top gear and with the engine revving at 1500 rpm, slowly release the clutch. Clutch slippage is evident if the engine does not stall. Make the test as quickly as possible to prevent any further clutch damage.

CLUTCH SHUDDER

(1) Oil on (gummy) driven plate facings: Check and renew clutch driven plate.

(2) Scored pressure plate or flywheel face: Renew pressure plate assembly or flywheel and ring gear.

(3) Loose or damaged driven plate hub: Check and renew clutch driven plate.

(4) Loose driven plate facings: Check and renew clutch driven plate.

(5) Cracked pressure plate face: Renew clutch pressure plate assembly.

(6) Weak or damaged pressure plate diaphragm: Check and renew the pressure plate assembly.

NOTE: Clutch shudder is usually most evident when reversing up an incline. As loose or damaged engine mountings are a cause for clutch shudder, thoroughly check the engine mounting rubbers and mounting hardware for damage or looseness before removing the clutch for inspection.

CLUTCH GRAB

(1) Gummy driven plate facings: Renew clutch driven plate.

(2) Cracked pressure plate face: Renew clutch pressure plate assembly.

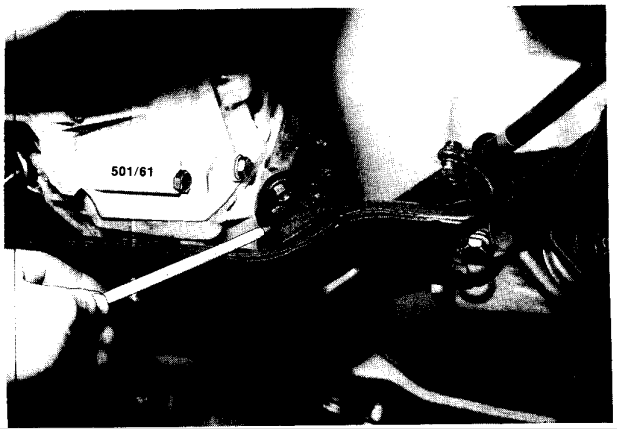
(3) Loose or broken engine mountings: Check and renew engine mountings as necessary.

(4) Clutch pedal free play excessive: Check and adjust if necessary.

(5) Crankshaft/flywheel spigot bearing faulty: Check and renew as necessary.

(6) Pedal and cable operation fouling: Check and repair, or renew as necessary.

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Check the engine mountings for wear and deterioration.

INSUFFICIENT CLUTCH RELEASE

(1) Frayed or broken clutch cable: Check and renew clutch cable.

(2) Worn or damaged release mechanism: Check and renew components as necessary.

(3) Warped or cracked clutch driven plate: Renew clutch driven plate.

NOTE: Visually check that the clutch cable operates the actuating lever at the clutch housing before removing the clutch for inspection.

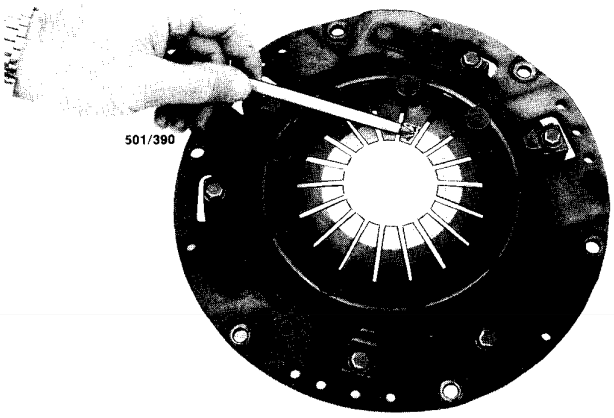
CLUTCH NOISE

(1) Dry or worn release bearing: Check and renew bearing.

(2) Damaged pressure plate diaphragm spring: Check and renew pressure plate assembly.

(3) Insufficient pedal free play: Check and adjust pedal free play.

(4) Worn, or dry spigot bearing: Check and renew as necessary.



Check the clutch pressure plate diaphragm fingers for scoring and other damage.

(5) Excessive crankshaft end play: Renew main bearings, refer to the Engine section.

(6) Engine torque stay rod incorrectly adjusted, 1979–1984 and Utility models only: Adjust the torque stay rod, refer to the Engine section.

(7) Clutch cable incorrectly routed: Adjust the cable as necessary.

(8) Clutch driven plate rivets loose: Renew clutch driven plate.

NOTE: Lightly depress the clutch pedal with the engine running to check for release bearing noise. If the release bearing is faulty and has to be renewed, always check the other clutch components.

2. DESCRIPTION

The clutch for the two wheel and four wheel drive transmission consists of a single dry driven plate, a diaphragm pressure plate and a prelubricated release bearing.

The driven plate is located between the pressure plate and the flywheel and transmits the drive from the engine to the transmission. The drive is cushioned by damper springs interposed between the driven plate hub and the driven plate friction surfaces.

On the diaphragm pressure plate, when the diaphragm fingers are depressed the driven plate mating surface on the pressure plate is withdrawn slightly to the rear allowing the drive plate to be independent of the flywheel and to disengage the clutch.

When the clutch is released the diaphragm fingers and the driven plate mating surface return to their engaged position and the driven plate and flywheel are as one unit transmitting drive to the transmission.

The transmission input shaft is supported by a pre-lubricated spigot bearing, located in the crankshaft on 1979–1980 models and on the flywheel on 1981–1987 models.

The clutch release bearing actuated by the release lever depresses the pressure plate diaphragm fingers during disengagement of the clutch and allows them to return during engagement by moving along the transmission input shaft bearing retainer tube.

The release bearing is pre-lubricated and is located on a carrier on all models except 1985–1987 four wheel drive models, where the bearing and carrier are one integral assembly.

The release mechanism is actuated by the clutch pedal via a cable to the release lever, the release lever is located behind the release bearing assembly, it pivots backwards and forwards on a pivot bolt on the transmission and is returned to the engaged position by a return spring on the lever.

On models equipped with the hill holder no release lever return spring is installed, as the return action of the hill holder cable returns the clutch release lever to the engaged position.

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The cable and the clutch operation are adjusted by an adjusting nut on the cable at the release lever to give the specified clearance at the lever and pedal, to ensure the clutch fully engages and disengages.

On 1985–87 four wheel drive models equipped with a hill holder, the clutch operation differs in that a pressure hold valve control cable is connected to the clutch release lever and a bracket on the transmission. By the use of the adjusting nut, the inner cable can be shortened or lengthened.

During the application of the brake and the disengagement of the clutch, the release lever pulls the hill holder cable which operates the pressure hold valve. This prevents the hydraulic pressure in the brake line from decreasing and holds the brakes on, even when the brake pedal is released. During engagement of the clutch the hill holder cable returns allowing the brakes to be released.

On models equipped with the pedal effort reducing mechanism, the clutch pedal, by means of an integral arm and spring, is assisted during the operational movements.

3. CLUTCH UNIT

Special Equipment Required:
To Instal — Clutch aligning tool

TO REMOVE

(1) Remove the transaxle from the vehicle as described in the Manual Transaxle section.

(2) Mark the pressure plate cover in relation to the flywheel so that they may be assembled to their original positions.

(3) Progressively loosen and remove the pressure plate assembly retaining bolts and washers, working in a diagonal fashion across the assembly.

(4) Remove the pressure plate and driven plate from the flywheel.

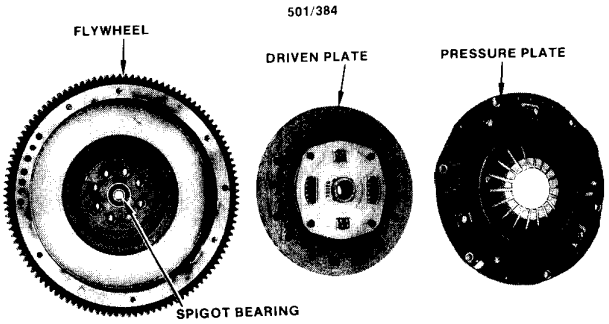
TO CHECK AND INSPECT

(1) Check the driven plate facings. If the driven plate facings are worn, highly glazed or gummy with oil, renew the driven plate as an assembly. If the driven plate is still serviceable, do not allow any cleaning fluid, oil or grease to contaminate the plate facings.

(2) Check the driven plate runout. If the runout exceeds the Specifications at the radius specified, renew the driven plate.

NOTE: The driven plate must be renewed when the facings are worn down to or within 0.3 mm of the rivet heads. Should there be any traces of oil on the facings the source has to be investigated and rectified.

(3) Check the hub of the driven plate for looseness and the damper springs for wear and breakage.



View of flywheel, clutch driven plate and pressure plate assembly.

(4) Check the pressure plate assembly for wear on the diaphragm spring fingers, diaphragm spring and a cracked or distorted cover. Check that the pressure plate face is not badly scored. Renew the pressure plate assembly as necessary.

(5) Check the flywheel face for heat cracks, burn marks and scoring. Renew the flywheel when the damage is severe.

(6) Check the spigot bearing in the crankshaft/flywheel for smoothness of operation and damage, renew as necessary.

NOTE: The spigot bearing is pre-lubricated and should not be immersed in cleaning solvent.

(7) It is advisable to remove the clutch release bearing and carrier and inspect the components before installing the transaxle. See Clutch Release Mechanism.

NOTE: If the pressure plate and/or clutch plate are unservicable, this is grounds to suspect that the release bearing is also due to be renewed. For removal and installation of the flywheel, refer to the Engine section.

TO INSTAL

NOTE: When renewing the clutch always check that the correct clutch has been supplied.

(1) If the flywheel was removed, instal the flywheel as described in the Engine section.

(2) If the release mechanism was removed for inspection, instal the release mechanism as described under the following heading.

(3) Thoroughly clean the flywheel and pressure plate faces.

(4) Position the clutch driven plate on the flywheel with the raised cushion spring section towards the transmission side.

(5) Position the pressure plate on the flywheel aligning the marks if the original components are reused.

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NOTE: Ensure that the pressure plate is installed the 'O' mark at least 120 degrees from the 'O' mark on the flywheel or the residual balance of the assembly will be wrong.

(6) Loosely instal the pressure plate retaining bolts.

(7) Align the hub of the clutch driven plate with the spigot bearing in the centre of the flywheel using the clutch alignment tool.

(8) Progressively tighten the pressure plate retaining bolts in a diagonal sequence finally tightening the bolts to the specified torque.

(9) Withdraw the alignment tool.

(10) Sparingly lubricate the splines of the transaxle input shaft with a high melting point grease. Instal the transaxle assembly, if necessary referring to the Manual Transaxle section for the correct procedure.

(11) Check and adjust the clutch pedal free play as described under Clutch Adjustments in this section.

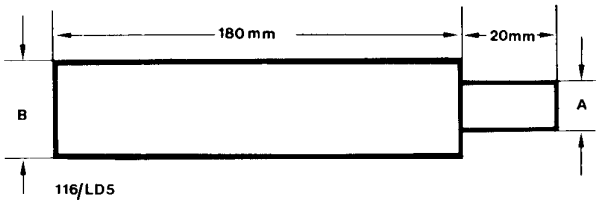


Illustration showing clutch aligning tool. The tool can be readily fabricated from a length of round section wood or metal. Dimension A = diameter of transaxle input shaft spigot. Dimension B = inside diameter of driven plate hub.

4. CLUTCH RELEASE MECHANISM

Special Equipment Required:
To Remove and Instal — Suitable press and press plates

TO REMOVE

(1) Remove the transaxle from the vehicle as described in the Manual Transaxle section.

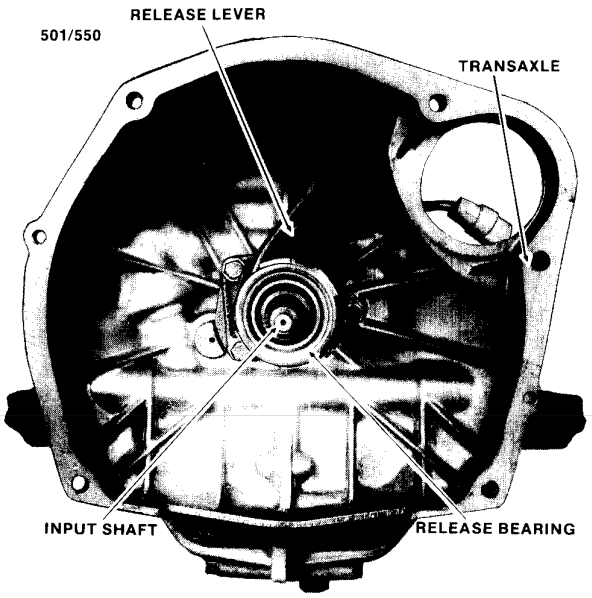
(2) Remove the rubber boot from the clutch release lever.

(3) Remove the retaining clips from the release bearing and remove the bearing/carrier from the input shaft bearing retainer tube.

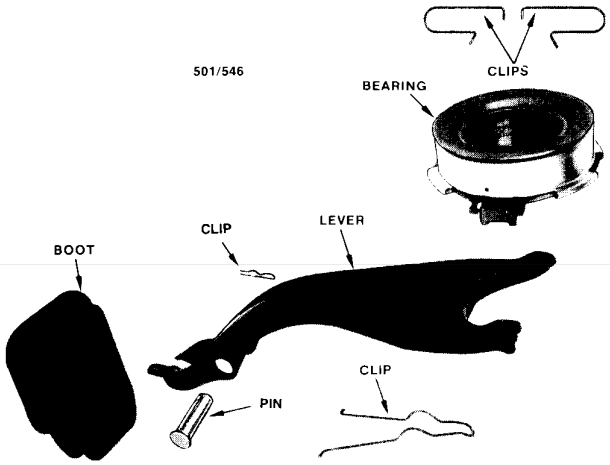
(4) Remove the return spring where installed from the release lever.

(5) Remove the release lever to pivot retaining clip and remove the release lever from the transaxle.

(6) On models with a clutch release bearing and carrier support the bearing on its outer edge on the open jaws of a vice and using a suitable drift and alternate blows on the side of the carrier drive the carrier from the bearing.



Installed view of clutch release mechanism.



Dismantled view of clutch release mechanism, 1986 model shown.

(7) On models equipped with a hill holder remove the clevis pin retaining clip and pin from the release lever.

(8) Thoroughly clean the release lever, bearing carrier, clevis pin and retaining clips in a suitable solvent.

NOTE: The release bearing is pre-lubricated and should not be immersed in solvent.

(9) Check the return spring for tension, wear and damage, renew as necessary.

(10) Check the release bearing for smoothness of

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operation and damage, renew as necessary. Pay particular attention to the radial free movement.

(11) Check the release bearing carrier for wear and damage, renew as necessary.

(12) Check the release lever pivot area, pivot bolt and clevis pin for wear and damage, renew as necessary.

TO INSTAL

(1) Lubricate the release lever bearing holder inner groove and lever contact surface with multi-purpose grease.

(2) Lubricate the input shaft splines and release lever pivot area surfaces with multi-purpose grease.

(3) On models with a clutch release bearing and carrier, using a suitable press and press plates support the bearing and press the bearing onto the carrier until it abuts the carrier shoulder. Check the operation of the bearing for smoothness.

(4) Instal the release lever onto its pivot bolt and instal the retaining clip.

(5) Instal the bearing/carrier to the input shaft bearing retainer tube and release lever and instal the retaining clips.

(6) On models equipped with a hill holder, instal the clevis pin and retaining clip to the release lever.

(7) Instal the rubber boot to the clutch release lever.

(8) Instal the return spring where applicable to the release lever.

5. CLUTCH PEDAL

TO REMOVE AND INSTAL

(1) Working inside the vehicle 1979–1984 and Utility models, remove the pedal retaining clip and washer from the pedal pivot shaft.

(2) On 1985–1987 Sedan and Station Wagon models proceed as follows:

(a) Remove the pedal retaining nut from the pivot shaft.

(b) Remove the pedal retainer bracket to pedal bracket retaining bolts and remove the retainer bracket.

(c) Remove the clutch cable to pedal bracket retaining bolts.

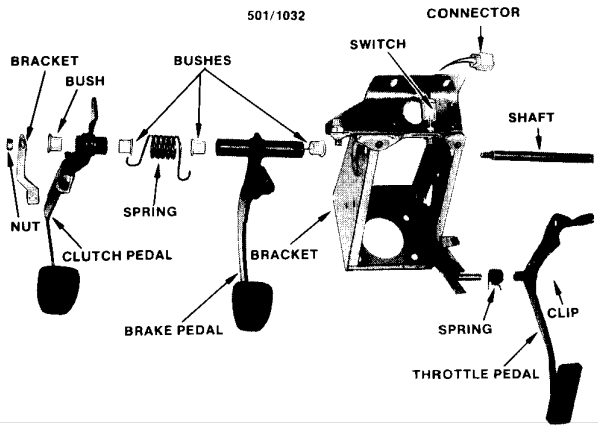
(3) On 1979–1984 and Utility models remove the clutch cable clamp to pedal bracket retaining bolt and remove the clamp.

(4) Remove the pedal and bushes with the attached cable from the pedal bracket.

(5) Remove the cable clevis retaining clip, clevis pin and cable from the pedal. Remove the pedal from the vehicle.

(6) Check the pedal and pedal retaining bracket for cracks and damage, renew as necessary.

(7) Check the pedal pad for wear and splits, renew as necessary.



View of pedals and pedal bracket components removed from the vehicle, 1986 model shown.

Installation is the reversal of the removal procedure with attention to the following points:

(1) Apply grease to the pivot shaft, bushes and moving contact surfaces.

(2) Adjust the clutch pedal free play as described under the Clutch Adjustments heading.

6. CLUTCH CABLE

TO REMOVE AND INSTAL

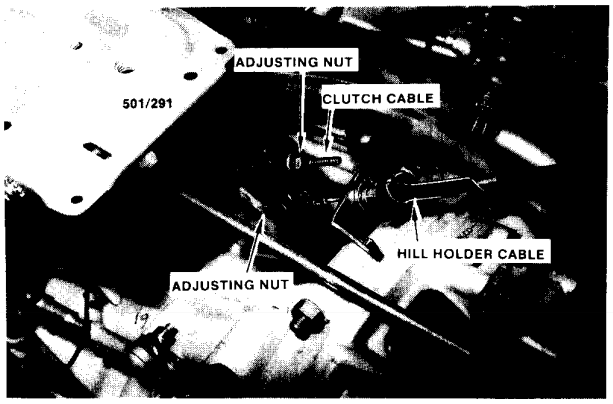
(1) Remove the clutch pedal as previously described.

(2) Remove the clutch cable to pedal bracket retaining clamp and remove the cable from the bracket.

(3) Working in the engine compartment remove the clutch cable from the retaining clip on the transaxle.

(4) Remove the cable to cable bracket retaining clip from the bracket on the transaxle.

(5) Remove the locknut, adjusting nut/domed spacer from the cable.



Installed view of clutch and hill holder cables, 1986 model shown.

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(6) Remove the clutch cable from the cable bracket, release lever and bulkhead and remove it from the vehicle.

Installation is the reversal of the removal procedure with attention to the following points:

(1) Check that the inner cable moves smoothly and easily in the outer cable.

(2) Lubricate the inner cable with grease.

(3) Ensure that the installed cable has no sharp bends or restrictions and is routed under the torque stay rod.

(4) Adjust the clutch pedal free play as described under Clutch Adjustments.

7. CLUTCH ADJUSTMENTS

TO CHECK AND ADJUST CLUTCH PEDAL FREE PLAY

The dimension for the pedal free play is measured by the amount of free play at the clutch release lever and then by the free play at the pedal.

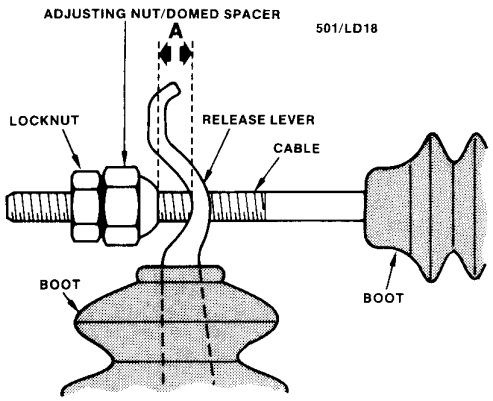
The pedal free play and the release lever free play is controlled by the adjusting nut on the clutch cable and when adjusted to the Specifications should be secured by the cable locknut.

(1) Working in the engine compartment, where installed, remove the clutch release lever return spring(s).

(2) Using a suitable set of feeler gauges inserted between the clutch cable adjusting nut/domed spacer and the inner face of the clutch release lever, check that the free play is within Specifications.

If the free play is not within Specifications, the clearance at the release lever should be adjusted as follows.

(3) Loosen the clutch cable adjusting nut/domed spacer locknut and adjust the adjusting nut/domed spacer in the required direction to obtain the specified clearance between the adjusting nut/domed spacer and the inner face of the clutch release lever.



Line diagram of the clutch release lever free play dimensions. 1980–1987 two wheel drive and 1980–1984 four wheel drive and Utility models dimension A = 2.0–3.0 mm. 1985–1987 four wheel drive Sedan and Station Wagon models dimension A = 3.0–4.0 mm.

(4) Operate the clutch pedal a number of times by hand and check that free play at the pedal pad is within Specifications. If the pedal free play is not within Specifications the clearance at the release lever should be adjusted as previously described.

(5) When the specified clearance is gained at the clutch pedal, tighten the adjusting nut/domed spacer securely.

(6) Where installed, instal the clutch return spring(s) to the release lever.

TO CHECK AND ADJUST HILL HOLDER CABLE

The check and adjustment procedures for the hill holder cable are fully covered in the Brakes section.

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SPECIFICATIONS

TWO WHEEL DRIVE FOUR SPEED TRANSAXLE

Drive shaft to pinion shaft clearance ..... 0.2 mm
Drive pinion shim adjustment
code location ..... End face
Drive pinion end float gauge
initial setting ..... 0.5 mm
Pinion shaft retaining pin depth in case ... 1.0 mm
Mainshaft bearing end float ..... 0–0.05 mm
Synchro sleeve to gear face clearance:
- First ..... 9.5 mm
- Second ..... 9.5 mm
- Third —
  - 1979–1984 models ..... 11.0 mm
  - 1985–1987 models ..... 9.5 mm
- Fourth ..... 9.5 mm

Reverse idler gear clearance ..... 1.5–3.0 mm
Pinion gear to side gear backlash:
- 1979–1980 models ..... 0.05–0.15 mm
- 1981–1987 models ..... 0.13–0.18 mm

Crownwheel to drive pinion
backlash ..... 0.10–0.18 mm
Shifter fork rod end separation clearances:
- 1979–1980 models ..... 0.3–1.6 mm
- 1981–1982 models —
  - Between first/second and third/fourth ..... 1.8–3.1 mm
  - Between third/fourth and reverse .. 0.3–1.6 mm
- 1983–1984 models ..... 0.3–2.1 mm
- 1985–1987 models ..... 0.3–1.6 mm

TWO WHEEL DRIVE FIVE SPEED TRANSAXLE

Drive shaft to pinion shaft clearance ..... 0.2 mm
Drive pinion shim adjustment
code location ..... End face
Drive pinion end float gauge
initial setting ..... 0.5 mm
Pinion shaft retaining pin depth in case ... 1.0 mm
Mainshaft bearing end float ..... 0–0.05 mm
Synchro sleeve to gear face clearance:
- First ..... 9.5 mm
- Second ..... 9.5 mm
- Third —
  - 1979–1984 models ..... 11.0 mm
  - 1985–1987 models ..... 9.3 mm
- Fourth —
  - 1979–1984 models ..... 9.5 mm
  - 1985–1987 models ..... 9.3 mm
- Fifth —
  - 1979–1984 models ..... 10.5 mm
  - 1985–1987 models ..... 9.3 mm

Reverse idler gear clearance:
- Reverse position ..... 1.5–3.0 mm
- Neutral position at washer ..... 0–0.5 mm

Pinion gear to side gear backlash:
- 1979–1980 models ..... 0.5–0.15 mm
- 1981–1987 models ..... 0.13–0.18 mm

Crownwheel to drive pinion
backlash ..... 0.10–0.18 mm
Shifter fork rod end separation clearances:
- 1979–1980 models ..... 0.3–1.6 mm
- 1981–1983–1984 models —
  - Between first/second and third/fourth ..... 1.8–3.1 mm
  - Between third/fourth and fifth .... 0.3–1.6 mm
- 1982 models ..... 0.3–2.1 mm
- 1985–1987 models —
  - Between first/second and third/fourth ..... 0.5–1.5 mm
  - Between third/fourth and fifth .... 0.6–1.4 mm

FOUR WHEEL DRIVE FOUR SPEED TRANSAXLE

Drive shaft to pinion shaft clearance ..... 0.2 mm
Drive pinion shim adjustment
code location ..... End face
Drive pinion end float gauge
initial setting ..... 0.5 mm
Pinion shaft retaining pin depth in case ... 1.0 mm
Mainshaft rear bearing end float ..... 0–0.05 mm
Synchro sleeve to gear face clearance:
- First ..... 9.5 mm
- Second ..... 9.5 mm
- Third ..... 11.0 mm
- Fourth ..... 9.5 mm

Reverse idler gear clearance ..... 1.5–3.0 mm
Pinion gear to side gear backlash:
- 1979–1980 models ..... 0.05–0.15 mm
- 1981–1987 models ..... 0.13–0.18 mm

Crownwheel to drive pinion
backlash ..... 0.10–0.18 mm
Shifter fork rod end separation clearances:
- 1979–1980 models ..... 0.3–1.6 mm
- 1981–1984 models —
  - Between first/second and third/fourth ..... 1.8–3.1 mm
  - Between third/fourth and reverse .. 0.3–3.6 mm
- 1985–1987 models —
  - Between first/second and third/fourth ..... 0.5–1.5 mm
  - Between third/fourth and reverse .. 0.6–1.4 mm

Dual Ratio Models

Mainshaft high/low synchro hub
end float ..... 0.60–0.10 mm
Input shaft front bearing end float ..... 0–0.08 mm
Input shaft front bearing end float
in retainer ..... 0–0.08 mm
Transfer drive gear to case clearance ..... 10 mm
Transfer shifter rod length from rear
face of ball joint
shoulder to end of rod ..... 178 mm
Selector lever forward clearance ..... 40 mm

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FOUR WHEEL DRIVE FIVE SPEED TRANSAXLE

Drive shaft to pinion shaft clearance ..... 0.2 mm
Drive pinion shim adjustment code location ..... End face
Drive pinion end float gauge initial setting ..... 0.5 mm
Pinion shaft retaining pin depth in case ... 1.0 mm
Mainshaft bearing end float ..... 0–0.05 mm
Synchro sleeve to gear face clearance:
- 1979–1987 models —
  - First ..... 9.5 mm
  - Second ..... 9.5 mm
- 1979–1984 models —
  - Third ..... 11 mm
  - Fourth ..... 9.5 mm
  - Fifth ..... 10.5 mm
- 1985–1987 models —
  - Third ..... 9.3 mm
  - Fourth ..... 9.3 mm
  - Fifth ..... 9.3 mm

Shifter fork rod end separation clearances:
- 1979–1980 models ..... 0.3–1.6 mm
- 1981–1983–1984 models —
  - Between first/second and third/fourth ..... 1.8–3.1 mm
  - Between third/fourth and fifth .... 0.3–1.6 mm
- 1982 models ..... 0.3–2.1 mm
- 1985–1987 models —
  - Between first/second and third/fourth ..... 0.5–1.5 mm
  - Between third/fourth and fifth .... 0.6–1.4 mm

Reverse idler gear clearances:
- Reverse position ..... 6.0–7.5 mm
- Neutral position ..... 0–0.5 mm
- Pinion gear to side gear backlash ..... 0.13–0.18 mm

Crownwheel to drive pinion backlash ..... 0.13–0.18 mm

Dual Ratio Models

Mainshaft high/low synchro hub end float ..... 0.60–0.10 mm
Input shaft front bearing end float ..... 0–0.08 mm
Input shaft front bearing end float in retainer ..... 0–0.08 mm
High/low shifter rod from rear ball joint to end of chamfer on rod (1985–1987 models) ..... 21 mm

AXLE SHAFTS

Distance between axle shaft rubber boot inner retaining clips:
- Two wheel drive —
  - 1979–1984 models ..... 224 mm
  - 1985–1987 models ..... 257 mm
- Four wheel drive —
  - 1979–1981 models ..... 210 mm
  - 1982–1984 and all Utility models .... 220 mm
  - 1985–1987 models ..... 257 mm

TORQUE WRENCH SETTINGS

Transaxle 1979–1984 and Utility Models

Crossmember to transaxle nuts ..... 47 Nm
Crossmember to body nuts:
- 1979–1981 models ..... 26 Nm
- 1982–1984 and Utility models ..... 67 Nm

Stay bracket to transaxle nuts/bolts ..... 18 Nm
Control rod nuts/bolts ..... 18 Nm
Stay bracket to cushion rubber nuts/bolts ..... 29 Nm
Cushion rubber to body nuts/bolts ..... 23 Nm
Four wheel drive selector control rod:
- To selector lever nuts ..... 22 Nm
- To transaxle control rod nuts ..... 49 Nm
- To dual ratio shifter rod nuts ..... 36 Nm

Transaxle 1985–1987 Sedan and Station Wagon Models

Crossmember to transaxle nuts ..... 47 Nm
Rigid crossmember to chassis bolts ..... 118 Nm
Transaxle half case/harness clip retaining bolt and nut ..... 26 Nm
Control rod nuts ..... 15 Nm
Stay rod nuts/bolts ..... 15 Nm
Cushion rubber nuts ..... 23 Nm
Dual ratio selector lever nuts ..... 23 Nm

Propeller Shaft 1979–1984 and Utility Models

Flange to rear drive pinion ..... 25 Nm

Propeller Shafts 1985–1987 Sedan and Station Wagon Models

Centre bearing/flange retaining nut ..... 235 Nm
Centre bearing to chassis nuts/bolt ..... 44 Nm
Flange to drive pinion/flange ..... 32 Nm

1. TRANSAXLE TROUBLE SHOOTING

DIFFICULT GEAR CHANGE

(1) Faulty clutch or clutch release mechanism: Check, adjust or overhaul clutch or release mechanism.

(2) Insufficient clutch release due to improper cable adjustment. Pay particular attention to the Hill Holder cable if installed: Check and adjust cable(s) as necessary.

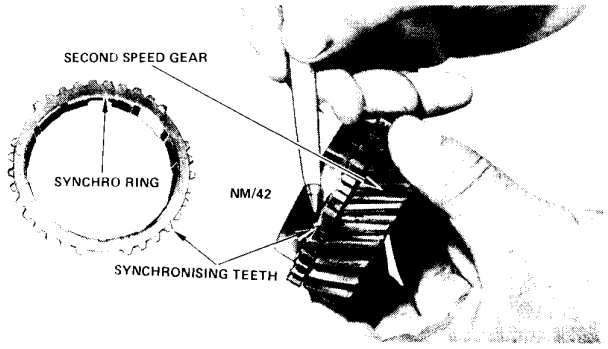
(3) Faulty gear synchroniser mechanism: Overhaul the transaxle assembly.

(4) Gear bushes worn and/or damaged: Overhaul the transaxle assembly.

(5) Worn selector mechanism or control lever linkages worn or damaged: Check and replace as necessary.

(6) Excessive end float in transaxle mainshaft

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Check the synchronising teeth on the gears and synchro rings for chipping or wear.

and/or gears and synchro assemblies: Overhaul the transaxle assembly.

NOTE: First check the clutch and Hill Holder where installed for correct operation. if reverse gear can be selected without any sign of 'clash' this is a fairly good indication that the clutch is functioning normally. Also check that the correct type and viscosity of oil is used as this can also cause difficult gear changing.

TRANSAXLE GEAR CLASH ON CHANGING DOWN

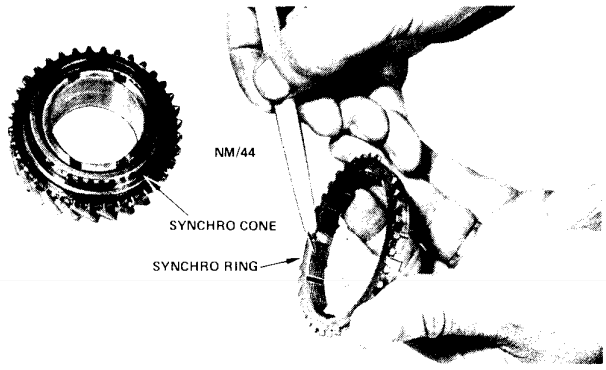
(1) Faulty clutch or clutch release mechanism: Check, adjust or overhaul clutch or clutch release mechanism.

(2) Faulty synchro rings and cones: Check and overhaul the transaxle assembly.

(3) Lubricating oil too heavy: Drain the transaxle and refill with the correct grade and quantity of oil.

(4) Broken, weak or incorrect positioning of the synchro springs on the synchro rings: Check and overhaul the transaxle assembly.

(5) Excessive end float in the mainshaft gears and/or laygear: Check and overhaul the transaxle assembly.



Check the friction surface of the synchro rings and cones for wear or damage.

NOTE: Check the clutch for correct operation as previously outlined before removing the transaxle for dismantling and inspection. Also check that the correct type of oil is being used.

TRANSAXLE SLIPPING OUT OF GEAR

(1) Weak or broken detent springs or worn detent balls and interlock plungers: Renew worn or damaged components as necessary.

(2) Torque stay rod damaged or incorrectly adjusted: Check and adjust or replace torque stay rod as described in the Engine section.

(3) Worn synchroniser assembly or worn synchro ring teeth. Worn sliding sleeve teeth on transfer gear: Renew the worn components.

(4) Worn gear needle bearings or bushes: Renew worn or damaged components as necessary.

(5) Loose engine mounting bolts: Check, tighten or renew as necessary.

(6) Support bearings worn or damaged: Renew as necessary.

NOTE: In most cases this condition is caused by wear or damage to components inside the transaxle . . . However, check the engine mounting rubbers and mounting hardware as vibrations caused by deteriorated mountings can cause the transaxle to slip out of gears.

TRANSAXLE NOISE IN NEUTRAL

(1) Worn input shaft/mainshaft support bearing(s): Overhaul transaxle and renew bearing(s).

(2) Insufficient or incorrect lubricant: Check and top up or renew as necessary.

(3) Constant mesh gears worn or pitted: Overhaul transaxle and renew as necessary.

(4) Worn input shaft/mainshaft spigot bearing in crankshaft/flywheel: Renew as necessary.



If the transmission oil level is low, check for the cause of oil loss. The output shaft oil seals are a likely source of leakage.

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(5) Excessive counter gear end float: Check and renew bearings, spacer and snap ring as necessary.

NOTE: First check the lubricant level in the transaxle assembly. To isolate transaxle noise in neutral, run the engine, depress the clutch and engage any gear. If the noise ceases with the clutch depressed it is indicated that the noise is in the transaxle.

TRANSAXLE NOISE (FORWARD GEARS ENGAGED, VEHICLE MOVING)

(1) Insufficient or incorrect lubricant: Check, top up or renew as necessary.

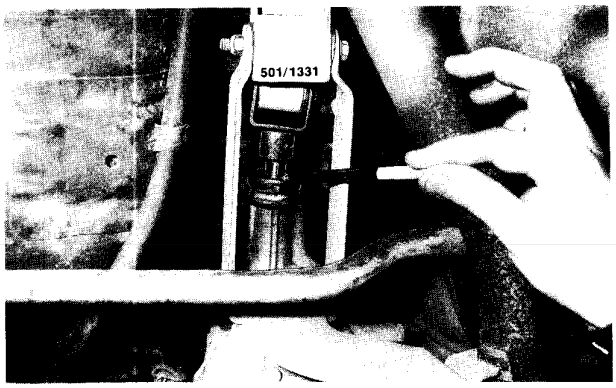
(2) Incorrect adjustment of differential and drive pinion assembly: Dismantle, check and readjust as necessary.

(3) Crownwheel insecure on differential: Dismantle and secure or renew parts as necessary.

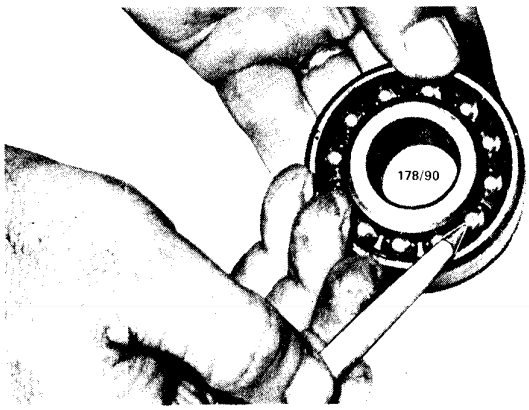
(4) Worn front and/or rear support bearings: Overhaul transaxle and renew bearings as necessary.

(5) Constant mesh gears worn or pitted: Overhaul transaxle and renew gears as necessary.

(6) Excessive counter gear end float: Check and renew bearings, spacer and snap ring as necessary.



Check the transaxle selector rod oil seal as a source of oil leakage, 1983 two wheel drive model shown.



Check the bearings for pitting in the hardening of the balls and tracks.

(7) Reverse idler gear chipped or damaged: Overhaul transaxle and renew components as necessary.

(8) Axle shaft joints worn or damaged: Check and renew components or axle shaft as necessary.

DIFFICULT HIGH TO LOW, OR LOW TO HIGH RANGE CHANGE

(1) High/low sliding sleeve or synchro assembly splines or rear drive shaft splines worn or damaged: Overhaul the transaxle and renew components as necessary.

(2) Worn or damaged gear and synchro teeth on the high and low input gears: Overhaul the transaxle and renew components as necessary.

(3) Loose or worn selector lever components: Check, adjust or renew components as necessary.

DIFFICULT TO ENGAGE FOUR WHEEL DRIVE

(1) Four wheel drive sliding sleeve or hub worn or damaged: Renew components as necessary.

(2) Worn or loose selector lever components: Check, adjust or renew components as necessary.

(3) Faulty switch or wiring and loose control cable: Check adjust or renew components as necessary.

(4) Faulty vacuum servo unit, manifold vacuum pipes or solenoid control valve: Check, and renew or service components as necessary.

GEAR SELECTED BUT NO FRONT WHEEL DRIVE

(1) Axle shaft or hub splines worn and damaged: Renew components as necessary.

(2) Constant velocity joint worn and damaged: Renew axle shaft.

(3) Axle shaft broken: Renew axle shaft.

(4) Double offset joint worn or damaged: Check and renew components or axle shaft as necessary.

(5) Differential drive shaft splines worn and damaged: Refer the problem to a suitable specialised workshop.

(6) Transaxle final drive worn and damaged: Refer the problem to a suitable specialised workshop.

(7) Incorrect offset joint installed: Refer the problem to a specialised workshop.

NOTE: Remove the axle shaft and check for damage. The axle shaft/constant velocity joint cannot be dismantled or repaired and if found to be faulty the axle shaft and joint must be renewed as a unit. The incorrect offset joint installed to the axle shaft such as a large diameter joint to a small diameter axle shaft will cause the splines to be damaged and cause slippage on the axle and drive shafts. When differential drive shafts and differential are found to be faulty, it is

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recommended that the problem be referred to a suitable specialised workshop for correction.

FRONT WHEEL NOISE (APPARENT)

(1) Tyre noise: Determine whether it is normal or excessive for the type of vehicle and tyre construction.

(2) Wheel loose on axle shaft hub: Check condition of wheel rim, hub, nuts and wheel studs and tighten or renew all faulty components.

(3) Defective brake components: Overhaul brakes as described in Brakes section.

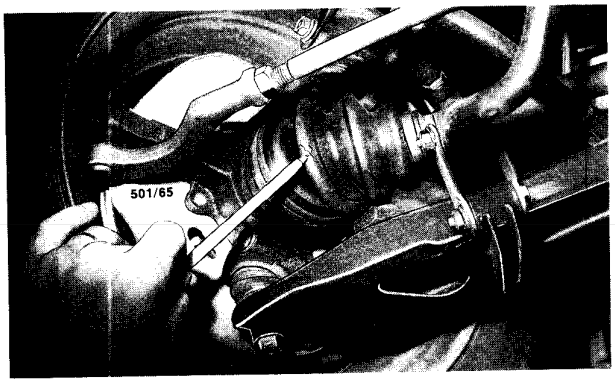
(4) Incorrect or faulty swivel hub bearings, loose axle shaft retaining nut: Check and tighten or renew faulty components.

(5) Worn or defective constant velocity joints: Check and renew the axle shaft assembly.

(6) Axle shaft and hub splines worn: Check and renew components as necessary.

(7) Wheel bent or out of balance: Renew the wheel rim or balance wheel and tyre assembly.

(8) Lack of lubricant in constant velocity joint. Check the rubber boots for damage or deterioration and renew driveshaft or components as necessary.



Check the constant velocity joint rubber boots for signs of leakage, damage and deterioration.

NOTE: The constant velocity joint noise is most obvious when the steering is in the right or left hand lock position with the vehicle in motion. The constant velocity joint cannot be dismantled or repaired and if found to be faulty the axle shaft and joint must be renewed as a unit.

Both the constant velocity joint and the double offset joint are protected by rubber boots, the boots if damaged can allow the loss of lubricant and the entry of dirt which will cause subsequent damage to the joints.

PROPELLER SHAFT VIBRATION

(1) Bent or dented propeller shaft(s): Renew the propeller shaft(s).

(2) Worn or damaged universal joint trunnions and/or needle bearings: Renew the universal joint assembly.

(3) Propeller shaft(s) out of balance: Balance or renew the propeller shaft(s).

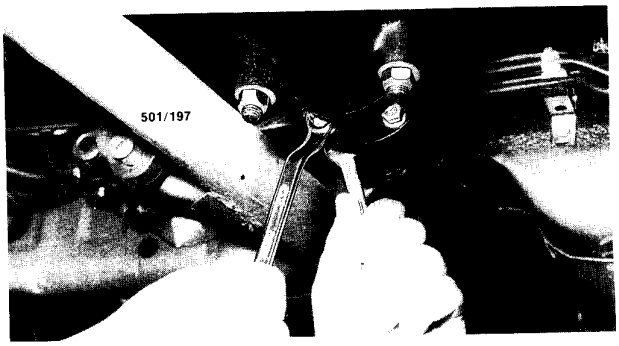
(4) Propeller shaft(s) and universal flanges retaining bolts and nuts loose: Check and renew or tighten the components as necessary.

(5) Propeller shaft interior sliding splines worn: Renew the propeller shaft.

(6) Propeller shaft(s) not correctly aligned to each other or the rear drive pinion flange: Correct the alignment.

(7) Worn or damaged centre bearing and rubber mounting: Renew the centre bearing and rubber mounting.

(8) Propeller shaft and centre flange serrations worn: Renew the propeller shaft and centre flange.



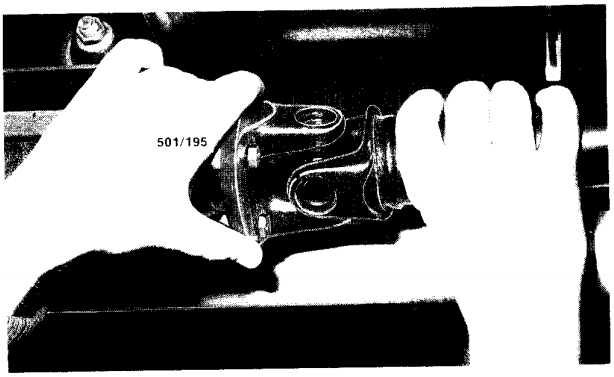
Check that the universal joint to pinion flange bolts are tight.

EXCESSIVE PROPELLER SHAFT BACKLASH

(1) Worn or damaged universal joint trunnions and/or needle bearings: Renew the universal joint assembly.

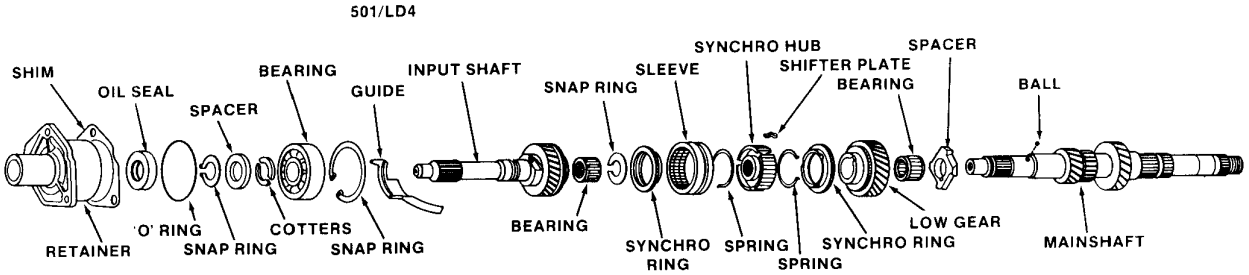
(2) Propeller shaft(s) interior sliding splines worn: Renew the propeller shaft(s).

(3) Centre universal joint flange and propeller shaft serrations worn: Renew the propeller shaft and flange.



Check the universal joints for wear by manual manipulation.

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Illustrated view of four wheel drive dual ratio mainshaft and components.

2. DESCRIPTION

The front wheel drive transaxle houses the drive and driven gears, the final drive pinion and differential assembly. The front axle shafts also engage with the assembly.

The four wheel drive transaxle unit is similar in design but includes a transfer case which provides the drive to the rear wheels by means of the propeller shaft to the rear axle.

In all transaxles the forward gears and where installed, the transfer high/low gears are of helical construction and fully synchromesh to achieve a quiet smooth operation. On models equipped with two wheel drive and four wheel drive single ratio the transaxle input shaft and mainshaft are integral and is supported by a roller bearing located in the front and by a ball bearing in the rear.

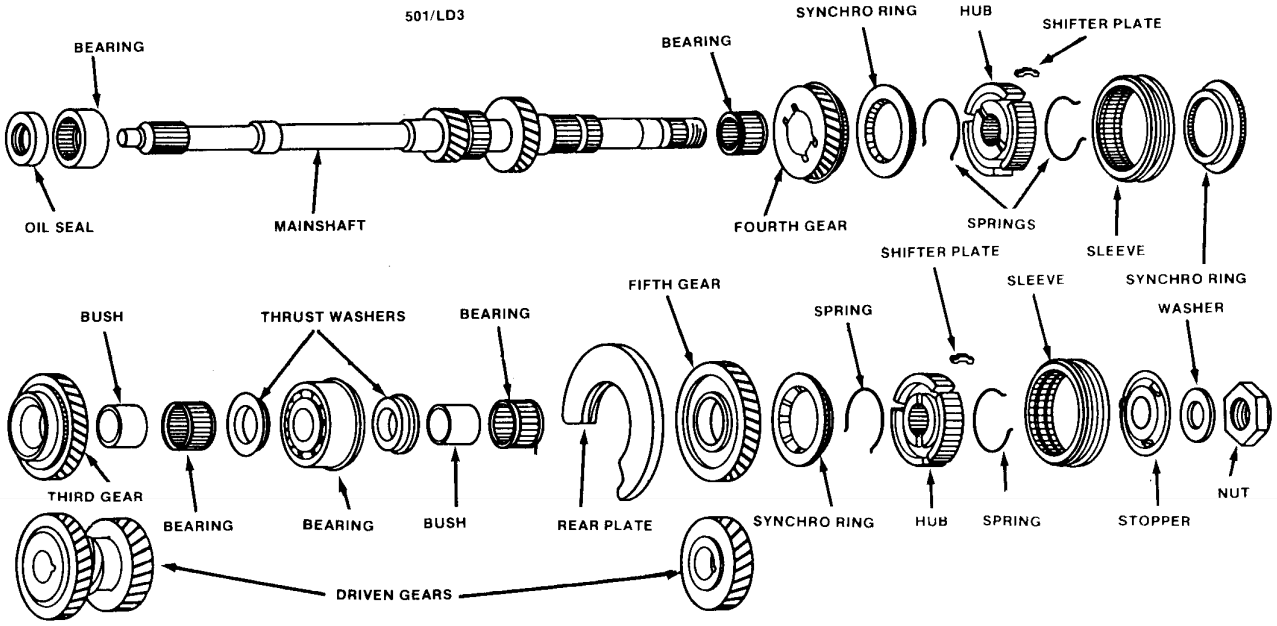
The rear of the mainshaft assembly includes, the fifth drive gear and synchro assembly where installed and the third and fourth drive gear and synchro assemblies which includes reverse gear, the front of the mainshaft has no other assemblies other than the bearing and oil seal.

On models equipped with four wheel drive dual ratio the mainshaft assembly comprises two separate components, the input shaft and the mainshaft.

The front of the mainshaft is supported by a spigot bearing in the rear of the input shaft and supported by bearings at the middle and rear. When assembled to the engine, all transaxle mainshafts/input shafts are further supported by a ball bearing located in the crankshaft on earlier models and in the flywheel on later models.

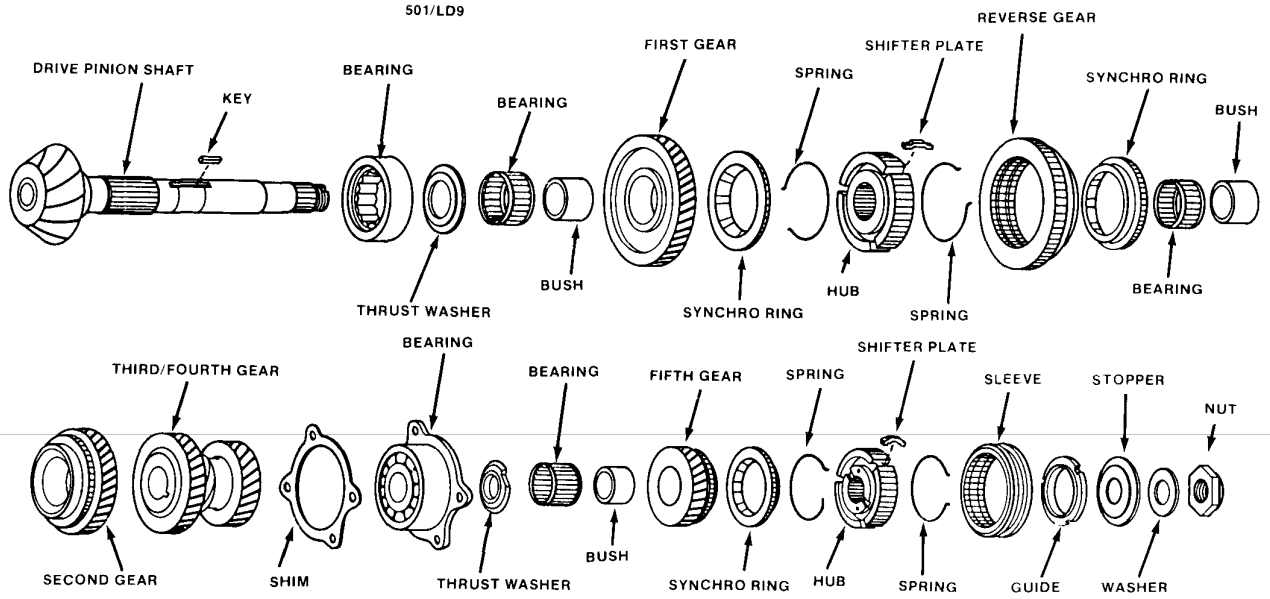
The gear assembly located on the rear of the four wheel drive dual ratio mainshaft is similar to the four wheel drive single ratio. The assembly on the front of the mainshaft includes the transfer input gear and synchro assembly.

The differential located inside the transaxle case consists of the differential pinion gears turned by the crownwheel. The differential is supported on each side by roller bearings in the transaxle case. Drive to the front wheels is provided by drive shafts located in



Illustrated view of four wheel drive, single ratio mainshaft and components.

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Illustrated view of two wheel drive, drive pinion shaft and components.

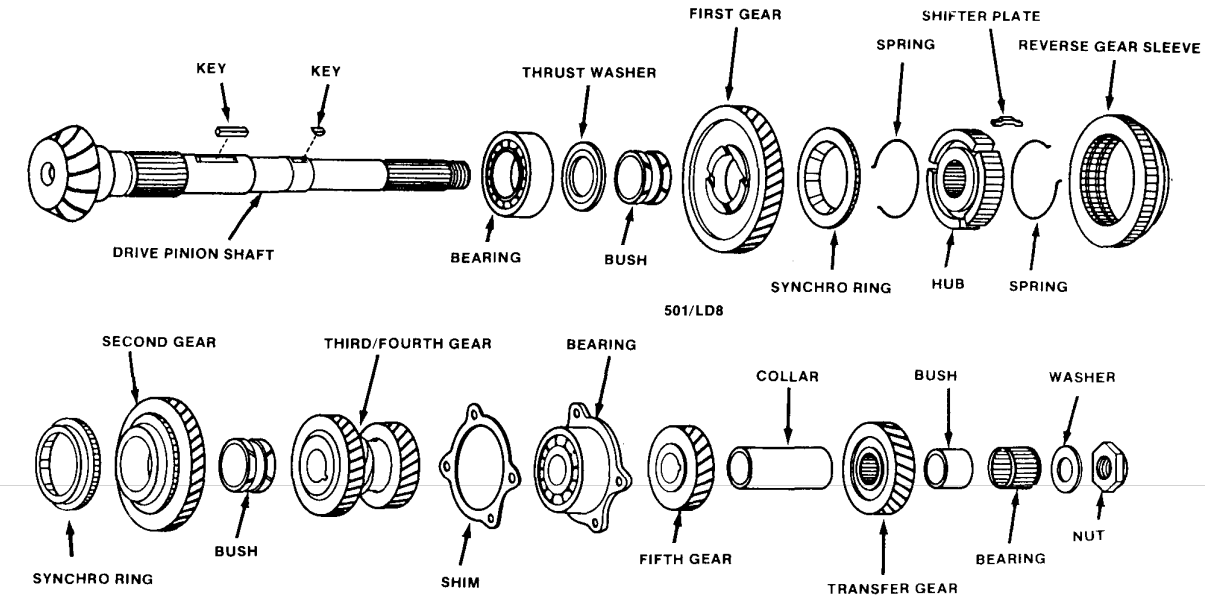
the differential side gears and external axle shafts to the road wheels.

On models equipped with two wheel drive the drive pinion assembly consists of the fifth driven gear and synchro assembly where installed, third and fourth driven gear and synchro assemblies, first and second driven gear and synchro assemblies including reverse gear retained by a lock nut.

On models equipped with four wheel drive, the drive pinion assembly is similar other than the inclusion of the transfer drive gear.

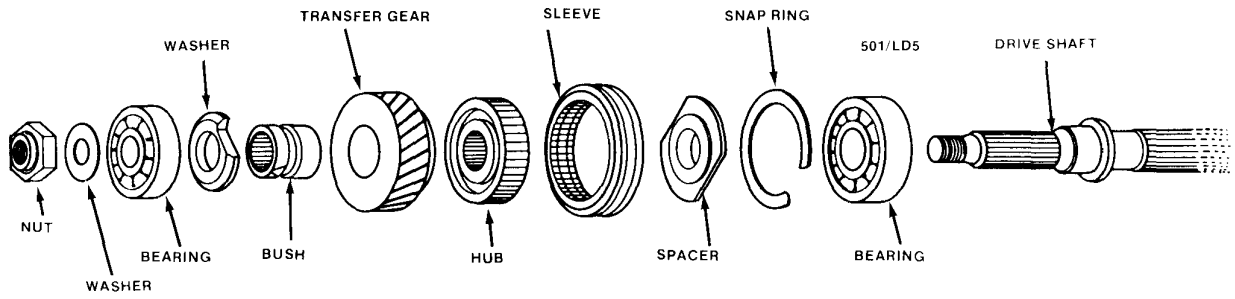
The reverse idler gear when engaged between the laygear and mainshaft gear changes the direction of rotation of the drive gear train, it is located inside the transaxle case and is supported on bushes on a shaft, or on the later models directly on the shaft.

The transfer case contains the mainshaft transfer drive gear, drive shaft driven gear assembly, high/low or four wheel drive synchro hub assembly, shifter rod and fork, transfer shifter lever, oil seal and reverse lamp switch.



Illustrated view of four wheel drive, drive pinion shaft and components.

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Illustrated view of four wheel drive rear drive shaft and components.

The rear extension on the transaxle assembly contains the rear drive shaft to the rear propeller shaft with the transfer driven gear and sliding hub assembly which locates in the transfer case during the final transaxle assembly. The rear extension also contains the four wheel drive indicator switch and the rear drive shaft oil seal. A floor type gear and transfer drive change control is installed to the floor and a stay bracket or rod secured to the transaxle and the vehicle floor.

On 1979–1984 and all Utility models equipped with four wheel drive, the transaxle control lever pivots on the transaxle extension housing. On 1985–1987 Station Wagon and Sedan models equipped with four wheel drive single ratio, the four wheel drive is actuated by an electric switch on the transaxle lever which allows manifold vacuum to operate a control cable to the transaxle via a vacuum servo unit.

Gear selection is obtained by the transaxle lever moving a control rod connected to the transaxle.

The design of the transaxle necessitates fine tolerances and adjustments, and many checks and adjustments are required during the overhaul of the transaxle. During the checks and adjustments, the use of specialised skills and equipment are essential and it is recommended that transaxle assembly repairs should be referred to a suitable specialised workshop.

Specifications and a tooth marking chart are included in this section for those who may feel competent and sufficiently equipped to undertake the operation.

The transaxle drive shaft oil seals must be removed from the differential bearing adjusting retaining rings when the rings are removed from the transaxle.

The differential retaining rings once removed will make it necessary to adjust the differential backlash and preload which can only be achieved with the transaxle removed from the vehicle.

If the oil seals require renewal, refer the work to a suitable specialised workshop.

On models equipped with two wheel drive, the transaxle selector rod enters an oil seal in the rear case. The transaxle selector rod oil seal can be renewed on the vehicle by first disconnecting the control linkage and withdrawing the oil seal over the selector rod.

On models equipped with four wheel drive, the rear propeller shaft engages with the rear drive shaft through an oil seal on the rear extension. The oil seal can be renewed on the vehicle by removing the propeller shaft(s) and withdrawing the oil seal over the transaxle rear drive shaft.

The front axle shafts on the two and four wheel drive models are similar and provide a smooth and flexible transfer of power during the driving operation. The axle shafts are secured to the transaxle drive shafts at the double offset joint outer race by interior splines and a retaining pin. The double offset joint comprising of an outer race, cage and balls and an inner race, allows flexibility during suspension flexing and is lubricated by a special grease. It is protected from the loss of lubricant or the entry of dirt by a rubber boot.

The outer end of the axle shaft has a constant velocity joint between the axle shaft and the hub drive shaft to allow for the larger turning angles when steering. The constant velocity joint is also lubricated by the special grease and protected by a rubber boot. The joint is an integral part of the front axle shaft and cannot be dismantled or repaired. In the event of a faulty constant velocity joint or damaged axle shaft the axle shaft must be renewed as a unit.

The splines on the axle shaft assemblies for the different year models vary and special care should be taken to ensure the correct axle assembly is installed othewise damage will occur after installation. The double offset joint outer race splines and diameter correspond with the splines and diameter of the drive shafts on the transaxle and special care should be taken to instal the correct components during assembly or damage will occur.

The four wheel drive propeller shaft(s) consist of a single piece tubular shaft on the 1979–1984 and all Utility models and two single piece tubular shafts and a centre bearing assembly on the 1985–1987 Sedan and Station Wagon models. The front of the propeller shaft has a splined interior which slides on the transaxle rear drive shaft external splines during the deflection of the rear suspension.

The rear of the propeller shaft is connected to the rear drive pinion flange by a flange and retaining bolts and nuts.

On the 1985–1987 Sedan and Station Wagon

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models equipped with the two propeller shafts, the centre bearing is secured on the rear of the front propeller shaft and retained by a flange and retaining nut. The centre bearing is secured to the chassis by retaining bolts and nuts.

The rear propeller shaft front flange is secured to the front propeller rear flange by retaining bolts and nuts. A universal joint is installed at each end of the shaft and in the case of the 1985–1987 Sedan and Station Wagon models one at the front and rear of the rear shaft and at the front of the front shaft.

The universal joint consists of a central cross or spider having four trunnions, four needle roller bearing cups and oil seals positioned in the propeller shaft yokes. On 1979–1984 and all Utility models the universal joint is retained by snap rings in the yokes and can be renewed. The trunnion bearing cup end float in the yokes can be controlled by selective fit snap rings.

On the 1985–1987 Sedan and Station Wagon models, the trunnion bearing cup in the propeller shaft yoke is retained by staking the yoke and cannot be renewed. In the event of a fault in the universal joint the propeller shaft must be renewed as a unit. The propeller shaft(s) if found to be worn or damaged on the splines, serrations or centre bearing contact surface must be renewed as a unit.

It is important to mark all mating flanges during dismantling and removal and to ensure the propeller shaft(s) are not dented and damaged as they are finely balanced otherwise damage will occur.

3. TRANSAXLE ASSEMBLY

Special Equipment Required:
To Remove and Instal — Transmission jack

TO REMOVE

(1) Disconnect the negative battery terminal.

(2) Remove the spare wheel from the engine compartment.

(3) Remove the spare wheel support bracket retaining bolts and remove the bracket.

(4) On models equipped with a Hill Holder remove the cable retaining nut and clip from the transaxle bracket and withdraw the cable.

(5) Remove the clutch cable locknut, adjusting nut and domed spacer from the cable.

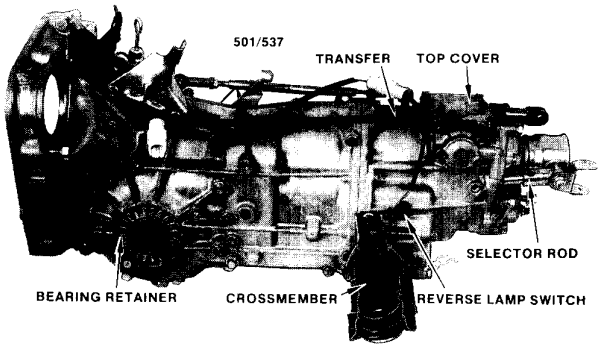
(6) Remove the cable to cable bracket retaining clip and remove the cable.

(7) On 1979–1984 and Utility models, remove the clutch return spring.

(8) Remove the clutch release lever rubber boot.

(9) On 1985–1987 Sedan and Station Wagon models, remove the hot air ducting from the carburettor.

(10) Unscrew the speedometer cable collar and remove the cable from the transaxle.



Left hand view of 1986 four wheel drive, five speed dual ratio transaxle removed from the vehicle.

(11) Disconnect the wiring harness and connectors to the reverse lamp.

(12) Remove the earth wire to body retaining screw and disconnect the earth wire.

(13) On 1979–1984 and Utility models, remove the starter motor retaining bolts and nuts and withdraw the starter motor. Position it securely on the engine compartment bulkhead.

(14) On 1985–1987 Sedan and Station Wagon models, proceed as follows:

(a) Where installed disconnect the wiring to the CO2 sensor on the exhaust.

(b) Disconnect the wiring cables to the starter motor.

(c) Remove the starter motor retaining nuts and remove the earth wire. Remove the starter motor from the vehicle.

(15) On 1979–1984 and Utility models, proceed as follows:

(a) Remove the transaxle to engine retaining bolts.

(b) Loosen the transaxle to engine lower retaining nuts.

(c) Loosen the torque stay rod to transaxle retaining nut sufficiently to allow the engine to be tilted to the rear on the transaxle removal.

(16) On 1985–1987 Sedan and Station Wagon models, remove the torque stay rod to body and transaxle retaining bolts and nuts and remove the stay rod from the vehicle.

(17) On 1979–1984 and Utility models, equipped with four wheel drive proceed as follows:

(a) Working inside the vehicle remove the gear lever knob.

(b) Remove the floor cover retaining screws and remove the lever and handbrake covers from the floor.

(c) Position the selector lever in four wheel drive position.

(d) Remove the selector control rod to selector/transaxle control rod retaining nuts.

(e) Remove the selector lever pivot bracket to floor retaining bolts and remove the lever assembly.

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(f) Remove the gear lever rubber boot to floor retaining screws and remove the rubber boot and plate.

(g) Remove the gear lever to transaxle shifter rod lever retaining bolt and nut and remove the gear lever.

(18) Raise the vehicle to a suitable working height and support it on chassis stands.

(19) On 1985–1987 Sedan and Station Wagon models, remove the transaxle to engine retaining bolt and nut.

(20) On 1979–1984 and Utility models, remove the hot air intake hose from the exhaust.

(21) Loosen the exhaust engine pipe to engine retaining nuts.

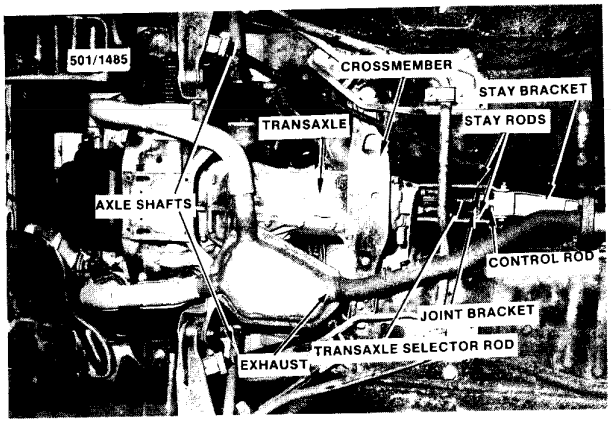
(22) Remove the engine pipe to intermediate pipe retaining bolts, springs and nuts.

(23) Remove the engine pipe to support bracket retaining bolt and nut.

(24) Remove the engine pipe to engine retaining nuts and remove the engine pipe from the vehicle.

(25) On models equipped with four wheel drive, remove the intermediate pipe to the rear muffler retaining bolts and nuts and remove the intermediate pipe from the vehicle.

(26) On models equipped with four wheel drive, remove the propeller shaft(s) from the vehicle ensuring that the transaxle aperture is plugged to prevent oil leakage.



Underbody view of installed manual transaxle. Two wheel drive, 1983 model.

(27) On 1979–1984 and Utility models, equipped with two wheel drive, working under the vehicle proceed as follows:

(a) Remove the gear lever control rod to joint bracket retaining bolt and nut and separate the rod.

(b) Remove the transaxle stay rods to stay bracket retaining nuts and separate the rods. Discard the retaining nuts.

(28) On 1985–1987 Sedan and Station Wagon models, working under the vehicle proceed as follows:

(a) Remove the neutral set spring from the spring retainer.

(b) Remove the control rod to joint bracket retaining bolt and nut and separate the rod.

(c) On models equipped with two wheel drive, remove the stay rod to clevis bracket retaining bolt and nut and separate the rod.

(d) On models equipped with four wheel drive single ratio, remove the stay rod pin bracket to transaxle retaining bolts and separate the pin bracket.

(e) On models equipped with four wheel drive dual ratio, remove the stay rod pin bracket to transaxle retaining bolts and separate the pin bracket.

(f) Remove the clevis pin from the selector lever control rod to the transaxle and separate the control rod.

(g) On models equipped with four wheel drive single ratio, remove the vacuum hoses from the vacuum servo unit.

(29) On 1979–1984 and Utility models, proceed as follows:

(a) Remove the stabiliser bar to chassis retaining bolts and nuts and remove the clamps and rubbers noting their installed position.

(b) Remove the stabiliser bar to radius rod retaining bolts and nuts and remove the clamps and rubber noting their installed position. Remove the stabiliser bar from the vehicle.

(30) On 1985–1987 Sedan and Station Wagon models, remove the stabiliser bar link plates to control arm retaining bolts and nuts and separate the stabiliser bar. Discard the retaining nuts.

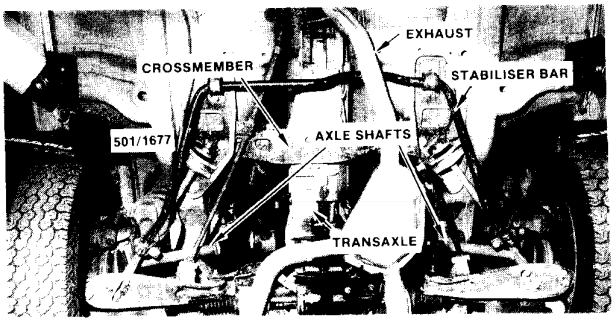
(31) Remove the control arms to front crossmember retaining bolts and nuts and lower the arms. Discard the retaining nuts.

(32) On 1985–1987 Sedan and Station Wagon models, remove the handbrake cable bracket to control arm retaining bolts and nuts and separate the cable and lower the arms.

(33) Using a suitable drift drive the axle shaft to drive shaft retaining pins from the axle and drive shafts. Discard the retaining pins.

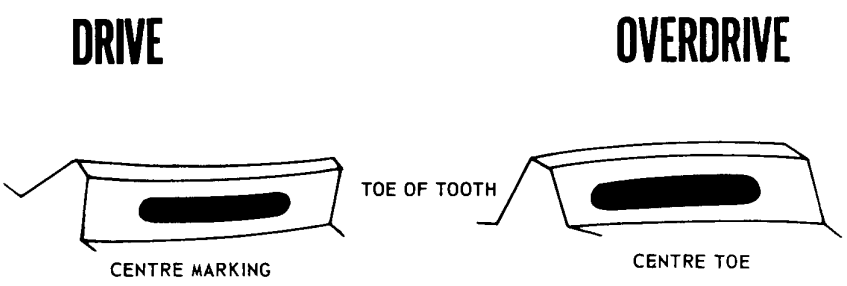
(34) Pushing the rear of the front wheels outwards separate the axle shafts from the drive shafts.

(35) On 1979–1984 and Utility models, remove the handbrake cable to chassis retaining bolt and nut and disconnect the cable.



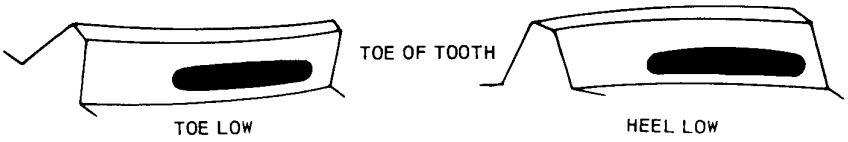
Underbody view of installed manual transaxle. Four wheel drive, dual ratio, 1983 model.

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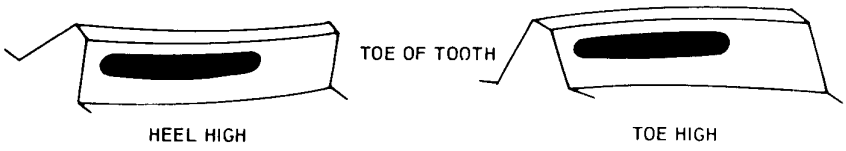


Crownwheel Tooth Marking for Correctly Adjusted Crownwheel and Pinion. Marking will be slightly Closer to Toe of Tooth on Overdrive or Concave Side. Changes in Thickness of Pinion Positioning Shims will Affect Tooth Marking on Overdrive to Greater Extent than on Drive or Convex Side of Tooth. Changes in Backlash have a more Pronounced Effect on Drive Side Markings (All models.)

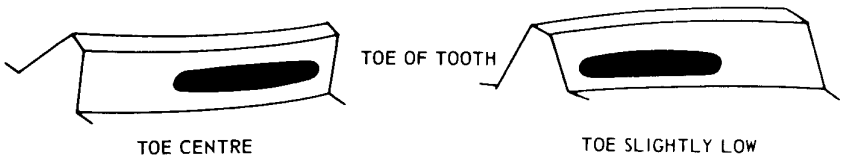
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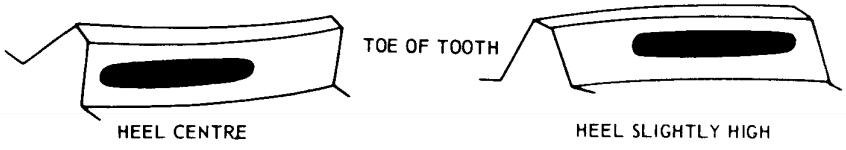
Low Profile Marking on Both Sides of Tooth. Rectify by Reducing Thickness of Pinion Positioning Shims and Reset Backlash (All models.)



High Profile Marking on Both Sides of Crownwheel Tooth. Rectify by Increasing of Pinion Positioning Shims and Reset Backlash (All models.)



Toe Marking on Drive Side and Low Profile Marking on Overdrive Side of Crownwheel Tooth. To Rectify, Increase Backlash. It may be Necessary to Increase Thickness of Pinion Positioning Shims to Maintain Backlash within Specified Limits (All models.)



Heel Marking on Drive Side and High Profile Marking on Overdrive Side of Crownwheel Tooth. To Rectify, Reduce Backlash. It may be Necessary to Decrease Thickness of Pinion Positioning Shims to Maintain Backlash within Specified Limits (All models.)

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(36) Remove the rear crossmember to transaxle retaining nuts.

(37) On 1985–1987 Sedan and Station Wagon models, remove the transaxle to engine retaining nuts.

(38) Using a transmission jack, support the weight of the transaxle.

(39) Remove the rear crossmember to chassis retaining bolts and remove the crossmember.

(40) On 1985–1987 Sedan and Station Wagon models, remove the rigid crossmember to chassis retaining bolts and remove the crossmember.

(41) On models equipped with four wheel drive, disconnect the wiring from the four wheel drive switch.

(42) Remove the transaxle to engine retaining bolts and nuts and carefully separate it from the engine.

(43) Carefully lower the transaxle ensuring it does not foul any component and withdraw it from the vehicle.

(44) Thoroughly clean the exterior of the transaxle assembly in a suitable solvent ensuring no foreign object or liquid enters the transaxle. Check the transaxle cases for cracks and damage, renew as necessary.

The design of the transaxle necessitates fine tolerances and adjustments and many checks and adjustments are required during the overhaul of the transaxle. During the checks and adjustments, the use of specialised skills and equipment are essential and it is recommended that transaxle assembly repairs should be referred to a suitable specialised workshop. Specifications and a tooth marking chart are included in this section for those who may feel competent and sufficiently equipped to undertake the operation.

TO INSTAL

(1) Apply grease to the input shaft splines, bearing retainer exterior tube and the clutch release lever pivot point.

(2) Ensure that the mating surfaces of the transaxle and the flywheel housing are clean and free of burrs and paint.

(3) Using the transmission jack, position the transaxle under the vehicle for entry onto the engine.

(4) Guide the transaxle forward to enter its input shaft into the clutch assembly and spigot bearing in the crankshaft/flywheel. Carefully guide the transaxle forward until it locates on the dowels and abuts the face of the flywheel housing.

NOTE: If the transaxle will not slip forward, simultaneously turn both transaxle shafts until the input shaft splines engage the driven plate splines.

(5) Instal the right hand retaining bolts and nuts and lower retaining nuts to the transaxle and engine and tighten them securely.

(6) Instal the rear crossmember to the transaxle and instal the new retaining nuts and tighten them to Specifications.

(7) Instal the rear crossmember to chassis and instal the retaining bolts and tighten them to Specifications.

(8) On 1985–1987 Sedan and Station Wagon models, instal the rigid crossmember to the chassis and instal the retaining bolts and tighten them to Specifications.

(9) Remove the transmission jack.

On 1979–1984 and Utility models, instal the handbrake cable to the chassis and instal the retaining bolt and nut and tighten the nut securely.

(10) Push the outside of the front wheels inwards and instal the axle shafts to the drive shafts ensuring the retaining pin holes are aligned.

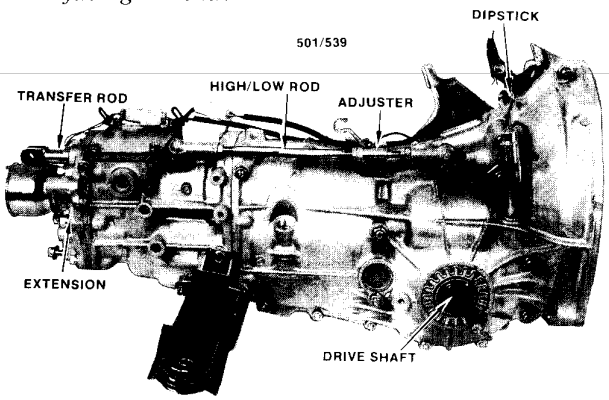
(11) Instal new steel roll retaining pins to the axle and drive shafts.

(12) Instal the control arms to the front crossmember and instal the retaining bolts and new nuts and tighten them securely.

(13) On 1979–1984 and Utility models, proceed as follows:

(a) Instal the stabiliser bar, rubbers and clamps to the chassis and instal the retaining bolts and nuts and tighten them to Specifications. Ensure that the rubbers are installed with their compliance slits to the rear.

NOTE: On models equipped with the modified stabiliser bar to chassis rubber bushes the compliance slits should be positioned facing the chassis.



Right hand view of 1986 four wheel drive five speed dual ratio transaxle removed from the vehicle.

(b) Instal the spacers, rubber bushings and clamping plates to each end of the stabiliser bar. Instal the retaining bolts and nuts to each end of the stabiliser bar and to the control arms. Tighten the nuts securely.

Ensure that the slits in the rubber bushings face towards the rear of the vehicle.

(14) On 1985–1987 Sedan and Station Wagon models proceed as follows:

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(a) Instal the stabiliser bar link plates to the control arms and instal the retaining bolts and new nuts and tighten them securely.

(b) Instal the handbrake cable bracket to the control arm and instal the retaining bolt and nut and tighten the nut securely.

(15) On 1979–1984 and Utility models equipped with two wheel drive proceed as follows:

(a) Instal the gear lever control rod to joint bracket and instal the retaining bolt and nut and tighten to Specifications.

(b) Instal the transaxle stay rods to the stay bracket and instal the new retaining nuts and tighten securely.

(16) On 1985–1987 Sedan and Station Wagon models proceed as follows:

(a) Instal the control rod to the joint bracket and instal the retaining bolt and nut and tighten to Specifications.

(b) Instal the neutral set spring to the spring retainer.

(c) On models equipped with two wheel drive, instal the stay rod to the clevis bracket and instal the retaining bolt and spring retainer/nut and tighten it to Specifications. Instal the neutral set spring to the retainer.

(d) On models equipped with four wheel drive, instal the control rod pin bracket to the transaxle and instal the retaining bolts and tighten securely.

(e) On models equipped with four wheel drive dual ratio, instal the selector control rod to the transfer selector rod and instal the clevis pin and secure with the split pin.

(17) On models equipped with four wheel drive, instal the propeller shaft(s).

(18) On 1985–1987 Sedan and Station Wagon models proceed as follows:

(a) Lower the vehicle to the ground and tighten the control arms to front crossmember retaining bolts and nuts to Specifications.

(b) Tighten the stabiliser bar linkplate to control arm retaining bolts and nuts to Specifications.

(c) Instal the transaxle to engine retaining bolt and nut and tighten to Specifications.

(d) Raise the vehicle to a suitable working height and support it on chassis stands.

(19) Position the engine exhaut pipe on its support bracket and instal the retaining bolt loosely.

(20) Instal the engine pipe and new gasket to the engine and instal the retaining nuts loosely.

(21) Instal the engine pipe and new gasket to the intermediate pipe. Instal the retaining bolts, springs and nuts and tighten securely.

(22) Tighten the engine pipe to engine and support bracket retaining bolts and nuts and tighten securely.

(23) On 1979–1984 and Utility models, instal the hot air intake hose to the exhaust.

(24) On models equipped with four wheel drive, instal the intermediate pipe and a new gasket to the rear muffler. Instal the retaining bolts and nuts and tighten securely. Ensure the exhaust is located on the hangers.

(25) Lower the vehicle to the ground.

(26) On 1979–1984 and Utility models proceed as follows:

(a) Instal the starter motor to the engine and instal the retaining bolts and nuts and tighten securely.

(b) Tighten the transaxle to engine retaining bolts and nuts to Specifications.

(27) On 1985–1987 Sedan and Station Wagon models proceed as follows:

(a) Instal the torque stay rod to the transaxle and body. Instal the retaining bolts and nuts and tighten to Specifications.

(b) Instal the starter motor to the engine. Instal the retaining bolts and nuts and tighten to Specifications. Ensure the earth wire is secured by the retaining nut.

(c) Instal the wiring cables to the starter motor.

(28) On 1979–1984 and Utility models proceed as follows:

(a) Loosen the stay rod adjusting nut until the rod is loose on the engine bracket.

(b) Tighten the rear nut and check the clearance between the washer and rubbers at the engine, it should be a maximum of 1.2 mm. This is specified as torque stay rod clearance and is controlled by the adjusting nut, or the installation of new rubbers.

(c) When adjustment is complete secure the rear nut and tighten the adjusting nut securely.

(29) Instal the speedometer cable to the transaxle and tighten the retaining collar securely ensuring that it is routed under the torque stay rod.

(30) Connect the wiring harness and wiring to the reverse lamp switch.

(31) Instal the earth wire to the body and instal the retaining screw and tighten securely.

(32) On 1985–1987 Sedan and Station Wagon models equipped with CO2 sensors, instal the wiring to the sensor on the exhaust.

(33) On 1979–1984 and Utility models, instal the return spring to the clutch release lever.

(34) Instal the clutch cable to the cable bracket and instal the retaining clip.

(35) Instal the clutch cable to the release lever and instal the domed spacer adjusting nut and locknut to the cable and adjust the cable and secure with the locknut. Refer to the Clutch section.

(36) On models equipped with a Hill Holder, instal the cable to the release lever and transaxle bracket and instal the retaining nut and clip to the cable and bracket.

(37) On 1979–1984 and Utility models equipped with four wheel drive proceed as follows:

(a) Position the gear lever on the transmission ensuring the lever dust seal is seated correctly.

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(b) Instal the gear lever to the transaxle shifter rod lever. Instal the retaining bolt and a new nut and tighten to Specifications.

(c) Position the selector lever transaxle control rod in the rubber boot and instal the boot and plate to the floor. Instal the rubber boot retaining screws and tighten securely.

(d) Instal the selector lever pivot bracket to the floor and the selector control rod to the selector transaxle control rod.

(e) Instal the lever pivot bracket to floor retaining bolts and tighten securely.

(f) Instal the selector control rod to selector transaxle control rod retaining nut and locknut, tighten the retaining nut and secure with the locknut.

(g) Instal the floor and handbrake covers and instal the retaining screws and tighten securely.

(h) Instal the knob to the gear lever ensuring the markings match the lever movements.

(38) On models equipped with four wheel drive, connect the wiring to the four wheel drive indicator switch.

(39) On 1985–1987 Sedan and Station Wagon models equipped with four wheel drive single ratio, connect the vacuum hose to the vacuum servo unit.

(40) On 1979–1984 and Utility models, tighten the control arms to the front crossmember retaining bolts and nuts to Specifications.

(41) On 1985–1987 Sedan and Station Wagon models instal the air ducting to the carburettor.

(42) Instal the spare wheel support bracket and instal the retaining bolts and tighten securely.

(43) Check the transaxle oil level and top up as necessary.

(44) Connect the negative battery terminal.

(45) Start the engine and check for exhaust leaks.

(46) Check the clutch and transaxle controls operations for free and smooth movement.

(47) Instal the spare wheel to the vehicle. On models equipped with a Hill Holder refer to the Brakes section.

TO RENEW REAR CASE OIL SEAL — TWO WHEEL DRIVE

(1) Raise the vehicle to a suitable working height and support it on chassis stands.

(2) Remove the transaxle control rod to joint bracket retaining bolt and nut. Ensure that the bushes are not mislaid.

(3) Using a suitable drift remove the joint bracket to transaxle selector rod retaining pin.

(4) Position the transaxle gear lever in a forward position and remove the joint bracket/sleeve from the selector rod.

(5) Using a suitable screwdriver or tool, prise the oil seal out of the rear case and over the transaxle selector rod. Discard the oil seal.

(6) Check the oil seal running surface on the transaxle selector rod for wear and damage, renew the selector rod as necessary. If appropriate refer the problem to a suitable specialised workshop.

(7) Check the oil seal aperture in the rear case for wear and damage, renew the rear case as necessary. If appropriate refer the problem to a specialised workshop.

(8) Ensure the oil seal aperture is clean and free from burrs and obstructions.

(9) Apply grease to the inner lips of the oil seal and position it in the rear case.

(10) Using a suitable tool or tube with the general dimensions of the oil seal, drive the oil seal into the rear case ensuring that it is fully home and that the lips of the seal are facing to the inside.

(11) Instal the joint bracket/sleeve to the transaxle selector rod. Align the retaining pin holes and instal the retaining pin to the selector rod and bracket/sleeve.

(12) Instal the transaxle control rod to the joint bracket. Instal the retaining bolt and nut and tighten to Specifications.

(13) Lower the vehicle to the ground.

TO RENEW REAR EXTENSION OIL SEAL — FOUR WHEEL DRIVE

(1) Raise the vehicle to a suitable working height and support it on chassis stands.

(2) Remove the propeller shaft from the vehicle.

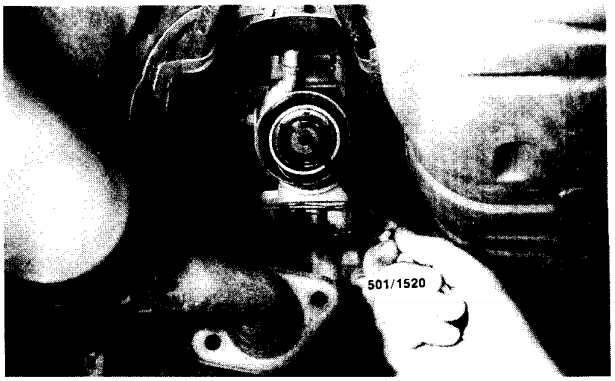
(3) Using a suitable tool or screwdriver prise the oil seal out of the rear extension and over the transaxle rear drive shaft. Discard the oil seal.

(4) Check the oil seal running surface on the propeller shaft(s) for wear and damage, renew as necessary.

(5) Check the oil seal aperture in the rear extension for wear and damage, renew the rear extension as necessary. If appropriate refer the problem to a suitable specialised workshop.

(6) Ensure that the oil seal aperture is clean and free from burrs and obstructions.

(7) Apply grease to the lips of the oil seal and position it on the rear extension.



Using a suitable screwdriver, prise the oil seal from the rear of the transaxle rear extension.

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(8) Using a suitable tool or a tube with the general dimensions of the oil seal, drive the oil seal into the rear extension, ensuring that it is fully home and that the lips of the seal are facing to the inside.

(9) Instal the propeller shaft(s) and lower the vehicle to the ground.

4. TRANSAXLE CONTROLS

Special Equipment Required:

To Adjust, 1981–1984 and all Utility Models — four wheel drive high/low linkage rod clamp/bracket

To Adjust, 1985–1987 Sedan and Station Wagon Models — high/low linkage rod locating pin tool, selector cable vacuum pump

TO REMOVE AND INSTAL

Two Wheel Drive 1979–1984 Models

(1) Raise the vehicle to a suitable working height and support it on chassis stands.

(2) Remove the engine exhaust pipes to engine retaining nuts.

(3) Remove the front exhaust bracket retaining bolt and nut.

(4) Remove the engine exhaust pipe to intermediate pipe retaining bolts and nuts and remove the exhaust pipe from the vehicle.

(5) Remove the gear lever knob.

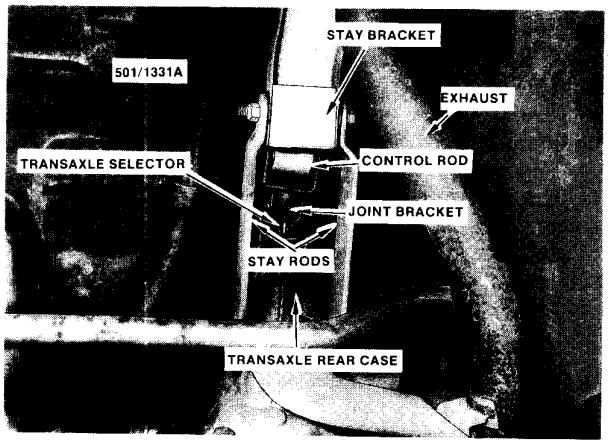
(6) Working underneath the vehicle, remove the neutral set spring from the joint bracket.

(7) Remove the stay bracket to stay rods retaining bolt, nut, bushes and spacer.

(8) Remove the control rod to joint bracket retaining bolt, nut, resin bushes, rubber bushes and spacer.

(9) Remove the cushion rubber to floor retaining nut and withdraw the lever assembly from the floor.

(10) Remove the control rod to transaxle lever retaining bolt, nut, resin bushes, rubber bushes and spacer. Remove the control rod.



Installed view of 1983 model two wheel drive transaxle controls.

(11) Remove the gear lever plate to stay bracket retaining bolts and remove the lever and plate.

(12) Remove the cushion, bush, plate and dust seal from the lever.

(13) Remove the cushion rubber to stay bracket retaining nut and remove the cushion rubber.

(14) Thoroughly clean all parts except the rubber components with a suitable solvent and check the control rod and lever for wear and damage, renew as necessary.

(15) Check the joint bracket, stay bracket and plate for wear and damage and renew as necessary.

(16) Check the cushion rubber for wear and damage, renew as necessary.

(17) Check the bushes, spacer and dust seal for wear and damage, renew as necessary.

(18) Check the neutral set spring for tension, wear and damage, renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the cushion rubber to the stay bracket, ensuring that its locating pin is in the stay hole and instal the retaining nut and tighten to Specifications.

(2) Instal the bushes and spacer to the stay bracket ensuring the bush small diameter flange is to the inside.

(3) Instal the dust seal to the plate and secure with wire ensuring the wire ends are at the long side of the plate.

(4) Apply grease to the bush and instal the cushion, bush and lever to the stay bracket.

(5) Apply sealant to the bracket to plate mating surface and grease to the transaxle lever and plate contact surface.

(6) Instal the plate and gear lever to the stay bracket ensuring the dust seal wire ends are to the left hand side. Instal the retaining bolts and tighten to Specifications. Check the lever for free smooth movement.

(7) Apply grease to the resin bushes and instal the bushes and chrome spacer to the lever end of the rod and the bushes and zinc spacer to the opposite end.

(8) Instal the control rod to the gear lever and instal the retaining bolt and a new nut and tighten to Specifications.

(9) Check that the control rod moves freely and smoothly on the lever.

(10) Instal the control rod to the joint bracket and instal the retaining bolt and a new nut from the right hand side and tighten to Specifications.

(11) Position the gear lever in the floor and instal the stay bracket to the stay rods. Instal the retaining bolt and nut and tighten to Specifications.

(12) Instal the cushion rubber on the body and instal the retaining nut and tighten to the Specifications.

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(13) Instal the neutral set spring to the joint bracket.

(14) Instal the locknut and knob to the gear lever ensuring the knob markings match the lever movement.

(15) Check the gear lever and selector lever operation functions freely and smoothly.

(16) Instal the engine exhaust pipes and new gaskets to the engine and instal the retaining nuts loosely.

(17) Instal the engine exhaust pipe and new gasket to the intermediate pipe and instal the retaining bolts and nuts loosely.

(18) Instal the engine exhaust pipe bracket retaining bolt and nuts loosely.

(19) Tighten the engine exhaust pipe to intermediate pipe retaining nuts securely.

(20) Tighten the exhaust pipe to engine and exhaust bracket retaining bolts and nuts securely.

(21) Lower the vehicle to the ground.

Two Wheel Drive 1985–1987 Models

(1) Remove the knob from the gear lever.

(2) Raise the vehicle to a suitable working height and support it with chassis stands.

(3) Working under the vehicle, remove the rear rigid crossmember retaining bolts and remove the crossmember.

(4) Remove the neutral set spring from the retainer bracket and clevis bracket.

(5) Remove the stay rod to clevis bracket retaining bolt and retainer bracket.

(6) Remove the joint bracket to double joint bracket retaining nut and bolt and rubber bushes.

(7) Remove the cushion rubber to body retaining nut and remove the assembly from the vehicle.

(8) Remove the control rod to gear lever retaining bolt and nut, nylon bushes, rubber bushes and spacer.

(9) Remove the double joint bracket to control rod retaining bolt and nut, nylon bushes, rubber bushes, spacer and remove the bracket.

(10) Remove the lever plate to stay rod retaining nuts and remove the lever.

(11) Remove the cushion, bush, plate, dust seal and locking wire from the lever.

(12) Remove the rubber bushes, and spacer from the stay rod.

(13) Remove the cushion rubber to stay rod retaining nut and remove the rubber cushion.

(14) Thoroughly clean all parts except the rubber components in a suitable solvent and check the control rod and stay rod for wear and damage, renew as necessary.

(15) Check the double joint bracket, clevis bracket and lever plate for wear and damage, renew as necessary.

(16) Check the cushion rubber for wear and damage, renew as necessary.

(17) Check the bushes, spacers and dust seal for wear and damage, renew as necessary.

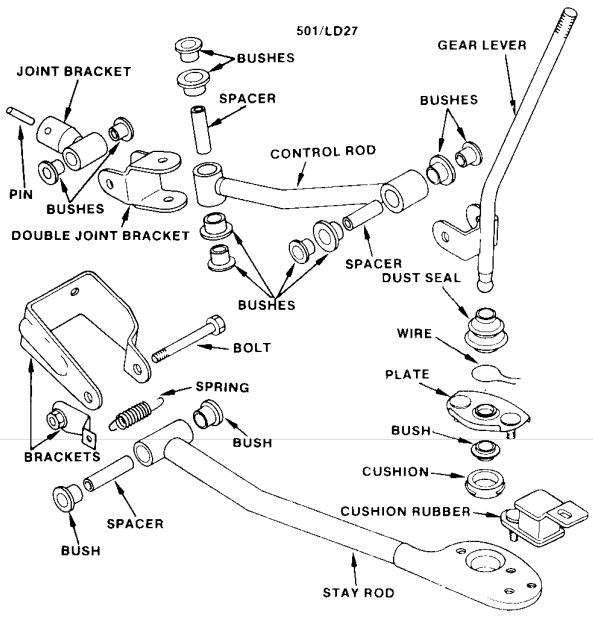


Illustration of 1985–1987 two wheel drive transaxle controls.

(18) Check the neutral set spring for tension, wear and damage, renew as necessary.

(19) Check the gear lever for wear and damage, renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the cushion rubber to the stay rod and instal the retaining nut and tighten to Specifications.

(2) Instal the rubber bushes and spacer to the stay rod.

(3) Instal the dust seal to the plate and secure with tying wire ensuring the wire ends are at the long side of the plate.

(4) Apply grease to the bush and instal the cushion, bush and lever to the stay rod.

(5) Apply a suitable sealant to the stay rod to plate mating surface and grease to the transaxle lever and plate contact surface.

(6) Instal the plate and the gear lever to the stay rod ensuring the dust seal wire ends are to the left hand side.

(7) Instal the plate retaining nuts and tighten to Specifications. Check the lever operation moves freely.

(8) Instal the rubber bushes, nylon bushes, spacer and double joint bracket to the control rod and instal the retaining bolt and nut and tighten to Specifications.

(9) Apply grease to the nylon bushes and instal the nylon bushes, rubber bushes and spacer to the control rod.

(10) Instal the control rod to the gear lever and instal the retaining bolt and nut and tighten to Specifications.

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(11) Check that the control rod moves freely and smoothly on the lever.

(12) Working under the vehicle instal the double joint bracket to the joint bracket and instal the retaining bolt and nut and tighten to Specifications.

(13) Instal the stay rod to the clevis bracket and instal the bolt and retainer bracket and tighten to Specifications.

(14) Instal the cushion rubber to the floor and instal the retaining nut and tighten to Specifications.

(15) Instal the neutral set spring to the retainer bracket and the double joint bracket ensuring the longest hook locates on the joint bracket.

(16) Instal the knob to the gear lever ensuring the knob markings match the lever movement.

(17) Check the gear lever operation functions freely and smoothly.

(18) Instal the rear rigid crossmember and instal the retaining bolts and tighten them securely.

(19) Lower the vehicle to the ground.

Four Wheel Drive 1979–1984 and Utility Models

(1) Remove the knob from the gear lever.

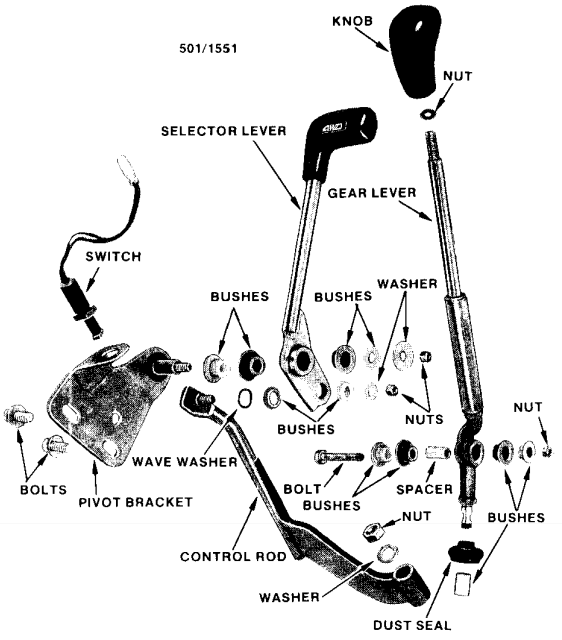
(2) Remove the retaining screws from the gear lever and selector lever covers and remove the covers.

(3) Remove the selector lever control rod to transaxle control rod retaining nut.

(4) Remove the selector lever pivot bracket to floor retaining bolts.

(5) On models equipped with dual ratio, disconnect the four wheel drive indicator switch wiring and remove the selector lever assembly from the vehicle.

(6) Remove the floor plate retaining screws and remove the plate and rubber boot.



Dismantled view of 1983 model, four wheel drive, dual ratio transaxle controls.

(7) Remove the gear lever to the shifter rod lever retaining bolt and nut and remove the gear lever from the transaxle.

(8) Remove the dust seal and gear lever pivot bush from the transaxle.

(9) Remove the rubber bushes, resin bushes and spacer from the gear lever.

(10) Remove the selector lever control rod to selector lever retaining nut, washer and bush and separate the control rod from the lever.

(11) Remove the bushes and wave washer from the selector lever control rod.

(12) Remove the selector lever to pivot bracket retaining nut and washer.

(13) Remove the resin bushes, rubber bushes and spacer from the selector lever.

(14) Thoroughly clean all parts except the rubber components with a suitable solvent.

(15) Check the control rod and levers for wear and damage, renew as necessary.

(16) Check the pivot bracket for wear and damage, renew as necessary.

(17) Check the bushes and spacers for wear and damage renew as necessary.

(18) Check the rubber boot and dust seal for cracks and damage, renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Apply grease to all the resin bushes.

(2) Instal the rubber bushes, resin bushes and spacer to the gear lever.

(3) Instal the resin bushes, rubber bushes and spacer to the selector lever.

(4) Instal the wave washer to the selector lever control rod.

(5) Instal the selector lever control rod to the selector lever and instal the new retaining nut and washer and tighten to Specifications. Ensure the control rod moves freely and smoothly on the lever.

(6) Instal the selector lever to the pivot bracket and instal the new retaining nut and tighten it securely.

(7) Apply grease to the gear lever pivot bush and position in the transaxle.

(8) Instal the dust seal to the transaxle and secure it with the retaining clip.

(9) Instal the gear lever to the dust seal and transaxle.

(10) Instal the gear lever to shifter rod lever, instal the retaining bolt and nut and tighten to Specifications.

(11) Instal the floor plate and rubber boot to the floor ensuring that the selector lever control rod is protuding from the boot. Instal the retaining screws and tighten them securely.

(12) Position the selector lever assembly and instal the selector lever control rod to the selector control rod and instal the retaining nut and tighten it to Specifications.

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(13) Ensure that the selector control rod is as far forward as possible and align the notch on the lower edge of the selector lever with the pin hole in the pin bracket. Instal a locating pin to hold the pivot bracket and selector lever rigid.

(14) Position the pivot bracket on the floor and instal the retaining bolts and tighten them to the Specifications.

(15) Remove the locating pin from the pivot bracket and check that the gear lever and selector lever operation functions freely and smoothly.

(16) Instal the gear lever and selector lever covers to the floor and instal the retaining screws and tighten them securely.

(17) On models equipped with dual range, ensure that the selector lever and cover have a clearance that is within the Specifications. This is specified as selector lever forward clearance and is controlled by adjusting the location of the selector lever pivot bracket.

(18) Instal the knob to the gear lever ensuring the knob markings match the lever movements.

Four Wheel Drive Single Ratio 1985–1987 Models

(1) Disconnect the negative battery terminal and disconnect the wiring from the four wheel drive switch.

(2) Raise the vehicle to a suitable working height and support it on chassis stands.

(3) Working under the vehicle, remove the engine exhaust pipe to intermediate pipe retaining bolts, springs and nuts.

(4) Remove the intermediate pipe and rear muffler from the mounting rubbers and secure it away from the work area.

(5) Remove the rear rigid crossmember retaining bolts and remove the crossmember.

(6) Remove the neutral set spring from the spring plate.

(7) Remove the control rod to double joint bracket retaining bolt and nut.

(8) Remove the pin bracket to transaxle retaining bolts.

(9) Remove the cushion rubber to floor retaining nut and remove the assembly from the vehicle.

(10) Remove the nylon bushes, rubber bushes and spacers from the control rod.

(11) Remove the gear lever plate to stay rod retaining nuts and remove the gear lever and plate.

(12) Remove the cushion, bush, plate, locking wire and dust seal from the lever.

(13) Remove the pin bracket to stay rod retaining nut and remove the spring plate, washers, pin bracket and bushes from the stay rod.

(14) Thoroughly clean all parts except the rubber components in a suitable solvent and check the control rod and stay rod for wear and damage, renew as necessary.

(15) Check the double joint bracket, pin bracket and gear lever plate for wear and damage renew as necessary.

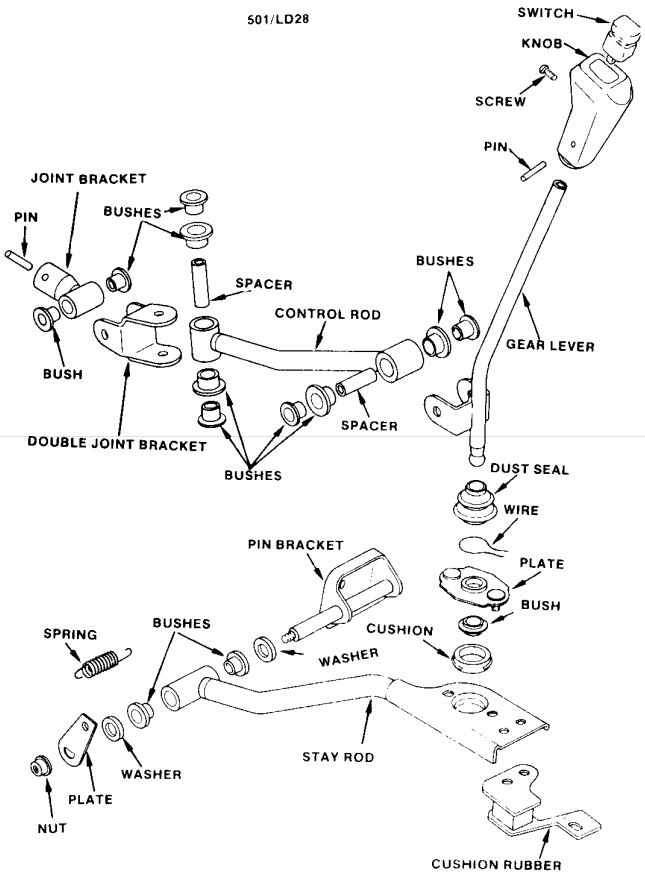


Illustration of 1985–1987 four wheel drive, single ratio transaxle controls.

(16) Check the cushion rubber for wear and damage, renew as necessary.

(17) Check the bushes, spacer and dust seal for wear and damage, renew as necessary.

(18) Check the neutral set spring for stretching, wear and damage, renew as necessary.

(19) Check the gear lever for wear and damage, renew as necessary.

(20) Check the wiring loom and connector for damage, renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the cushion rubber to the stay rod and instal the retaining bolts and nuts and tighten to Specifications.

(2) Instal the bushes, washers, pin bracket, spring plate and retaining nut to the stay rod and tighten the retaining nut to Specifications. Instal the neutral set spring to the spring plate.

(3) Instal the dust seal to the gear lever plate and secure it with tying wire, ensure that the wire ends are at the long side of the plate.

(4) Apply grease to the bush and instal the

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cushion, bush and lever to the stay rod.

(5) Apply a suitable sealant to the stay rod to plate mating surfaces and grease to the gear lever and plate contact surface.

(6) Instal the plate and the gear lever to the stay rod ensuring the dust seal wire ends are to the left hand side.

(7) Instal the plate retaining nuts and tighten to Specifications. Check the gear lever operation functions freely and smoothly.

(8) Apply grease to the nylon bushes and instal the nylon bushes, rubber bushes and yellow spacer to the transaxle end of the control rod.

(9) Apply grease to the nylon bushes at the lever end of the control rod and instal the rubber bushes, nylon bushes and chrome spacer to the control rod.

(10) Instal the control rod to the gear lever and instal the retaining bolt and nut and tighten to Specifications.

(11) Check that the control rod moves freely and smoothly on the lever.

(12) Working under the vehicle, instal the control rod to the double joint bracket and instal the retaining bolt and nut and tighten to Specifications.

(13) Instal the pin bracket to the transaxle and instal the retaining bolts and tighten them to Specifications.

(14) Instal the cushion rubber to the floor and instal the retaining nut and tighten it to Specification.

(15) Connect the neutral set spring to the double joint.

(16) Connect the wiring to the four wheel drive switch.

(17) Check that the gear lever operation functions freely and smoothly.

(18) Instal the intermediate exhaust pipe assembly to the mounting rubbers.

(19) Instal the intermediate exhaust pipe and new gasket to the engine exhaust pipe and instal the retaining bolts, springs and nuts and tighten them securely.

(20) Instal the rear rigid crossmember and instal the retaining bolts and tighten them to Specifications..

(21) Lower the vehicle to the ground.

Four Wheel Drive Dual Ratio 1985–1987 Sedan and Station Wagon Models

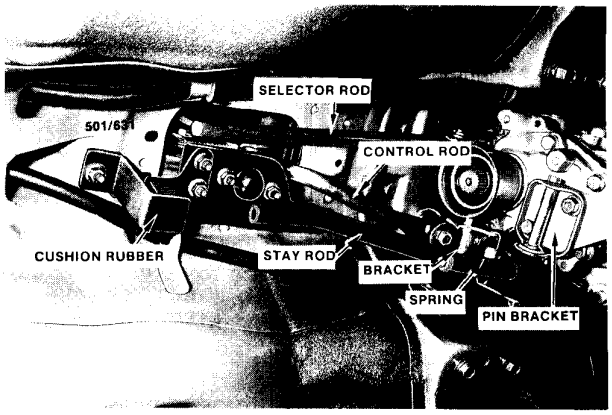
(1) Raise the vehicle to a suitable working height and support it on chassis stands.

(2) Remove the engine exhaust pipe bracket retaining bolt.

(3) Loosen the engine exhaust pipes to engine retaining nuts.

(4) Remove the intermediate pipe to rear muffler retaining bolts, springs and nuts. Discard the gasket.

(5) Remove the engine exhaust pipe to engine retaining nuts and remove the engine pipe and intermediate pipe. Discard the gaskets.



Installed view of 1986 four wheel drive five speed, dual ratio transaxle controls. Propeller shaft and crossmember removed for clarity.

(6) Remove the rear rigid crossmember retaining bolts and remove the crossmember.

(7) Remove the propeller shaft from the vehicle.

(8) Remove the gear lever and selector lever knobs.

(9) Remove the retaining screws and remove the gear lever and selector lever covers from the floor.

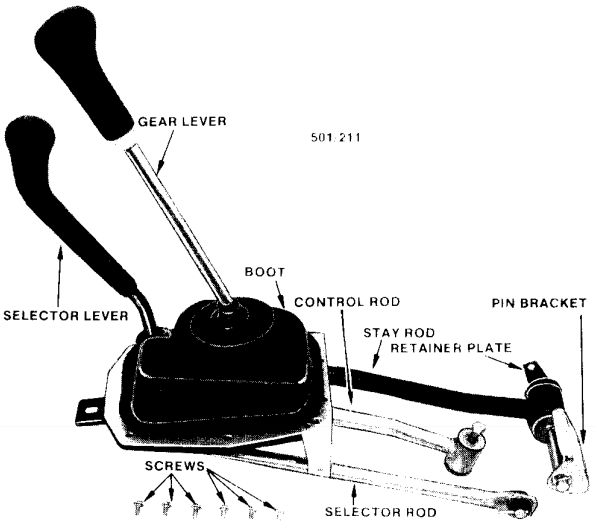
(10) Remove the four wheel drive indicator switch plate to pivot bracket retaining nuts and remove the switch and plate.

(11) Remove the rubber boot plate to floor retaining screws and remove the plate and boot.

(12) Disconnect the neutral set spring from the double joint bracket.

(13) Remove the pin bracket to transaxle retaining bolts.

(14) Remove the control rod to double joint bracket retaining bolt, rubber bushes, nylon bushes, spacer and nut.



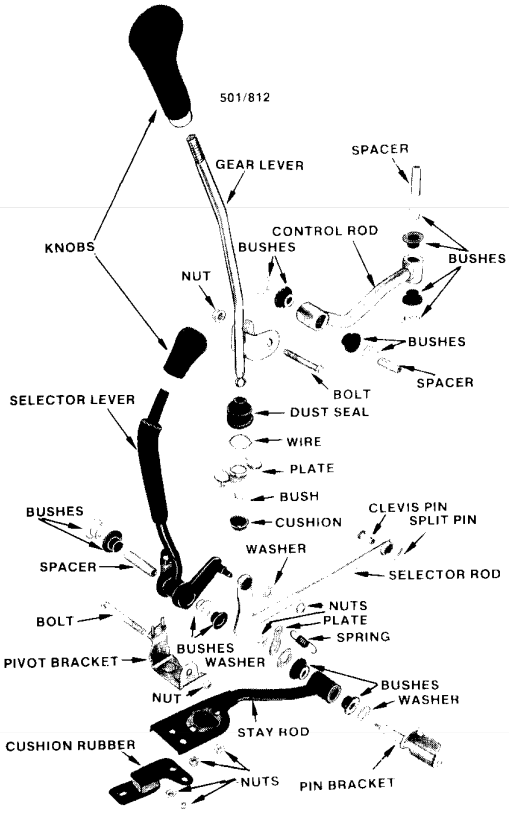
View of 1986 four wheel drive, five speed, dual ratio transaxle controls removed from the vehicle.

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(15) Remove the selector rod to transaxle selector rod split pin and clevis pin.
(16) Remove the cushion rubber to floor retaining nut.
(17) Remove the selector lever pivot bracket to stay rod retaining nuts and remove the transaxle control assembly from inside the vehicle.
(18) Separate the cushion rubber from the stay rod and remove it from the assembly.
(19) Remove the control rod to gear lever retaining bolt and nut.
(20) Remove the nylon bushes, rubber bushes and spacers from the control rod.
(21) Remove the gear lever plate to stay rod retaining nuts and remove the lever.
(22) Remove the cushion, bush, plate, locking wire and dust seal from the lever.
(23) Remove the pin bracket to stay rod retaining nut and remove the retainer plate, washers, pin bracket and bushes.
(24) Remove the selector rod to selector lever retaining nut and remove the selector rod.
(25) Remove the selector lever to pivot bracket retaining bolt and nut and remove the bracket.
(26) Remove the nylon bushes, rubber bushes and spacer from the selector lever.
(27) Remove the bushes from the selector rod.
(28) Thoroughly clean all parts except the rubber components in a suitable solvent and check the control rod, stay rod, and selector rod for wear and damage, renew as necessary.
(29) Check the double joint bracket, pin bracket, lever plate, selector lever pivot bracket and switch plate for wear and damage, renew as necessary.
(30) Check the cushion rubber for wear and damage, renew as necessary.
(31) Check the bushes, spacers and dust seal for wear and damage, renew as necessary.
(32) Check the neutral set spring for signs of stretching, wear and damage, renew as necessary.
(33) Check the gear and selector levers for wear and damage and renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Apply grease to all nylon bush interior surfaces.
(2) Instal the rubber bushes, nylon bushes and spacer to the selector lever.
(3) Instal the selector lever to the pivot bracket and instal the retaining bolt and nut and tighten it to Specifications.
(4) Instal the bushes to the selector rod.
(5) Instal the selector rod to the selector lever and instal the retaining nut and tighten it to Specifications.
(6) Instal the bushes, washers, pin bracket, retainer plate and retaining nut to the stay rod and tighten it to Specifications. Connect the neutral set spring to the retainer plate.
(7) Instal the dust seal to the plate and secure it with tying wire, ensuring that the wire ends are at the long side of the plate.
(8) Apply grease to the bush and instal the cushion, bush and lever to the stay rod.
(9) Apply a suitable sealant to the stay rod to plate mating surfaces and grease to the gear lever and plate contact surfaces.
(10) Instal the plate and the gear lever to the stay rod, ensuring the dust seal wire ends are to the left hand side.
(11) Instal the plate retaining nuts and tighten them to Specifications.
(12) Check the gear lever operation for free, smooth movement.
(13) Instal the rubber bushes, nylon bushes and yellow spacer to the control rod at the gear lever end of the rod.
(14) At the transaxle end of the control rod, instal the rubber bushes, nylon bushes and chrome spacer.
(15) Instal the control rod to the gear lever. Instal the retaining bolt and nut and tighten them to Specifications.
(16) Instal the selector lever pivot bracket to the stay rod together with the cushion rubber, instal the retaining nuts and tighten them to Specifications.



Dismantled view of 1986 five speed, four wheel drive, dual ratio transaxle controls.

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(17) Check that the control rods moves freely and smoothly on their levers and instal the transaxle control assembly into the vehicle.

(18) Working under the vehicle, instal the control rod to the transaxle selector rod and instal the retaining clevis pin and split pin.

(19) Instal the transaxle control rod to the double joint bracket and instal the retaining bolt and nut and tighten them to Specifications. Insert the retaining bolt at the double joint lower side.

(20) Instal the pin bracket to the transaxle and instal the retaining bolts and tighten them securely.

(21) Connect the neutral set spring to the double joint bracket.

(22) Instal the cushion rubber to the body and instal the retaining nut and tighten it to Specifications.

(23) Instal the propeller shaft.

(24) Instal the engine exhaust pipe with new gaskets to the engine and instal the retaining nuts loosely.

(25) Instal the intermediate pipe with a new gasket to the rear muffler and instal the retaining bolts, spring and nuts and tighten them securely.

(26) Instal the engine pipe to bracket retaining bolt.

(27) Tighten the engine pipe retaining nuts and bracket retaining bolt securely.

(28) Instal the rear rigid crossmember and instal the retaining bolts and tighten them to Specifications.

(29) Instal the gear lever and selector lever rubber boot and plate to the floor and instal the retaining screws and tighten them securely.

(30) Instal the four wheel drive indicator switch and plate onto the pivot bracket and instal the retaining nuts and tighten them securely.

(31) Check the operational functions of the gear and selector levers and the four wheel drive switch.

(32) Instal the gear lever and selector lever covers to the floor and instal the retaining screws and tighten them securely.

(33) Instal the knobs to the gear lever and the selector lever ensuring the knob markings match the lever movements.

(34) Lower the vehicle to the ground.

TO ADJUST FOUR WHEEL DRIVE DUAL RATIO HIGH/LOW LINKAGE

1979–1984 and Utility Models

With the clutch and four wheel drive selector lever adjustments correct, the high/low linkage rod should be checked and adjusted as necessary. The high/low linkage rod can be adjusted on the vehicle.

(1) Disconnect the negative battery terminal.

(2) Remove the spare wheel from the engine compartment.

(3) Remove the starter motor retaining bolts and nuts and withdraw the starter motor, position it securely on the engine compartment bulkhead.

(4) Disconnect the reverse lamp and four wheel drive warning switches harness from the harness retaining clip on the transaxle case.

(5) Loosen the front and rear locknuts of the high/low linkage adjuster screw.

NOTE: The linkage rod adjuster rear locknut is left hand threaded.

(6) Shorten the linkage rod by turning the adjuster screw one or two turns in a clockwise direction.

(7) Position the selector lever in four wheel drive low and loosen the transaxle half case/harness clip retaining bolt and nut.

(8) Using the special linkage rod adjusting tool to hold the linkage rod secure, remove the rod clamp and position the bracket between the retaining bolt head and the transaxle case and the top of the linkage rod.

(9) Instal the rod clamp to the adjusting tool bracket and tighten the retaining bolts. Tighten the transaxle case and rod clamp bolts and nuts securely ensuring that the bracket face firmly abuts the transaxle case and holds the linkage rod rigid.

(10) While securing the linkage rod front ball joint by hand lengthen the linkage rod by turning the adjuster screw anti-clockwise until the front ball joint becomes tight.

(11) Turn the adjuster screw clockwise 90 degrees and while securing the ball joint, tighten the adjuster screw rear and front locknuts securely.

(12) Remove the linkage rod adjusting tool from the linkage rod and transaxle case, tighten the transaxle half case/harness clip retaining bolt and nut to Specifications.

(13) Instal the reverse lamp and four wheel drive warning switches harness to the retaining clip.

(14) Instal the starter motor to the engine/transaxle and instal the retaining bolt and nuts. Tighten the retaining bolt and nuts securely.

(15) Connect the negative battery terminal.

(16) Check the operation of the four wheel drive selection for free and smooth movement.

1985–1987 Sedan and Station Wagon Models

With the clutch, the four wheel drive selector and the hill holder adjustment correct, the high/low linkage rod should be checked and adjusted as necessary. The design of the transaxle and the method of adjustment necessitates the removal of the transaxle from the vehicle.

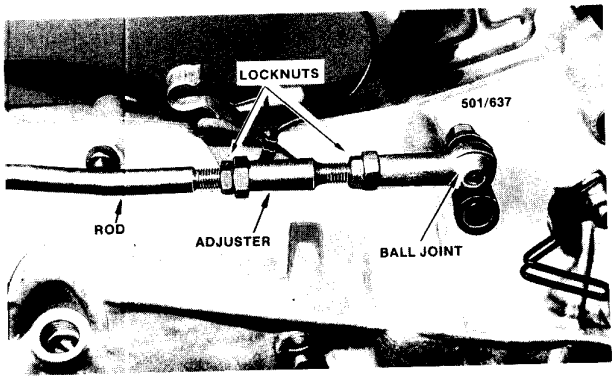
(1) Remove the transaxle from the vehicle as previously described.

(2) Remove the top cover and gasket from the transfer case.

(3) Ensure that the curved section of the linkage rod is horizontal to the transaxle.

(4) Position the transfer rod in four wheel drive low and instal the special linkage adjusting locating pin tool in the locating pin holes at the transfer rod on

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View of high/low linkage and adjuster, 1986 model shown.

the transfer case in order to hold the transfer rod and linkage rigid.

(5) While securing the linkage front ball joint by hand loosen the front and rear locknuts.

NOTE: The linkage rod adjuster rear locknut is left hand threaded.

(6) While holding the front ball joint by hand turn the adjuster screw anti-clockwise until the front ball joint becomes tight.

(7) Turn the adjuster screw clockwise 90 degrees and while securing the ball joint tighten the adjuster screw rear and front locknut to Specifications.

(8) Remove the linkage adjusting locating pin tool from the transaxle.

(9) Check the operation of the four wheel drive selection for free and smooth movement.

(10) Instal the top cover and gasket to the transfer case and instal the retaining bolts and tighten to Specifications.

(11) Instal the transaxle to the vehicle as previously described.

TO ADJUST FOUR WHEEL DRIVE SINGLE RATIO CABLE

1985–1987 Sedan and Station Wagon Models

With the electrical components operating correctly and the vacuum hoses serviceable and secure, the four wheel drive selection cable should be checked and adjusted as necessary. The design of the transaxle and the method of adjustment necessitates the removal of the transaxle from the vehicle.

(1) Remove the transaxle from the vehicle as previously described.

(2) Using a vacuum pump, apply a vacuum to the outer aperture on the vacuum servo-unit until the cable is fully extended forward as in the two wheel drive position and secure the cable.

(3) Loosen the cable adjusting turnbuckle locknuts and using the turnbuckle, shorten the cable until the turnbuckle becomes tight.

(4) Release the turnbuckle 180 degrees and secure by tightening the locknuts securely.

(5) Using the vacuum pump check the operation of the four wheel selection for free and smooth movement.

(6) Remove the vacuum pump and instal the transaxle to the vehicle as previously described.

5. AXLE SHAFTS

Special Equipment Required:
To Remove — Axle shaft puller
To Instal — Axle shaft installing tool

TO REMOVE AND DISMANTLE

It is possible to renew the axle shaft double offset joint and rubber boot with the axle shaft on the vehicle. This is achieved by removing the front exhaust pipe and disconnecting the control arm from the front crossmember and utilising the appropriate part of the following procedures for the removal and installation of the rubber boot and offset joint.

Special care should be taken that the correct diameter offset joint is installed. The installation of the incorrect component will result in damage to the assembly.

(1) Disconnect the negative battery terminal.

(2) Ensure the handbrake is fully applied.

(3) Remove the front wheel hub caps where fitted and remove the axle shaft retaining nut split pin.

(4) Loosen the road wheel nuts and axle shaft retaining nut.

(5) Raise the vehicle to a suitable working height and support it on chassis stands.

(6) Remove the road wheels and release the handbrake.

(7) Remove the caliper to swivel hub retaining bolts and remove the caliper. Secure the caliper away from the work area ensuring no strain is put on the flexible hose.

(8) Remove the axle shaft retaining nut, spacer, shaped washer and hub assembly from the axle shaft.

(9) Remove the suspension unit to steering knuckle retaining bolts and separate the suspension unit.

(10) Remove the steering tie rod end to steering knuckle retaining nut split pin and remove the retaining nut. Separate the tie rod end.

NOTE: Disconnect the tie rod end ball joint stud by placing a suitable dolly or hammer against the side of the steering knuckle steering eye and striking the opposite side with a hammer.

(11) Remove the steering knuckle control arm ball joint retaining bolt and expanding the ball joint retaining gap on the hub separate the ball joint. Do not expand the gap any further than 4 mm. This is specified as the ball joint retaining gap.

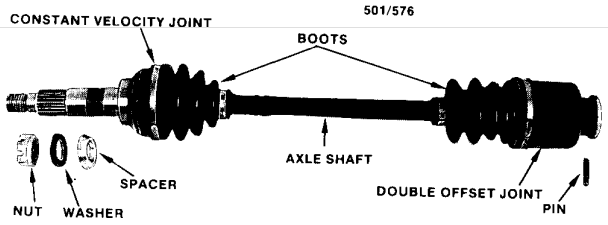
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(12) Remove the disc dust cover to steering knuckle retaining bolt and remove the dust cover.

(13) Using the special axle shaft puller separate the steering knuckle from the axle shaft and remove it from the vehicle.

(14) Working under the vehicle and using a suitable drift, drive the axle shaft to differential drive shaft retaining pin from the axle and drive shaft, discard the pin, remove the axle shaft from the vehicle.

(15) Secure the axle shaft in a suitable vice or holding fixture and carefully remove the offset joint rubber boot retaining clips ensuring the boots are not damaged. Discard the retaining clips.



View of front axle shaft assembly removed from the vehicle.

(16) Remove the rubber boot from the joint outer race and using a suitable screwdriver remove the retaining snap ring from the outer race.

(17) Mark or note the installed position of the outer race to the joint cage and remove the outer race from the axle shaft.

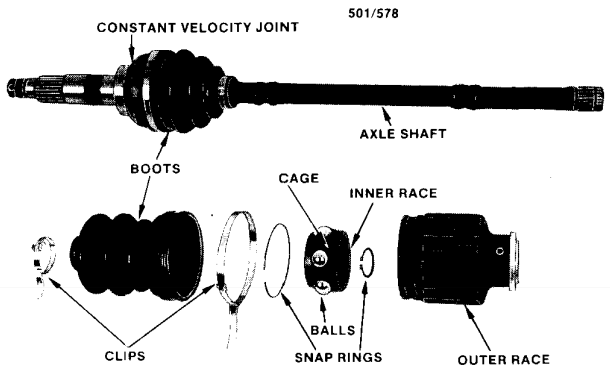
(18) Carefully remove the balls from the joint cage ensuring they are not mislaid.

(19) Turn the joint cage with its protusion aligned with its groove on the inner race and remove it to the rear of the inner race.

(20) Using a suitable pair of snap ring pliers, remove the inner race retaining snap ring from the axle shaft and remove the inner race, cage and rubber boot. Note or mark the installed direction of the cage.

(21) Carefully remove the constant velocity joint rubber boot retaining clips ensuring the boots are not damaged. Discard the retaining clips.

(22) Remove the constant velocity joint rubber boots from the axle shaft.



Dismantled view of double offset joint.

NOTE: The axle shaft constant velocity joints are an integral part of the axle shaft and cannot be dismantled. Any faults found with the axle shaft assembly will make it necessary to renew the axle shaft assembly as a unit. The axle shaft and double offset joints can differ in spline numbers and diameters and if installed incorrectly will cause damage to the components.

TO CHECK AND INSPECT

(1) Clean all components other than the rubber boots in a suitable solvent.

(2) Check the rubber boots for damage and deterioration, renew as necessary.

(3) Check the axle shaft for bend and damage, pay particular attention to the splines and retaining snap ring groove, renew as necessary.

(4) Check the constant velocity joint for smoothness of operation damage and corrosion, renew the axle shaft assembly as necessary.

(5) Check the double offset joint balls, inner race and outer race for wear and damage pay particular attention to the splines and retaining snap ring groove, renew as necessary.

(6) Check the double offset joint outer race interior splines and retaining pin hole for wear and damage, renew as necessary.

TO ASSEMBLE AND INSTAL

(1) Position the rubber boot on the axle shaft constant velocity joint and pack with Subaru Molylex No. 2 grease, or alternatively, any molybdenum disulphide grease.

(2) Position the double offset joint rubber boot on the centre of the axle shaft and instal the double offset joint cage to the shaft as noted.

On 1985–1987 Sedan and Station Wagon models, ensure that the cage is installed with the recessed cut-out face towards the inner end of the shaft, (towards the retaining pin boss).

(3) Instal the double offset joint inner race to the axle shaft and instal the retaining snap ring.

NOTE: The axle shaft, double offset joint and differential drive shaft splines must correspond with each other. Special care should be taken to ensure their dimensions are correct prior to installation otherwise damage will occur.

(4) Draw the offset joint cage forward and turn it to allow its protusion to align with its groove on the inner race, position it on the inner race.

(5) Apply the recommended grease to the cage

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and instal the balls to the cage. Refer to the Lubrication and Maintenance section.

(6) Instal the outer race to the cage as noted on removal and instal the retaining snap ring. Ensure that the retaining snap ring is fully home and that the joint operates smoothly.

(7) Apply the recommended grease to the outer race and rubber boot interiors. Position the rubber boot on the offset joint.

(8) Instal new retaining clips to the rubber boots ensuring they are located on their axle shaft grooves. Ensure the rubber boots inner retaining clips are located correctly in accordance with Specifications.

(9) Instal the axle shafts to the differential drive shafts ensuring the retaining pin holes are aligned and instal the new retaining steel roll pins.

(10) Position the steering knuckle on the axle shaft and using the special axle shaft installing tool instal it to the axle shaft threads.

Secure the axle shaft installing tool centre threaded bolt and unscrew the outer sleeve from the threaded bolt until the shaft is fully pulled through. Alternatively using suitable spacers and a washer on the axle shaft abutting the steering knuckle, instal the retaining nut and pull the shaft through the knuckle.

(11) Instal the control arm ball joint to the steering knuckle and instal the retaining bolt and tighten to Specifications.

(12) Instal the suspension unit in the steering knuckle and instal the clamp and retaining bolts and tighten to Specifications.

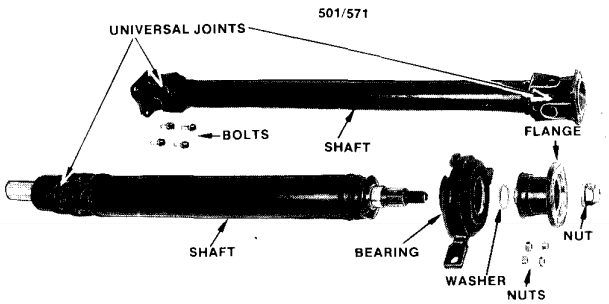
(13) Instal the tie rod end to the steering knuckle and instal the retaining nut and tighten it to Specifications. Tighten the retaining nut a maximum of a further 60 degrees to align the holes and secure it with the split pin.

(14) Remove the installing tool/spacers and instal the disc dust cover and instal the retaining bolt and tighten to Specifications.

(15) Instal the hub onto the axle shaft ensuring it is fully home by turning during installation.

(16) Instal the caliper to the steering knuckle and instal the retaining bolts and tighten to Specifications.

(17) Connect the handbrake cable to the caliper and secure the outer cable with the retaining clip.



Dismantled view of propeller shaft and components, 1986 model shown.

(18) Instal the shaped spacer, washer and retaining nut to the axle shaft. Tighten the retaining nut to Specifications.

(19) Tighten the retaining nut a maximum of a further 30 degrees to align the holes and secure the nut with the split pin.

NOTE: Ensure the spacer is installed with the painted front face to the retaining nut.

(20) Instal the road wheels and lower the vehicle to the ground.

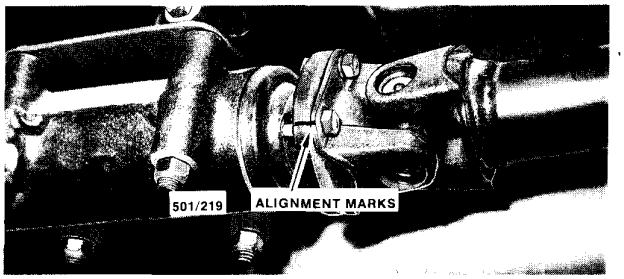
6. PROPELLER SHAFT

TO REMOVE AND INSTAL

(1) Raise the vehicle to a suitable working height and support it on chassis stands.

(2) Apply identifying marks on the propeller shaft flange and rear axle drive pinion flange to ensure the propeller shaft is installed in its original position.

(3) Remove the retaining bolts and nuts from the propeller shaft and rear drive pinion flanges and withdraw the propeller shaft from the transaxle.



Mark the installed position of the propeller shaft mating flanges to ensure correct installation.

On 1985–1987 Sedan and Station Wagon models, remove the propeller shaft centre bearing to chassis retaining bolts and remove the propeller shaft assembly from the vehicle.

Ensure the propeller shaft aperture is plugged to prevent the loss of lubricant and the entry of dirt.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the propeller shaft according to the identifying marks made during removal and tighten the retaining bolts and nuts to Specifications.

(2) On the 1985–1987 Sedan and Station Wagon models, instal the centre bearing assembly to the chassis and instal the retaining bolts and tighten them to Specifications.

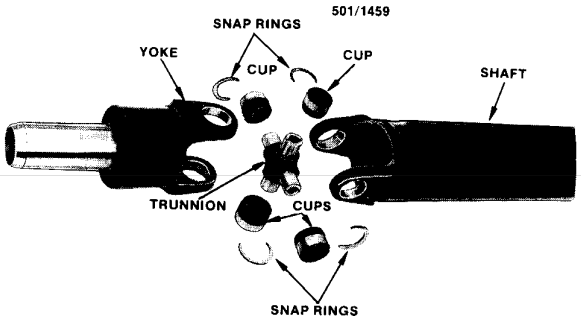
TO RENEW UNIVERSAL JOINTS

On 1979–1984 and Utility models, in the event of the universal joint being worn or the trunnion bearing cups having excessive end float, the joint can be renewed and the bearing cup end float controlled by the use of selective fit retaining snap rings.

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NOTE: Each universal joint is serviced as a kit which includes trunnion, four needle rollers bearings and cups, seals and snap rings. It is not practicable to dismantle a universal joint unless the components are to be renewed.

Do not hold the propeller shaft or the interior splined tube too tightly in the vice as damage and distortion will result.



Dismantled view of propeller shaft universal joint, 1983 model shown.

On 1985–1987 Sedan and Station Wagon models, the trunnion bearing cups are retained by the top surface of the yoke, which is staked over during manufacture and if worn or faulty it is necessary to renew the propeller shaft as a unit.

(1) Remove the propeller shaft from the vehicle as previously described.

(2) Remove the trunnion bearing cup retaining snap rings from the propeller shaft.

(3) Support the propeller shaft in a suitable vice or holding fixture and using a suitable drift, tap one of the bearing cups in to drive the trunnion and other bearing cup out of the yoke.

(4) Again using the drift, tap the trunnion of the bearing cup just removed to drive the other cup back into and then out of the yoke.

NOTE: The propeller shaft is balanced to fine tolerances and must not be dented or otherwise damaged.

(5) Manoeuvre the yoke and trunnion out of the propeller shaft yoke.

(6) Repeat this procedure with the other universal joints.

(7) Clean and remove all burrs from the bearing cup apertures in the yokes.

The assembly procedure is the reversal of the dismantling procedure with attention to the following points:

(1) Ensure that the needle rollers in the bearing cups are not out of alignment and lubricate the needle rollers with grease.

(2) Ensure the bearing cup end float is not more than 0.02 mm and that the retaining snap rings are correctly located.

NOTE: Whilst using selective fit retaining snap rings to control the trunnion bearing cup end float in the yoke, the same thickness of selective fit snap rings must be installed on both sides of the yoke.

TO REMOVE AND INSTAL CENTRE BEARING ASSEMBLY

(1) Remove the propeller shaft from the vehicle as previously described.

(2) Secure the propeller shafts in a suitable vice or holding fixture and remove the front to rear propeller shaft retaining bolts and nuts. Separate the propeller shafts.

(3) Support the front propeller shaft in a suitable vice or holding fixture and remove the bearing/flange retaining nut, discard the retaining nut.

(4) Apply identifying marks to the flange and shaft to ensure the flange is installed to the original serrations on the propeller shaft during assembly.

(5) Using a copper hammer remove the flange, washer and centre bearing from the propeller shaft.

(6) Check the propeller shaft serrations, splines and bearing contact surfaces for wear and damage, renew as necessary.

(7) Check the flanges and interior serrations for wear and damage, renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:

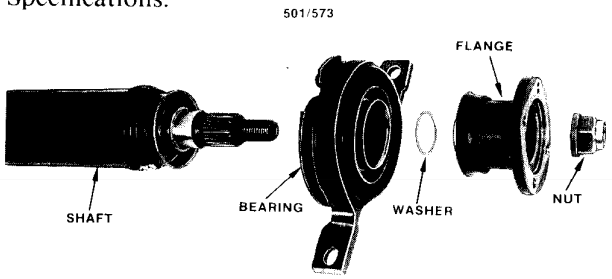
(1) Apply molybdenum disulphide grease to both faces of the washer and instal the bearing assembly, washer and flange to the propeller shaft. Ensure that the flange is installed to the correct propeller shaft serrations as marked prior to removal.

(2) Instal the new bearing/flange retaining nut and tighten it to Specifications and secure by staking the retaining nut.

(3) Position the propeller shafts and instal the retaining bolts and nuts. Ensure the propeller shafts are connected as marked prior to removal and tighten retaining bolts and nuts to Specifications.

(4) Position the propeller shaft on the vehicle and instal the centre bearing to chassis retaining bolts and nuts and tighten to Specifications.

(5) Instal the propeller shaft to differential drive pinion flange retaining bolts and tighten them to Specifications.



Dismantled view of propeller shaft centre bearing and components, 1986 model shown.

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SPECIFICATIONS

Type	Two and four wheel drive, 3 speed, two phase torque converter coupling
Operation	Automatic hydraulic
Band adjustment	Tighten adjuster to 9 Nm and back off 2 turns
Torque stay rod rubber clearance:	
1979–1984 and all Utility models	0.8–1.2 mm

TORQUE WRENCH SETTINGS

Brake band adjuster locknut	28 Nm
Drive plate to crankshaft bolts:	
1979–1984 and all Utility models	53 Nm
1985–1987 Sedan and Station Wagon models	75 Nm
Torque converter to drive plate bolts	26 Nm
Oil pan to transaxle case bolts	5 Nm

1. AUTOMATIC TRANSAXLE TROUBLE SHOOTING

NOTE: The following faults can be caused by conditions that may be rectified within the scope of the information given in this section.

NO DRIVE IN D RANGE

(1) Low fluid level in transaxle: Check fluid level in transaxle and top up.
(2) Disconnected or incorrectly adjusted control linkage: Check and connect or adjust as necessary.
(3) Incorrect transmission fluid: Check and drain and fill with the correct quantity and grade of fluid. Refer to the Lubrication and Maintenance section.

NO REVERSE DRIVE IN R RANGE

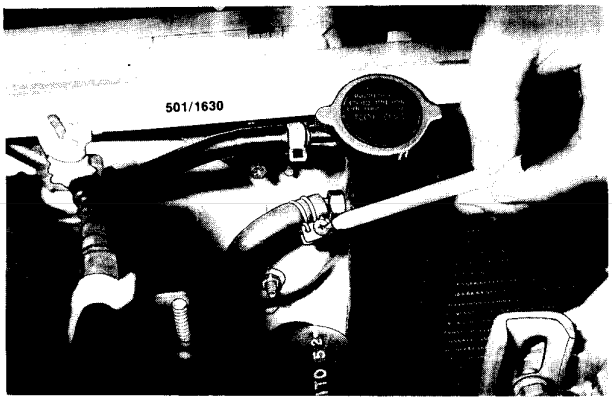
(1) Low fluid in transaxle: Check fluid level in transaxle and top up.
(2) Brake band adjustment incorrect: Check and adjust brake band.
(3) Disconnected or incorrectly adjusted control linkage: Check and connect or adjust as necessary.

NO FOUR WHEEL DRIVE SELECTION

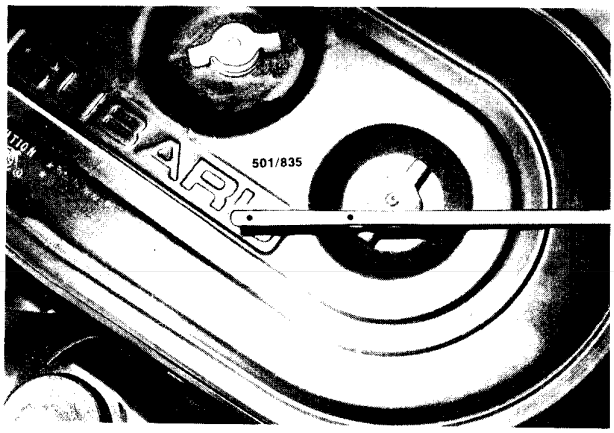
(1) Transfer solenoid faulty or wiring disconnected: Check and connect wiring or renew transfer solenoid.

SLIPPING OR ROUGH IN UPSHIFT

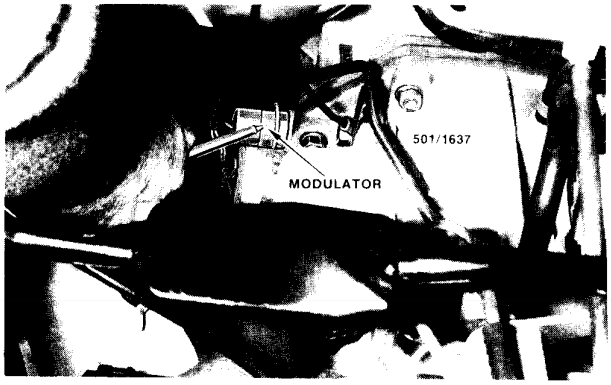
(1) Low fluid level in transaxle: Check fluid level in transaxle and top up.
(2) Incorrect transmission fluid: Check and drain and fill with the correct quantity and grade of fluid. Refer to the Lubrication and Maintenance section.
(3) Brake band adjustment incorrect: Check and adjust brake band.
(4) Vacuum modulator punctured or pipe disconnected: Check and connect or renew as necessary.



Ensure that the oil cooler hose clips are secure.



Check the fluid level and top up as necessary.



Check for vacuum and oil leaks at the vacuum modulator.

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NO TRANSAXLE KICKDOWN

(1) Kickdown switch or solenoid faulty or disconnected: Check and connect or remove and check solenoid operation.
(2) Brake band adjustment incorrect: Check and adjust brake band.
(3) Vacuum modulator punctured or pipe disconnected: Check and connect or renew as necessary.

ENGINE WILL NOT START IN N OR P POSITION OR WILL START IN ANY POSITION

(1) Linkage incorrectly adjusted: Adjust linkage.
(2) Neutral safety switch faulty: Check and renew as necessary.

2. DESCRIPTION

The transaxle is a three speed automatic unit consisting of a torque converter, compound planetary train, two multiple-disc clutches, one way sprag clutch, a multi-disc brake and one band brake assembly.

An internal oil pump operated by a drive shaft located in an inner and outer gear turning in the transaxle cover/intermediate plate supplies lubricating oil and oil pressure to the transaxle. From 1983 models onward, a four wheel drive transaxle is optional with the oil pump located in the intermediate case between the transaxle and transfer case.

The cooling of the transmission fluid/oil is achieved by circulating the fluid through an oil cooler which is an integral part of the left hand side of the radiator. The fluid level can be checked by the means of a dipstick in a filler tube located at the left hand rear side of the engine.

The vacuum modulator located on the side of the transaxle, is operated by the inlet manifold vacuum. The modulator regulates the oil pressure in the transaxle.

The transfer solenoid located on the rear of the transaxle, controls the selection of four wheel drive. The solenoid, operated by the depression of the four wheel drive switch on the selector lever, operates a transfer valve which allows fluid pressure to the transfer clutch to engage the rear drive.

The transmission selector lever is marked 1, 2, D (drive), N (neutral), R (reverse) and P (park). The neutral safety switch located at the selector lever allows the engine to be started only when the selector lever is in the P or N position.

On four wheel drive models, the four wheel drive switch is located on the selector lever grip, the switch when depressed, engages and disengages four wheel drive as well as illuminating the four wheel drive indicator lamp. On 1985–1987 Sedan and Station Wagon four wheel drive models, an additional switch is installed on the instrument cluster surround or the centre console for the automatic selection of four wheel drive when the four wheel drive switch on the selector lever is in the two wheel drive position.

When the automatic selector switch is on, four wheel drive selection will be made and the warning indicator lamp illuminated when the brake or throttle pedals are fully depressed or the windscreen wipers switched on. When reverse gear is selected, two wheel drive is automatically selected until a forward range selection is made which will illuminate the indicator warning lamp.

When operated, the four wheel drive switch at the lever grip selects four wheel drive regardless of the automatic selector switch position. Four wheel drive selection is indicated by a light shock on engagement and can be selected when the vehicle is in motion.

Four wheel drive models with a damaged or inoperative transaxle should only be towed with the road wheels having no contact with the road surface or the vehicle carried completely by another vehicle to avoid further damage to the transaxle. Two wheel drive models with a damaged or inoperative transaxle can be towed with the selector lever in the N position, provided the distance does not exceed 10 km or a speed of 30 km/h. In the event of a longer distance the vehicle must be towed by lifting the front of the vehicle.

When tuning or testing the engine, the handbrake must be fully applied and the selector lever in P or N position otherwise the vehicle will be set in motion when the engine speed is increased. It is not possible to start the engine by either towing or pushing the vehicle.

3. TRANSMISSION FLUID

Only the recommended transmission fluid specified by the manufacturer should be used when topping up or changing the fluid in the system. Refer to the Lubrication and Maintenance section.

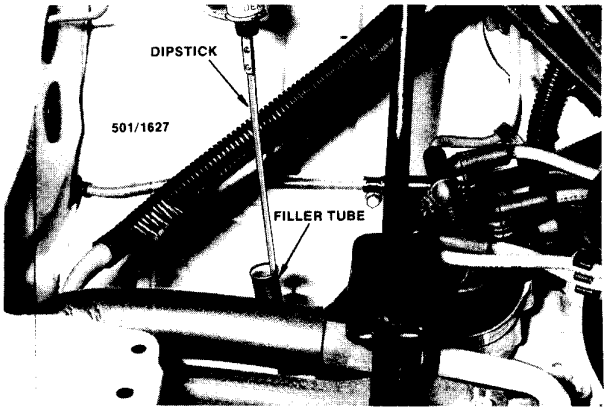
TO CHECK AND TOP UP

(1) Place the vehicle on a level floor, open the bonnet and clean around the dipstick/filler tube to ensure that no dirt or foreign matter enters the transmission.

> *NOTE: When working on automatic transmissions it is essential that thorough cleanliness is observed and that no dirt or used transmission fluid be allowed to enter the transmission.*

(2) Place the selector in P and ensure the handbrake is fully applied.
(3) Move the selector lever through each gear range and return it to the P position.
(4) Check the fluid level with the engine running at idle ensuring the dipstick is fully inserted in the dipstick filler tube.

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View showing location of transmission fluid dipstick.

NOTE: The fluid level should be checked after approximately 10 minutes driving on the road.

If the vehicle has been driven at high speed, in hot weather or has had a load in tow, sufficient time should be allowed to elapse to permit the transaxle to cool down before commencing the fluid level check.

(5) Withdraw the dipstick and check the fluid level reading. The level mark should read above the centre of the upper and lower dipstick marks, if the level is low, stop the engine and remove the dipstick from the dipstick filler tube.

(6) Using a suitable funnel, top up the transmission fluid with the recommended grade and quantity of fluid through the dipstick/filler tube.

(7) If the level reading is too high, ensure that the engine has cooled down as previously described and recheck the fluid level.

(8) If the fluid level again reads too high, a small amount of fluid may be drained from the transaxle.

(9) Instal the dipstick, start the engine and recheck the fluid level.

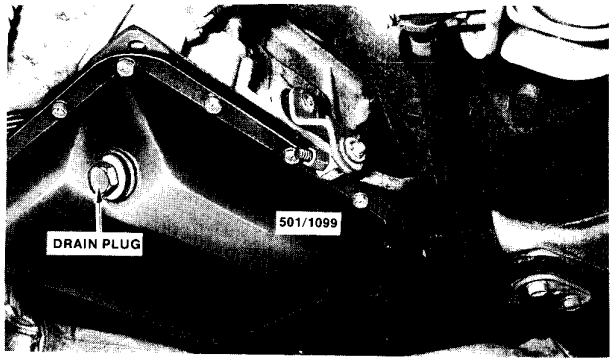
TO DRAIN AND REFILL

The transaxle fluid is normally only renewed at the manufacturers recommended frequencies or when the transaxle assembly is overhauled. Refer to the Lubrication and Maintenance section.

When the transaxle is removed for repairs the torque converter, oil cooler and the fluid pipes should be cleaned and flushed out to remove any sludge or obstruction. After transaxle overhaul, instal the correct quantity and grade of transmission fluid into the transaxle.

(1) Allow the transaxle to cool and raise the vehicle to a suitable working height and support it on chassis stands.

(2) Place a suitable drain tin beneath the transaxle and remove the transaxle oil pan drain plug allowing the fluid to drain into the tin.



Installed view of transaxle drain plug.

(3) When the fluid has completed draining, instal the drain plug and a new sealing washer and tighten securely.

(4) Lower the vehicle to the ground, ensuring that it is level and refill the transaxle with the correct quantity and grade of automatic transmission fluid. Refer to Lubrication and Maintenance section.

(5) Start the engine and warm the transmission fluid to the normal operating temperature. Operate the transaxle selector lever through all the ranges.

(6) Check the fluid level with the dipstick and top up as necessary.

4. BRAKE BAND

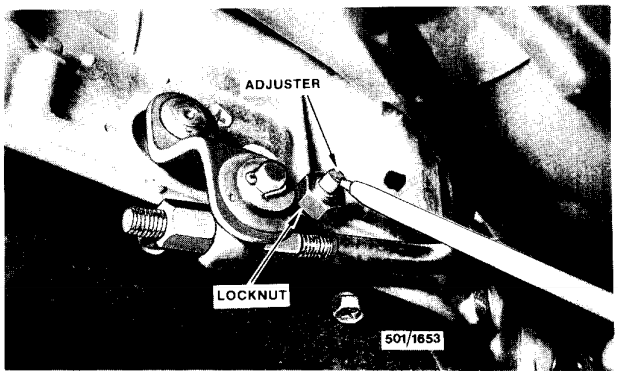
Special Equipment Required:
To Adjust — Suitable torque wrench

TO ADJUST

(1) Raise the vehicle to a suitable working height and support it on chassis stands.

(2) Working under the vehicle, hold the brake band adjuster screw and loosen off the adjuster locknut.

NOTE: Do not loosen the adjuster screw excessively or the brake band strut or piston will drop out of position.



Installed view of brake band adjuster screw on left hand side of transaxle.

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(3) Using a suitable torque wrench, tighten the adjuster screw to the Specifications and back off two turns.

(4) Hold the adjuster screw and tighten the adjuster locknut to the Specifications.

5. KICKDOWN SOLENOID

TO REMOVE AND INSTAL

(1) Raise the vehicle to a suitable working height and support it on chassis stands.

(2) Using a suitable drain tin drain approximately one litre of fluid from the transaxle.

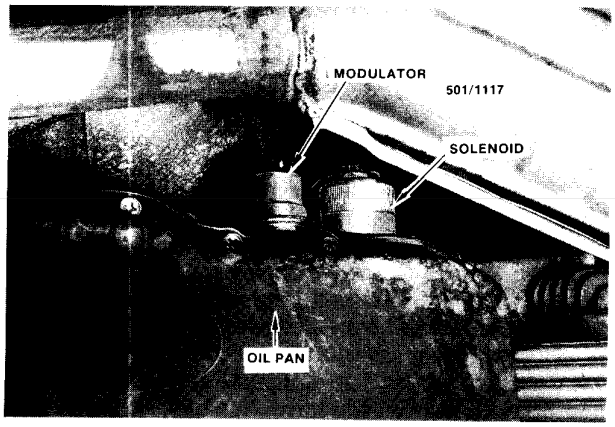
(3) Ensuring the ignition is Off, disconnect the solenoid wiring and unscrew the solenoid from the transaxle.

(4) Carefully clean the solenoid valve in a suitable solvent and check its operation by energising its circuit, renew as necessary.

The installation procedure is a reversal of the removal procedure with attention to the following points:

(1) Ensure that no dirt or foreign matter enters the transaxle assembly.

(2) Lower the vehicle to the ground and top up the transmission fluid as necessary.



Installed view of vacuum modulator and kickdown solenoid.

6. VACUUM MODULATOR

TO REMOVE AND INSTAL

(1) Raise the vehicle to a suitable working height and support it on chassis stands.

(2) Working under the vehicle use a suitable drain tin and drain approximately one litre of fluid from the transaxle.

(3) Loosen the vacuum pipe retaining bolts at the governor and transaxle and move the pipe, hose and bracket away from the vacuum modulator.

(4) Carefully unscrew the vacuum modulator from the transaxle.

(5) Remove the diaphragm sealing ring and piston rod from the transaxle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that no dirt or foreign matter enters the transaxle assembly.

(2) Lower the vehicle to the ground and top up the transmission fluid as necessary.

7. FOUR WHEEL DRIVE TRANSFER SOLENOID

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Remove the spare wheel from the engine compartment.

(3) Loosen the torque stay rod retaining bolts and/or nuts to allow the transaxle to move slightly to one side.

(4) Disconnect the transfer solenoid wiring and suspend the wiring harness away from the work area.

(5) Remove any cables from the transaxle which will restrict its movement.

(6) Raise the vehicle to a suitable working height and support it on chassis stands.

(7) Working under the vehicle using a suitable drain tin and drain approximately one litre of fluid from the transaxle.

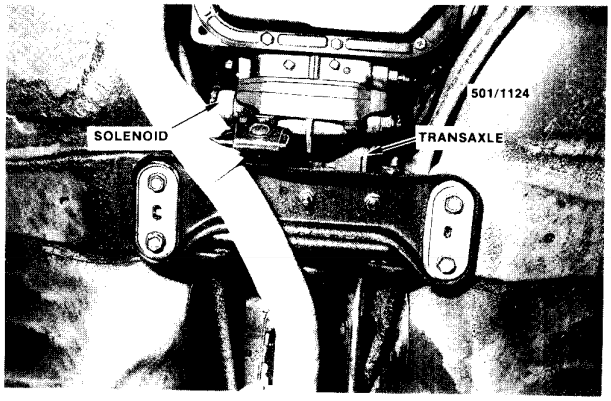
(8) Using a jack, support the weight of the transaxle under the oil pan. Insert a block of wood between the oil pan and the jack.

(9) Remove the crossmember to transaxle retaining nuts.

(10) Remove the crossmember to chassis retaining bolts and remove the crossmember from the vehicle.

(11) Remove the cable from the clamp and move it away from the work area.

(12) Move the transaxle to the left sufficiently to gain access to the transfer solenoid and secure it by inserting a block of wood between the transaxle and the vehicle body. Carefully remove the transfer solenoid from the transaxle.



Installed view of four wheel drive transfer solenoid.

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Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that no dirt or foreign matter enters the transaxle assembly.

(2) Lower the vehicle to the ground and top up the transmission fluid as necessary.

8. AUTOMATIC FOUR WHEEL DRIVE SWITCH

TO REMOVE AND INSTAL

1985–1986 Sedan and Station Wagon Models

(1) Disconnect the negative battery terminal.

(2) Using a suitable screwdriver carefully prise the automatic switch from the instrument cluster surround or, on later models, the console.

(3) Remove the wiring connector from the rear of the switch and remove the switch from the vehicle.

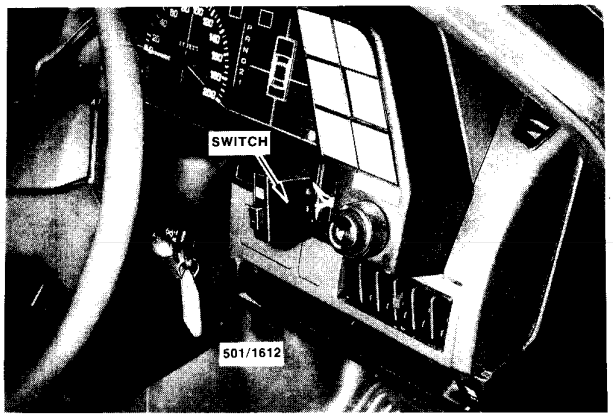
Installation is a reversal of the removal procedure.

1987 Sedan and Station Wagon Models

(1) Disconnect the negative battery terminal.

(2) Remove the instrument cluster surround as described in the Electrical System section and remove the switch from the instrument cluster surround.

Installation is a reversal of the removal procedure.



View of 1985 model four wheel drive automatic selector switch partially removed from the instrument cluster surround.

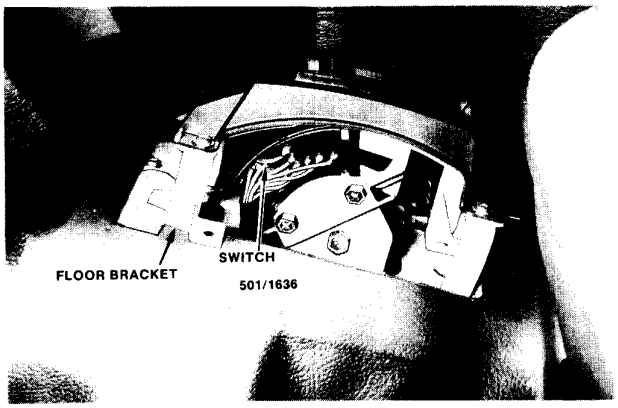
9. NEUTRAL SAFETY SWITCH

The neutral safety switch is situated on the side of the transmission selector lever and is not adjustable or repairable, for the removal and installation procedure reference should be made to the Selector Lever and Linkage heading later in this section.

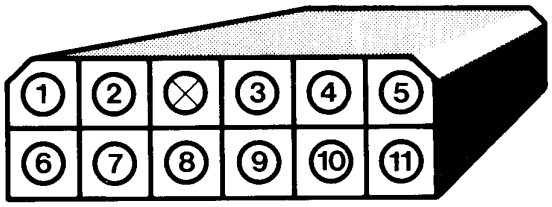
TO TEST

(1) Remove the retaining screws and remove the centre console from the vehicle. Refer to the Body section if necessary.

(2) Lift the floor mat and disconnect the neutral safety switch wiring connector.



Installed view of neutral safety switch and selector lever floor bracket.



501/LD24

Illustration showing neutral safety switch end of wiring connector, 1985–1987 models.

(3) Using a suitable circuit continuity tester, connect the leads to the terminals on the neutral safety switch side of the connector as follows:

(a) On 1979–1984 and all Utility models, connect one lead to the black/white wiring terminal and the other lead to the black/yellow wiring terminal.

(b) On 1985–1987 Sedan and Station Wagon models, connect one lead to the terminal marked 8 and the other lead to the terminal marked 9.

(4) Have an assistant select Park and Neutral in turn. Continuity should exist between the black/white and black/yellow wiring terminals or between wiring terminals 8–9 in the P and N positions only.

(5) Select Reverse and proceed as follows:

(a) On 1979–1984 and all Utility models, connect one lead to the green/yellow wiring terminal and the other lead to the blue/white wiring terminal.

(b) On the 1985–1987 Sedan and Station Wagon models, connect one lead to the terminal marked 10 and the other lead to the terminal marked 11.

(6) Continuity should exist between the green/yellow and the blue/white terminal or between wiring terminals 10–11 in the R position only.

(7) To test the operation of the indicator lamp circuits on 1985–1987 Sedan and Station Wagon models, proceed as follows:

(a) Selecting P, R, N, D, 2 and 1, in sequence with one test equipment lead on connector terminal number 1 and the other lead on connector terminals

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numbers 2, 3, 4, 5, 6, 7, also in sequence. Continuity should exist in each lever position.

(8) If the test equipment fails to show continuity in any of the above tests, the neutral safety switch will require renewal.

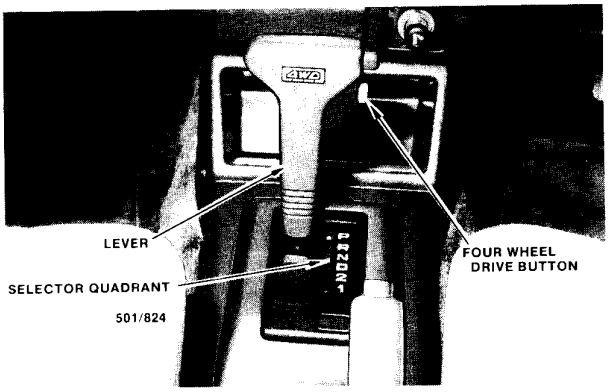
10. SELECTOR LEVER AND LINKAGE

TO REMOVE AND DISMANTLE

(1) Remove the centre console as described in the Body section.

(2) Disconnect the indicator lamp neutral safety switch and where installed, the four wheel drive switch wiring.

(3) Remove the floor bracket to floor retaining screws.



Installed view of selector lever, 1986 four wheel drive model shown.

(4) Raise the vehicle to a suitable working height and support it on chassis stands.

(5) Working under the vehicle, remove the control rod to the selector lever retaining pin split pin and disconnect the control rod.

(6) Remove the control rod connector to transaxle selector arm retaining split pin and remove the rod from the vehicle.

(7) Remove the bush from the selector arm.

(8) Working inside the vehicle, remove the screws retaining the selector lever assembly to the vehicle floor and remove the assembly from the vehicle.

(9) On two wheel drive models proceed as follows:

(a) Remove the lever grip to lever retaining screws and remove the grip.

(b) Remove the button and spring from the grip.

(10) On four wheel drive models proceed as follows:

(a) Remove the four wheel drive switch and retaining spring clip or, on later models the retaining screw and withdraw the switch.

(b) Remove the wiring to switch retaining screws and remove the switch from the lever.

(c) Remove the lever grip to lever retaining screws and remove the grip.

(d) Remove the button and spring from the grip.

(11) Remove the control rod bush from the lever.

(12) Remove the indicator cover to floor bracket retaining screws and remove the cover.

(13) Remove the neutral safety switch to floor bracket retaining bolts and remove the switch.

(14) Using a suitable drift drive the selector lever detent pin from the lever sufficiently to clear the guide plate. Do not drive the retaining pin out completely at this stage.

(15) Remove the selector lever to floor bracket retaining pivot bolt and nut and remove the lever, rubber boot and spacer from the bracket.

NOTE: Do not remove the bushes from the selector lever.

(16) Using a suitable screwdriver, press the lever rod down on its spring and drive the selector lever detent pin from the rod and the lever.

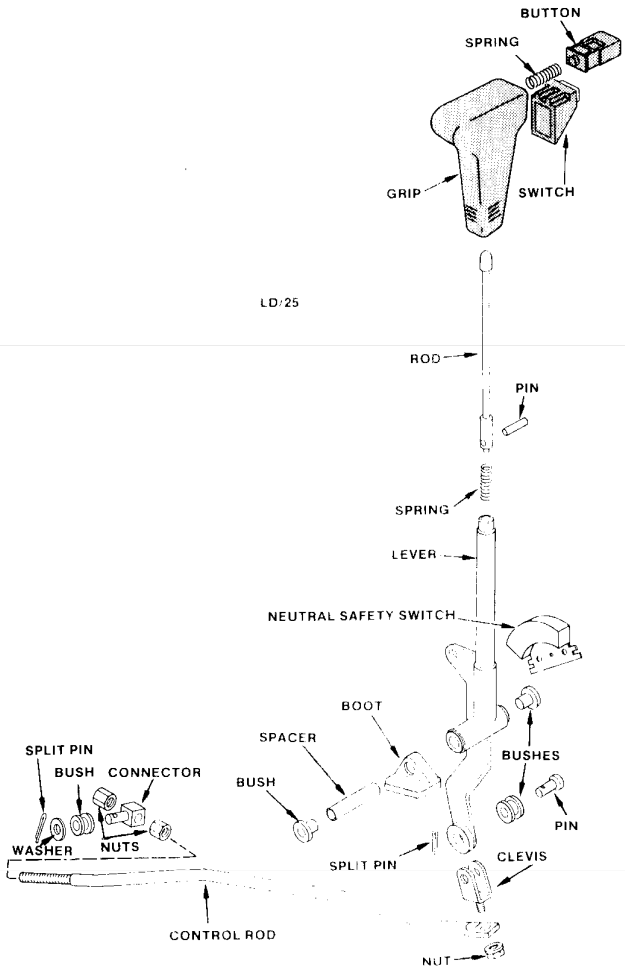


Illustration of dismantled view of transaxle selector lever and linkage, 1985–1987 models.

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(17) Remove the rod and spring from the lever interior.

(18) Check the sliding fit of the button in the grip, renew as necessary.

(19) Check the rods, lever, connector and clevis for wear and damage, renew as necessary.

(20) Check the lever grip, button, switch, indicator and neutral safety switch for cracks and damage, renew as necessary.

(21) Check the bushes for wear and damage, renew as necessary.

(22) Check the springs for damage and loss of tension, renew as necessary.

TO ASSEMBLE AND INSTAL

(1) Apply grease to the large diameter ends of the lever interior rod, the surface of the spacer, the spacer contact surface of the rubber boot and the coils of the springs.

(2) Instal the control rod bush to the selector lever.

(3) Instal the spring and lever rod into the interior of the lever, align the detent pin holes on the rod and lever and instal the detent pin. Ensure that the pin is entered from the right hand side and is flush with the left hand side of the lever. Do not drive the pin fully home at this stage.

(4) Instal the spacer and rubber boot to the lever ensuring the boot is installed from the bottom and locates on the lever pivot bolt left hand protusion.

(5) Instal the selector lever and rubber boot to the floor bracket and instal the retaining pivot bolt and nut and tighten securely.

(6) Using a suitable drift drive the detent pin fully home until it is flush with the lever right hand side and enters the guide bracket on the left hand side of the floor bracket.

(7) Check the movement of the neutral safety switch mechanism and temporarily secure the moving plate by installing a 2 mm diameter pin through the moving plate to the switch base plate.

(8) Position the selector lever in Neutral and instal the neutral safety switch to the floor bracket ensuring the switch locating pin locates on the bracket.

(9) Instal the neutral safety switch to floor bracket retaining bolts and tighten to the Specifications. Remove the pin.

(10) On models equipped with two wheel drive proceed as follows:

(a) Instal the spring and button to the lever grip.

(b) Ensuring the button is to the right hand side and depressed instal the grip to the lever. Instal the retaining screws and tighten securely.

(11) On four wheel drive models proceed as follows:

(a) Using a piece of string or wire attached to the four wheel drive switch wires, pull the wiring in from the bottom of the lever grip and out of the switch aperture.

(b) Connect the wires to the four wheel drive switch and tighten the retaining screws securely.

(c) Instal the spring and button to the grip.

(d) Ensuring the button is to the right hand side and depressed, instal the grip to the lever. Instal the retaining screws and tighten securely.

(e) Instal the four wheel drive switch and retaining spring or, on later models, the retaining screw to the grip.

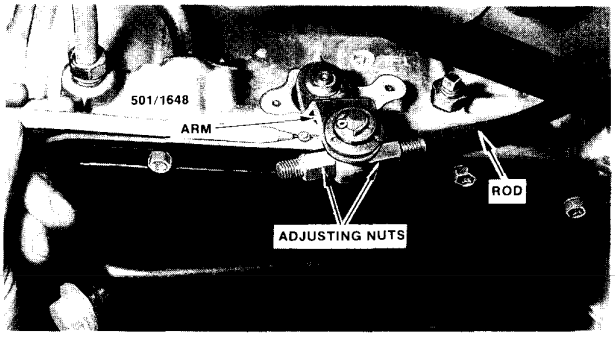
(12) Check that the lever operates freely and smoothly and that the lever movements and the indicator are aligned.

(13) Instal the selector lever assembly to the floor, instal the retaining screws and tighten securely.

(14) Position the selector lever at Neutral. Working under the vehicle instal the bush and control rod connector to the transaxle selector arm and instal the retaining split pin.

(15) Loosen the control rod adjusting nuts.

(16) On early models, position the transaxle selector arm in neutral by aligning the arm with the protusion on the transaxle case.



Installed view showing 1985–1987 models selector arm and one of the neutral alignment protusions.

(17) On later models, position the transaxle selector arm in neutral by aligning the arm between the two protrusions on the transaxle case.

(18) Position the control rod clevis on the selector lever and instal the clevis pin. Secure the clevis pin with the split pin.

(19) Screw the control rod inner adjusting nut until it nearly abuts the connector leaving a clearance of 0–2 mm.

(20) Hold the inner adjusting nut and tighten the outer adjusting nut securely against the connector.

(21) Check the operation of the selector lever.

(22) Connect the indicator lamp, neutral safety switch and where installed, the four wheel drive switch wiring.

(23) Ensure that the engine can only be started at the N and P positions of the selector lever.

(24) Ensure that the R position cannot be selected unless the button is depressed.

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(25) Ensure that the reverse lamps illuminate only at the R position of the selector lever.

(26) Instal the centre console and lower the vehicle to the ground.

11. TRANSAXLE ASSEMBLY

Special Equipment Required:
To Remove and Instal — Trolley jack

TO REMOVE

(1) Disconnect the negative battery terminal.

(2) Remove the spare wheel from the engine compartment.

(3) Remove the spare wheel support bracket retaining bolts and remove the bracket.

(4) Disconnect the vacuum hose from the vacuum modulator.

(5) On 1985–1987 four wheel drive Sedan and Station Wagon models disconnect the air breather hose.

(6) Unscrew the speedometer cable collar and remove the cable from the transaxle.

(7) Disconnect the wiring connectors at the kickdown solenoid, temperature switch and where applicable, the transfer solenoid.

(8) Remove the earth wire to body retaining screw and disconnect the earth wire.

(9) On 1979–1984 and all Utility models, remove the starter motor retaining bolts and nuts, withdraw the starter motor and position it securely on the engine compartment bulkhead.

(10) On 1985–1987 Sedan and Station Wagon models proceed as follows:

(a) Disconnect the wiring cables to the starter motor.

(b) Remove the starter motor retaining nuts and remove the earth wire. Remove the starter motor from the vehicle.

(11) On 1979–1984 and all Utility models, loosen the torque stay rod nuts sufficiently to allow the engine to be tilted to the rear to facilitate transaxle removal.

(12) On 1985–1987 Sedan and Station Wagon models, remove the torque stay rod to body and transaxle retaining bolts and remove the stay rod from the vehicle.

(13) Remove the ignition timing mark access cover from the torque converter housing and remove the converter to the drive plate retaining bolts. Ensure that the retaining bolts are not mislaid inside the housing.

(14) Disconnect the transmission fluid cooler hoses from the transaxle. Plug the pipes to prevent the loss of fluid and the entry of dirt.

(15) On 1979–1984 and all Utility models, remove the transaxle to engine upper bolts and nuts and loosen the lower retaining nuts.

(16) On 1985–1987 Sedan and Station Wagon models, remove the transaxle to engine right hand retaining bolt and nut.

(17) Raise the vehicle to a suitable working height and support it on chassis stands.

(18) On 1979–1984 and all Utility models, remove the hot air intake hose from the exhaust.

(19) Loosen the exhaust engine pipe to manifold retaining nuts.

(20) Remove the engine pipe to intermediate pipe retaining bolts, springs and nuts.

(21) Remove the engine pipe to support bracket retaining bolt and nut.

(22) Remove the engine pipe to manifold retaining nuts and remove the engine pipe from the vehicle.

(23) On four wheel drive models remove the intermediate pipe to the rear muffler retaining bolts and nuts and remove the intermediate pipe from the vehicle.

(24) Using a suitable drain tin positioned under the oil pan remove the drain plug and drain the transmission fluid. Instal the drain plug and new washer and tighten securely.

(25) Disconnect the dipstick/filler tube from the transaxle ensuring that the pipe aperture is plugged to prevent the entry of dirt and that the sealing 'O' ring is not damaged.

(26) On four wheel drive models remove the propeller shaft(s) from the vehicle ensuring that the transaxle aperture is plugged to prevent entry of dirt. Refer to the heading Propeller Shaft in the Manual Transaxle section.

(27) Position the selector lever in N and mark the position of the inner and outer adjusting nuts on the selector lever control rod and remove the outer nut.

(28) Remove the selector lever to control rod retaining split pin and clevis pin and remove the rod.

(29) On 1979–1984 and all Utility models, proceed as follows:

(a) Remove the stabiliser bar to chassis retaining bolts and nuts and remove the clamps and rubbers noting their installed position.

(b) Remove the stabiliser bar to radius rod retaining bolts and nuts and remove the clamps and rubbers noting their installed position. Remove the stabiliser bar from the vehicle.

(30) On 1985–1987 Sedan and Station Wagon models, remove the stabiliser bar link plates to control arm retaining bolts and nuts and separate the stabiliser bar. Discard the retaining nuts.

(31) Remove the control arm to front crossmember retaining bolts and nuts and lower the arms. Discard the retaining nuts.

(32) On 1985–1987 Sedan and Station Wagon models, remove the handbrake cable bracket to control arm retaining bolts and nuts and separate the cable and lower the arms.

(33) Using a suitable drift drive the axle shaft to drive shaft retaining pins from the axle and drive

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shafts. Discard the retaining pins.

(34) Push the rear of the front wheels outwards and separate the axle shaft from the drive shaft.

(35) Remove the rear crossmember to transaxle retaining nuts.

(36) On the 1985–1987 Sedan and Station Wagon models, remove the transaxle to engine retaining nuts.

(37) Suitably support the engine and position the jack underneath the transaxle assembly.

(38) Remove the rear crossmember to chassis retaining bolts and remove the crossmember.

(39) On 1979–1984 and all Utility models, remove the transaxle to engine retaining nuts.

(40) On four wheel drive models, disconnect the wiring from the four wheel drive and the transmission fluid temperature switches.

(41) Carefully separate the transaxle assembly from the engine and lower it carefully to avoid fouling any components. Withdraw the transaxle assembly from the vehicle.

NOTE: Under no circumstances may the converter or drive plate be hammered or levered to remove the transaxle. This should be done by inserting a wedge between the two mating faces in the area of the locating dowels.

(42) Thoroughly clean the exterior of the transaxle assembly in a suitable solvent ensuring that no foreign object or liquid enters the transaxle.

(43) Check the transaxle cases for cracks and damage, renew as necessary.

TO INSTAL

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the torque converter is correctly installed to the transaxle.

(2) Ensure that the mating surfaces of the transaxle and torque converter housing are clean and free of burrs.

(3) Using the trolley jack, position the transaxle under the vehicle.

(4) Guide the transaxle forward to locate onto the engine. Carefully guide the transaxle forward until it locates on the dowells and abuts the face of the torque converter housing.

(5) Instal the right hand retaining bolts and nuts and lower retaining nuts to the transaxle and engine and tighten securely.

(6) Instal the rear crossmember to the transaxle and instal the new retaining nuts and tighten securely.

(7) Instal the rear crossmember to the chassis and instal the retaining bolts and tighten securely.

(8) On 1985–1987 Sedan and Station Wagon models, tighten the transaxle to engine lower retaining nuts securely.

(9) Remove the jack. On 1980–1984 and all Utility models, instal the handbrake cable to the chassis and instal the retaining bolt and nut and tighten securely.

(10) Push the outside of the front wheels inwards and instal the axle shafts to the drive shafts ensuring that the retaining pin holes are aligned.

(11) Instal the new retaining roll pins to the axle and drive shafts.

(12) Instal the control arms to the front crossmember, instal the retaining bolts and new nuts and tighten securely.

(13) On 1979–1984 and all Utility models proceed as follows:

(a) Instal the stabiliser bar, rubbers and clamps to the chassis and instal the retaining bolts and nuts and tighten securely. Ensure that the rubbers are installed with their compliance slits to the rear.

NOTE: On models equipped with the modified stabiliser bar to chassis rubber bushes the compliance slits should be positioned facing the chassis.

(b) Instal the stabiliser bar, rubbers and clamps to the radius rod and instal the retaining bolts and nuts and tighten securely. Ensure that the rubbers are installed with their compliance slits to the inside.

(14) On 1985–1987 Sedan and Station Wagon models proceed as follows:

(a) Instal the stabiliser bar link plates to the control arms and instal the retaining bolts and nuts and tighten securely.

(b) Instal the handbrake cable to the control arms and instal the retaining bolt and nut and tighten securely.

(15) Position the selector lever at N and instal the control rod on the lever.

(16) Instal the control rod to selector lever retaining clevis pin and secure with the split pin.

(17) Ensuring the transaxle selector arm is in the neutral position instal the control rod to the arm and adjust the nuts to the position noted on removal and tighten securely.

(18) Connect the dipstick/filler tube to the transaxle and tighten securely ensuring the sealing 'O' ring is correctly located.

(19) On four wheel drive models instal the propeller shaft(s). Refer to the heading Propeller Shaft in the Manual Transaxle section.

(20) On 1985–1987 Sedan and Station Wagon models proceed as follows:

(a) Lower the vehicle to the ground and tighten the control arms to front crossmember retaining bolts and nuts securely.

(b) Tighten the stabiliser bar link plate to control arm retaining bolts and nuts securely.

(c) Raise the car to a suitable working height and support it on chassis stands.

(21) Position the engine exhaust pipe on its support bracket and instal the retaining bolt and nut loosely.

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(22) Instal the engine pipe and new gasket to the manifold and instal the retaining nuts loosely.

(23) Instal the engine pipe and new gasket to the intermediate pipe and instal the retaining bolts, springs and nuts and tighten securely.

(24) Tighten the engine pipe to manifold and support bracket retaining bolts and nuts securely.

(25) On 1979–1984 and all Utility models instal the hot air intake hose to the exhaust.

(26) On four wheel drive models, instal the intermediate pipe and new gasket to the rear muffler and instal the retaining bolts and nuts and tighten securely. Ensure the exhaust is located correctly on the hangers.

(27) Lower the vehicle to the ground.

(28) On 1979–1984 and all Utility models proceed as follows:

(a) Instal the starter motor to the engine, instal the retaining bolts and nuts and tighten securely.

(b) Tighten the transaxle to engine retaining bolts and nuts and tighten securely.

(29) On 1985–1987 Sedan and Station Wagon models proceed as follows:

(a) Remove the engine support rod, instal the torque stay rod to the transaxle and body and instal the retaining bolts and nuts and tighten securely.

(b) Instal the starter motor to the engine and instal the retaining bolts and nuts and tighten securely. Ensure that the earth wire is secured by the retaining nut.

(c) Instal the wiring cables to the starter motor.

(30) Align the torque converter to the drive plate, instal the retaining bolts and tighten to Specifications. Instal the ignition timing mark access cover to the converter housing.

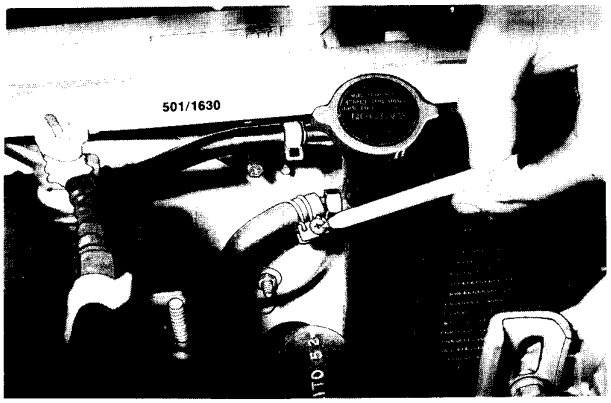
NOTE: Align the drive plate to torque converter and access hole by turning the engine by hand.

(31) On 1979–1984 and all Utility models proceed as follows:

(a) Loosen the stay rod adjusting nut until the rod is loose on the engine bracket.

(b) Tighten the rear nut and check the clearance between the washer and rubbers at the engine. This is specified as torque stay rod clearance and is controlled by the adjusting nut or the installation of new rubbers. Refer to Specifications.

(c) When adjustment is complete hold the rear nut and tighten the adjusting nut securely.



Ensure that the oil cooler hose clips are secure.

(32) Connect the fluid cooler hoses to their pipes and the vacuum hose to the vacuum modulator. Ensure that the hoses are secure.

(33) Instal the speedometer cable to the transmission and tighten the retaining collar securely ensuring it is routed under the torque stay rod.

(34) Connect the wiring to the fluid temperature switch, kickdown solenoid and, where applicable, the transfer solenoid.

(35) On four wheel drive models, connect the wiring to the four wheel drive.

(36) Instal the earth wire to the body and instal the retaining screw and tighten securely.

(37) On 1985–1987 four wheel drive Sedan and Station Wagon models, instal the air breather hose. Ensure the hose is secure.

(38) On 1979–1984 and all Utility models, tighten the control arms to the front crossmember retaining bolts and nuts securely.

(39) Instal the spare wheel support bracket and instal the retaining bolts and tighten securely.

(40) Connect the negative battery terminal.

(41) Fill the transaxle with the recommended grade and quantity of transmission fluid.

(42) Start the engine and check for exhaust and fluid leaks.

(43) Check the transaxle controls for free and smooth operation.

(44) When the transaxle has reached operating temperature stop the engine and check the transmission fluid level and top up if necessary.

(45) Instal the spare wheel to the vehicle.

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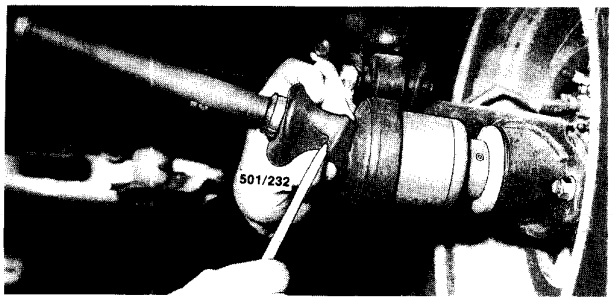
REAR AXLE

SPECIFICATIONS

Type	Salisbury type, semi floating axle shafts with hypoid final drive
Carrier bearing preload adjustment	Shims
Pinion and carrier bearing types	Tapered roller
Pinion preload without oil seal:	
New bearing	19.6–28.4 N
Used bearing	8.34–16.67 N
Side gear rear face clearance	0.1–0.2 mm
Drive pinion to crownwheel backlash	0.1–0.2 mm
Crownwheel maximum runout	0.05 mm
Distance between axle shaft rubber boot inner retaining clips:	
1979–1984 and all Utility models	181 mm
1985–1986 Sedan and Station Wagon models	201 mm
1987 Sedan and Station Wagon models	223.5 mm

TORQUE WRENCH SETTINGS

Propeller shaft flange to drive pinion flange:	
1979–1984 and Utility models	25 Nm
1985–1987 Sedan and Station Wagon models	32 Nm
Drive pinion nut	167–196 Nm
Differential side bearing retainer	12 Nm
Crownwheel to differential carrier bolt	113 Nm
Differential drive shaft to side gear	36 Nm
Rear cover to differential	25 Nm
Differential mounting crossmember to chassis	78 Nm
Mounting crossmember to rear cover	78 Nm
Differential mounting bracket to body	78 Nm
Mounting bracket to differential:	
1979–1984 models	78 Nm
1985–1987 Sedan and Station Wagon models	54 Nm
Suspension unit to trailing arm	118 Nm
Trailing link to trailing arm:	
1979 models	137 Nm
1980–1985 and Utility models	147 Nm
1986–1987 Sedan and Station Wagon models	177 Nm
Trailing arm to crossmember:	
1979–1984 and Utility models	93 Nm
1985 Sedan and Station Wagon models	127 Nm
1986–1987 Sedan and Station Wagon models	137 Nm
Trailing link bush to crossmember:	
1985–1987 Sedan and Station Wagon models	177 Nm



Check the axle shaft double offset joint rubber boot for signs of leakage, damage and deterioration.

1. REAR AXLE TROUBLE SHOOTING

REAR WHEEL NOISE

(1) Tyre noise: Determine whether normal or excessive for the type of vehicle and tyre construction.

(2) Wheel loose on hub: Check condition of hub and wheel rim and tighten or renew faulty components.

(3) Defective brake components: Overhaul brakes, refer to the Brakes section.

(4) Defective or incorrectly adjusted hub drive shaft or bearings: Adjust or renew faulty components, refer to the Rear Suspension section.

(5) Bent axle shaft: Renew axle shaft.

(6) Damaged axle shaft outer double offset joint: Renew double offset joint.

(7) Lack of lubricant in axle shaft outer double offset joint: Check and renew double offset joint rubber boot and lubricant.

(8) Wheel bent or out of balance: Renew wheel or balance wheel and tyre assembly.

NOTE: Raise and support the rear of the vehicle. Check the road wheel nuts for tightness and spin the wheels to check for runout. Axle shaft or hub bearing noises can be diagnosed by spinning one wheel at a time and listening for a rumble. When carrying out the bearing test, place the transmission in neutral and stop the other side wheel from turning. If the axle shaft is suspected of being bent remove the axle shaft and check for runout between centres.

FINAL DRIVE GEAR NOISE

(1) Loose propeller shaft(s) or universal joints: Tighten the retaining bolts or renew the components.

(2) Lack of lubricant: Rectify oil leak and top up with the correct grade of oil.

(3) Loose drive pinion flange retaining nut: Tighten or renew and tighten the retaining nut, check pinion preload.

(4) Loose differential carrier side bearing retainer retaining bolts: Tighten and check noise or refer to a suitable specialised workshop.

NOTE: Check the possible causes in the order given. Final drive gear noise can also

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be caused by internal damage and wear, in which case the differential assembly will have to be removed for overhaul.

Due to the design of the differential assembly it is recommended that it be referred to a suitable specialised workshop for repair.

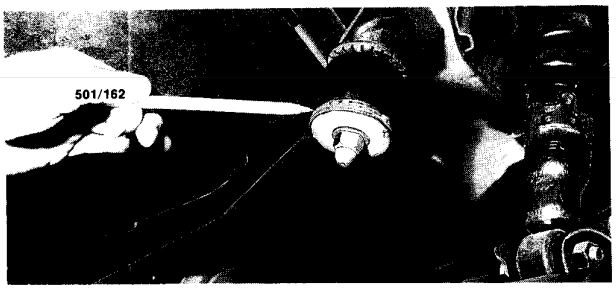
REPEATED AXLE SHAFT OR DOUBLE OFFSET JOINT BREAKAGE

(1) Repeated overloading: Revise load capacity.
(2) Abnormal clutch operation: Revise driving habits or check condition.

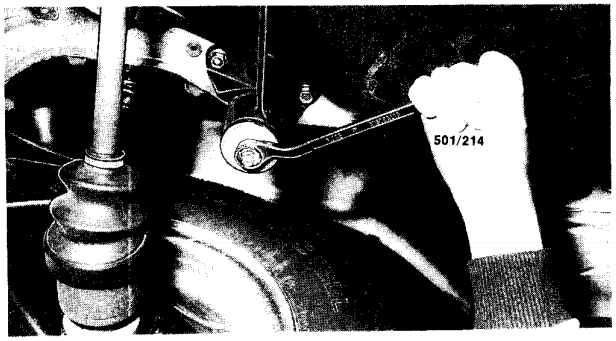
NOTE: If the clutch is operating correctly and overloading is not the cause check the axle shafts for bend and misalignment.

NOISE DURING VEHICLE INITIAL MOVEMENT

(1) Differential rear crossmember mounting rubber bushes worn or damaged: Renew rubber bushes.
(2) Differential front mounting rubber bushes worn or damaged: Renew rubber bushes.
(3) Differential rear crossmember mounting retaining nuts loose: Check and tighten retaining nuts.
(4) Damaged axle shaft inner double offset joint: Renew double offset joint.
(5) Excessive differential drive pinion to crownwheel backlash: Overhaul differential assembly.



Check the differential rear mounting crossmember rubber bushes for wear and deterioration.



Check the differential rear mounting crossmember nuts for tightness.

(6) Propeller shaft(s) universal joints worn and damaged: Renew propeller shaft(s) or universal joint.
(7) Propeller shafts centre bearing loose on chassis and shaft: Retighten the centre bearing and propeller flange retaining bolts and nuts.
(8) Propeller shaft(s) flanges loose: Retighten the flange retaining bolts and nuts.

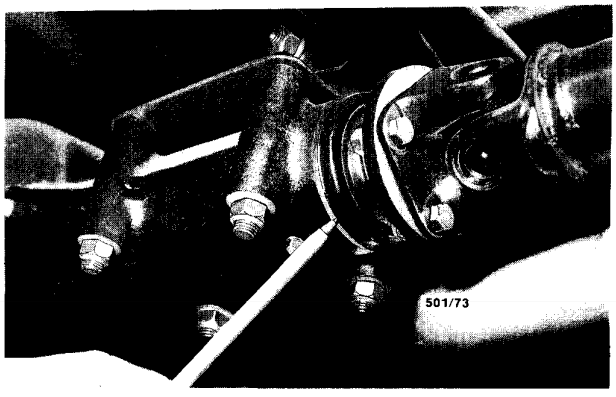
PINION SHAFT WILL ROTATE BUT NOT DRIVE VEHICLE

(1) Broken axle shaft: Check and renew axle shaft.
(2) Internal differential damage: Remove differential assembly rear cover, check and if necessary refer the problem to a suitable specialised workshop.

NOTE: The axle shaft inner and outer offset joints are of different spline numbers and diameters and if installed incorrectly will cause damage to the components.

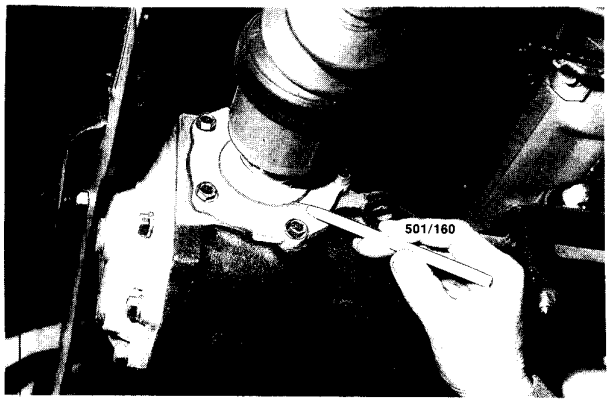
LOSS OF LUBRICANT

(1) Damaged or obstructed air breather: Clear or replace.
(2) Leaking pinion oil seal: Renew oil seal and check flange contact surface.
(3) Leaking differential drive shaft oil seal: Renew oil seal and check drive shaft running surface.
(4) Leaking differential bearing retainer and rear cover gaskets: Renew gaskets and check mating contact surfaces.
(5) Loose oil filler or drain plug: Tighten plugs securely.
(6) Incorrect oil seals installed: Renew oil seals.
(7) Incorrect or blocked axle shaft double offset joint outer race inner sealing plug: Check and clear or renew sealing plug.
(8) Damaged axle shaft double offset joint rubber boot: Renew rubber boot.
(9) Porous or cracked differential assembly case: Remove, check and if necessary refer the problem to a suitable specialised workshop.



If the rear axle differential is losing oil, check the drive pinion oil seal as a likely leakage source.

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If the rear axle differential is losing oil, check the drive shaft oil seals as a likely leakage source.

NOTE: Check the breather for damage and obstruction before cleaning the differential assembly and checking for leaks.

If the oil leakage is not apparent when the differential is cold, run the vehicle on the road until the differential reaches operating temperature. Check thoroughly for small cracks in the differential case.

Normally small cracks do not open up and leak oil until the differential reaches operating temperature.

2. DESCRIPTION

The four wheel drive rear axle assembly consists of three sub assemblies, the differential, axle shafts and hub drive shafts, of which the axle shafts and differential assembly can be removed separately. The removal of the brake drum hub and the hub drive shaft requires the disconnection of the outer double offset joint and the trailing arm.

The brake drum hub and its drive shaft are located on the trailing arm, the axle shafts with their double offset joints at each end are located between the hub drive shafts and the differential drive shafts. The differential assembly is located in the centre and secured to the body and rear mounting crossmember by retaining bolts and nuts.

The hypoid differential assembly drive pinion shaft is supported by three bearings located in the differential case. The pinion height is controlled by selective fit washer shims located between the inner bearing and the pinion gear on the drive pinion.

The drive pinion preload is controlled by selective fit shims and spacers located between the inner bearing and the centre bearing. The differential carrier is supported by an outer bearing on each side and the drive pinion to crownwheel backlash and tooth contact is controlled by selective fit shims located between the bearing retainers and the differential case.

The pinion to side gear backlash is controlled by selective fit thrust washers located between the side gears and the interior of the differential carrier.

The differential drive shafts are splined and located in the side gear splined interior at one end and exit through an oil seal located in the differential carrier bearing retainers at the other and are secured externally to the side gears by a special Torx retaining bolt.

The drive shafts are externally splined and locate in the splined interior of the axle shaft inner double offset joints and are secured by a retaining pin.

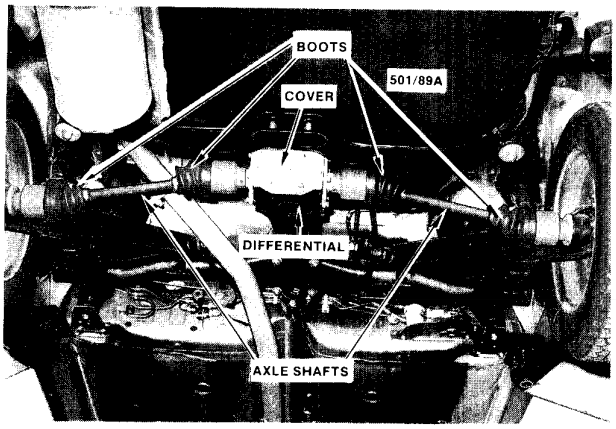
The axle shaft outer double offset joint interior is also splined and locates on the splined exterior of the hub drive shaft and is secured by a retaining pin.

The drive shaft and the splined components diameters and splines must correspond with each other and care should be taken to ensure that any new components installed are correct otherwise damage will occur.

The axle shaft double offset joints allow for the flexing of the rear suspension and are protected by rubber boots from the loss or contamination of its lubricant. The axle shaft double offset joints are similar in removal and installation to the front axle offset joints but may differ in their diameters and applications. The hub drive shafts supported by two roller bearings in the trailing arms are secured in the arm by a ring nut and protrude through to the outside of the trailing arm.

The brake drum hub interior is splined and is located on the exterior splines of the hub drive shaft and is secured by a shaped washer, special spacer, retaining nut and split pin. The differential rear cover and gasket can be renewed by removing the differential rear crossmember, the drive pinion and differential oil seals can also be renewed with the differential in position.

The design of the differential necessitates fine tolerances, checks and adjustments during overhaul. The use of specialised equipment is essential and it is recommended that any differential repairs other than



Underbody view of rear axle

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previously mentioned should be referred to a suitable specialised workshop.

Specifications and a tooth marking chart are included in this section for those who may feel competent and sufficiently equipped to undertake the operation.

3. AXLE SHAFTS

TO REMOVE

(1) Ensure the handbrake is fully applied.

(2) Raise the vehicle to a suitable working height and support it on chassis stands.

(3) Remove the suspension unit to trailing arm retaining bolt and disconnect the suspension unit.

(4) On 1979–1984 and all Utility models, remove the trailing link to trailing arm retaining bolts and lower the trailing arm.

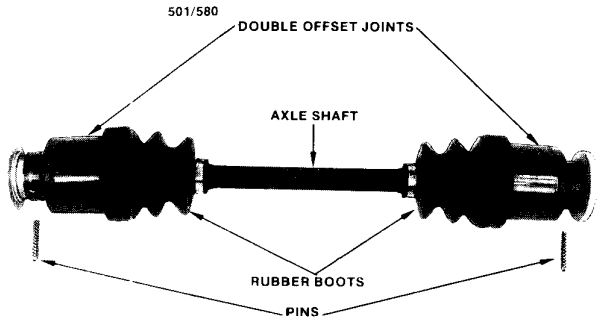
(5) On 1985–1987 Sedan and Station Wagon models, loosen the trailing link bush to crossmember retaining bolt and lower the trailing arm.

(6) Working under the vehicle and using a suitable drift, drive the axle shaft to rear hub drive shaft retaining pins from the axle and drive shafts. Discard the retaining pins.

(7) Using a suitable drift, drive the axle shaft to differential drive shaft retaining pins from the axle and drive shafts. Discard the retaining pins.

(8) Lower the trailing arms and manoeuvre the axle shafts from the vehicle. Mark or tag the inner and outer ends of the axle shafts in order to instal them to their original positions during installation.

(9) Remove the rubber dust rings from the hub and differential drive shafts.



View of rear drive shaft assembly removed from the vehicle.

TO DISMANTLE AND ASSEMBLE

The dismantling and assembling procedure of the axle shaft is similar to the procedure for the double offset joints on the front axle shafts and is fully covered in the Manual Transaxle section.

NOTE: The axle shaft inner and outer offset joints are of different spline numbers and diameters and if installed incorrectly will cause damage to the components.

TO INSTAL

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the rubber dust rings and the axle shafts to the differential drive shafts and the hub drive shafts ensuring the retaining pin holes are aligned as during removal.

(2) Instal the new retaining steel roll pins to the axle shafts and drive shafts.

(3) Instal the suspension unit to the trailing arm and instal the retaining bolt and tighten it to the Specifications.

(4) On 1979–1984 and all Utility models, instal the trailing link to the trailing arm and instal the retaining bolts and tighten them to Specifications.

(5) On 1985–1987 Sedan and Station Wagon models, tighten the trailing link bush to crossmember retaining bolt to Specifications.

(6) Lower the vehicle to the ground.

4. DIFFERENTIAL ASSEMBLY

Special Equipment Required:

To Renew Differential Drive Shaft Oil Seal — Torx socket

To Renew Differential Drive Pinion Oil Seal — Spring balance, suitable puller

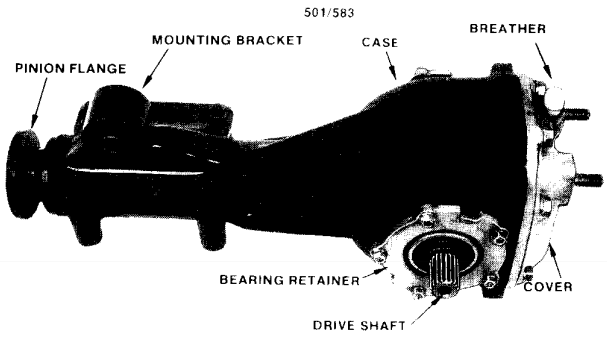
TO REMOVE AND INSTAL

(1) Remove the rear axle shafts as previously described in this section.

(2) Remove the propeller shaft and instal a plug in the transaxle aperture to prevent the loss of lubricant and the entry of dirt. Refer to the Manual Transaxle section.

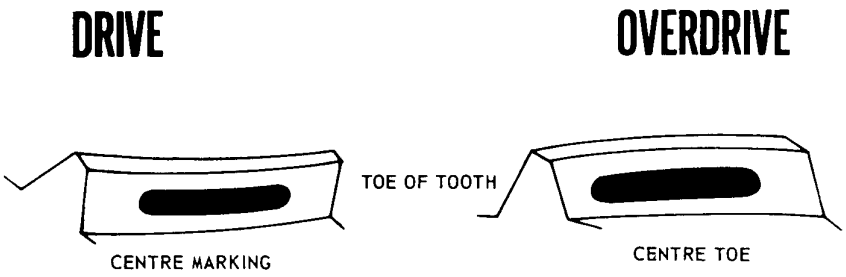
(3) Using a trolley jack support the differential assembly and remove the differential to rear mounting member retaining nuts.

(4) Remove the differential front support bracket to the body retaining bolt and nut and lower the differential and remove it from the vehicle.



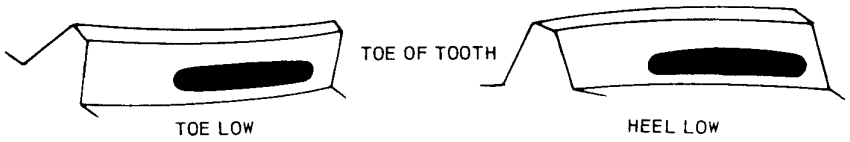
View of rear axle differential assembly removed from the vehicle.

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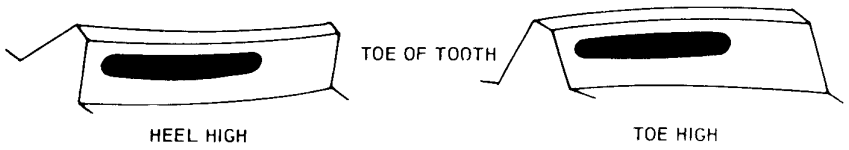


Crownwheel Tooth Marking for Correctly Adjusted Crownwheel and Pinion. Marking will be slightly Closer to Toe of Tooth on Overdrive or Concave Side. Changes in Thickness of Pinion Positioning Shims will Affect Tooth Marking on Overdrive to Greater Extent than on Drive or Convex Side of Tooth. Changes in Backlash have a more Pronounced Effect on Drive Side Markings (All models.)

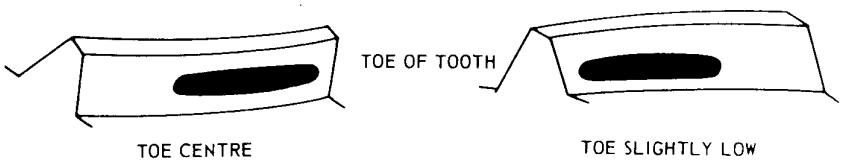
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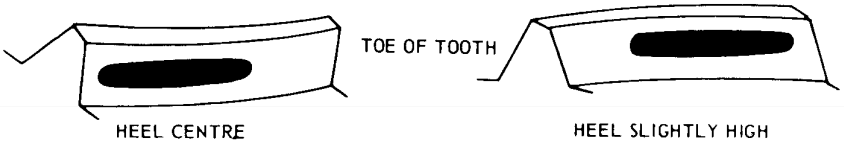
Low Profile Marking on Both Sides of Tooth. Rectify by Reducing Thickness of Pinion Positioning Shims and Reset Backlash (All models.)



High Profile Marking on Both Sides of Crownwheel Tooth. Rectify by Increasing of Pinion Positioning Shims and Reset Backlash (All models.)



Toe Marking on Drive Side and Low Profile Marking on Overdrive Side of Crownwheel Tooth. To Rectify, Increase Backlash. It may be Necessary to Increase Thickness of Pinion Positioning Shims to Maintain Backlash within Specified Limits (All models.)



Heel Marking on Drive Side and High Profile Marking on Overdrive Side of Crownwheel Tooth. To Rectify, Reduce Backlash. It may be Necessary to Decrease Thickness of Pinion Positioning Shims to Maintain Backlash within Specified Limits (All models.)

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(5) Thoroughly clean the exterior of the differential assembly and check for cracks, leakage and damage, renew as necessary. Refer all serious problems to a suitable specialised workshop.

(6) Check the differential front mounting rubber bush for wear and deterioration, renew as necessary.

NOTE: The design of the differential necessitates fine tolerances, checks and adjustments during overhaul. The use of specialised equipment is essential and it is recommended that any differential repair other than the oil seals and the rear cover and gasket be referred to a suitable specialised workshop.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Using a trolley jack, position the differential assembly under the vehicle and instal the differential front support bracket to the body retaining bolt.

(2) Instal the differential to the rear mounting nuts and tighten to Specifications.

(3) Tighten the differential front support to body bracket retaining bolts to the Specifications.

(4) Remove the plug and instal the propeller shaft.

(5) Instal the axle shafts as previously described in this section.

(6) Check the oil level and top up as necessary.

TO RENEW DIFFERENTIAL DRIVE SHAFT OIL SEAL

(1) Remove the relevant rear axle shaft as previously described in this section.

(2) Using the special Torx socket, remove the retaining bolt from the centre of the differential drive shaft and remove the drive shaft from the differential.

(3) Using a suitable screwdriver prise the oil seal from the differential side housing.

(4) Apply grease to the lips of the new oil seal and using a suitable drift instal the oil seal to the differential side housing.

(5) Instal the differential drive shaft and retaining bolt, using the special Torx socket tighten the retaining bolt to Specifications.

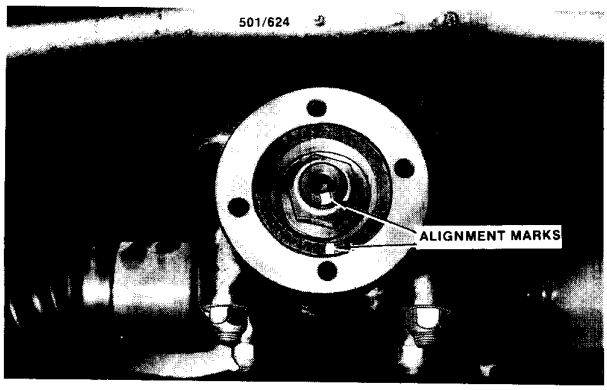
(6) Instal the rear axle shaft as previously described in this section.

NOTE: The axle shaft inner and outer offset joints are of different spline numbers and diameters and if installed incorrectly will cause damage to the components.

(7) Lower the vehicle to the ground.

TO RENEW DIFFERENTIAL DRIVE PINION OIL SEAL

(1) Raise the vehicle to a suitable working height and support it on chassis stands.



Mark the installed position of the differential drive pinion flange to ensure the correct installation.

(2) Remove the propeller shaft flange to drive pinion retaining bolts and nuts and separate the flanges. Secure the propeller shaft away from the work area with tying wire.

(3) Secure a force gauge to a bolt hole on the drive pinion flange and measure and record the force required to turn the drive pinion.

This is specified as the drive pinion turning force and can be affected by the drive pinion oil seal, the reading should be noted for use during the installation procedure.

(4) Using a suitable Stillson wrench, secure the drive pinion flange and remove the flange retaining nut. Note the installed position of the flange to the drive pinion and mark accordingly. Discard the retaining nut.

(5) Using a suitable puller, remove the flange from the drive pinion.

(6) Using a suitable screwdriver, prise the oil seal from the differential housing.

(7) Check the drive pinion flange oil seal contact surface for wear and damage, renew as necessary.

(8) Apply grease to the lips of the new oil seal and using a suitable drift instal the oil seal to the differential housing.

(9) Instal the drive pinion flange with a new retaining nut to the pinion and tighten it within Specifications. Using the same procedure as during its removal, use a force gauge to measure the drive pinion turning force. Tighten the flange retaining nut within Specifications to achieve the same drive pinion turning force as recorded during dismantling. When correct stake the retaining nut.

(10) Instal the propeller shaft to the drive pinion flange and instal the retaining bolts and nuts and tighten them to Specifications.

(11) Lower the vehicle to the ground.

TO REMOVE AND INSTAL DIFFERENTIAL REAR COVER

(1) Raise the vehicle to a suitable working height and support it on chassis stands.

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(2) Using a suitable drain tin positioned under the rear axle differential, remove the drain plug and drain the oil.

(3) Supporting the weight of the differential remove the differential to the rear crossmember retaining nuts.

(4) Remove the rear crossmember to chassis retaining nuts and stopper washers and remove the crossmember.

(5) Remove the rear cover to differential retaining bolts and remove the cover and gasket.

(6) Thoroughly clean the cover in a suitable solvent and check for cracks and damage, renew as necessary.

(7) Clean the cover mating face on the differential and check for cracks and damage. Refer all serious problems to a suitable specialised workshop as necessary.

(8) Check the differential rear crossmember rubber bushes for wear and deterioration, renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the rear cover and gasket to the differential, instal the retaining bolts and tighten them to Specifications.

(2) Instal the rear crossmember to the differential, instal the retaining bolts and tighten them to Specifications.

(3) Position the rear crossmember and stopper washers to the chassis and instal the stopper washers and nuts, tighten them to Specifications.

(4) Instal the drain plug with a new washer to the differential and tighten it securely.

(5) Fill the differential with the correct quantity and grade of oil, instal the filler plug and tighten it securely.

(6) Lower the vehicle to the ground.

8. DIFFERENTIAL MOUNTING RUBBER BUSHES

Special Equipment Required:
To Renew Bushes — Suitable press and press plates

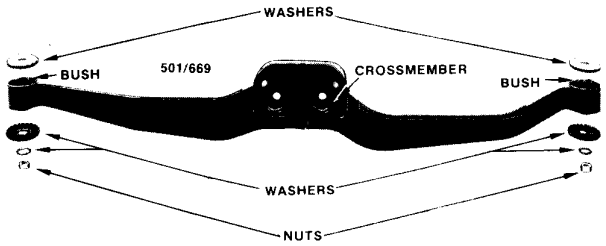
TO RENEW REAR CROSSMEMBER BUSHES

(1) Raise the rear of the vehicle to a suitable working height and support it on chassis stands.

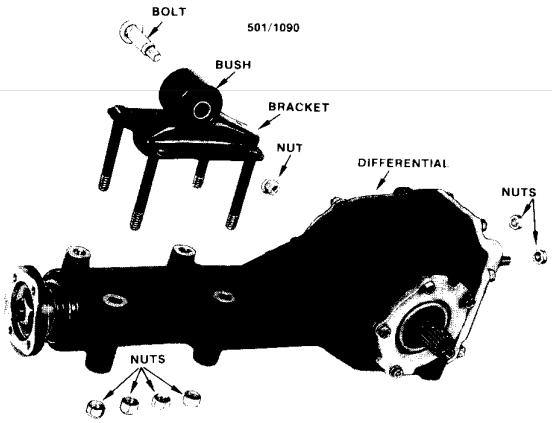
(2) Support the weight of the differential and remove the differential to the rear crossmember retaining nuts.

(3) Remove the rear crossmember to chassis retaining nuts and stopper washers and remove the crossmember from the vehicle.

(4) Using a suitable press and press plates, support the crossmember on the outer edge of the bush aperture in order to allow the bush to exit when



View of rear crossmember and components removed from the vehicle.



Dismantled view of differential front mounting bracket and components.

pressed. Using a suitable drift, press the bush from the crossmember.

(5) Turning the crossmember to the other end and using the press and press plates, remove the other bush from the crossmember.

(6) Clean the crossmember thoroughly in a suitable solvent and check for cracks and damage, renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the crossmember mounting bush aperture is clean and free from burrs.

(2) Using the press and press plates, support the crossmember on the end face of the bush aperture. Position the new bush on the crossmember and using the drift press the bush fully home ensuring that it is central relative to the crossmember bush aperture end faces.

(3) Turning the crossmember to the other end and using the press and press plates, in a similar manner, instal the other new bush to the crossmember.

(4) Instal the crossmember to the vehicle as previously described.

TO RENEW DIFFERENTIAL MOUNTING BRACKET BUSH

(1) Raise the rear of the vehicle to a suitable working height and support it on chassis stands.

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(2) Using a trolley jack support the weight of the differential assembly.

(3) Remove the differential mounting bracket to body retaining bolt and nut and lower the bracket clear.

(4) Remove the mounting bracket to differential retaining nuts and remove the mounting bracket.

(5) Using a suitable press and press plates support the bracket on the outer edge of the bush aperture in order to allow the bush to exit when pressed. Using a suitable drift, press the bush from the bracket.

(6) Clean the mounting bracket thoroughly in a suitable solvent and check it for cracks and damage, renew as necessary.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the mounting bracket bush aperture is clean and free from burrs.

(2) Using the press and press plates, support the bracket on the end face of the bush aperture. Position the new bush on the bracket and using the drift, press the bush fully home ensuring that it is central relative to the crossmember bush aperture end faces.

(3) Position the mounting bracket on the differential assembly, instal the retaining nuts and tighten them to Specifications.

(4) Position the differential mounting bracket to the body, instal and tighten the retaining bolt and nut to Specifications.

(5) Lower the vehicle to the ground.

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PART 1. STEERING TROUBLE SHOOTING

FAULTS, CAUSES AND REMEDIES

EXCESSIVE PLAY OR LOOSENESS IN STEERING GEAR

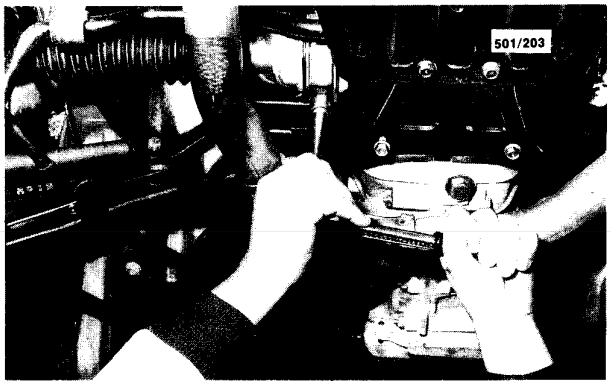
(1) Tie rod end loose or worn: Tighten or renew the tie rod end.

(2) Steering gear assembly loose on cross-member: Inspect for damage and tighten the steering gear assembly mounting bolts.

(3) Steering gear worn: Overhaul the steering gear.

(4) Loose or worn intermediate shaft flexible joints: Tighten or renew the intermediate shaft flexible joints.

NOTE: Looseness in the steering linkage is best assessed with the weight of the vehicle on the front wheels. Have an assistant turn the steering wheel from left to right while the inspection for wear is being carried out. If looseness is found in the steering gear it will be necessary to overhaul the steering gear assembly.



Checking the steering gear mounting bolts for tightness.

HEAVY STEERING

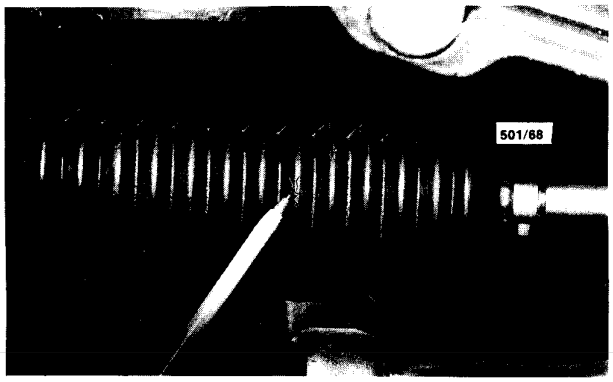
(1) Low or uneven tyre pressures: Check tyres and inflate to the recommended pressures.

(2) Low fluid level in the power steering reservoir: Replenish the fluid in the power steering reservoir. Check for leakage, repair and/or renew faulty components.

(3) Suspension worn, or out of alignment: Check the suspension for wear, renew worn components and realign the suspension.

(4) Binding intermediate shaft flexible joints: Renew the intermediate shaft flexible joints.

(5) Insufficient power steering pump pressure: Check the pump drive belt tension and the reservoir fluid level. If necessary, overhaul or renew the power steering pump assembly.



Check the steering gear rubber boots for deterioration.

(6) Loss of lubricant from steering gear: Check rubber boots for cracking and deterioration, renew as required and replenish lubricant.

(7) Loss of lubricant from tie rod ends: Check rubber boots for cracking and deterioration, renew tie rod ends as necessary.

NOTE: Ensure that both front tyres have ample depth of tread and are inflated to the correct pressure. Check the front suspension components for wear before having the steering geometry checked. Refer to the Front Suspension section for component checking procedure.

STEERING PULLS TO ONE SIDE

(1) Uneven tyre wear or pressures: Check the tyre condition and inflate the tyres to the recommended pressures.

(2) Incorrect front wheel alignment: Check and align the front wheels.

(3) Dragging brakes: Check each wheel for dragging brakes. Repair the brakes as described in the Brakes section.

(4) Damaged suspension components: Check and renew the damaged components as described in the Front Suspension section.

(5) Faulty pinion valve in the steering gear: Check and renew the pinion valve assembly.

NOTE: Dragging brakes are normally indicated by excessive heat felt at the centre of the road wheel.

FRONT WHEEL WOBBLE OR SHIMMY

(1) Irregular tyre wear or incorrect tyre pressures: Check the tyre condition and inflate the tyres to the recommended pressures.

(2) Tyre or wheel unbalance: Check and balance as necessary.

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(3) Worn front hub bearings: Check the condition and if necessary, renew the front hub bearings.

(4) Faulty or worn suspension unit: Check and renew the suspension unit, preferably as a pair.

NOTE: Check the steering linkage as previously described. Raise the front of the vehicle and check the adjustment of the hub bearings by working the road wheel in and out at the top and bottom. No perceptible movement in the bearings should be felt. Check the suspension units as outlined in the Front Suspension section.

STEERING ERRATIC OR WANDERING

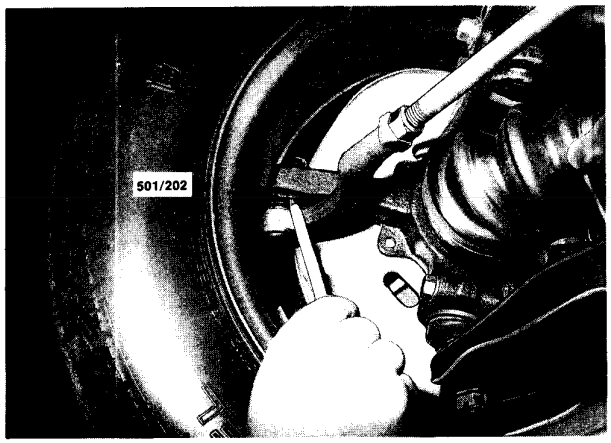
(1) Incorrect or uneven wheel alignment: Check and if necessary adjust the front wheel alignment.

(2) Smooth front tyres: Check and renew the tyres as necessary.

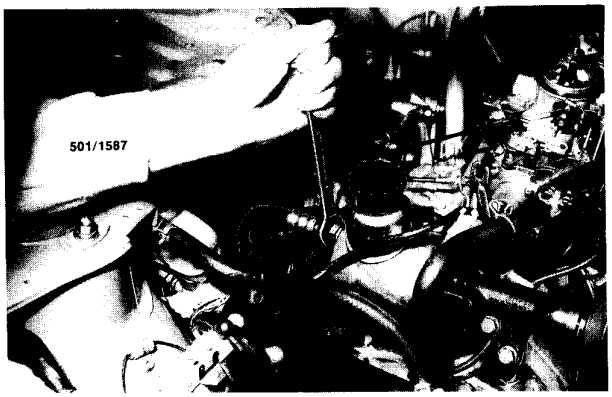
(3) Steering gear assembly loose on cross-member: Inspect for damage and tighten the steering gear assembly mounting bolts.

(4) Tie rod end ball joint worn: Renew worn tie rod end.

(5) Steering gear assembly worn: Overhaul steering gear assembly.



Check the tie rod end rubber boot for deterioration.



Checking the power steering fluid line for tightness.

(6) Worn or incorrectly adjusted front hub bearings: Check the condition and if necessary, renew the front hub bearings.

NOTE: Check the steering linkage as previously described. Under no circumstances mix radial ply and conventional ply tyres. Instal only tyres of the same construction on all four wheels.

FAILURE OF POWER ASSISTANCE

(1) Loose or broken power steering pump drive belt: Renew or adjust the drive belt.

(2) Low fluid level in the power steering reservoir: Replenish the fluid in the power steering reservoir. Check for leakage, repair or renew faulty components.

(3) Insufficient power steering pump pressure: Check the pump drive belt tension and the reservoir fluid level. If necessary, overhaul or renew the power steering pump assembly.

(4) Faulty power steering gear assembly: Overhaul the power steering gear assembly.

NOTE: In most cases a loose drive belt can be heard squealing when a load is placed on the pump. Such as when the steering wheel is turned or when the engine is accelerated.

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PART 2. CONVENTIONAL STEERING

SPECIFICATIONS

Type	Rack and pinion
Steering angle:	
1979–1984 and Utility models —	
Inner wheel	36.5 deg
Outer wheel	35.0 deg
1985–1987 Sedan and Station Wagon models —	
Inner wheel	39.0 deg
Outer wheel	35.0 deg
Steering wheel free play	0–25 mm
Non-adjustable column steering shaft standard overall length:	
1979–1984 models	857.9 mm
1985–1987 models	861.7 mm
Tilt adjustable column steering shaft standard overall length:	
1982–1984 models	644.9 ± 1 mm
1985–1987 models	517.2 ± 1 mm
Maximum rack bend:	
1979–1984 and Utility models	0.1 mm
1985–1987 Sedan and Station Wagon models	0.2 mm
Pinion rotating torque:	
1979–1985 models	1.1–1.5 Nm
1986–1987 models	0.9–1.4 Nm
Steering gear lubricant	Subaru steering grease

TORQUE WRENCH SETTINGS

Steering gear mounting bolts:	
1979–1984 and Utility models	54 Nm
1985–1987 Sedan and Station Wagon models	71 Nm
Intermediate shaft:	
Universal joint clamp bolt	26 Nm
Rubber coupling bolts	20 Nm
Rack pad adjusting screw locknut:	
1979–1982 models	59 Nm
1983–1987 models	49 Nm
Inner tie rod ball joint to rack	78 Nm
Outer tie rod end locknut	88 Nm
Outer tie rod end to steering arm nut	29 Nm

1. DESCRIPTION

The steering gear is of the rack and pinion type and is mounted on the underside of the front suspension crossmember.

The rack is supported by a bush at one end and a spring loaded pad at the pinion end. The spring loaded pad is adjusted by an adjusting screw and locknut.

The pinion rotates in a ball bearing with an oil seal to retain the lubricant and prevent the entry of water and dirt.

The ends of the steering gear are sealed by corrugated rubber boots clamped at one end to the steering gear housing and at the other end to the tie rod. The boots expand and contract with the movement of the rack.

No replenishment of lubricant is necessary in service unless the lubricant leaks out by damage to or failure of the rubber boots or the pinion oil seal.

The variable ratio rack and pinion steering gear has different tooth profiles on the end of the rack to the tooth profiles in the middle of the rack. This alters the contact point on the pinion teeth which alters the mechanical advantage and velocity ratio of the rack and pinion.

To facilitate removal of the steering gear or the steering column assembly an intermediate shaft is installed between the steering gear and the steering shaft.

The steering column is a collapsible type designed to absorb secondary impact in the event of a severe front end collision.

2. STEERING GEAR ASSEMBLY

Special Equipment Required:

To Dismantle and Assemble — Suitable press and press plates

To Measure Pinion Rotating Torque — Suitable torque gauge

To Check Rack Runout — Suitable dial gauge and 'vee' blocks

TO REMOVE

(1) Disconnect the negative battery terminal.

(2) Raise the front of the vehicle, support it on chassis stands and remove the front wheels.

(3) Disconnect the outer tie rod ends from the steering arms.

NOTE: Disconnect each ball joint stud by placing a suitable dolly or hammer against one side of the steering arm eye and striking the opposite side with a hammer.

(4) Remove the clamp bolt from the intermediate shaft lower universal joint or pinion flange.

NOTE: Suitably mark the components of the intermediate shaft to aid assembly

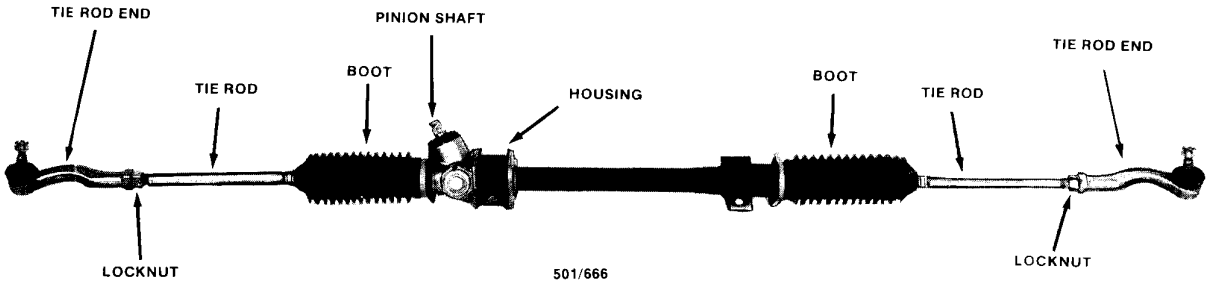
(5) Remove the exhaust engine pipe as described in the Engine section and remove the crossmember plate.

(6) Remove the steering gear mounting bolts from the suspension crossmember.

(7) Lower the steering gear until it is clear of the intermediate shaft.

(8) Rotate the steering gear rearward and withdraw the steering gear out from the right hand side of the vehicle.

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View of the steering gear assembly removed from the vehicle.

TO DISMANTLE

(1) Carefully hold the steering gear in a vice, using suitable protection on the vice jaws.

(2) Using a suitable spanner on the flats provided on the tie rod, hold the tie rod, loosen the locknut and remove the outer tie rod end and the locknut from the tie rod.

(3) Remove the rubber boot retaining clips and slide the rubber boot from the tie rod.

(4) Carefully straighten the lock washer tab, hold the rack with a suitable spanner and loosen the inner tie rod ball joint. Remove the tie rod from the end of the rack, discard the lock washer.

Repeat items (2), (3) and (4) for the opposite end of the assembly.

(5) Loosen the rack pad adjusting screw locknut and remove the adjusting screw, spring and pad. Discard the 'O' ring on the adjusting screw.

(6) Where fitted, remove the dust cover from the top of the pinion and, using a suitable screwdriver, carefully prise the pinion oil seal out of the steering gear housing, discard the oil seal.

(7) Remove the pinion retaining snap ring and withdraw the pinion assembly from the steering gear housing.

(8) Slide the rack out of the pinion end of the steering gear housing.

(9) On constant ratio steering gear, renew the pinion bearing as follows:

(a) Remove the pinion bearing retaining snap ring.

(b) Support the pinion bearing inner race on suitable press plates and pressing on the end of the pinion, remove and discard the pinion bearing and where applicable the pinion oil seal.

(c) Reverse the components in the press, instal a new pinion bearing, oil seal and bearing retaining snap ring.

NOTE: The pinion bearing on variable ratio steering gear cannot be renewed separately.

(10) Using a suitable screwdriver, remove the rack bush retainer and carefully push the rack bush out of the steering gear housing using the rack or a suitable soft punch to push on the bush. Discard the bush and the retainer.

TO CLEAN AND INSPECT

(1) Wash all the components except the inner and outer tie rod ends in suitable cleaning solvent and dry thoroughly.

(2) Inspect all the components for wear, deterioration and damage. Renew all unserviceable components.

(3) Check the runout at the centre of the rack using 'vee' blocks and a dial gauge. Renew the rack if the runout exceeds Specifications.

TO ASSEMBLE

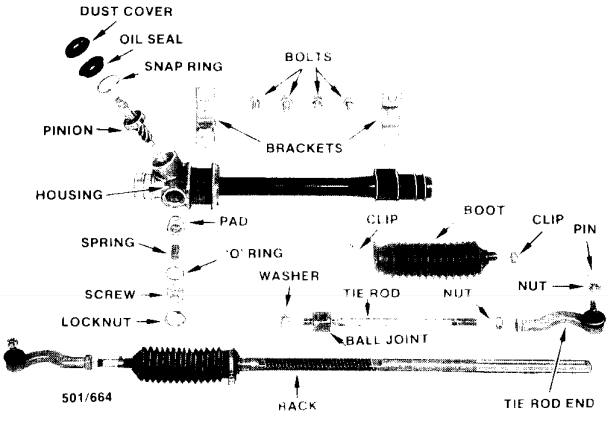
(1) Push a new rack bush into the end of the steering gear housing until the bush is inside the retainer location and instal a new retainer to secure the bush.

(2) Smear suitable grease on the inside of the rack bush and the inside of the steering gear pinion housing.

(3) Smear suitable grease on the rack teeth and sliding surfaces and slide the rack into the steering gear housing from the pinion end of the housing being careful not to damage the rack bush.

(4) Smear suitable grease on the bearing and teeth of the pinion and slide the pinion assembly into the steering gear housing.

(5) Instal a new pinion retaining snap ring. Turn



Dismantled view of a variable ratio steering gear assembly.

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the snap ring in the groove to verify correct installation.

(6) Instal a new pinion oil seal into the steering gear housing until the seal contacts the bearing retaining snap ring. In this position the outer face of a plain seal on 1986–1987 models, will be level with the face of the pinion housing and for 1979–1985 models the gap between the flange of a flanged seal and the face of the pinion housing, will be 0.9 mm or less.

(7) Apply a liberal amount of suitable grease to the pad and inside the housing and instal the rack pad and spring into the steering gear housing.

(8) Instal a new 'O' ring to the adjusting screw and instal the adjusting screw and locknut to the steering gear housing.

(9) Screw the rack pad adjusting screw into the steering gear housing until the turning effort noticeably increases and screw the adjusting screw back 15 deg. Hold the adjusting screw in this position and tighten the locknut to the specified torque.

(10) Turn the pinion and check for smooth and uniform rotational effort, over the full travel of the rack. If necessary, repeat the adjustment described in operation (9).

(11) Turn the pinion until the rack is in the centre position with equal amounts of the rack protruding from each end of the steering gear housing.

(12) Suitably mark the pinion, the oil seal and the steering gear housing with quick drying paint to indicate the centre position of the rack.

(13) Instal the lock washers and the tie rods to the rack. Hold the rack with a suitable spanner and tighten the inner tie rod ball joints to the specified torque.

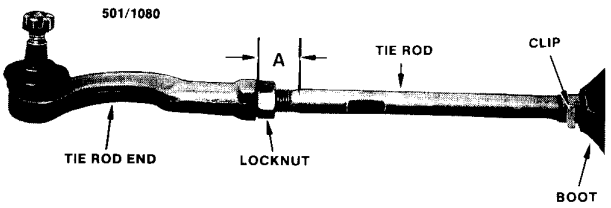
(14) Support the inner tie rod ball joints to avoid damage to the rack and bend the lock washers over the flats on the inner tie rod ball joints.

NOTE: Lock washers on variable ratio steering gear are staked into the cutaways on the face of the inner tie rod ball joints using a suitable blunt pointed punch.

(15) Position the rack at the end of its travel at each end of the steering gear housing and coat the rack with suitable grease. Return the rack to the centre position.

(16) Fill the corrugations inside the steering gear rubber boots with suitable grease over approximately half the length of the boots and instal the boots to the steering gear ensuring that the ends of the boots are correctly positioned and that the boots can be rotated smoothly after installation. Secure the ends of the boots with the retaining clips.

(17) Instal the outer tie rod end locknut to the position where the outer face of the nut is 23 mm from the shoulder at the inside end of the threaded portion of the tie rod. Instal the outer tie rod end until it abuts the locknut. Repeat the above procedure for the other tie rod end.



View of the outer tie rod end, dimension A = 23 mm.

NOTE: The outer tie rod ends are stamped LH and RH for identification and should not be interchanged..

(18) Using a suitable torque gauge, measure the pinion rotating torque. If necessary, adjust the rack pad adjusting screw as previously described to obtain the specified torque when the steering gear is within 30 mm of the rack centre position.

TO INSTAL

(1) Being careful to avoid damage to the rubber boots, slide the steering gear assembly into the crossmember from the right hand side of the vehicle.

(2) Rotate the steering gear assembly and insert the pinion into the intermediate shaft lower universal joint or pinion flange, aligning the marks made during removal.

(3) Instal the steering gear mounting clamps and tighten the mounting bolts to the specified torque ensuring that the clamp on the pinion end of the steering gear assembly is tightened first. Instal the crossmember plate and tighten the retaining bolts securely.

(4) Instal the intermediate shaft lower clamp bolt and tighten to the specified torque.

(5) Connect the outer tie rod ends to the steering arms and tighten the retaining nuts to the specified torque.

(6) Adjust the toe in/out as described in the Front Suspension section.

3. NON-ADJUSTABLE STEERING COLUMN

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Suitably mark the components and remove the intermediate shaft upper universal joint clamp bolt.

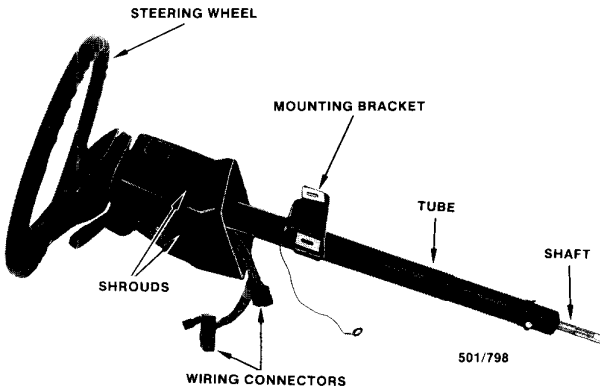
(3) Working inside the vehicle, remove the retaining screws and withdraw the lower section of the instrument panel below the steering column.

(4) Disconnect the wiring to the steering column ignition and combination switches.

(5) Remove the steering column mounting bolts from below the instrument panel, noting the position of the earth wire.

(6) Slide the steering column assembly out of the floor panel and withdraw the steering column from the vehicle.

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View of the non-adjustable steering column removed from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Tighten all bolts to the specified torque.

(2) Road test the vehicle and check for satisfactory steering performance.

TO DISMANTLE AND ASSEMBLE

(1) Remove the steering wheel and combination switch as described in the Electrical System section.

(2) Remove the screws retaining the upper and lower steering column shrouds and withdraw the shrouds from the steering column.

(3) Remove the retaining screw and withdraw the horn contact from the steering column.

(4) Remove the steering column upper seal and bearing retaining snap ring.

(5) Remove the steering column lower bearing retaining bolts and slide the steering shaft and bearing assembly out of the bottom of the steering column.

(6) On 1979–1984 and all Utility models remove the snap ring and slide the lower bearing, seal and washer off the steering shaft.

On 1985–1987 Sedan and Station Wagon models remove the steering column lower seal and bearing retaining snap ring. Remove the washers and spring and remove the lower bearing assembly from the steering shaft.

(7) Inspect the components of the steering column for wear and damage and measure the overall length of the steering shaft. Renew all worn and damaged components, renew the steering shaft if the overall length is not within Specifications.

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) On 1985–1987 Sedan and Station Wagon models lubricate and instal the lower bearing assembly onto the steering shaft.

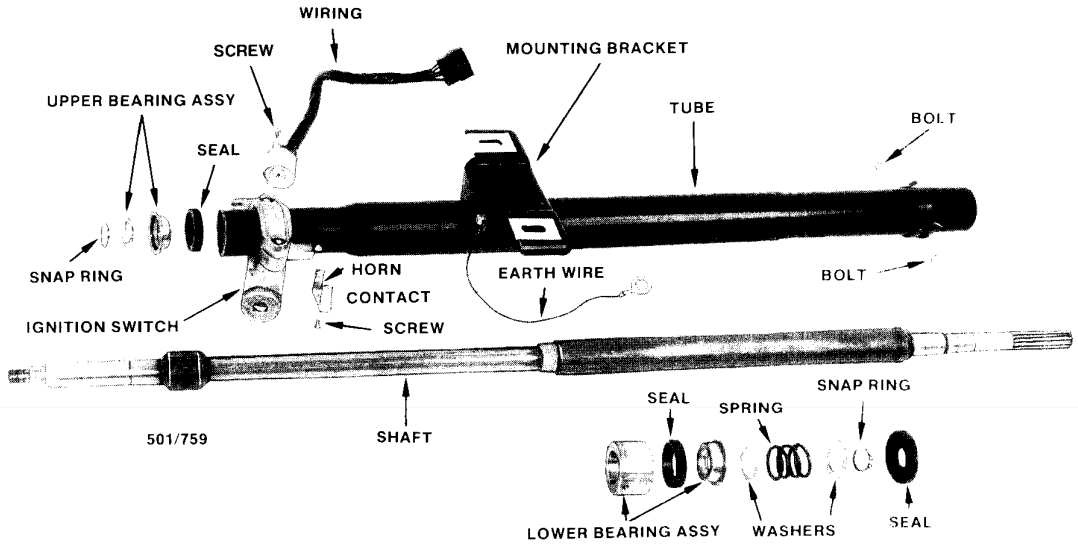
Smear suitable grease on the upper and lower bearing surfaces and the horn contact area of the steering shaft.

(2) On 1979–1984 and all Utility models slide the lower bearing, 'O' ring and washer onto the steering shaft and instal the bearing retaining snap ring to the steering shaft.

On 1985–1987 Sedan and Station Wagon models instal the washers and spring, the bearing retaining snap ring and the steering column lower seal.

(3) Instal the steering shaft and bearing assembly through the bottom of the steering column. Ensure that the slot in the bearing housing is aligned with the welded seam of the steering column tube.

(4) On 1985–1987 Sedan and Station Wagon models stand the steering column upright, resting on the lower end of the steering shaft and using a suitable tube to contact the upper bearing retaining snap ring push the snap ring into the groove adjacent to the



Dismantled view of the non-adjustable steering column, 1986 model shown.

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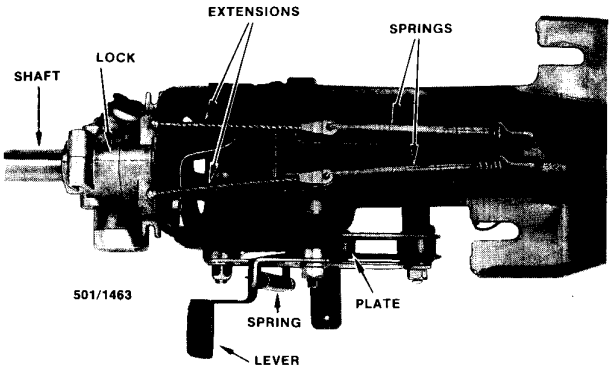
upper bearing. Do not apply excess force during this procedure.

Instal a new steering column upper seal.

(5) Instal the horn contact and tighten the retaining screw securely. Ensure that the contact face is rubbing squarely and firmly on the steering shaft.

(6) Instal the upper and lower steering column shrouds and tighten the retaining screws securely.

(7) Instal the combination switch and steering wheel as described in the Electrical System section, ensure that clearance exists between the steering wheel and the steering column shrouds. Loosen the retaining screws and relocate the shrouds if binding occurs.



Installed view of the tilt adjustable steering column components, 1983 model shown.

4. TILT ADJUSTABLE STEERING COLUMN

TO REMOVE AND INSTAL

The removal and installation procedures for the tilt adjustable steering column are the same as for the non-adjustable steering column. Refer to the previous centre heading for details of the removal and installation procedures.

TO DISMANTLE AND ASSEMBLE

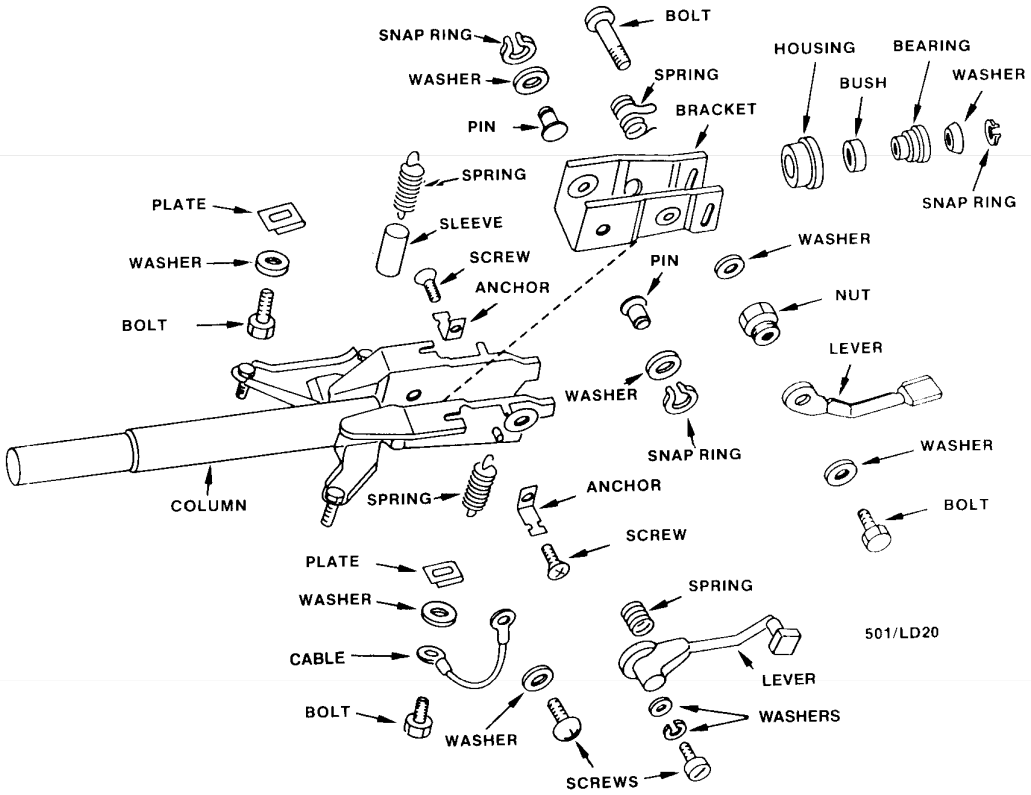
1979–1984 Models

(1) Remove the steering wheel as detailed in the Electrical System section.

(2) Remove the retaining screws and remove the steering column upper and lower shrouds.

(3) Move the steering column to the fully upward tilt position, disconnect the extensions and remove the extensions and the tension springs from the tilt mechanism.

(4) Suitably mark the universal joint and the lower steering shaft relationship, remove the universal joint clamp bolt and remove and dismantle the lower steering shaft using the procedure previously described to remove and dismantle the non-adjustable steering column steering shaft.



Dismantled view of the tilt adjustable steering column, 1986 model shown.

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(5) Remove the steering lock retaining bolts and withdraw the steering lock, upper steering shaft and universal joint assembly from the tilt bracket.

(6) If necessary, remove the upper steering shaft and bearings from the steering lock as follows:

(a) Remove the snap ring from the top end of the upper steering shaft and slide the upper steering shaft out of the steering lock.

(b) Remove the washer, the needle roller bearing, the outer race and the circular spring from the bore of the steering lock using a suitable pointed tool.

(c) Remove the snap ring from the bore of the steering lock and remove the needle roller bearing, the outer race and the circular spring from the steering lock using a suitable pointed tool.

(7) Remove the tilt lever return spring from the tilt mechanism.

(8) Remove the nuts and washers and remove the plate from the side of the tilt lever. Note the installed position and remove the spacer from the tilt lever shaft.

(9) Remove the pawl and the tilt lever from the tilt lever shaft.

(10) Remove the snap ring, washers and the pivot pin from the left hand side of the tilt bracket.

(11) Remove the pivot bolt and bush from the right hand side of the tilt bracket.

(12) Remove the tilt bracket from the steering column.

(13) Inspect the components of the steering column for wear and damage and measure the overall length of the steering shaft. Renew all worn and damaged components, renew the steering shaft if the overall length is not to Specifications.

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Tighten all nuts and bolts securely.

(2) Lubricate the moving parts with suitable grease before assembly.

(3) Ensure that the tilt mechanism operates correctly before installing the steering column in the vehicle.

1985–1987 Models

(1) Remove the steering wheel as described in the Electrical section.

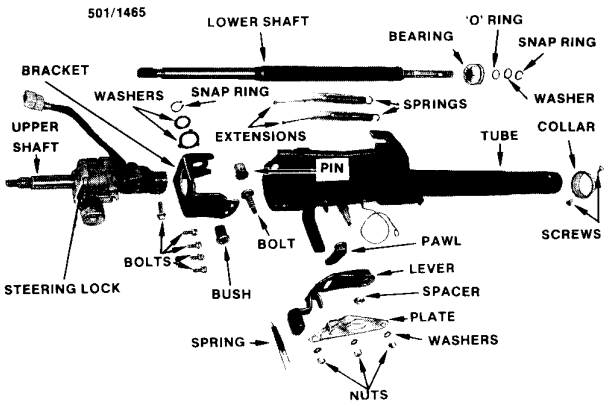
(2) Remove the retaining screws and remove the steering column upper and lower shrouds.

(3) Moving the tilt lever, loosen the adjusting nut located adjacent to the tilt lever.

(4) Remove the tilt lever retaining bolt and washer and remove the tilt lever from the tilt mechanism.

(5) Remove the tilt lever adjusting nut, washer and adjusting bolt from the tilt mechanism.

(6) Remove the universal joint clamp bolt and slide the upper column and steering shaft assembly out of the tilt mechanism. If it is necessary to dismantle the upper column assembly, proceed as follows:



Dismantled view of the tilt adjustable steering column, 1983 model shown.

(a) Remove the snap ring from the upper steering shaft adjacent to the upper bearing.

(b) Remove the snap ring from the lower bearing end of the shaft and remove the washers and spring from the lower bearing.

(c) Using a suitable screwdriver remove the lower bearing and the bush from the lower end of the upper steering column.

(d) Slide the upper steering shaft out of the lower end of the upper steering column and remove the upper bearing from the upper steering column.

(7) Remove the steering column lower bearing retaining bolt and slide the steering shaft and bearing assembly out of the bottom of the steering column.

(8) Remove the steering column lower seal and bearing retaining snap ring. Remove the washers and spring remove the lower bearing assembly from the steering shaft.

(9) Move the steering column to the fully upward tilt position and remove the release lever retaining screws. Remove the retaining plate and the release lever noting the positions of the release lever spring and the locking pin and spring.

(10) Remove the tension springs from the sides of the tilt bracket.

(11) Using a suitable spanner, remove the tension spring anchors from the sides of the tilt bracket.

(12) Remove the snap rings and washers from the tilt bracket pivot pins and remove the pivot pins from the tilt bracket.

(13) Withdraw the tilt bracket from the steering column.

(14) Inspect the components of the steering column for wear and damage and measure the overall length of the steering shaft. Renew all worn and damaged components, renew the steering shaft if the overall length is not to Specifications.

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Lubricate the moving parts with suitable grease before assembly.

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(2) Instal the bearing washers with the tapered side facing the bearings.

(3) Tighten the tilt lever adjusting nut to a torque of 10 Nm and position the tilt lever to touch the stop before tightening the tilt lever retaining bolt.

(4) Ensure that the tilt mechanism operates correctly before installing the steering column in the vehicle.

5. INTERMEDIATE SHAFT

TO REMOVE AND INSTAL

Rubber Coupling Model

(1) Raise the front of the vehicle and support it on chassis stands.

(2) Suitably mark the relationship of the intermediate shaft upper universal joint to the steering shaft and the steering gear to the steering gear pinion flange.

(3) Remove the clamp bolt retaining the steering gear pinion flange to the steering gear.

(4) Remove the steering gear mounting bolts and lower the steering gear slightly to clear the intermediate shaft.

(5) Remove the intermediate shaft upper universal joint clamp bolt and withdraw the intermediate shaft assembly from the vehicle.

(6) Inspect the rubber coupling for wear and deterioration, the universal joints for wear and rough rotation and the spline for wear and damage. Renew all unserviceable parts.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the intermediate shaft upper universal joint and the steering gear pinion flange to the marks made on removal.

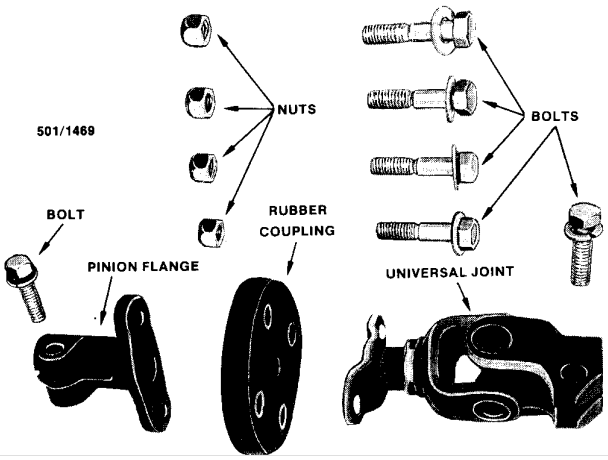
(2) Tighten all bolts to the specified torque.

(3) Road test the vehicle and check for satisfactory steering performance.

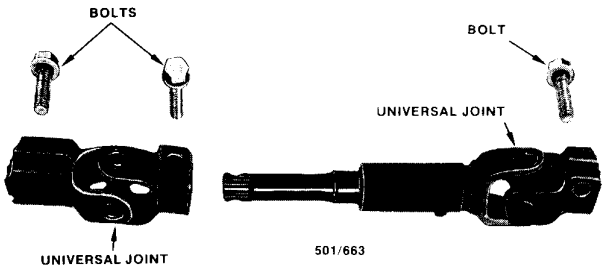
Double Universal Joint Model

(1) Suitably mark the relationship of the intermediate shaft upper universal joint to the steering shaft and the intermediate shaft lower universal joint to the steering gear pinion.

(2) Remove the intermediate shaft upper and lower universal joint clamp bolts, slide the intermediate shaft up the steering shaft until the intermediate shaft lower universal joint is clear of the steering gear pinion.



Dismantled view of the rubber coupling type intermediate shaft assembly, 1983 model shown.



Dismantled view of the double universal joint type intermediate shaft assembly, 1986 model shown.

(3) Slide the intermediate shaft off the steering shaft and withdraw the intermediate shaft from the vehicle.

(4) Inspect the universal joints for wear and rough rotation and the splines for wear and damage. Renew all unserviceable parts.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the intermediate shaft universal joints to the marks made on removal.

(2) Tighten all bolts to the specified torque.

(3) Road test the vehicle and check for satisfactory steering performance.

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PART 3. POWER STEERING

SPECIFICATIONS

Steering gear type	Rack and pinion with integral power cylinder
Linkage	Direct from rack ends to tie rods and steering arms
Steering gear valve type	Rotary, integral with pinion
Pump type	Rotary, vane
Pump output:	
1981 models	9.5 cc/rev
1982 models	7.4 cc/rev
1983 models	10.0 cc/rev
1984 models	7.4 cc/rev
1985–1987 models	5.9 cc/rev
Pump relief pressure:	
1981–1982 models	4921 kPa
1983–1984 models	4904 kPa
1985–1987 models	4413 kPa
Steering wheel turning effort:	
1980–1982 models	24.5 N
1983–1987 models	29.4 N

TORQUE WRENCH SETTINGS

Steering gear mounting bolts:	
1980–1984 models	54 Nm
1985–1987 models	71 Nm
Intermediate shaft:	
Universal joint clamp bolt	26 Nm
Rubber coupling bolts	20 Nm
Rack pad adjusting screw locknut	49 Nm
Inner tie rod ball joint to rack	78 Nm
Outer tie rod end locknut	88 Nm
Outer tie rod end to steering arm nut	29 Nm
Outer tie rod end to steering arm nut	29 Nm + 0–60 deg to align split pin hole

1. DESCRIPTION

The power steering is a rack and pinion type with an integral power cylinder and a rotary valve to direct the hydraulic pressure to the appropriate side of the piston in the power cylinder. This hydraulic pressure assists the mechanical components which operate in a similar manner to the manual rack and pinion steering system.

The steering gear is mounted on the underside of the front suspension crossmember and the hydraulic pressure is supplied by an engine driven pump.

The rack is connected, by ball joints, to the tie rods on either end which are connected to the steering arms by tie rod ends.

If a fault is encountered within the hydraulic system, such as pump failure or pressure drop due to a broken pipe or leaking seals, the vehicle may still be driven, although steering effort will be substantially increased.

In the interests of safety the vehicle should be driven in this condition for only short distances or to the nearest repair facility where attention to the damaged components can be obtained.

2. PRELIMINARY INSPECTION AND TESTING

If the power steering system becomes partially or fully inoperative it is most important that the following preliminary inspection and testing procedures are peformed prior to undertaking any trouble shooting or repair operations.

PUMP DRIVE BELT

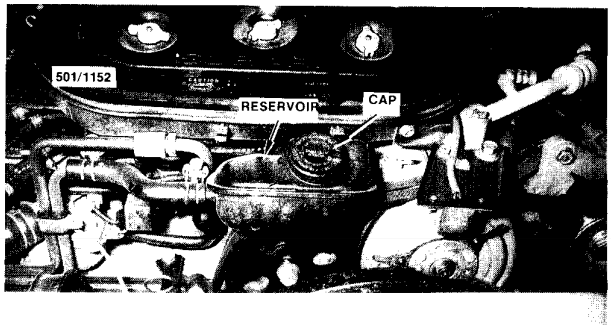
Inspect the pump drive belt for breakage, glazing or wear, renew the drive belt if any of these characteristics are evident.

If the belt is loose but still serviceable adjust the belt as described in the Engine Tune-up section.

NOTE: In most cases a loose drive belt can be heard squealing when a load is placed on the pump such as when the steering wheel is turned or as the engine is accelerated.



Checking the power steering pump drive belt for deterioration.



Installed view of the power steering fluid reservoir, 1986 model shown.

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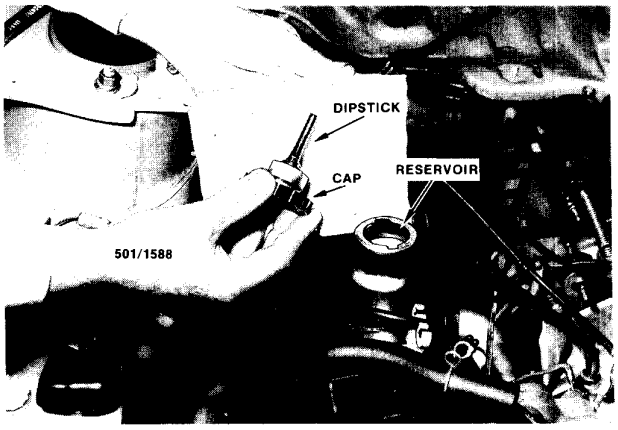
TO CHECK FLUID LEVEL

With the vehicle parked on a level surface, start the engine and run it until the power steering fluid is at the normal operating temperature of approximately 60 deg C. Turn the steering wheel slowly from lock to lock several times and stop the engine.

Check the fluid level in the power steering reservoir reading on the side of the dipstick marked Hot. The dipstick is located on the reservoir cap.

If it is necessary to top up the fluid, fill up to the full mark indicated on the dipstick using the fluid specified in the Lubrication and Maintenance section.

NOTE: If the fluid is cold, approximately 21 deg C, use the side of the dipstick marked Cold. Do not overfill the reservoir.



Checking the power steering fluid level on the reservoir dipstick, 1983 model shown.

TO CHECK FOR FLUID LEAKS

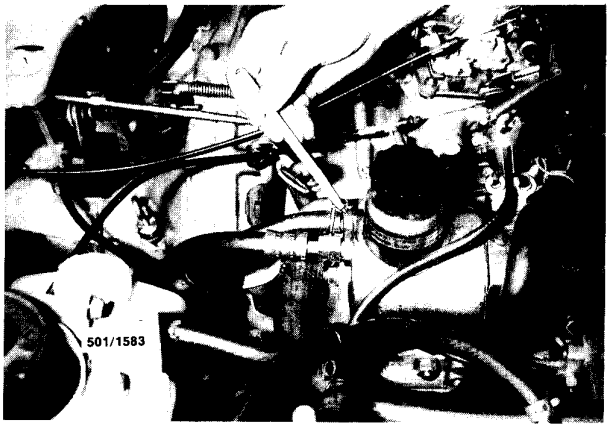
Using a suitable solvent clean around all the power steering assemblies and hose or pipe fittings where fluid leakage might prevail and start the engine. Turn the steering wheel from lock to lock several times, stop the engine, and check the system for leakage.

Where leakage is found at pipe or hose fittings, tighten the fitting and repeat the above procedure. In some cases, when tightening the fitting does not rectify the problem, it may be necessary to disconnect the fitting and clean the mating faces.

Where leakage is found in the pump and reservoir assembly, the overhaul procedures are described later in this section.

If it is necessary to renew a hose or pipe refer to In Car Adjustments and Minor Repairs for the hose or pipe removal and installation precautions.

If it is necessary to instal a replacement steering gear assembly or pump and reservoir assembly the removal and installation procedures are described later in this section.



Check the power steering fluid lines for leaks.

TO CHECK TURNING EFFORT

Ensure that the tyre pressures and front wheel alignment are correctly adjusted and drive the vehicle on the road until the engine and steering fluid are at the normal operating temperature. Park the vehicle on a dry bitumen or concrete surface.

Attach a force gauge to the rim of the steering wheel, start and run the engine at normal idle speed. Pull on the force gauge to obtain alternatively both left and right hand steering locks from the straight ahead position.

The turning effort should for both left and right hand steering locks be approximately equal, they should also be within Specifications.

NOTE· Increased turning effort may be encountered when the steering wheel is turned rapidly with an engine speed in excess of 2000 rpm.

3. IN CAR ADJUSTMENTS AND MINOR REPAIRS

PUMP DRIVE BELT TENSION

The correct procedure to adjut the pump drive belts is described in the Engine Tune-up section.

It is most essential that the pump drive belts are adjusted enough to prevent slipping but without imposing excessive load on the pump bearings.

On 1985–1987 non-airconditioned models should the deflection of the drive belts be unequal both drive belts should be renewed as a matched pair.

TO PURGE THE POWER STEERING SYSTEM OF AIR

(1) Ensure that the fluid reservoir is full of fluid.

(2) Raise the front of the vehicle and support it on chassis stands.

(3) Turn the steering wheel slowly from lock to lock until air bubbles cease appearing in the reservoir and the fluid level remains constant.

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NOTE: During this operation ensure that the fluid level is kept on the Full mark to avoid introducing more air into the system.

(4) With the engine running at normal idle speed, turn the steering wheel slowly from lock to lock until air bubbles cease appearing in the reservoir and the fluid level remains constant.

NOTE: It is unacceptable for the fluid level to alter more than 3 mm during the above operation.

(5) Lower the vehicle to the ground and repeat operation (4).

(6) Road test the vehicle and check for oil leaks. With the engine stopped, check the fluid level on the dipstick as previously described.

TO FLUSH THE POWER STEERING SYSTEM

(1) Disconnect the fluid return hose at the pump reservoir and place the end of the hose in a suitable clean container. Plug the return hose fitting on the reservoir.

(2) Fill the reservoir with the recommended fluid.

(3) Raise the front of the vehicle and support it on chassis stands.

(4) Turn the steering wheel slowly from lock to lock and, constantly filling the reservoir with new fluid, flush approximately two litres of fluid through the system until the fluid flowing out of the return hose is clean and free from contaminants.

(5) Lower the vehicle to the ground, remove the plug and connect the fluid return hose to the reservoir. Check and top up the fluid level in the reservoir.

(6) Road test the vehicle and check for leaks. With the engine stopped, check the fluid level on the dipstick as previously described.

FLUID LINES

When fluid lines are disconnected it is important that all openings are plugged to prevent the entry of dirt. Any fluid lost during repair operations must be replenished and the system purged of air. Do not allow power steering fluid to contact any engine drive belts and ensure that the fluid lines are positioned clear of other components to prevent chaffing.

4. POWER STEERING PUMP

Special Equipment Required:
To Dismantle and Assemble — Suitable puller, press and press plates

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Disconnect the fluid lines from the power steering pump. Plug the openings to prevent the loss of fluid and the entry of dirt.

(3) On 1980–1984 models, carefully remove the cap from the centre of the idler pulley using suitable pliers and a cloth pad, loosen the locking bolt approximately two turns then turn the adjusting bolt to relieve the tension from the pump drive belt.

(4) On 1985–1987 models, loosen the alternator mounting and adjusting bolts and relieve the tension from the pump drive belts.

(5) Remove the power steering pump drive belt/s.

(6) On 1980–1984 models remove the air cleaner as described in the Fuel System section.

(7) Remove the power steering pump mounting bolts and manoeuvre the power steering pump from the engine compartment.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Adjust the drive belts as described in the Engine Tune-up section.

(2) Fill the reservoir and check the fluid level as previously described.

(3) Purge the system of air as previously described.

(4) Road test the vehicle and check for fluid leaks.

TO DISMANTLE

(1) Carefully clamp the power steering pump in a vice using timber to provide protection.

(2) Where fitted, remove the spark plug lead/hose mounting bracket from the top of the pump body.

(3) Remove the pulley retaining bolts and washers and the nut from the end of the pump shaft.

(4) Remove the pulley from the front of the pump shaft.

(5) Remove the reservoir cap and where fitted, the fluid filter from the reservoir.

(6) On 1980-1984 models remove the pipe connector union and the bolt from the end of the reservoir. Remove and discard the 'O' rings.

On 1985-1987 models remove the flange bolts and lift the reservoir off the front pump body. Remove and discard the 'O' ring.

(7) On 1980-1984 models, tapping carefully on the front edge of the reservoir with a soft hammer, remove the reservoir from the pump body. Remove and discard the 'O' ring from the pump body.

Remove the spring clip and withdraw the filter and magnet from the reservoir.

(8) Carefully clamp the front pump body in a vice with suitable jaw protection and on 1985-1987 models remove the connector from the side of the front pump body and withdraw the relief valve and spring.

(9) Remove the retaining bolts and detach the rear pump body.

(10) On 1985-1987 models remove the snap ring from the rear end of the pump shaft, remove the rear

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end plate, the cam ring, the rotor with vanes and the front end plate where fitted, from the front of the pump body, remove and discard the gasket.

(11) On 1980-1984 models, remove and discard the 'O' rings from the rear pump body.

(12) On 1980-1984 models, remove the relief valve and spring from the rear pump body.

(13) On 1980-1984 models remove the pulley flange from the front end of the pump shaft using a suitable puller. Remove the key from the shaft using suitable pliers.

(14) Using a suitable screwdriver, remove the outer seal from the front pump body noting the direction of the seal lip. Remove the snap ring, using suitable snap ring pliers.

(15) Pushing on the spline end of the pump shaft, remove the pump shaft, bearing and spacer from the front pump body section. Note the installed position of the spacer, where fitted.

(16) Using a press and suitable press plates remove the bearing from the pump shaft.

(17) On 1980-1984 models, using a suitable punch, remove the inner seal from the front pump body, noting the direction of the seal lip.

(18) Remove the rotor with vanes, cam ring and end plates from the rear end of the front pump body.

TO INSPECT

(1) Clean the pump components in suitable cleaning solvent and blow dry with compressed air.

(2) Inspect the front and rear pump body machined surfaces for wear, scratches and damage.

(3) Inspect the pump shaft for bend and wear on the seal contact surfaces.

(4) Inspect the end plates, cam ring, rotor and vanes for wear, scratches and damage.

(5) Inspect the relief valve for wear, scratches and damage and the spring for cracks and bend.

(6) Inspect the shaft bearing for wear and damage and the bolts, spacer, key and connector for wear and damage. Renew all the unserviceable components.

TO ASSEMBLE

NOTE: Lubricate all the pump components with the specified power steering fluid and pack the seals with suitable grease before assembly.

(1) On 1980-1984 models, using a suitable tube to contact the outer edge, press a new inner seal into the front pump body with the seal lip facing the direction noted during dismantling.

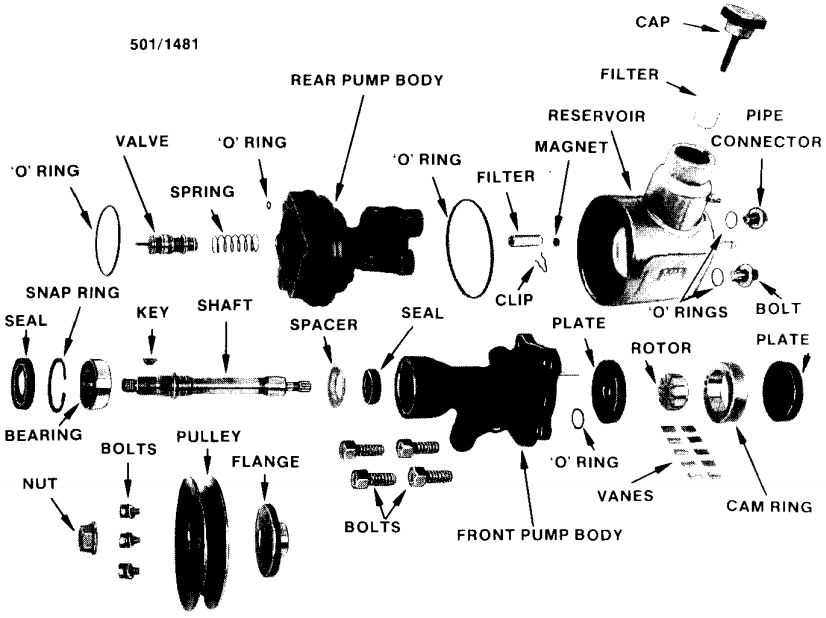
(2) Using a press and suitable press plates instal the bearing onto the pump shaft. Instal the spacer in the position noted during dismantling.

(3) Using a suitable tube to contact the bearing outer race, press the pump shaft into the front pump body ensuring that the spacer where fitted, does not damage the pump body or the seal.

(4) Instal the snap ring to the groove in the front pump body bore adjacent to the bearing. Rotate the snap ring in the groove to verify correct installation.

(5) Using a suitable tube to contact the outer edge, press a new outer seal into the front pump body with the seal lip facing the direction noted during dismantling.

(6) On 1980-1984 models instal the key and the pulley flange to the front end of the pump shaft.



Dismantled view of the power steering pump, 1983 model shown.

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(7) On 1980-1984 models, instal the relief valve spring in the rear pump body. Push the relief valve squarely into the rear pump body avoiding any twisting movement. Check the valve for free, smooth operation.

(8) On 1980-1984 models, instal a new 'O' ring to the recess in the front pump body and instal the front end plate ensuring that the chamfered end of the shaft holes face the front pump body.

(9) Instal the rotor on the pump shaft and instal the vanes with the radius ground edge facing the outside.

(10) Instal the cam ring with the chamfered ends of the pin holes facing the front of the pump body.

(11) Instal the rear end plate with the chamfered ends of the pin holes facing the cam ring.

(12) Instal new 'O' rings or a new gasket, as applicable, to the rear pump body, press the rear pump body squarely onto the front pump body and instal the retaining bolts.

(13) Tighten the retaining bolts to a torque of 59 Nm on 1980-1984 models and 29 Nm on 1985-1987 models.

(14) On 1980-1984 models, instal a new 'O' ring to the rear pump body to seal the reservoir.

(15) On 1980-1984 models instal the magnet and filter into the reservoir and instal the spring clip.

(16) On 1980-1984 models using a soft hammer, carefully tap the reservoir onto the rear pump body.

(17) On 1980-1984 models renew the pipe connector union 'O' ring and instal the pipe connector union to the end of the reservoir.

(18) On 1980-1984 models renew the bolt 'O' ring and instal the bolt to the end of the reservoir.

(19) On 1980-1984 models tighten the connector and bolt to a torque of 49 Nm.

(20) On 1985-1987 models instal the relief valve and spring in the side of the front pump body. Renew the connector 'O' ring, instal the connector and tighten to a torque of 59 Nm.

(21) Instal the pulley to the front of the pump shaft and tighten the retaining nut and bolts where fitted, securely.

(22) On 1985-1987 models renew the 'O' ring on the reservoir flange and instal the reservoir. Tighten the flange bolts securely.

(23) Instal the fluid filter where fitted and the reservoir cap to the reservoir.

(24) Turn the pump shaft by hand and check for smooth rotation. If binding occurs, dismantle the pump and check for presence of dirt, foreign matter or misalignment. Clean the pump or rectify faults and repeat the assembly procedure.

5. POWER STEERING GEAR ASSEMBLY

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Raise the front of the vehicle, support it on chassis stands and remove the front wheels.

(3) Disconnect the outer tie rod ends from the steering arms.

(4) Where fitted, remove the bolts and disconnect the rubber coupling from the pinion flange, or remove the clamp bolt from the intermediate shaft lower universal joint, as applicable.

NOTE: Suitably mark the components of the intermediate shaft to aid assembly.

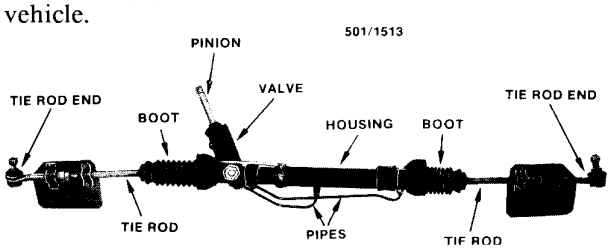
(5) Remove the exhaust engine pipe as described in the Engine section and remove the crossmember plate.

(6) Disconnect the fluid lines from the steering gear assembly, plug the lines to prevent leakage. Plug the holes in the steering gear to prevent the entry of dirt.

(7) Remove the steering gear mounting bolts from the suspension crossmember.

(8) Lower the steering gear until it is clear of the intermediate shaft.

(9) Rotate the steering rearward and withdraw the steering gear out of the right hand side of the vehicle.



Power steering gear removed from the vehicle, 1983 model shown.

NOTE: Special equipment is required to overhaul the power steering rack and pinion assembly. It is therefore recommended that should an overhaul be required the assembly be taken to a specialised workshop for the overhaul to be carried out.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Being careful to avoid damage to the rubber boots, slide the steering gear assembly into the crossmember from the right hand side of the vehicle.

(2) Rotate the steering gear assembly and insert the pinion into the intermediate shaft lower universal joint or, where fitted, connect the pinion flange to the rubber coupling, aligning the marks made during removal.

(3) Instal the steering gear mounting clamps and tighten the mounting bolts to the specified torque ensuring that the clamp on the pinion end of the steering gear assembly is tightened first. Instal the crossmember plate and tighten the retaining bolts securely.

(4) Where fitted, instal the intermediate shaft

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lower universal joint clamp bolt or the rubber coupling bolts. Tighten the bolts to the specified torque.

(5) Connect the fluid lines to the steering gear assembly and tighten the connections securely.

(6) Connect the outer tie rod ends to the steering arms and tighten the retaining nuts to the specified torque.

(7) Fill the power steering pump reservoir and check the fluid level as previously described.

(8) Purge the system of air as previously described.

(9) Adjust the toe in/out as described in the Front Suspension section.

6. STEERING COLUMN

To remove, instal, dismantle and assemble the steering column follow the procedures outlined in Part 2. Conventional Steering.

7. INTERMEDIATE SHAFT

To remove and instal the intermediate shaft follow the procedures outlined in Part 2. Conventional Steering.

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SPECIFICATIONS

Type ..... Independent, McPherson strut with coil spring
Suspension unit:
Type ..... Double acting
Repairable type oil capacity —
Four wheel drive ..... 220 cc
Two wheel drive ..... 205 cc
*Camber angle two wheel drive:
Sedan —
1979–1984 ..... 1 deg 30 min ± 45 min
1985–1987 ..... 45 min ± 45 min
Station Wagon —
1979–1984 ..... 1 deg 45 min ± 45 min
1985–1987 ..... 1 deg ± 45 min
*Camber angle four wheel drive:
1979–1884 and Utility .. 2 deg 35 min ± 45 min
1985–1987—
Sedan ..... 1 deg 40 min ± 45 min
Station Wagon .....1 deg 45 min ± 45 min
*Caster angle two wheel drive:
Sedan —
1979–1984 ..... minus 25 min ± 45 min
1985–1987 ..... 2 deg 30 min ± 45 min
Station Wagon —
1979–1984 ..... minus 5 min ± 45 min
1985–1987 ..... 2 deg 5 min ± 45 min
*Caster angle four wheel drive:
1979–1884 and Utility .. minus 35 min ± 45 min
1985–1987—
Sedan ..... 1 deg 50 min ± 45 min
Station Wagon ..... 1 deg 35 min ± 45 min
Toe in/out:
Two wheel drive —
1979–1984 ..... 1 ± 1 mm toe in
1985–1986 ..... 2 ± 1 mm toe out
1987 ..... 2 ± 3 mm toe in
Four wheel drive —
1979–1984 and Utility ..... 5 mm toe out
1985–1986 ..... 4.5 ± 0.5 mm toe out
1987 ..... 5 ± 3 mm toe out
**Four wheel drive standard ground clearance:
1979–1984 Station Wagon —
Front 250–280
Rear ..... 335–355 mm
Utility —
Front ..... 250–280 mm
Rear ..... 345–365 mm
1985–1987 Station Wagon —
Front ..... 248–282 mm
Rear ..... 259–289 mm
1985–1987 Sedan —
Front ..... 244–278 mm
Rear ..... 245–275 mm

*The camber and caster angles are not adjustable.
**For rear ground clearance adjustment on two wheel drive vehicles refer to the Rear Suspension section. 1987 model suspensions are not adjustable.

TORQUE WRENCH SETTINGS

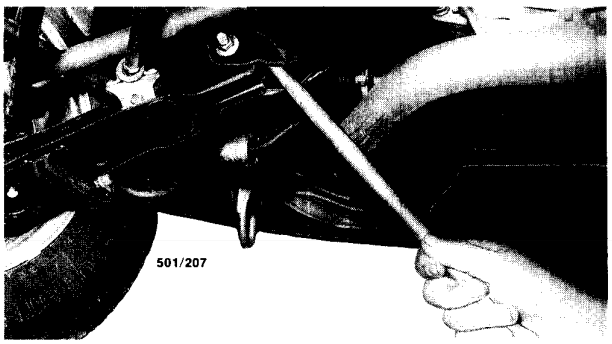
Suspension unit upper mounting to body nuts ..... 36 Nm
Drive shaft nut ..... 196 Nm + 0–30 deg to align split pin hole
Tie rod end to steering arm nut ..... 29 Nm + 0–60 deg to align split pin hole
Repairable suspension unit piston gland nut ..... 118 Nm
Suspension control arm pivot bolt nut:
1979–1982 ..... 64 Nm
1983–1987 ..... 69 Nm
Ball joint stud nut ..... 39 Nm + 0–60 deg to align split pin hole
Suspension unit piston rod nut:
1979–1984 and Utility ..... 74 Nm
1985–1987 ..... 67 Nm

1. FRONT SUSPENSION TROUBLE SHOOTING

NOISY FRONT SUSPENSION

(1) Loose upper suspension mounting or piston rod nuts: Tighten mounting and/or piston rod nuts.
(2) Loose or worn suspension control arm ball joints: Tighten or renew ball joints.
(3) Noise in suspension units: Repair or renew suspension units.
(4) Loose or defective stabiliser bar mountings: Check, tighten or renew mounting rubbers.
(5) Loose or defective radius rod mountings: Check, tighten or renew radius rod mountings.
(6) Worn or damaged front hub bearings: Renew defective parts.
(7) Worn steering gear: Renew defective parts as described in the Steering section.

NOTE: To check the front suspension components for wear, raise the front of the vehicle and support it on chassis stands allowing both front wheels and suspension units to hang free. With an assistant pushing and pulling at the top and then at the



Using a lever to check the suspension control arm inner pivot bushes.

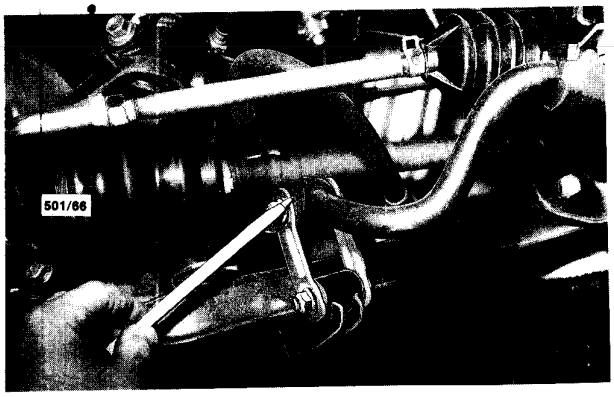
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bottom, check for excessive looseness in the front hub bearings, suspension control arm ball joints and inner pivot bushes.

The inner pivot bushes may also be checked using a lever between the suspension control arm and the crossmember.

To check the radius rod mounting bushes, have the assistant push the wheel firmly towards the rear and then towards the front of the vehicle.

Stabiliser bar mounting rubbers can be visually checked for damage or deterioration.



Check the stabiliser bar rubber visually for deterioration.

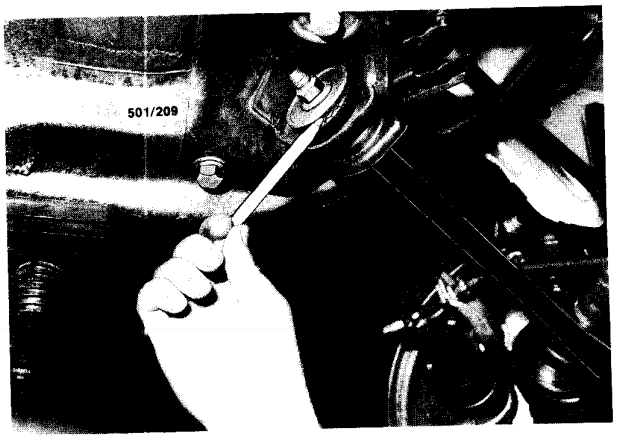
POOR OR ERRATIC ROAD HOLDING ABILITY

(1) Low or uneven tyre pressures: Inflate tyres to the recommended pressures.

(2) Defective suspension unit: Repair or renew defective suspension unit, preferably in pairs.

(3) Unevenly worn front tyres: Instal a matching pair of front tyres.

(4) Loose or defective stabiliser bar mounting rubbers: Check and tighten or renew mounting rubbers.



Check the radius rod mounting bushes for deterioration.

(5) Weak or broken front coil spring: Renew front coil spring, preferably in pairs.

(6) Loose or defective radius rod mounting: Check, tighten or renew radius rod mounting.

(7) Unevenly adjusted ground clearance right to left sides: Adjust ground clearance as detailed later in this section until vehicle attitude, side to side, is level (four wheel drive only).

NOTE: As a quick guide to suspension unit condition, bounce the front of the vehicle up and down (one side at a time) and observe that the vehicle comes to rest in a single movement. If it bounces two or three times before settling, the suspension unit should be repaired or renewed.

If the front of the vehicle is laying down further on one side than the other, remove the coil spring and check its free length against a new spring. If the spring is found to be unserviceable it is a good practice to instal a matching pair of front springs. On four wheel drive vehicles unevenly adjusted ground clearance can give the same result.

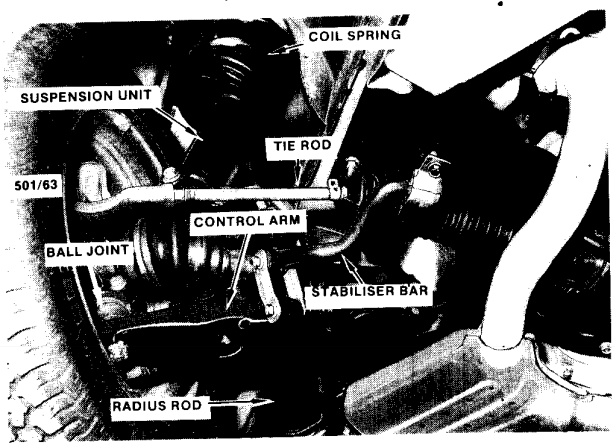
2. DESCRIPTION

Each suspension unit comprises a vertical tubular strut and shock absorber unit, surrounded at the upper end by a coil spring, in the top of which is an upper mounting attached to the underside of the front wheel housing.

The piston rod of the shock absorber is in turn attached to the upper centre of the spring upper mounting.

The lower end of the suspension unit tube is clamped into the top of the steering knuckle which is attached to the suspension control arm by a ball joint clamped into the bottom of the steering knuckle.

The inner end of the suspension control arm is attached to the vehicle front crossmember by a bolt which is retained by a self locking nut.



Underbody view of the right hand side front suspension, 1986 model shown.

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In order to maintain the suspension control arm in correct relationship with the other suspension components in service, a radius rod is mounted between the suspension control arm and the radius rod mounting bracket.

On 1979–1984 and Utility models, a stabiliser bar, atached to the rear of the radius rod mounting brackets and clamped to each radius rod contributes considerably to the riding qualities of the front suspension units. On 1985–1987 Sedan and Station Wagon models, the stabiliser bar is attached to the suspension control arms.

Caster and camber angles are set in production and cannot be adjusted, Any variation in these angles will be caused by worn or damaged components.

Four wheel drive models, prior to 1987, have adjusting nuts to raise the coil spring lower seat which increases the ground clearance. These nuts must be adjusted evenly from front to back and side to side. The correct adjustment procedure is described at the end of this section.

3. FRONT HUB

TO REMOVE AND DISMANTLE

(1) With the handbrake firmly applied, remove the split pin securing the front axle shaft nut. Loosen the drive shaft nut and the front wheel nuts.

(2) Raise the front of the vehicle, support it on chassis stands and remove the front wheel.

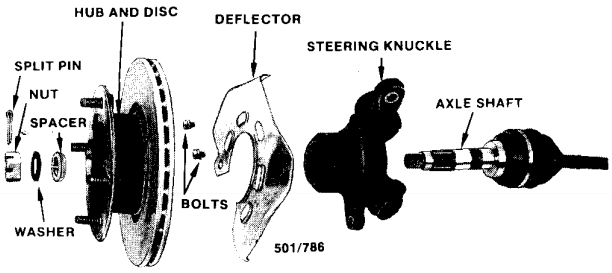
(3) Release the handbrake and disconnect the outer handbrake cable from the retaining bracket on the brake caliper lever.

(4) Disconnect the inner handbrake cable from the caliper lever.

(5) Remove the retaining bolts and lift the brake caliper off the brake disc. Suspend the caliper with a cord or wire to avoid damage to the brake hose.

(6) Remove the split pin and the nut retaining the tie rod end to the steering arm.

(7) Disconnect the tie rod end from the steering arm by holding a suitable dolly or hammer against one side of the steering arm boss and striking the other side with a hammer.



Front hub and steering knuckle components removed from the vehicle.

(8) Remove the bolts retaining the bottom of the suspension unit to the steering knuckle and separate the steering knuckle from the suspension unit. If necessary, open the steering knuckle slightly with a suitable screwdriver and lower the steering knuckle, using care to avoid damage to the axle shaft rubber boot.

(9) Remove the axle shaft nut, washer and spacer.

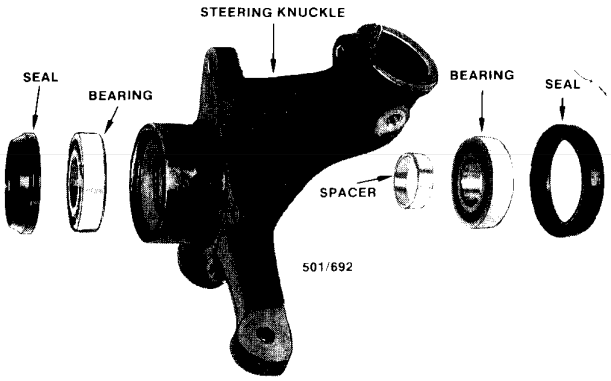
(10) Withdraw the hub and brake disc assembly from the axle shaft by pulling on the hub and tapping the end of the axle shaft with a soft faced hammer. It may be necessary to use a suitable puller if this method fails.

Remove the retaining bolts and withdraw the air deflector from the steering knuckle.

(11) Remove the clamp bolt and disconnect the steering knuckle from the control arm ball joint. If necessary, open the steering knuckle slightly with a suitable screwdriver and withdraw the steering knuckle from the vehicle.

(12) Slide the bearing spacer to one side to gain access to the inner bearing race and using a suitable punch lightly tap the bearing and seal from one end of the steering knuckle housing and remove the spacer.

Reverse the direction of the steering knuckle and remove the bearing and seal from the other end of the steering knuckle. Discard the seals.



Dismantled view of the steering knuckle components.

TO CLEAN AND INSPECT

(1) Remove all the old grease and thoroughly wash all the components in suitable cleaning solvent.

NOTE: Do not spin the bearings with compressed air as damage to the bearings and/or injury to the operator may result.

(2) Inspect the inside of the hub and steering knuckle for wear and damage. Inspect the bearing spacer for wear. Renew all worn or damaged parts.

(3) Turn the bearings by hand and check for roughness or excessive side movement which indicates a faulty bearing.

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TO ASSEMBLE AND INSTAL

(1) Lubricate the bearings by holding a liberal amount of suitable grease in the palm of one hand and kneading the side of the bearing down through the grease. During the kneading process turn the bearing approximately 20 deg at a time until the balls and cage section inside the bearing inner and outer races is full of grease.

(2) Instal a bearing in one side of the steering knuckle tapping with a suitable punch on the bearing outer race until the bearing outer race contacts the shoulder inside the steering knuckle bore.

(3) Reverse the direction of the steering knuckle and smear 10–13 grams of suitable grease inside the steering knuckle bore. Instal the spacer to contact the installed bearing inner race.

(4) Instal the bearing into the other side of the steering knuckle as described in operation (2).

(5) Using a suitable tube on the outside edge of the seal, carefully tap the seal into the end of the steering knuckle bore until the inside edge of the seal contacts the bearing.

Repeat the procedure to instal the seal in the other end of the steering knuckle.

(6) Carefully slide the steering knuckle onto the end of the axle shaft and using the axle shaft nut and suitable spacers pull the axle shaft end through the bearings in the steering knuckle being careful not to damage the seals. Remove the nut and spacers.

(7) Push the control arm ball joint into the bottom of the steering knuckle and tighten the clamp bolt securely.

(8) Push the steering knuckle onto the bottom of the suspension unit and tighten the retaining bolts securely.

(9) Connect the tie rod end to the steering arm, tighten the retaining nut to the specified torque and instal a new split pin.

(10) Instal the air deflector to the steering knuckle and tighten the retaining bolts securely.

(11) Holding the axle shaft outer joint, push the hub and brake disc onto the end of the axle shaft until the inside of the hub contacts the outer steering knuckle bearing.

(12) Instal the spacer, the washer and the drive shaft nut, with the concave side of the washer against the spacer.

(13) Instal the brake caliper to the steering knuckle and tighten the retaining bolts securely.

(14) Connect the inner handbrake cable to the lever on the brake caliper and the outer handbrake cable to the retaining bracket on the brake caliper.

(15) Instal the front wheel, lower the vehicle and tighten the axle shaft nut to the specified torque.

(16) Instal a new split pin to the drive shaft nut and tighten the wheel nuts securely.

(17) Pump the brake pedal to position the brake pads against the brake disc. If necessary, adjust the handbrake as described in the Brakes section.

4. SUSPENSION UNIT

Special Equipment Required:
To Dismantle and Assemble — Spring compressor

TO REMOVE

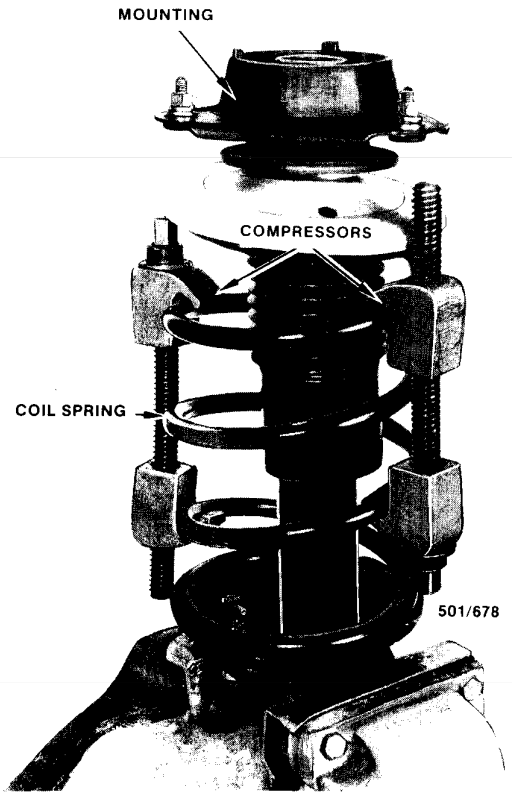
(1) Raise the front of the vehicle, support it on chassis stands and remove the front wheel.

(2) Disconnect the brake hose from the front brake caliper. Plug the end of the hose and the hole in the caliper to prevent the entry of dirt and the loss of fluid.

(3) Remove the retaining clip and disconnect the brake hose from the bracket on the suspension unit.

(4) Remove the suspension unit clamp bolt and the suspension unit bracket retaining bolt from the steering knuckle and push the steering knuckle down off the suspension unit, using care to avoid damage to the drive shaft rubber boot. It may be necessary to open the steering knuckle slightly with a suitable screwdriver.

(5) Working in the engine compartment, mark the installed position of the upper mounting. Remove the nuts retaining the suspension unit to the body and withdraw the suspension unit from the vehicle.



Using spring compressors to compress the coil spring.

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TO DISMANTLE AND ASSEMBLE

(1) Prior to dismantling the suspension unit, clean it thoroughly and ensure that a clean working area is available.

(2) Attach the spring compressors and compress the coil spring. Remove the rubber plug and the piston rod nut from the piston rod.

(3) Remove the suspension unit upper mounting, spacer, seal where fitted, spring seat with rubber insulator, coil spring, rubber boot and bump rubber.

(4) To renew the seals in the hydraulic section of a repairable type suspension unit proceed as follows:

(a) Carefully mount the suspension unit in a vice using suitable jaw protection.

(b) Remove the gland nut from the top of the suspension unit tube.

(c) Remove the piston rod and guide from the suspension unit tube slowly to avoid fluid spillage.

(d) Remove the inner cylinder slowly to avoid fluid spillage.

(e) Invert the suspension unit tube and discard the fluid from the suspension unit.

(f) Inspect the components for wear, bend and damage and renew all the seals supplied in the seal kit.

NOTE: Lubricate all the seals with the fluid supplied with the seal kit prior to installation.

(g) Instal the piston into the inner cylinder, compressing the piston ring with finger pressure and instal the inner cylinder and piston rod into the suspension unit tube and fill the suspension unit with the specified quantity of the fluid supplied with the seal kit.

(h) Instal the guide and gland nut. Tighten the gland nut to the specified torque.

(i) With the suspension unit in a vertical position, extend and retract the piston rod fully several times until a steady and uniform resistance is felt which indicates satisfactory operation of the suspension unit.

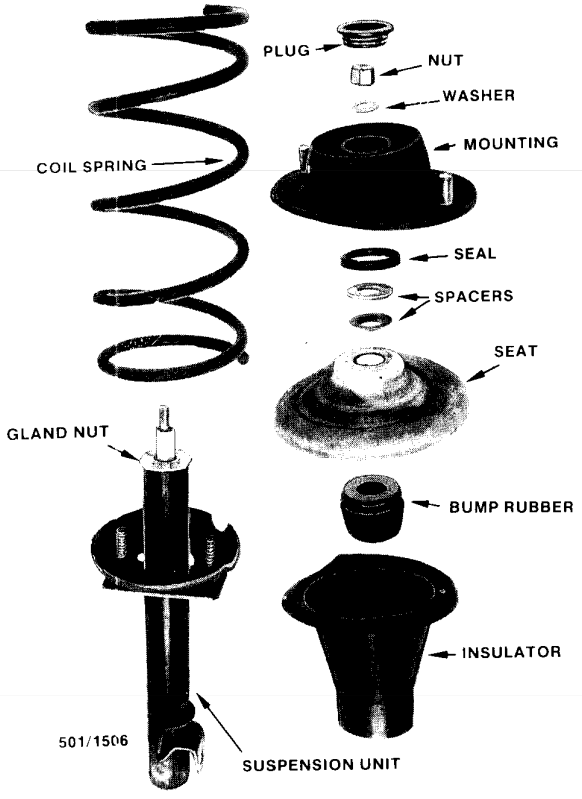
(5) Assemble the coil spring and upper mounting components in the reverse order of dismantling.

TO INSTAL

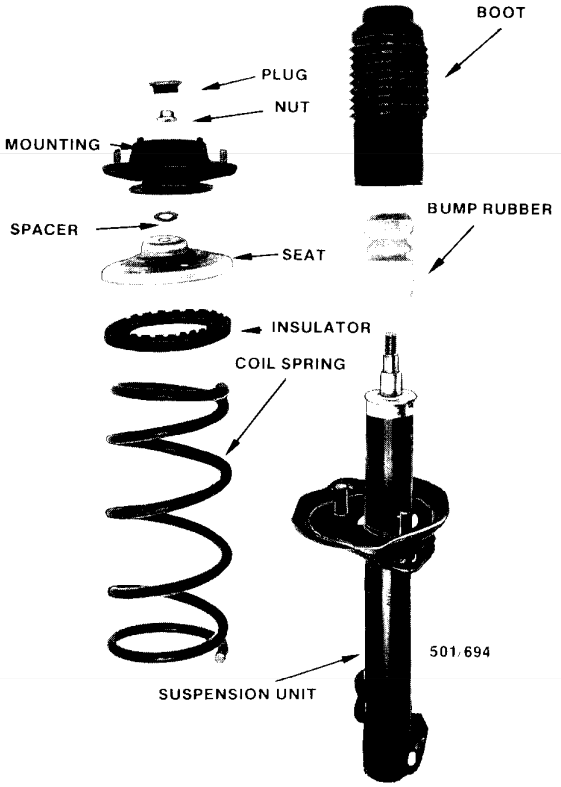
(1) Place the suspension unit in position with the upper mounting in the position marked prior to removal and instal the retaining nuts to the upper mounting. Tighten the retaining nuts to the specified torque.

(2) Slide the steering knuckle onto the bottom of the suspension unit and instal the suspension unit bracket retaining bolt and the clamp bolt. Tighten the bolts securely.

(3) Connect the brake hose to the suspension unit bracket and instal the retaining clip.



Dismantled view of the repairable suspension unit components, 1983 model shown.



Dismantled view of the non-repairable suspension unit components, 1986 model shown.

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(4) Connect the brake hose to the brake caliper and bleed the brakes as described in the Brakes section.

5. BALL JOINT

Special Equipment Required:
To Remove Ball Joint — Suitable puller

TO REMOVE AND INSTAL

(1) Raise the front of the vehicle, support it on chassis stands and remove the front wheel.

(2) Remove the split pin and nut retaining the ball joint stud to the suspension control arm and separate the ball joint from the suspension control arm using a suitable puller.

(3) Remove the clamp bolt from the steering knuckle and slide the ball joint out of the steering knuckle. If necessary use a suitable screwdriver to open the steering knuckle.

(4) Inspect the ball joint rubber boot for cracks and deterioration and the ball joint for wear, cracks and damage. Renew any damaged ball joint.

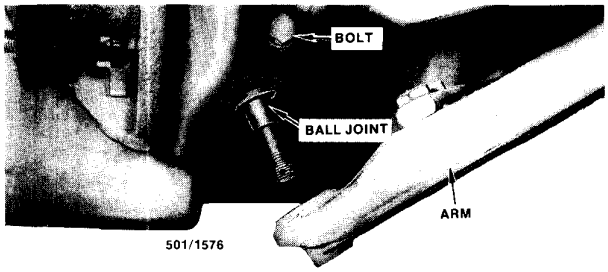
Use the following test procedure to ascertain the serviceability of the ball joints:

(a) Apply a force of 686 N to the end of the ball joint stud and note the distance the stud moves into the ball joint body.

(b) Apply a pull of 686 N to the end of the ball joint stud and note the distance the stud moves out of the ball joint body.

(c) Subtract the distance obtained in (a) from the distance obtained in (b) and renew the ball joint if the result is more than 0.3 mm.

Installation is a reversal of the removal procedure using a new split pin to lock the ball joint stud nut.



View of the ball joint disconnected from the suspension control arm.

6. SUSPENSION CONTROL ARM

Special Equipment Required:
To Remove Ball Joint — Suitable puller

TO REMOVE AND INSTAL

(1) Raise the front of the vehicle, support it on chassis stands and remove the front wheel.

(2) Remove the nut retaining the handbrake cable bracket and separate the handbrake cable bracket from the suspension control arm.

(3) Remove the bolts and disconnect the end of the radius rod from the suspension control arm.

(4) On 1985–1987 Sedan and Station Wagon models, remove the bolt and disconnect the stabiliser bar links from the suspension control arm.

(5) Remove the split pin and nut retaining the ball joint to the suspension control arm and disconnect the ball joint from the suspension control arm, using a suitable puller, if necessary.

(6) Remove the pivot bolt and nut from the inner end of the suspension control arm and withdraw the suspension control arm from the vehicle.

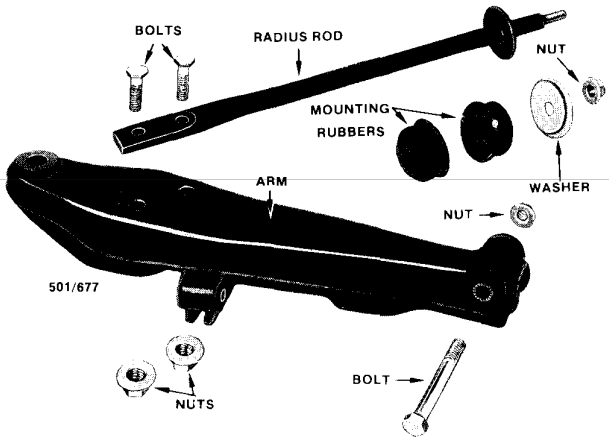
(7) Inspect the suspension control arm rubber bushes for deterioration and the suspension control arm for cracks, bend and damage. Renew as necessary.

Installation is reversal of the removal procedure with attention to the following points:

(1) Coat the radius rod mounting rubbers with a saturated soap solution before installation.

(2) Tighten the suspension control arm inner pivot bolt nut to the specified torque with the weight of the vehicle on the front wheels.

(3) Check and if necessary, adjust the front wheel alignment.



Suspension control arm removed from the vehicle.

7. RADIUS ROD

TO REMOVE AND INSTAL

(1) Raise the front of the vehicle, support it on chassis stands and remove the front wheel.

(2) Remove the bolts retaining the radius rod to the suspension control arm.

(3) Remove the retaining nut from the end of the radius rod and withdraw the radius rod from the vehicle. Note the installed position of the radius rod mounting rubbers to aid assembly.

(4) Inspect the radius rod for bend and damage

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and the mounting rubbers and hardware for damage and deterioration. Renew all damaged parts.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Coat the radius rod mounting rubbers with a saturated soap solution before installation to the positions noted during removal.

(2) Tighten all the bolts and nuts securely.

(3) Check and if necessary, adjust the front wheel alignment.

8. STABILISER BAR

TO REMOVE AND INSTAL

1979–1984 and Utility Models

(1) Raise the front of the vehicle and support it on chassis stands.

(2) Remove the bolts retaining the front stabiliser bar brackets to the radius rods at each side of the vehicle.

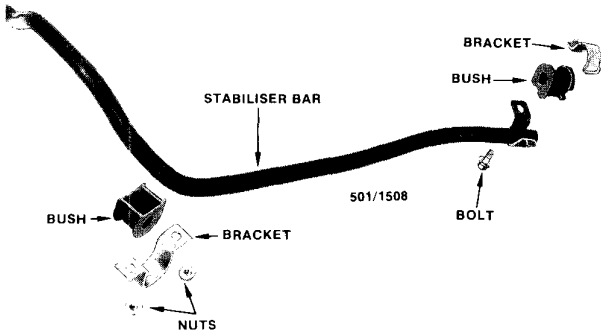
(3) Remove the nuts retaining the stabiliser bar mounting brackets to the rear of the radius rod mounting brackets and remove the mounting brackets and rubber bushes from the stabiliser bar.

(4) Withdraw the stabiliser bar from the vehicle.

(5) Inspect the stabiliser bar for bend and damage and the rubber bushes and mounting hardware for damage and deterioration. Renew all damaged parts.

Installation is a reversal of the removal procedure with attention to the following point:

(1) Tighten the stabiliser bar mounting bracket nuts and bolts securely with the weight of the vehicle on the front wheels.



1979–1984 and Utility stabiliser bar components.

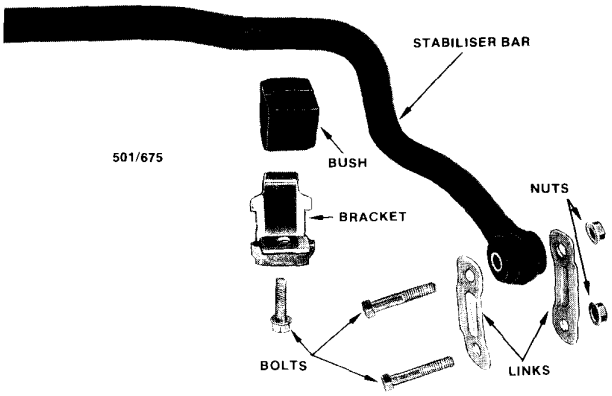
1985–1987 Sedan and Station Wagon Models

(1) Raise the front of the vehicle and support it on chassis stands.

(2) Remove the bolts retaining the engine sump guard to the crossmember at the rear and the body panel at the front and manoeuvre the engine sump guard from the vehicle.

(3) Remove the bolts retaining the ends of the stabiliser bar to the suspension control arms.

(4) Remove the bolts retaining the stabiliser bar mounting brackets to the crossmember and remove the mounting brackets and rubber bushes from the stabiliser bar.



1985–1987 Sedan and Station Wagon stabiliser bar components.

(5) Manoeuvre the stabiliser bar from the vehicle.

(6) Inspect the stabiliser bar for bend and damage and the rubber bushes and mounting hardware for damage and deterioration. Renew all damaged parts.

Installation is a reversal of the removal procedure with attention to the following point:

(1) Tighten the stabiliser bar mounting bracket bolts securely with the weight of the vehicle on the front wheels.

9. STEERING ANGLES AND GROUND CLEARANCE

Special Equipment Required:

To Adjust Rear Ground Clearance, 1985–1986 Sedan and Station Wagon Models — Suitable coil spring compressor

WHEEL ALIGNMENT

NOTE: Extensive knowledge and specialised equipment is required to measure and correct the suspension and steering angles except the front wheel toe in/out. It is therefore not a worthwhile proposition for the layman to do a complete wheel alignment and the vehicle should be taken to a wheel alignment specialist.

Prior to carrying out a wheel alignment the front suspension should be completely checked to ascertain that it is in a serviceable condition.

Carry out a thorough inspection of the steering linkage, front hub bearings, suspension ball joints, springs and suspension unit recoil action. Renew or repair components where necessary.

The tread of the front tyres should be examined for excessive or uneven wear as certain conditions of tyre wear are indicative of damaged or worn compo-

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nents in the suspension, steering linkage or the wheels and hub bearings. Refer to Tyre Wear Trouble Shooting in the Wheels and Tyres section. If the tyres are found to be defective, renew with serviceable tyres.

The vehicle should be unladen, except for the normal amount of fuel, with the tyres inflated to the normal pressures.

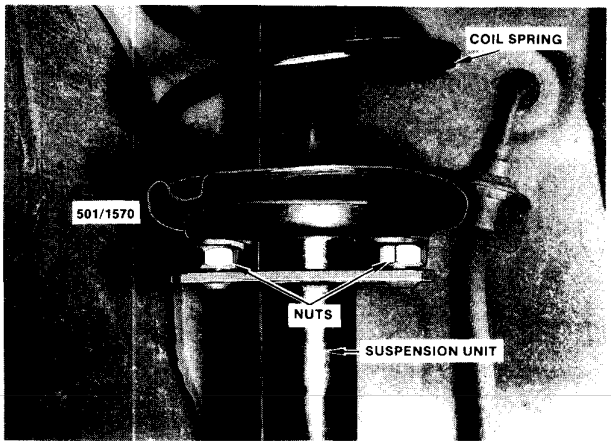
TO CHECK AND ADJUST GROUND CLEARANCE

(1) With the vehicle unladen, on a flat surface and the tyres inflated to the correct pressures measure the distance from the front of the suspension control arm pivot bolt to the ground to obtain the front ground clearance and from the lowest point at each end of the rear suspension tube to the ground to obtain the rear ground clearance.

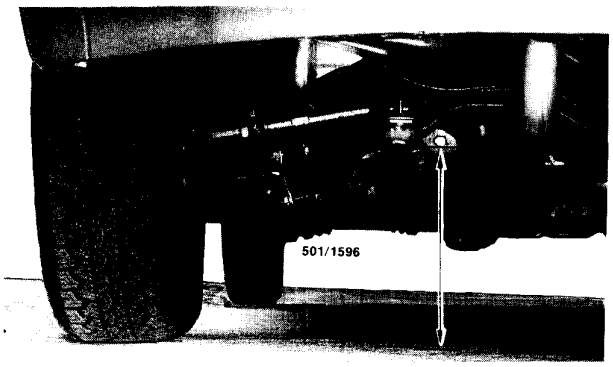
(2) If the front ground clearance is not to Specifications on four wheel drive models, turn the adjusting nuts located under the lower coil spring seat by equal amounts until the front ground clearance is equal on both sides of the vehicle and to Specifications. Two wheel drive models are non-adjustable.

(3) If the rear ground clearance is not to Specifications on 1979–1984 four wheel drive and Utility models, turn the adjusting bolt located at the centre of the rear suspension crossmember until the rear ground clearance is to Specifications.

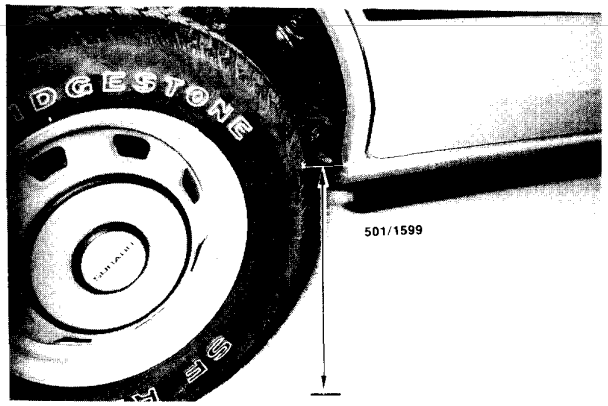
NOTE: On Sedan and Station Wagon models remove the rear seat and the rubber plug in the floor panel to gain access to the adjusting bolt. It will be necessary to work underneath the vehicle on Utility models. On two wheel drive models it will be necessary to alter the position of the trailing link engagement with the torsion bar as described in the Rear Suspension section Part 2. Torsion Bar Suspension.



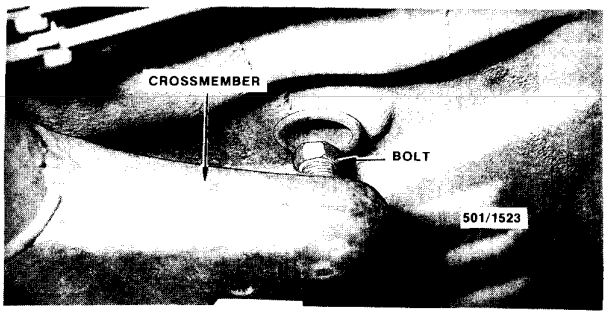
View of the four wheel drive front ground clearance adjustment nuts. Note that two wheel drive vehicles are non adjustable.



View of the front ground clearance measuring point.



View of the rear ground clearance measuring point.

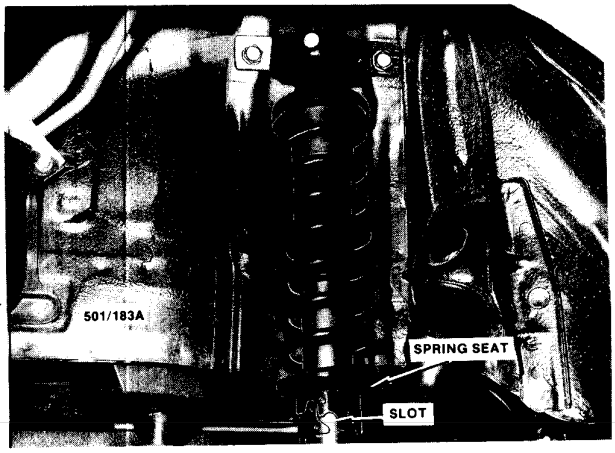


View of the 1979–1984 four wheel drive and Utility models rear ground clearance adjustment bolt.

On 1985–1986 four wheel drive Sedan and Station Wagon models, compress the rear coil spring and rotate the lower coil spring seat until the rear ground clearance is equal on both sides of the vehicle and to Specifications.

NOTE: Changing the rear coil spring lower seat from one slot to the adjacent slot will alter the ground clearance by 15 mm. Two wheel drive 1985–1986 Sedan and Station Wagon models do not have adjustable suspension. 1987 model suspensions are not adjustable, ground clearance errors require coil spring renewal for rectification.

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View of the 1985–1986 Sedan and Station Wagon four wheel drive rear ground clearance adjustment.

TO CHECK AND ADJUST TOE IN/OUT

(1) Ensure that the vehicle ground clearance is at the specified height.

(2) Raise the front of the vehicle and support it on chassis stands.

(3) Spin each front wheel in turn and using a piece of chalk, mark a thin line around the periphery of each tyre as near to the centre as possible.

(4) Lower the vehicle to the floor and bounce the vehicle up and down several times to settle the suspension. Set the front wheels in the straight ahead position.

(5) Mark the centre chalk line on both tyres in front of the suspension at the height of the wheel centres.

(6) Using a telescopic gauge or rule, measure the distance between the two marks on the tyre centres. Record the measurement.

(7) Maintain the wheels in the straight ahead position, roll the vehicle forward until the marks are the same distance above the floor, but to the rear of the front suspension.

(8) Again, use the telescopic gauge or rule to measure the distance between the marks on the tyres. Subtract the measurement taken with the marks at the front of the suspension from the measurement taken with the marks at the rear of the suspension to obtain the toe in figure. Alternatively, subtract the measurement taken with the marks at the rear of the suspension from the measurement taken with the marks at the front of the suspension to obtain the toe out figure. Compare the toe in/out figures to Specifications.

(9) If adjustment is required proceed as follows:

(a) Remove the outer clips from the steering gear rubber boots and loosen the tie rod end locknuts.

(b) Adjust the tie rods as required until the correct toe in/out is reached.

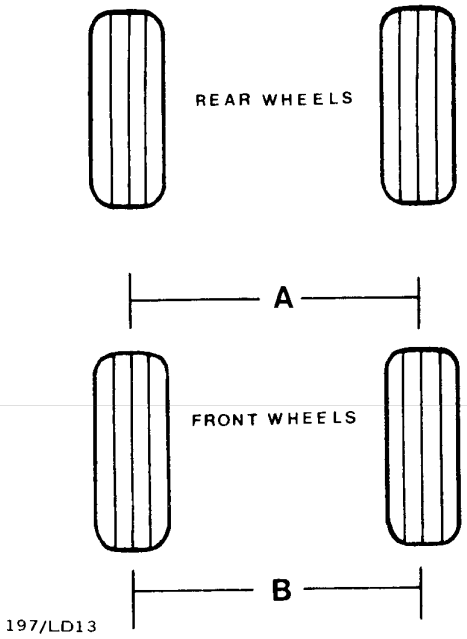
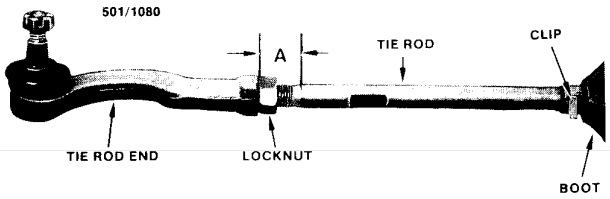


Diagram indicating front wheel toe in/out. Refer to Specifications for the correct difference between measurement 'A' and 'B'.



View of the tie rod and components used to adjust toe in/out. Arrows indicate the initial tie rod end installation measurement. Refer to the Steering section.

NOTE: It is important to make equal adjustments to each tie rod to maintain the central position of the steering gear.

(c) Tighten the tie rod end locknuts and instal the outer clips to the steering gear rubber boots.

(d) Check the position of the steering wheel with the front wheels in the straight ahead position. If necessary remove and reposition the steering wheel. Refer to the Electrical System section for the correct steering wheel removal and installation procedure.

NOTE: Ensure that the steering gear is in the central position when the front wheels are in the straight ahead position. If necessary, shorten and lengthen the appropriate tie rods by equal amounts to achieve this condition.

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PART 1. REAR SUSPENSION TROUBLE SHOOTING

FAULTS, CAUSES AND REMEDIES

NOISE IN SUSPENSION

(1) Defective shock absorbers, suspension units or mountings: Renew faulty components.

(2) Loose or worn trailing arm/link bushes or pivot bolts: Check and tighten or renew worn components.

(3) Where applicable, worn or broken torsion bar: Check and renew torsion bar.

(4) Where applicable, broken coil spring: Renew coil spring.

NOTE: As a quick guide to shock absorber or suspension unit condition, bounce the vehicle up and down (one side at at time) and observe if the vehicle comes to rest in a single movement. If the vehicle bounces two or three times before coming to rest the shock absorber or suspension unit is suspect. If suspect, remove the shock absorber or suspension unit and check for damage or leaks.

To check the trailing arms, bushes and pivot bolts, insert a lever between the suspect unit and its mounting and lever the unit back and forth checking for excessive movement.

Where fitted, check the rear springs visually for breaks and check the spring seats for damage and distortion.

Where fitted, remove the torsion bars and height adjustment arm and check for wear and damage.

REAR WHEELS NOT IN ALIGNMENT WITH FRONT WHEELS

(1) Broken or badly worn trailing arm bolts or bushes: Renew faulty parts.

(2) Damaged or bent trailing arm: Renew faulty parts.

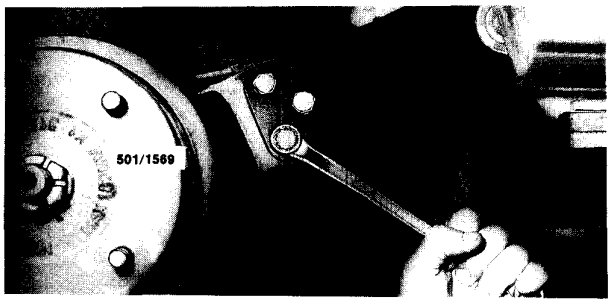
(3) Bent suspension crossmember: Renew suspension crossmember.

NOTE: to check this condition measure from the centre of the front wheels to the centre of the rear wheels on both sides. Compare the measurements which must be equal. Before measuring, ensure that the front wheels are in the straight ahead position.

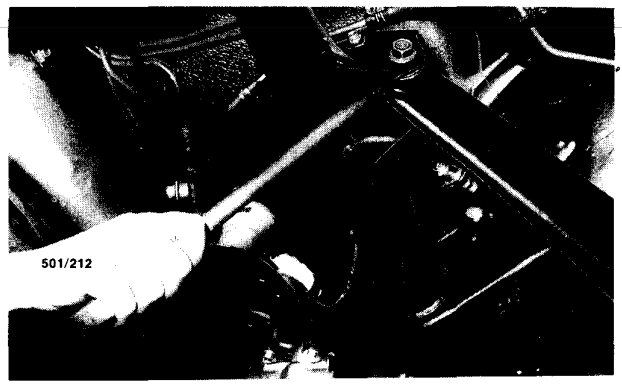
POOR OR ERRATIC ROAD HOLDING ABILITY

(1) Low or uneven tyre pressures: Inflate the tyres to the recommended pressures.

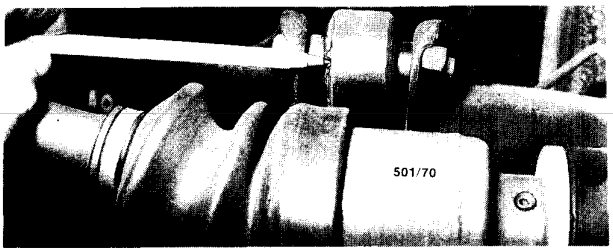
(2) Defective suspension unit or shock absorber:



Checking the trailing link bolts for security.



Using a lever to check the trailing arm pivot bushes.



Inspect the suspension unit lower mounting bush for deterioration.

Check and renew the defective suspension unit or shock absorber, preferably in pairs.

(3) Worn or damaged trailing arm pivot bushes or bolts: Check and renew trailing arm pivot bolts or bushes.

(4) Where applicable, worn or damaged coil spring: Renew the coil spring, preferably in pairs.

(5) Where applicable, worn or damaged torsion bar: Check and renew the torsion bar.

NOTE: If the rear of the vehicle is laying down further on one side that the other, check that the suspension unit lower spring seats are adjusted equally. Remove the coil spring and check its free length against a new spring. Remove and check the torsion bar on torsion bar suspension.

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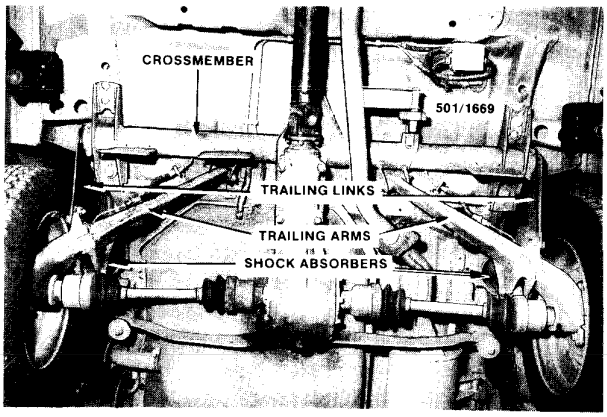
PART 2. TORSION BAR REAR SUSPENSION

SPECIFICATIONS

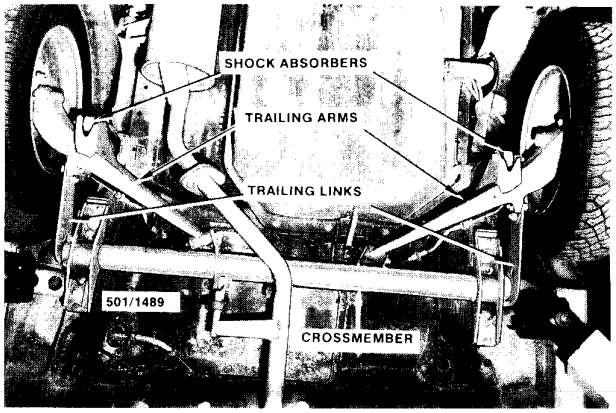
Type	Independent, trailing arm with torsion bar and shock absorber
Shock absorber type:	
1979–1980 models	Double acting, telescopic, hydraulic
1981–1984 and Utility models	Double acting, telescopic, gas pressurised
Four wheel drive hub end float	0.06–0.10 mm
Two wheel drive hub starting force, except 1984 models	14 N
Two wheel drive hub starting force, 1984 models	18 N

TORQUE WRENCH SETTINGS

Four wheel drive hub nut	196 Nm
Four wheel drive hub ring nut	221 Nm
Two wheel drive hub nut, except 1984 models	49 Nm then back $\frac{1}{8}-\frac{1}{10}$ turn
Two wheel drive hub nut, 1984 models	39 Nm then back $\frac{1}{8}-\frac{1}{10}$ turn
Trailing link to trailing arm bolts	147 Nm
Trailing arm pivot bolt	93 Nm
Trailing link pivot bush retaining bolt	39 Nm
Shock absorber upper mounting bolt	127 Nm
Shock absorber lower mounting bolt	118 Nm
Suspension crossmember mounting bolt	147 Nm



Underbody view of the four wheel drive torsion bar type rear suspension.



Underbody view of the two wheel drive torsion bar type rear suspension.

1. DESCRIPTION

The rear suspension fitted to 1979–1984 and Utility models consists of a hollow, tubular suspension crossmember which is attached to the vehicle underbody by brackets welded to the outer ends of the suspension crossmember.

The rear hubs on four wheel drive models are splined onto the drive shafts which rotate on bearings located in the end of the trailing arm.

Trailing arms which pivot in brackets welded to the rear of the suspension crossmember are held in alignment in service by trailing links which are bolted to the trailing arms and located in the ends of the suspension crossmember by Metalastic bushes.

Torsion bars are splined into the trailing links at one end and the centre of the suspension crossmember at the other end.

On four wheel drive models, the torsion bar inner ends are splined into the height adjustment arm and by turning the bolt in the end of the height adjustment arm, the torque on the torsion bars is increased or decreased with a subsequent change in the vehicle ground clearance.

Double acting, telescopic shock absorbers are installed between the rear of the trailing arms and the vehicle body to aid stability and enhance the riding qualities of the suspension.

2. TORSION BAR AND TRAILING LINK

Special Equipment Required:

To Renew Trailing Link Pivot Bush: Press and press plates

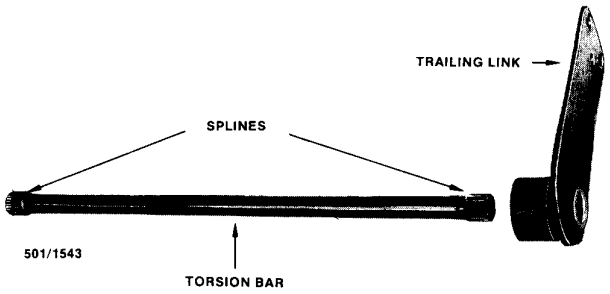
TO REMOVE AND INSTAL

(1) Working between the rear wheel arch and the wheel, remove the rear shock absorber upper mounting bolts.

(2) Raise the rear of the vehicle, support it on chassis stands placed clear of the rear suspension and remove the rear wheel.

(3) Disconnect the brake hose from the brake pipe at the bracket on the front of the trailing arm. Plug the ends of the hose and pipe to prevent the entry of dirt and the loss of fluid.

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View of the trailing link and torsion bar removed from the vehicle.

(4) Remove the suspension crossmember mounting bolts on the side being repaired and loosen the suspension crossmember mounting bolts on the opposite side of the vehicle.

(5) Suitably support the suspension crossmember in a position low enough for the torsion bar to clear the body panel on removal.

(6) Suitably mark the splines of the torsion bar and the trailing link to aid assembly.

(7) Remove the bolts retaining the trailing link to the trailing arm.

(8) Remove the trailing link pivot bush retaining bolt from the end of the suspension crossmember and withdraw the trailing link and torsion bar from the vehicle.

(9) Separate the trailing link from the torsion bar and inspect the trailing link, torsion bar and mounting hardware for cracks, wear and damage. Renew all the unserviceable components. Inspect the Metalastic bush in the trailing link for deterioration and, if necessary, renew the bush as follows:

(a) Support the trailing link in a press using suitable press plates behind the Metalastic bush.

(b) Using a suitable mandrel to slide inside the bush and engage the mounting tube, push on the mounting tube and remove the Metalastic bush from the trailing link.

(c) Place the trailing link flat on the press bed plates and press the new bush onto the mounting tube using a suitable tube to contact the steel outer bush.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Align the torsion bar and trailing link marks made prior to removal.

(2) Tighten all the bolts to the specified torque.

(3) Tighten the trailing link pivot bush retaining bolt with the weight of the vehicle on the rear wheels.

(4) Check the rear ground clearance as described in the Front Suspension section.

On four wheel drive models the ground clearance adjustment procedure is fully outlined in the Front Suspension section.

On two wheel drive models no adjustment is provided, except for the repositioning of the torsion bar. If it is necessary to alter the rear ground clearance proceed as follows:

(a) Raise the rear of the vehicle, support it on chassis stands placed clear of the rear suspension and remove the rear wheel.

(b) Using the criteria that a change of one spline on the inner end of the torsion bar, which has 37 splines, will alter the ground clearance by 68 mm and a change of one spline on the outer end of the torsion bar, which has 34 splines, will alter the ground clearance by 74 mm, determine the number of splines change required at each end of the torsion bar.

(c) Mark the original position of the trailing link on the torsion bar and measure the vertical distance between the end of the trailing link and the vehicle underbody. Remove the trailing link and torsion bar as previously described.

(d) Rotate the torsion bar and trailing link assembly the required number of splines. Separate the trailing link from the torsion bar and rotate the trailing link in the opposite direction the required number of splines to obtain the specified ground clearance.

(e) Connect the trailing link to the trailing arm and repeat the measurement taken in operation (c). The change in ground clearance will be twice the change in this measurement.

3. SHOCK ABSORBER

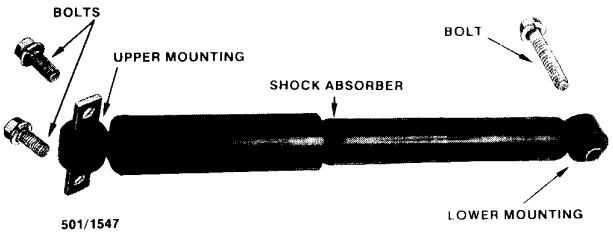
TO REMOVE

(1) Raise the rear of the vehicle and support it on chassis stands

(2) For ease of access remove the rear wheel.

(3) Support the trailing arm and remove the shock absorber lower mounting bolt from the trailing arm.

(4) Remove the shock absorber upper mounting bolts and withdraw the shock absorber from the vehicle.



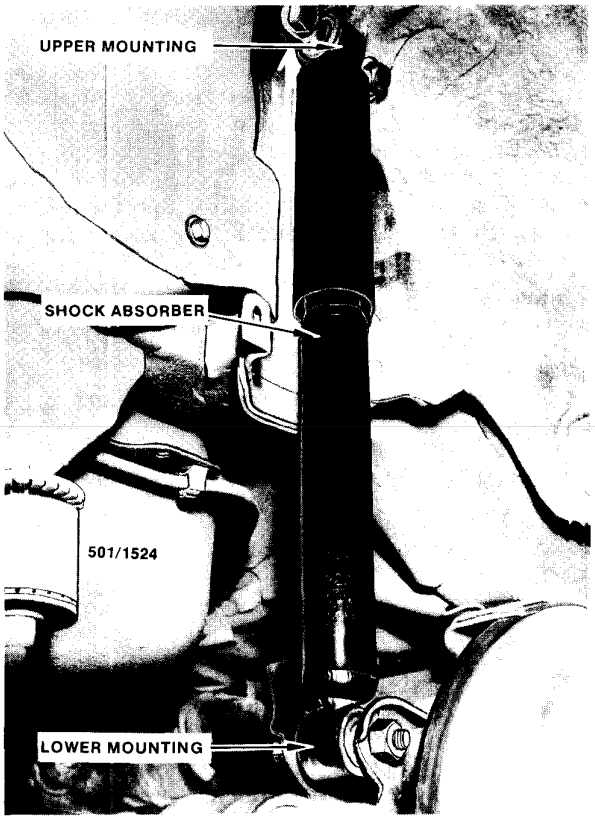
Shock absorber assembly removed from the vehicle.

TO TEST AND BLEED

(1) Hold the shock absorber upright and fully extend it.

(2) Push the top of the shock absorber downward and note the movement travelled before resistance is felt. The movement should be 10 mm or less. Continue to fully compress and extend the shock absorber and check for steady and uniform resistance

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Installed view of the shock absorber.

which should be felt over the entire travel of the shock absorber.

(3) If the initial free movement is more than 10 mm proceed as follows:

(a) Invert the shock absorber and fully compress it.

(b) With the shock absorber fully compressed, turn it upright and fully extend it.

Repeat the above operation several times until the initial free movement is 10 mm or less. Renew the shock absorber if the above operation is not successful or if the shock absorber has dents, damage or fluid leaks.

TO INSTAL

Installation is a reversal of the removal procedure ensuring that the lower shock absorber mounting bolt is tightened to the specified torque with the weight of vehicle on the rear wheels.

GAS PRESSURISED SHOCK ABSORBERS

The removal, installation and test procedures for vehicles fitted with gas pressurised shock absorbers are identical to those for conventional shock absorbers. However bleeding is not required nor possible.

4. TRAILING ARM

Special Equipment Required:
To Renew Trailing Arm Pivot Bush: Press and press plates

TO REMOVE AND INSTAL

(1) Raise the rear of the vehicle, support it on chassis stands and remove the rear wheel.

(2) On four wheel drive models, disconnect the axle shaft from the hub drive shaft as described in the Rear Axle section.

(3) Remove the shock absorber lower mounting bolt from the trailing arm bracket.

(4) Disconnect the brake hose from the brake pipe at the bracket on the front of the trailing arm. Plug the ends of the hose and the pipe to prevent the entry of dirt and loss of fluid .

(5) Remove the bolts retaining the trailing link to the trailing arm.

(6) Remove the trailing arm pivot bolt from the bracket on the suspension crossmember and withdraw the trailing arm from the vehicle.

(7) Inspect the trailing arm for cracks, bend and damage, the trailing arm pivot bush for deterioration and the mounting hardware for wear and damage.

If necessary, renew the trailing arm pivot bush as follows:

(a) Support the trailing arm in a press and using a mandrel slightly smaller than the outer diameter of the bush, press the bush out of the trailing arm.

(b) Press the new bush into the trailing arm using a suitable tube to contact the steel outer bush.

Installation is a reversal of the removal procedure ensuring that the trailing arm pivot bolts and the shock absorber lower mounting bolt are tightened to the specified torque.

5. REAR HUB

The removal, installation and overhaul procedures for four wheel drive and two wheel drive rear hubs are fully explained in Part 3. Coil Spring Suspension.

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PART 3. COIL SPRING REAR SUSPENSION

SPECIFICATIONS

Type	Independent, trailing arm with coil spring and gas pressurised suspension unit
Four wheel drive hub end float	0.06–0.10 mm
Two wheel drive hub starting force	14 N

TORQUE WRENCH SETTINGS

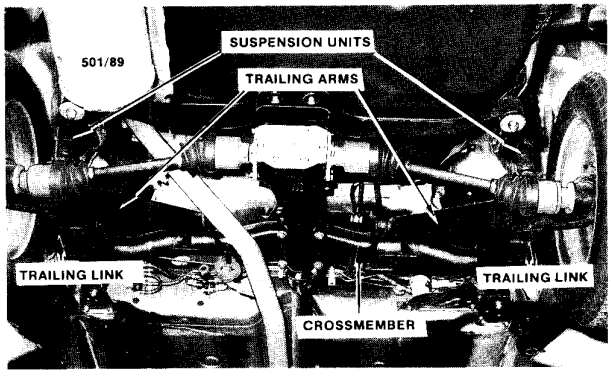
Four wheel drive hub nut	196 Nm
Four wheel drive hub ring nut	221 Nm
Two wheel drive hub nut	49 Nm then back $\frac{1}{8} - \frac{1}{10}$ turn.
Piston rod nut	20 Nm
Piston rod locknut	25 Nm
Suspension unit upper mounting bolts	127 Nm
Suspension unit lower mounting bolt	118 Nm
Trailing link to trailing arm bolts	177 Nm
Trailing arm pivot bolt	137 Nm
Trailing link pivot bolt	177 Nm

1. DESCRIPTION

The rear suspension fitted to 1985–1987 Sedan and Station Wagon models consists of a hollow, tubular suspension crossmember which is attached to the vehicle underbody by brackets fixed to the outer ends of the suspension crossmember.

Trailing arms which pivot in brackets welded to the rear of the suspension crossmember are held in alignment in service by trailing links which are bolted to the trailing arms and pivot in brackets welded to the rear of the suspension crossmember.

The rear hubs on four wheel drive models are splined onto the drive shafts which rotate on bearings located in the end of the trailing arm. The rear hubs on two wheel drive models rotate on bearings located on stub axles on the end of the trailing arm.



Underbody view of the four wheel drive coil spring type rear suspension.

Double acting, telescopic suspension units with integral coil springs are installed between the rear of the trailing arms and the vehicle body.

On four wheel drive models, prior to 1987, the lower coil spring seat is adjustable to alter the vehicle ground clearance. The two wheel drive models are not adjustable.

2. TRAILING LINK

Special Equipment Required:
To Renew Trailing Link Bush — Press and press plates

TO REMOVE AND INSTAL

(1) Raise the rear of the vehicle, support it on chassis stands and for ease of access remove the rear wheel.

(2) Remove the bolts retaining the trailing link to the trailing arm.

(3) Remove the trailing link pivot bolt and withdraw the trailing link from the vehicle.

(4) Inspect the trailing link for cracks, bend and damage and the pivot bush for deterioration. If necessary, renew the pivot bush as follows:

(a) Support the trailing link in a press and using a mandrel with a diameter slightly smaller than the outer diameter of the bush, press the bush out of the trailing link.

(b) Press the new bush into the trailing link using a suitable tube to contact the steel outer bush.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Tighten the trailing link pivot bolt to the specified torque with the weight of the vehicle on the rear wheels.

(2) Tighten the trailing link retaining bolts to the specified torque.

3. TRAILING ARM

Special Equipment Required:
To Renew Trailing Arm Bush — Press and press plates

TO REMOVE AND INSTAL

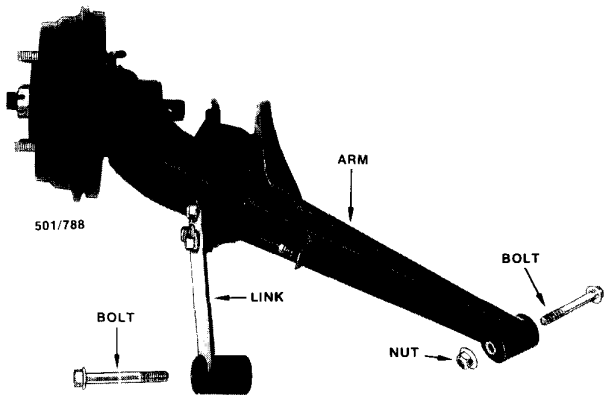
(1) Raise the rear of the vehicle, support it on chassis stands and remove the rear wheel.

(2) On four wheel drive models, disconnect the axle shaft from the hub drive shaft as described in the Rear Axle section.

(3) Remove the suspension unit lower mounting bolt.

(4) Disconnect the brake hose from the brake pipe at the bracket on the front of the trailing arm.

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View of the trailing arm and trailing link removed from the vehicle.

Plug the ends of the hose and the pipe to prevent the entry of dirt and the loss of fluid.

(5) Remove the bolts retaining the trailing link to the trailing arm.

(6) Remove the trailing arm pivot bolt and withdraw the trailing arm from the vehicle.

(7) Inspect the trailing arm for cracks, bend and damage and the pivot bush for deterioration. If necessary, renew the pivot bush as follows:

(a) Support the trailing arm in a press and using a mandrel with a diameter slightly smaller than the outer diameter of the bush, press the bush out of the trailing arm.

(b) Press the new bush into the trailing arm using a suitable tube to contact the steel outer bush.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Tighten the trailing arm pivot bolt and the suspension unit lower mounting bolt with the weight of the vehicle on the rear wheels.

(2) Tighten all the bolts to the specified torque.

4. SUSPENSION UNIT

Special Equipment Required:
To Dismantle and Assemble — Suitable coil spring compressor

TO REMOVE

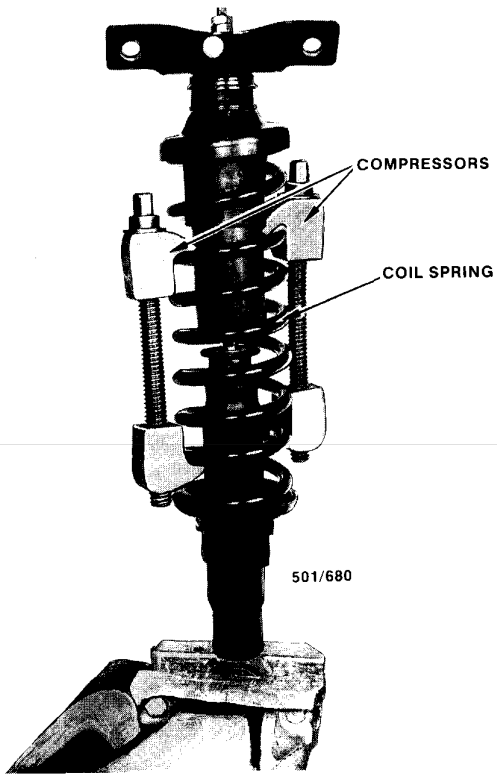
(1) Raise the rear of the vehicle and support it on chassis stands. For ease of access remove the rear wheel.

(2) Support the trailing arm and remove the suspension unit lower mounting bolt from the trailing arm.

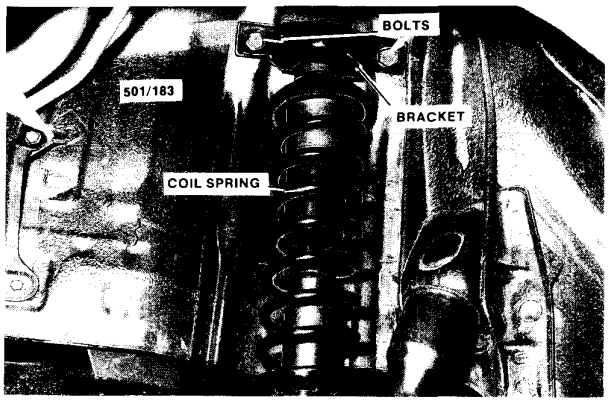
(3) Remove the suspension unit upper mounting bolts and withdraw the suspension unit from the vehicle.

TO DISMANTLE, INSPECT AND ASSEMBLE

(1) Instal the spring compressor and compress the coil spring.



Using spring compressors to compress the coil spring.



Installed view of the suspension unit upper mounting.

(2) Remove the piston rod locknut, nut, washer and rubber bush and remove the mounting bracket.

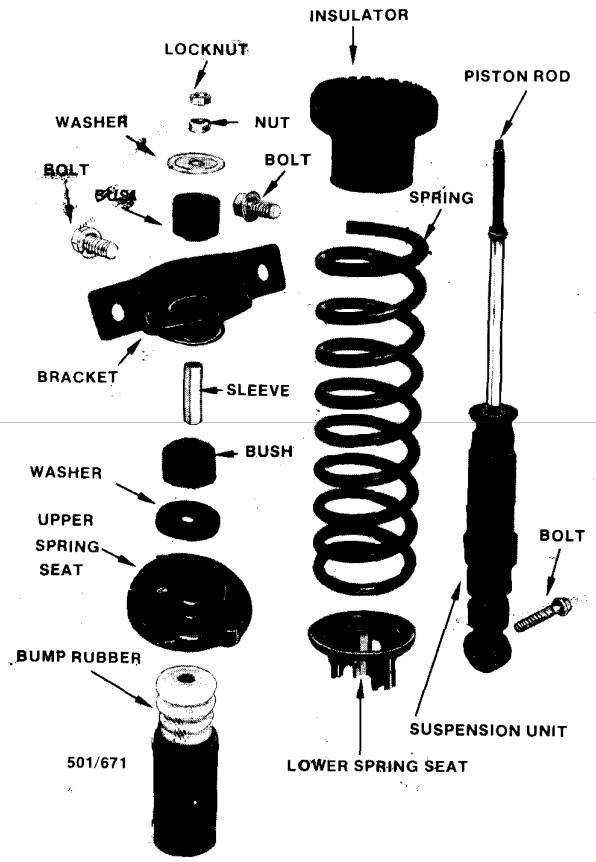
(3) Remove the sleeve, rubber bush, washer, upper spring seat and insulator.

(4) Remove the coil spring, bump rubber and on four wheel drive models. the lower spring seat. Note that the coil spring is installed with the flat end down.

(5) Inspect all the components for cracks, wear, damage and deterioration. Compare the coil spring free length with the free length of a new spring. Renew all unserviceable components.

(6) Check the suspension unit for dents, damage and fluid leaks. Push the piston rod into the body of

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Dismantled view of the suspension unit.

the suspension unit and check for steady and uniform resistance over the entire travel. Release the piston rod and check that it returns to the fully extended position in a smooth manner.

(7) Check the lower mounting bush for deterioration and if necessary, renew the bush as follows:

(a) Support the suspension unit in a press and using a mandrel with a diameter slightly smaller than the outer diameter of the bush, press the bush out of the suspension unit.

(b) Press the new bush into the suspension unit using a suitable tube to contact the steel outer bush.

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Instal the coil spring in the position noted during dismantling.

(2) Tighten the piston rod nuts to the specified torque.

TO INSTAL

Installation is a reversal of the removal procedure ensuring that the lower suspension unit mounting bolt is tightened to the specified torque with the weight of the vehicle on the rear wheels.

5. REAR HUB

Special Equipment Required:

To Remove and Instal — Hub ring nut tool, suitable press and press plates, dial gauge, suitable puller

FOUR WHEEL DRIVE MODELS

To Remove and Dismantle

(1) Ensure that the handbrake is fully applied.

(2) Remove the rear wheel hub caps and brake drum hub retaining nut split pin and loosen the retaining nut and wheel nuts.

(3) Raise the rear of the vehicle and support it on chassis stands, remove the road wheels and the hub retaining nut from the axle.

(4) Remove the axle shafts as described in the Rear Axle section.

(5) Remove the spacer, shaped washer and brake drum hub from the drive shaft noting the installed position of the spacer.

(6) Disconnect the brake pipe from the brake hose on the crossmember, remove the retaining clip and separate the hose from the crossmember. Plug the brake hose and pipe apertures to prevent the entry of dirt.

(7) Remove the retaining bolts and remove the brake backing plate from the trailing arm.

(8) Support the trailing arm and remove the suspension unit lower mounting bolt from the trailing arm.

(9) Remove the trailing arm to trailing link retaining bolts.

(10) Remove the trailing arm pivot bolt and remove the trailing arm from the vehicle.

(11) Secure the trailing arm in a suitable vice or holding fixture, remove the staking and using the special rear hub ring nut tool remove the ring nut from the trailing arm.

(12) Using a soft headed hammer drive the hub drive shaft, inner bearing cone and spacer, where fitted, from the trailing arm.

(13) Using a suitable screwdriver, prise the oil seal from the outer side of the trailing arm and remove the outer bearing cone. Discard the oil seal.

NOTE: If the hub drive shaft bearings are being removed for repacking only it will not be necessary to remove the inner and outer bearing cups.

(14) Using a suitable press and press plates, support the trailing arm and position a suitable drift or tube on the outer bearing cup and press the cups and spacer from the trailing arm. Note the installed position of the cups and their mating cones.

(15) Using a suitable press and press plates support the inner bearing cone and drive shaft and press the bearing cone and spacer, where fitted, from the drive shaft. Discard the bearing.

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(16) Using a suitable screwdriver prise the oil seal from the interior of the rear hub ring nut. Discard the oil seal.

To Check and Inspect

(1) Thoroughly clean all parts in a suitable solvent.

(2) Check the bearing cones and cups for wear and damage, renew as necessary.

NOTE: Do not spin the bearings with compressed air as damage to the bearings and or injury to the operator may result. Individual components of bearings should not be renewed separately. If any component of the bearing is faulty the complete bearing must be renewed.

(3) Check the hub drive shaft for spline damage, bend and wear, renew as necessary.

(4) Check the ring nut for wear and damage, renew as necessary.

(5) Check the trailing arm pivot bushes for wear and damage, renew as necessary. Refer to the Trailing Arm heading for the renewal procedure.

Check the trailing arm for wear and damage. Pay particular attention to the bearing aperture surface.

To Assemble and Instal

(1) Lubricate the bearings by holding a liberal amount of suitable grease in the palm of one hand and kneading the side of the bearing down through the grease. During the kneading process turn the bearing approximately 20 deg at a time until the roller and cage section is full of grease.

(2) Using a suitable press and press plates, support the inner bearing cone, position the hub drive shaft and press the drive shaft into the bearing until it is positioned as noted on removal. Where applicable instal the inner spacer.

NOTE: Ensure that pressure is only applied to the inner race of the bearing cone to avoid damage to the bearing.

(3) Using a suitable press and press plates, support the trailing arm and position the outer bearing cup and a suitable drift or tube on the cup. Press the cup into the trailing arm until it is positioned as noted on removal.

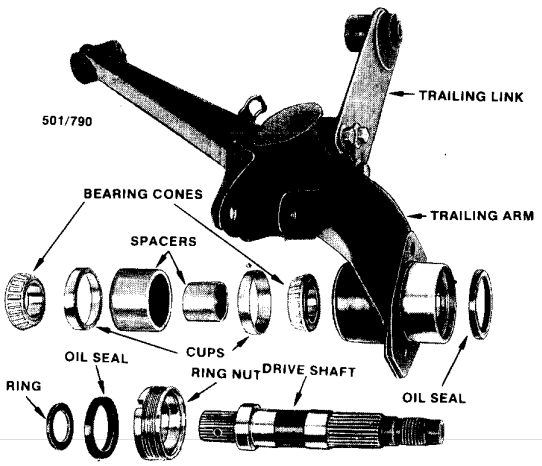
(4) Using a similar procedure, instal the spacer, the inner bearing cup into the trailing arm as noted on removal.

(5) Apply the recommended grease to the cups in the trailing arm. Refer to the Lubrication and Maintenance section.

(6) Instal the hub drive shaft and inner bearing cone to the trailing arm.

(7) Using a suitable drift or tube instal the outer bearing cone to the drive shaft and trailing arm while supporting the drive shaft.

(8) Using a suitable drift, instal a new oil seal into the ring nut.



Dismantled view of four wheel drive rear hub components, 1986 model shown.

Instal the ring nut to the trailing arm and using the hub ring nut tool tighten the nut to Specifications and secure the nut by staking the trailing arm housing.

(9) Using a suitable drift, instal the new oil seal to the outer side of the trailing arm.

(10) Instal the trailing arm to the crossmember and the trailing link and instal the retaining bolts and nuts loosely.

(11) Instal the brake backing plate assembly to the trailing arm and instal the retaining bolts and nuts and tighten to Specifications.

(12) Remove the plugs from the brake pipe and hose and instal the hose to the crossmember and secure with the retaining clip.

(13) Instal the brake pipe to the hose and tighten securely. Instal the brake drum hub, shaped washer, spacer and retaining nut to the axle.

NOTE: Ensure that when the spacer is installed, the painted front face is towards the retaining nut.

(14) Bleed the brake system. Refer to the Brakes section.

(15) Have an assistant apply the footbrake and tighten the hub retaining nut to Specifications. Tighten the retaining nut a further 30 degrees maximum and instal the retaining split pin.

(16) Instal the axle shafts as described in the Rear Axle section.

(17) Tighten the trailing arm to trailing link retaining bolts and nuts to Specifications.

(18) Using a dial gauge, secure it to the trailing arm with its plunger at zero and against the end face of the hub drive shaft. Ensuring the brake shoes are not dragging on the drum, measure the hub end float of the drive shaft. If the hub end float is not within Specifications, the hub retaining nut, bearings and bearing spacers will require checking.

(19) When complete instal the road wheels and lower the vehicle to the ground.

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(20) Connect the suspension unit to the trailing arm and instal the lower mounting bolt. Tighten the trailing arm pivot bolt and the suspension unit lower mounting bolt to the specified torque.

TWO WHEEL DRIVE MODELS

To Remove and Dismantle

(1) Raise the rear of the vehicle, support it on chassis stands and remove the rear wheel.

(2) Using a suitable screwdriver, remove the cap from the centre of the hub. Discard the 'O' ring.

(3) Straighten the lockwasher and remove the nut, lockwasher and plate from the end of the stub axle.

(4) Slide the hub assembly off the stub axle, using care not to drop the outer bearing cone.

(5) Where necessary, use a suitable puller, to withdraw the spacer and the inner bearing cone from the stub axle. Discard the spacer 'O' ring.

NOTE: It may be necessary to move the spacer and the inner bearing cone slightly with a screwdriver to gain space for the puller.

(6) If the bearings are to be renewed, suitably support the hub assembly and tap out the inner and outer bearing cups using a soft drift and a hammer. The removal of the inner bearing cup will force the seal out of the hub. Discard the seal.

NOTE: If the hubs are dismantled only to renew the grease in the bearing it is not necessary to remove the bearing cups. The seal can be removed with a suitable screwdriver.

(7) Remove all the old grease and thoroughly wash all the components in a suitable cleaning solvent.

NOTE: Do not spin the bearing cones with compressed air as damage to the bearings and/or injury to the operator may result. If any part of a bearing is faulty the complete bearing must be renewed.

To Check and Inspect

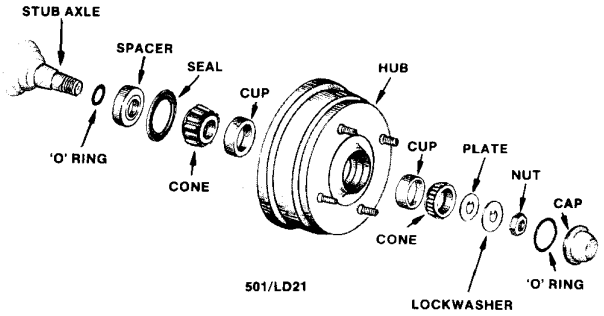
(1) Inspect the stub axle for cracks, overheating, wear on the bearing surfaces and thread damage.

(2) Inspect the bearing cups, cone rollers, cone inner race and roller cage for pitting, cracks, discolouration due to heat, and wear, and discard any bearing that is damaged.

To Assemble and Instal

(1) If removed, instal the outer bearing cups into the hub using a soft drift and a hammer. Instal the cups with the tapers facing the outside.

(2) Instal a new seal into the inner end of the hub. Correctly seated, the outer side of the seal should be level with the end of the hub. Apply a small amount of suitable grease to the seal lip.



Schematic diagram of the two wheel drive rear hub components.

(3) Lubricate the bearing cones by holding a liberal amount of suitable grease in the palm of one hand and kneading the side of the bearing cone down through the grease. During the kneading process turn the bearing cone approximately 20 deg at a time until the roller and cage section is full of grease.

(4) Instal the spacer 'O' ring, the spacer and the inner bearing cone on the stub axle with the stepped face of the spacer towards the bearing cone.

(5) Smear approximately 30 g of suitable grease inside the hub aperature and slide the hub onto the stub axle.

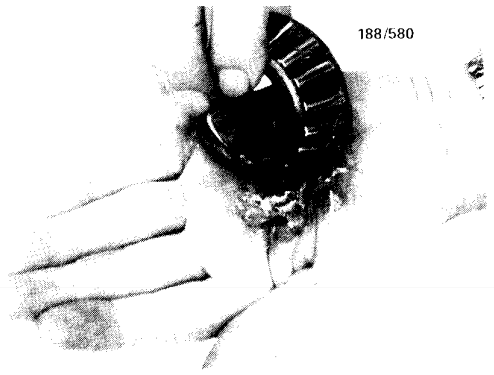
(6) Instal the outer bearing cone, plate, lockwasher and nut onto the end of the stub axle.

(7) Tighten the nut to the specified torque. Loosen the nut slightly and rotate the hub to seat the bearings. Loosen the nut $\frac{1}{8} - \frac{1}{10}$ turn and using a spring balance attached to a wheel stud measure the force required to start the hub turning. The force must be to Specifications.

NOTE: The spring balance must be pulled at 90 deg to the line between the centre of the stub axle and the centre of the stud.

(8) Adjust the stub axle nut until the correct starting force is obtained and bend the lockwasher over the flat on the nut.

(9) Instal the cap to the centre of the hub using a new 'O' ring.



Pack the hub bearings by thoroughly working grease between the rollers and the inner race and roller cage.

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SPECIFICATIONS

Type:	
Front	Disc
Rear	Drum
Operation:	
Footbrake	Hydraulic
Handbrake	Mechanical on front wheels
Master cylinder, 1979–1984 and Utility models:	
Type	Dual circuit
Bore diameter	20.64 mm
Master cylinder, 1985–1987 Sedan and Station Wagon models:	
Type	Dual circuit with fast fill mechanism
Bore diameter —	
Front	20.64 mm
Rear	25.4 mm
Front disc brakes, 1979–1984 and Utility models:	
Disc thickness, nominal	12.5 mm
Disc thickness, minimum	10.00 mm
Maximum disc run out	0.10 mm
Minimum pad and backing plate thickness	7.5 mm
Front disc brakes, 1985–1987 Sedan and Station Wagon models:	
Disc thickness, nominal	18.0 mm
Disc thickness, minimum	16.0 mm
Maximum disc run out	0.10 mm
Minimum pad and backing plate thickness	7.5 mm
Rear drum brakes:	
Drum diameter, nominal	180.0 mm
Drum diameter, maximum	182.0 mm
Minimum lining thickness	1.5 mm

TORQUE WRENCH SETTINGS

Front caliper lock pin:	
1979–1984 and Utility models—	
Lock pin to caliper body	74 Nm
Lock pin to anchor plate	24 Nm
1985–1987 Sedan and Station Wagon models	41 Nm
Front caliper guide pin:	
1985–1987 Sedan and Station Wagon models	54 Nm
Front caliper anchor bolt	69 Nm
Bleeder valve	9 Nm
Disc to hub bolt	58 Nm

1. BRAKES TROUBLE SHOOTING

BRAKE PEDAL HARD

(1) Vacuum servo system inoperative: Check servo system and rectify.

(2) Frozen wheel cylinder or caliper, pistons: Overhaul cylinder or caliper.

(3) Restricted brake lines: Check lines and remove restriction or renew lines.

(4) Incorrect brake pads or shoe linings fitted: Check and replace with the recommended type.

(5) Frozen brake pedal pivot: Overhaul pedal pivot assembly.

NOTE: The vacuum servo system can be checked as follows: With the engine switched off, pump the brake pedal several times to deplete any vacuum in the system. With the engine still switched off, press down firmly on the brake pedal and hold it in this position, noting the position and effort applied. Holding down on the brake pedal, start the engine. If the servo unit is operating correctly, the pedal will sink slightly and the effort required on the pedal will reduce slightly. If the pedal does not sink slightly when the engine is started, the servo unit may be considered inoperative and should be renewed.

BRAKE DRAG

(1) Frozen wheel cylinder or caliper pistons: Overhaul cylinder or caliper.

(2) Frozen handbrake cable: Renew handbrake cable.

(3) Broken or stretched brake shoe return springs: Renew defective springs.

(4) Clogged master cylinder ports: Overhaul master cylinder.

(5) Faulty or maladjusted hill holder valve (HHV): Adjust the HHV cable or renew the HHV.

NOTE: To check this condition, jack up the vehicle and place on chassis stands. Spin the wheels one at a time to check for binding. If the wheels are not binding, have an assistant apply the brakes and release them. Check that the brakes are immediately releasing. A clogged master cylinder port will cause binding of the two wheels fed by that circuit of the master cylinder. Open the bleeder valve on one of the offending cylinders and check if pressure build up is the cause of the binding. A frozen handbrake cable will usually cause binding on both front wheels. Disconnect the handbrake cable from the calipers and check that the wheels turn freely. The HHV operates on the right front/left rear brake circuit only. If drag is felt in this circuit only, the HHV may be considered to be at fault.

LOW AND/OR SPONGY BRAKE PEDAL

(1) Air in brake hydraulic system: Bleed hydraulic system

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(2) Insufficient fluid in the system: Locate and rectify cause of fluid loss, replenish fluid and bleed the system

(3) Incorrectly adjusted rear brake shoes: Check and adjust the rear brakes.

(4) Binding front caliper pistons or guide pins: Overhaul calipers.

(5) Worn master cylinder cups: Overhaul the master cylinder.

NOTE: A spongy brake pedal in most cases is caused by air in the hydraulic system. For air to enter the system one or more of the sealing rubbers or pipes must be sucking in air. The source of the leak must be rectified before bleeding the brake system. The source of the air leak may show as a fluid leak.

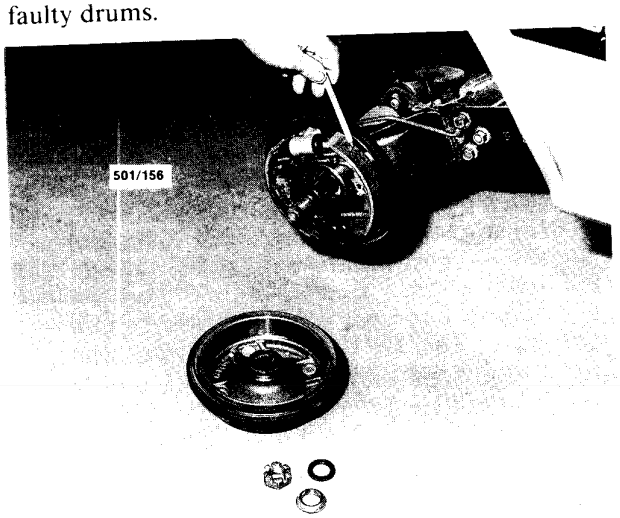
Worn master cylinder cups may be indicated by the brake pedal sinking to the floor on very light application of the brake pedal, the fluid will bypass the cups causing the piston to travel to the end of the cylinder with no effect. There may be no indication of an external fluid leak.

Seized caliper guide pins or pistons may also cause a low brake pedal, it is possible for the caliper to appear to be functioning correctly on application of the brakes but the binding condition will cause the caliper piston to return slightly into the caliper bore, thereby increasing the pad to disc clearance which will, in turn cause a low pedal.

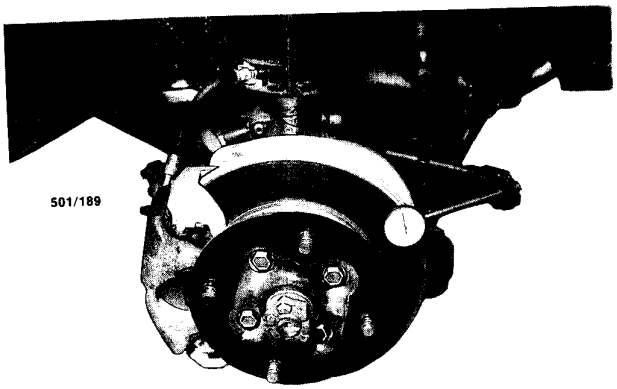
BRAKES LOCK ON APPLICATION

(1) Gummy linings or brake pads due to fluid contamination: Renew the linings or brake pads and rectify any fluid leaks.

(2) Eccentric brake drums: Check and renew all faulty drums.



Check the brake linings for wear and contamination.



Method of checking disc run out using a dial gauge.

(3) Incorrect brake linings installed: Check and renew the linings as a set with the recommended type.

(4) Broken or stretched brake return springs: Check and renew all the springs.

(5) Faulty proportioning valve: Renew the proportioning valve.

NOTE: If this condition arises, first remove all the wheels and check the condition of friction material for both oil contamination and excessive wear. Check the brake shoe return springs for stretching by comparing the free length with a new spring. An eccentric brake drum will be indicated by a pulsating brake pedal when the brakes are lightly applied.

BRAKE PEDAL PULSATES

(1) Eccentric brake drum or disc: Check and renew the brake drum or disc.

(2) Worn hub bearings: Check and renew bearings.

NOTE: Brake drums or discs that prove to be running out must be machined. This job is best entrusted to a brake specialist who will be able to determine if a new disc or drum is required.

BRAKE FADE

(1) Brake pads or linings saturated with hydraulic fluid: Renew as a set the pads or linings and rectify all fluid leaks.

(2) Incorrect shoe adjustment: Check and adjust the rear brakes.

(3) Eccentric brake drum: Check and recify faulty drum.

(4) Incorrect linings fitted: Check and replace with the recommended type.

NOTE: In most cases brake fade is caused by overuse of the footbrake, which in turn causes a build up of heat in the friction

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material and drums or discs. Once this excess heat is allowed to dissipate the brakes should again function normally.

BRAKES OVERHEATING

(1) Incorrect rear brake shoe adjustment: Check and adjust rear brakes.

(2) Broken brake shoe return spring: Renew all the springs.

(3) Faulty handbrake cables or adjustment: Check the cables, renew or adjust.

(4) Frozen wheel cylinder or caliper piston: Overhaul the wheel cylinder or caliper.

(5) Obstructed or damaged hydraulic hose or line: Remove obstruction or renew the hose or line.

(6) Obstructed master cylinder compensating port: Overhaul the master cylinder.

(7) Blocked vent in the master cylinder reservoir cap: Check and remove the obstruction in vent.

(8) Overuse of footbrake: Revise driving habits.

(9) Maladjusted hill holder valve (HHV), or broken return spring: Adjust HHV cable or renew return spring.

NOTE. To check for brake binding, raise the vehicle and spin each wheel in turn by hand.

If it is found that one wheel cylinder or caliper piston is sticking then it is advisable to overhaul all wheel cylinders and calipers and the master cylinder.

BRAKE FAILURE

(1) Loss of brake fluid due to leaking wheel cylinder: Overhaul or renew the wheel cylinders.

(2) Loss of brake fluid due to leaking caliper: Overhaul or renew the caliper

(3) Faulty master cylinder: Overhaul the master cylinder.

(4) Loss of brake fluid due to a fractured hose, pipe or faulty union: Renew faulty components as necessary and bleed the hydraulic system.

(5) Air in the hydraulic system: Locate the source of air leak and rectify. Bleed the hydraulic system.

(6) Water in hydraulic fluid: Drain, flush, refill and bleed the hydraulic system.

NOTE: To locate the source of a brake fluid leak, refill the master cylinder reservoir with brake fluid and have an assistant pump the brake pedal. Check for obvious signs of external leakage, prior to dismantling and overhauling the brake system.

If it is found that water has entered the hydraulic system, it is advisable to dismantle the system and check for corrosion of the components.

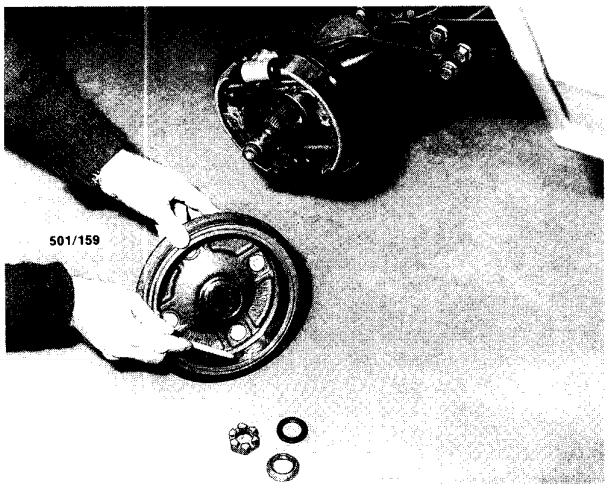
BRAKE NOISE

(1) Brakes squeal during application: Glazed friction material. Remove and inspect the brake pads and deglaze the friction material with emery paper.

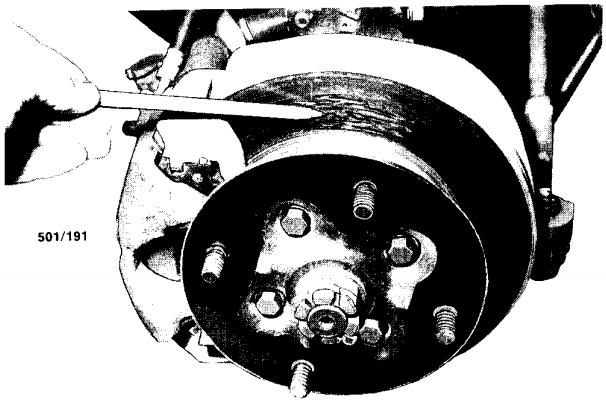
(2) Grinding noise during application: Friction material worn away. Inspect the friction material on the brake pads and shoes, renew the brake pads or shoes as necessary and machine or renew the brake drums or discs.

NOTE: Brake squeal in most cases is caused by the friction material on the brake pads or shoes becoming glazed. Wear indicators are incorporated in the disc pads and will provide an audible warning when the pads are approaching the wear limit. Unsuitable friction material or the ommision of the anti-squeal shims may also cause brake noise.

If the brake pads or shoes are worn to metal always renew the brake pads or shoes as a set of four. If scored, the brake drum or disc will require machining or renewing otherwise braking efficiency will be impaired.



Check the brake drums for wear, scoring and cracking.



Check the disc for scoring and cracking.

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2. DESCRIPTION

The brakes are applied by two circuits by means of a dual circuit master cylinder. The braking is split diagonally, i.e. the right front and the left rear circuits are controlled by one portion of the master cylinder and the left front and right rear circuits are controlled by the other portion of the master cylinder. Should a malfunction occur in one circuit, the remaining circuit is capable of stopping the vehicle safely.

The four wheel hydraulically operated brakes utilise drum brakes on the rear wheels and disc brakes on the front wheels.

The rear drum brakes are manually adjusted on all 1979–1984 and Utility models and also 1985–1987 two wheel drive Sedan and Station Wagon models. The brakes are of the self adjusting type on 1985–1987 four wheel drive Sedan and Station Wagon models.

On all models a vacuum servo unit is installed between the master cylinder and the bulkhead.

The calipers are of the floating type and are self adjusting. The single piston caliper automatically compensates for brake pad wear by the floating caliper feature. The caliper floats on two guide pins located in the anchor plate. Wear indicators are incorporated in the front disc pads on later models and provide an audible warning when the pads are approaching the wear limit.

The dual circuit master cylinder incorporates the fluid reservoir and fluid level warning lamp switch. 1985–1987 Sedan and Station Wagon models have a fast fill feature whereby a larger rear chamber provides fluid to the operating chambers of the master cylinder at a faster rate than is normal with conventional master cylinders. This feature shortens the stroke of the brake pedal and improves brake pedal "feel".

1985–1987 Sedan and Station Wagon models are equipped with a proportioning valve mounted to the left hand rear of the vehicle underbody. The proportioning valve prevents rear brake lock up under severe braking conditions. Pressure is applied equally to the front and rear brakes until a pre-determined pressure or split point is reached.

Once this split point is reached, the pressure applied to the rear brakes is proportionally less than that applied to the front brakes. In the case of a failure of either brake circuit, pressure is applied equally to the front and rear brakes on the remaining circuit even though the split point may be exceeded.

The Hill Holder Valve (HHV) assembly is installed on 1985–1987 manual transaxle Sedan and Station Wagon models to assist the driver when moving off uphill, doing away with the need to use the handbrake. The HHV is incorporated in the right hand front/left hand rear brake hydraulic circuit and is brought into operation by the action of the clutch pedal and the inclination of the vehicle. The valve incorporates a ball, a seal and a pushrod activated by the clutch pedal. When the vehicle is positioned on an uphill incline, the ball rolls into contact with the pushrod. When the clutch pedal is operated, the pushrod moves away and the ball covers the seal, closing the port from the master cylinder and maintaining the pressure applied in the brake circuit until the clutch pedal is released.

The cable operated handbrake is incorporated in the front caliper assemblies and is applied to the front disc pads via a screw mechanism in the caliper piston.

3. MASTER CYLINDER

TO REMOVE AND INSTAL

(1) Raise the bonnet and fit fender covers to the front fenders.

(2) Disconnect the fluid level switch wiring connector by pulling on the connector not the wires.

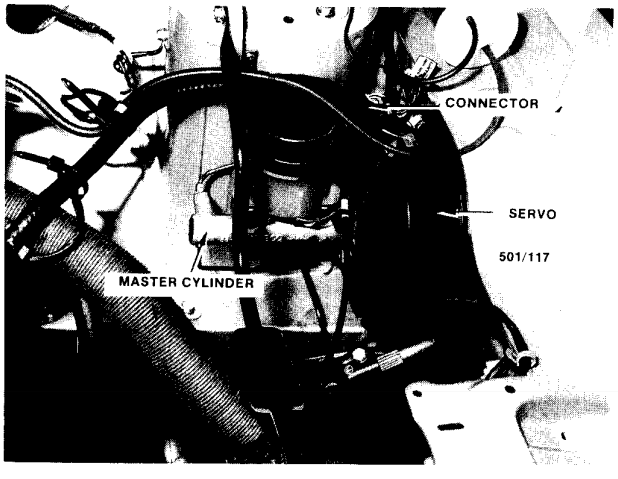
(3) Disconnect the brake fluid pipes from the master cylinder and plug all pipes to prevent the entry of dirt.

(4) Remove the nuts retaining the master cylinder to the servo unit and remove the master cylinder from the vehicle.

NOTE: Care should be exercised when removing or installing the master cylinder assembly to ensure that brake fluid is not permitted to drop onto the surrounding paintwork of the vehicle. Brake fluid, if accidently split, should be immediately washed away with water and allowed to dry naturally. Do not wipe it with a cloth.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Pour a small quantity of new brake fluid into the master cylinder and pump the piston assemblies with a blunt rod until fluid begins to emerge from the outlets.



Installed view of the brake master cylinder and servo unit, 1986 model shown.

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(2) Instal the master cylinder to the vehicle. Installation may be made easier if the brake pipes are loosely installed to the master cylinder before the master cylinder is mounted to the servo.

(3) Bleed the brakes system as described later in this section.

TO DISMANTLE

(1) Remove the master cylinder from the vehicle as previously described. Remove the reservoir cap/s and, where fitted, the strainer and drain the brake fluid from the reservoir.

(2) Press the piston into the master cylinder slightly using a blunt rod and remove the piston stopper screw.

(3) Hold the piston into the master cylinder and remove the piston retaining snap ring and, on 1979–1984 and Utility models, the stopper washer.

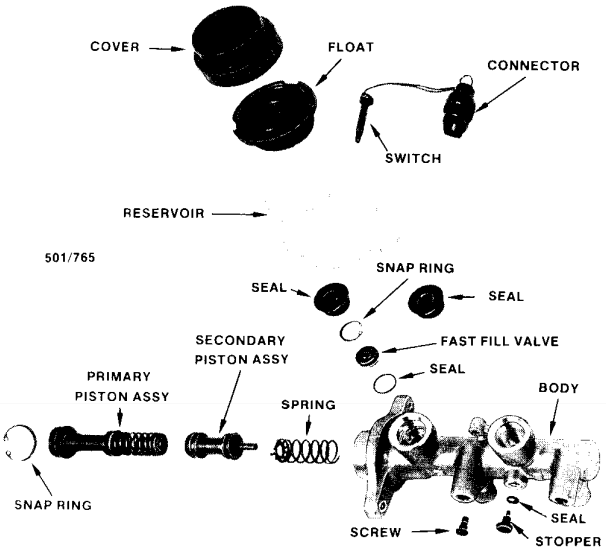
(4) Remove the primary and secondary piston assemblies from the master cylinder bore. It may be necessary to tap the master cylinder on a block of wood to free the piston assemblies from the master cylinder.

(5) On 1979–1984 and Utility models, remove the brake pipe unions and withdraw the check valve assemblies from the master cylinder, note the installed position of the components to aid assembly.

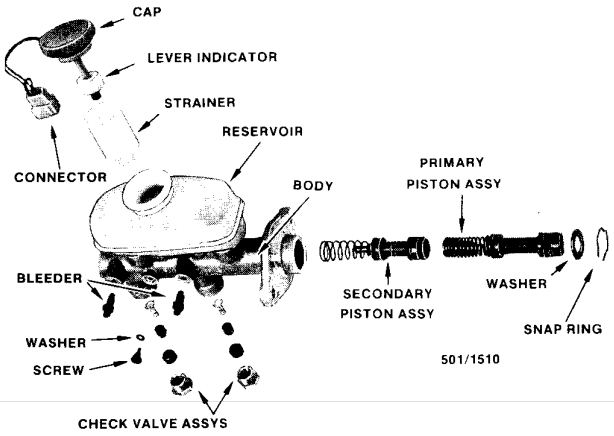
(6) Further dismantling of the master cylinder is not recommended. The piston assemblies must be renewed as units.

The reservoir/s should not be removed unless fluid leakage is evident.

If the reservoirs are to be removed from early 1979–1984 model master cylinders, new reservoirs will be required. Loosen the clamps retaining the reservoirs to the master cylinder and remove the reservoirs from the master cylinder.



Dismantled view of a 1986 model master cylinder.



Dismantled view of a 1983 model master cylinder.

On later models, remove the screw/s retaining the reservoir to the master cylinder and remove the reservoir and seals.

The fast fill valve on 1985–1987 Sedan and Station Wagon model master cylinders may be removed after the removal of the reservoir. Remove the snap ring retaining the valve to the master cylinder and remove the valve from the cylinder.

TO CLEAN AND INSPECT

(1) Wash all components throughly in methylated spirits. Do not use petrol, kerosene or other cleaning solvents.

(2) Check the master cylinder bore for wear, corrosion and pitting.

NOTE: Do not hone the master cylinder bore. If the bore is pitted or worn, renew the master cylinder as an assembly.

(3) Ensure that the inlet and compensating ports between the reservoir and the cylinder bore are free of all obstructions.

(4) Discard all rubber parts and the piston assemblies. Inspect the check valve springs for possible reuse on 1979–1984 and Utility models. Ensure that the overhaul kit contains all the necessary components to overhaul the master cylinder before discarding any components.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points;

(1) Always use a genuine major repair/overhaul kit which contains pre-assembled pistons and rubber seals. The use of a major kit will ensure a thorough overhaul and long service life from the unit.

(2) Liberally lubricate the cylinder bore and all the internal parts with clean brake fluid.

(3) On 1979–1984 and Utility models instal the check valve assemblies and unions to the master

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cylinder outlet ports in the order noted during dismantling, ensuring that the wide end of the springs are facing the master cylinder body. Tighten the unions securely.

(4) Instal the primary and secondary piston assemblies to the master cylinder, press the primary piston into the master cylinder slightly using a blunt rod and instal the stopper screw using a new sealing washer.

(5) On 1979–1984 and Utility models, instal the stopper washer to the master cylinder bore.

(6) While holding the primary piston into the master cylinder, instal the piston retaining snap ring to the groove in the master cylinder ensuring that the snap ring is correctly seated.

(7) If removed, instal the fast fill valve and reservoir/s using new seals and reservoirs as required.

(8) Pour a small quantity of clean brake fluid into the reservoir and pump the piston assemblies with a blunt rod until fluid begins to flow from all of the outlets.

(9) Instal the master cylinder to the vehicle as previously described.

4. FRONT DISC BRAKE ASSEMBLY

Special Equipment Required:
To Check Brake Disc Run Out — Dial gauge
To Renew Brake Pads — Piston resetting tool
To Overhaul Caliper — Spring compressor

TO REMOVE AND INSTAL BRAKE PADS

(1) Raise the front of the vehicle and support it on chassis stands. Remove the front wheels.

(2) Drain approximately two thirds of the brake fluid from the master cylinder reservoir. This may be done by syphoning, or by loosening the brake pipe unions or bleeder valves, if fitted, at the master cylinder and bleeding the fluid into a container.

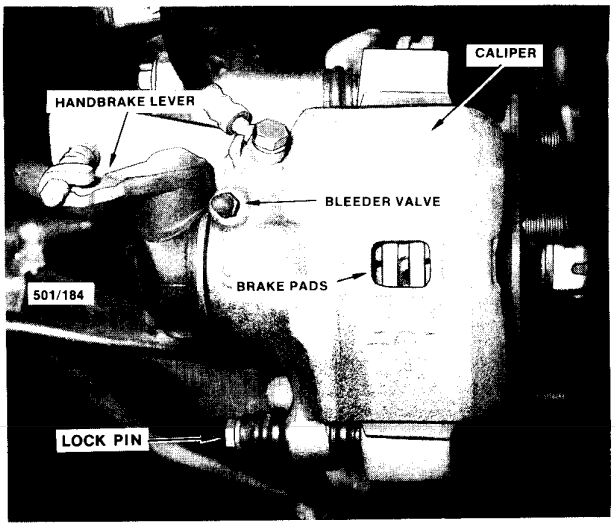
NOTE: Do not completely remove the brake pipe from the master cylinder or drain all the fluid from the reservoir otherwise it will be necessary to bleed the hydraulic system. The fluid is drained to prevent overflow when the caliper piston is pushed back into its bore to facilitate brake pad renewal.

Complete work on one caliper assembly at a time and renew the brake pads as complete sets of four, that is two pads to each caliper assembly.

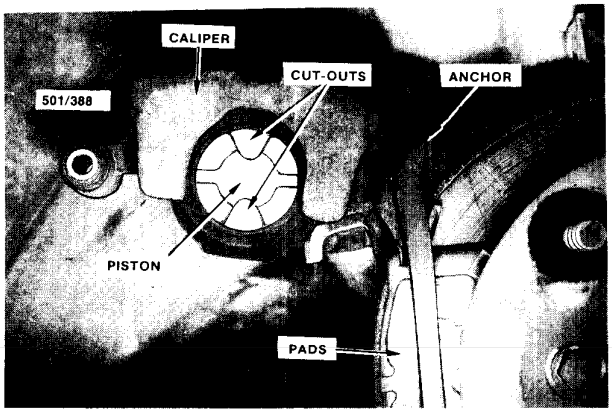
(3) Ensure that the handbrake is fully released.

(4) Push the caliper handbrake lever towards the applied position and disconnect the inner handbrake cable from the lever.

(5) Remove the clip retaining the outer handbrake cable to the support bracket on the caliper and remove the cable from the bracket.



Installed view of the front brake caliper, 1986 model shown.



View showing the caliper positioned as for pad renewal, 1983 model shown.

(6) Remove the lock pin from the caliper and swing the caliper up to allow the pads to be removed from the anchor plate. Tie the caliper in this position if necessary.

(7) Remove the pads from the anchor plate noting the position of the anti rattle springs and the anti squeal shims.

(8) Wind the piston into the caliper bore in a clockwise direction using the piston resetting tool or a suitable alternative. A discarded ½ inch drive socket of the appropriate outer diameter may be ground to provide lugs to locate in the piston grooves. The socket, a short extension and ratchet handle may then be used to wind the piston into the bore. Do not push the piston into the caliper bore without rotating it or damage to the handbrake spindle may occur.

(9) Align the cut-outs in the piston so that the peg on the rear of the inner disc pad will fit within one of the cut-outs in the piston when the caliper is in position on the anchor plate.

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(10) Ensure that the dust seal is not distorted after the piston has been wound in and set to position.

NOTE: Overhaul the caliper if fluid leaks are evident or the dust seals are deteriorated. If the pistons are difficult to wind into the caliper, the caliper may be considered to require overhaul. It is good practice to remove the caliper from the guide pin and lubricate the pin with silicone grease. After installation of the caliper on the guide pin, hold it in as far as it will go for at least 5 seconds to expell any air from the guide pin bore in the caliper. On models fitted with an air bleed plug on the guide pin bore, remove the plug before installing the caliper and instal the plug after the caliper is in place.

(11) Apply a thin smear of PBC grease available from Subaru dealers, to the surfaces of the brake pads which are in contact with the anchor plate and instal the new pads, shims and clips to the caliper. Ensure that the anti rattle clips and anti squeal shims are installed to the position noted on removal.

(12) Lubricate the lock pin and sleeve with silicone grease. Ensure that the caliper moves smoothly on the pins, also that the dust covers are in a serviceable condition. Renew all defective pins and seals.

(13) Swing the caliper down over the pads and into position on the anchor plate. Instal the lock pin and tighten it to Specifications.

(14) Instal the outer handbrake cable to the mounting bracket and instal the retaining clip. Push the lever towards the applied position and instal the inner handbrake cable to the lever.

(15) Repeat the procedure for the remaining wheel.

(16) Top up the brake master cylinder reservoir with the recommended fluid and pump the brake pedal several times to bring the pads into position alongside the disc.

(17) Instal the wheels and lower the vehicle to the ground.

NOTE: Do not drive the vehicle before pumping the caliper pistons back to position, the first application of the brake pedal may not apply the brakes.

TO OVERHAUL CALIPER

NOTE: As special tools are required to overhaul the caliper assemblies, it is recommended that this work be entrusted to a Subaru dealer or a specialist brake workshop having the necessary equipment.

(1) Raise the front of the vehicle and support it on chassis stands. Remove the front wheels.

(2) Disconnect the brake hose from the caliper. Plug the hose to prevent the entry of dirt.

(3) Ensure that the handbrake is fully released.

(4) Push the caliper handbrake lever towards the applied position and disconnect the inner handbrake cable from the lever.

(5) Remove the clip retaining the outer handbrake cable to the support bracket on the caliper and remove the cable from the bracket.

(6) Remove the lock pin from the caliper and swing the caliper up to allow the caliper to be withdrawn from the guide pin on the anchor plate and remove the caliper from the vehicle.

On 1985–1987 Sedan and Station Wagon models, the guide pin and sleeve are bolted to the anchor plate, it is not necessary to remove this assembly.

NOTE: Do not remove the anchor plate unless the disc is to be removed.

(7) Remove the guide and lock pin sleeves, where fitted, and boots from the caliper, note the installed positions as an aid to assembly.

(8) Carefully prise the piston dust seal retaining clip from the seal and remove the seal from the caliper.

(9) Place a pad of cloth in front of the piston and carefully remove the piston from the caliper by applying low air pressure to the fluid inlet port of the caliper. Use care during this operation, do not use excessive air pressure and keep hands clear of the piston.

(10) Using a thin blunt probe, preferably made from wood or plastic, lift and remove the seal from the groove in the caliper bore.

(11) Remove the rings retaining the handbrake lever boots to the caliper, remove the small boot from the lever, disconnect the large boot from the caliper and leave it in place on the lever.

(12) Remove the snap ring retaining the handbrake lever and shaft assembly to the caliper.

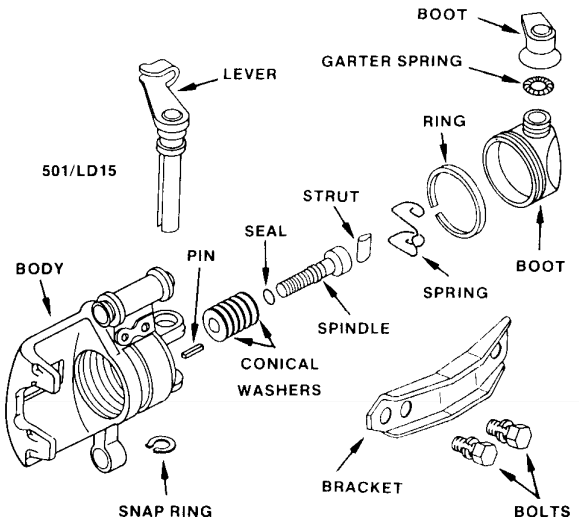
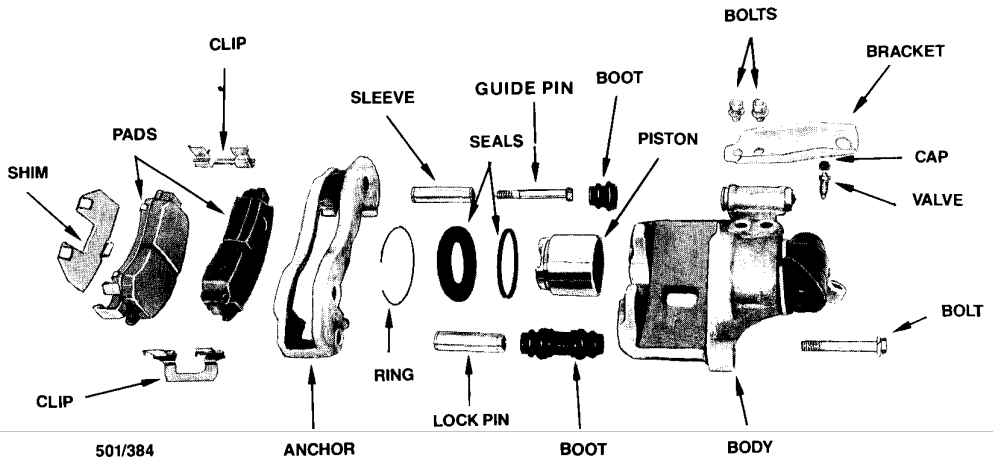


Illustration of the brake caliper showing the handbrake mechanism, 1986 model shown.

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Dismantled view of the front caliper, 1986 model shown.

(13) Using the spring compressor or a suitable alternative, apply pressure to the spindle to relieve the tension between the spindle and the shaft of the handbrake lever.

(14) Remove the shaft and lever assembly from the caliper and remove the spring compressor. Remove the boot from the lever.

(15) Remove the return spring and the strut from the caliper.

(16) Remove the spindle assembly from the caliper.

(17) Note the position of the conical washers and remove the washers from the spindle.

(18) Carefully prise the seal from the groove on the spindle and discard the seal.

(19) Clean all parts except the brake pads in methylated spirits and examine them carefully for wear and corrosion, particularly the piston. Renew any corroded, worn or doubtful parts. Discard the piston and spindle seals.

A small degree of corrosion in the caliper bore may not necessitate the renewal of the caliper body as the sealing surface is on the piston.

(20) If the operation of the handbrake mechanism in the piston is in doubt, renew the piston.

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Coat the new piston seal with clean brake fluid and instal the seal into the groove in the caliper bore. Ensure that the seal is not twisted and is correctly seated in the groove.

(2) Coat the bore of the caliper with clean brake fluid and instal the piston to the bore by hand aligning the grooves on the piston to ensure clearance for the peg on the rear of the inner brake pad when the caliper is installed to the anchor plate.

(3) Apply the RX2 grease supplied in the repair kit to the grooves in the caliper and the piston and instal the dust seal to the caliper and the piston. Ensure that the seal is not twisted and instal the retaining clip.

(4) Suitably cover the screw portion of the spindle to protect the seal, coat the seal groove with the silicone grease supplied in the repair kit and instal the 'O' ring seal to the spindle ensuring that it is not twisted and is correctly seated in the groove.

(5) Apply the RX2 grease supplied in the repair kit to the spindle at the location of the conical washers and instal the washers to the spindle as noted during dismantling. Alternate the mounting of the washers so that the outer circumferences of the washers are in contact with each other and the inner circumferences of the two end washers will contact with the spindle and caliper body respectively, liberally coat each washer with RX2 grease.

(6) Instal the spindle to the caliper, wind it into the piston in a clockwise direction.

(7) Liberally coat the head of the spindle and the handbrake lever bearings with RX2 grease.

(8) Place the return spring and strut in position on the caliper body and compress the spindle and conical washer assembly using the spring compressor.

(9) Instal the large handbrake lever boot to the lever, liberally coat the lever shaft with RX2 grease and instal the lever to the caliper. Align the return spring and strut in the groove in the lever shaft.

(10) Instal the snap ring to the handbrake lever shaft.

(11) Pack the area of the handbrake mechanism with RX2 grease, instal the boot to the caliper body and instal the retaining ring.

(12) Instal the small handbrake lever boot to the lever and instal the retaining ring.

(13) Instal the guide and lock pin boots to the positions noted during dismantling, coat the sleeves, where fitted, with the silicone grease supplied in the repair kit and instal the sleeves to the caliper.

(14) Instal the caliper to the anchor plate ensuring that the pads, springs and shims are located correctly and tighten the lock pin(s) to the following torque figures:

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Models with fixed guide pin fitted and the lock pin screwed into the caliper body	74 Nm
Models with fixed guide pin fitted and the lock pin screwed into the anchor plate	24 Nm
1985–1987 Sedan and Station Wagon models	41 Nm

NOTE: On 1979–1984 and Utility models, after installation of the caliper on the guide pin, hold it in as far as it will go for at least 5 seconds to expel all air from the guide pin bore in the caliper.

On models fitted with an air bleed plug, remove the plug before installing the caliper and instal the plugs after the caliper is in place.

(15) Instal the brake hose to the caliper using new sealing washers. Ensure that the brake hose is not twisted, is correctly routed and will not contact any suspension components. In 1979–1984 and Utility models, ensure that the brake hose is mounted to the inner bracket on the suspension unit.

(16) Instal the inner handbrake cable to the lever and the outer cable to the support bracket. Ensure that the handbrake cable is correctly routed and will not contact any suspension components.

(17) Bleed the brakes as described later in this section.

(18) If necessary, adjust the handbrake as described later in this section.

(19) Top up the brake fluid and pump the brake pedal several times to bring the pads into position against the disc.

(20) Lower the vehicle to the ground and test the operation of the brakes.

TO REMOVE AND INSTAL BRAKE DISC

(1) Raise the front of the vehicle and support it on chassis stands. Remove the front wheels.

NOTE: If the disc run-out is not to be checked, it is adviseable to remove the split pin from the nut retaining the hub and disc assembly to the drive shaft and loosen the retaining nut before raising the vehicle.

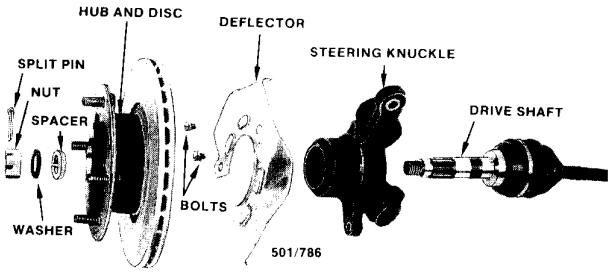
(2) Ensure that the handbrake is fully released.

(3) Push the caliper handbrake lever towards the applied position and disconnect the inner handbrake cable from the lever.

(4) Remove the clip retaining the outer handbrake cable to the support bracket on the caliper and remove the cable from the bracket.

(5) Remove the lock pin from the caliper and swing the caliper up to allow the caliper to be removed from the anchor plate.

Remove the caliper from the anchor plate tie it away from the working area.



Dismantled view of the front hub and disc assembly and steering knuckle.

(6) Note the installed positions of the anti rattle clips and shims and remove the brake pads from the anchor plate.

(7) Mount a suitable dial gauge to a suspension component in a position to allow the plunger of the gauge to contact the disc at a point not further than 5 mm from the outer circumference of the disc.

(8) Rotate the disc and check that the run-out is within Specifications.

Have the disc machined, or renew the disc if the run-out exceeds Specifications.

NOTE: A small amount of run-out may be corrected by changing the mounted position of the disc on the hub.

(9) Remove the bolts retaining the caliper anchor plate to the steering knuckle and remove the anchor plate from the steering knuckle.

(10) Remove the split pin from the nut retaining the hub and disc assembly to the drive shaft and remove the retaining nut, washer and spacer.

(11) Withdraw the hub and disc assembly from the drive shaft. It may be necessary to use a suitable puller for this operation.

(12) Remove the bolts retaining the disc to the hub, suitably mark the relationship of the disc to the hub and remove the disc from the hub.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the mounting surfaces of the hub and disc are clean and true.

(2) Instal the disc to the marks made during removal.

(3) Tighten the disc to hub retaining bolts to Specifications.

(4) Check the disc run out as previously described.

(5) Tighten the anchor plate retaining bolts and the caliper lock pin to Specifications.

(6) Instal the brake pads, springs and clips to the positions noted on removal. Ensure that the caliper piston is in the correct position to allow the pin on the rear of the rear brake pad to enter the groove in the piston when the caliper is positioned on the anchor plate.

(7) Pump the brake pedal several times to en-

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sure that the brake pads are correctly positioned prior to driving the vehicle as the first application of the brake pedal may not apply the brakes.

5. REAR DRUM BRAKE ASSEMBLY

TO ADJUST REAR BRAKES

NOTE: 1985–1987 four wheel drive Sedan and Station Wagon models are equipped with self adjusting rear brakes, the following procedure applies to all other models.

(1) Raise the rear of the vehicle and support on chassis stands.

(2) Working under the vehicle at the rear of the brake assembly, tighten the adjusting screw until the wheel is locked.

(3) Loosen the adjusting screw 180 deg and check that the wheel rotates freely.

(4) If any tight spots are felt, remove the rear hub and brake drum assembly and inspect the brake system. Check the brake drum for distortion.



Method of adjusting the rear brakes, 1983 model shown.

TO REMOVE AND DISMANTLE

(1) Raise the rear of the vehicle and support it on chassis stands. Remove the rear wheels.

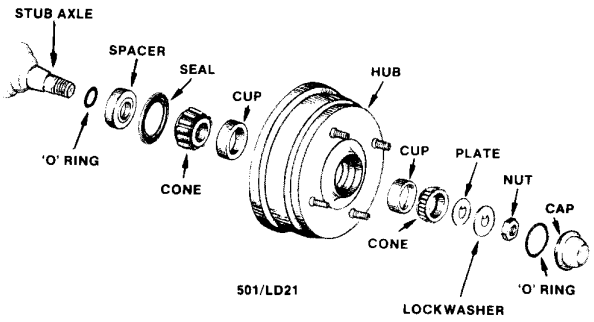
On four wheel drive models, remove the hub caps and brake drum hub retaining nut split pins and loosen the brake drum hub retaining nut prior to raising the vehicle.

(2) On four wheel drive models, remove the brake drum hub retaining nut, washer and spacer, noting the installed position of the spacer, and remove the brake drum hub from the vehicle. It may be necessary to release the brake adjustment to allow the drum to clear the linings.

On two wheel drive models proceed as follows:

(a) Remove the grease cap from the brake drum hub using a suitable lever. Discard the O ring.

(b) Straighten the lockwasher and remove the nut, lockwasher and plate from the end of the stub axle.



Schematic diagram of the two wheel drive rear hub components.

(c) Slide the brake drum hub from the stub axle, using care not to drop the outer bearing. It may be necessary to release the brake adjustment to allow the drum to clear the linings.

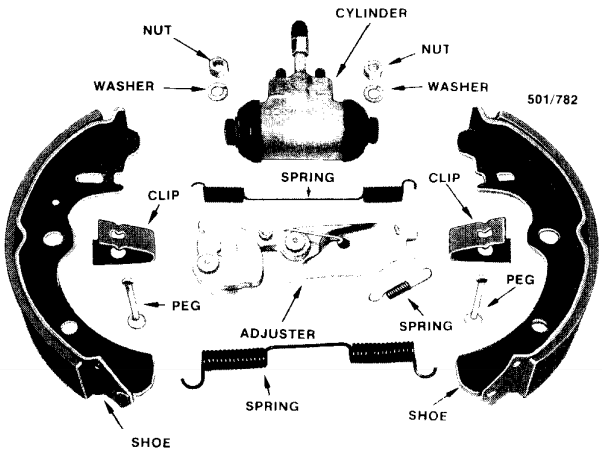
(3) Remove the brake shoe hold down clips and pegs by depressing the clips and rotating the pegs to allow the clips to be removed from the pegs. Withdraw the pegs from the rear of the brake backing plate.

(4) Pull the brake shoes away from each other and disconnect them from the wheel cylinder and the adjuster on early models, late two wheel drive models and Utilities or the lower anchor on late four wheel drive Sedan and Station Wagon models. Remove the shoes with the return springs and self adjuster, if fitted, attached.

(5) Separate the return springs and adjuster from the brake shoes noting the installed position of the springs and adjuster.

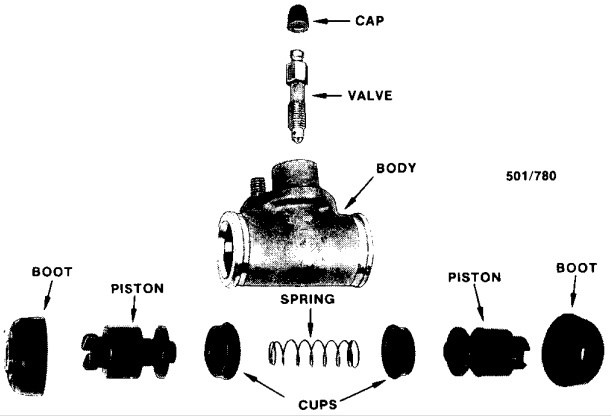
(6) Undo the flare nut retaining the brake pipe to the wheel cylinder and withdraw the brake pipe from the wheel cylinder. Plug the brake pipe to prevent the entry of dirt and loss of brake fluid.

(7) Remove the nuts retaining the wheel cylin-



Dismantled view of the rear drum brake assembly, 1986 four wheel drive model shown with automatic adjuster.

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Dismantled view of the rear wheel cylinder.

der to the backing plate and remove the wheel cylinder.

(8) If necessary, remove the nuts retaining the adjuster to the backing plate and remove the adjuster.

(9) Clean all the parts except the brake shoes in methylated spirits and inspect them for wear and deterioration. Renew all unserviceable and suspect parts.

(10) Inspect the brake drum for scoring and distortion, repair or renew the brake drum as necessary.

(11) If necessary, overhaul the wheel cylinder as follows:

(a) Remove the boots from either end of the wheel cylinder.

(b) Withdraw the pistons and spring from the wheel cylinder. Remove and discard the cups from the pistons.

(c) Remove the bleeder valve from the wheel cylinder.

(d) Clean all the parts in methylated spirits and inspect them for wear, deterioration and corrosion, renew all unserviceable and suspect parts.

(e) Inspect the bore of the wheel cylinder for scores and corrosion, if the serviceability of the cylinder is in doubt, renew the wheel cylinder.

(f) Coat the new cups with brake fluid and instal the cups to the pistons ensuring that the cups are correctly seated in the grooves in the piston.

(g) Instal the piston assemblies and spring to the wheel cylinder and instal the boots.

(h) Instal the bleeder valve to the wheel cylinder.

TO ASSEMBLE AND INSTAL

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Instal the wheel cylinder to the backing plate and tighten the retaining nuts securely.

(2) Instal the adjuster, if fitted, to the backing plate and tighten and retaining nuts securely.

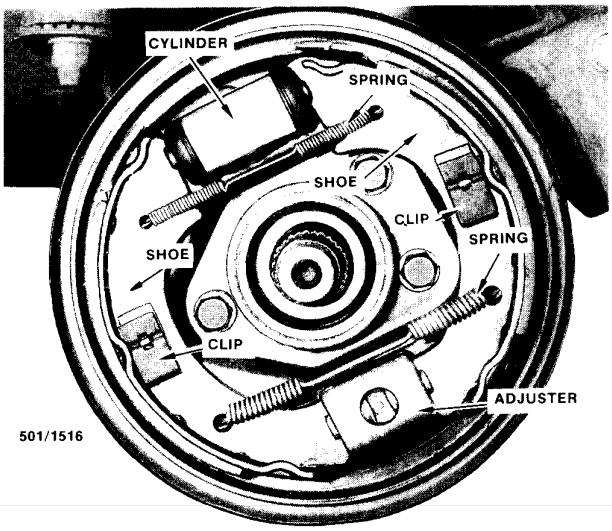
(3) Instal the return springs and the self adjuster, if fitted, to the positions on the brake shoes noted during dismantling.

(4) Locate one shoe on one side of the wheel cylinder and adjuster or lower anchor and stretch the remaining shoe to locate on the remaining wheel cylinder and adjuster or lower anchor.

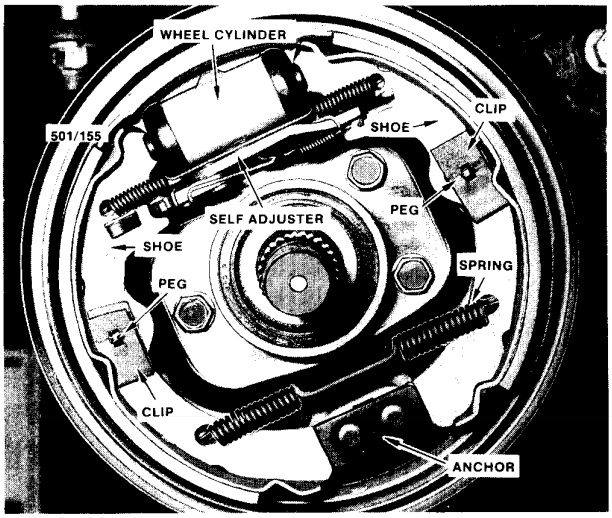
(5) Ensure that the self adjuster, if fitted, is correctly located, and instal the hold down pegs and clips to the backing plate and brake shoes.

(6) Instal the brake pipe to the wheel cylinder and tighten the flare nut securely.

(7) On models with self adjusting rear brakes, lift the pawl away from the ratchet cam on the self adjuster and move the adjuster to the minimum setting to allow the brake drum to be installed.



Installed view of the rear drum brakes, 1983 model shown with manual adjuster.



Installed view of the rear drum brakes, 1986 four wheel drive model shown with automatic adjuster.

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(8) On two wheel drive models, repack or renew the hub bearings as required, refer to the Rear Suspension section if necessary.

(9) Instal the brake drum hub, spacer, washer and nut to the axle shaft. On four wheel drive models, tighten the retaining nut securely.

On two wheel drive models, refer to the Rear Suspension section for the rear hub bearing adjusting procedure. Renew the O ring and instal the grease cap.

NOTE: On four wheel drive models, ensure that the painted front face of the spacer is facing toward the retaining nut.

(10) Adjust the rear brakes as previously described.

On models with self adjusting rear brakes, adjustment of the brakes is effected by the action of the brakes shoes during application of the brakes, the shoes should self adjust during the bleeding operation. If the rear brakes are not adjusted after the bleeding operation, pump the brake pedal until the correct adjustment is achieved.

(11) Bleed the brakes as described later in this section.

(12) Instal the wheels, lower the vehicle to the ground and test the operation of the brakes.

On four wheel drive models, tighten the brake drum hub retaining nut to Specifications as listed in the Rear Suspension section. Tighten the retaining nut a further 30 degrees maximum if necessary and instal the retaining nut split pin.

6. BRAKE SERVO UNIT

TO CHECK OPERATION

(1) With the engine switched off, apply the footbrake several times to exhaust all vacuum from the system.

(2) Again apply the footbrake and hold the footbrake fully depressed.

(3) Start the engine, if the servo unit and the vacuum circuit are functioning correctly, a distinct downward movement of the brake pedal should be felt.

Should the pedal fail to sink when the engine is started and vacuum is applied to the servo unit, the vacuum circuit or servo unit may be considered faulty and the cause of the fault should be investigated.

(4) Ensure that the brake pedal is released, start the engine and run at a medium speed. Stop the engine.

Let the vehicle stand for one to two minutes, press the brake pedal several times and check the operation. The pedal feel should get progressively harder as the vacuum is exhausted from the system. If the pedal feel is hard to start with and does not change during this check, the system may be suspected of developing a vacuum leak or the one way check valve may be faulty.

NOTE: Before removing the servo unit from the vehicle for inspection, disconnect the vacuum supply hose, start the engine and check that vacuum is reaching the servo unit. Check the one way check valve as described below.

TO TEST ONE WAY CHECK VALVE

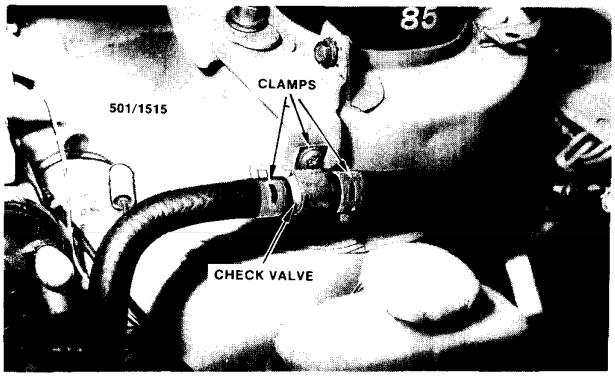
NOTE: The check valve is located on the right hand inner fender on 1979–1984 and Utility models and is incorporated in the vacuum hose on 1985–1987 Sedan and Station Wagon models.

(1) Remove the check valve or hose from the vehicle.

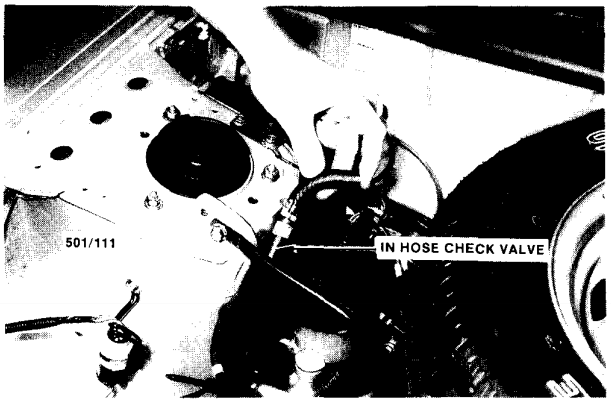
(2) Check the valve for sticking, suction on the manifold side of the valve or hose should allow air to flow freely. Air blown into the valve from the manifold side should not pass through the valve

(3) Instal the valve or hose and check the operation of the system as previously described.

NOTE: Check that there are no vacuum leaks at the hose connections and that the hose is not collapsed due to deterioration.



View showing the location of the check valve, 1983 model shown.



Check for vacuum at the servo vacuum hose, 1986 model shown.

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TO REMOVE AND INSTAL SERVO UNIT

(1) Raise the bonnet and instal fender covers to the front fenders.

(2) Remove the brake master cylinder as previously described.

(3) Disconnect the vacuum hose from the servo unit.

(4) Working inside the vehicle, remove the clip retaining the clevis pin to the brake pedal and remove the clevis pin.

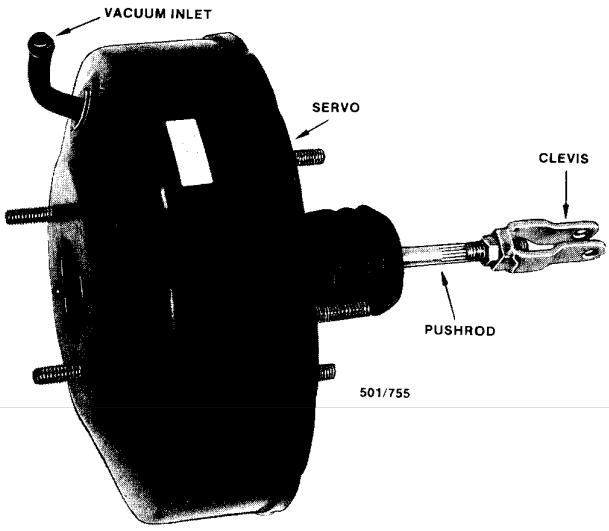
(5) Remove the nuts retaining the servo to the bulkhead and, working in the engine compartment, remove the servo from the vehicle taking care not to damage the brake pipes.

NOTE: Use care when handling the servo unit after removal from the vehicle. Do not allow the master cylinder side of the servo unit to face downwards after removal as internal components of the servo unit may become dislodged necessitating the renewal of the servo unit. Do no apply excessive sideways force to the pushrod or damage to the servo unit may occur.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the pedal height and free play are to Specifications. If necessary, adjust as described under the heading Brake Pedal later in this section.

(2) Bleed the brakes as described under the heading Hydraulic System later in this section.



View of the servo unit removed from the vehicle, 1986 model shown.

7. HANDBRAKE

TO ADJUST HANDBRAKE

(1) Remove the centre panel of the centre console.

(2) Operate the handbrake lever several times.

(3) Loosen the locknut and rotate the adjusting nut until the handbrake is applied when the lever is raised three or four notches on the ratchet. Operate the footbrake lightly several times during the adjusting operation.

(4) When the adjustment is satisfactory, tighten the locknut and instal the console centre panel.

TO REMOVE AND INSTAL HANDBRAKE CABLES

(1) Raise the front of the vehicle and support it on chassis stands. Remove the front wheels.

(2) Remove the centre panel of the centre console.

(3) Remove the locknut and the adjusting nut from the equaliser.

(4) Remove the inner cables from the equaliser and remove the clamps retaining the outer cables to the vehicle floor.

(5) Working under the front of the vehicle, pull the inner cables from the outer cables sufficiently to disconnect them from the caliper handbrake lever and disconnect the cables.

6) Remove the clip retaining the outer cable to the support bracket on the caliper and remove the clamps from the lower control arm and the crossmember.

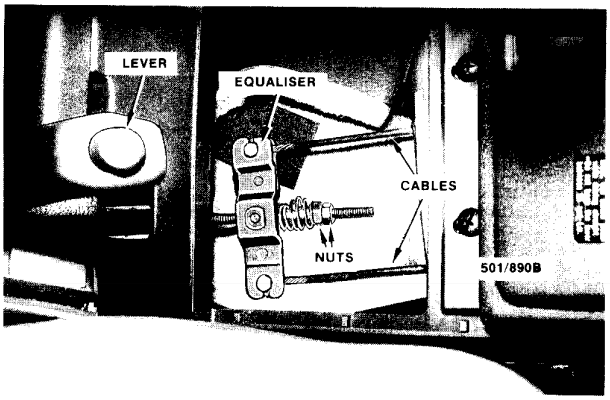
(7) Detach the outer cable from the guides at the rear of the crossmember.

(8) Withdraw the cable assemblies from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

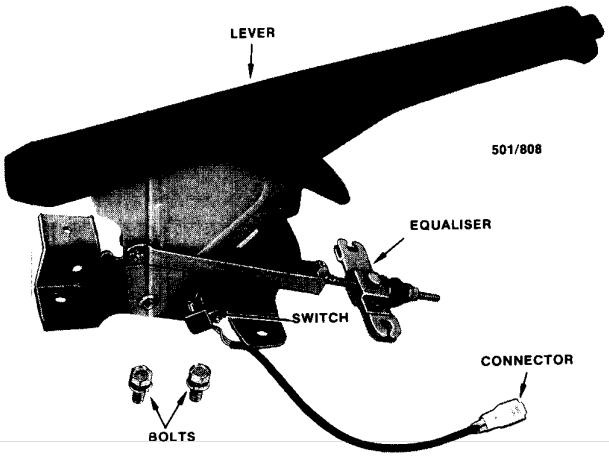
(1) Ensure that the handbrake cables are routed correctly and will not contact any suspension components.

(2) Adjust the handbrake as previously described.



View showing the location of the handbrake adjustment point, 1986 four wheel drive model shown.

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View of the handbrake assembly removed from the vehicle.

TO REMOVE AND INSTAL HANDBRAKE LEVER

(1) Remove the centre console as described in the Body section.

(2) Remove the locknut and the adjusting nut from the equaliser.

(3) Remove the equaliser from the handbrake cables.

(4) Disconnect the warning lamp switch wiring connector by pulling on the connector not the wires.

(5) Remove the bolts retaining the handbrake assembly to the vehicle floor and remove the handbrake assembly from the vehicle.

Installation is a reversal of the removal procedure with attention to the following point:

Adjust the handbrake as previously described.

8. BRAKE PEDAL

TO ADJUST PEDAL HEIGHT AND FREE PLAY

1979–1984 and Utility Models

(1) Check that the free play of the brake pedal is within 5–11 mm and that the distance between the clevis pin and the front section of the pedal mounting bracket is 175 mm.

(2) If necessary, loosen the locknut on the stop lamp switch, disconnect the wiring connector by pulling on the connector not the wires and screw the switch in or out to achieve the correct pedal height.

(3) Loosen the locknut of the pushrod, and screw the pushrod in or out to achieve the correct free play.

(4) Tighten the locknuts securely and connect the wiring connector.

1985–1987 Sedan and Station Wagon Models

(1) Check that the free play of the brake pedal is within 5–11 mm and that the distance between the clevis pin and the front section of the pedal mounting bracket is 146.5 mm.

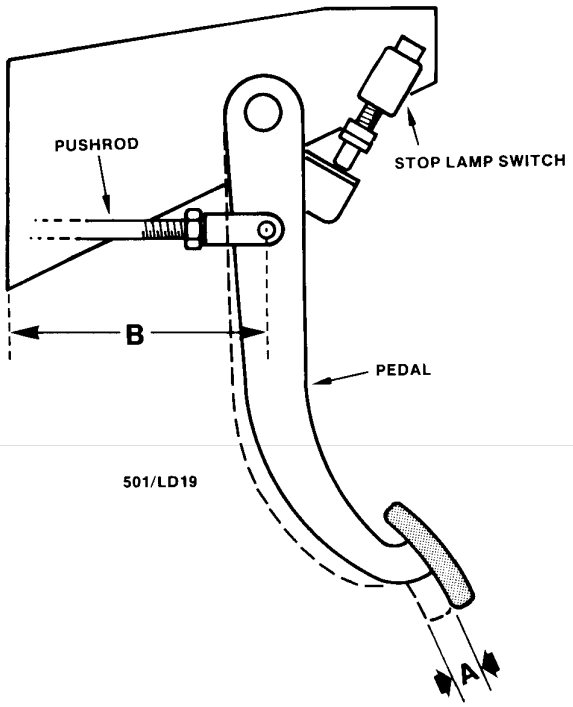


Illustration showing the pedal height and free play measurement points. A = free play. B = pedal height. Refer to text for specifications.

(2) If necessary, loosen the locknut on the stop lamp switch, disconnect the wiring connector by pulling on the connector not the wires and screw the switch in or out to achieve the correct pedal height.

(3) Loosen the locknut on the pushrod, and screw the pushrod in or out to achieve the correct free play.

(4) Tighten the locknuts securely and connect the wiring connector.

TO REMOVE AND INSTAL

(1) Remove the lower trim panel from the dashboard.

(2) Remove the nuts from the pedal shaft and the clutch cable support bracket on 1985–1987 Sedan and Station Wagon models or the snap ring from the pedal shaft on 1979–1984 and Utility models, and withdraw the clutch pedal with the cable attached.

(3) Remove the clip from the clevis on the brake pushrod and remove the clevis pin from the clevis.

(4) Withdraw the pedal shaft and withdraw the brake pedal, return spring and bushes.

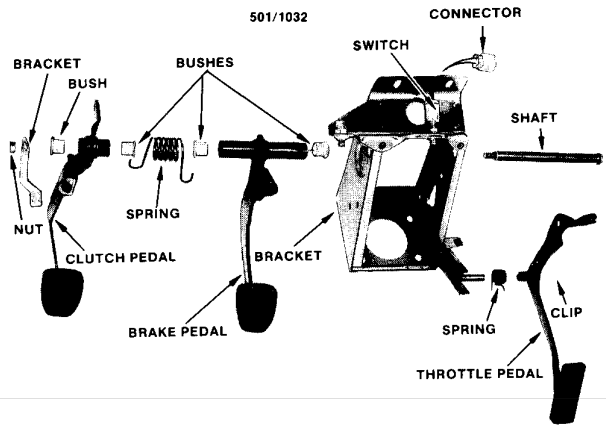
(5) Inspect the bushes for wear, renew the bushes if necessary.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the return spring is correctly located.

(2) Adjust the pedal height and free play as previously described.

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Dismantled view of the pedal assembly, 1986 model shown.

9. PROPORTIONING VALVE

The proportioning valve is not repairable and must be renewed if found to be faulty.

TO REMOVE AND INSTAL

(1) Raise the rear of the vehicle and support it on chassis stands.

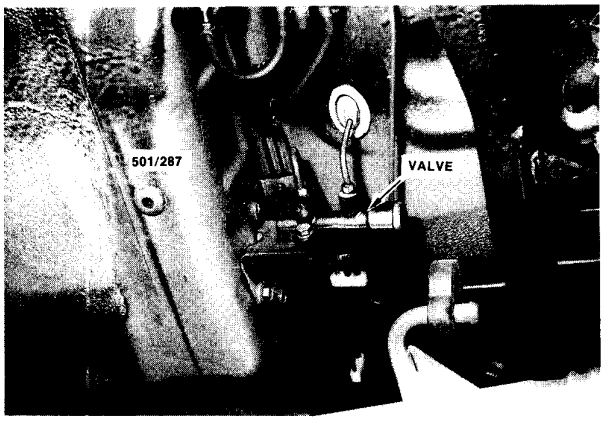
(2) Place a suitable container under the proportioning valve and loosen the flare nuts retaining the brake pipes to the valve.

(3) Remove the bolts retaining the mounting bracket to the vehicle and remove the valve and bracket from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Tighten the brake pipe flare nuts securely. Installation may be made easier if the brake pipes are loosely installed to the valve before the valve is installed to the vehicle.

(2) Bleed the brakes as described later in this section.



Installed view of the proportioning valve, 1986 four wheel drive model shown.

10. HILL HOLDER VALVE (HHV)

The Hill Holder Valve (HHV) is not repairable and must be renewed if found to be faulty.

TO ADJUST

(1) Ensure that the clutch cable is adjusted correctly, refer to the Clutch section if necessary.

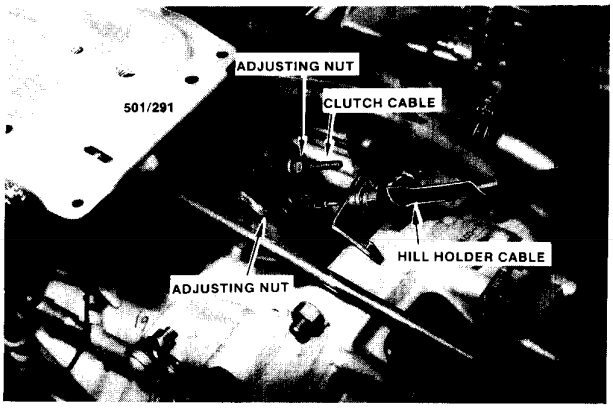
(2) Locate the vehicle on an incline of more than 3 deg gradient, facing uphill.

(3) Check the operation of the HHV as follows: The vehicle should move off from rest smoothly when the clutch is released without the brakes holding on or the vehicle slipping downhill.

(4) If the brakes hold on when the clutch is released and the vehicle starts to move off, loosen the locknut at the transaxle end of the cable and turn the adjusting nut half a turn at a time to lengthen the cable.

(5) If the vehicle slips downhill when the clutch is released, loosen the locknut and turn the adjusting nut half a turn at a time to shorten the cable.

(6) Tighten the locknut securely when the operation of the HHV is satisfactory.



Installed view of clutch and HHV cables, 1986 model shown.

TO REMOVE AND INSTAL

(1) Drain the brake fluid from the master cylinder and place a suitable container under the HHV.

(2) Remove the clip retaining the outer cable to the HHV bracket, pull the outer cable back to allow the inner cable to be withdrawn from the bracket and disconnect the inner cable from the HHV.

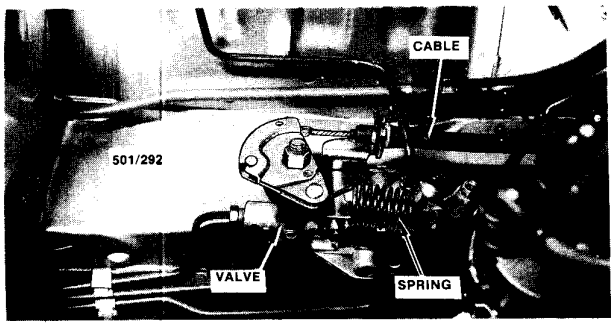
(3) Loosen the flare nuts retaining the brake pipes to the HHV and withdraw the brake pipes from the valve.

(4) Remove the bolts retaining the HHV to the chassis and remove the HHV from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Tighten the brake pipe flare nuts securely. Installation may be made easier if the brake pipes are

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Installed view of the HHV, 1986 model shown.

loosely installed to the HHV before it is installed to the vehicle.

(2) Bleed the brakes as described later in this section.

(3) If necessary, adjust the HHV cable as previously described.

11. HYDRAULIC SYSTEM

TO BLEED

Bleeding the hydraulic system is not a routine maintenance operation and should only be necessary when some portion of the hydraulic system has been disconnected or fluid has been drained off, thereby allowing air to enter the system.

The brake fluid in the system should be changed at regular intervals, refer to the Lubrication and Maintenance section. The procedure for changing the brake fluid and bleeding the system is similar with attention to the notes in the text. Always store brake fluid in an air tight container as moisture can be absorbed by the fluid thereby reducing the serviceability of the fluid. Do not mix conventional and silicone brake fluid.

(1) Fill the fluid reservoir on the master cylinder with clean brake fluid of the specified type and maintain the level to at least half full during the bleeding operation.

NOTE: If changing the fluid, drain the fluid from the reservoir, clean the reservoir and fill it with clean fluid.

On 1979–1984 and Utility model master cylinders, it is possible to drain the master cylinder by loosening the bleeder valves and pumping the brake pedal to drain the fluid from the cylinder, taking care not to completely empty the reservoir thereby allowing air to enter the system. On later model master cylinders, it is necessary to syphon the fluid from the reservoirs.

(2) Bleed the brakes in the following sequence:
1979–1984 and Utility models.
1. right rear, 2. left front, 3. left rear, 4. right front.
1985–1987 Sedan and Station Wagon models.
1. left front, 2. right rear, 3. right front, 4. left rear.

(3) Attach a transparent bleeder tube to the first bleeder valve in the sequence and allow the free end of the tube to be immersed in a jar containing a small amount of brake fluid.

(4) With the aid of an assistant, pump the brake pedal several times and with the brake pedal depressed, open the bleeder valve. Close the bleeder valve whilst fluid of fluid and air is escaping from the bleeder tube to maintain pressure in the system and prevent air being taken back into the system. Allow the pedal to return slowly and remain in the returned position for two–three seconds. Repeat this step until clear fluid containing no air bubbles flows from the bleeder tube.

NOTE: If changing the brake fluid, continue bleeding until clean fluid flows from the bleeder tube.

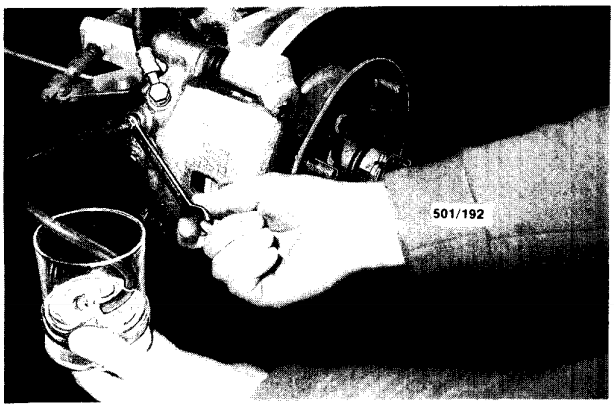
(5) Carry out the bleeding operation on the remaining bleeder valves in the system, working in the sequence previously described.

NOTE: Do not allow the fluid in the reservoir to fall below half full at any time during the bleeding operation or air may enter the system and the bleeding operation will have to be carried out again from the beginning. Always use new fluid for topping up the reservoir.

(6) After the bleeding operation, the brake pedal should be firm when depressed with no evidence of sponginess. Ensure that all the bleeder valves are tight.

NOTE: If sponginess is evident after the bleeding operation, it may be necessary to pressure bleed the brake system to expel all traces of air from the lines. This is best entrusted to an authorised dealer or brake specialist.

(7) Top up the master cylinder reservoir with clean brake fluid of the specified type.



Method of bleeding air from the hydraulic brake system.

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CAUTION: To prevent severe electrical shock extreme care must be taken when working on or near the electronic ignition system as dangerous high tension voltages are produced in both the primary and secondary circuits.

SPECIFICATIONS

BATTERY

Type ..... 12 volt lead acid
Polarity to earth ..... Negative (−)
*Specific gravity:
Fully charged ..... Above 1.260
Fully discharged ..... Below 1.130
*Electrolyte specific gravity varies 0.007 for every 10 deg C rise or fall in temperature above or below 20 deg C. For above temperature add, for below temperature subtract.

ALTERNATOR

Type ..... 14 volt AC
Make ..... Hitachi
Model ..... LT 150–113
LT 150−120
LR 150−151 or 151B
LR 150–199 or 200
LR 160–137 or 138
Maximum output:
LT 150–113, LR 150–199, LR 150–200 ..... 50 amps
LT 150–120, LR 150–151, LR 150–151B ..... 55 amps
LR 160–137, LR 160–138 ..... 60 amps
Polarity to earth ..... Negative (−)
Stator windings ..... Star wound
Regulator type:
LT ..... External adjustable
LR ..... Internal non adjustable
Regulated voltage ..... 14.5 ± 0.3 volt at 20 deg C
Minimum brush length ..... Limit line

EXTERNAL VOLTAGE REGULATOR

Voltage regulator core gap ..... 0.6–1.0 mm
Voltage regulator point gap ..... 0.35–0.45 mm
Voltage regulator yoke gap ..... 0.9 mm
Charge relay core gap ..... 0.6–1.0 mm
Charge relay point gap ..... 0.4–0.6 mm

STARTER MOTOR

Type ..... Reduction drive or direct drive
Make ..... Nippon Denso
Minimum brush length:
Direct drive ..... 11 mm
Reduction drive ..... 9 mm
Minimum commutator diameter:
Direct drive 30.7
Reduction drive ..... 29 mm
Minimum commutator undercut:
Direct drive ..... 0.2 mm
Reduction drive ..... 0.2 mm

DISTRIBUTOR

Make ..... Hitachi
Type ..... Breaker point or electronic
Control ..... Vacuum and centrifugal advance
Rotation of rotor ..... Anti-clockwise
*Firing order (in direction of rotation) ..... 1−3−2−4
Point gap (breaker type) ..... 0.5 mm
Dwell angle (breaker type) ..... 49–55 deg
Air gap:
Hitachi electronic type ..... 0.3–0.5 mm
Nippon Denso electronic type .... 0.2–0.4 mm
*The cylinders are numbered as follows: No. 1 right hand front, No. 2 left hand front, No. 3 right hand rear, No.4 left hand rear.

TORQUE SETTINGS

Alternator pulley nut ..... 59 Nm

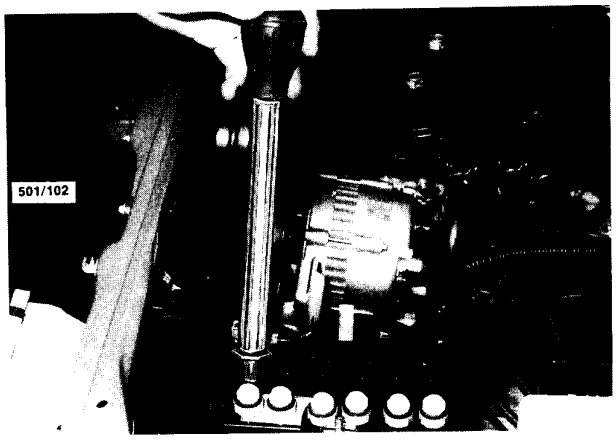
NOTE: For further specifications regarding the ignition system refer to the Engine Tune-up section.

1. BATTERY AND CHARGING SYSTEM TROUBLE SHOOTING

BATTERY UNDERCHARGED

(1) Loose or broken drive belt: Adjust or renew drive belt.

(2) Faulty battery: Instal a new battery of the recommended type and capacity.



Check the specific gravity of the battery electrolyte in each cell with a hydrometer.

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(3) Faulty alternator: Overhaul or renew alternator.

(4) Fault in charging system wiring: Check and renew or repair wiring harness.

(5) Faulty connections in charging system: Check and renew or repair component(s).

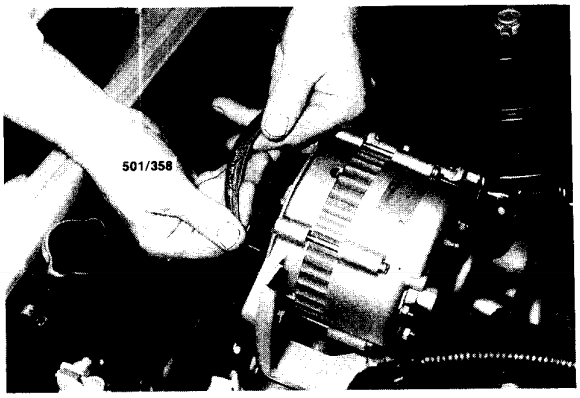
NOTE: The first thing to do is to test the state of charge of the battery with a hydrometer. As specific gravity varies with temperature it is advisable to use a hydrometer with an inbuilt thermometer so that the necessary variation can be calculated. Also an accurate hydrometer reading cannot be taken if distilled water has recently been added to the electrolyte. If the electrolyte level is below the battery plates it will be necessary to add water and charge the battery before testing with the hydrometer.

The specific gravity should not vary more than 0.030 between cells. If the variation is more than this then the serviceability of the battery is questionable and the battery should be recharged and retested before renewing it.

If all readings are above 1.220 and uniform the battery can be considered to be operational. However, it may require recharging depending on the reading. See attached chart showing charge condition for the various specific gravity readings.

1.110–1.130 . . . . . Dead flat
1.140–1.160 . . . . . Nearly flat
1.170–1.190 . . . . . About one quarter charged
1.200–1.220 . . . . . Half charged
1.230–1.250 . . . . . About three quarters charged
1.260–1.280 . . . . . Fully charged

If the battery is undercharged but serviceable seek out the cause by checking out the possible causes in the order given.



Checking the drive belt for wear and deterioration.

BATTERY OVERCHARGED

(1) Faulty alternator: Overhaul alternator and replace internal alternator regulator.

(2) Faulty battery: Instal a new battery of the recommended type and capacity.

(3) Faulty charging circuit wiring or connections: Check and renew or repair faulty components.

NOTE: An overcharged battery is indicated by continual loss of water through boiling. This is usually accompanied by discolouration of the electrolyte.

CHARGE INDICATOR LAMP REMAINS ON

(1) Broken or defective alternator drive belt: Renew drive belt.

(2) Faulty alternator: Check and overhaul alternator.

(3) Short to earth in lamp circuit. Check and repair circuit.

CHARGE INDICATOR LAMP DOES NOT OPERATE

(1) Charge indicator lamp bulb blown: Check and renew faulty bulb.

(2) Faulty ignition switch: Check and renew faulty switch.

(3) Blown fusible link: Repair cause and renew fusible link.

NOISE IN DRIVE BELT OR ALTERNATOR

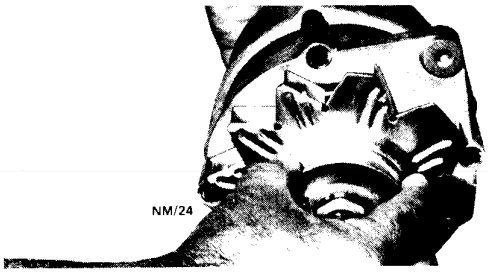
(1) Drive belt frayed: Renew drive belt.

(2) Loose alternator mounting bolts or worn bearings: Tighten mounting bolts or renew bearings.

(3) Loose alternator pulley: Tighten pulley retaining nut.

(4) Faulty alternator: Overhaul or renew alternator.

NOTE: To check if the noise is in the alternator or drive belt loosen the alternator retaining bolts, remove the drive belt and disconnect the wiring connector. If the noise has gone when the engine is run for a short time, check the serviceability of the drive belt and alternator components.



Spin the alternator pulley over by hand to check bearings for noise.

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2. BATTERY AND STARTING SYSTEM TROUBLE SHOOTING

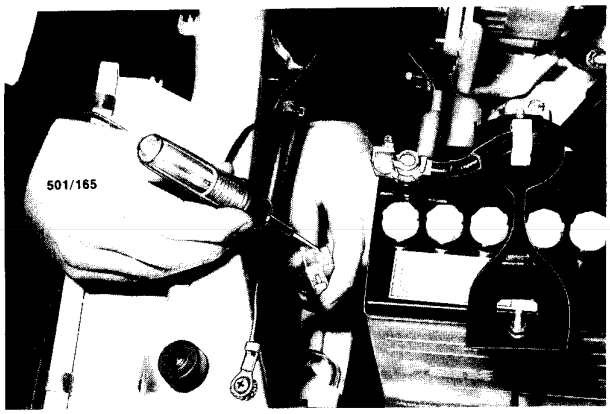
STARTER LACKS POWER TO CRANK ENGINE

(1) Battery undercharged: Check the charging system and rectify as necessary.
(2) Battery faulty, will not hold charge: Check and renew battery.
(3) Battery terminals loose or corroded: Clean and tighten terminals.
(4) Faulty starter solenoid switch or contacts: Check and renew solenoid as necessary.

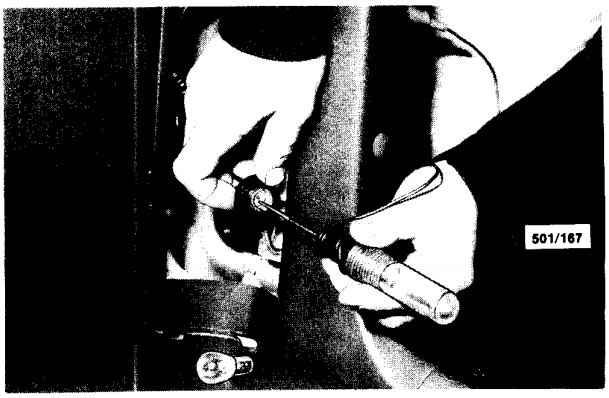
NOTE: Check the state of charge of the battery and check all terminals for cleanliness and security. If necessary test and overhaul the starter motor as described in this section.

STARTER WILL NOT ATTEMPT TO CRANK ENGINE

(1) Open circuit in starting system: Check for dirty or loose terminals, dirty commutator, faulty solenoid or faulty switch.



Checking for power at the headlamp connectors using a test lamp.



Checking for power at the rear combination lamp sockets using a test lamp.

(2) Discharged battery: Check for fault or short circuit in system.
(3) Battery fully charged but will not crank engine: Check for locked drive and ring gear, internal starter fault or seized engine.
(4) Faulty neutral safety switch: Check and renew faulty neutral safety switch. (Automatic transaxle only. Refer to that section for details.)

NOTE: Turn engine over by hand to ensure that the starter drive is not locked with the flywheel ring gear and that the engine is not seized. Ensure that the ignition is switched off before turning the engine.

3. LIGHTING SYSTEM TROUBLE SHOOTING

LAMP OR LAMPS FAIL TO LIGHT

(1) Faulty bulbs(s): Check and renew faulty bulb(s).
(2) Open circuit in wiring or connections: Check lamp circuits and rectify as necessary.
(3) Faulty lamp switch: Check and if necessary renew lamp switch.
(4) Faulty fuse: Repair cause and renew fuse.

NOTE: Switch on the lamps concerned and using a test lamp, check that the lamp circuits are operating. This is best done by starting at the lamp wiring connector or bulb holder and working back to the power source.

LAMP OR LAMPS INCORRECTLY ILLUMINATED

(1) Lamp or lamps incorrectly earthed: Check lamp earth for looseness or clean contact, either at lamp body or wire and repair as necessary.
(2) Incorrect bulbs fitted: Check bulbs wattage and voltage and renew with the correct type if necessary.
(3) Dirty or damaged lamp reflector: Clean or renew lamp reflector.
(4) Faulty bulbs: Check with a known serviceable unit and renew if necessary.
(5) Dirty lamp lens: Clean or renew lamp lens.

NOTE: The most common cause for this condition is incorrect lamp earthing. Check the lamps at their earthing points.

LAMPS FLARE WITH ENGINE SPEED INCREASE

(1) Faulty battery: Check and renew battery.
(2) Battery in low state of charge: Recharge battery and check charging system.
(3) High resistance or faulty connections between alternator and battery: Check circuit and rectify condition.

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(4) Poor earth connection between battery and engine or alternator: Check battery earth lead and the strap between engine and body.

(5) Voltage regulator unit faulty: Check and renew voltage regulator.

NOTE: The most common cause for this condition is dirty terminals on the earth leads. Check all earth leads at their earthing points.

4. TURN SIGNAL LAMP TROUBLE SHOOTING

TURN SIGNAL WARNING LAMP DOES NOT BURN AND NO AUDIBLE CLICKING FROM FLASHER UNIT

(1) Fuse blown: Rectify fault and renew fuse.

(2) Faulty flasher unit: Renew flasher unit. Do not attempt repairs.

(3) Faulty turn signal switch: Renew switch.

(4) Fault in wiring circuit: Check and repair fault.

NOTE: If the fuse is functional check the flasher unit for serviceability by replacing with a known serviceable unit. The flasher unit on 1985 and 1986 Sedan and Station Wagon models is incorporated in the combination switch and is not available as a separate unit.



Remove the right hand trinket tray to gain access to the flasher unit on 1979–1984 models and all Utility models.

TURN SIGNAL WARNING LAMP DOES NOT FLASH BUT AUDIBLE CLICKING FROM FLASHER UNIT

(1) Warning lamp bulb blown: Check and renew bulb.

(2) Fault in warning lamp wiring: Check and repair fault.

NOTE: When renewing bulbs ensure that a new bulb of the correct wattage is used.

BOTH WARNING LAMPS FLASH WEAKLY AND AT GREATER THAN NORMAL SPEED

(1) Faulty flasher unit: Check and renew flasher unit.

(2) Front bulb blown on turn side: Check and renew bulb.

(3) Rear bulb blown on turn side: Check and renew bulb.

NOTE: If one lamp unit is constantly blowing bulbs check for poor earth in circuit.

BOTH TURN SIGNAL WARNING LAMPS BURN CONSTANTLY

(1) Faulty turn signal switch: Check and renew turn signal switch.

(2) Fault in turn signal switch wiring: Check and repair fault.

(3) Faulty flasher unit: Check and renew flasher unit.

NOTE: If the flasher unit is to be renewed always try to obtain a genuine replacement part. The flasher unit on 1985 and 1986 Sedan and Station Wagon models is incorporated in the combination switch and is not available as a separate unit.

5. IGNITION SYSTEM TROUBLE SHOOTING

ENGINE WILL NOT START

(1) Fault in ignition primary circuit wiring: Check ignition primary circuit and repair as necessary.

(2) Faulty ignition switch: Renew ignition switch.

(3) Fault in coil primary winding: Renew ignition coil.

(4) Burnt or dirty contact breaker points in contact breaker system: Clean or renew and adjust contact breaker points.

(5) Faulty capacitor or capacitor lead in contact breaker ignition system: Check and renew capacitor.

(6) Fused or broken low tension lead from breaker arm to low tension terminal in contact breaker ignition system: Check and renew lead.

(7) Electronic control unit not securely earthed in electronic ignition system: Earth control unit.

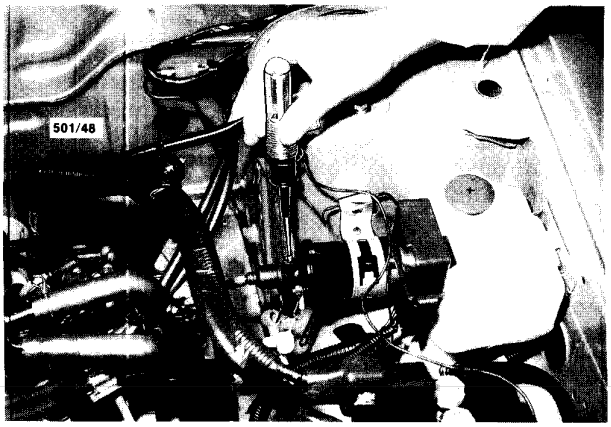
(8) Electronic control unit faulty in electronic ignition system: Renew control unit.

(9) Faulty wiring or terminals to control unit in electronic ignition system: Check and renew wiring or terminals.

(10) Fault in coil high tension circuit: Test and renew ignition coil as necessary.

(11) Cracks in distributor cap: Renew distributor cap.

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Checking for power at the coil positive terminal with a test lamp.

(12) Crack in distributor rotor: Renew distributor rotor.

(13) Faulty high tension leads: Check and renew high tension leads.

(14) Faulty or incorrectly adjusted spark plugs: Renew or clean and adjust spark plugs.

NOTE: Refer to the Roadside Trouble Shooting section and make the necessary tests to ensure that the trouble is in the ignition system.

ENGINE STARTS BUT MISFIRES UNDER LOAD

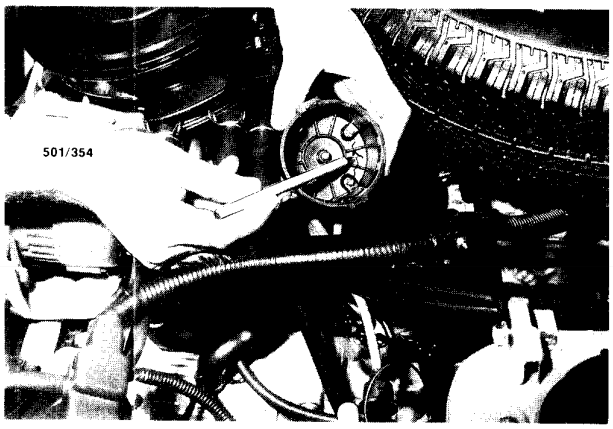
(1) Faulty, dirty or incorrectly adjusted spark plugs: Renew or clean and adjust spark plugs.

(2) Condensation moisture in distributor cap: Check and dry out and examine cap for cracks.

(3) Faulty high tension leads: Check and renew leads.

(4) Cracked spark plug insulator(s): Renew faulty spark plug(s).

(5) Faulty ignition coil: Check and renew ignition coil.



Check the distributor cap for cracks and tracking.

NOTE: Check possible causes in the order given.

ENGINE RUNS BUT LACKS POWER

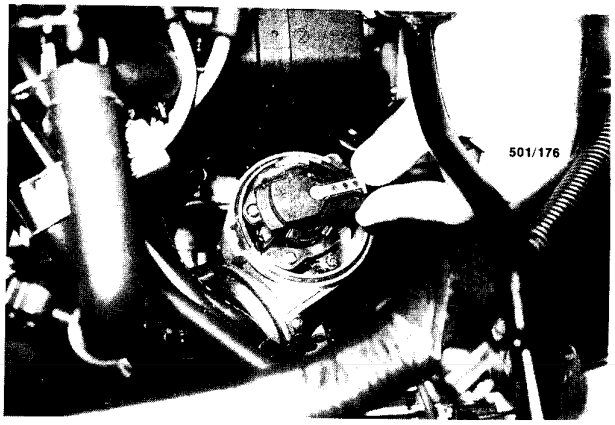
(1) Ignition timing incorrectly set: Check and readjust timing.

(2) Centrifugal advance mechanism seized or excessively worn: Overhaul distributor.

(3) Vacuum advance unit inoperative: Check for broken vacuum pipe or faulty unit.

(4) Vacuum advance unit operates but ineffective: Advance unit link disconnected or broken.

NOTE: To check if the centrifugal advance mechanism is operating correctly remove the distributor cap and twist the rotor in the direction of normal rotation. It should spring back to its original static position when released.



Turn the rotor in the direction of rotation then release it to check the operation of the centrifugal advance mechanism.

6. TEST EQUIPMENT AND SOME APPLICATIONS

TO MAKE A TEST LAMP

When working on the electrical system, a test lamp will be found to be most helpful for checking the continuity of live circuits. A simple test lamp can be made from two suitable lengths of 4 millimetre wire, two small alligator type clips, a double contact bulb holder and a 12 volt single filament double contact bulb.

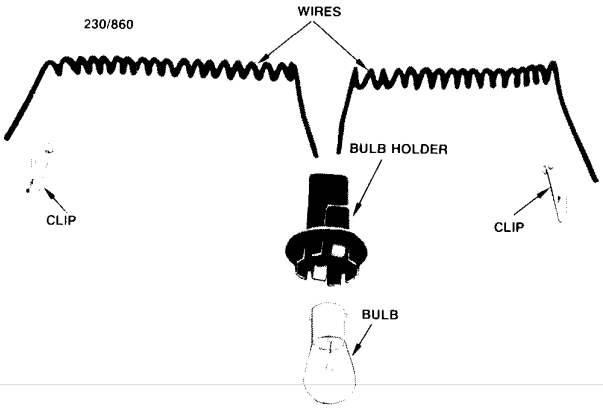
(1) Bare both ends of the two lengths of 4 millimetre wire.

(2) Solder an alligator clip to one end of each wire lead.

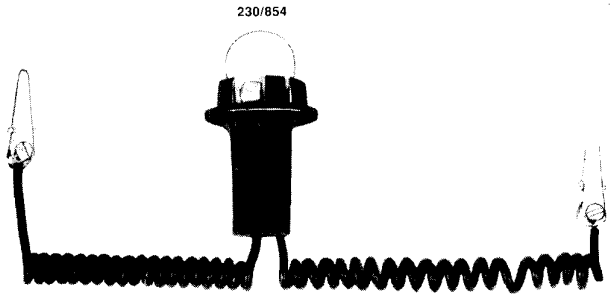
(3) Connect the other end of each lead to the double contact bulb holder terminals and ensure that they are insulated from each other and from the bulb holder base.

(4) Instal the bulb in the bulb holder.

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Components and materials for assembling a test lamp.



Assembled view of test lamp.

(5) To test the unit connect it across a 12 volt battery, the bulb should light up if the wiring is correct and the bulb serviceable.

TO MAKE A JUMPER LEAD

When testing components of the electrical system a jumper lead is very handy.

(1) Bare both ends of a suitable length of 4 millimetre wire.

(2) Connect a small alligator clip to each end of the wire. Solder and tape the connections.

(3) Test the jumper lead for continuity by removing one battery cable and connecting the lead between the cable and the battery terminal. Turn the ignition key to 'ON' and the dash warning lamps should operate indicating a completed circuit through the jumper lead.

(4) Remove the jumper lead from the circuit and reconnect the battery.

NOTE: Make a few test leads of various lengths using different sizes and types of alligator and battery clips.

TO TEST SWITCHES

If a switch is suspected of being faulty, remove the wires from the switch and using a test lamp, test each lead to find the power wire. It may be necessary to turn the ignition switch 'ON' as the switch may be wired through the ignition circuit.

After noting the color/position of the wire, disconnect the test lamp and using a suitable jumper lead, connect the jumper lead from the power wire of the switch to the other side of the switch. If the circuit functions, the switch is faulty and should be renewed. See Switches and Controls.

TO TEST BULBS

If a bulb is suspected of being faulty, remove the bulb from the bulb holder and using a small jumper lead connect one end of the jumper lead to the power terminal of a serviceable battery and the other end of the jumper lead to a lug on the side of the bulb.

Connect one end of a second jumper lead to the earth terminal of the battery and with the other end of the jumper lead touch the bulb contact. The bulb should light.

If the bulb has two filaments, touch the other bulb contact with the end of the jumper lead. The bulb should light. If the bulb should fail to light, the bulb should be replaced with a bulb of the correct voltage and wattage.

TO TEST CIRCUITS

If a circuit is suspected of being faulty, turn the switch on in the normal manner so as to supply power to the circuit.

Where connections are in the circuit, disconnect the connection and connect one lead of the test lamp to the power or switch side of the disconnected circuit and the other lead of the test lamp to a clean earth (e.g. bolt or screw). If the lamp does not light, check the circuit towards the power or switch end of the circuit.

If the lamp lights, continue checking towards the motor or bulb in the circuit.

NOTE: A fuse or its associated connections is always a good starting point, but reconnect each connector or fuse after testing that particular connector or fuse.

7. BATTERY

Special Equipment Required:
To Test — Hydrometer

MAINTENANCE

Maintenance consists mainly of regular inspection and servicing.

(1) Keep the battery and its surroundings clean and dry. Give the top of the battery particular attention to prevent electrical leakage between the cell terminals.

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(2) Remove the vent plugs and check that the vent holes are clear.

(3) Check the electrolyte level and top up as necessary. The correct level is just over the top of the separators. Do not overfill or acid will escape through the vent holes with detrimental effect to the connections and to adjacent parts of the vehicle.

(4) Use only distilled water for topping up.

NOTE: Never use a naked light when examining the battery, as the gases given off by the battery are dangerously explosive.

(5) If the battery required an excessive amount of topping up, the cause should be sought. If overcharging is suspected, then check the output of the alternator.

If one cell in particular is at fault, check the case for cracks. Never transfer electrolyte from one cell to another.

(6) Keep the terminals clean and apply a small amount of petroleum jelly to the terminals to prevent corrosion.

TO REMOVE AND INSTAL

(1) Remove the retaining nut and remove the negative lead from the battery post.

(2) Remove the positive lead in the same manner.

(3) Remove the battery holding clamp and lift the battery from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

Do not overtighten the clamp nuts and make sure of correct polarity.

After installation coat the terminals with petroleum jelly to prevent corrosion.

TO CLEAN BATTERY CASE

(1) Remove the battery from the vehicle as previously described.

(2) Pour hot water over the battery being careful not to pour water through the vent holes of the filler caps.

(3) Wipe the battery case clean.

(4) If there is a crack in the case or around the base of the terminal(s) the battery should be repaired or renewed. Take the battery to an automotive electrical shop or battery agent for the necessary servicing.

TO CLEAN BATTERY CARRIER

If the battery electrolyte has overflowed and contaminated the surrounding body panels, it will be necessary to remove this contamination and repaint the surfaces where necessary. The contamination can be neutralised by using an alkaline solution consisting of two tablespoons of washing soda to a quart of boiling water. Cloudy ammonia can also be used in concentrated form. Both these items are readily available at grocery stores.

After neutralising the contaminated body panels allow them to dry. Clean off the old paint and repaint the surfaces with an antirust based paint.

TO TEST

Use a hydrometer to check the specific gravity of the battery electrolyte. Refer to Specifications for a fully charged and fully discharged battery.

If the battery is in a low state of charge or completely flat take it to an automotive electrical shop to have it charged and load tested.

8. ALTERNATOR

Special Equipment Required:

To Test on Vehicle — 60–0–60 DC– Ammeter, 0–20 DC voltmeter

To Dismantle — Bearing puller, soldering iron

To Assemble — Press, soldering iron

DESCRIPTION

In the alternator the field and pole shoe assembly is the moving part and is shaped to form the rotor. Since only a low amperage current flows between the slips rings on the rotor shaft and the brushes, wear on brushes and slip rings is very slight and maintenance is reduced to a minimum.

The output current is generated in the fixed stator windings and is a three phase alternating current (AC). The stator windings, which are wound on a laminated soft iron former, are star connected and fitted between the end brackets.

As it is not possible to recharge a storage battery with alternating current, it is necessary to rectify the output of the stator windings to direct current (DC). This is performed by a bank of diodes mounted within the alternator slip ring end bracket.

The output of the alternator is governed by the regulator and built in characteristics of the alternator.

The external, adjustable regulator fitted to LT model alternators is mounted on the right hand inner fender panel to the rear of the battery. The regulator fitted to LR model alternators is an internal non-adjustable type, mounted on the alternator slip ring end bracket.

An electrical cut out unit is not necessary with the alternator charging system as the diodes prevent a reverse current flow through the alternator.

SERVICE PRECAUTIONS

(1) Ensure that the battery is connected with the correct polarity to earth. Refer to Specifications.

(2) Do not short out or ground any terminals common to the charging circuit.

(3) Always disconnect the battery before connecting a battery charger.

(4) If a booster battery is used always connect it

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in a parallel circuit i.e. positive to positive (+ to +) and negative to negative (− to −) to maintain a 12 volt supply pressure.

(5) Never disconnect the battery or terminals in the charging circuit while the engine is running.

(6) Regularly check the drive belt tension.

(7) Keep the battery terminals clean and all electrical connections tight.

(8) Disconnect the battery and alternator when electric welding on the vehicle.

TO TEST ON VEHICLE

If the ignition warning lamp stays on after the engine has been started and run at approximately 1000 rpm, carry out the following tests and precautions.

(1) Stop the engine, do not open circuit any parts of the charging circuit while the engine is running.

(2) Check the condition and adjustment of the drive belt.

(3) Clean the battery terminals, tighten all electrical connections, check the wiring for shorts to earth and/or bridged circuits and make sure the battery is fully charged. If the battery is low either charge it or replace it with one fully charged.

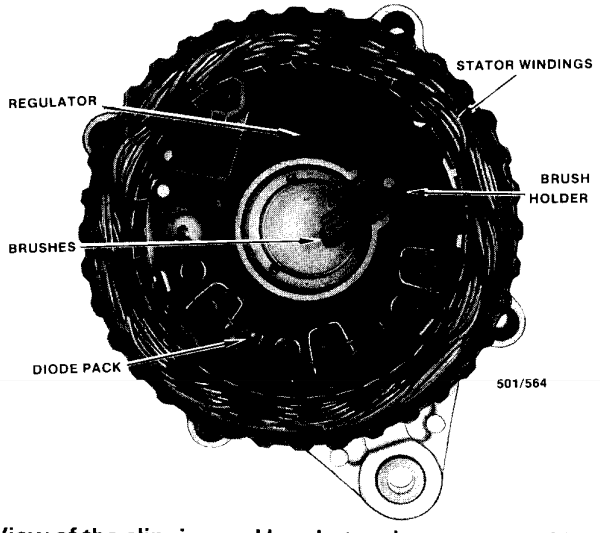
(4) Start the engine and allow it to run until normal operating temperature is reached.

(5) Stop the engine and disconnect the negative battery terminal.

(6) Remove the nut and washer from the alternator output terminal and disconnect the alternator output lead.

(7) Connect one lead of a 60–0–60 ammeter to the alternator output terminal and the other lead of the ammeter to the lead removed from the output terminal.

(8) Reconnect the battery negative terminal and connect a 0–20 voltmeter across the battery terminals.



View of the slip ring end bracket and stator assembly.

(9) Switch on all lamps and allow them to burn for approximately five minutes to reduce the charge of the battery and to apply a load to the circuit.

(10) Start the engine and gradually increase the engine speed to approximately 2500rpm. The reading on the ammeter should be approximately 75 per cent of the rated output of the alternator. (See Specifications).

(11) Switch off all the lamps and run the engine at 1500–2000 rpm until the indicated charge is below 10 amps. The voltmeter should now read between 12.5–14.7 volts.

NOTE: Should the alternator fail to reach the specified output the unit will have to be removed and overhauled or a replacement unit fitted. Should the voltage reading be above or below Specifications, the regulator will have to be renewed or adjusted.

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Disconnect the terminal block at the alternator by pulling on the terminal block, not the wires.

(3) Remove the nut and washer from the output terminal on the alternator and disconnect the output lead.

(4) Remove the bolt securing the alternator to the drive belt adjusting bar.

(5) Remove the mounting bolt nut, push the alternator towards the engine and slip the drive belt from the pulley.

(6) Withdraw the mounting bolt whilst supporting the alternator with the other hand. Remove the alternator.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Do not over tension the drive belt and apply pressure to the mounting end bracket only when adjusting the drive belt.

(2) Check the wiring where soldered to the terminals.

TO DISMANTLE

(1) Remove the alternator from the vehicle as previously described.

(2) Mark the assembled position of the alternator components by scribing a line from the drive and bracket to the rear of the slip ring end bracket.

(3) Grip the alternator carefully in a vice with suitable protection between the vice jaws and the alternator body. Remove the pulley retaining nut whilst locking the shaft against rotation with a suitable Allen key inserted in the end of the shaft.

(4) Remove the nut, retaining washer, split pulley, cooling fan and inner spacer from the rotor shaft.

(5) Remove the alternator from the vice. Remove the diode pack retaining nuts and the nut and plastic insulating bush from the output stud. Remove

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the through bolts and withdraw the slip ring end bracket from the alternator.

(6) Lift the brushes clear of the rear bearing on the rotor shaft and withdraw the rotor and drive end bracket from the stator and diode pack.

(7) Using a soft faced hammer, tap the rotor shaft from the drive end bracket.

(8) Remove the set screws from the drive end bracket bearing retainer and remove the bearing from the bracket.

NOTE: The diode pack is supplied as an integral unit and in the event of a component failure, the diode pack must be replaced as a complete unit.

(9) Tag and mark all wiring connections prior to removal to avoid incorrect connections during reassembly.

(10) Using a very hot soldering iron and a pair of long nosed pliers unsolder the stator winding leads from the connector terminals on the diode pack.

NOTE: Do not apply undue heat to the connections as damage may result to the terminal insulator and/or the diodes.

(11) Using a suitable puller, remove the bearing from the slip ring end of the rotor shaft.

TO CLEAN PARTS

(1) Do not immerse units of the alternator in cleaning solvent as damage to the windings may result.

(2) The end bracket may be washed in kerosene or similar cleaning fluid after they have been completely dismantled from the unit. They should be thoroughly dried after cleaning.

(3) Compressed air can be used to carefully blow out the dust from the stator windings and the field windings on the rotor.

(4) Slip rings that are burned or scored should be polished using very fine glass paper.

(5) Clean the brushes and brush holders using a petrol damp rag and check and remove all burrs from the holders.

(6) Check the sealed type ball bearings for wear, roughness and lack of lubrication and renew as necessary.

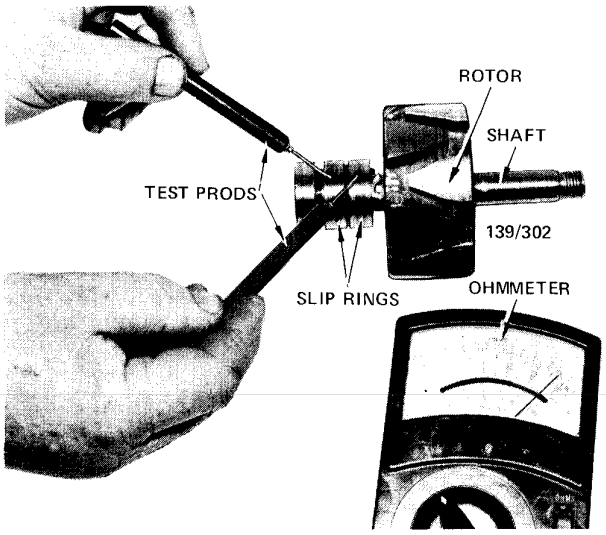
Unsealed type ball bearings, if still serviceable, may be sparingly lubricated with high melting point grease and installed for further service.

TO CHECK AND TEST COMPONENT PARTS

All parts being electrically tested should be resting on a non-conductive pad.

Slip Rings

(1) Visually check the slip ring assembly for damage.



Use an ohmmeter to test for bridging or internal shorting of rotor fields.

(2) Remove all burrs and burn marks with fine glass paper (not emery paper).

Field Windings and Rotor Assembly

(1) The insulation to earth test is made with an ohmmeter, connect one of the prods to one of the field wires or slip rings and the other test prod to one pole piece of the rotor.

(2) If the ohmmeter shows a reading and no visual earthing can be seen and rectified, a new rotor assembly will have to be installed.

(3) To check for bridged or internal shorting of the field coils use an ohmmeter to check the resistance of the rotor windings. Compare the ohmmeter reading with Specifications, a low reading indicates a bridged circuit internally, a high reading indicates an open circuit or high resistance in the windings. In both the above cases a new rotor assembly will have to be installed.

Diodes

The diode pack may be tested after disconnection. The testing can be made using a 12 volt battery and a 1.5 watt bulb in series with a jumper lead.

(1) Connect the jumper lead from the negative terminal of a charged battery to the diode pack body holding the diodes to be tested.

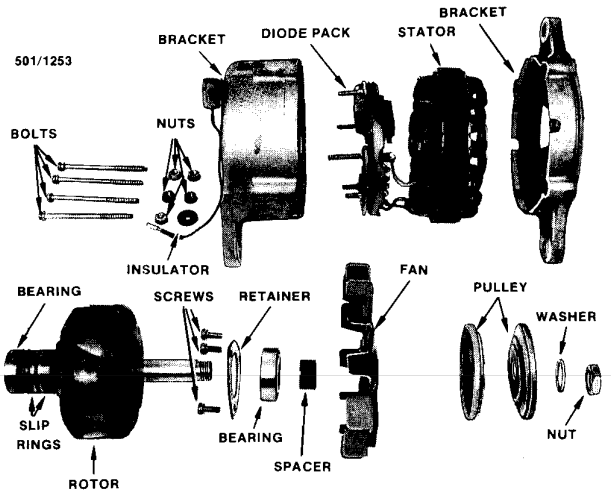
(2) Connect one lead of a test lamp to the battery positive terminal and with the other lead of the test lamp touch each diode lead in turn. Note whether the lamp is illuminated and then reverse the connections on the battery. Again test each diode with the test lamp lead.

(3) If the lamp was illuminated in both directions or was not illuminated at all, the diodes are faulty and the diode pack must be renewed.

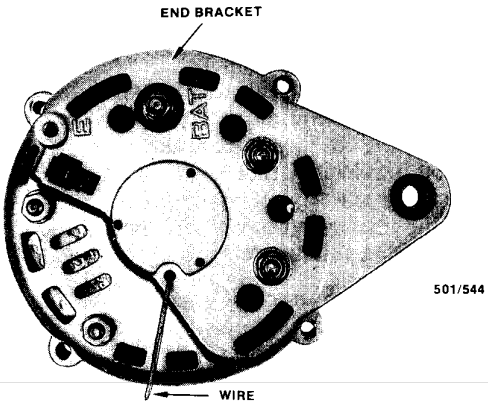
Brush Springs and Brushes

(1) Unsolder and remove the brushes.

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Dismantled view of the alternator.



View of the slip ring end bracket showing the method of holding the bushes in a retracted position for assembly.

(2) Check the brush springs for overheating and distortion, check for binding in the brush holder.

(3) Check the brush length and renew as necessary. Refer to Specifications for minimum length.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Press the bearing onto the slip ring end of the rotor shaft.

(2) Using a very hot soldering iron and a pair of long nosed pliers as a heat sink, solder the stator wires to the diode pack.

(3) Instal the front bearing to the drive end bracket. Instal the bearing retainer with the retaining screws and tighten them securely.

(4) Using a soft faced hammer tap the drive end bracket onto the rotor shaft as far as it will go.

(5) Grip the rotor carefully in a vice with suitable protection between the vice jaws and the rotor. Instal the spacer, the fan, the split pulley, the washer and retaining nut. Tighten the pulley nut to Specifications.

(6) Instal the diode pack and stator assembly into the slip ring end bracket. Instal the plastic insulating bush and retaining nut on the output stud and tighten it securely.

(7) Instal the diode pack retaining nuts and tighten them securely.

(8) Retract the slip ring brushes into the brush holder and insert a piece of stiff wire through the brush hold up hole in the slip ring end bracket.

Ensure that the brush hold up wire does not become dislodged during the next stage of assembly.

(9) Instal the rotor and drive end bracket assembly in the stator and slip ring end bracket assembly.

(10) Align the scribed marks made before dismantling, instal the through bolts and tighten them securely.

(11) Remove the brush hold up wire from the slip ring end bracket and check the rotor for smooth rotation.

(12) Instal the alternator to the vehicle and test its operation as previously described.

EXTERNAL VOLTAGE REGULATOR

To Remove and Instal

(1) Disconnect the negative battery terminal.

(2) Disconnect the wiring connector by pulling on the connector not the wires.

(3) Remove the screws retaining the regulator to the inner fender panel and remove the regulator from the vehicle.

Installation is a reversal of the removal procedure.

To Adjust

It is recommended that the vehicle be taken to an automotive electrician if the operation of the voltage regulator is in doubt. However the following air gap measurements and adjusting procedures may prove helpful in determining the condition of the regulator.

(1) Disconnect the negative battery terminal.

(2) Remove the regulator from the vehicle as previously described.

(3) Remove the screws retaining the cover to the regulator and remove the cover from the regulator.

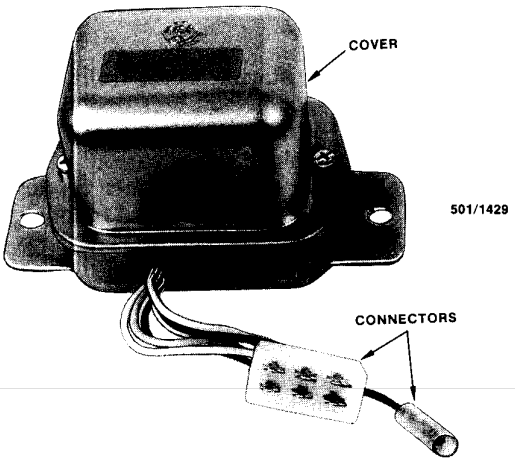
(4) Inspect the points for pitting and burning. If the points are excessively burnt or pitted the regulator must be renewed. If the points are dirty they may be dressed using fine emery cloth.

(5) Using feeler gauges of the correct thickness, measure the core gap and the point gap of the voltage regulator and the charge relay.

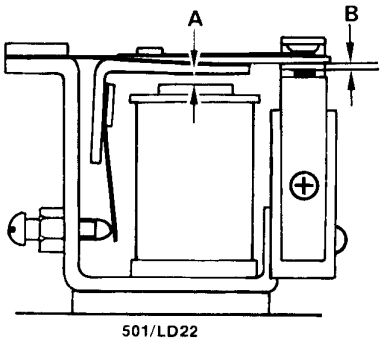
(6) If the core or point gaps are not to Specification, adjust the core gap first followed by the point gap.

(7) Adjust the core gap by loosening the screw

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View of the external regulator removed from the vehicle.



Line drawing showing the measuring points for the core gap and point gap. A = core gap, B = point gap.

retaining the point set to the yoke and moving the point set up or down to achieve the correct gap.

(8) Adjust the point gap by loosening the screw retaining the upper point to the regulator body and moving the upper point up or down to achieve the correct gap.

(9) Adjustment of the yoke gap is not necessary.

(10) Instal the cover and tighten the retaining screws securely.

(11) Instal the regulator to the vehicle and check the operation of the charging system as previously described.

9. STARTER MOTOR

Two types of Nippon Denso starter motor are fitted to the Subaru range of vehicles, being of the direct drive, or indirect reduction drive type.

DESCRIPTION

Direct Drive Type

The direct drive type starter motor is of the induced pole type with four brushes and four pole shoes with field coils.

A solenoid switch is attached to the starter drive end bracket. The solenoid plunger is connected to the over-running clutch and drive pinion through a lever and spring arrangement.

When the solenoid windings are energised, the plunger acting on the lever and pivot engages the drive pinion with the flywheel ring gear and at the same time closes the switch supplying power from the positive side of the battery to the starter motor field coils and armature to operate the motor.

As the engine fires, the over-running clutch of the drive pinion assembly prevents high speed rotation of, and possible damage to, the starter armature if the solenoid winding are not immediately de-energised by releasing the switch key.

The starter solenoid switch windings are energised by the key operated combination ignition and starter switch.

Reduction Drive Type

The reduction drive type starter motor is of the induced pole type with four brushes and four pole shoes with field coils.

A solenoid switch is incorporated in the main housing, the solenoid plunger contacts the drive pinion through a spring loaded ball which acts as a bearing.

When the solenoid switch is activated, the plunger contacts the ball to move the drive pinion into mesh with the engine flywheel.

At the same time the switch contacts in the solenoid switch, supply power from the battery positive terminal to the starter motor field coils and armature to operate the starter motor.

The starter motor operates through a reduction gear set which is housed in the end bracket. The use of a reduction gear set increases the torque of the starter motor.

As the engine fires, the over-running clutch of the drive pinion assembly prevents high speed rotation of and possible damage to, the starter armature if the solenoid winding are not immediately de-energised by releasing the switch key.

The starter solenoid switch windings are energised by the key operated combination ignition and starter switch.

TO TEST ON VEHICLE

Should the starter fail to operate when the switch is moved to the start position check the following points:

(1) Check the battery condition and state of charge, refer to Battery heading in this section.

(2) Clean the battery terminals, taking particular care to remove the scale from the positive (+) terminal post and terminal.

(3) Check the earth connections for tightness and cleanliness.

(4) Switch on the headlamps and operate the

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starter control switch. If the lamps go dim but the starter is not heard to operate, it could indicate that a short circuit or low resistance has developed in the starting system which could be either external or internal.

Also check that the engine is not "seized" or "locked up" as this condition would give the same indication as above.

(5) If the lamps do not go dim and the starter does not operate this would indicate an open circuit such as a broken or disconnected wire or a switch not operating. If the vehicle is fitted with automatic transmission operate the starter control switch and move the selector lever through all the gear selection range. If the starter operates in any position other than N or P, the neutral safety switch is faulty.

(6) Check all the external wiring to make sure the fault is not external, if the external circuit proves satisfactory, indicating that the problem is in the starter assembly, the unit will have to be removed for inspection.

TO REMOVE AND INSTAL

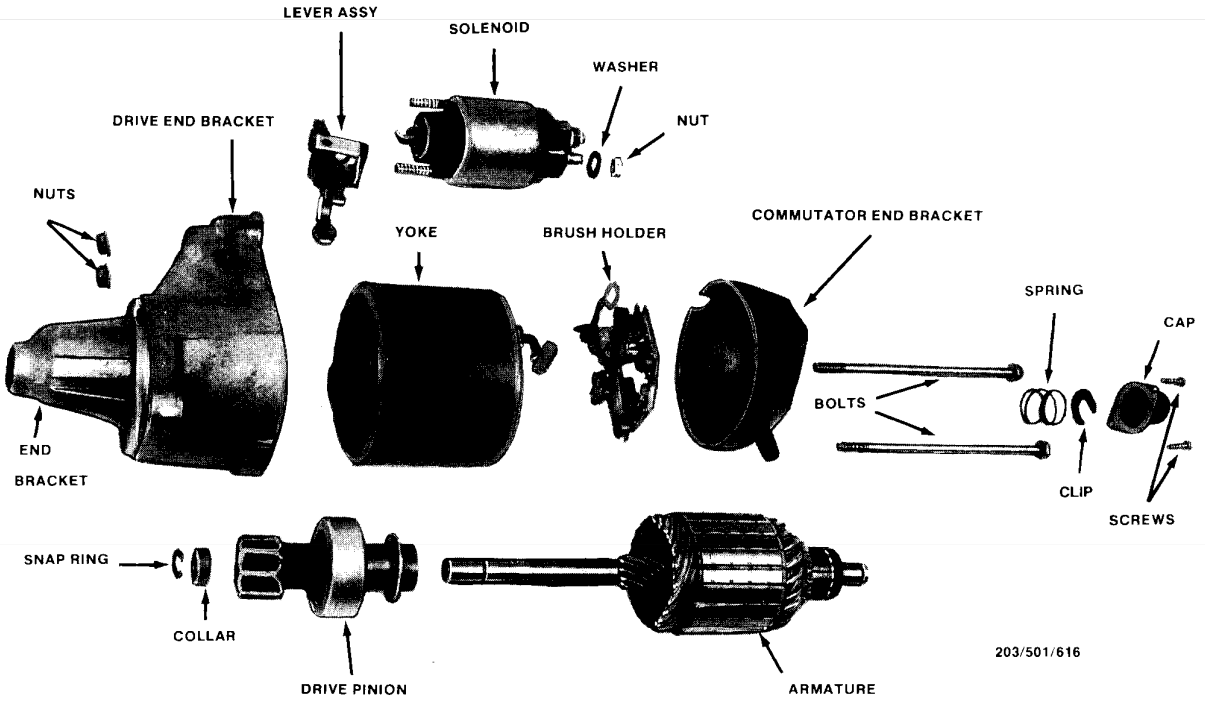
(1) Disconnect the negative battery terminal.
(2) Remove the spare tyre from the carrier.
(3) Disconnect the wires from the starter motor solenoid.
(4) Remove the bolts and nuts retaining the starter motor to the transaxle housing and withdraw the starter motor from the vehicle.

Installation is a reversal of the removal procedure.

TO DISMANTLE

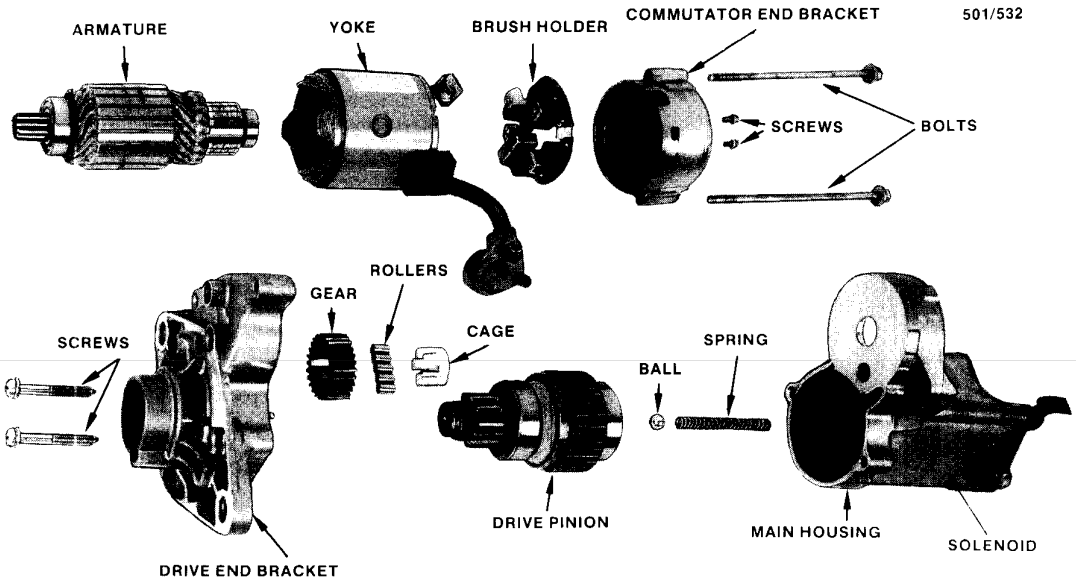
Direct Drive Type

(1) Remove the starter motor from the vehicle as previously described.
(2) Disconnect the field connector strap from the terminal on the solenoid.
(3) Remove the screws or nuts retaining the solenoid to the drive end bracket and manoeuvre the solenoid from the bracket.
(4) Remove the screws retaining the armature end cap to the commutator end bracket and remove the armature end cap, clip, spring and seal from the commutator end bracket.
(5) Remove the through bolts retaining the commutator end bracket to the drive end bracket and remove the commutator end bracket from the starter motor.
(6) Remove the field coil brushes from the brush holder and remove the brush holder.
(7) Withdraw the yoke and solenoid seal from the drive end bracket.
(8) Withdraw the armature and lever from the drive end bracket.
(9) Support the armature in a vertical position with the drive pinion assembly uppermost.
(10) Using a suitable tubular drift or socket, tap the stop collar towards the drive pinion and clutch assembly and remove the snap ring from the armature shaft.
(11) Remove any burrs from the shaft and withdraw the stop collar and the drive pinion and clutch



Dismantled view of the direct drive starter motor.

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Dismantled view of the reduction drive starter motor.

assembly from the armature shaft.

(12) Clean all parts thoroughly but do not immerse the yoke, armature, solenoid or drive clutch in cleaning fluid.

(13) Visually check all parts for wear and burned insulation.

Reduction Drive Type

(1) Remove the starter motor from the vehicle as previously described.

(2) Disconnect the field connector strap from the solenoid.

(3) Remove the through bolts retaining the yoke and commutator end bracket to the main housing and withdraw the yoke complete with the armature and commutator end bracket from the main housing.

(4) Remove the screws retaining the brush holder to the commutator end bracket and remove the commutator end bracket from the yoke.

(5) Withdraw the armature from the yoke.

(6) Disconnect the field brushes from the brush holder and withdraw the brush holder from the yoke.

(7) Remove the screws retaining the drive end bracket to the main housing and withdraw the drive end bracket from the main housing taking care not to misplace the spring, ball, rollers and cage.

(8) Remove the drive pinion, intermediate gear, rollers and cage from the drive end bracket.

TO CHECK AND INSPECT

(1) With the starter motor dismantled check the brush holder insulation using an ohmmeter.

Connect one test lead on the brush holder positive side and the other lead on the negative side. If there is any indication of leakage the ohmmeter will show a reading other than infinite. Repair or renew the brush holder if a short circuit is evident.

(2) Check the brushes for adequate length. Brushes should be renewed when their length is below Specifications. They should be a free sliding fit in the brush holders.

(3) Check the brush springs, and compare them with new springs.

(4) Check that the commutator is free from pitting and burning, clean with a petrol moistened cloth and polish with a strip of fine glass paper.

A badly worn commutator may be cleaned up by mounting the armature in a lathe, spinning at high speed, and a light cut taken along the commutator with a very sharp tool. After turning, undercut the insulation between the segments.

(5) Check the armature for short circuit, using an ohmmeter.

(6) Place one of the test leads on the armature shaft or core and move the other lead around the circumference of the commutator. If the ohmmeter shows a reading at any point the armature is faulty and should be renewed.

(7) Test the field coils for continuity by connecting the test leads in series with the field windings.

Failure of the ohmmeter to show a reading indicates an open circuit in the wiring of the field coils.

(8) Check the field coil for ground by placing one test lead on the field coil lead and the other lead on the yoke. If the ohmmeter shows a reading the field coils and yoke assembly are faulty and will have to be renewed.

(9) Check the drive assembly clutch pinion teeth for wear, scoring or chipping. A clutch in good condition should take up the drive in one direction

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only. It should rotate easily and smoothly in the non-drive direction and the assembly should move smoothly along the armature helical splines.

NOTE: Do not wash the drive assembly or clutch in solvent as this will destroy the clutch lubricant and cause early failure of the unit.

(10) Check the armature shaft bushes or bearings for wear and renew as necessary. The old bushes must be removed and the new ones pressed into the end brackets using a polished mandrel of the exact diameter of the armature shaft.

NOTE: The new bushes must not be reamed to size, as reaming will impair the porosity of the bushes and cause early failure. New bushes should be allowed to stand immersed in clean light engine oil for one hour before fitting.

On reduction drive starter motors, the bearings may be removed from the armature shaft using a suitable puller.

Instal the bearing using a suitable tube no larger than the diameter of the inner race and a press with suitable attachments.

TO ASSEMBLE

Direct Drive Type

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Lubricate the helix on the armature shaft lightly with graphite grease and instal the drive pinion and clutch assembly to the armature shaft.

(2) Fit the stop collar and snap ring, slide the stop collar over the snap ring to lock the snap ring in position.

(3) Lubricate the bushes in both end brackets sparingly with engine oil.

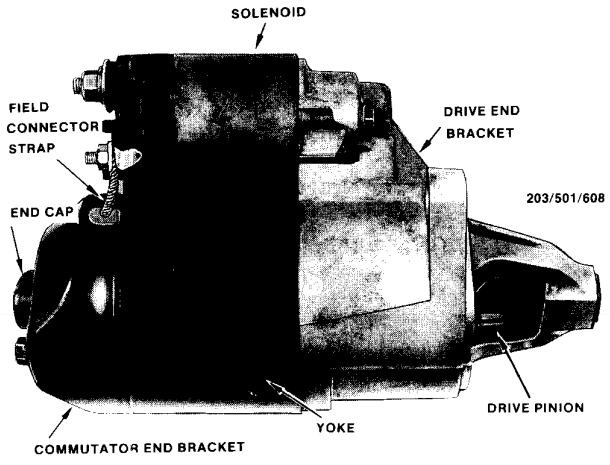
(4) To instal the brush holder with the brushes fitted it will be necessary to push the brushes against the brush spring tension into their holders and then slide the assembly onto the commutator.

(5) When installing the end cover, ensure that the field connector strap and insulator are seated correctly in the end cover.

(6) Instal the solenoid plunger to the pinion lever.

(7) Instal the solenoid and retaining screws, tighten the retaining screws securely.

(8) Connect the field connector strap to the solenoid terminal.



Assembled view of the direct drive starter motor.

Reduction Drive Type

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Apply suitable grease to the drive pinion and armature bearings prior to assembly.

(2) Instal the rollers and cage to the drive end bracket and apply suitable grease.

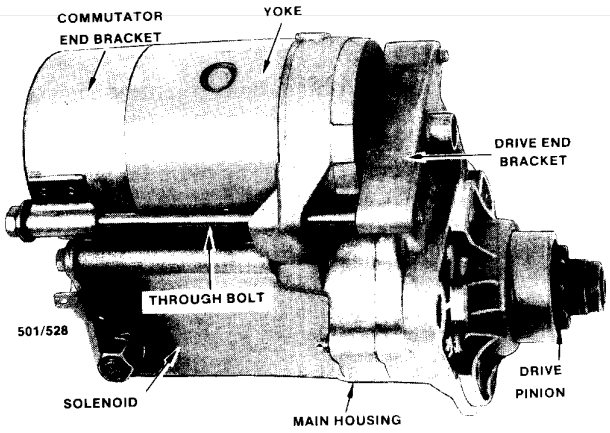
(3) Engage the teeth of the intermediate gear and drive pinion and instal them to the drive end bracket.

(4) Ensure that the ball and spring are correctly installed and instal the drive end bracket to the main housing. Instal and tighten the retaining screws securely.

(5) Instal the armature, brush holder and commutator end bracket to the yoke.

(6) Instal the motor to the main housing, instal and tighten the through bolts securely.

(7) Connect the field connector strap to the solenoid terminal, instal and tighten the retaining nut securely.



Assembled view of the reduction drive starter motor.

10. BREAKER POINT DISTRIBUTOR

DESCRIPTION

The breaker point distributor is installed to the OHV engines on 1979–1984 and all Utility models.

The distributor is driven by a helical gear from the front of the crankshaft.

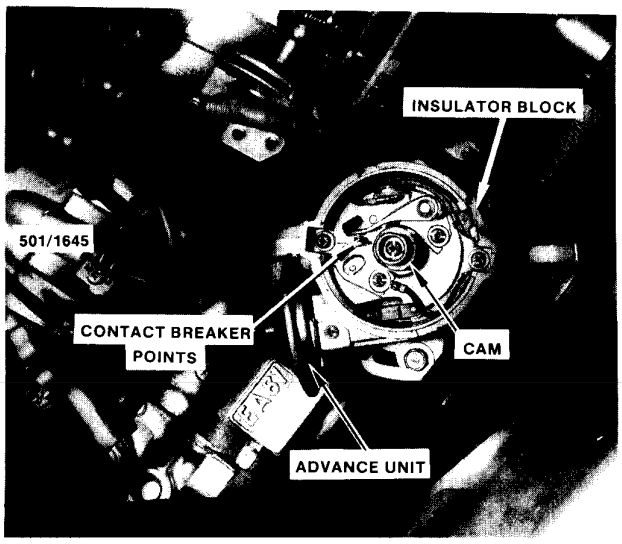
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The distributor houses the contact breaker points which interupt the ignition primary circuit and cause a high tension current to flow from the ignition coil. This current is distributed to the spark plugs by means of a rotor arm, a distributor cap and high tension leads which are mounted on the distributor.

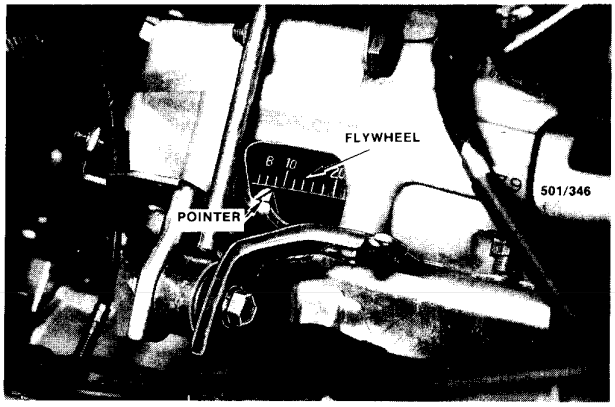
The distributor also provides the means of ignition spark advance required by varying engine operating conditions. Two types of advance systems are incorporated, mechanical advance which advances the spark as engine speed rises and vacuum advance which caters for engine requirements at low engine rpm.

Mechanical advance is supplied by centrifugal weights mounted on the distributor drive shaft and is governed by springs.

Vacuum advance is supplied by manifold vacuum through a diaphragm mounted externally on the distributor body. Linkage between the breaker plate and the vacuum diaphragm enables spark advance, which is controlled by throttle position and engine loading.



Installed view of the distributor with cap and rotor arm removed.



The timing marks are located on the flywheel and flywheel housing, 1986 model shown.

TO REMOVE AND INSTAL

(1) Remove the air cleaner as described in the Fuel System section.

(2) Remove the distributor cap and secure it to one side.

(3) Rotate the crankshaft in the direction of normal rotation until the rotor arm is positioned adjacent to the distributor cap terminal for number one cylinder and the timing mark on the flywheel is aligned to the pointer on the transaxle flywheel housing.

(4) Disconnect the wiring connector from the distributor by pulling on the connector not the wires.

(5) Remove the bolt located at the rear of the distributor, retaining the distributor adaptor plate to the crankcase.

(6) Suitably mark the relationship of the distributor to the crankcase and lift the distributor and adaptor plate from the crankcase.

(7) Suitably mark the relationship of the distributor shaft to the distributor body after the distributor is removed as an aid to installation.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the engine has not been rotated. If the engine has been rotated with the distributor removed, remove the number one spark plug and place a finger or compression gauge in the spark plug hole. Rotate the crankshaft in the normal direction of rotation until compression pressure is indicated. Continue to rotate the crankshaft until the timing mark on the flywheel is aligned to the pointer on the transaxle flywheel housing.

(2) Align the marks on the distributor shaft and body made after removal or align the mating mark on the distributor drive gear with the right hand edge of the notch in the distributor body as viewed with the distributor in an upright position.

(3) Instal the distributor to the crankcase and align the distributor body to the crankcase using the marks made before removal. When the distributor is installed in the correct position, the points should be just about to open with the rotor pointing to the number one spark plug lead terminal in the distributor cap. If necessary, remove the distributor and reset the shaft position making allowances for the rotation of the shaft as the distributor is installed.

(4) Check and adjust the ignition dwell and timing as described in the Engine Tune-up section.

TO DISMANTLE

(1) Remove the distributor as previously described and remove the rotor from the distributor shaft.

(2) Remove the screws retaining the vacuum

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advance unit to the distributor body, manoeuvre the advance unit link from the breaker plate and remove the advance unit from the distributor.

(3) Remove the screws retaining the earth lead at the contact breaker fixed point and breaker plate and remove the earth lead from the distributor.

(4) Remove the remaining contact breaker mounting screw.

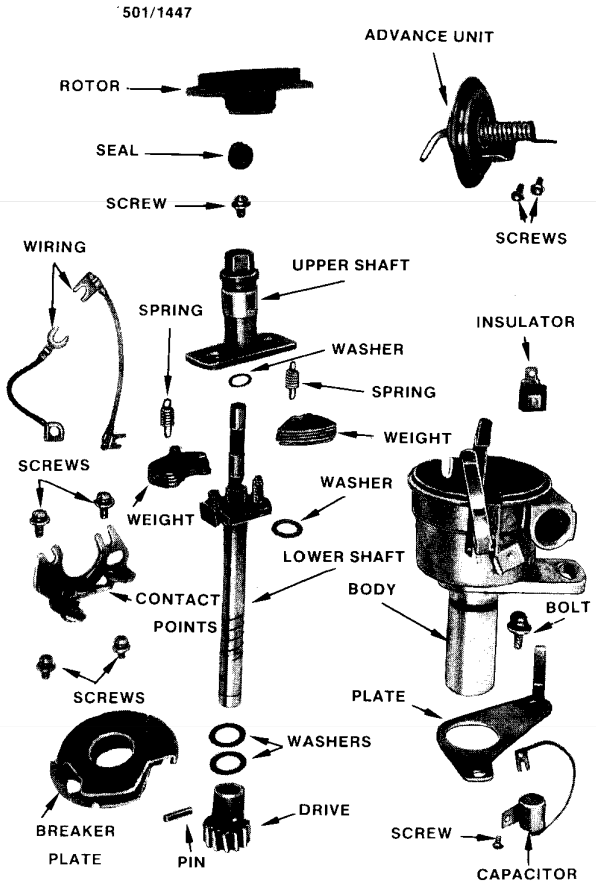
(5) Remove the screw retaining the capacitor to the distributor body.

(6) Lift the wiring insulator from the slot in the side of the distributor body and withdraw the contact breaker points, capacitor and wiring harness from the distributor body as an assembly. If necessary, loosen the screw and separate the contact breaker points, capacitor and wiring harness.

(7) Remove the remaining breaker plate retaining screws and withdraw the breaker plate from the distributor.

(8) Prise the seal from the top of the upper shaft assembly and remove the screw retaining the upper shaft to the lower shaft.

(9) Suitably mark the relationship of the upper shaft to the lower shaft and withdraw the upper shaft from the distributor.



Dismantled view of the breaker point distributor.

NOTE: It should not be necessary to remove the centrifugal weights and springs from the lower shaft, nor to dismantle the distributor further. If the lower shaft requires renewal, the distributor shaft and body should be renewed as a unit.

TO CLEAN AND INSPECT

(1) Thoroughly clean all parts with cleaning solvent, taking care not to immerse the distributor body, capacitor or vacuum advance unit in solvent.

(2) Check the contact breaker points for pitting and burning, if necessary, renew as a set.

(3) If the contacts are excessively burnt or pitted, renew the capacitor.

NOTE: Points should be cleaned with a contact file or oil stone, never use emery cloth or sand paper.

(4) Check all low tension leads for possible fractures.

(5) Check the distributor shaft and body for wear and renew as necessary. If the clearance between the shaft and body is excessive the shaft and body will have to be renewed.

(6) Check the cams for wear and roughness. Variation in lift between any two cams in excess of 0.05 mm will necessitate renewing the cam assembly.

(7) Check the clearance between the shaft and the cam assembly. Excessive clearance will necessitate the renewal of the shaft and cam assembly.

(8) Inspect the centrifugal advance weights for binding with the pivot pins.

(9) Check the distributor cap for cracks, carbon tracks, burned and corroded terminals.

(10) Check the centre carbon for wear and protrusion.

(11) Check the rotor arm for damage and cracks.

(12) Check the vacuum advance unit for a leaking diaphragm. To do this suck on the inlet pipe and observe the connecting link. The connecting link should move into the diaphragm housing.

TO ASSEMBLE

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Apply a small amount of high melting point grease to the centrifugal weight pivot points.

(2) Instal the upper shaft to the lower shaft as marked during dismantling, ensuring that the slots in the upper shaft are correctly engaged with the centrifugal weights.

(3) Instal the upper shaft retaining screw and tighten it securely. Instal the seal to the upper shaft.

(4) Instal the breaker plate and instal the retaining screws, ensuring that the earth lead is positioned correctly.

(5) Instal the vacuum advance unit link to the

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breaker plate and lightly lubricate it with high melting point grease. Instal the screws retaining the advance unit to the distributor body and tighten them securely.

(6) Instal the contact breaker points to the breaker plate ensuring that the earth lead is positioned correctly. Lightly lubricate the cam and the rubbing block of the moveable point with high melting point grease.

(7) Adjust the point gap using a feeler gauge of the correct thickness. With the rubbing block of the moveable point on the highest point of one of the cam lobes, insert the feeler gauge between the fixed and moveable point. Insert a screwdriver into the hole in the fixed point and using the pin in the breaker plate as a pivot, move the fixed point to obtain the correct gap.

The feeler gauge should be a light sliding fit between the fixed and moveable points. Tighten the retaining screws securely when the point gap is satisfactory and check the point gap, adjust them again if necessary.

(8) Instal the wiring insulator and the wiring harness to the distributor body ensuring that the leads for the breaker points and the capacitor are correctly positioned.

(9) Instal the capacitor to the distributor body and tighten the retaining screw securely.

(10) Instal the rotor arm and check that the centrifugal weights are free to operate by turning the rotor arm against the centrifugal weight springs while holding the drive pinion. When the rotor arm is released it should return freely to the fully retarded position.

If the rotor arm is inclined to stick or does not return to the retarded position the cause should be located and rectified.

11. ELECTRONIC DISTRIBUTOR

DESCRIPTION

The Hitachi or Nippon Denso distributor on 1985–1987 Sedan and Station Wagon models is driven from the rear of the left hand camshaft by helical gears.

The electronic ignition system is incorporated in the distributor and comprises a control unit, a reluctor and, on Hitachi models, a stator and magnet.

The reluctor rotates with the distributor upper shaft generating magnetic pulses which are detected by the control unit. The control unit uses these signals to switch the ignition coil on and off at the appropriate time during the operating cycle of the engine, providing the high tension current necessary to produce the spark at the spark plugs. The system is maintenance free requiring no routine servicing beyond inspecting the wiring, distributor cap and rotor for physical damage and deterioration.

Mechanical and vacuum advance systems are incorporated in the distributor. Mechanical advance is provided by centrifugal weights, mounted on the distributor shaft and governed by springs. Mechanical advance is controlled by engine speed.

Vacuum advance consists of a diaphragm unit mounted externally on the distributor body with a linkage to the base plate from the diaphragm. Vacuum advance is controlled by throttle position and engine loading.

Dwell angle is not adjustable on electronic ignition systems and can only be measured using an oscilloscope. Some types of tachometers and timing lights are unsuitable for electronic ignition systems. Always ensure that suitable test equipment is used and correctly connected to the vehicles wiring ciruits.

TO REMOVE AND INSTAL

(1) Remove the spare tyre from the carrier.

(2) Disconnect the negative battery terminal.

(3) Remove the distributor cap and secure it to one side.

(4) Mark the relationship of the distributor to the crankcase.

(5) Rotate the crankshaft in the normal direction of rotation until the rotor is positioned adjacent to the position in the distributor cap for No. 1 spark plug lead terminal and the timing mark on the flywheel is aligned to the pointer on the transaxle flywheel housing.

(6) Remove the nuts retaining the wiring to the ignition coil and disconnect the wiring.

(7) Remove the bolts retaining the distributor to the crankcase and lift the distributor from the crankcase.

(8) Mark the relationship of the distributor shaft to the distributor body after the distributor is removed as an aid to installation.

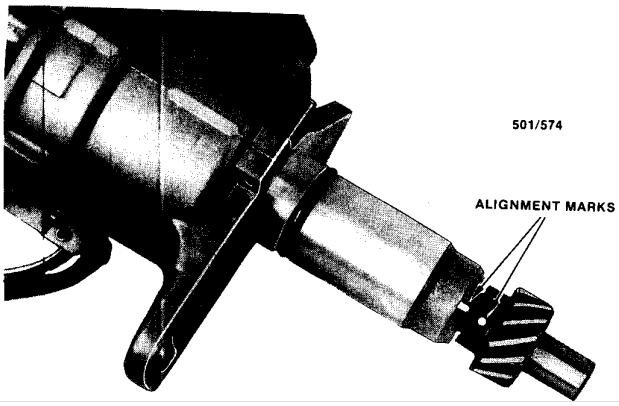
Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the engine has not been rotated. If the engine has been rotated with the distributor removed, remove the No. 1 spark plug and place a finger or compression gauge into the spark plug hole. Rotate the crankshaft in the normal direction of rotation until compression pressure is indicated. Continue to rotate the crankshaft until the timing marks on the flywheel and the flywheel housing are aligned.

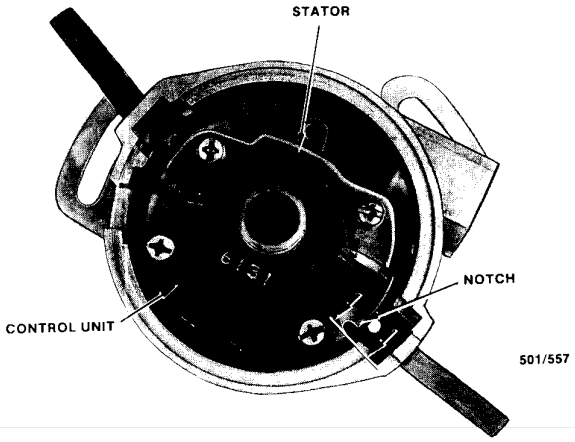
(2) Align the marks made on the distributor shaft and body after removal or, if necessary, align the mating marks on the drive gear and the distributor body and turn the shaft against the normal direction of rotation sufficiently to allow for the turn of the shaft as the distributor is installed.

(3) Instal the distributor to the crankcase and align the marks made during removal. The distributor is correctly installed when the rotor is pointing to the position in the distributor cap for No 1. spark plug lead terminal and the reluctor and stator poles are aligned. If necessary, remove the distributor and reset

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View showing the alignment marks on the Hitachi electronic distributor drive gear.



View showing the alignment marks for the Hitachi electronic distributor base plate. The base plate should be aligned as shown.

the shaft position making allowances for the rotation of the shaft as the distributor is installed.

(4) Connect the distributor wiring to the ignition coil and tighten the retaining nuts securely.

(5) Check and adjust the ignition timing as described in the Engine Tune-up section.

TO DISMANTLE

Hitachi

(1) With the distributor removed from the vehicle, remove the rotor arm from the shaft.

(2) Remove the screw retaining the vacuum advance unit link to the distributor base plate and the screw retaining the vacuum advance unit to the distributor body and remove the advance unit from the distributor.

(3) Remove the distributor cap seal from the distributor body, remove the screw retaining the wiring harness to the distributor body and remove the wiring harness from the distributor.

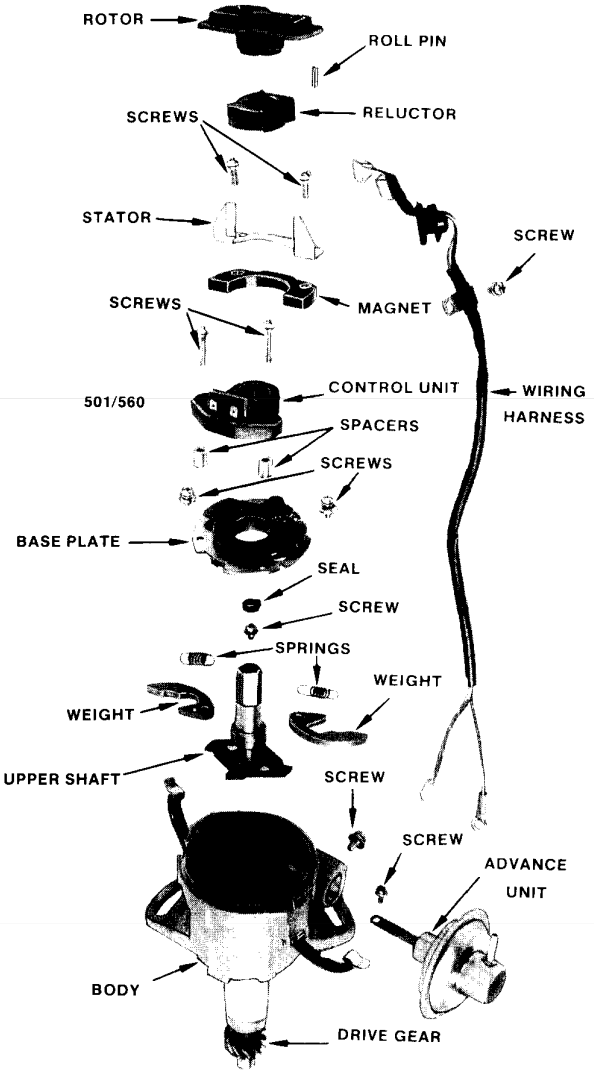
NOTE: Suitably mark the terminals as an aid to assembly and take care when removing the terminals from the control unit not to damage the wires or control unit.

(4) Carefully prise the reluctor from the shaft using two levers equally spaced and the body of the distributor as a pivot point. Take care not to misplace the roll pin.

(5) Suitably mark the relationship of the base plate to the distributor body.

NOTE: The base plate is not positively located in the distributor body, relying on the mounting screws and washers for retention. Therefore it is necessary to note the installed position before dismantling.

(6) Remove the screws retaining the base plate to the distributor body and remove the base plate.



Dismantled view of the Hitachi electronic distributor.

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(7) Remove the screws retaining the control unit to the base plate and remove the control unit and spacers.

(8) Remove the screws retaining the stator and magnet to the base plate then remove the stator and magnet.

NOTE: The screws retaining the stator and magnet are non-magnetic stainless steel. Keep the screws to one side to avoid confusion during assembly. If the screws are to be renewed, use only screws of the same type.

(9) Suitably mark the centrifugal weights and springs to aid assembly and remove the seal from the top of the upper shaft.

(10) Remove the screw retaining the upper shaft to the lower shaft. Disconnect the centrifugal weight springs and remove the upper shaft from the distributor.

(11) Remove the centrifugal weights from the lower shaft.

NOTE: Further dismantling of the distributor should not be necessary.

Nippon Denso

(1) With the distributor removed from the vehicle, remove the rotor arm from the shaft.

(2) Remove the snap ring retaining the vacuum advance link to the distributor base plate and the screw retaining the advance unit to the distributor body and remove the advance unit from the distributor.

(3) Remove the screws retaining the control unit to the base plate and remove the control unit and wiring from the distributor.

(4) Remove the distributor cap seal from the distributor body. Remove the screws and square washers retaining the base plate to the distributor and remove the base plate noting the installed position of the base plate as an aid to assembly.

(5) Suitably mark the position of the centrifugal weight springs and disconnect the springs from the upper and lower shafts.

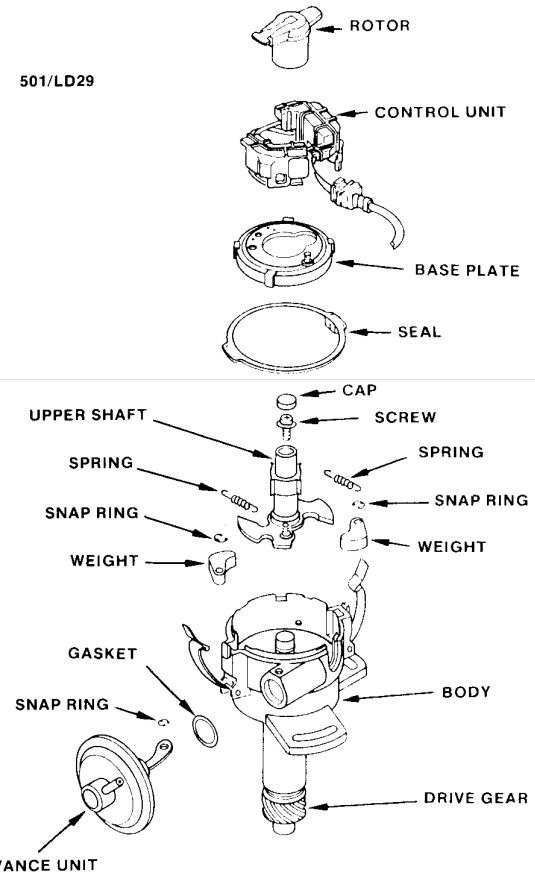
(6) Remove the cap from the centre of the upper shaft, remove the screw retaining the upper shaft to the lower shaft and remove the upper shaft from the distributor noting the position of the upper shaft in relation to the lower shaft as an aid to assembly.

(7) Remove the snap rings retaining the centrifugal weights to the lower shaft and remove the centrifugal weights from the distributor.

NOTE: Further dismantling of the distributor should not be necessary.

TO CHECK AND INSPECT

(1) Clean all parts thoroughly taking care not to immerse the control unit or vacuum advance unit in cleaning solvent.



Dismantled view of the Nippon Denso electronic distributor.

(2) Check the low tension wiring for possible fractures.

(3) Check the upper and lower shafts for distortion and wear. Renew the shafts and distributor body if there is excessive clearance between the shaft and distributor body.

(4) Check the reluctor for wear and damage. Do not dress the reluctor poles to rectify any faults, the reluctor must be renewed if wear or damage is evident.

(5) Where fitted, check the stator for wear and distortion. Renew the stator if wear or distortion is evident.

(6) Check that the base plate moves freely and is not distorted.

(7) Check that the centrifugal weights move freely on the pivots and that the springs are not distorted or stretched.

(8) Check the vacuum advance unit by pushing the link into the unit and placing a finger over the port. The link should not move out. If the operation of the unit is suspect it should be renewed.

(9) Check the high tension leads for damage and measure the resistance of each lead. Renew any lead if the reading is not within specification.

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(10) Check the distributor cap for cracks, signs of arcing and corroded terminals.

(11) Check that the centre carbon brush is in a serviceable condition and protrudes at least 10 mm from the distributor cap.

(12) Check the rotor arm for cracks and signs of arcing.

TO ASSEMBLE

Hitachi

Assembly is a reversal of the removal procedure with attention to the following points:

(1) If the upper shaft has been removed from the distributor, align the mating mark on the drive gear with the projection on the distributor body and instal the upper shaft so that the rotor locating flat on the shaft is facing the position for number one cylinder.

NOTE: As the upper shaft may be installed in one of two positions, it is important that the alignment of the upper shaft is correct at this stage to allow the correct alignment of the distributor during installation.

(2) Instal the centrifugal weights and springs to the positions noted during dismantling.

(3) Instal the stator and magnet to the base plate. Ensure that the non-magnetic screws are installed to the stator and magnet assembly.

(4) Instal the base plate to the marks made during dismantling.

(5) Instal the reluctor to the shaft and instal the roll pin so that the slot in the pin is parallel to the flat on the upper shaft. Refer to the illustration.

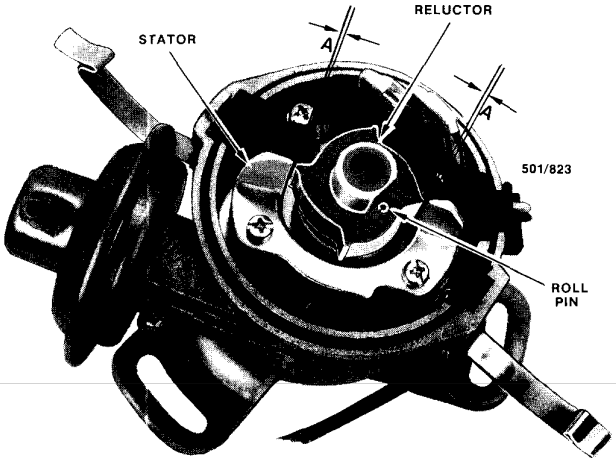
(6) Check that the air gap between the stator and magnet is between 0.3 and 0.5 mm. Adjust the air gap by loosening the screws and moving the stator and magnet on the base plate so that the air gap is to Specifications. Measure the air gap with non-magnetic feeler gauges and ensure that the gap is equal on both sides of the stator.

(7) Instal the vacuum advance link to the base plate and the vacuum advance unit to the distributor body, instal and tighten the retaining screws securely.

(8) Instal the wiring harness to the distributor body, instal and tighten the retaining screw securely.

(9) Instal the rotor arm and check that the centrifugal weights are free to operate by turning the rotor arm against the centrifugal weight springs while holding the drive pinion. When the rotor arm is released it should return freely to the fully retarded position.

If the rotor arm is inclined to stick or does not return to the retarded position when released the cause should be located and rectified.



View of the Hitachi electronic distributor showing the air gap and the installed position of the reluctor roll pin. Dimension A to be between 0.3 and 0.5 mm.

Nippon Denso

Assembly is a reversal of the dismantling procedure with attention to the following points:

(1) Instal the centrifugal weights to the lower shaft and instal the snap rings.

(2) Instal the upper shaft to the lower shaft in the position noted during dismantling. Instal the retaining screw and tighten securely. Instal the cap to the centre of the upper shaft.

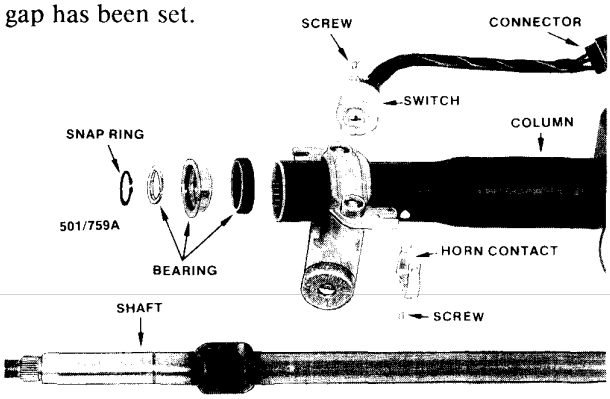
(3) Instal the centrifugal weight springs to the upper and lower shafts in the positions noted during dismantling.

(4) Instal the base plate to the distributor in the position noted during dismantling. Instal the retaining screws and square washers and tighten the retaining screws securely. Instal the distributor cap seal.

(5) Instal the control unit to the base plate and tighten the retaining screws temporarily.

(6) Align one of the reluctor projections with the projection on the control unit and measure the air gap with a non magnetic feeler guage of the correct dimension. Refer to Specifications.

(7) If necessary, adjust the air gap by loosening the control unit mounting screws and moving the control unit on the base plate to obtain the correct gap. Tighten the retaining screws securely when the correct gap has been set.



Dismantled view of the steering column showing the location of the ignition switch, 1986 model shown.

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(8) Instal the vacuum advance unit to the distributor base plate, instal the retaining screw and tighten securely. Instal the snap ring retaining the advance unit link to the base plate.

(9) Instal the rotor arm to the upper shaft and check that the centrifugal weights are free to operate by turning the rotor arm against the centrifugal weight springs while holding the drive pinion. When the rotor arm is released it should return freely to the fully retarded position.

If the rotor arm is inclined to stick or does not return to the retarded position when released, the cause should be located and rectified.

12. SWITCHES AND CONTROLS

IGNITION SWITCH

To Remove and Instal 1979–1984 and all Utility Models

(1) Disconnect the negative battery terminal.

(2) Remove the screws retaining the lower trim panel to the dashboard and remove the trim panel from the vehicle.

(3) Remove the screws retaining the lower steering column cover to the steering column and remove the cover from the vehicle.

(4) Disconnect the wiring connector by pulling on the connector not the wires.

(5) Remove the screw(s) retaining the ignition switch to the steering column and withdraw the switch from the steering column.

Installation is a reversal of the removal procedure.

To Remove and Instal 1985–1987 Sedan and Station Wagon Models

(1) Disconnect the negative battery terminal.

(2) Remove the self tapping screws and the screws in the plastic clips retaining the lower trim panel to the dashboard, disconnect the hose from the vent duct in the trim panel and withdraw the trim panel from the dashboard.

(3) Remove the screws retaining the lower steering column cover to the steering column and remove the cover.

(4) Disconnect the wiring connector by pulling on the connector not the wires.

(5) Remove the screw retaining the ignition switch to the steering column and withdraw the ignition switch from the steering column.

Installation is a reversal of the removal procedure.

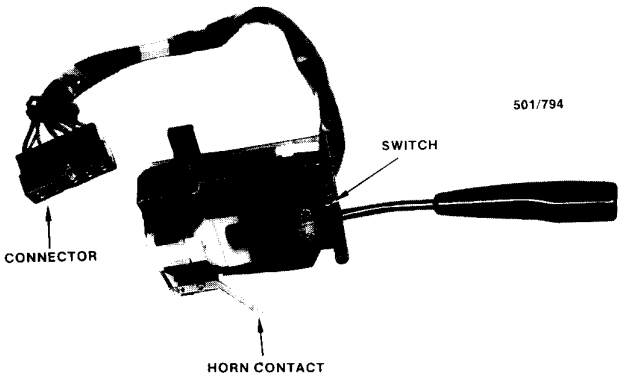
COMBINATION SWITCH

To Remove and Instal

(1) Disconnect the negative battery terminal.

(2) Remove the steering wheel as described later in this section under the Steering Wheel and Horn Control heading.

(3) Remove the screws retaining the steering column covers to the steering column and remove the steering column lower cover.



View of the combination switch removed from the vehicle, 1986 model shown. The flasher unit is incorporated in the switch.

(4) Disconnect the wiring connector by pulling on the connector not the wires.

(5) Withdraw the combination switch and upper steering column cover from the steering column.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the upper steering column cover to the combination switch and instal the combination switch and upper cover to the steering column.

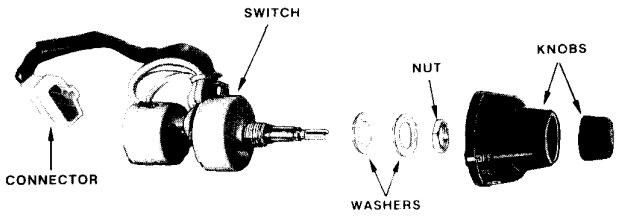
(2) Ensure that the wiring is routed correctly.

HEADLAMP SWITCH 1979–1986 MODELS

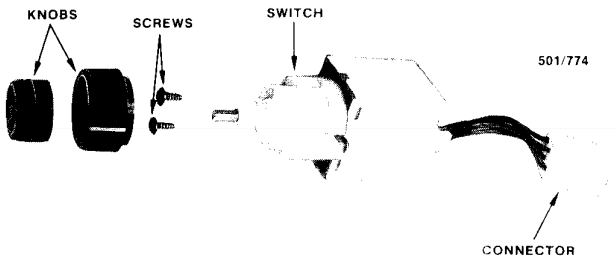
To Remove and Instal

(1) Disconnect the negative battery terminal.

(2) Remove the instrument cluster surround as



View of the headlamp switch removed from the vehicle, 1983 model shown.



View of the headlamp switch removed from the vehicle, 1986 model shown.

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described under the Instrument Cluster heading later in this section.

(3) Remove the headlamp switch and instrument lamp control knobs from the switch shaft.

(4) Remove the nut or two screws retaining the switch to the instrument cluster surround and withdraw the switch from the rear of the surround.

Installation is a reversal of the removal procedure.

WIPER/WASHER SWITCH 1979–1986 MODELS

To Remove and Instal

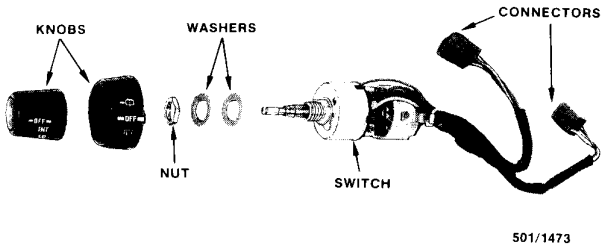
(1) Disconnect the negative battery terminal.

(2) Remove the Instrument cluster surround as described under the Instrument Cluster heading later in this section.

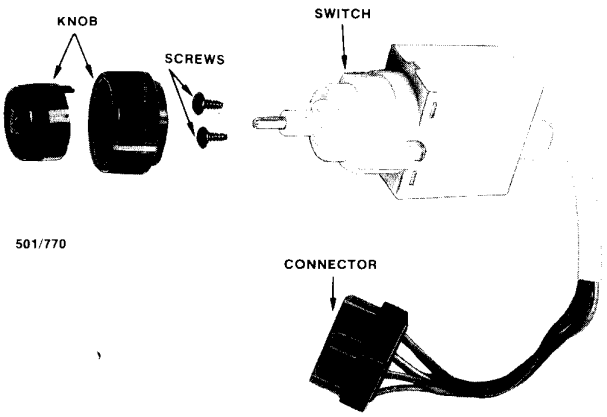
(3) Remove the wiper and washer switch knobs from the switch shaft.

(4) Remove the nut or two screws retaining the wiper/washer switch to the instrument cluster surround and withdraw the switch from the surround.

Installation is a reversal of the removal procedure.



View of the wiper/washer switch removed from the vehicle, 1983 Station Wagon model shown.



View of the wiper/washer switch removed from the vehicle, 1986 model shown.

REAR WIPER/WASHER SWITCH

To Remove and Instal 1979–1984 Models

The 1979–1984 Model rear wiper/washer switch is incorporated in the front wiper/washer switch. Refer to the heading Wiper Washer Switch earlier in this section.

To Remove and Instal 1985–1987 Models

(1) Disconnect the negative battery terminal.

(2) Carefully prise the switch from the instrument cluster surround and withdraw it sufficiently to disconnect the wiring connector.

(3) Disconnect the wiring by pulling on the connector not the wires.

(4) Withdraw the switch from the instrument cluster surround.

Installation is a reversal of the removal procedure.

HEATER FAN SWITCH

To Remove and Instal 1979–1984 and all Utility Models

(1) Remove the heater control panel as described in the Cooling System section.

(2) Remove the nut retaining the heater fan switch to the heater control panel and withdraw the switch from the rear of the panel.

Installation is a reversal of the removal procedure.

To Remove and Instal 1985–1987 Sedan and Station Wagon Models

(1) Disconnect the negative battery terminal.

(2) Remove the instrument cluster surround as described under the heading Instrument Cluster later in this section.

(3) Remove the knob from the switch shaft.

(4) Remove the nut retaining the switch to the instrument cluster surround and withdraw the switch from the rear of the surround.

Installation is a reversal of the removal procedure.

REAR DEMISTER SWITCH

To Remove and Instal 1979–1984 and all Utility Models

(1) Disconnect the negative battery terminal.

(2) Remove the heater control panel as described in the Cooling System section.

(3) Disconnect the wiring connector by pulling on the connector not the wires.

(4) Remove the screws retaining the switch to the heater control panel and withdraw the switch from the panel.

Installation is a reversal of the removal procedure.

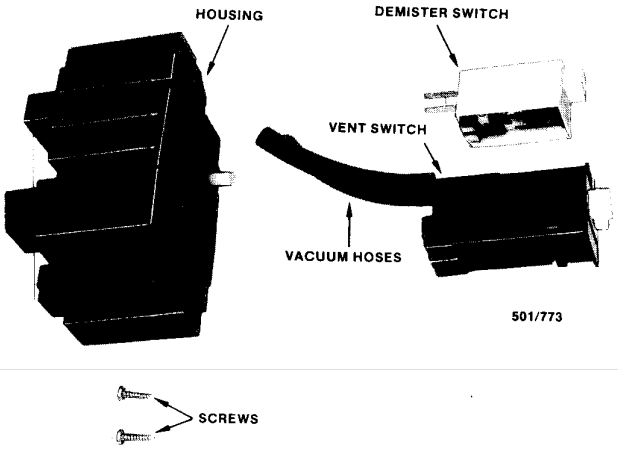
To Remove and Instal 1985–1987 Sedan and Station Wagon Models

(1) Disconnect the negative battery terminal.

(2) Remove the instrument cluster surround as described under the heading Instrument cluster later in this section.

(3) Remove the screws retaining the rear demister switch and the heater fresh/recirculation mode switch housing to the surround and withdraw the assembly from the rear of the surround.

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View of the rear demister switch and housing assembly removed from the instrument cluster surround, 1986 model shown.

(4) Withdraw the rear demister switch from the housing assembly.

Installation is a reversal of the removal procedure.

STOP LAMP SWITCH

To Remove and Instal

(1) Disconnect the negative battery terminal.

(2) Remove the screws retaining the lower trim panel to the dashboard and remove the trim panel.

(3) Disconnect the wiring connector by pulling on the connector not the wires.

(4) Remove the locknut from the stop lamp switch and unscrew the switch from the pedal support bracket.

Installation is a reversal of the removal procedure with attention to the following point:

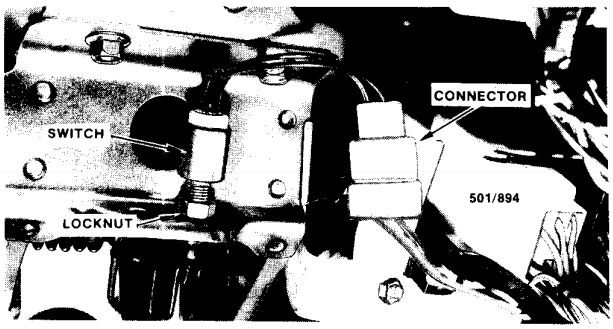
Adjust the stop lamp switch as described in the Brakes section.

To Test

(1) Remove the switch as previously described.

(2) Connect a suitable ohmmeter between the terminals on the switch.

(3) With the plunger of the switch depressed 1.8–3.3 mm, continuity should be present. With the plunger of the switch released, continuity should not be present.



Installed view of the stop lamp switch, 1986 model shown.

REVERSE LAMP SWITCH — MANUAL TRANSAXLE MODELS

To Remove and Instal

(1) Disconnect the negative battery terminal.

(2) Disconnect the wiring connector by pulling on the connector not the wires. Refer to the Manual Tansaxle section for the location of the reverse lamp switch.

(3) Unscrew the switch from the side of the transaxle case.

Installation is a reversal of the removal procedure.

NEUTRAL SAFETY/REVERSE LAMP SWITCH — AUTOMATIC TRANSAXLE MODELS

The removal and installation procedures for the neutral safety/reverse lamp switch are fully covered in the Automatic Tansaxle section.

HANDBRAKE WARNING LAMP SWITCH

To Remove and Instal

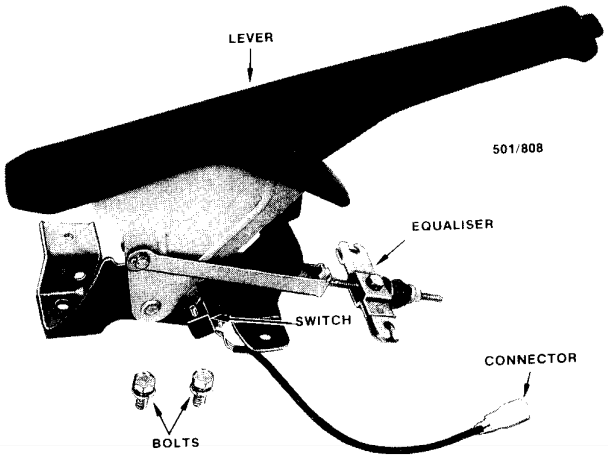
(1) Disconnect the negative battery terminal.

(2) Remove the centre console from the vehicle as described in the Body section.

(3) Disconnect the wiring by pulling on the connector not the wires.

(4) Remove the screw retaining the switch to the handbrake assembly and remove the switch from the vehicle.

Installation is a reversal of the removal procedure.



View of the handbrake assembly showing the location of the handbrake switch, 1986 model shown.

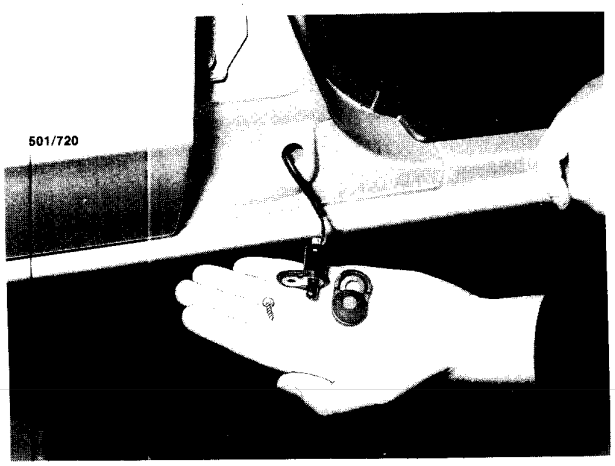
COURTESY LAMP DOOR SWITCH

To Remove and Instal

(1) Disconnect the negative battery terminal.

(2) Remove the screw retaining the switch to the

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View of the courtesy lamp door switch removed from the vehicle, 1986 model shown.

door pillar and withdraw the switch sufficiently to disconnect the wiring connector.

(3) Disconnect the wiring by pulling on the connector not the wires and remove the switch from the vehicle.

Installation is a reversal of the removal procedure.

COURTESY LAMP TAILGATE SWITCH

To Remove and Instal

The luggage compartment lamp switch is incorporated in the tailgate lock assembly. Refer to the Body section for Removal and Installation procedures.

13. STEERING WHEEL AND HORN CONTROL

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

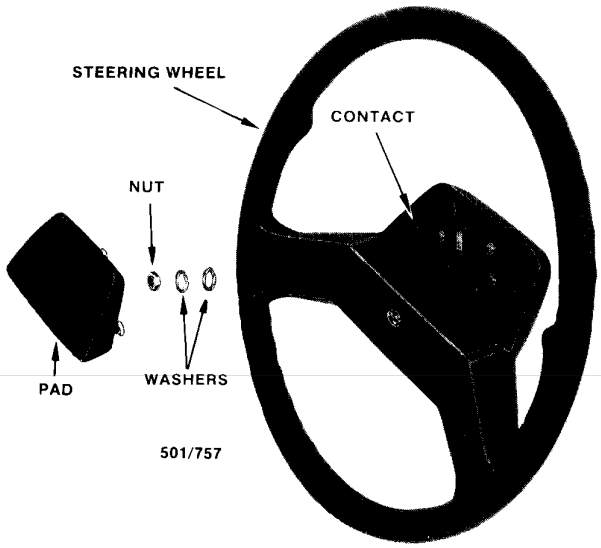
(2) Remove the horn pad by removing the screws from the rear of the steering wheel on two and four spoke steering wheels or carefully prising the horn pad from the centre of the steering wheel on soft grip steering wheels.

(3) Where installed, remove the screw/s retaining the contact strip to the steering wheel and withdraw the strip from the steering wheel while disconnecting the terminal.

(4) Suitably mark the relationship of the steering wheel to the steering shaft, remove the nut retaining the steering wheel to the steering shaft and, using a suitable puller, remove the steering wheel from the shaft.

NOTE: Do not strike the end of the puller or the steering shaft to free the steering wheel from the shaft or damage to the energy absorbing components of the steering column may occur.

(5) Remove the screws retaining the steering column upper and lower covers to the steering column and withdraw the covers from the vehicle.



Dismantled view of the steering wheel, 1986 model shown.

(6) Remove the screw retaining the lower horn control to the combination switch and unsolder the contact from the wire.

(7) Where applicable, remove the screw retaining the earth contact to the steering column and remove the earth contact from the steering column.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the horn contacts are clean and free from corrosion.

(2) Ensure that the horn contacts are in the correct position to contact the steering shaft and the underside of the steering wheel and have sufficient tension to maintain electrical contact with the steering wheel and steering shaft.

(3) Instal the steering wheel to the marks made during removal.

14. INSTRUMENT CLUSTER

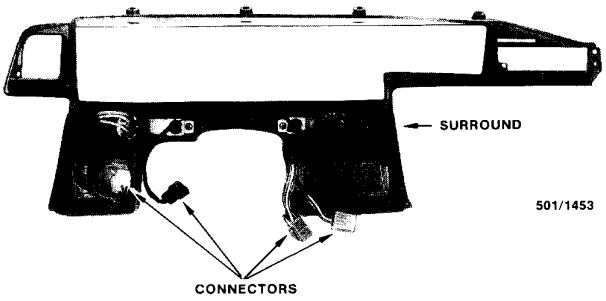
TO REMOVE AND INSTAL 1979–1984 AND ALL UTILITY MODELS

(1) Disconnect the negative battery terminal.

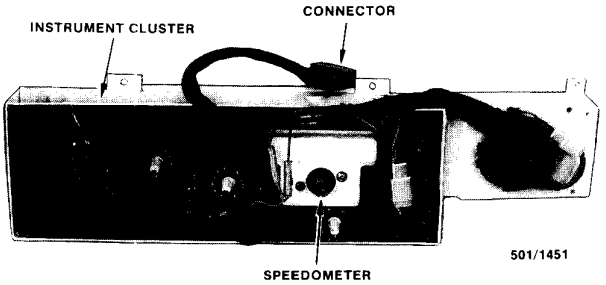
(2) Remove the screws retaining the instrument cluster surround to the dashboard and, on some models, remove the vent lever knob by carefully pulling it from the lever. The screws in the vent areas are covered by plastic covers, carefully prise the covers from the surround to gain access to the screws.

(3) Withdraw the instrument cluster surround from the dashboard, disconnect the wiring connectors by pulling on the connectors not the wires and remove the surround from the vehicle.

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Rear view of the instrument cluster surround, 1983 model shown.



Rear view of the instrument cluster, 1983 electronic type shown.

NOTE: It may be necessary to lower the steering column slightly to remove the instrument cluster surround from the vehicle. Refer to the Steering section if necessary.

(4) Remove the screws retaining the instrument cluster to the dashboard and withdraw the instrument cluster sufficiently to disconnect the speedometer cable and the wiring connectors.

NOTE: It may be necessary to disconnect the speedometer cable from the transaxle to allow the instrument cluster to be withdrawn sufficiently to gain access to the speedometer and wiring connectors.

(5) Disconnect the speedometer cable from the speedometer head by easing the cable out from the speedometer head.

Disconnect the wiring connectors by pulling on the connectors not the wires and remove the instrument cluster from the dashboard.

Installation is a reversal of the removal procedure with attention to the following point:

Ensure that the speedometer cable is correctly located in the speedometer head.

TO REMOVE AND INSTAL 1985–1987 SEDAN AND STATION WAGON MODELS

(1) Disconnect the negative battery terminal.

(2) Remove the self tapping screws and the screws from the plastic plugs retaining the lower trim panel to the dashboard, disconnect the hose from the vent duct in the trim panel and withdraw the trim panel from the vehicle.

(3) Remove the screws retaining the upper and lower steering column covers to the steering column and remove the lower steering column cover.

(4) Disconnect the combination switch wiring connector and withdraw the combination switch and upper steering column cover from the steering column.

(5) Disconnect the heater temperature control cable from the heater unit.

(6) Remove the screws retaining the instrument cluster surround to the dashboard and carefully prise the surround from the dashboard. The surround is retained to the dashboard by lugs moulded into the surround as well as the retaining screws, therefore use care not to damage the surround when removing it from the dashboard.

(7) Withdraw the instrument cluster surround sufficiently to disconnect the wiring connectors and the heater control vacuum hoses.

(8) Disconnect the wiring connectors by pulling on the connectors not the wires and remove the instrument cluster surround from the vehicle.

(9) Note the installed positions of the vacuum hoses on the heater controls and disconnect the hoses from the controls.

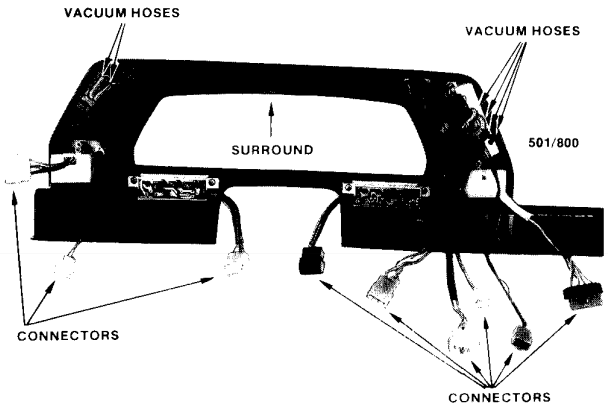
(10) Withdraw the instrument cluster surround from the vehicle.

(11) Reach up behind the instrument cluster to the left of the steering column and disconnect the speedometer cable from the speedometer head by pulling the cable from the speedometer head.

(12) Remove the screws retaining the instrument cluster to the dashboard and withdraw the instrument cluster sufficiently to disconnect the wiring.

(13) Disconnect the wiring by pulling on the connectors not the wires and withdraw the instrument cluster from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:



Rear view of the instrument cluster surround, 1986 model shown.

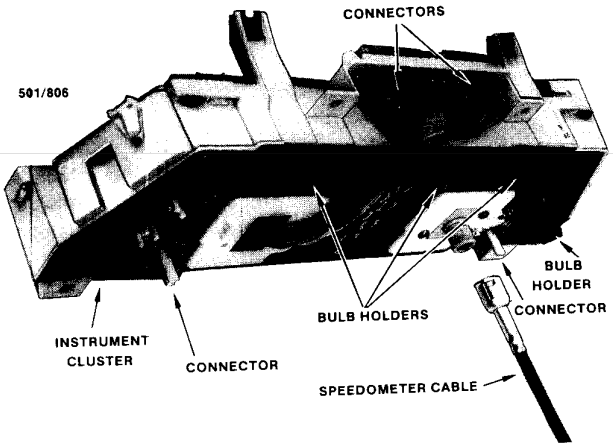
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(1) Ensure that the speedometer cable is correctly located in the speedometer head.

(2) Adjust the heater temperature cable as described in the Cooling System section.

(3) Ensure that the wiring and vacuum hoses are correctly routed.

(4) Instal the combination switch to the upper steering column cover and instal the combination switch and upper cover to the steering column.



View of the instrument cluster removed from the vehicle, 1986 model shown.

15. SPEEDOMETER CABLE

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Working in the engine compartment, unscrew the speedometer cable assembly from the transaxle.

(3) Disconnect all cable clips from the speedometer cable.

(4) Working inside the vehicle under the dash, reach up under the instrument cluster at the left hand side of the steering column and disconnect the speedometer cable by pulling the cable from the speedometer head.

(5) Prise the grommet from the bulkhead and withdraw the speedometer cable from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the speedometer cable is not kinked and that there are no sharp bends.

(2) Ensure that the cable is correctly installed to the speedometer head and that the inner cable is fully engaged with the speedometer head.

16. HEATER BLOWER MOTOR

TO REMOVE AND INSTAL 1979–1984 AND ALL UTILITY MODELS

(1) Disconnect the negative battery terminal.

(2) Remove the screws retaining the parcel shelf and lower trim panel to the dashboard. Remove the parcel shelf and trim panel from the vehicle.

(3) Remove the screws retaining the glove compartment lid to the dashboard and manoeuvre the lid from the dashboard.

(4) Rotate the glove compartment lamp and withdraw the lamp into the glove compartment.

(5) Remove the screws retaining the glove compartment to the dashboard.

(6) Disconnect the vacuum hose clamp from the lower edge of the glove compartment and withdraw the glove compartment sufficiently to disconnect the wiring connector.

(7) Disconnect the wiring connector by pulling on the connector not the wires and remove the glove compartment from the vehicle.

(8) Disconnect the heater duct from the fresh air duct and remove the heater duct from the vehicle.

(9) Disconnect the wiring connector from the blower motor by pulling on the connector not the wires.

(10) Remove the hose from the vacuum servo. Remove the screws retaining the vacuum servo to the fresh air duct and remove the servo from the duct.

(11) Remove the nuts and bolt retaining the fresh air duct to the vehicle body and remove the duct from the vehicle.

(12) Remove the screws retaining the heater blower motor to the fresh air duct and remove the blower motor from the duct.

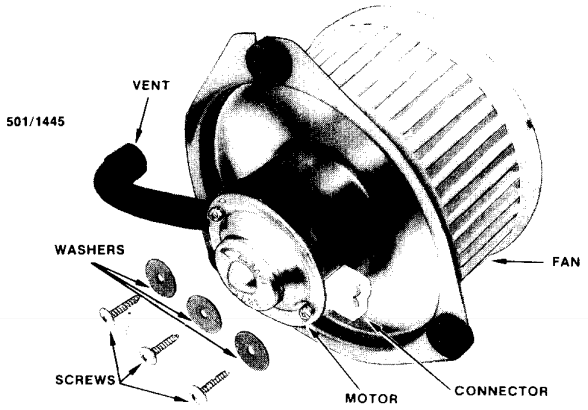
Installation is a reversal of the removal procedure.

TO REMOVE AND INSTAL 1985–1987 SEDAN AND STATION WAGON MODELS

(1) Disconnect the negative battery terminal.

(2) Remove the screws retaining the left hand lower trim panel to the dashboard and withdraw the panel from the dashboard.

(3) Disconnect the wiring from the blower motor assembly by pulling on the connectors not the wires.



View of heater blower motor removed from the vehicle, 1986 model shown.

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(4) Remove the screws retaining the resistor block to the footwell fresh air duct and remove the resistor block from the duct.

(5) Remove the screws retaining the blower motor assembly to the footwell fresh air duct and withdraw the blower motor assembly from the duct.

(6) Disconnect the wiring connector by pulling on the connector not the wires.

Installation is a reversal of the removal procedure.

17. LAMP UNITS

PARK LAMP — TWIN HEADLAMP MODELS

To Remove and Instal

(1) Remove the screws retaining the park lamp to the headlamp surround.

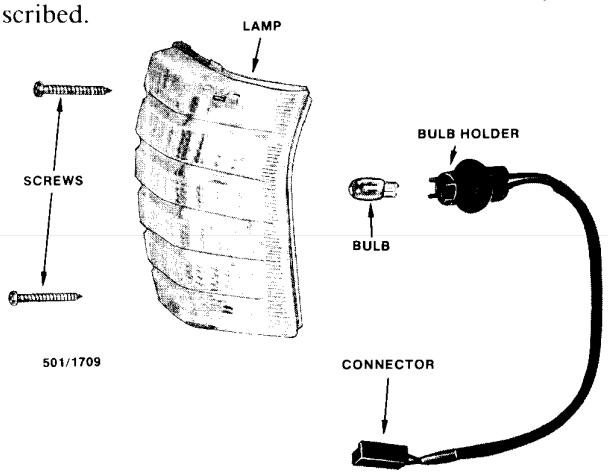
(2) Withdraw the park lamp from the headlamp surround sufficiently to remove the bulb holder.

(3) Remove the bulb holder by turning anti-clockwise and remove the park lamp from the vehicle.

Installation is a reversal of the removal procedure.

To Renew Bulb

(1) Remove the park lamp as previously described.



Dismantled view of the park lamp. Twin headlamp model shown.

(2) Remove the baseless bulb by pulling it from the bulb holder.

(3) Ensure that the bulb holder is free from corrosion and instal the new bulb to the bulb holder.

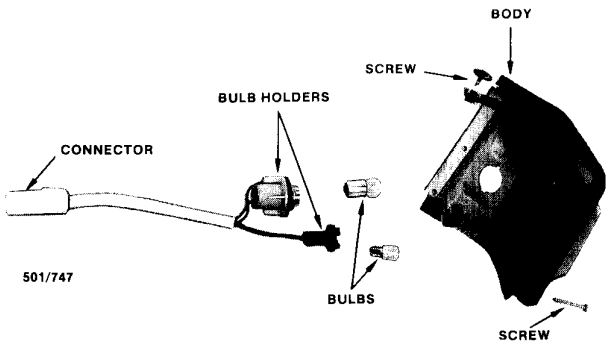
(4) Instal the bulb holder to the lamp. Instal the lamp to the headlamp surround and instal and tighten the retaining screws securely.

COMBINATION LAMP — SINGLE HEADLAMP MODELS

To Remove and Instal

(1) Remove the screws retaining the combination lamp to the headlamp surround.

(2) Withdraw the combination lamp sufficiently to remove the bulb holders.



Dismantled view of the front combination lamp, 1986 model shown.

(3) Remove the bulb holders by turning anti-clockwise and remove the lamp from the vehicle.

Installation is a reversal of the removal procedure.

To Renew Bulb

(1) Remove the combination lamp as previously described.

(2) Remove the bulb holder by turning anti-clockwise.

(3) Remove the bayonet pin bulb by pressing in slightly and turning it anti-clockwise. Remove the baseless bulb by pulling it from the bulb holder.

(4) Ensure that the bulb holder is free from corrosion and instal the new bulb.

(5) Instal the bulb holder to the combination lamp. Instal the lamp to the vehicle and instal and tighten the retaining screws securely.

HEADLAMP

To Renew Bulb 1979–1984 and all Utility Models

The headlamps on 1979—1984 models are sealed beam units. Refer to the heading To Remove and Instal.

To Renew Bulb 1985–1987 Sedan and Station Wagon Models

(1) Working in the engine compartment, disconnect the wiring connector by pulling on the connector not the wires.

(2) Remove the dust cover from the rear of the lamp assembly.

(3) Disconnect the retaining clip from the bulb holder and remove the bulb from the bulb holder.

NOTE: Extreme care should be taken not to touch the glass section of the halogen bulb, otherwise the life of the bulb will be shortened. If the glass is inadvertantly touched or becomes contaminated with grease etc. it should be cleaned with methylated spirits.

(4) Instal the new bulb to the bulb holder ensuring that the locating tab on the bulb is correctly aligned to the cutout in the bulb holder.

(5) Retain the bulb in the bulb holder with the clip and instal the dust cover and wiring connector.

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To Remove and Instal 1979–1984 and all Utility Models

(1) Working in the engine compartment, disconnect the headlamp wiring connector by pulling on the connector not the wires.

(2) Remove the screws retaining the radiator grille to the vehicle body and remove the grille from the vehicle.

(3) Remove the park lamp from the vehicle as previously described.

(4) Remove the screws retaining the headlamp surround assembly to the vehicle body and remove the surround assembly from the vehicle.

(5) Remove the screws retaining the headlamp retaining ring to the headlamp mounting bracket. Support the headlamp and remove the retaining ring. Remove the headlamp from the vehicle.

Installation is a reversal of the removal procedure with attention to the following point:

Adjust the headlamps as described later in this section.

To Remove and Instal 1985–1987 Sedan and Station Wagon Models

(1) Working in the engine compartment, disconnect the headlamp wiring connector by pulling on the connector not the wires.

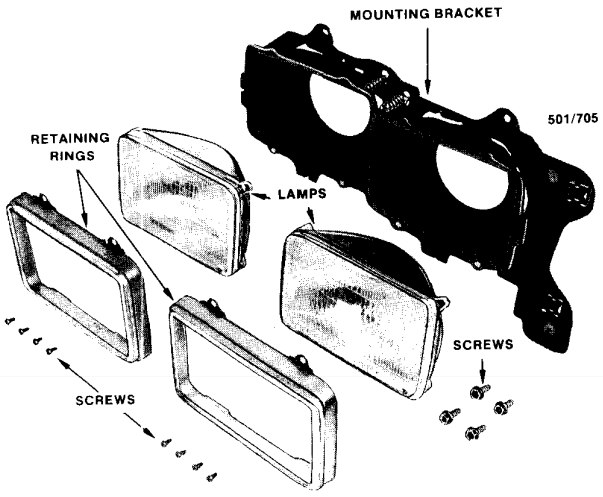
(2) Remove the front combination lamp from the vehicle as previously described.

(3) Remove the grille from the vehicle as described in the Body section.

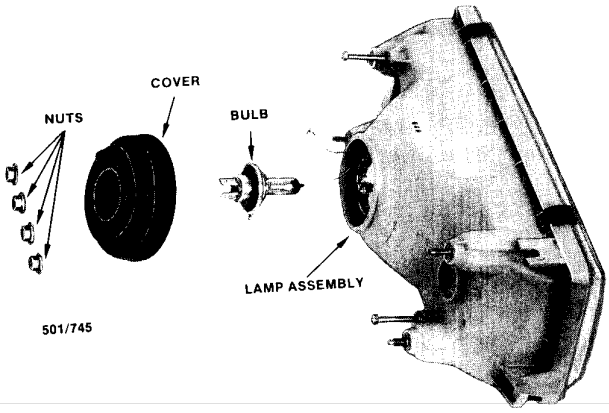
(4) Remove the screws retaining the headlamp surround to the vehicle and remove the surround.

(5) Remove the nuts retaining the headlamp assembly to the vehicle body and manoeuvre the headlamp from the vehicle by rotating it 90 deg clockwise as it is withdrawn from the vehicle.

Installation is a reversal of the removal procedure with attention to the following point:



Dismantled view of the headlamps. Twin headlamp model shown.



View of the headlamp removed from the vehicle, 1986 model shown.

Adjust the headlamps as described under the following heading.

To Adjust Headlamps

(1) Ensure that the tyres are inflated to the correct pressures and that the vehicle is in an unladen condition with the normal equipment installed and a full tank of fuel.

(2) Position the vehicle on level ground and square to the test equipment being used.

(3) Switch on the headlamps and select high beam.

(4) If a headlamp aiming machine is used, follow the manufacturer's instructions.

(5) If an aiming board is used, position the vehicle three metres from and square to the aiming board.

(6) For models with single headlamps, cover the headlamp not being adjusted.

The headlamp is correctly adjusted when the centre point of the projected 'hot spot' strikes the aiming board at a point 21 mm below the horizontal and coincident with the vertical centre line of the headlamp. Repeat the operation for the remaining headlamp. Refer to the diagram.

(7) For models with twin headlamps proceed as follows:

(a) Select main beam and cover both outer headlamps and the inner headlamp not being adjusted.

(b) The headlamp is correctly adjusted when the centre point of the projected 'hot spot' strikes the aiming board at a point 21 mm below the horizontal and coincident with the vertical centre lines of the headlamp. Repeat items (a) and (b) for the remaining inner headlamp.

(c) Select low beam and cover the outer headlamp not being adjusted.

(d) The headlamp is correctly adjusted when the upper edge of the 'hot spot' contacts the horizontal centre line and the right hand edge of the 'hot spot' contacts the vertical centre line of the headlamp on

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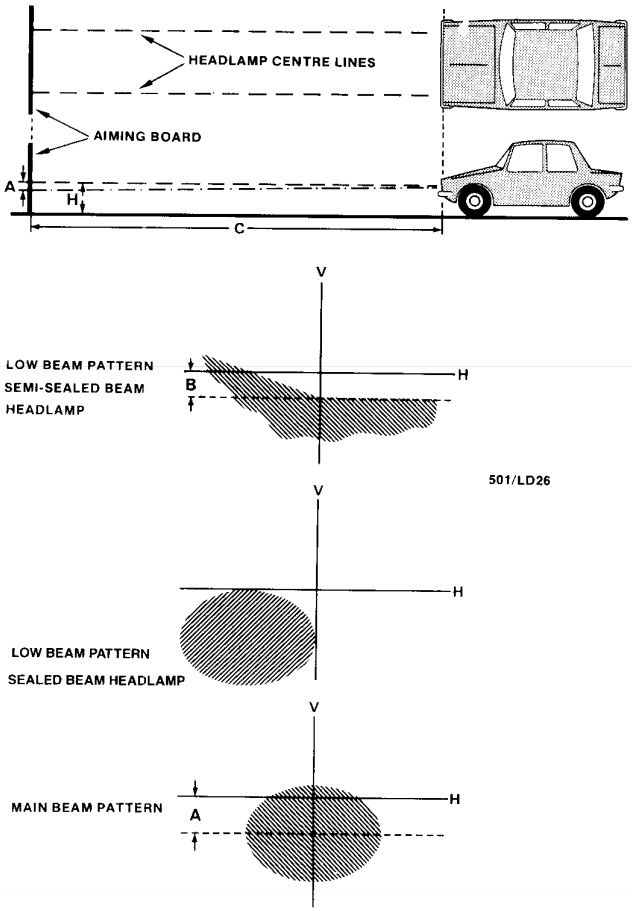
the aiming board. Repeat items (c) and (d) for the remaining outer headlamp. Refer to the diagram.

(e) Low beam adjustment on 1985–1987 Sedan and Station Wagon models having semi-sealed beam headlamp units should be made as follows. Select low beam and cover the lamp not being adjusted.

(f) The headlamp is correctly adjusted when the point of cut-off coincides with the vertical centre line and at a point 30 mm below the horizontal centre line of the headlamp. Repeat items (e) and (f) for the remaining headlamp. Refer to the diagram.

NOTE: It is not necessary to adjust the low beam on models having sealed beam headlamps. Adjustment is made on high beam only.

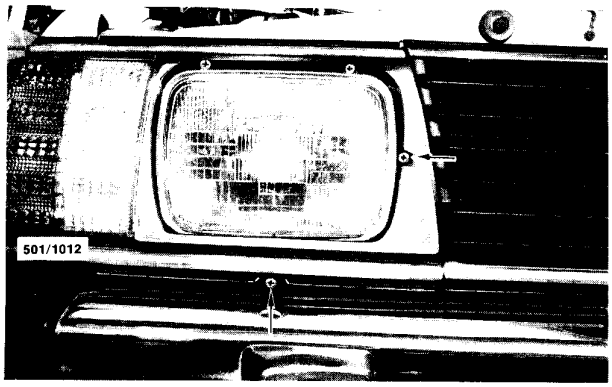
(8) To adjust the headlamp vertically, turn the lower adjusting screw accessible from the front of the headlamp on 1979–1984 and Utility models and from the rear of the headlamp on 1985–1987 Sedan and Station Wagon models.



Line drawing providing essential dimensions for the adjustment of headlamp aim. V and H are the vertical and horizontal centre lines of the headlamp respectively. On high beam, dimension A = 21 mm, for low beam with semi-sealed headlamps dimension B = 30 mm. Dimension C = 3 m. Refer to the text for method of adjustment.

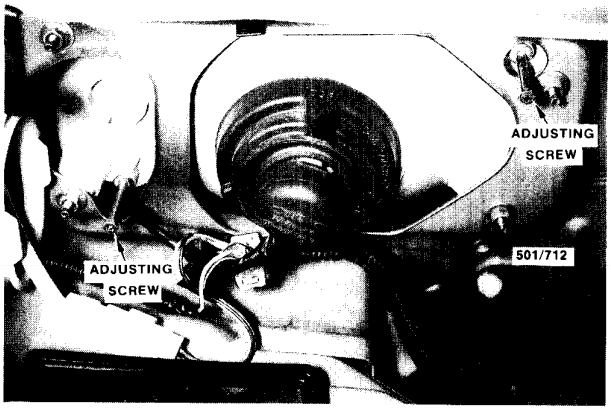


View showing the headlamp adjusting screws, 1983 twin headlamp model shown.



View showing the headlamp adjusting screws, 1981 model shown.

(9) To adjust the headlamp horizontally, turn the upper adjusting screw accessible from the front of the headlamp on 1979–1984 and Utility models and from the rear of the headlamp on 1985–1987 Sedan and Station Wagon models.



Rear view of the headlamp showing the adjusting screws, 1986 model shown.

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NOTE: Reference should be made to local government regulations governing headlamp aim and the headlamps adjusted accordingly.

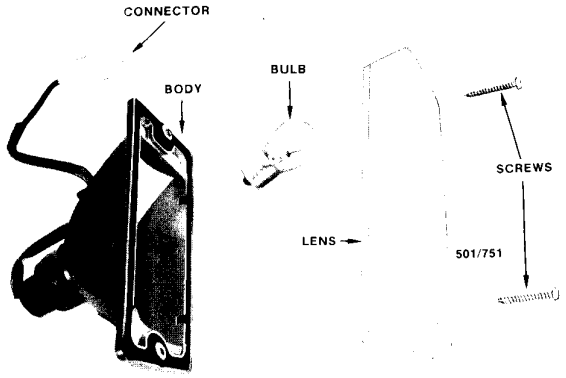
FRONT TURN SIGNAL LAMP — BUMPER MOUNTED

To Renew Bulb

(1) Remove the screws retaining the lamp and lens assembly to the bumper and carefully prise the lens from the lamp body.

(2) Remove the bulb from the bulb holder by pressing it in slightly, rotating it anti-clockwise and withdrawing the bulb from the holder.

(3) Ensure that the bulb holder is free from corrosion and instal the new bulb. Instal the lens and tighten the retaining screws.



Dismantled view of the front bumper mounted turn signal lamp, 1986 model shown.

To Remove and Instal

(1) Remove the screws retaining the lamp and lens assembly to the bumper and withdraw the lamp sufficiently to disconnect the wiring connector.

(2) Disconnect the wiring connector by pulling on the connector not the wires and remove the lamp from the vehicle.

Installation is a reversal of the removal procedure.

FRONT TURN SIGNAL REPEATER LAMP — FENDER MOUNTED

To Renew Bulb

(1) Remove the screws retaining the lamp and lens to the front fender and remove the lens.

(2) Remove the bulb by pulling it from the bulb holder.

(3) Ensure that the bulb holder is free from corrosion and instal the new bulb by pushing it into the bulb holder. Instal the lens and tighten the retaining screws.

To Remove and Instal

(1) Remove the screws retaining the repeater lamp to the front fender and withdraw the lamp sufficiently to allow the wiring to be disconnected.

(2) Disconnect the wiring by pulling on the connector not the wires and remove the lamp from the vehicle.

Installation is a reversal of the removal procedure.

REAR COMBINATION LAMP

To Renew Bulb 1979–1984 Sedan and Coupe

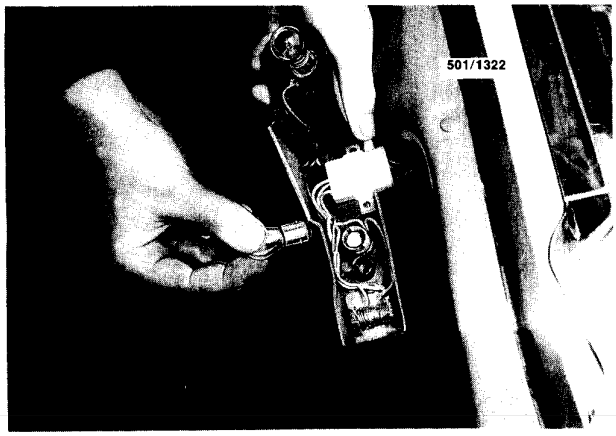
(1) Where fitted, remove the luggage compartment trim panel.

(2) Remove the relevant bulb holder from the lamp by it turning anti-clockwise.

(3) Remove the bulb by pressing it in slightly and turning it anti-clockwise.

(4) Ensure that the bulb holder is free from corrosion and instal the new bulb.

(5) Instal the bulb holder to the lamp body and the trim panel to the vehicle body.



View showing the bulb holder and bulb removed from the rear combination lamp, 1983 Coupe shown.

To Renew Bulb 1985–1987 Sedan

(1) Where fitted, remove the luggage compartment trim panel.

(2) Remove the bulb holder from the rear of the lamp body.

(3) Remove the relevant bulb from the bulb holder by pushing it in slightly and turning it anti-clockwise.

(4) Ensure that the bulb holder is free from corrosion and instal the new bulb.

(5) Instal the bulb holder to the lamp body and the trim panel to the vehicle.

To Renew Bulb 1979–1984 Station Wagon

(1) Remove the screws retaining the combination lamp to the vehicle body and withdraw the lamp sufficiently to remove the bulb holders.

(2) Remove the relevant bulb holder from the lamp by turning it anti-clockwise.

(3) Remove the relevant bulb from the bulb holder by pressing it in slightly and turning it anti-clockwise.

(4) Ensure that the bulb holder is free from

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corrosion and instal the new bulb to the bulb holder. Instal the bulb holder to the lamp body.

(5) Instal the lamp to the vehicle and tighten the retaining screws securely.

To Renew Bulb 1985–1987 Station Wagon

(1) Depress the locktab on the rear interior trim panel and remove the trim panel.

(2) Remove the relevant bulb holder from the lamp by turning it anti-clockwise.

(3) Remove the bulb from the bulb holder by pressing it in slightly and turning it anti-clockwise.

(4) Ensure that the bulb holder is free from corrosion and instal the new bulb to the bulb holder. Instal the bulb holder to the lamp body and instal the trim panel to the vehicle.

To Renew Bulb–Utility

(1) Remove the screws retaining the combination lamp to the vehicle body and withdraw the lamp sufficiently to remove the bulb holders.

(2) Remove the bulb holders from the lamp assembly by turning them anti-clockwise and remove the lamp assembly from the vehicle.

(3) Remove the bulb from the bulb holder by pressing it in slightly and turning it anti-clockwise.

(4) Ensure that the bulb holder is free from corrosion and instal the new bulb to the bulb holder.

(5) Instal the bulb holders to the lamp body, instal the lamp assembly to the vehicle and tighten the retaining screws.

To Remove and Instal–Sedan and Coupe

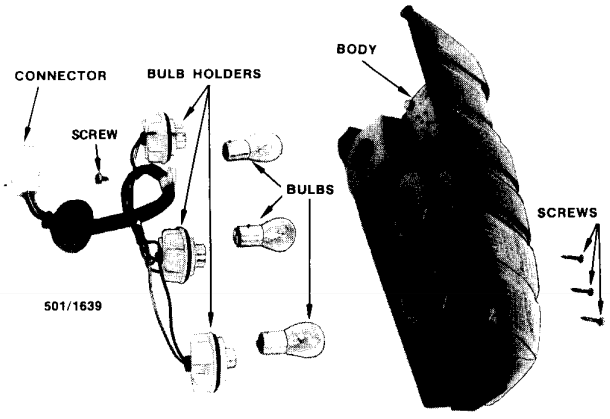
(1) Where fitted, remove the luggage compartment trim panel.

(2) Disconnect the wiring connector by pulling on the connector not the wires.

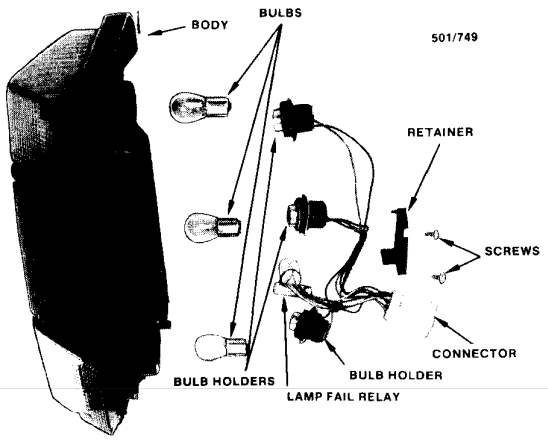
(3) Remove the nuts retaining the lamp to the rear panel and withdraw the lamp from the vehicle.

Installation is a reversal of the removal procedure with attention to the following point:

Apply a suitable sealant to the lamp body to ensure a weatherproof seal between the lamp and the vehicle body.



Dismantled view of the rear combination lamp, 1983 Station Wagon shown.



Dismantled view of the rear combination lamp, 1986 Station Wagon shown.

To Remove the Instal 1979–1984 Station Wagon

(1) Remove the screws retaining the combination lamp to the vehicle and withdraw the lamp sufficiently to remove the bulb holders.

(2) Remove the bulb holders from the lamp by turning them anti-clockwise and withdraw the lamp assembly from the vehicle.

(3) If the bulb holders are to be removed from the vehicle, carefully prise the wiring grommet from the lamp mounting panel and withdraw the wiring sufficiently to disconnect the wiring connector.

Installation is a reversal of the removal procedure.

To Remove and Instal 1985–1987 Station Wagon

(1) Depress the locktab on the rear interior trim panel and remove the trim panel.

(2) Remove the bulb holders from the lamp by turning them anti-clockwise.

(3) Remove the nuts retaining the combination lamp to the vehicle body and carefully prise the lamp from the vehicle body.

Installation is a reversal of the removal procedure with attention to the following point:

Apply a suitable sealant to the lamp body to ensure a weather proof seal between the lamp and the vehicle body.

To Remove and Instal — Utility

(1) Remove the screws retaining the combination lamp to the vehicle body and withdraw the lamp sufficiently to remove the bulb holders.

(2) Remove the bulb holders from the lamp assembly by turning them anti-clockwise and remove the lamp assembly from the vehicle.

Installation is a reversal of the removal procedure.

NUMBER PLATE LAMP

To Remove and Instal 1979–1984 Sedan and Coupe

(1) Working in the luggage compartment, dis-

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connect the wiring by pulling on the connectors not the wires.

(2) Remove the nuts retaining the lamp to the rear panel and withdraw the lamp and wiring from the vehicle.

Installation is a reversal of the removal procedure.

To Remove and Instal 1985–1986 Sedan

(1) Remove the screws retaining the lamp to the rear bumper.

(2) Remove the lens and cover from the upper side of the bumper and withdraw the lamp from the lower side of the bumper.

(3) Disconnect the wiring connector.

Installation is a reversal of the removal procedure.

To Remove and Instal 1979–1987 Station Wagon

(1) Remove the screws retaining the lamp to the vehicle tailgate.

(2) Withdraw the lamp sufficiently to disconnect the wiring.

(3) Disconnect the wiring by pulling on the connectors not the wires and withdraw the lamp from the tailgate.

Installation is a reversal of the removal procedure.

To Remove and Instal — Utility

(1) Disconnect the wiring connector by pulling on the connector not the wires.

(2) Remove the screws retaining the lamp to the vehicle body and withdraw the lamp from the vehicle.

Installation is a reversal of the removal procedure.

To Renew Bulb 1979–1984 Sedan and Coupe

(1) Remove the number plate lamp assembly as previously described.

(2) Remove the screws retaining the lens to the lamp body.

(3) Remove the bulb by pulling it from the bulb holder.

(4) Ensure that the bulb holder is free from corrosion and instal the new bulb to the bulb holder.

(5) Instal the lamp assembly to the vehicle rear panel.

To Renew Bulb 1985–1987 Sedan

(1) Remove the screws retaining the lens and lamp to the rear bumper and withdraw the lamp body from under the bumper.

(2) Remove the bulb by pulling it from the bulb holder.

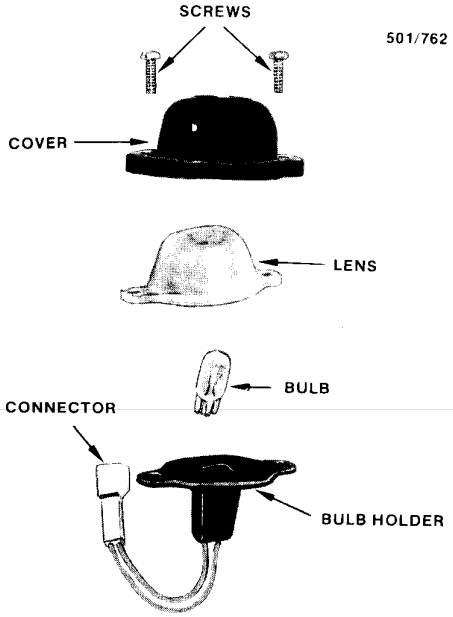
(3) Ensure that the bulb holder is free from corrosion and instal the new bulb.

(4) Instal the lamp body to the underside of the bumper, place the lens on the upper side of the bumper and tighten the retaining screws securely.

To Renew Bulb 1979–1987 Station Wagon

(1) Remove the screws retaining the lamp and lens to the tailgate and remove the lens from the lamp body.

(2) Remove the bulb by pulling it from the bulb holder.



Dismantled view of the number plate lamp, 1986 Station Wagon shown.

(3) Ensure that the bulb holder is free from corrosion and instal the new bulb.

(4) Instal the lens and screws to the tailgate and tighten the screws securely.

To Renew Bulb–Utility

(1) Remove the screws retaining the lamp and lens to the vehicle body and remove the lens from the lamp.

(2) Remove the bulb by pulling it from the bulb holder.

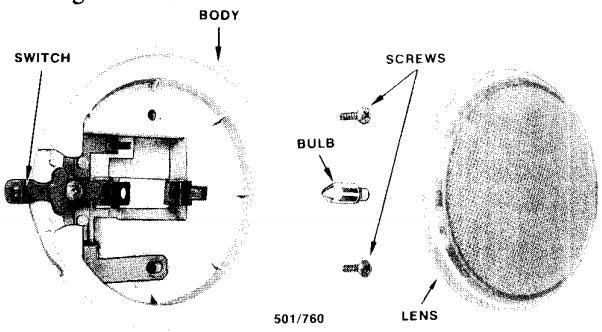
(3) Ensure that the bulb holder is free from corrosion and instal the new bulb.

(4) Instal the lens and screws to the lamp and tighten the screws securely.

COURTESY LAMP

To Renew Bulb

(1) Remove the lens from the courtesy lamp by turning it anti-clockwise.



Dismantled view of the interior lamp, 1986 model shown.

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(2) Remove the bulb by carefully moving it to one side and withdrawing it from the bulb holder.

(3) Ensure that the bulb holder is free from corrosion and instal the new bulb.

(4) Instal the lens by turning it clockwise.

To Remove and Instal

(1) Disconnect the negative battery terminal. Remove the lens from the courtesy lamp by turning it anti-clockwise.

(2) Remove the screws retaining the lamp to the roof brace and withdraw the lamp sufficiently to allow the wiring to be disconnected.

(3) Disconnect the wiring by pulling on the connectors not the wires and withdraw the lamp from the vehicle.

Installation is a reversal of the removal procedure.

18. WINDSCREEN WIPERS

TO RENEW WIPER BLADES

1979–1984 and all Utility Models

(1) Raise the wiper arm from the windscreen until it locks in the vertical position.

(2) Lift the locking lever on the wiper arm and withdraw the wiper blade from the wiper arm.

Installation is a reversal of the removal procedure.

1985–1987 Sedan and Station Wagon Models

(1) Raise the wiper arm from the windscreen until it locks in the vertical position.

(2) Remove the screws retaining the wiper blade to the wiper arm and withdraw the blade from the arm.

Installation is a reversal of the removal procedure.

TO REMOVE AND INSTAL WIPER ARMS

1979–1984 and all Utility Models

(1) Lift the cover from the pivot end of the wiper arm and withdraw it from the arm.

(2) Remove the nut retaining the arm to the pivot.

(3) Lift the wiper arm to the locked position and carefully rock the lower section of the arm to free it from the splines of the pivot. Withdraw the arm from the vehicle.

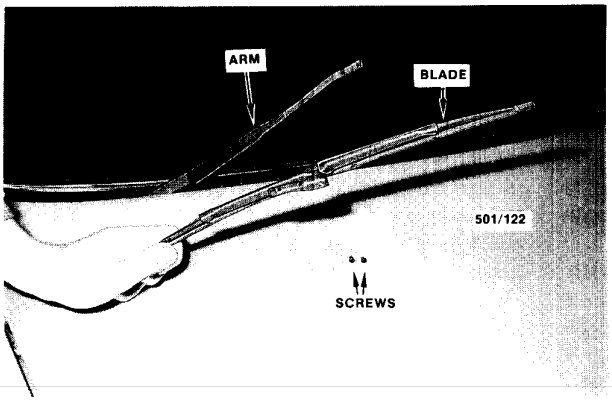
Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the wiper motor is in the Park position before installing the wiper arm. If in doubt, turn the wiper switch to the Off position and turn the ignition switch to the On position until the wiper motor stops.

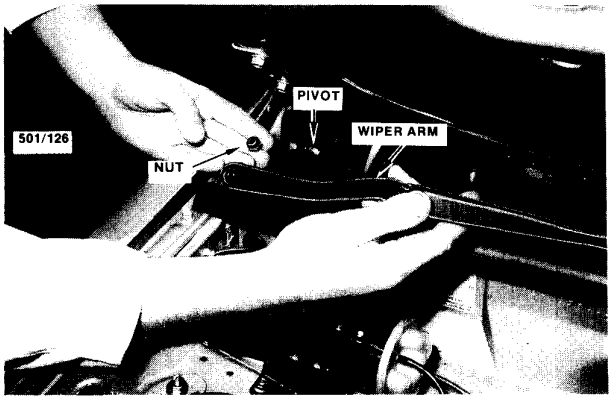
(2) Instal the wiper arm on the pivot so that it will not hit the lower or side windscreen mouldings during operation.

1985–1987 Sedan and Station Wagon Models

(1) Working in the engine compartment, remove the nut retaining the wiper arm to the pivot.



Windscreen wiper blade removed from the arm, 1986 model shown.



Windscreen wiper arm removed from the vehicle, 1986 model shown.

(2) Manoeuvre the wiper arm from the pivot and withdraw the arm from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the wiper motor is in the Park position before installing the wiper arm. If in doubt, turn the wiper switch to the Off position and turn the ignition switch to the On position until the wiper motor stops.

(2) Instal the wiper arm to the pivot so that it will not hit the lower or side windscreen mouldings during operation.

TO REMOVE AND INSTAL WIPER MOTOR

1979–1984 and all Utility Models

(1) Remove the wiper arms from the vehicle as previously described.

(2) Disconnect the negative battery terminal.

(3) Working in the engine compartment, disconnect the wiper motor wiring connector by pulling on the connector not the wires.

(4) Remove the screws retaining the plenum chamber grille to the vehicle body and withdraw the grille from the vehicle.

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(5) Suitably mark the relationship of the wiper motor crank to the wiper motor shaft and remove the nut retaining the crank to the shaft.

(6) Remove the crank from the wiper motor shaft.

(7) Remove the bolts retaining the wiper motor to the vehicle body and withdraw the wiper motor from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the crank to the wiper motor shaft, aligning the marks made during removal.

(2) Ensure that the wiper motor is in the Park position before installing the wiper arms. If in doubt, connect the battery, turn the wiper switch to the Off position and turn the ignition switch to the On position until the wiper motor stops.

(3) Instal the wiper arms to the pivots so that they will not hit the lower or side windscreen mouldings during operation.

1985–1987 Sedan and Station Wagon Models

(1) Remove the wiper arms from the vehicle as previously described.

(2) Disconnect the negative battery terminal.

(3) Working in the engine compartment, disconnect the wiring at the wiper motor by pulling on the connector not the wires.

(4) Remove the bolts retaining the wiper motor to the vehicle body and withdraw the wiper motor sufficiently to remove the nut retaining the crank to the wiper motor shaft.

(5) Suitably mark the relationship of the crank to the wiper motor shaft and remove the nut retaining the crank to the shaft.

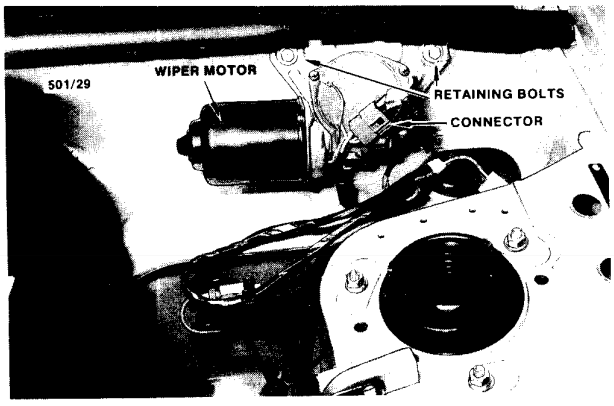
(6) Remove the crank from the shaft and withdraw the wiper motor from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the crank to the wiper motor shaft aligning the marks made during removal.

(2) Ensure that the wiper motor is in the Park position before installing the wiper arms. If in doubt, connect the battery, turn the wiper switch to the Off position and turn the ignition switch to the On position until the wiper motor stops.

(3) Instal the wiper arms to the pivots so that they will not hit the lower or side windscreen mouldings during operation.



Installed view of the wiper motor, 1986 model shown.

19. REAR WIPERS

TO RENEW WIPER BLADE

1979–1984 and all Utility Models

(1) Lift the wiper arm from the rear window until it locks in the vertical position.

(2) Depress the lever on the wiper blade and withdraw the blade from the arm.

Installation is a reversal of the removal procedure.

1985–1987 Station Wagon Models

(1) Lift the wiper arm from the rear window until it locks in the vertical position.

(2) Tilt the wiper blade pivot up to disengage the blade from the arm and withdraw the blade from the arm.

Installation is a reversal of the removal procedure.

TO REMOVE AND INSTAL WIPER ARM

(1) Lift the cover from the wiper arm at the pivot end and remove the cover from the arm.

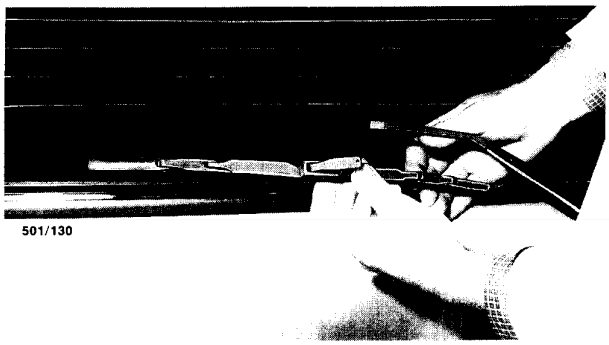
(2) Remove the nut retaining the wiper arm to the wiper motor pivot.

(3) Lift the wiper arm from the rear window until it locks in position and carefully rock the lower section of the arm to free it from the splines on the pivot. Withdraw the arm from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

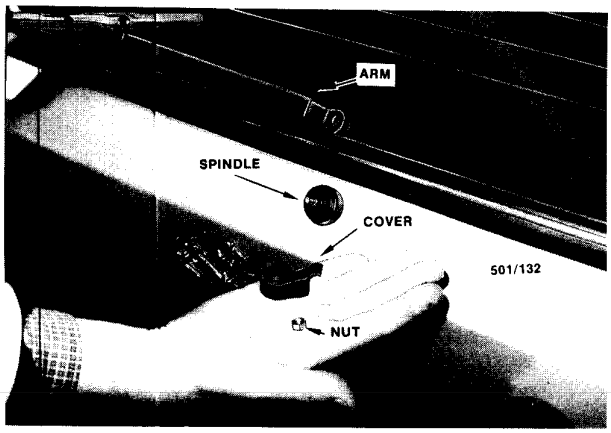
(1) Ensure that the wiper motor is in the Park position before installing the wiper arm. If in doubt, turn the wiper switch to the Off position and turn the ignition switch to the On position until the wiper motor stops.

(2) Instal the wiper arm to the pivot so that the blade will not hit the lower window moulding during operation.



Rear window wiper blade removed from the wiper arm, 1986 model shown.

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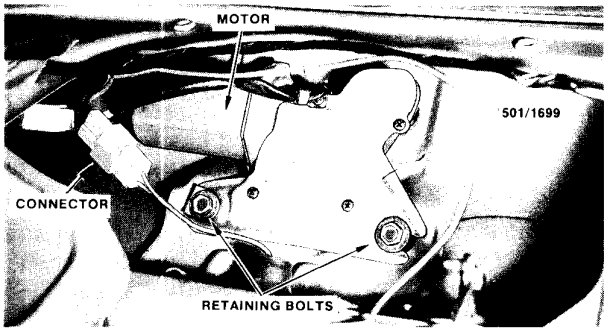


Rear window wiper arm removed from the pivot shaft, 1986 model shown.

TO REMOVE AND INSTAL WIPER MOTOR

(1) Disconnect the negative battery terminal.
(2) Remove the wiper arm from the vehicle as previously described.
(3) Remove the nut retaining the wiper pivot to the tailgate.
(4) Remove the tailgate interior trim by carefully prising the retaining clips from the tailgate.
(5) Disconnect the wiring by pulling on the connectors not the wires.
(6) Remove the bolts retaining the wiper motor to the tailgate and withdraw the wiper motor from the tailgate.

Installation is a reversal of the removal procedure with attention to the following point:



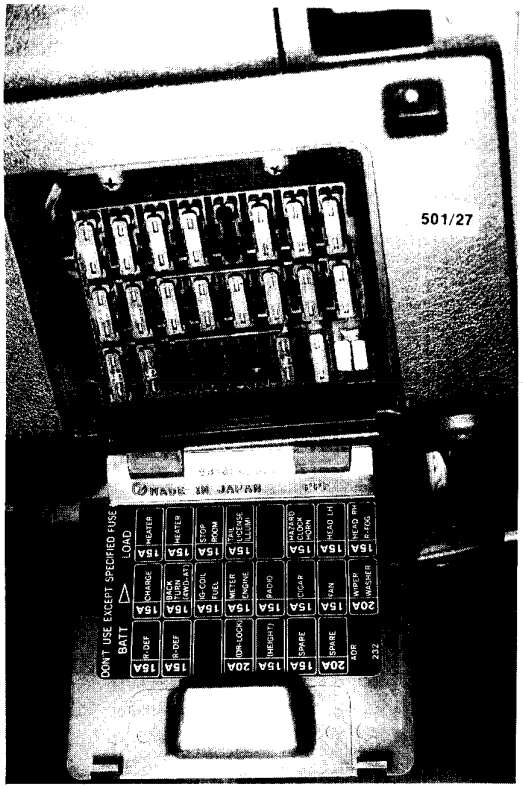
Installed view of the rear wiper motor, 1983 model shown.

Instal the wiper arm as previously described.

20. FUSES AND FUSIBLE LINKS

TO CHECK AND RENEW FUSE

NOTE: If a fuse is found to be faulty or burnt out, use a new fuse of the specified amperage only. The use of a higher rated fuse than specified could cause damage to the vehicle wiring harness.



View showing location of fuses, 1986 model shown.

(1) Remove the cover from the fuse box and locate the fuse protecting the circuit at fault.
(2) Pull the fuse from the socket and visually inspect it for serviceability. If the fuse appears to be intact, connect a suitable ohmmeter to the terminals on the fuse and check that continuity exists. Renew the fuse if serviceability is in doubt.
(3) If the circuit is still faulty, refer the problem to an automotive electrician.

TO CHECK AND RENEW FUSIBLE LINK

NOTE: If the fusible link is found to be faulty or burned out use a new fusible link of the specified amperage only. The use of a higher rated fusible link than specified could cause damage to the vehicle wiring harness.

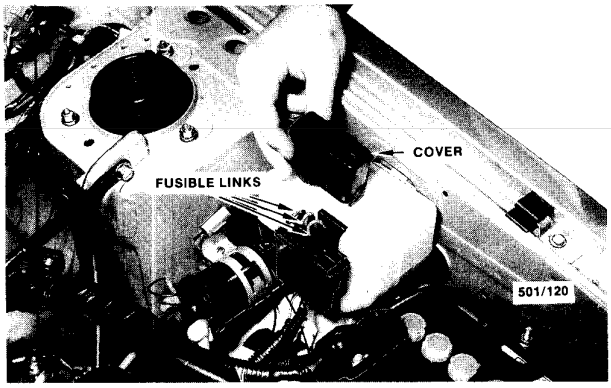
The fusible links are located in a holder adjacent to the battery.
(1) Disconnect the negative battery terminal.
(2) Remove the cover from the holder and disconnect the link by pulling on the connectors not the wires.
(3) Inspect the fusible link visually for serviceability. If the link appears to be intact, connect a suitable ohmmeter to the terminals on the link and check that continuity exists. Renew the fusible link if serviceability is in doubt.

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(4) If a new fusible link is installed, have an assistant temporarily connect the battery terminal while checking the operation of the circuit.

NOTE: While checking the operation using a new fusible link, loosely connect the battery terminal only, to safeguard against damage to the wiring harness.

(5) If the circuit is still faulty, refer the problem to an automotive electrician.



View showing location of fusible links, 1986 model shown.

21. HOW TO WIRE UP A TRAILER

There are many different brands of trailer electrical combination plugs and sockets on the market. Some makes can even be obtained with a varying number of circuit pin connections. Most manufacturers however, now choose to market the seven pin variety only. The seven pin plug and socket provides for two auxiliary circuits and in caravan use, these are usually used for the 12 volt interior lights and the electrical brakes.

If the trailer which is to be towed by the vehicle already has a connector plug then the matching type of socket will have to be fitted to the vehicle. If on the other hand, the trailer has no plug then it is advisable to fit a seven pin type unit to the vehicle and trailer so that if an a later time auxiliary circuits are needed, it is only a matter of using the vacant pins.

FITTING THE SOCKET AND PLUG

NOTE: The minimum amount of material needed will be:

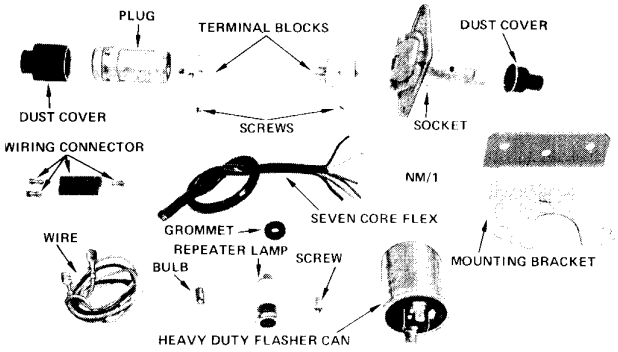
Trailer socket and plug, socket mounting bracket, multi core flex, wiring connectors, grommet, heavy duty flasher unit with repeater lamp.

When wiring the stop lamp, the stop lamp warning system must be taken into consideration.

If the trailer stop lamp wiring is taken from a point before the warning relay, located either in the right hand rear combination lamp or at a point close to the right hand rear combination lamp, the warning lamp will not indicate any fault in the trailer lamps.

If the trailer stop lamp wiring is taken from one of the wires from the relay to one of the vehicle stop lamps, the warning lamp will indicate a fault in the stop lamp circuit whenever the trailer wiring is connected and the stop lamps are operated, even though no fault exists.

If the trailer stop lamp wiring is connected so that a separate wire for each side trailer stop lamp is taken from each side vehicle stop lamp circuit at a point beyond the warning relay, the warning system will indicate if a fault exists in either the vehicle or trailer stop lamps.



Minimum material needed for wiring up a trailer. Utilux trailer socket and plug shown.

(1) Disconnect the negative battery terminal.

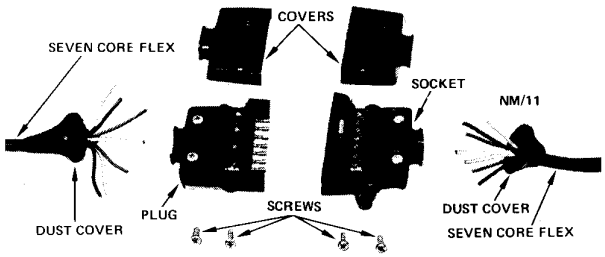
(2) Locate the main wiring harness at the rear of the vehicle and using the length of multi core flex, cut if necessary and tap into the right hand flasher wire, left hand flasher wire, tail lamp wire, stop lamp wire and an earth wire. Use insulated connectors when tapping into the wires.

NOTE: To determine which colour wire on the vehicle is for each particular rear lamp refer to the wiring diagram in this section which shows the colours for the various wires. Ensure the right diagram for the applicable model is used. When tapping into the rear wires on the vehicle conform to the standard caravan colour coding by mating the correct colour wire of the multi core flex to its applicable lamp or earth wire on the vehicle.

The standard caravan coding is as follows:

Left flasher ..... Yellow
Right flasher ..... Green
Stop lamp ..... Red

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Brylite seven pin trailer plug and socket.

Tail lamp ..... *Brown*
Earth ..... *White*
Auxiliary spare ..... *Blue*
Auxiliary spare ..... *Black*

This colour coding has nothing to do with the wiring on the vehicle. It is only for the caravan or trailer wiring.

(3) Drill a suitable sized hole through the vehicle floor, instal a rubber grommet and push through the multi core flex.

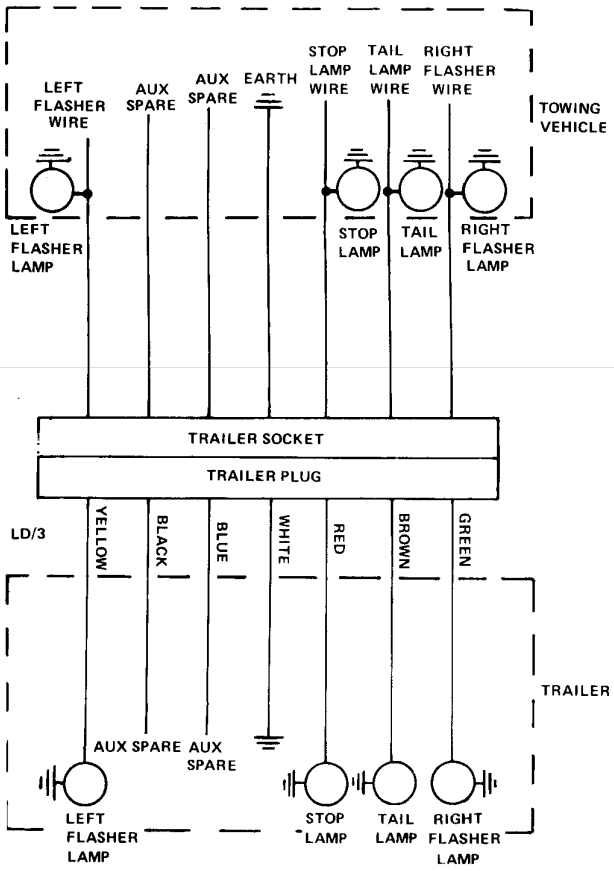
NOTE: Before drilling a hole through the floor, check to see if there is an existing hole which will take the multi core flex. It may be convenient to use the number plate lamp wire hole. Whichever hole is used ensure that a rubber grommet is installed to prevent the wires from chafing.

(4) Cut the multi core flex to the length required and slide the socket dust cover onto the flex. Strip about 15 mm of covering from each wire and connect the wires to the terminals of the socket. Ensure that each coloured wire is connected to its correct terminal. On the brands of sockets where the terminals are only numbered it will be necessary to refer to the instruction sheet which comes with the unit to find out the correct circuit connection for each pin number.

(5) After wiring up and reassembling the socket mount the socket to the rear of the vehicle. Try to mount the socket as near as possible to the tow bar ball and high enough to prevent damage to the socket if the rear of the vehicle happens to scrape on driveways, etc. On brands of sockets that do not have an inbuilt mounting bracket it will be necessary to make up a mounting bracket or use the optional mounting bracket for the particular socket.

(6) Using the same wiring up procedure, wire the plug to the trailer wiring. If the wiring on the trailer is not to the standard colour code and is an unknown quantity then it will be necessary to connect up the wiring as follows:

(a) Locate the earth wire for the trailer even if all wires have to be traced on the trailer. Connect the earth wire only to the wiring plug and connect the plug to the connector on the vehicle.



Typical diagram for wiring up a trailer.

(b) Connect up the vehicle's battery and switch on the tail lamps. Connect each trailer wire in turn to the live tail lamp terminal on the plug until the trailer tail lamp illuminates. When the trailer tail lamp wire is found connect this to the tail lamp terminal on the plug. Switch off the tail lamps and using the same procedure turn the other lamps on in turn and find the applicable trailer lamp by connecting to the live terminal on the plug.

NOTE: On some makes of plug it will be necessary to dismantle the terminal blocks from the plug and/or socket in order to expose the terminals.

(7) Instal the heavy duty flasher unit and repeater lamp to the vehicle following the wiring up instructions which are enclosed in the flasher unit and repeater lamp kit. Ensure the correct kit is purchased for the applicable model of vehicle.

The heavy duty flasher unit keeps the flash rate constant regardless of additional load. The repeater lamp, which should be mounted in some easy to see position on the dash panel, indicates if the trailer turn signal lamps are operating.

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Wiring diagram for 1979–1981 models

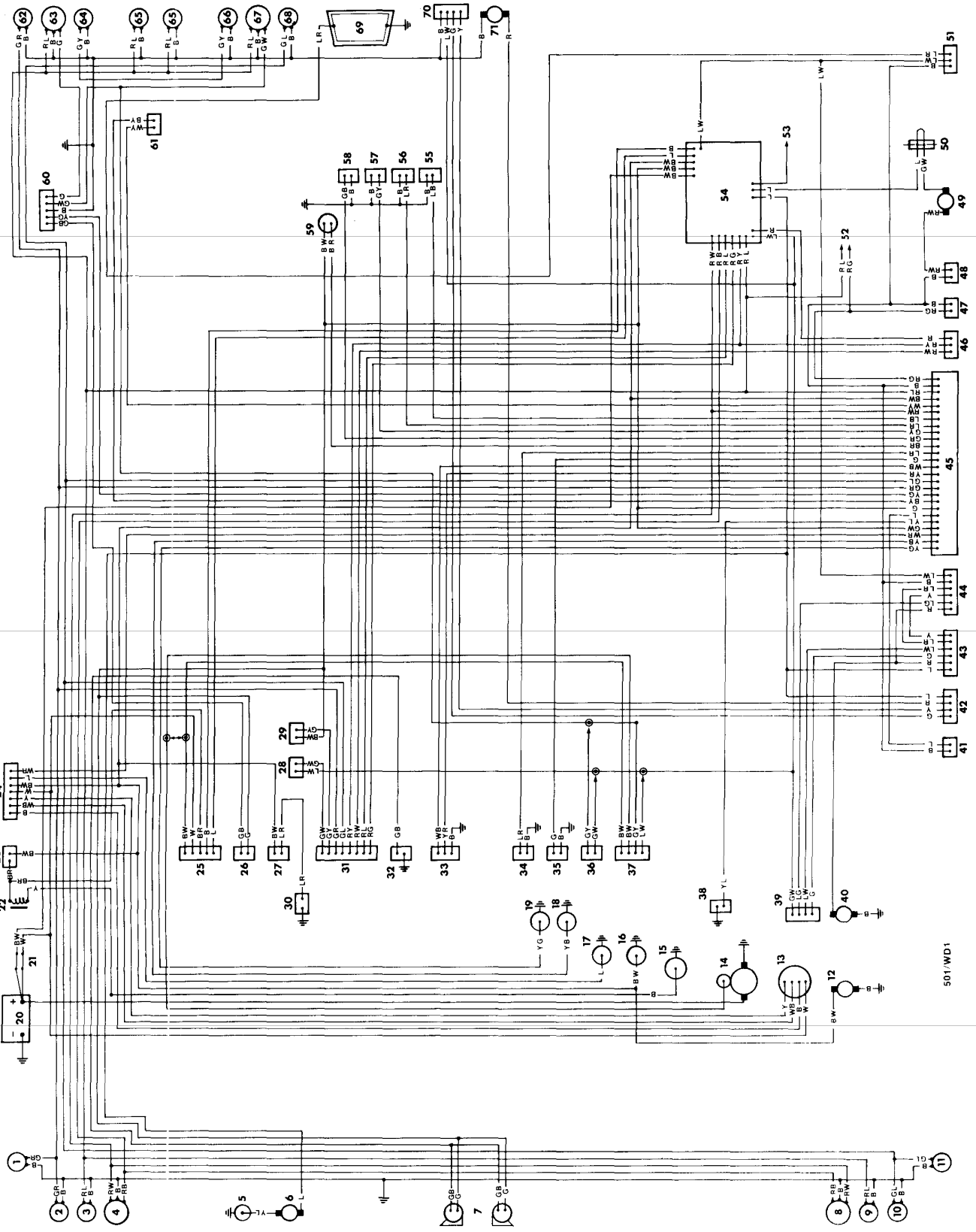
COLOUR CODE

The first letter of the code represents the main wire colour, the other letters represent the trace colours.

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X — LIGHT GREEN
Z — LIGHT BLUE
M — DARK GREEN
T — DARK BLUE
A — LIGHT BROWN
E — SLATE
D — TAN

KEY

1. R.H.F. turn signal repeater lamp
2. R.H.F. turn signal lamp
3. R.H. park lamp
4. R.H. headlamp
5. Radiator cooling fan and thermosensor
6. Radiator cooling fan
7. Horn
8. L.H. headlamp
9. L.H. park lamp
10. L.H.F. turn signal lamp
11. L.H.F. turn signal repeater lamp
12. Fuel pump
13. Alternator
14. Starter motor
15. Distributor
16. Fuel cut solenoid
17. Automatic choke
18. Oil pressure sender unit
19. Temperature gauge sender unit
20. Battery
21. Fusible link
22. Ignition coil
23. Ballast resistor
24. Alternator regulator
25. Ignition switch
26. Stop lamp switch
27. Kickdown switch — automatic transaxle models
28. Turn signal flasher unit
29. Hazard flasher unit
30. Kickdown solenoid — automatic transaxle models
31. Combination switch
32. Horn control
33. Brake fluid level sensor
34. 4WD warning lamp switch
35. HI LO warning lamp switch
36. Reverse lamp switch — manual transaxle models
37. Neutral safety switch — automatic transaxle models
38. Handbrake warning lamp switch
39. Wiper motor
40. Washer motor
41. Choke switch
42. Rear wiper/washer switch
43. Wiper/washer switch
44. Intermittant wiper control
45. Instrument cluster
46. Headlamp switch
47. Instrument lamp rheostat
48. Heater blower switch
49. Heater blower motor
50. Air conditioner wiring connector
51. Rear demister switch
52. To switch illumination lamps
53. To radio and cigarette lighter
54. Fuse box — refer Fuse Box Wiring Diagrams
55. L.H.R. courtesy lamp door switch
56. R.H.R. courtesy lamp door switch
57. L.H.F. courtesy lamp door switch
58. L.H.R courtesy lamp door switch
59. Courtesy lamp
60. Stop lamp warning lamp control unit
61. Fuel gauge sender unit
62. R.H.R. turn signal lamp
63. R.H. stop/tail lamp
64. R.H. reverse lamp
65. Number plate lamp
66. L.H. reverse lamp
67. L.H. stop/tail lamp
68. L.H.R. turn signal lamp
69. Rear demister
70. Rear wiper motor
71. Rear washer motor



Wiring diagram for 1979–1981 models

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Wiring diagram for 1982 models

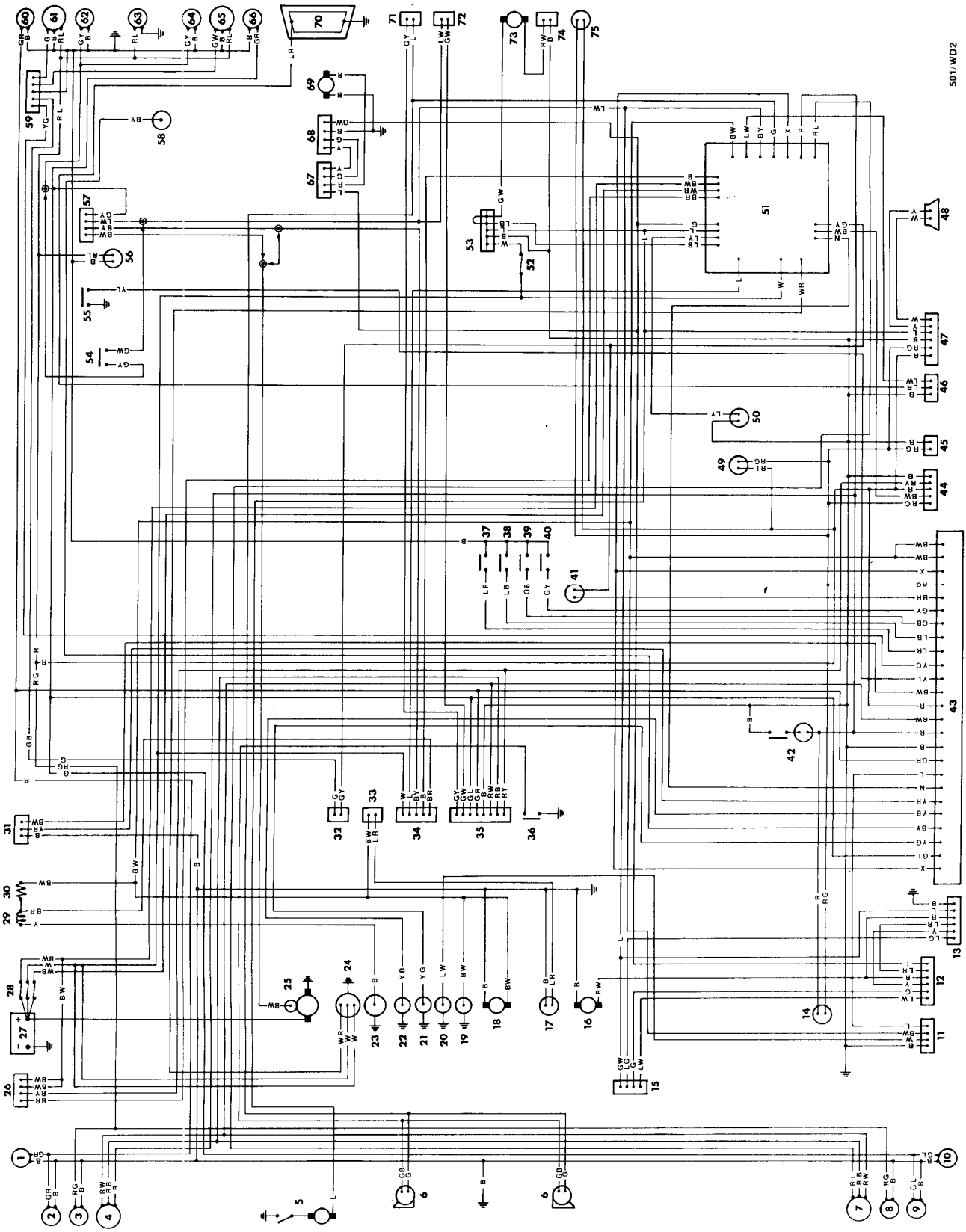
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Z — LIGHT BLUE
M — DARK GREEN
T — DARK BLUE
A — LIGHT BROWN
E — SLATE
D — TAN

KEY

1. R.H.F turn signal repeater lamp
2. R.H.F. turn signal lamp
3. R.H. park lamp
4. R.H. headlamp
5. Radiator cooling fan and thermosensor
6. Horn
7. L.H. headlamp
8. L.H. park lamp
9. L.H.F. turn signal lamp
10. L.H.F. turn signal repeater lamp
11. Choke control
12. Wiper/washer switch
13. Intermittant wiper control
14. Wiper switch lamp
15. Wiper motor
16. Washer motor
17. Kickdown solenoid — automatic transaxle models
18. Fuel pump
19. Fuel cut solenoid
20. Choke temperature sensor
21. Temperature gauge sender unit
22. Oil pressure sender unit
23. Distributor
24. Alternator
25. Starter motor
26. Headlamp relay
27. Battery
28. Fusible link
29. Ignition coil
30. Ballast resistor
31. Brake fluid level sensor
32. Stop lamp switch
33. Kickdown switch — automatic transaxle models
34. Ignition switch
35. Combination switch
36. Horn control
37. R.H.R. courtesy lamp door switch
38. L.H.R. courtesy lamp door switch
39. R.H.F. courtesy lamp door switch
40. L.H.F. courtesy lamp door switch
41. Courtesy lamp
42. Glove compartment lamp and switch
43. Instrument cluster
44. Headlamp switch
45. Instrument lamp rheostat
46. Rear demister switch
47. Radio
48. Speaker
49. Ash tray lamp
50. Cigarette lighter
51. Fuse box — refer Fuse Box Wiring Diagrams
52. Fuse
53. Air conditioner wiring connector
54. Reverse lamp switch — manual transaxle models
55. Handbrake warning lamp switch
56. Lamps on warning lamp — where fitted
57. Neutral safety switch — automatic transaxle models
58. Fuel gauge sender unit
59. Stop lamp warning lamp control unit
60. R.H.R. turn signal lamp
61. R.H. stop/tail lamp
62. R.H. reverse lamp
63. Number plate lamp
64. L.H. reverse lamp
65. L.H. stop/tail lamp
66. L.H.R. turn signal lamp
67. Rear wiper/washer switch
68. Rear wiper motor
69. Rear washer motor
70. Rear demister
71. Hazard flasher unit
72. Turn signal flasher unit
73. Heater blower motor
74. Heater blower switch
75. Heater panel lamp



Wiring diagram for 1982 models

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Wiring diagram for 1983–1984 and late Utility models

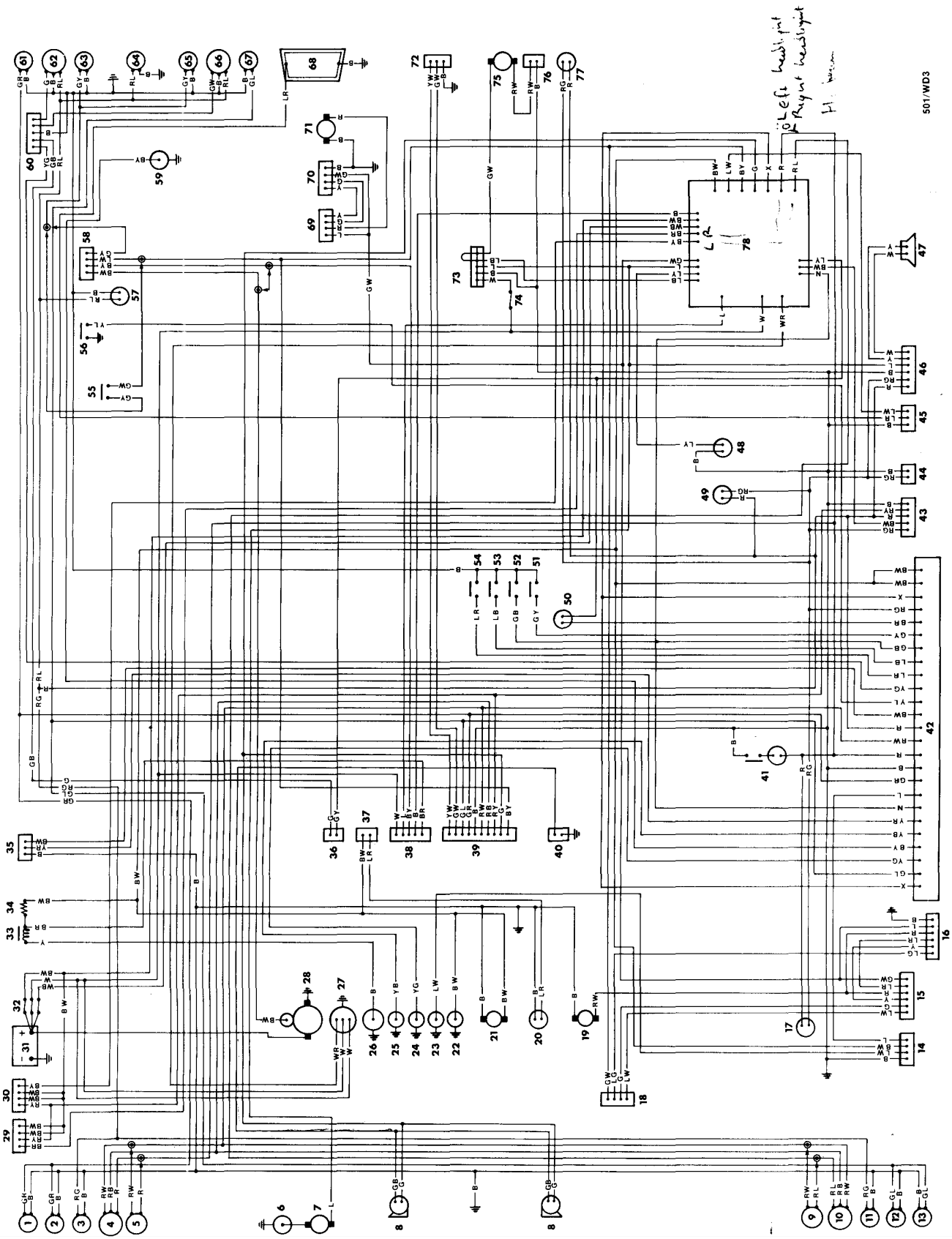
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M — DARK GREEN
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A — LIGHT BROWN
E — SLATE
D — TAN

KEY

1. R.H.F. turn signal repeater lamp
2. R.H.F. turn signal lamp
3. R.H. park lamp
4. R.H. headlamp
5. R.H. inner headlamp — where fitted
6. Radiator cooling fan thermoswitch
7. Radiator cooling fan
8. Horn
9. L.H. inner headlamp — where fitted
10. L.H. headlamp
11. L.H. park lamp
12. L.H.F. turn signal lamp
13. L.H.F. turn signal repeater lamp
14. Choke control
15. Wiper/washer switch
16. Intermittant wiper control unit
17. Wiper switch lamp
18. Wiper motor
19. Washer motor
20. Kickdown solenoid — automatic transaxle models
21. Fuel pump
22. Fuel cut solenoid
23. Choke temperature sensor
24. Temperature gauge sender unit
25. Oil pressure sender unit
26. Distributor
27. Alternator
28. Starter motor
29. Headlamp relay
30. Headlamp relay
31. Battery
32. Fusible links
33. Ignition coil
34. Ballast resistor
35. Brake fluid level sensor
36. Stop lamp switch
37. Kickdown switch — automatic transaxle models
38. Ignition switch
39. Combination switch
40. Horn control
41. Glove compartment lamp and switch
42. Instrument cluster
43. Headlamp switch
44. Instrument lamp rheostat
45. Rear demister switch
46. Radio
47. Speaker
48. Cigarette lighter
49. Ash tray lamp
50. Courtesy lamp
51. L.H.F. courtesy lamp door switch
52. R.H.F. courtesy lamp door switch
53. L.H.R. courtesy lamp door switch
54. R.H.R. courtesy lamp door switch
55. Reverse lamp switch — manual transaxle models
56. Handbrake warning lamp switch
57. Lamps on warning lamp — where fitted
58. Neutral safety switch — automatic transaxle models
59. Fuel gauge sender unit
60. Stop lamp warning lamp control unit
61. R.H.R. turn signal lamp
62. R.H. stop/tail lamp
63. R.H. reverse lamp
64. Number plate lamp
65. L.H. reverse lamp
66. L.H. stop/tail lamp
67. L.H.R. turn signal lamp
68. Rear demister
69. Rear wiper switch
70. Rear wiper motor
71. Rear washer motor
72. Hazard flasher unit
73. Air conditioner wiring connector
74. Fuse
75. Heater blower motor
76. Heater blower switch
77. Heater panel lamp
78. Fuse box — refer Fuse Box Wiring Diagrams



Wiring diagram for 1983–1984 and late Utility models

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Wiring diagram for 1985–1986 Sedan and Station Wagon models

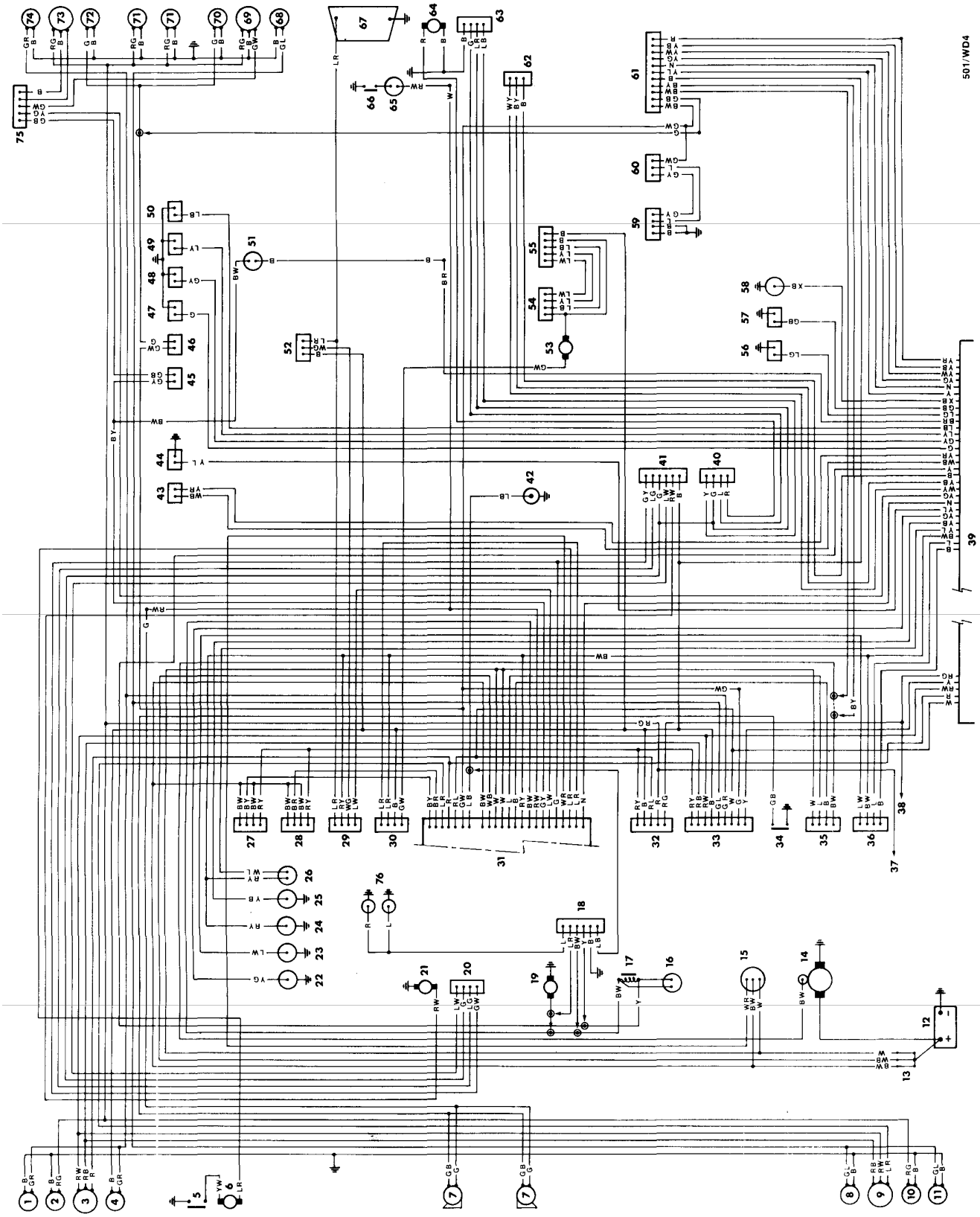
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E — SLATE
D — TAN

KEY

1. R.H.F. turn signal repeater lamp
2. R.H.F. turn signal lamp
3. R.H. headlamp
4. R.H. park lamp
5. Radiator cooling fan thermosensor
6. Radiator cooling fan
7. Horn
8. L.H. park lamp
9. L.H. headlamp
10. L.H.F. turn signal lamp
11. L.H.F. turn signal repeater lamp
12. Battery
13. Fusible link
14. Starter motor
15. Alternator
16. Distributor
17. Ignition coil
18. Engine revolution sensor — 1986 models
19. Fuel pump
20. Wiper motor
21. Washer motor
22. Temperature gauge sender unit
23. Choke temperature sensor
24. Fuel cut solenoid
25. Oil pressure sender unit
26. EGR solenoid — 1985 models
27. Headlamp relay
28. Headlamp relay
29. Demister relay
30. Heater relay
31. Fuse box — refer Fuse Box Wiring Diagrams
32. Headlamp switch
33. Combination switch
34. Horn control
35. Ignition switch
36. Choke control
37. To switch illumination circuit
38. To switch illumination circuit
39. Instrument cluster
40. Rear wiper/washer switch
41. Wiper/washer switch
42. Cigarette lighter
43. Brake fluid level sensor
44. Handbrake warning lamp switch
45. Stop lamp switch
46. Reverse lamp switch — manual transaxle models
47. R.H.F. courtesy lamp door switch
48. L.H.F. courtesy lamp door switch
49. R.H.R. courtesy lamp door switch
50. L.H.R. courtesy lamp door switch
51. Courtesy lamp
52. Rear demister switch
53. Heater blower motor
54. Blower motor resister
55. Heater blower switch
56. 4WD warning lamp switch
57. HI LO warning lamp switch
58. Automatic transaxle temperature sensor
59. 4WD solenoid
60. 4WD switch
61. Neutral safety switch — automatic transaxle models
62. Fuel gauge sender unit
63. Rear wiper motor
64. Rear washer motor
65. Luggage compartment lamp
66. Luggage compartment lamp switch
67. Rear demister
68. L.H.R. turn signal lamp
69. L.H. stop/tail lamp
70. L.H. reverse lamp
71. Number plate lamp
72. R.H. reverse lamp
73. R.H. stop/tail lamp
74. R.H.R. turn signal lamp
75. Stop lamp warning lamp control unit
76. Automatic choke — 1986 model



Wiring diagram for 1985–1986 Sedan and Station Wagon models

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Wiring diagram for 1987 models

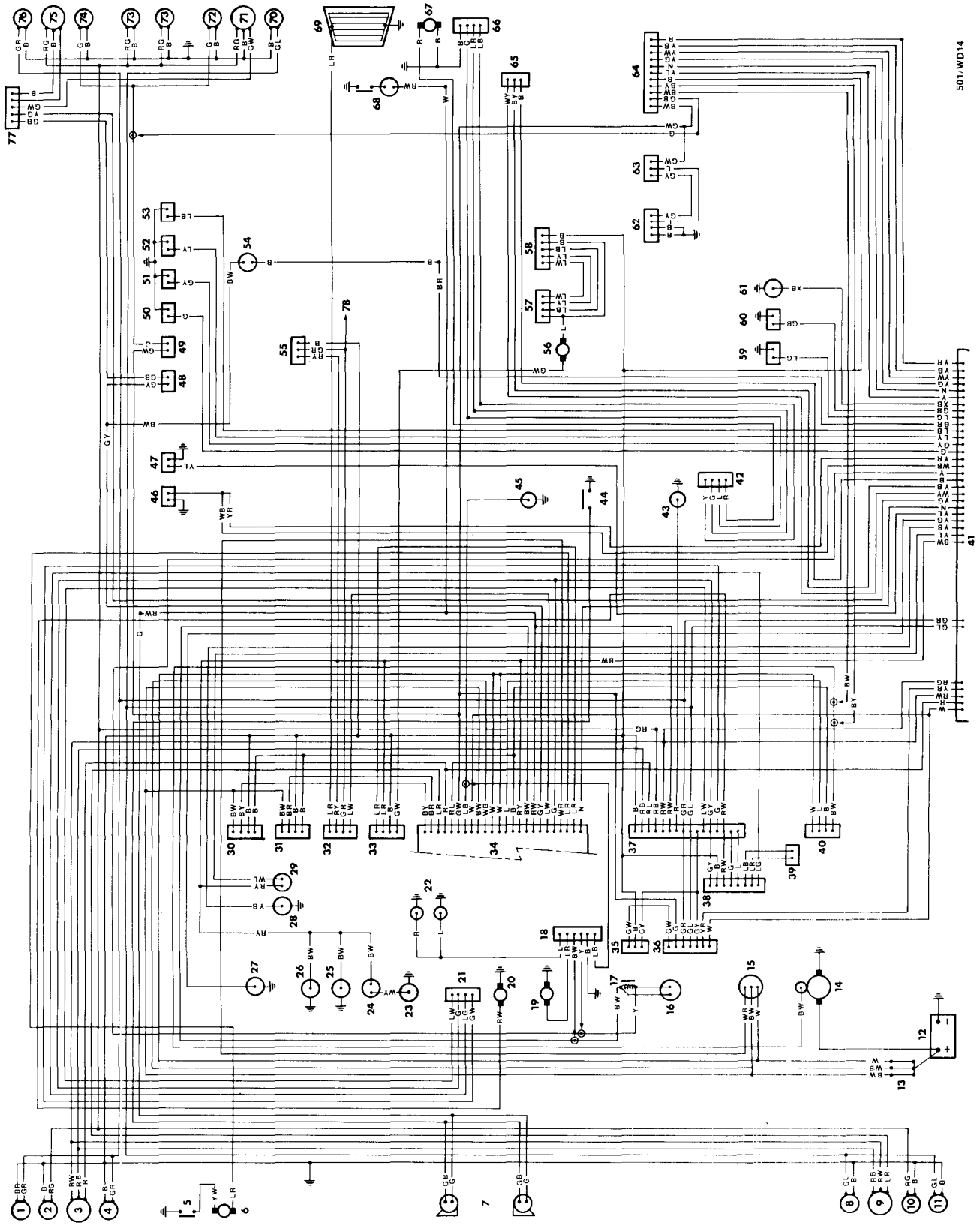
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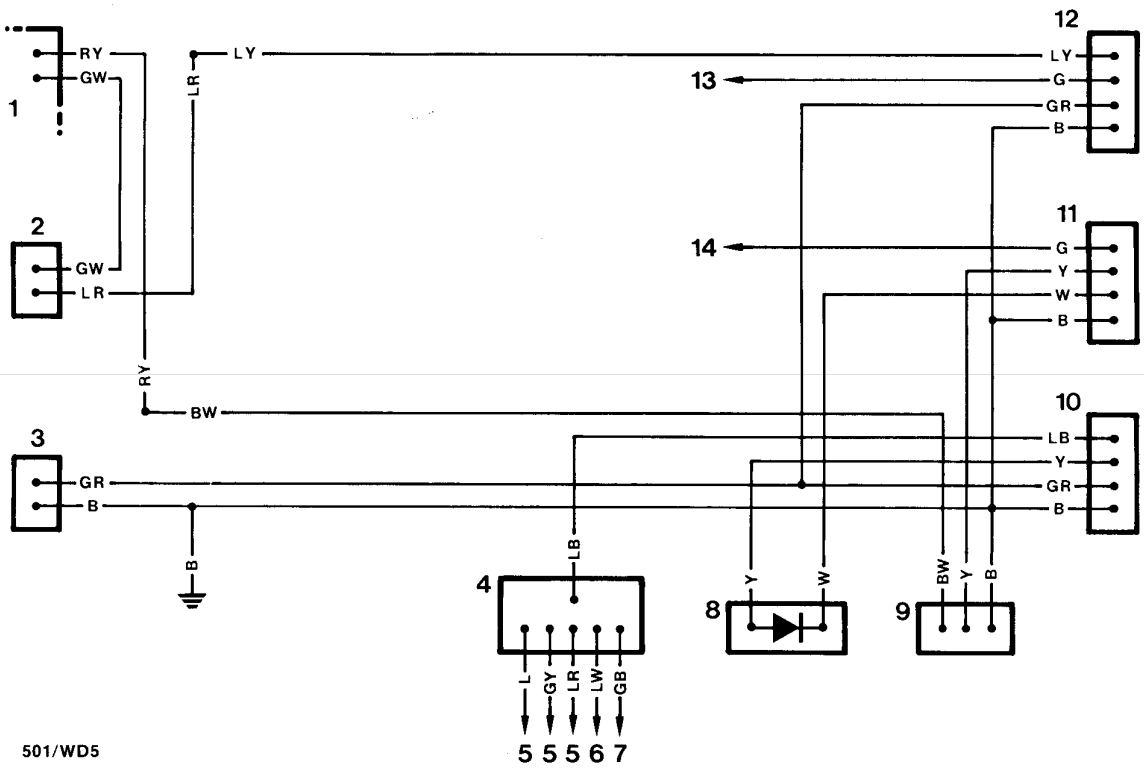
KEY

1. R.H.F. turn signal repeater lamp
2. R.H park lamp
3. R.H. headlamp
4. R.H.F turn signal lamp
5. Radiator cooling fan thermosensor
6. Radiator cooling fan
7. Horns
8. L.H.F turn signal lamp
9. L.H. headlamp
10. L.H park lamp
11. L.H.F turn signal repeater lamp
12. Battery
13. Fusible links
14. Starter motor
15. Alternator
16. Distributor
17. Ignition coil
18. Engine revolution sensor
19. Fuel pump
20. Windscreen washer motor
21. Windscreen wiper motor
22. Automatic choke
23. Float chamber vent temperature sensor
24. Float chamber vent
25. Bowl vent
26. Idle cut solenoid
27. Temperature gauge sender unit
28. Oil pressure switch
29. EGR solenoid
30. R.H headlamp relay
31. L.H headlamp relay
32. Demister relay
33. Heater relay
34. Fuse box — refer Fuse Box Wiring Diagrams
35. Turn signal flasher unit
36. Hazard flasher unit
37. Combination switch
38. Windscreen wiper intermittant control unit
39. Windscreen wiper intermittant control adjuster
40. Ignition switch
41. Instrument cluster
42. Rear wiper/washer switch
43. Automatic transmission selector indicator lamp
44. Horn control
45. Cigarette lighter
46. Brake fluid level sensor
47. Handbrake warning lamp switch
48. Stop lamp switch
49. Reverse lamp switch — manual transaxle
50. R.H.F courtesy lamp
51. L.H.F courtesy lamp door switch
52. R.H.R courtesy lamp door switch
53. L.H.R courtesy lamp door switch
54. Courtesy lamp
55. Rear demister switch
56. Heater blower motor
57. Heater blower motor resistor
58. Heater blower switch
59. 4WD indicator switch
60. 4WD HI-LO indicator switch
61. Automatic transaxle temperature switch
62. 4WD solenoid
63. 4WD switch
64. Neutral safety switch — Automatic transaxle models
65. Fuel gauge sender unit
66. Rear wiper motor
67. Rear washer motor
68. Luggage compartment lamp and switch
69. Rear demister
70. L.H.R turn signal lamp
71. L.H stop/tail lamp
72. L.H Reverse lamp
73. Number plate lamp
74. R.H reverse lamp
75. R.H stop/tail lamp
76. R.H.R turn signal lamp
77. Stop lamp warning lamp control unit
78. To rear demister warning lamp



Wiring diagram for 1987 models

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Wiring diagram for auto 4WD system 1983–1986 models

COLOUR CODE

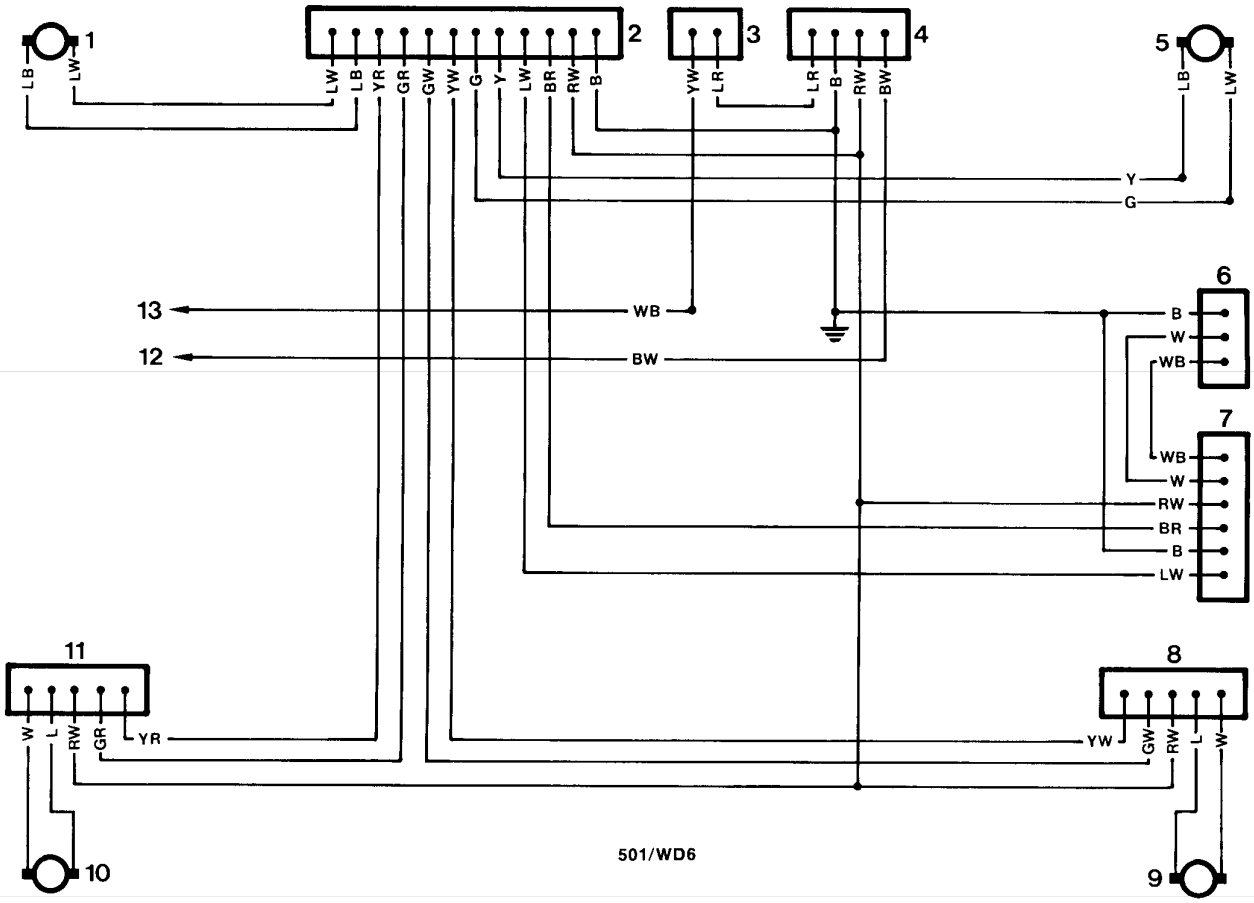
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M — DARK GREEN
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E — SLATE
D — TAN

KEY

1. Fuse box
2. 4WD solenoid
3. 4WD switch
4. Diode pack
5. To wiper switch
6. To kickdown switch
7. To stop lamp switch
8. 4WD diode
9. Auto 4WD switch
10. Auto 4WD relay
11. Reverse cancel relay
12. 4WD checker unit
13. To instrument cluster
14. To neutral safety switch

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Wiring diagram for power windows 1983–1984 models

COLOUR CODE

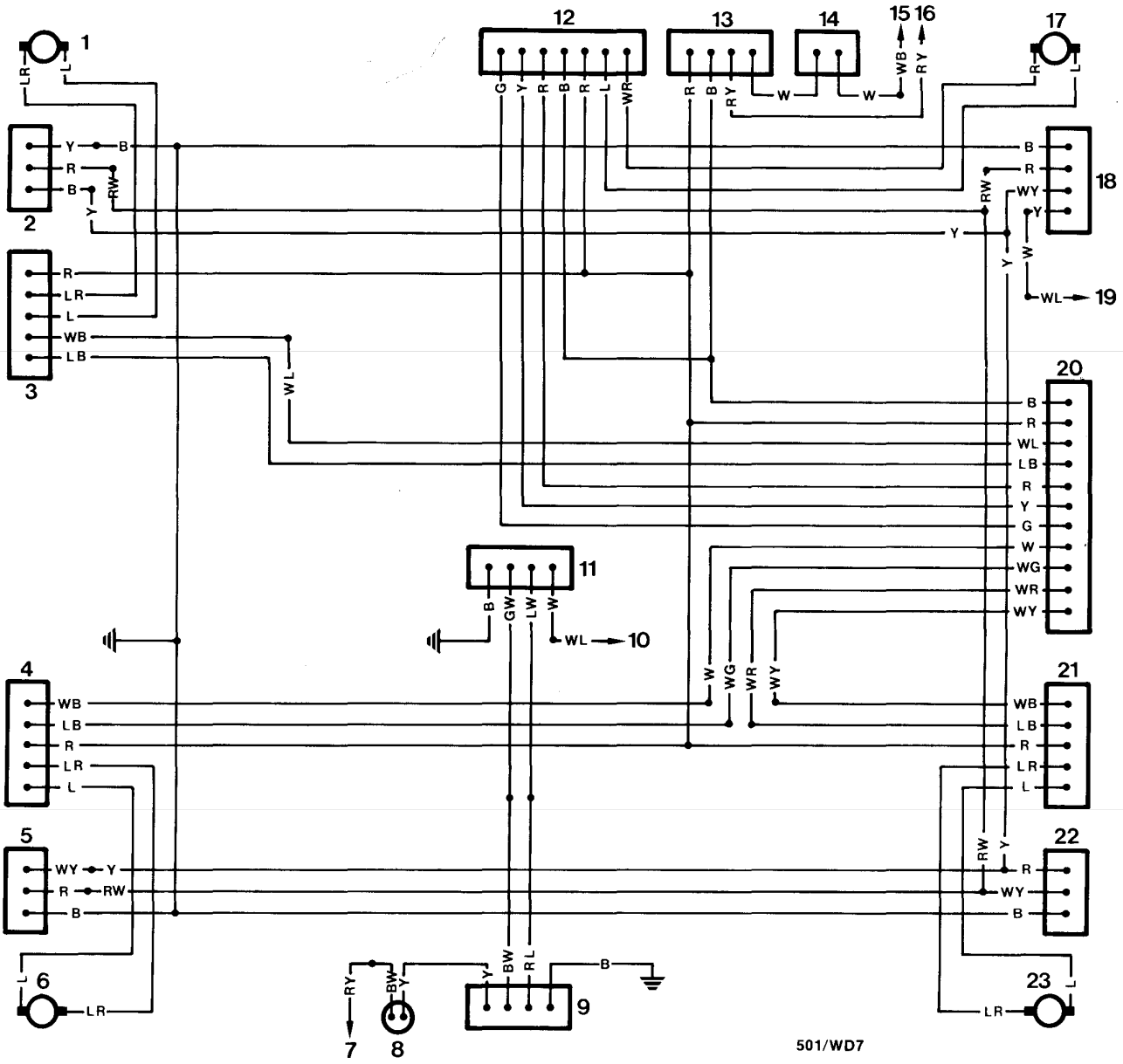
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P — PURPLE
X — LIGHT GREEN
Z — LIGHT BLUE
M — DARK GREEN
T — DARK BLUE
A — LIGHT BROWN
E — SLATE
D — TAN

KEY

1. L.H.F. motor
2. Main switch
3. Circuit breaker
4. Relay
5. R.H.F. motor
6. Auto switch
7. Control unit
8. R.H.R. switch
9. R.H.R. motor
10. L.H.R. motor
11. L.H.R. switch
12. To fuse box
13. To fusible link

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Wiring diagram for power windows and door locks 1985–1986 models

COLOUR CODE

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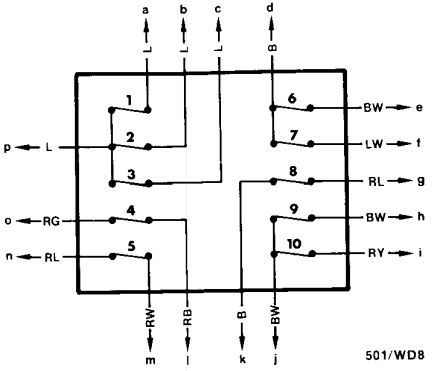
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X — LIGHT GREEN
Z — LIGHT BLUE
M — DARK GREEN
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A — LIGHT BROWN
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D — TAN

KEY

1. L.H.F. window motor
2. L.H.F. door lock and switch
3. L.H.F. window switch
4. L.H.R. window switch
5. L.H.R. door lock and switch
6. L.H.R. window motor
7. To fuse box
8. Tailgate warning lamp
9. Tailgate lock actuator
10. To fuse box
11. Tailgate switch
12. Control unit
13. Relay
14. Circuit breaker
15. To fusible link
16. To fuse box
17. R.H.F. window motor
18. R.H.F. door lock and switch
19. To fuse box
20. Main window switch
21. R.H.R. window switch
22. R.H.R. door lock and switch
23. R.H.R. window motor

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Fuse box wiring diagram for 1979–1981 models

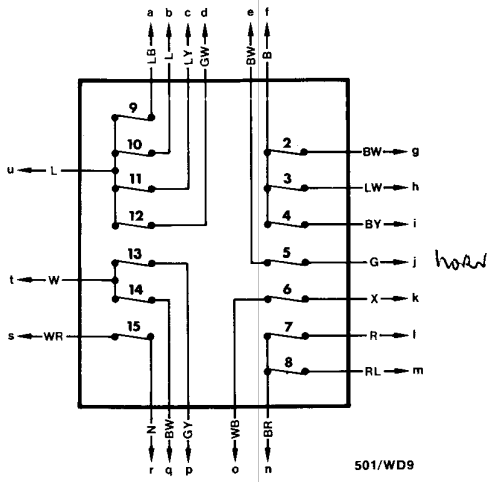
KEY

a. To heater blower motor
b. To radio and cigarette lighter
c. To wiper/washer switch and radiator cooling fan
d. To ignition switch
e. To ignition switch
f. To turn signal, rear demister and reverse lamp circuits
g. To tail lamps
h. To horn, stop lamp, hazard lamp and courtesy lamp circuits
i. To Headlamp switch
j. To fusible link
k. To lamp switch
l. To headlamp low beam
m. To headlamp high beam
n. To combination switch
o. To combination switch
p. To ignition switch

COLOUR CODE

The first letter of the code represents the main wire colour, the other letters represent the trace colours.

B — BLACK
L — BLUE
G — GREEN
R — RED
Y — YELLOW
W — WHITE
N — BROWN
O — ORANGE
K — PINK
S — GREY
V — VIOLET
P — PURPLE
X — LIGHT GREEN
Z — LIGHT BLUE
M — DARK GREEN
T — DARK BLUE
A — LIGHT BROWN
E — SLATE
D — TAN



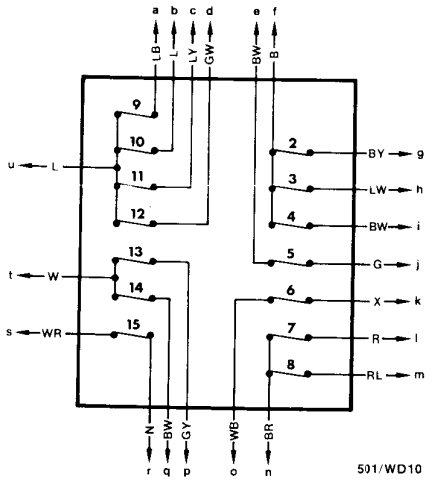
Fuse box wiring diagram for 1982 models

KEY

a. To heater blower motor
b. To cigarette lighter
c. To radiator cooling fan and radio
d. To wiper/washer switch
e. To fusible link
f. To ignition switch
g. To ignition circuit
h. To rear demister switch
i. To reverse lamp and turn signal circuits
j. To horn and hazard lamp circuits
k. To clock, luggage compartment lamp and door ajar warning circuits
l. To R.H. headlamp
m. To L.H. headlamp
n. To headlamp relay
o. To fusible link
p. To fusible link
q. To fusible link
r. To alternator warning lamp
s. To alternator
t. To fusible link
u. To ignition switch

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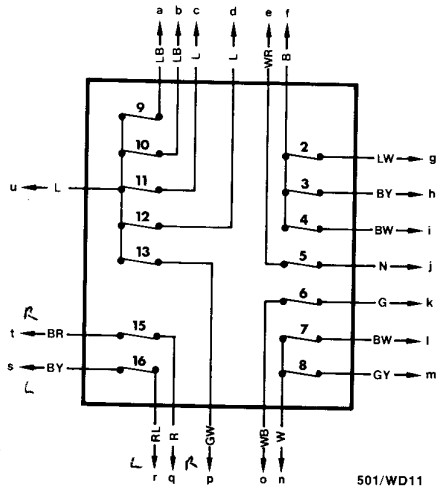
Fuse box wiring diagram for 1983 models



KEY

a. To heater blower motor
b. To cigarette lighter
c. To radio
d. To wiper switch
e. To fusible link
f. To ignition switch
g. To turn signal, reverse lamp and auto 4WD circuits
h. To rear demister switch
i. To ignition circuit
j. To headlamp and horn circuits
k. To clock
l. To R.H. headlamp
m. To L.H. headlamp
n. To headlamp relay
o. To fusible link
p. To stop lamp and courtesy lamp circuits
q. To tail lamp circuits
r. To alternator
s. To alternator warning lamp
t. To fusible link
u. To ignition switch

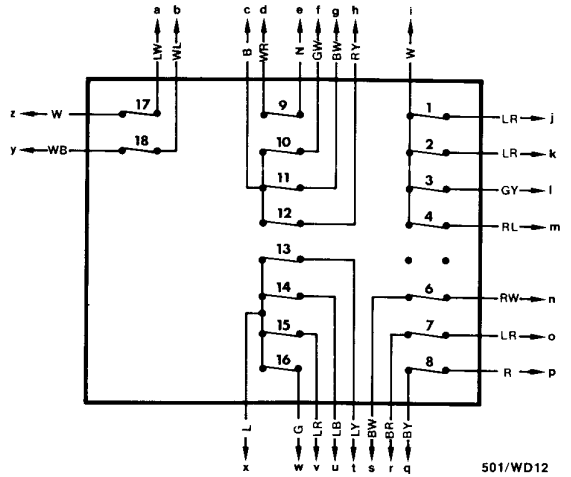
Fuse box wiring diagram for 1984 models



KEY

a. To heater circuit
b. To heater circuit
c. To cigarette lighter
d. To radio and radiator cooling fan
e. To alternator
f. To ignition switch
g. To rear demister
h. To turn signal, reverse lamp and auto 4WD circuits
i. To ignition circuit
j. To alternator warning lamp
k. To clock, hazard warning lamp and horn circuits
l. To tail lamp circuit
m. To stop lamp and courtesy lamp circuits
n. To fusible link
o. To fusible link
p. To wiper/washer circuit
q. To R.H. headlamp
r. To L.H. headlamp
s. To headlamp relay
t. To headlamp relay
u. To ignition switch

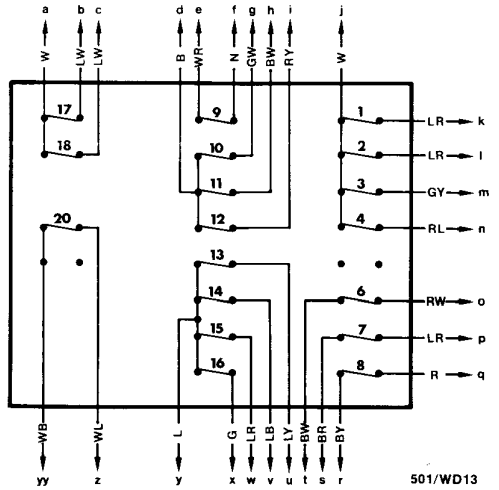
Fuse box wiring diagram for 1985 models



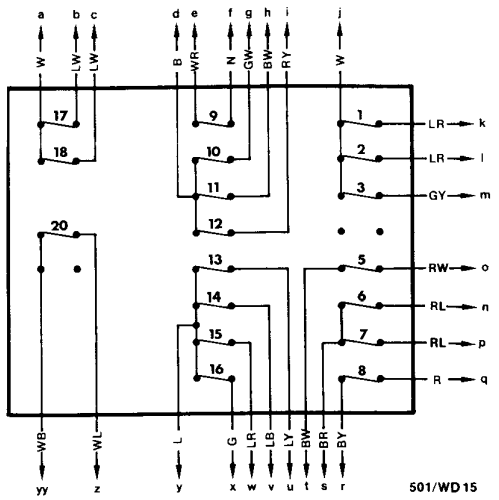
KEY

a. To rear demister circuit
b. To door lock circuit
c. To ignition switch
d. To alternator
e. To warning lamp circuit
f. To turn signal lamp, reverse lamp and 4WD solenoid circuits
g. To ignition circuit
h. To instrument cluster, heater blower relay and rear demister relay
i. To fusible link
j. To heater blower motor circuit
k. To heater blower motor circuit
l. To stop lamp and courtesy lamp circuits
m. To tail lamp circuit
n. To hazard lamp, luggage compartment lamp, horn and clock circuits
o. To L.H. headlamp circuit
p. To R.H. headlamp circuit
q. To headlamp relay
r. To headlamp relay
s. To fusible link
t. To radio
u. To cigarette lighter
v. To radiator cooling fan circuit
w. To wiper/washer circuit
x. To ignition switch
y. To fusible link
z. To fusible link

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Fuse box wiring diagram for 1986 models



Fuse box wiring diagram for 1987 models

KEY

a. To fusible link
b. To rear demister circuit
c. To rear demister circuit
d. To ignition switch
e. To alternator
f. To warning lamp circuit
g. To turn signal lamp, reverse lamp and 4WD solenoid circuits
h. To ignition circuit
i. To instrument cluster, heater blower relay and rear demister relay
j. To fusible link
k. To heater blower motor circuit
l. To heater blower motor circuit
m. To stop lamp and courtesy lamp circuits
n. To tail lamp circuit
o. To hazard lamp, luggage compartment lamp, horn and clock circuits
p. To L.H. headlamp circuit
q. To R.H. headlamp circuit
r. To headlamp relay
s. To headlamp relay
t. To fusible link
u. To radio
v. To cigarette lighter
w. To radiator cooling fan circuit
x. To wiper/washer circuit
y. To ignition switch
z. To door lock circuit
yy. To fusible link

COLOUR CODE

The first letter of the code represents the main wire colour, the other letters represent the trace colours.

B — BLACK
L — BLUE
G — GREEN
R — RED
Y — YELLOW
W — WHITE
N — BROWN
O — ORANGE
K — PINK
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P — PURPLE
X — LIGHT GREEN
Z — LIGHT BLUE
M — DARK GREEN
T — DARK BLUE
A — LIGHT BROWN
E — SLATE
D — TAN

KEY

a. To fusible link
b. To rear demister circuit
c. To rear demister circuit
d. To ignition switch
e. To alternator
f. To warning lamp circuit
g. To turn signal lamp, reverse lamp and 4WD solenoid circuits
h. To ignition circuit
i. To instrument cluster, heater blower relay and rear demister relay
j. To fusible link
k. To heater blower motor circuit
l. To heater blower motor circuit
m. To stop lamp and courtesy lamp circuits
n. To tail lamp circuit
o. To hazard lamp, luggage compartment lamp, horn and clock circuits
p. To L.H. headlamp circuit
q. To R.H. headlamp circuit
r. To headlamp relay
s. To headlamp relay
t. To fusible link
u. To radio
v. To cigarette lighter
w. To radiator cooling fan circuit
x. To wiper/washer circuit
y. To ignition switch
z. To door lock circuit
yy. To fusible link

EMISSION CONTROL

INTRODUCTION

To reduce the output level of carbon monoxide, hydrocarbons and oxides of nitrogen, which are the three primary automotive emissions and thus comply with the legislation on the maintenance of clean air, several different types of emission control systems are used in the Subaru range of vehicles.

The systems will be discussed under the headings (1) Positive Crankcase Ventilation (PCV) System, (2) Evaporative Control System, (3) Air Preheat System, (4) Exhaust Gas Recirculation (EGR) System, (5) Coasting by-pass system, (6) Air Injection System, (7) Catalytic Converter System.

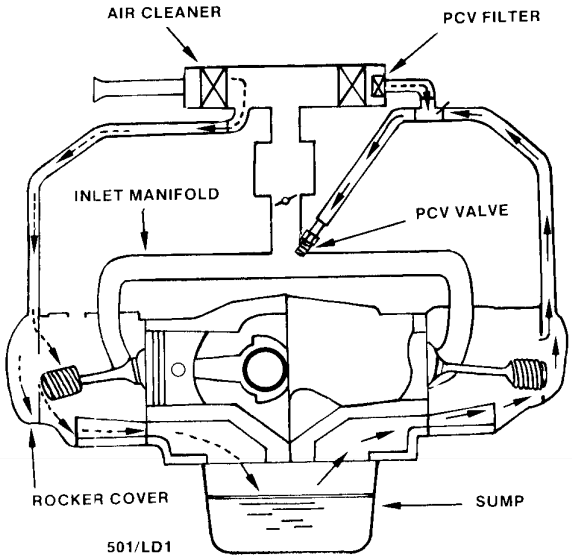
Each system is covered separately, as a combination of some or all of the systems may be applicable to a particular vehicle depending on the local emission control regulations.

1. POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

DESCRIPTION

To reduce the emission of unburnt crankcase hydrocarbons to the atmosphere a closed type of positive crankcase ventilation system is used.

In a closed type system, the engine draws clean induction air from within the air cleaner assembly through a hose connected between it and one rocker cover. The air then passes through the engine and is fed into the combustion chambers via another hose and a regulating valve (PCV valve) mounted in the inlet manifold. There is a small connecting hose between the air cleaner and the PCV valve hose to prevent engine oil being sucked into the inlet manifold during hard cornering or off road conditions.



Schematic diagram of the positive crankcase ventilation system.

The system is most effective at moderate throttle conditions when a high manifold depression (vacuum) exists which allows the PCV valve to open and all the crankcase vapours to be scavenged.

At wide open throttle, manifold depression is insufficient to scavenge all of the crankcase vapours and the ventilation flow reverses with some of the blow by fumes entering the air cleaner instead of the inlet manifold.

If the engine is excessively worn and blow by is at a high level, then irrespective of throttle operation a certain amount of crankcase vapour will recycle back through the rocker covers and into the air cleaner.

TO SERVICE THE SYSTEM

The system should be regularly serviced with particular attention given to the following:

(1) Check the condition of the rubber hoses ensuring that they are not blocked, collapsed or deteriorated. Renew the hoses or hose clips as necessary.

(2) Check the seals on the engine oil filter cap and the dipstick. Renew the seals if they are damaged or if their sealing quality is suspect.

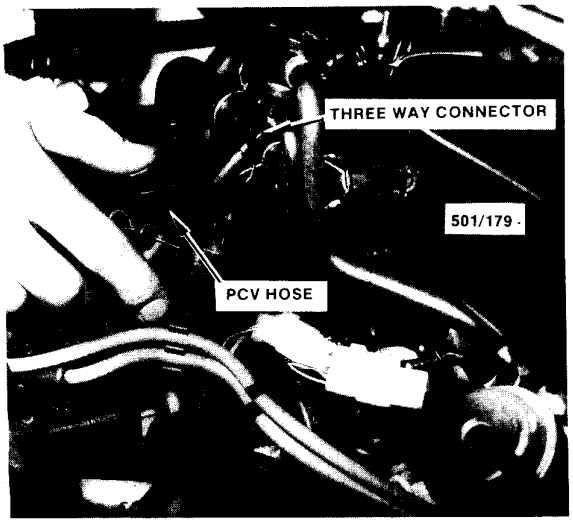
TO CHECK OPERATION

Check the operation of the PCV valve as follows:

(1) With the engine running at a steady idle speed disconnect the PCV valve hose at the three way connector.

(2) Place a finger over the just disconnected hose. A strong vacuum should be immediately felt as the finger is placed over the hose.

(3) Connect the PCV valve hose to the three way connector.



With the engine running disconnect the PCV hose at the three way connector. A strong vacuum should be felt if the PCV system is functioning correctly, 1986 model shown.

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(4) Disconnect the large diameter hose that connects one rocker cover to the air cleaner at the air cleaner.

(5) With the engine still at a steady idle speed place a piece of paper over the hose opening. If the system is functioning correctly the piece of paper will be pulled with noticeable force against the hose opening. Stop the engine.

(6) If the valve is found to be partially or fully inoperative, then renew the valve as a complete assembly.

2. EVAPORATIVE CONTROL SYSTEM

Special Equipment Required:
To Test Components — Hot air gun, thermometer, hand vacuum pump

DESCRIPTION

The evaporative control system is another approach in reducing the amount of hydrocarbon emitted to the atmosphere through fuel evaporation.

With the advent of evaporative control systems fuel vapour loss to the atmosphere has been cut to a minimum.

To control vapour loss Subaru vehicles use the absorption regeneration system which utilities either the air cleaner on early models or a canister of activated charcoal on later models to trap and hold any fuel vapours until such time as they can be fed into the induction system for burning in the combustion chambers.

1984–1987 models are equipped with a bowl vent valve to prevent percolation in the float bowl and evaporative loss into the atmosphere.

The basic components of the evaporative control system are:

(a) Fuel tank and vapour separator.
(b) Evaporative line with a two way valve.
(c) Charcoal canister 1981–1984 and all Utility models.
(d) Charcoal canister with thermal vacuum valve (TVV) control 1985–1987 Sedan and Station Wagon models.
(e) Fuel return line 1984–1987 models.
(f) Bowl vent valve 1984–1987 models.
(g) Bowl ventilation system 1986–1987 Sedan and Station Wagon models.

When the engine is at rest vapour through evaporation gradually fills the air space in the vapour separator. The fuel tank is fitted with a sealed filler cap therefore vapour pressure builds up within the system.

The vapour separator is above the fuel tank and its volume is such that expanded fuel is always accommodated and never forced upwards into the remaining parts of the system.

Fuel vapour in the vapour separator will force its way past the two way valve in the evaporative line when a predetermined pressure is reached. The vapour is then routed to the charcoal canister on late models or the air cleaner on early models which absorbs the vapour. When the engine is started vapours stored in the air cleaner or the charcoal canister are drawn into the engine via the purge hose. This is controlled by a TVV on 1985–1987 Sedan and Station Wagon models.

On 1984–1987 models vapours from the carburettor float bowl are also routed to the charcoal canister via the bowl vent valve. These vapours are also purged when the engine in started.

The complete evaporative control system should be checked for damage and deterioration at regular intervals. Renew the charcoal canister at the intervals recommended in the Lubrication and Maintenance section. Special attention should be given to the rubber hoses because any kinking or restrictions in these hoses can cause a serious loss of performance. Test the components applicable to the particular vehicle using the following procedures:

TO TEST TWO WAY VALVE

(1) Raise the rear of the vehicle and disconnect the two way valve from the vapour hose noting the installed position of the valve.

(2) It should be possible to blow into either pipe of the valve with little resistance.

(3) If the valve appears damaged or it has excessive resistance renew the two way valve.

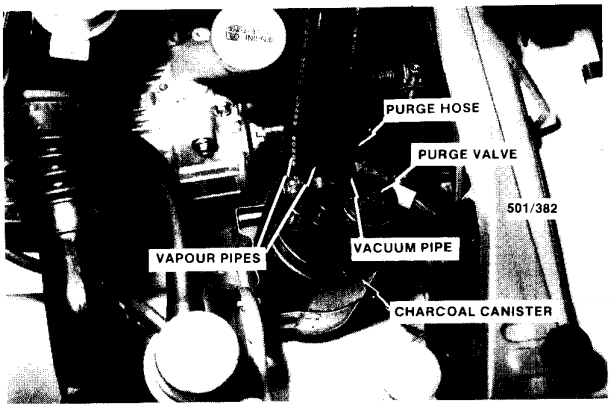
(4) Instal the valve ensuring that the pipe marked "to engine" is connected to the hose that goes to the engine compartment.

TO TEST CHARCOAL CANISTER

(1) Suitably mark and disconnect the charcoal canister hoses.

(2) Visually inspect the charcoal canister for obvious signs of damage and renew if necessary.

(3) Attempt to blow through the purge valve



Installed view of the charcoal canister. 1986 model shown.

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vacuum pipe of the charcoal canister. If it is possible to blow through this pipe the purge valve diaphragm has been damaged and the charcoal canister should be renewed.

(4) Attempt to blow through the vapour pipe(s) of the charcoal canister. It should be possible to blow through the pipe(s) with little restriction. If necessary renew the charcoal canister.

(5) Attempt to blow through the purge pipe of the charcoal canister. If it is possible to blow through this pipe renew the charcoal canister.

TO TEST TWO PORT THERMAL VACUUM VALVE (TVV)

(1) Disconnect the negative battery terminal.

(2) Suitably mark and disconnect the hoses from the TVV.

(3) Remove the TVV from the inlet manifold using a suitable spanner.

(4) Connect two rubber tubes to the two ports of the TVV.

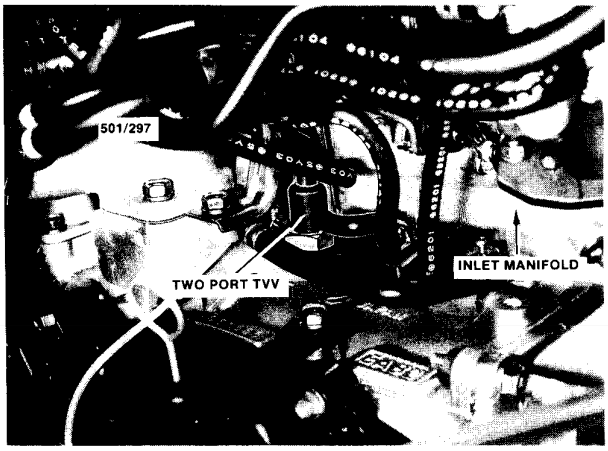
(5) Suspend and immerse the TVV together with a reliable thermometer in a vessel of cold water, ensuring that neither the TVV nor the thermometer are touching the bottom or sides of the vessel.

NOTE: Do not allow water to get inside the TVV.

(6) Progressively heat the water, noting the temperature reading on the thermometer. At the same time attempt to blow air into one of the rubber hoses. Air should flow freely.

(7) Note the temperature reading on the thermometer when it is not possible to blow through the rubber hose. This temperature should be above 40° C for 1986 models and earlier or above 35° C for 1987 models. Renew the TVV if necessary.

(8) Instal the TVV to the inlet manifold and connect the vacuum hoses ensuring that they are not blocked or in bad condition.



Installed view of the two port thermal vacuum valve (TVV).

TO TEST THREE PORT THERMAL VACUUM VALVE (TVV)

The test procedure for the three port TVV is fully covered under the heading EGR system later in this section.

TO TEST FUEL BOWL VENTILATION SYSTEM

Bowl Vent Valve

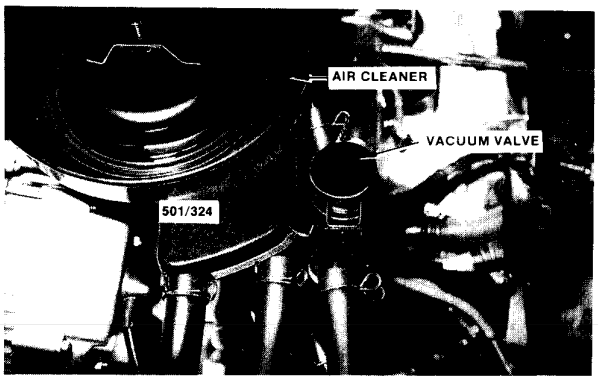
Refer to the Fuel System section for the testing procedure of the bowl vent valve.

Vacuum Valve

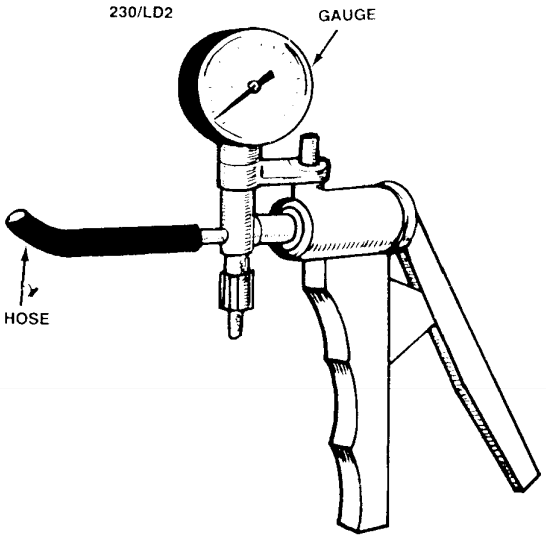
(1) Release the vacuum valve from the air cleaner bracket.

(2) Suitably mark and disconnect the hoses from the vacuum valve.

(3) Attempt to blow through the large diameter port then the small diameter port of the vacuum valve. No air should pass. If air does pass through either port of the vacuum valve the valve should be renewed.

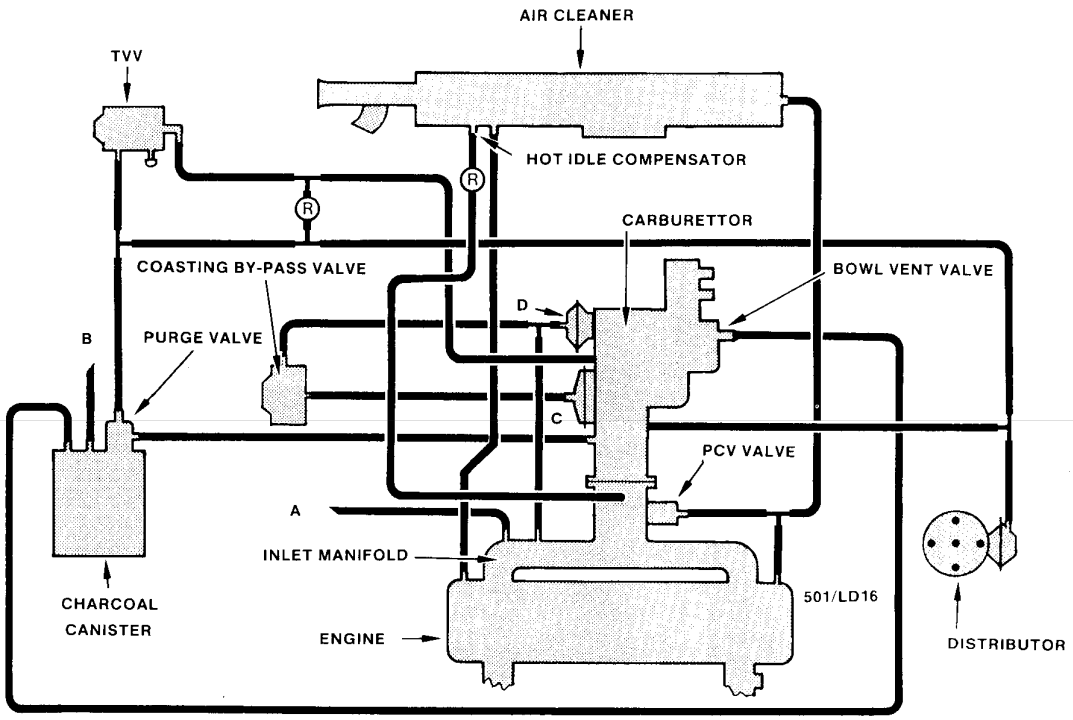


Installed view of the fuel bowl ventilation system vacuum valve. 1986 model shown.



Line drawing showing a suitable hand vacuum pump.

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Schematic layout of emission control components for 1985 models with two wheel drive and manual transaxle. A = To heater controls, B = To fuel tank, C = Coasting by-pass diaphragm, D = Choke breaker, R = Restrictor.

(4) Using a suitable hand vacuum pump apply a vacuum greater than 200 mm Hg to the small diameter port of the vacuum valve. It should be possible to blow through the large diameter port of the vacuum valve freely if the valve is functioning correctly.

(5) Instal the valve to the air cleaner bracket and connect the hoses ensuring that they are free from obstruction and in good condition.

Air Control Valve

(1) Release the air control valve from the mounting bracket.

(2) Suitably mark and disconnect the hoses from the air control valve.

(3) Attempt to blow through all the ports of the valve except the one that is plugged. No air should pass if the valve is functioning correctly. Renew the air control valve if necessary.

(4) Using a suitable hand vacuum pump apply a vacuum greater than 200 mm Hg to the small diameter port of the air control valve.

(5) Test the valve by blowing air through the middle ports of the valve one at a time with the other middle port blocked. Air should flow freely from the other ports. Renew the air control valve as necessary.

(6) Connect the hoses to the air control valve and instal the valve in the mounting bracket.

Bowl Ventilation Solenoid and Thermal Switch

(1) Remove the spare tyre from the engine compartment.

(2) Suitably mark and disconnect the hoses from the bowl ventilation solenoid.

(3) Connect suitable rubber hoses to the two ports on the bowl ventilation solenoid.

(4) It should be possible to blow through the hose connected to port A as shown on the illustration. The air blown in should flow out of the small filter on the solenoid not the other hose.

(5) Switch the ignition switch to ON.

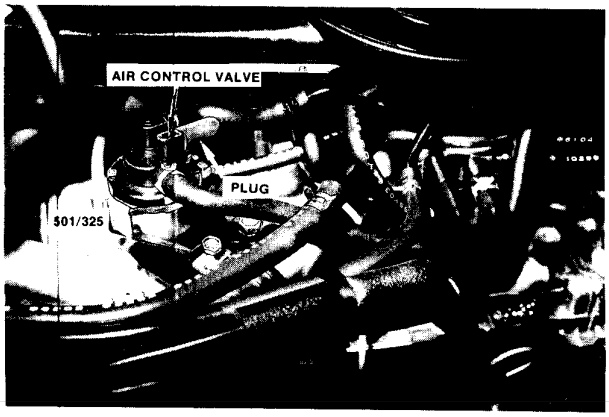
(6) Using a suitable hot air gun and a thermometer heat the thermal switch adjacent to the ventilation solenoid to 67°C or more.

(7) If the bowl ventilation solenoid and thermal switch are operating correctly it should be possible to blow through one hose connected to the solenoid and have air flow from the other hose. No air should come from the filter.

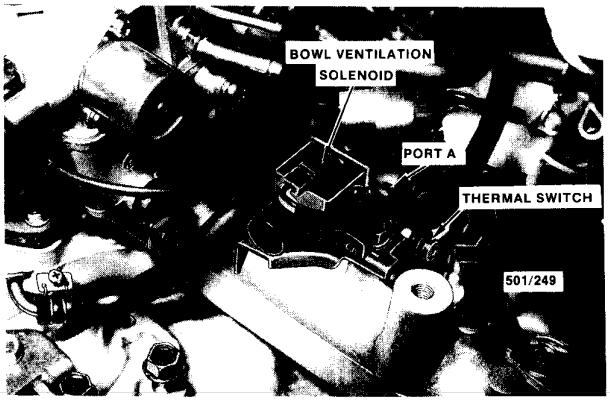
(8) If air does not flow as described in step (7) connect the wire from the thermal switch to a good earth. Air should flow as described in step (7). If air flows renew the thermal switch. If air does not flow renew the bowl ventilation solenoid.

(9) Switch off the ignition and connect the hoses using the marks made previously as a guide.

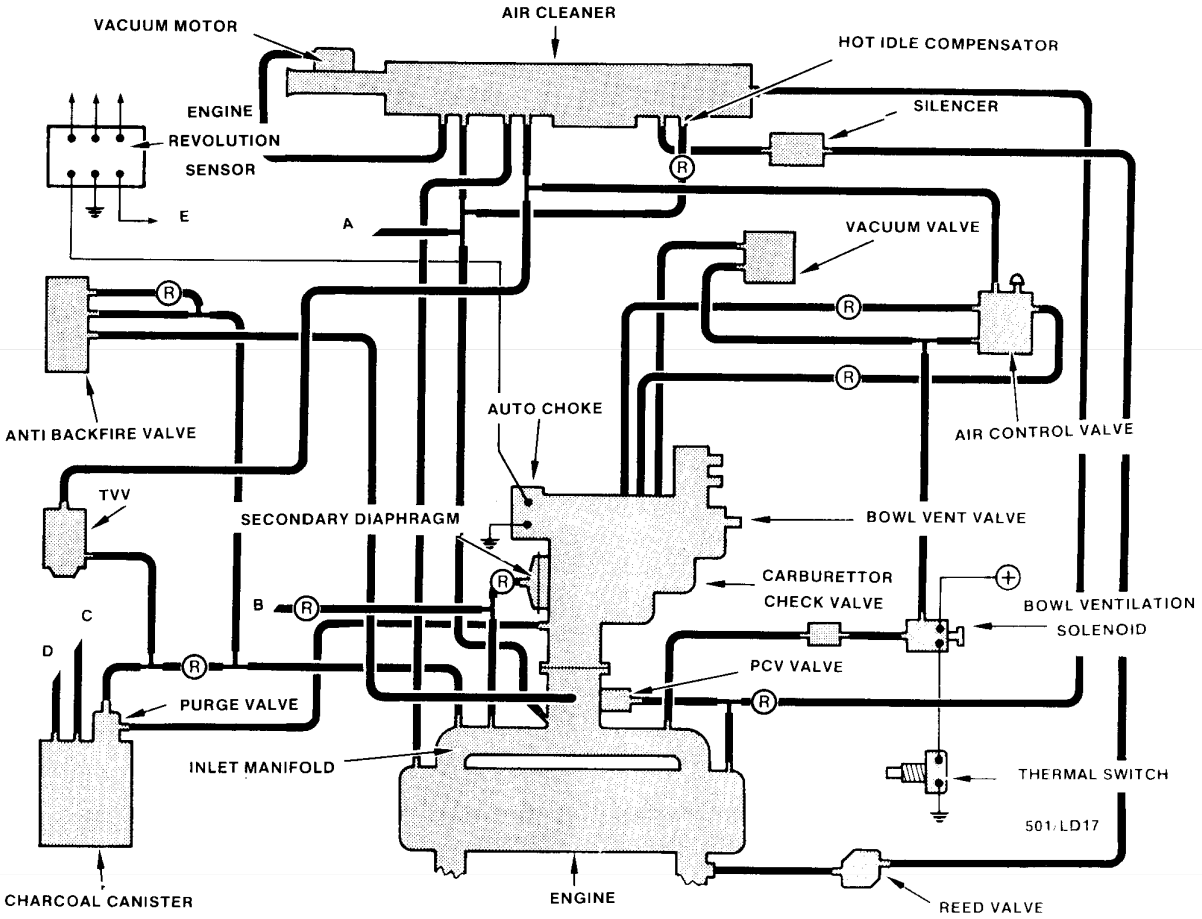
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Installed view of the air control valve. 1986 model shown.



Installed view of the bowl ventilation solenoid and thermal switch. 1986 model shown.



Schematic layout of emission control components for 1986–1987 models. A = To heater controls, B = To automatic transaxle, if applicable, C = To fuel tank, D = To bowl vent valve, E = To fuel pump, R = Restrictor

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3. AIR PREHEAT SYSTEM

Special Equipment Required:
To Check Hot Idle Compensator — Thermometer, hot air blower

DESCRIPTION

Efficient combustion of the air/fuel mixture is dependent upon a constant inlet air temperature. An air preheat system is employed to heat the inlet air under cold conditions.

The system allows a quicker warm up cycle and leaner air/fuel mixture, which reduces exhaust emissions.

Two sources of air supply are available at the air cleaner snorkle:

(a) Unheated air.

(b) Preheated air from a stove around the exhaust manifold.

On early model vehicles, selection of the air supply is manually controlled by a flap in the air cleaner snorkle. The flap should be set as shown on the decal to the most suitable temperature range.

On late models selection of the air supply is automatically controlled by a thermosensor and vacuum motor. The thermosensor controls the amount of vacuum to the vacuum motor depending on the temperature of the incoming air within the air cleaner. Therefore, the inlet air temperature is kept constant.

A hot idle compensator is fitted to some models to allow extra air into the engine should the temperature within the air cleaner exceed 55°C. Under hot conditions fuel vapourises more readily, causing a richer mixture particularly at idle. The idle compensator employs a bi-metal strip which controls an air bleed to the inlet manifold in such a way, that, as engine compartment temperatures increase, the bi-metal strip opens the air bleed and extra air is drawn into the engine, thereby leaning the mixture.

This reduces Co and HC emission and also gives a smoother idle.

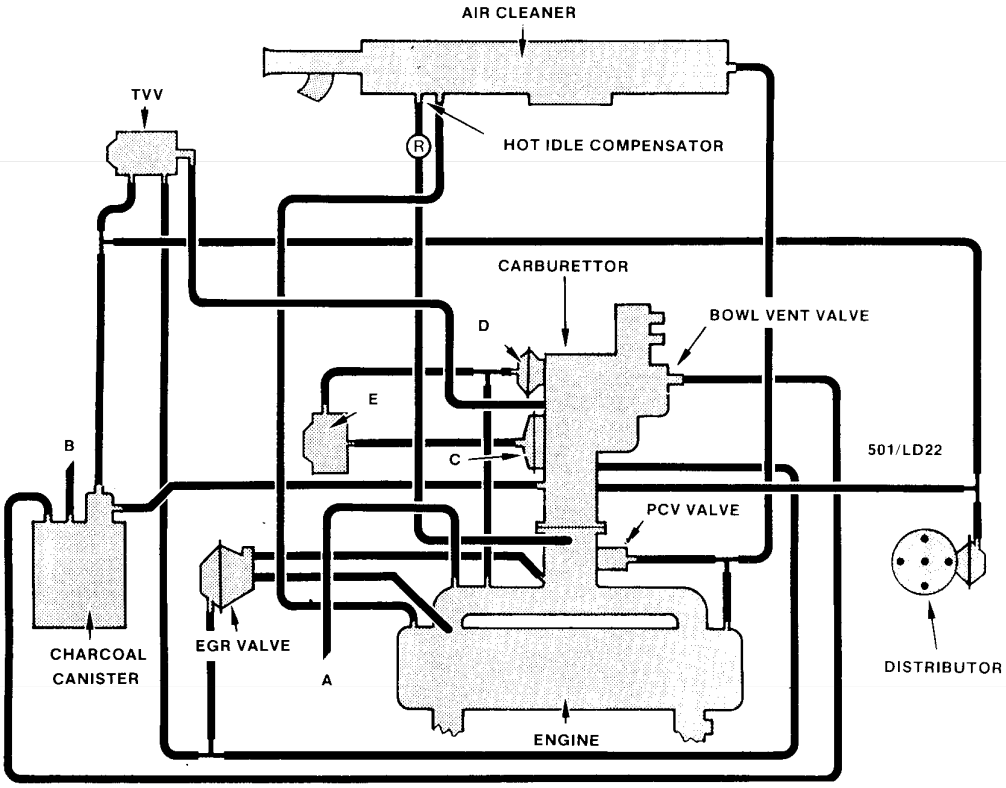
TO CHECK OPERATION

Thermosensor and Vacuum Motor

(1) Remove the cold air tube from the air cleaner snorkle.

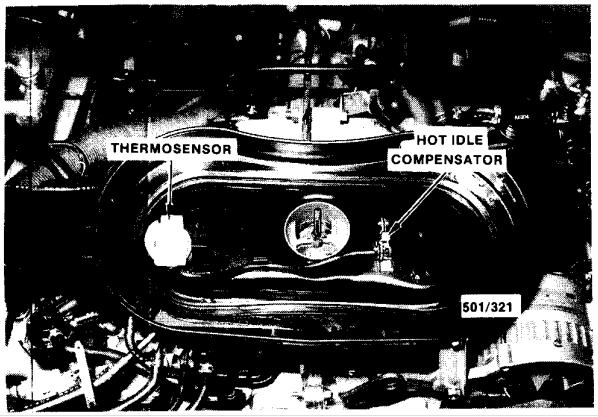
(2) Check the position of the flap in the air cleaner snorkle. The flap should be in the cold air position with the flap closing off the air supply from the exhaust manifold heat stove.

(3) Start the engine and allow it to idle. The air cleaner flap should rise, allowing hot air from the exhaust manifold heat stove to enter the engine.



Schematic layout of emission control components for 1985 models with four wheel drive and manual transaxle. A = To heater controls, B = To fuel tank, C = Coasting by-pass diaphragm, D = Choke breaker, E = Coasting by-pass valve, R = Restrictor.

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View of the air cleaner with top cover removed showing the thermosensor and hot idle compensator. 1986 model shown.

NOTE: The success of this test depends upon ambient temperature. The optimum time to conduct the test is when the engine is cold and the ambient temperature is low, although the test will work at higher temperatures to varying degrees.

(4) If the flap does not rise, stop the engine and detach the vacuum hose from the vacuum motor. On models fitted with a hot idle compensator in the air cleaner, suitably crimp the hose from the hot idle compensator between the air cleaner connection and the tee piece.

(5) Connect a vacuum gauge to the hose disconnected from the vacuum motor or hold a finger over the hose, restart the engine and note the amount of vacuum produced.

(6) If a satisfactory amount of vacuum is produced then the system is functional to this point. Check the vacuum motor assembly or flap linkage and renew if necessary.

(7) If little or no vacuum is produced, check the vacuum hoses or the thermosensor in the air cleaner. Isolate the thermosensor by detaching the hose to the thermosensor and taking a vacuum reading at this point.

If the vacuum at this hose is low then either the hose or the vacuum fitting is blocked. Repair or renew the component concerned.

(8) If operation 3 was satisfactory, allow the engine to run until normal operating temperature is reached. As the engine temperature increases the air cleaner flap should fall allowing cold air to enter the engine.

Hot Idle Compensator

(1) Remove the air cleaner as described in the Fuel System section.

(2) Remove the top cover and the air cleaner element from the air cleaner.

(3) Using a suitable hot air gun and a thermometer heat the hot idle compensator to 55°C. The hot idle compensator should open. If the idle compensator fails to function as described it should be renewed.

NOTE: The idle compensator is factory preset and no attempt should be made to disassemble it or alter the tension of the bimetal strip.

4. EXHAUST GAS RECIRCULATION (EGR) SYSTEM

Special Equipment Required:
To Test EGR Valve — Hand vacuum pump
To Test TVV — Thermometer

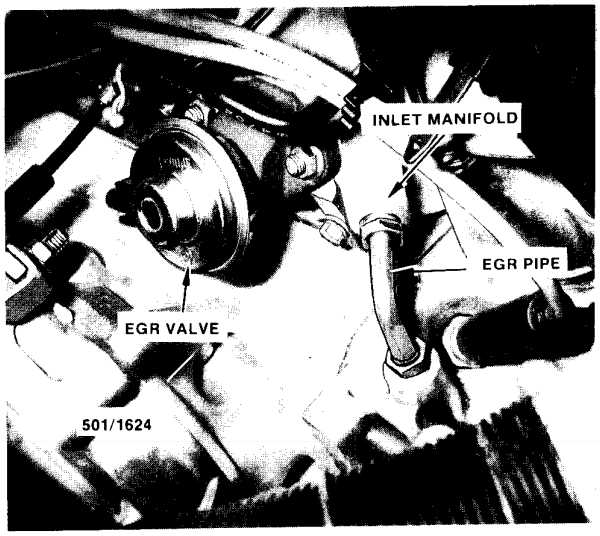
DESCRIPTION

The exhaust gas recirculation (EGR) control system is fitted in order to lower combustion temperature and so reduce the level of oxides of nitrogen (Nox) in the exhaust gas.

Part of the exhaust gas is metered from an exhaust port in one cylinder head and is routed to the inlet manifold by the EGR valve.

The EGR valve is operated by manifold vacuum. On some models the valve is regulated by a thermal vacuum TVV or the combination of a TVV and a speed switch. When a TVV is installed the EGR circuit does not operate at low engine temperatures therefore improving driveability. When a speed switch is installed the EGR circuit does not operate at speeds over 80 km/h thus improving fuel economy.

The operation of the EGR system should be checked every 12 months or 20,000 kilometres and the valve should be removed and cleaned if necessary.



Installed view of the EGR valve and pipe with the pipe cover removed, 1985 model shown.

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TO TEST EGR VALVE

(1) Run the engine until it is at normal operating temperature.

(2) Disconnect the vacuum hose from the EGR valve.

(3) Connect the hand vacuum pump or another suitable source of vacuum to the vacuum pipe on the EGR valve.

(4) Run the engine at approximately 2,000 rpm and slowly apply vacuum to the EGR valve using the hand vacuum pump. If vacuum cannot be produced the EGR diaphragm is leaking. Renew the EGR valve.

NOTE: Do not apply more than 800 mm Hg vacuum to the EGR valve otherwise damage may occur to the diaphragm.

(5) Engine speed should drop or the engine stall as vacuum is applied if the EGR valve is working correctly. Switch off the engine.

(6) If no change is noted in engine speed remove the EGR valve from the inlet manifold by removing the retaining bolts.

(7) Clean any deposits from the EGR valve shaft and body using a sharp object and a wire brush. Do not oil the valve.

(8) Apply vacuum to the vacuum pipe on the EGR valve using the hand vacuum pump again. The EGR valve shaft should move. If the shaft does not move, renew the EGR valve.

(9) When satisfied that the EGR valve is working correctly instal the valve to the inlet manifold using a new gasket and tighten the retaining bolts securely.

(10) Ensure that the vacuum hose to the EGR valve is not blocked or leaking before it is connected.

TO TEST THREE PORT THERMAL VACUUM VALVE (TVV)

(1) Disconnect the negative battery terminal.

(2) Remove the air cleaner assembly. Refer to the Fuel System section if necessary.

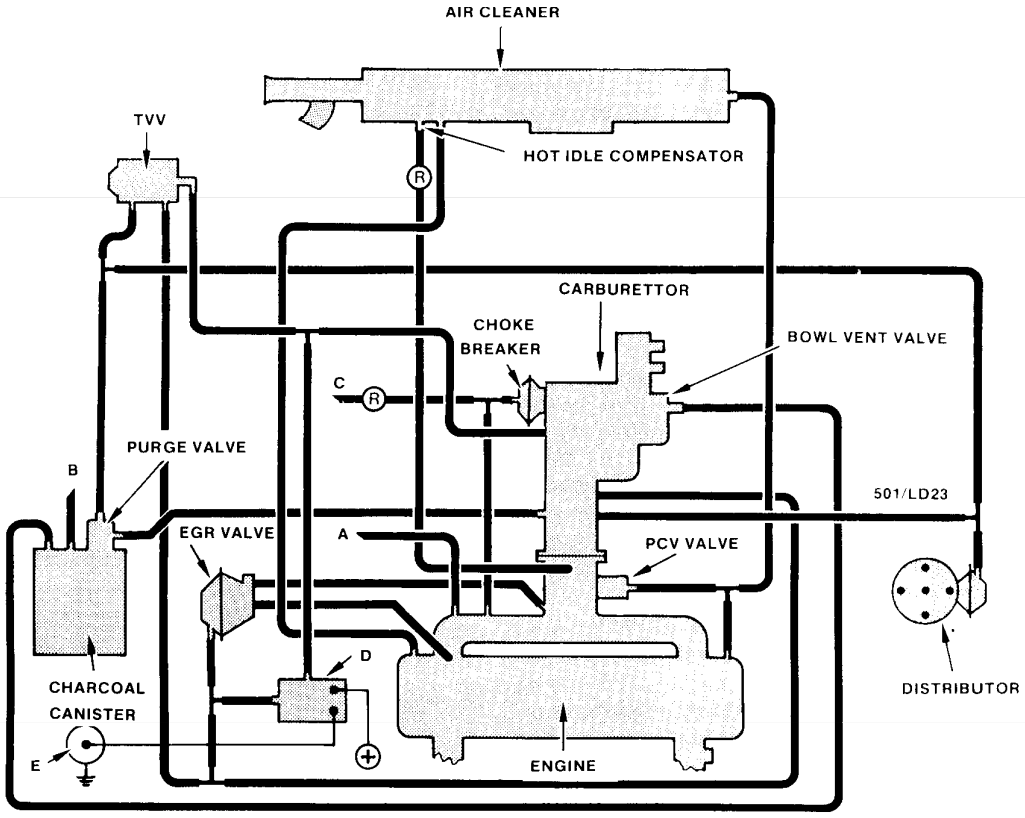
(3) Suitably mark and disconnect the hoses from the TVV.

(4) Remove the TVV using a suitable spanner.

(5) Connect two rubber tubes to the two ports of the TVV furthest from the threaded portion.

(6) Block the port of the TVV nearest the threaded portion using a suitable rubber cap.

(7) Suspend and immerse the TVV together with a reliable thermometer in a vessel of cold water,



Schematic layout of emission control components for 1985 models with automatic transaxle. A = To heater controls, B = To Fuel tank, C = To automatic transaxle, D = Speed switch solenoid valve, E = Speed switch, R = Restrictor.

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ensuring that neither the TVV nor the thermometer are touching the bottom or sides of the vessel.

NOTE: Do not allow water to get inside the TVV.

(8) Progressively heat the water, noting the temperature reading on the thermometer. At the same time attempt to blow air into one of the rubber hoses. Air should flow freely.

(9) Note the temperature reading on the thermometer, when it is not possible to blow through the rubber hose. This temperature should be between 45°–55° degrees C. Remove the TVV from the water. Renew the TVV if necessary.

(10) Remove the cap from the port nearest the threaded portion of the TVV and instal it on the port furthest from the threaded portion of the TVV.

(11) Instal the rubber hose on the port nearest the threaded portion of the TVV.

(12) Cool the TVV to a temperature below 10° degrees using an ice cube. Attempt to blow through the rubber hose. This should not be possible. Renew the TVV if necessary.

(13) Immerse the TVV again and heat the water while blowing into one of the rubber hoses. Note the temperature on the thermometer when it is no longer possible to blow through the hose. This temperature reading should be between 45–55 degrees C. Remove the TVV from the water and renew it if necessary.

(14) Instal the TVV and connect the vacuum hoses ensuring that they are not blocked or in an unserviceable condition.

TO TEST SPEED SWITCH SOLENOID VALVE

(1) Disconnect the solenoid valve wires at the connector.

(2) Disconnect the hoses to the solenoid valve and connect a rubber tube to one of the switch ports. Attempt to blow through the rubber tube, this should not be possible.

(3) Using jumper leads and a 12 volt battery connect the positive lead to one connector of the solenoid valve and the negative lead to the other. Attempt to blow through the rubber tube. This should be possible. Renew the solenoid valve if necessary.

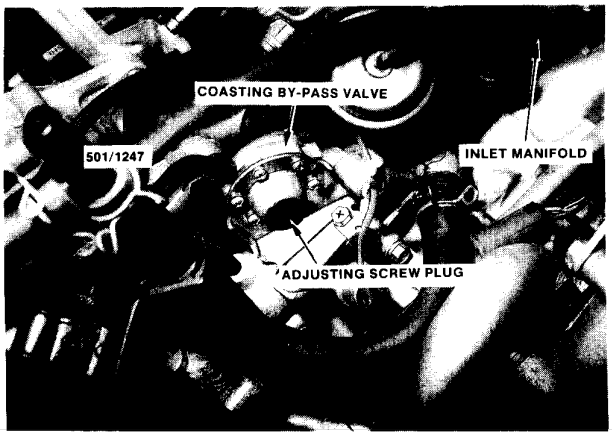
(4) Connect the solenoid wires and the hoses when the test procedure is complete.

5. COASTING BY-PASS SYSTEM

DESCRIPTION

High manifold vacuum during deceleration causes an increase in HC emission due to incomplete combustion of the fuel/air mixture.

The coasting by-pass valve is a vacuum actuated by-pass valve which meters additional fuel/air mixture to the inlet manifold during deceleration to assist in the complete combustion of the mixture, thereby reducing HC emissions.



Installed view of the coasting by-pass valve that is fitted to some models.

TO CHECK OPERATION

The coasting by-pass valve and diaphragm will normally not require checking or adjustment, however if it does become necessary proceed as follows:

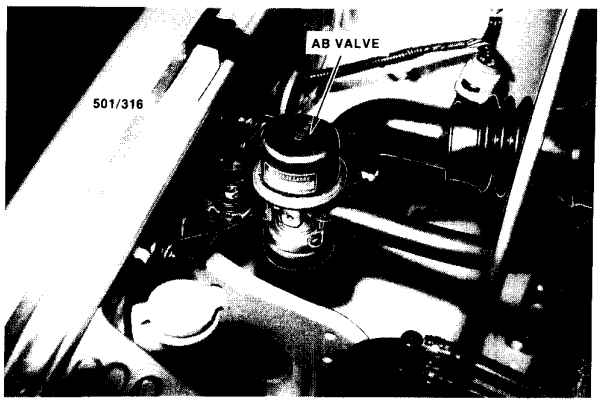
(1) Run the engine until normal operating temperature is reached, ensure that the ignition timing and the carburettor idle speed and mixture are set to Specifications

(2) Remove the air cleaner top cover.

(3) Using a tee piece and a suitable piece of hose, connect a quick response type vacuum gauge in the line between the inlet manifold and the coasting by-pass valve.

(4) Run the engine at 3,000 to 4,000 rpm and then release the throttle lever. When the throttle lever is released a change in tone should be heard at the carburettor throat. This change in tone indicates that the coasting by-pass system is working.

(5) Repeat step (4) several times and take a reading on the vacuum gauge when the change in tone first occurs. The change in tone should occur at 550 mm Hg.



Installed view of the anti-backfire (AB) valve. 1986 model shown.

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(6) If the change in tone is not occurring or it is occurring at a vacuum higher than 550 mm Hg. Remove the rubber plug from the coasting by-pass valve and turn the adjusting screw clockwise. If the change in tone is still not occurring remove the diaphragm assembly from the carburettor and ensure that its plunger is drawn in when a vacuum is applied. Renew the components as necessary.

NOTE: Do not apply pressure to the adjusting screw.

(7) If the change in tone is occuring at a vacuum lower than 550 mm Hg. Remove the rubber plug from the coasting by-pass valve and turn the adjusting screw anti-clockwise. Retest the valve and renew it if necessary.

6. AIR INJECTION SYSTEM

DESCRIPTION

To aid complete combustion of the air fuel mixture before being discharged from the exhaust system to the atmosphere, extra oxygen is introduced into the exhaust system by way of the air injection system. In doing so, the emission of hydrocarbons (HC) and carbon monoxide (CO) to the atmosphere is reduced.

The system comprises of a silencer, a reed valve, a tuned length air injection pipe and an anti-backfire (AB) valve with associated hoses.

Due to the design of the exhaust system the pulsations of the exhaust create a vacuum in the air injection pipe, drawing filtered air from the air cleaner via the silencer and the reed valve, thereby enriching the exhaust gases with oxygen.

When pressure in the exhaust system exceeds the air pressure in the air injection system, due to engine speed increase, or due to a mechanical failure such as a poor hose connection, air leak etc., the back pressure closes the reed valve and prevents hot exhaust gases from entering the air cleaner.

To prevent a temporarily rich mixture from entering the engine and then igniting in the exhaust the AB valve is used. The AB valve supplies additional air to the inlet manifold when vacuum is high, for instance when the vehicle is coasting down hill or being rapidly decelerated. The AB valve is non repairable and can only be renewed as a complete unit.

REED VALVE

To Remove and Instal

(1) Disconnect the negative battery terminal.

(2) Remove the spare wheel from the engine compartment.

(3) Using a suitable spanner loosen the air injection pipe union at the reed valve.

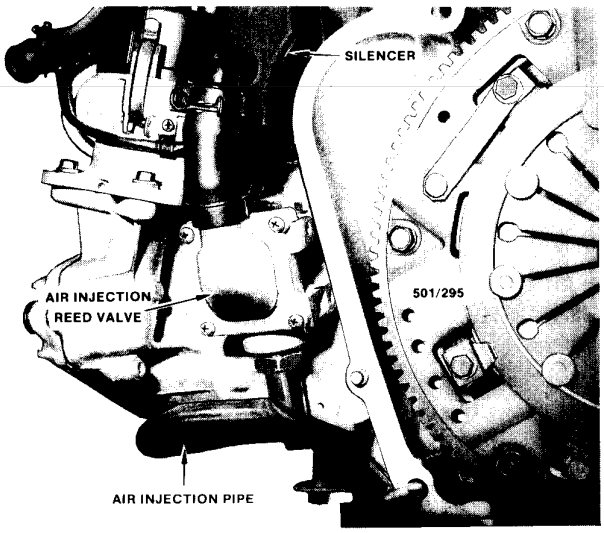
(4) Remove the bolts retaining the silencer to the engine block.

(5) Disconnect the hose between the reed valve and the silencer and position the silencer clear of the work area.

(6) Remove the bolts retaining the reed valve to the engine block.

(7) Manoeuvre the reed valve from the air injection pipe and out of the engine compartment.

Installation is a reversal of the removal procedure.



View of the air injection reed valve. 1986 model shown.

To Check and Inspect

(1) Remove the reed valve as previously described.

(2) Attempt to blow through the port on the reed valve that connects to the silencer. Air should flow freely. If not dismantle the reed valve as described in step (4).

(3) Attempt to blow through the port on the reed valve that connects to the air injection pipe. Air should not flow if the reed valve is functioning correctly. Dismantle the reed valve as described in step (4) if necessary.

(4) Remove the screws retaining the reed valve top cover to the body. Remove the top cover and discard the gasket.

(5) Remove the reed valve from the body and clean all components in a suitable cleaning solvent.

(6) Inspect all components for distortion, damage and cracks and renew any components as necessary.

(7) Assemble the reed valve using a new top cover gasket. Tighten the top cover screws securely.

(8) Test the valve as described in steps (2) and (3) and instal the valve to the engine as previously described.

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7. CATALYTIC CONVERTER SYSTEM

On unleaded petrol models a catalytic converter is located in the exhaust system at the join of the two engine pipes. The catalytic converter converts hydrocarbons (HC) and carbon monoxide (CO) present in the exhaust gases into carbon dioxide, water and heat.

The catalytic converter does not require maintenance or replacement under normal circumstances, however it can be damaged or 'poisoned' with leaded petrol and raw fuel. Therefore certain devices are fitted to protect the catalytic converter. These devices are as follows.

(1) A small diameter fuel filler neck with a spring loaded trap door, to prevent the use of leaded petrol.

(2) A non adjustable idle mixture screw, to prevent incorrect mixtures which will 'poison' the converter.

To prevent damage to the catalytic converter, or fires, the following precautions should be observed.

SERVICE PRECAUTIONS

(1) Do not push or tow start the vehicle.

(2) Do not "prime" the carburettor by pouring fuel down the carburettor throat.

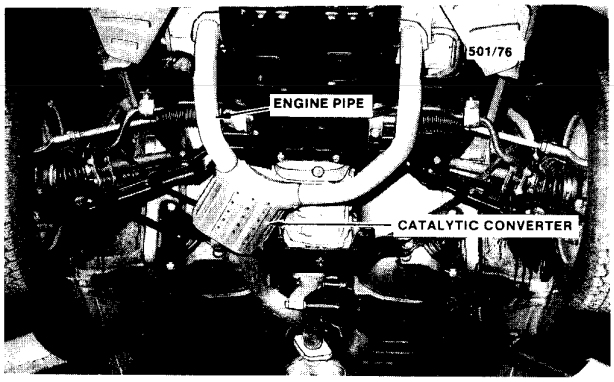
(3) Do not disconnect the ignition system while the vehicle is in motion and the transaxle is in gear, i.e. do not switch off the ignition while in gear.

(4) Do not allow the engine to run with any ignition high tension leads disconnected.

(5) Do not allow the engine to run for prolonged periods if the engine is misfiring or idling roughly.

(6) Do not apply underbody sealer to the exhaust heat shields.

(7) Do not park the vehicle over long grass or dry leaves, the high temperatures produced in the catalytic converter may cause these to ignite.



Installed view of the catalytic convertor fitted to 1986–1987 models.

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PART 1. BODY COMPONENTS

1. WINDSCREEN AND REAR GLASS

The renewal or replacement of the windscreen and the Sedan rear glass follows the same basic procedure.

The windscreen and rear glass on 1979–1984 and Utility models are mounted to the body using weather strips, the windscreen and Sedan rear glass on 1985–1987 models are mounted to the body using Urethane adhesive, the Station Wagon tailgate glass on 1985–1987 models is mounted using a weather strip.

The successful fitting and sealing of the windscreen or rear glass will depend to a large extent on the technical knowledge and experience of the operator. It is not recommended that the windscreen or rear glass replacement be attempted by anyone lacking previous experience.

2. FRONT DOORS

INTERIOR HANDLES AND TRIM PANELS

The following operations refer to vehicles with manually operated windows. The procedures for vehicles with electrically operated windows are similar, with allowances made for the different window regulator mechanism.

To Remove and Instal

(1) Note the position of the window regulator handle with the window in the uppermost position. Push the window regulator handle escutcheon in to expose the retaining clip. Using a piece of strong thin wire with a hook on one end, place the hooked end of the wire under the retaining clip. Withdraw the clip from the regulator handle and manoeuvre the handle and escutcheon from the door. Instal the retaining clip to the handle after removal.

(2) Where fitted, remove the plugs covering the arm rest retaining screws. Remove the screws retaining the arm rest to the door panel and remove the arm rest from the door.

(3) Hold the interior remote door lock control in the unlatched position. On 1979–1984 and Utility models, remove the screw retaining the escutcheon to the door panel and manoeuvre the escutcheon from the door. On 1985–1987 Sedan and Station Wagon models, unclip the escutcheon from the door.

(4) Using a wide bladed lever, carefully prise the door trim panel from the door panel by prising between the door panel and the door trim close to the retaining clips. The 1979–1984 and Utility models have two piece door trims, remove the upper trim panel first on these models.

NOTE: When removing the door trim panels, the retaining clips should remain attached to the trim panel. The trim panel may be damaged if the clips remain in the door panel.

(5) Disconnect any wiring connectors for power windows, speakers, etc. and remove the trim panel from the vehicle.

(6) Carefully remove the sealing sheet from the door panel and place it to one side.

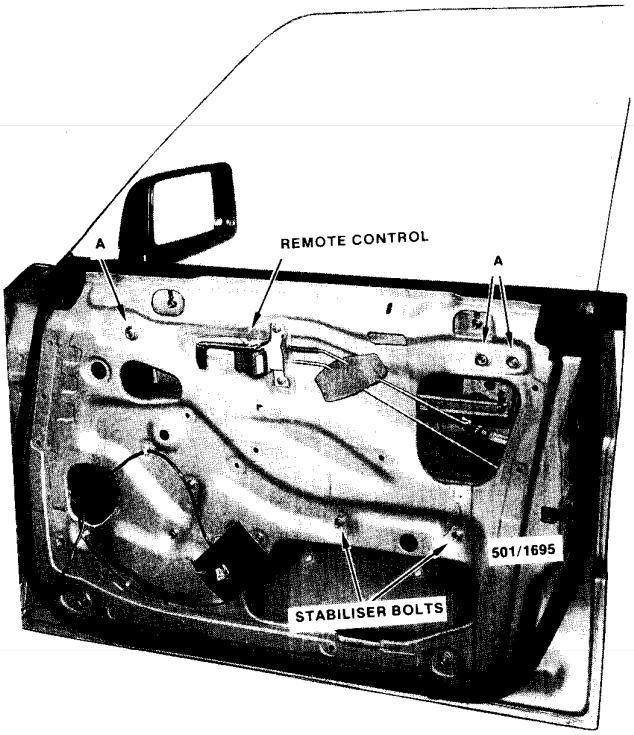
Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the sealing sheet is in a serviceable condition. Position the sheet correctly on the door panel and ensure that the edges are sealed against the entry of water and dust.

(2) Check that the retaining clips are in a serviceable condition, renew any damaged clips.

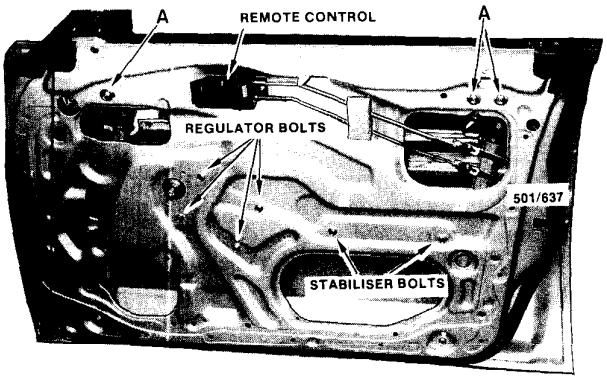
(3) Connect any wiring connectors and instal the trim panel to the door, align the clips to the holes in the door panel and progressively engage the retaining clips in the holes.

(4) Hold the interior remote door lock control in the unlatched position and instal the escutcheon and where applicable, the retaining screw.



View of the front door with trim panel and sealing sheet removed, 1983 model with power windows shown. Door glass channel adjustment is carried out using studs A.

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View of front door with trim panel and sealing sheet removed, 1986 model shown. Door glass channel adjustment is carried out using studs A.

(5) Instal the retaining clip to the window regulator handle and instal the escutcheon and handle to the regulator shaft in the position noted on removal.

The handle will snap into position if the retaining clip has been installed to the handle prior to assembly. If it is necessary to align the position of the regulator handle, leave the retaining clip off the handle until the correct position has been established.

DOOR GLASS

To Remove and Instal

(1) Remove the door trim panel as previously described.

(2) Temporarily instal the regulator handle to the regulator shaft with the retaining clip removed and lower the door glass fully.

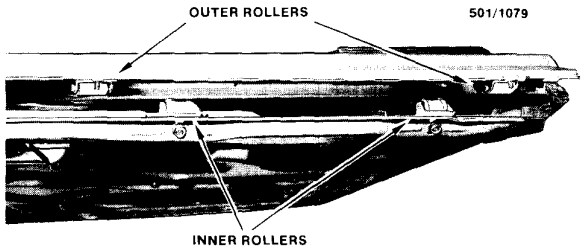
(3) Remove the clips retaining the door weather strip to the door panel at the upper rear edge of the door and withdraw the door weather strip sufficiently to gain access to the belt line weather strip retaining screw or rivet. Remove the screws or rivets retaining the belt line weather strip to the outer door panel and remove the weather strip from the door by carefully prising with a suitable lever. The rivets may be removed by drilling the heads, being careful not to drill into the door panel.

(4) Raise the door glass to a position to allow the door glass retaining bolts to be removed, remove the upper stoppers and, on 1985–1987 Sedan and Station Wagon models, the inner rollers from the door panel.

(5) Support the door glass, remove the screws retaining the door glass to the regulator upper channel and manoeuvre the door glass from the door. Do not move the regulator position after the door glass has been removed.

Installation is a reversal of the removal procedure with attention to the following points:

(1) When installing the inner rollers on 1985–1987 Sedan and Station Wagon models, hold the door glass against the outer rollers and the inner



View of the front door showing the position of the rollers fitted to 1985–1987 Sedan and Station Wagon models.

rollers against the door glass while tightening the retaining bolts. Ensure that the rollers rotate freely, any binding of the rollers will scratch the door glass.

(2) If necessary, adjust the door glass as described later in this section.

(3) Instal the door trim as previously described.

WINDOW REGULATOR

To Remove and Instal

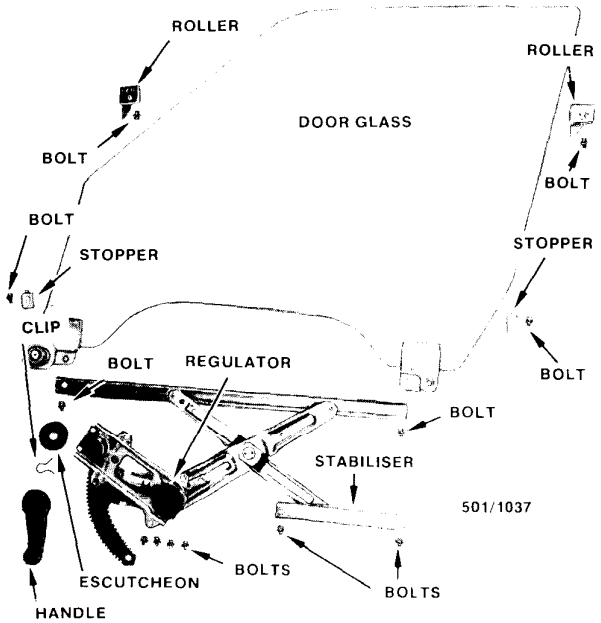
(1) Remove the door trim and sealing sheet as previously described.

(2) Remove the door glass as previously described.

(3) Remove the bolts retaining the regulator assembly and the stabiliser channel to the door inner panel and manoeuvre the regulator through the large access hole in the door inner panel.

Installation is a reversal of the removal procedure with attention to the following point:

Adjust the door glass as follows.



Front door regulator and door glass components, 1986 model shown.

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TO ADJUST DOOR GLASS

(1) Remove the door trim and sealing sheet as previously described.

(2) If the vertical alignment of the door glass requires adjustment, adjust the upper stoppers to allow the door glass to contact the body weather strip in a position to effect a weather tight seal.

(3) If the horizontal alignment of the door glass requires adjustment, loosen the bolts retaining the regulator stabiliser channel to the door panel and adjust the channel evenly up or down until the door glass contacts the body weather strip evenly. Lowering the channel will tilt the front of the door glass forward, raising the channel will tilt the door glass rearward. Ensure that the lower channel is parallel after adjustment.

(4) If the tension of the glass to the body weather strip when the door is closed requires adjustment, the door glass channel upper mounting studs may be repositioned to tilt the upper edge of the door glass in or out to achieve the correct tension. On 1985–1987 Sedan and Station Wagon models, adjust the upper rollers as described in Door Glass — To Remove and Instal.

Loosen the nuts retaining the door glass channel upper mounting studs to the door inner panel and screw the studs in or out to position the glass. Adjust the rear channel studs equally to prevent twisting of the channel. If necessary adjust the vertical and horizontal alignment of the door glass in conjunction with this operation.

(5) After adjustment, and before installing the door trim panel, check the fit of the door glass with the weather strip when closing the door with the door glass in the uppermost position and when winding the glass up with the door closed.

(6) Instal the door sealing sheet and door trim panel.

REMOTE CONTROL AND DOOR LOCK

To Remove and Instal

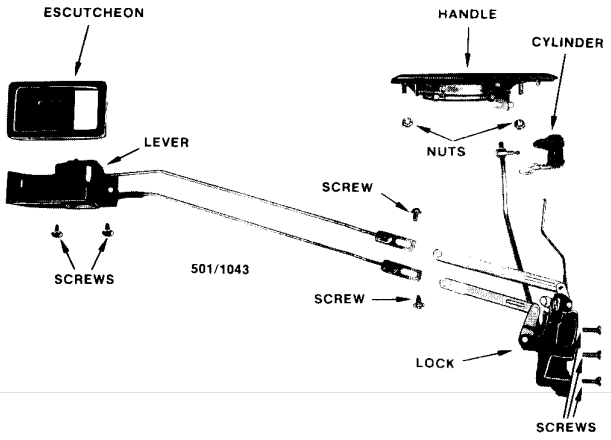
(1) With the door glass in the fully raised position, remove the door trim panel and sealing sheet as previously described.

(2) Remove the control rods from the lock assembly.

On 1979–1984 and Utility models, one control rod is retained by a clip and the other is retained by a screw.

On 1985–1987 Sedan and Station Wagon models, both rods are retained by screws.

(3) Remove the screws retaining the remote control lever assembly to the inner door panel and withdraw the remote control from the door. On 1985–1987 Sedan and Station Wagon models, manoeuvre the control rods through the insulator block on the inner door panel.



Front door lock assembly, 1986 model shown.

(4) Disconnect the lock cylinder control rod from the lock cylinder.

(5) Disconnect the outer door handle control rod from the outer door handle.

(6) Remove the screws retaining the lock assembly to the door panel and withdraw the lock assembly through the lower access hole in the inner door panel.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the lock assembly to the door and connect the lock cylinder and outer door handle control rods.

(2) Instal the remote control to the door panel, passing the control rods through the insulator where fitted.

(3) Place the lock mechanism in the latched position by pushing the tongue of the lock with a suitable screwdriver.

(4) On 1979–1984 and Utility models, insert the lock control rod into the lever on the lock assembly and secure it with the retaining clip.

On 1985–1987 Sedan and Station Wagon models, place the lock control rod onto the lever on the lock assembly and instal the retaining screw with the rod and lock assembly lever in the at rest position.

(5) Place the latch control rods onto the lever on the lock assembly and instal the retaining screw with the rod and the lock assembly lever in the at rest position.

(6) Lift the outer door handle to unlatch the lock before closing the door.

(7) Check the operation of the door lock assembly before installing the door sealing sheet and door trim panel.

EXTERIOR DOOR HANDLE AND LOCK CYLINDER

To Remove and Instal

(1) With the door glass in the fully raised

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position, remove the door trim panel and sealing sheet as previously described.

(2) Disconnect the latch control rod from the outer door handle.

(3) Disconnect the lock control rod from the lock cylinder.

(4) Remove the nuts retaining the outer door handle to the door panel.

(5) On 1985–1987 Sedan and Station Wagon models, withdraw the lock cylinder from the inner side of the outer door handle.

(6) Withdraw the door handle from the door.

(7) On 1979–1984 and Utility models, remove the clip retaining the lock cylinder to the door panel and withdraw the lock cylinder from the door.

Installation is a reversal of the removal procedure with attention to the following points.

(1) Instal the control rods as described under the heading Remote Control and Door Lock.

(2) Adjust the outer door handle latch control rod so that a clearance of 0.5–1.0 mm exists between the control rod and the lock assembly lever.

LOCK STRIKER

To Renew and Adjust

(1) Mark the position of the striker plate on the door pillar with a soft lead pencil to facilitate correct replacement of the striker plate.

(2) Remove the screws retaining the striker plate to the door pillar and remove the striker from the vehicle.

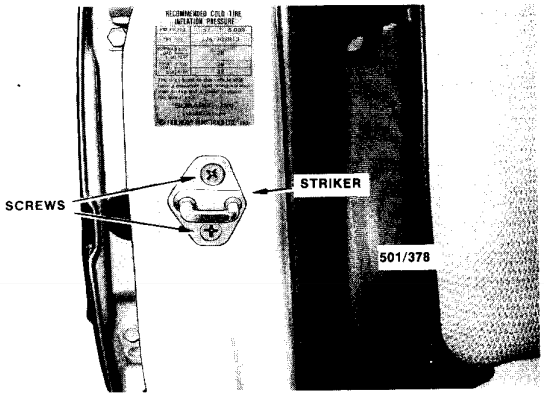
Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the striker plate according to the marks made on removal and tighten the screws sufficiently to hold the striker in position.

(2) Gently close the door and check the closed position of the door.

(3) If necessary, adjust the striker plate in or out to achieve a smooth closing action and a weather tight seal.

(4) Tighten the retaining screws securely.



View of the front door lock striker.

EXTERIOR MIRROR

To Remove and Instal, 1979–1984 and Utility Models

(1) Support the mirror and remove the screws retaining the mirror to the door.

(2) Remove the mirror from the door.

Installation is a reversal of the removal procedure.

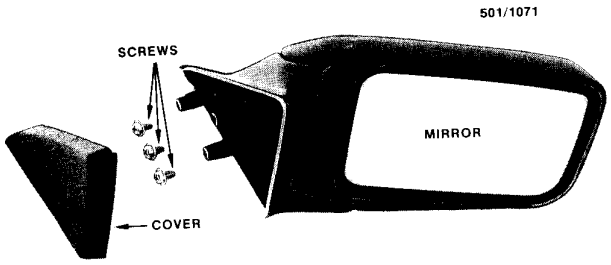
To Remove and Instal, 1985–1987 Sedan and Station Wagon Models

(1) Carefully prise the mirror inner cover from the door.

(2) Support the mirror and remove the screws retaining the mirror to the door.

(3) Remove the mirror from the door.

Installation is a reversal of the removal procedure.



View of the exterior rear vision mirror, 1986 model shown.

3. REAR DOORS

INTERIOR HANDLES AND TRIM PANELS

The following operations refer to vehicles with manually operated windows. The procedures for vehicles with electrically operated windows are similar, with allowances made for the different window regulator mechanism.

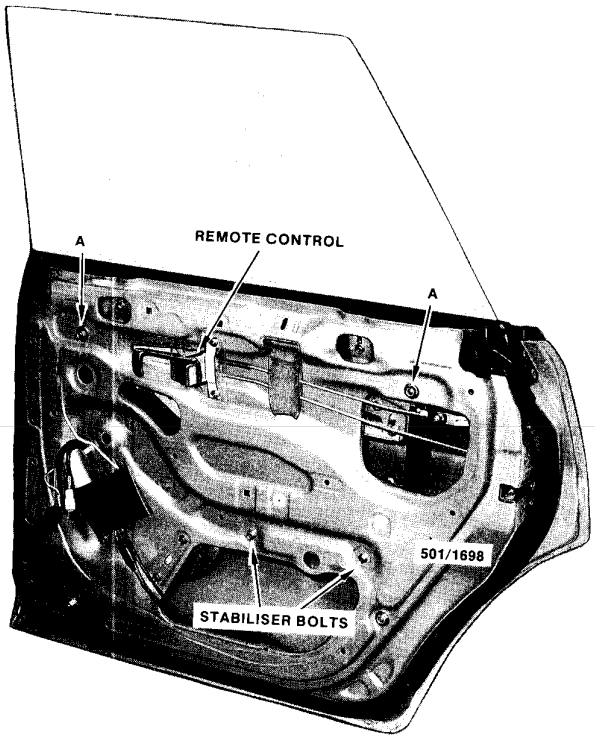
To Remove and Instal

(1) Note the position of the window regulator handle with the window in the uppermost position. Push the window regulator handle escutcheon in to expose the retaining clip. Using a piece of strong thin wire with a hook on one end, place the hooked end of the wire under the retaining clip. Withdraw the clip from the regulator handle and manoeuvre the handle and escutcheon from the door. Instal the retaining clip to the handle after removal.

(2) Where fitted, remove the plugs covering the arm rest screws. Remove the screws retaining the arm rest to the door panel and remove the arm rest from the door.

(3) Hold the interior remote door lock control in the unlatched position. On 1979–1984 models, remove the screw retaining the escutcheon to the door panel and manoeuvre the escutcheon from the door. On 1985–1987 Sedan and Station Wagon models, unclip the escutcheon from the door.

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View of rear door with trim panel and sealing sheet removed, 1983 model with power windows shown. Door glass channel adjustment is carried out using studs A.

(4) Using a wide bladed lever, carefully prise the door trim panel from the door panel by prising between the door panel and the door trim close to the retaining clips. The 1979–1984 models have two piece door trims, remove the upper trim panel first on these models.

NOTE: When removing the door trim panels, the retaining clips should remain attached to the trim panel. The trim panel may be damaged if the clips remain in the door panel.

(5) Disconnect any wiring connectors for power windows, speakers, etc. and remove the trim panel from the vehicle.

(6) Carefully remove the sealing sheet from the door panel and place it to one side.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the sealing sheet is in a serviceable condition. Position the sheet correctly on the door panel and ensure that the edges are sealed against the entry of water and dust.

(2) Check that the retaining clips are in a serviceable condition, renew any damaged clips.

(3) Connect any wiring connectors and instal the trim panel to the door, align the clips to the holes in the door panel and progressively engage the retaining clips in the holes.

(4) Hold the interior remote door lock control in the unlatched position and instal the escutcheon and where applicable the retaining screw.

(5) Instal the retaining clip to the window regulator handle and instal the escutcheon and handle to the regulator shaft in the position noted on removal.

The handle will snap into position if the retaining clip has been installed to the handle prior to assembly. If it is necessary to align the position of the regulator handle, leave the retaining clip off the handle until the correct position has been established.

DOOR GLASS

To Remove and Instal

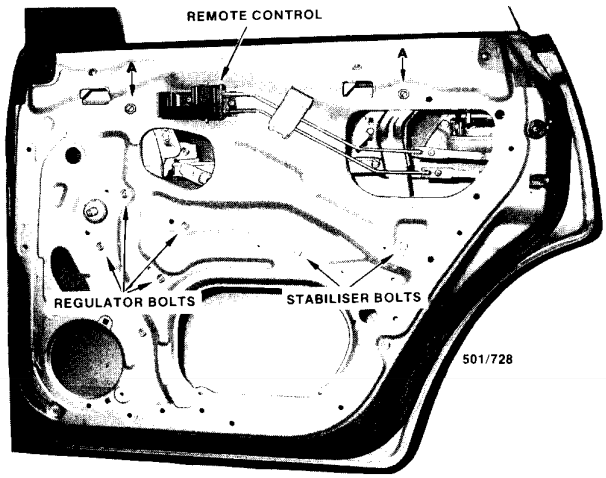
(1) Remove the door trim panel as previously described.

(2) Temporarily instal the regulator handle to the regulator shaft with the retaining clip removed and lower the door glass fully.

(3) Remove the clips retaining the door weather strip to the door panel at the upper rear edge of the door and withdraw the door weather strip sufficiently to gain access to the belt line weather strip retaining screw or rivet. Remove the screws or rivets retaining the belt line weather strip to the outer door panel and remove the weather strip from the door by carefully prising with a suitable lever. The rivets may be removed by drilling the heads, being careful not to drill into the door panel.

(4) Raise the door glass to a position to allow the door glass retaining bolts to be removed, remove the upper stoppers and, on 1985–1987 Sedan and Station Wagon models, the inner rollers from the door panel.

(5) Support the door glass, remove the screws retaining the door glass to the regulator upper channel and manoeuvre the door glass from the door. Do not move the regulator position after the door glass has been removed.



View of rear door with trim panel and sealing sheet removed, 1986 model shown. Door glass channel adjustment is carried out using studs A.

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Installation is a reversal of the removal procedure with attention to the following points:

(1) When installing the inner rollers on 1985–1987 Sedan and Station Wagon models, hold the door glass against the outer rollers and the inner rollers against the door glass while tightening the retaining bolts. Ensure that the rollers rotate freely, any binding of the rollers will scratch the door glass.

(2) If necessary, adjust the door glass as described later in this section.

(3) Instal the door trim as previously described.

WINDOW REGULATOR

To Remove and Instal

(1) Remove the door trim and sealing sheet as previously described.

(2) Remove the door glass as previously described.

(3) Remove the bolts retaining the regulator assembly and the stabiliser channel to the door inner panel and manoeuvre the regulator through the large access hole in the door inner panel.

NOTE: On some models it is necessary to remove the rear channel to allow the regulator to be withdrawn from the door panel. Ensure that the position of the upper mounting stud is not altered when removing the upper retaining nut. If the position of the stud is altered the tension of the door glass to the body weather strip will be altered. Refer to the heading To Adjust Door Glass.

Installation is a reversal of the removal procedure with attention to the following point:

Adjust the door glass as follows.

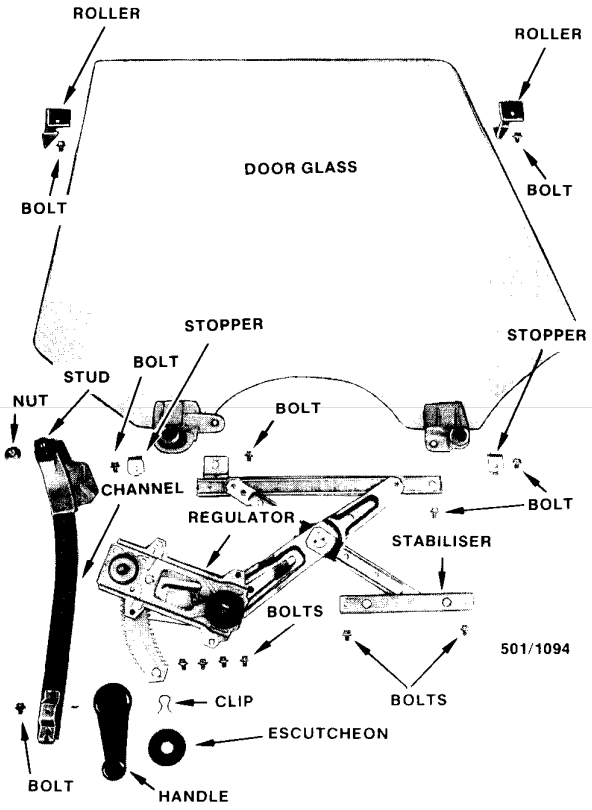
TO ADJUST DOOR GLASS

(1) Remove the door trim and sealing sheet as previously described.

(2) If the vertical alignment of the door glass requires adjustment, adjust the upper stoppers to allow the door glass to contact the body whether strip in a position to effect a weather tight seal.

(3) If the horizontal alignment of the door glass requires adjustment, loosen the bolts retaining the regulator stabiliser channel to the door panel and adjust the channel evenly up or down until the door glass contacts the body weather strip evenly. Lowering the channel will tilt the front of the door glass forward, raising the channel will tilt the door glass rearward. Ensure that the lower channel is parallel after adjustment.

(4) If the tension of the glass to the body weather strip when the door is closed requires adjustment, the door glass channel upper mounting studs may be repositioned to tilt the upper edge of the door glass in or out to achieve the correct tension. On 1985–1987 Sedan and Station Wagon models, adjust the upper rollers as described in Door Glass — To Remove and Instal.



Rear door regulator and door glass components, 1986 model shown.

Loosen the nuts retaining the door glass channel upper mounting studs to the door inner panel and screw the studs in or out to position the glass. If necessary adjust the vertical and horizontal alignment of the door glass in conjunction with this operation.

(5) After adjustment, and before installing the door trim panel, check the fit of the door glass with the weather strip when closing the door with the door glass in the uppermost position and when winding the glass up with the door closed.

(6) Instal the door sealing sheet and door trim panel.

REMOTE CONTROL AND DOOR LOCK

To Remove and Instal

(1) With the door glass in the fully raised position, remove the door trim panel and sealing sheet as previously described.

(2) Remove the control rods from the lock assembly.

On 1979–1984 models, one control rod is retained by a clip and the other is retained by a screw.

On 1985–1987 Sedan and Station Wagon models, both rods are retained by screws.

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(3) Remove the screws retaining the remote control lever assembly to the inner door panel and withdraw the remote control from the door. On 1985–1987 Sedan and Station Wagon models, manoeuvre the control rods through the insulator block on the inner door panel.

(4) Disconnect the outer door handle control rod from the outer door handle.

(5) Remove the screws retaining the lock assembly to the door panel and withdraw the lock assembly through the lower access hole in the inner door panel.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the lock assembly to the door and connect the outer door handle control rod.

(2) Instal the remote control to the door panel, passing the control rods through the insulator where fitted.

(3) Place the lock mechanism in the latched position by pushing the tongue of the lock with a suitable screwdriver.

(4) On 1979–1984 models, insert the lock control rod into the lever on the lock assembly and secure it with the retaining clip.

On 1985–1987 Sedan and Station Wagon models, place the lock control rod onto the lever on the lock assembly and instal the retaining screw with the rod and lock assembly lever in the at rest position.

(5) Place the latch control rods onto the lever on the lock assembly and instal the retaining screw with the rod and the lock assembly lever in the at rest position.

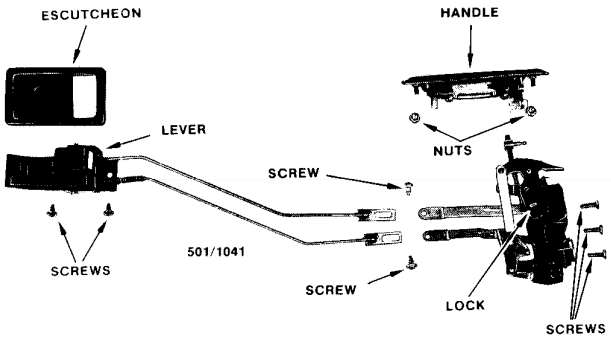
(6) Lift the outer door handle to unlatch the lock before closing the door.

(7) Check the operation of the door lock assembly before installing the door sealing sheet and door trim panel.

EXTERIOR DOOR HANDLE

To Remove and Instal

(1) With the door glass in the fully raised position, remove the door trim panel and sealing sheet as previously described.



Rear door lock assembly, 1986 model shown.

(2) Disconnect the latch control rod from the outer door handle.

(3) Remove the nuts retaining the outer door handle to the door panel and withdraw the door handle from the door.

Installation is a reversal of the removal procedure with attention to the following points.

(1) Instal the control rods as described under the heading Remote Control and Door Lock.

(2) Adjust the outer door handle latch control rod so that a clearance of 0.5–1.0 mm exists between the control rod and the lock assembly lever.

LOCK STRIKER

To Renew and Adjust

(1) Mark the position of the striker plate on the door pillar with a soft lead pencil to facilitate correct replacement of the striker plate.

(2) Remove the screws retaining the striker plate to the door pillar and remove the striker from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the striker plate according to the marks made on removal and tighten the screws sufficiently to hold the striker in position.

(2) Gently close the door and check the closed position of the door.

(3) If necessary, adjust the striker plate in or out to achieve a smooth closing action and a weather tight seal.

(4) Tighten the retaining screws securely.

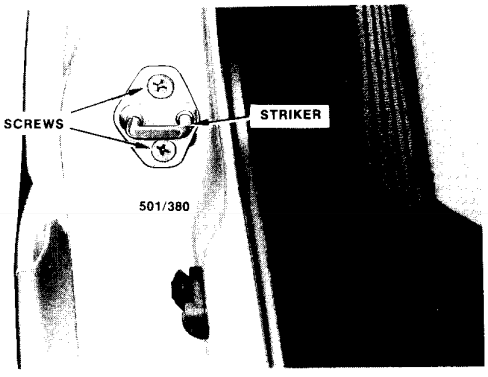
4. ENGINE BONNET

TO REMOVE AND INSTAL

(1) Raise the bonnet and support it with the bonnet stay.

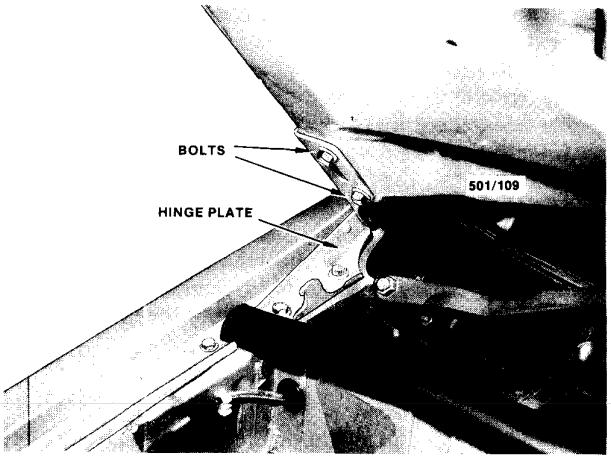
(2) Place protective covers on both front fenders to prevent damage to the paintwork, especially on the corners of the bonnet.

(3) Using a soft lead pencil, mark around the outside edge of the hinge plate on the bonnet.



View of the rear door lock striker.

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View of bonnet hinge plate, 1986 model shown.

(4) With the help of an assistant, support the bonnet and remove the bolts retaining the bonnet to the hinges. Remove the bonnet from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the bonnet to the marks made on removal and instal the retaining bolts without finally tightening them.

(2) With an assistant holding the bonnet release in the unlatched position, carefully close the bonnet and check the alignment of the bonnet in relation to each front fender and the rear edge of the bonnet

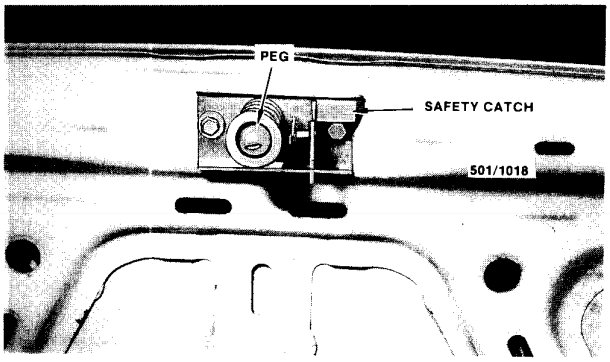
(3) If adjustment is required, open the bonnet, loosen the retaining bolts and move the bonnet on the hinges in the direction required. Tighten the retaining bolts.

(4) When all alignment of the bonnet is satisfactory, tighten the retaining bolts securely.

(5) Check the operation of the bonnet lock. When the lock is released, the bonnet should pop up sufficiently to allow access to the safety catch.

(6) If further adjustment is required on 1979–1984 and Utility models, proceed as follows:

(a) Adjust the rubber bumpers located on the front panel to bring the bonnet to the correct height in relation to the front fenders.



View of the bonnet lock peg, 1983 model shown.

(b) Loosen the locknut on the bonnet lock peg located on the bonnet.

(c) Screw the peg in or out to achieve the correct adjustment.

(d) Tighten the locknut securely.

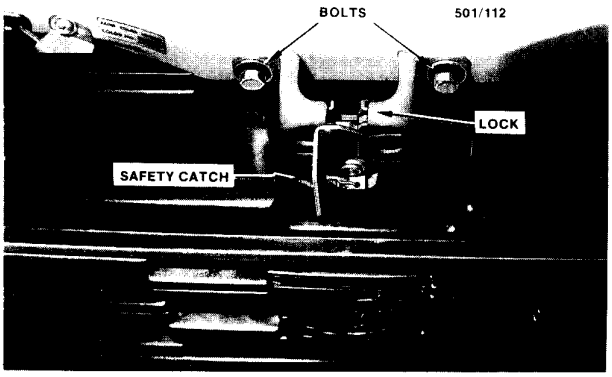
(7) If further adjustment is required on 1985–1987 Sedan and Station Wagon models, proceed as follows:

(a) Adjust the rubber bumpers located on the front panel to bring the bonnet to the correct height in relation to front fenders.

(b) Loosen the bolts retaining the bonnet lock to the front panel.

(c) Move the lock up or down to achieve the correct adjustment.

(d) Tighten the retaining bolts securely.



View of bonnet lock, 1986 model shown.

5. LUGGAGE COMPARTMENT LID — SEDAN AND COUPE

TO REMOVE AND INSTAL

(1) Raise the luggage compartment lid and place protective covers on the rear fenders.

(2) Using a soft lead pencil, mark around the hinge plate on the lid.

(3) Where applicable, disconnect the remote release cable from the lock assembly.

(4) With the help of an assistant, support the lid and remove the bolts retaining the lid to the hinges. Remove the lid from the vehicle.

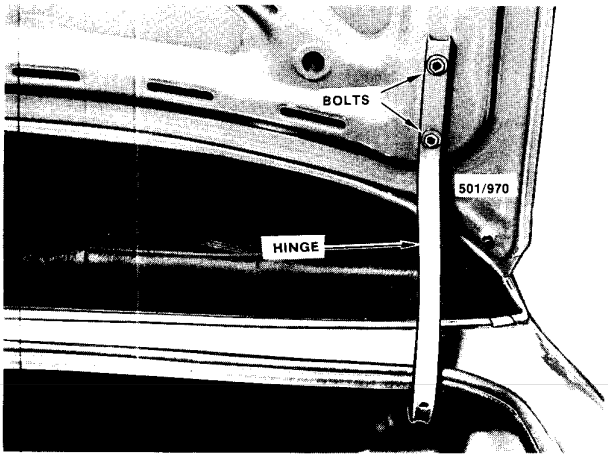
Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the luggage compartment lid to the hinges and instal the retaining bolts without finally tightening them.

(2) Carefully close the lid and check the alignment of the lid in relationship to the rear fenders and the vehicle body.

(3) If adjustment is required, raise the lid, loosen the retaining bolts and move the lid in the required direction.

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Installed view of the Sedan luggage compartment lid hinge.

(4) If necessary, adjust the lock striker on 1979–1984 models or the lock assembly on 1985–1987 models by loosening the retaining bolts and moving the lock striker or lock assembly in the required direction to allow the lid to close smoothly and provide a weather tight seal.

TO REMOVE AND INSTAL LID LOCK AND LOCK CYLINDER

1979–1984 Models

(1) Raise the luggage compartment lid.

(2) Where fitted, disconnect the remote release cable from the lock assembly.

(3) Remove the bolts retaining the lock assembly to the luggage compartment lid and remove the lock assembly from the lid.

(4) Remove the self adhesive lock cylinder surround from the luggage compartment lid. The removal of the surround will be made easier by applying heat from a hair dryer to the surround.

(5) Remove the clip retaining the lock cylinder to the luggage compartment lid and withdraw the lock cylinder from the lid.

Installation is a reversal of the removal procedure with attention to the following points:

(1) If the surround was not broken during removal, clean the adhesive compound from the surround and apply a suitable double sided rubber adhesive tape to the rear of the surround.

(2) Clean any adhesive compound from the luggage compartment lid and instal the surround to the lid after installation of the lock cylinder.

(3) If necessary, adjust the lock striker by loosening the retaining bolts and moving the striker in the required direction to allow the luggage compartment lid to close smoothly and provide a weather tight seal.

1985–1987 Models

(1) Raise the luggage compartment lid.

(2) Remove the bolt retaining the remote release cable to the rear panel and disconnect the remote release cable from the lock assembly.

(3) Disconnect the lock cylinder control rod from the lock assembly.

(4) Remove the bolts retaining the lock assembly to the rear panel and withdraw the lock from the rear panel.

(5) Disconnect the drain tube from the lock cylinder.

(6) Remove the clip retaining the lock cylinder to the rear panel and withdraw the lock cylinder from the rear panel.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Ensure that the lock cylinder drain tube is correctly installed.

(2) If necessary, adjust the lock by loosening the retaining bolts and moving the lock in the required direction to allow the luggage compartment lid to close smoothly and provide a weather tight seal.

6. TAILGATE — STATION WAGON

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Raise the tailgate, remove the clips retaining the inner tailgate trim panel to the tailgate on 1979-1984 models and remove the trim panel from the tailgate. On 1985–1987 models, remove the trim by carefully prising the trim from the tailgate using a wide bladed lever placed close to the retaining clips.

(3) Disconnect the wiring connectors for the rear demister, rear wiper, power door lock, courtesy lamp switch and number plate lamp by pulling on the connectors not the wires.

(4) Disconnect the rear washer hose.

(5) Tie suitable lengths of cord to the wiring and the washer hose, disconnect the wiring and washer hose grommets from the tailgate and carefully pull the wiring and hose through the tailgate panel. Undo the cord from the wiring leaving the cord in place to facilitate installation.

(6) Using a soft lead pencil, mark around the outer edge of the hinges on the tailgate as an aid to installation and loosen the bolts retaining the tailgate to the hinges.

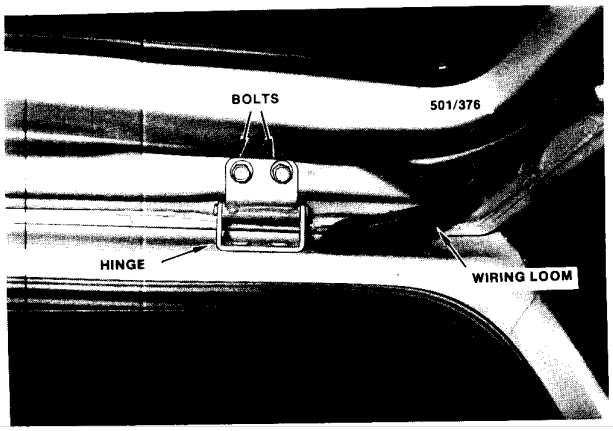
(7) With an assistant supporting the tailgate, remove the bolts retaining the gas struts to the tailgate and the body. Remove the gas struts from the vehicle.

(8) Remove the bolts retaining the tailgate to the hinges and carefully remove the tailgate from the vehicle.

(9) If the hinges are to be removed, remove the clips retaining the rear upper interior trim to the vehicle body and remove the trim from the vehicle.

(10) Carefully unclip and withdraw the headlining from the vehicle body sufficiently to allow access to the hinge retaining bolts.

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Installed view of the Station Wagon tailgate hinge.

(11) Using a soft lead pencil, mark around the outer edge of the hinges on the vehicle body as an aid to installation, remove the nuts retaining the hinges to the vehicle body and remove the hinges from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) If the hinges were removed from the vehicle body, apply a suitable sealer to the hinges to provide a weather tight seal, align the hinges to the marks on the body made on removal and instal the retaining nuts without finally tightening them.

(2) Apply a suitable sealer to the hinges, instal the tailgate to the hinges and instal the retaining bolts without finally tightening them.

(3) Check the installed position of the tailgate before installing the gas struts and trims.

(4) Adjust the position of the tailgate on the hinges to provide an even gap around the tailgate.

(5) Adjust the installed height of the lock striker by adding or removing shims between the striker and the vehicle body.

(6) Instal the gas struts and tighten all the retaining bolts securely after the tailgate is correctly aligned.

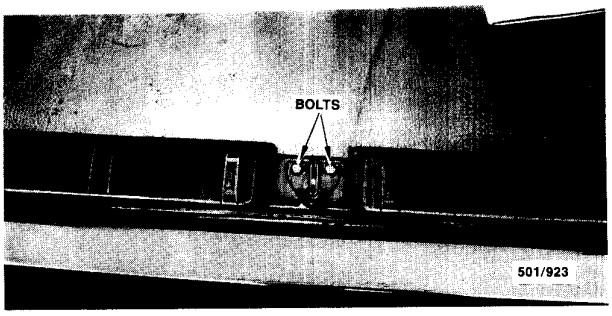
(7) Carefully draw the wiring through the tailgate panel using the cord left in place during removal.

(8) Instal the wiring and washer grommets to the tailgate and body ensuring that they are positioned to provide a weather tight seal.

(9) Instal the headlining, interior trims and tailgate trim.

TO REMOVE AND INSTAL LOCK, LOCK CYLINDER AND OUTER HANDLE

(1) Raise the tailgate and remove the clips retaining the inner door trim to the tailgate on 1979–1984 models and remove the trim from the vehicle. On 1985–1987 models, remove the trim by carefully prising the trim from the tailgate using a wide bladed lever placed close to the retaining clips.



Installed view of the Station Wagon tailgate lock striker.

(2) Disconnect the wiring from the lock assembly by pulling on the connector not the wires.

(3) Disconnect the lock control rod from the handle or lock button lever.

(4) On 1985–1987 models, disconnect the lock cylinder control rod from the lock cylinder lever.

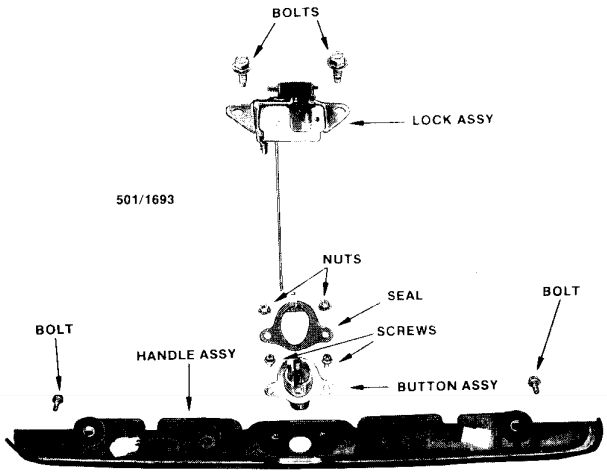
(5) Remove the bolts retaining the lock assembly to the tailgate and withdraw the lock assembly from the tailgate.

(6) On 1979–1984 models, disconnect the number plate lamp wiring connectors by pulling on the connectors not the wires, remove the nuts and bolts retaining the handle and number plate lamp assembly to the tailgate and withdraw the handle assembly from the tailgate.

On 1985–1987 models, remove the nuts retaining the handle assembly to the tailgate and withdraw the handle assembly from the tailgate.

(8) On 1979–1984 models, remove the screws retaining the lock and button assembly to the handle and number plate assembly and withdraw the lock and button from the handle assembly.

On 1985–1987 models, remove the clip retaining the lock cylinder assembly to the tailgate panel and withdraw the lock cylinder from the tailgate.



View of the tailgate lock and handle, 1983 model shown.

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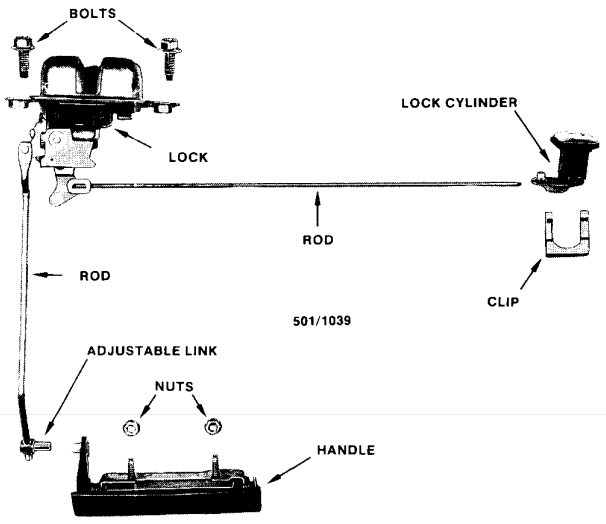
Installation is a reversal of the removal procedure with attention to the following points:

(1) Prior to installation of the lock control rod, place the lock in the latched position by pushing the tongue of the lock with a suitable screwdriver.

(2) Adjust the position of the moveable pin on the control rod to allow the control rod to be installed without applying unlatching movement to the lock assembly. Operate the outer handle or button to unlatch the lock before closing the tail gate.

(3) If necessary, loosen the bolts retaining the lock striker to the body and move the striker in the required direction to allow the tailgate to close smoothly and provide a weather tight seal.

(4) The height of the striker may be adjusted by adding or subtracting shims between the striker and body.



View of the tailgate lock and handle, 1986 model shown.

7. TAILGATE—UTILITY

TO REMOVE AND INSTAL

(1) Open the tailgate and support it in the open position.

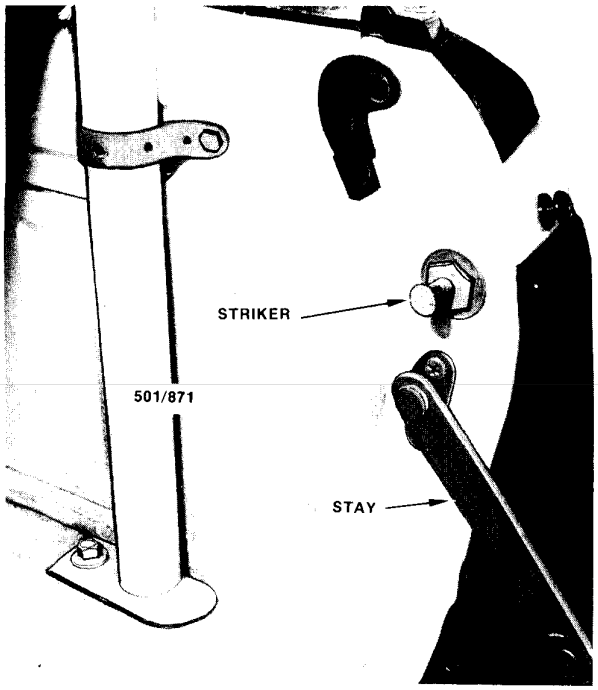
(2) Remove the bolts retaining the stays to the tailgate.

(3) Remove the bolts retaining the tailgate hinges to the rear panel and remove the tailgate from the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Adjust the position of the tailgate in relation to the vehicle body by moving the tailgate on the hinges before finally tightening the retaining bolts.

(2) If necessary, adjust the tailgate locks as described under the following heading.



Installed view of the Utility tailgate lock striker and stay.

TO REMOVE AND INSTAL TAILGATE LOCKS

(1) Open the tailgate.

(2) Remove the screws retaining the centre and side covers to the tailgate and remove the covers from the tailgate.

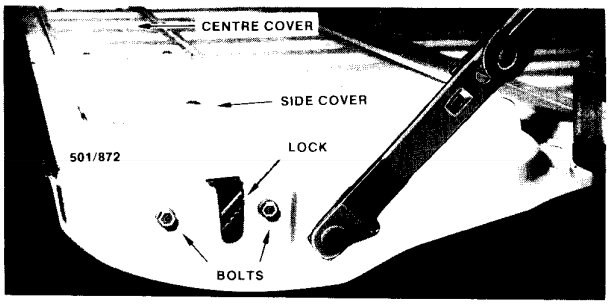
(3) Remove the screws retaining the control rods to the centre lever assembly and disconnect the control rods from the lever assembly.

(4) Remove the bolts retaining the lock assemblies to the tailgate and remove the lock assemblies and control rods from the tailgate.

Installation is a reversal of the removal procedure with attention to the following points:

(1) Instal the locks and place them in the latched position by pushing the lock tongues with a suitable screwdriver.

(2) Instal the control rods to the centre lever



Installed view of the Utility tailgate lock and the access hole covers.

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assembly without applying latching or unlatching movement to the locks and tighten the retaining screws securely. Lift the outer handle to unlatch the locks before closing the tailgate.

(3) If necessary, adjust the position of the lock strikers to allow the tailgate to close smoothly without being loose.

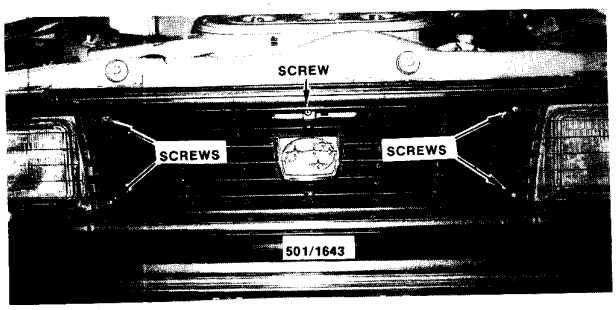
8. RADIATOR GRILLE

TO REMOVE AND INSTAL

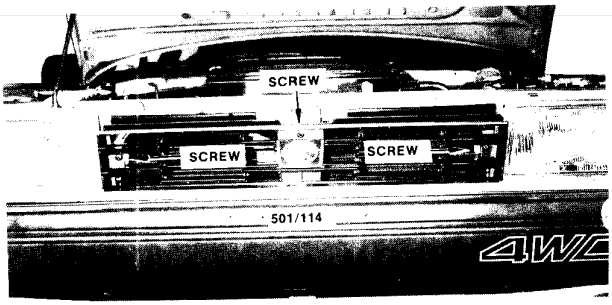
(1) Raise the bonnet and support it with the bonnet prop.

(2) Remove the screws retaining the grille to the front panel and remove the grille from the vehicle. Refer to the relevant illustration for the location of the screws.

Installation is a reversal of the removal procedure.



Installed view of the 1983 Touring Wagon radiator grille showing the location of the retaining screws.



Installed view of 1986 Station Wagon radiator grille showing the location of the retaining screws.

9. CENTRE CONSOLE

TO REMOVE AND INSTAL

(1) Disconnect the negative battery terminal.

(2) Carefully prise the centre cover from the console. On 1979–1984 four wheel drive models, unclip the boot surrounding the four wheel drive lever and manoeuvre the cover from the lever.

(3) On manual transaxle models, remove the gear lever knob by unscrewing it from the gear lever.

On automatic transaxle models, remove the screws retaining the selector lever knob to the selector lever and withdraw the knob from the lever.

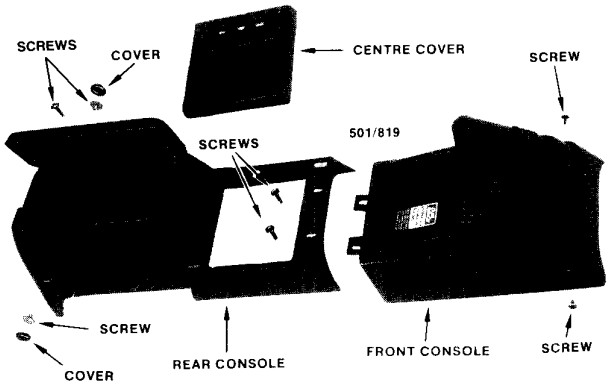
(4) On 1985–1987 Sedan and Station Wagon four wheel drive models, remove the four wheel drive lever knob by unscrewing it from the lever.

(5) Remove the screws retaining the rear console section to the vehicle floor accessible through the console storage box, under the centre cover, and, on 1985–1987 Sedan and Station Wagon models, under plastic covers at the rear of the console.

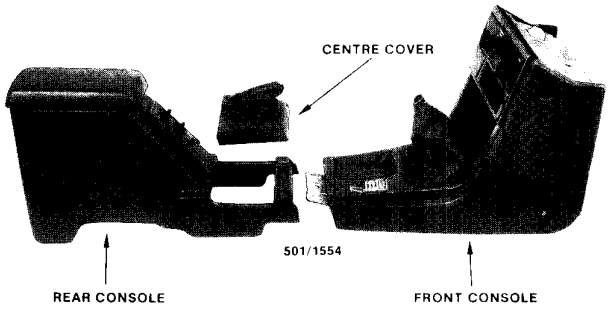
(6) Remove the screws retaining the front section of the console to the vehicle dashboard on 1979–1984 and Utility models and the vehicle floor on 1985–1987 Sedan and Station Wagon models.

Remove the front console section from the vehicle, on 1979–1984 and Utility models, disconnect the wiring connectors by pulling on the connectors not the wires.

Installation is a reversal of the removal procedure.



View of 1983 four wheel drive centre console.



View of 1986 four wheel drive centre console.

10. VEHICLE CLEANING

CLEANING THE EXTERIOR

In order to remove dirt and road grime and thus preserve paint finish, vehicles in continuous use should be washed at least once a week.

Before washing the paintwork it is good policy to first hose all dirt from the underbody and clean out the drain holes in the doors and sill panels.

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Hose the vehicle first to remove as much grit as possible then wash using a clean chamois or sponge, ensuring that the chamois or sponge is free from dirt or grit which could scratch the paint surface.

Avoid washing the vehicle in bright sunlight with high temperatures as this will give the paintwork a streaky watermarked finish.

If necessary wash the vehicle using a reputable brand 'Wash and Wax' liquid. The 'Wash and Wax' liquid will restore the paint lustre and leave the paintwork with a protective coating of wax.

After a period it may become necessary to polish the vehicle in order to remove built up foreign matter and to give the paintwork maximum protection from industrial fall-out and salt from sea air etc. Before polishing the paintwork always wash the surface to remove as much road grime as possible. When polishing follow the polishing instruction which come with the polish.

NOTE: Grease, oil or tar on the paint surface can be removed with a little kerosene or white spirits. To prevent from staining, wash and polish the affected area as soon as the grease, oil or tar is removed.

GENERAL CLEANING OF VINYL UPHOLSTERY AND TRIM

To maintain the vinyl upholstery and interior trim in good condition it should be regularly vacuumed over to remove loose dirt and when wiped over with a dry or damp cloth.

If the upholstery is soiled or stained the following cleaning procedure is recommended:

(1) Using warm water, cheese cloth and a mild soap thoroughly wash the affected areas.

(2) Repeat the operation using a damp cheese cloth only.

(3) To complete the cleaning operation wipe the upholstery over with a dry piece of cheese cloth.

NOTE: If the upholstery or interior trim is badly soiled or stained, wash with a reputable brand of upholstery cleaner carefully following the makers instructions.

TO REMOVE STUBBORN STAINS ON VINYL UPHOLSTERY AND TRIM

NOTE: The following cleaning procedures with recommended removal agents should be used before contemplating trim renewal.

Chewing Gum

(1) Apply an ice cube to harden the gum.

(2) Remove as much of the gum as possible with the edge of a spoon.

(3) Wipe the remaining gum off with a cloth moistened with methylated spirits.

(4) Finish by washing the affected area with warm soapy water and drying with a clean cloth.

Grease and Other Fatty Stains

(1) Use a clean dry cloth and remove as much of the grease as possible taking care not to spread the grease any further.

(2) Carefully wipe away the remaining grease using a cotton cloth moistened with methylated spirits or mineral turps.

(3) Finish by washing the affected area with warm soapy water and drying with a clean cloth.

Chocolate

(1) Remove as much of the chocolate as possible with the edge of a spoon.

(2) Wipe the remaining chocolate off with a cloth moistened with methylated spirits.

(3) Finish by washing the affected area with warm soapy water and drying with a clean cloth.

Ball Points Pen Inks

(1) Mix up equal parts of fresh Calcium Chloride and Fullers Earth. The Calcium Chloride and Fullers Earth can be purchased at the local chemist.

(2) Add a few drops of methylated spirits and mix all ingredients into a thick paste.

(3) Apply the paste to the ink stain and allow it to dry.

(4) Remove the dried paste with a damp cloth.

(5) Finish by wiping the affected area with a wet cloth and drying with a clean cloth.

(6) If some of the ink stain still remains, repeat the cleaning procedure.

NOTE: If the removal of the ink stain leaves the affected area dull, the affected area can be revived by wiping over with cotton wool moistened with glycerine

Toffee

(1) Remove as much of the toffee as possible with the edge of a spoon.

(2) Wash as much of the remaining toffee off using a soft cloth and very hot water.

(3) To finish the cleaning operation first wipe the affected area over with a cloth moistened with methylated spirits then wash with warm soapy water and dry with a clean cloth.

Blood

(1) Wash the affected area immediately with cold water.

(2) If the affected area is still stained, wipe over with household ammonia.

(3) Finish by washing with warm soapy water and drying with a clean cloth.

Liquor and Fruit Stains

(1) Wash the affected area with very hot water and allow it to dry.

(2) When dry wipe over with a clean cloth moistened with methylated spirits.

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(3) Finish by washing the affected area with cold water.

Tar

(1) Wipe with a clean cloth moistened with mineral turps or kerosene.

(2) Finish by washing the affected area with cold water.

NOTE: Quick action is most essential with tar stains. If the tar is left on the upholstery for any length of time permanent staining will result.

Ice Cream

(1) Wash the affected area with warm soapy water.

(2) If the stain still remains wash repeatedly with very hot soapy water.

(3) Finish by wiping over the affected area with a cloth moistened with methylated spirits and washing again with warm soapy water.

CLEANING CLOTH TRIM

Loose dirt and dust on cloth trim should be removed with a vacuum cleaner or a very soft brush. Do not use a whisk brush or any other type of coarse brush or damage to the cloth could result. If the fabric is soiled the following cleaning procedure is recommended:

(1) Sponge the fabric lightly with warm water containing a little detergent and household ammonia.

(2) After sponging rub the fabric lightly. If soiling is still apparent repeat the sponging operation.

(3) Use a clean dry cloth to soak up excess fluid.

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PART 2. BODY REPAIRS

1. INTRODUCTION

This section has been compiled to assist the vehicle owner who feels they are sufficiently competent to carry out their own basic bodywork and paintwork repairs.

Bodywork and paintwork repair is a more complicated subject then first imagined, there is more to panel beating than swinging a hammer and there is more to painting than squeezing the trigger on the spray gun. No two tradesmen will approach a repair job in the same manner, but possibly each method of repair will have its own points of merit. Where possible, it will greatly assist the amateur repairer to just sit and observe a good tradesman at work.

Normally too much emphasis is placed on the painting side of the repair and not enough on the surface to which the paint is being applied. Paint was never designed, to fill dents or cover up a shoddy repair job. The final paint finish is totally dependent on the surface to which it is being applied.

Before starting any repair job it will be necessary to thoroughly inspect the vehicle for more than just the obvious damage. On modern vehicles where the materials used in construction are relatively light, structural damage may be sustained even though the external panels have only minor damage. Where structural damage has been sustained the vehicle should be taken to a competent repairer who has the necessary pullers and jigs to ensure that the vehicle is returned to a structurally sound condition.

In some instances where a panel is bolted to a vehicle it may be cheaper and less time consuming to purchase a secondhand panel from a wreckers yard, but ensure that the panel being purchased is in a sound condition ie: no hidden rust or excessive amounts of body filler from a previous repair job.

There are many different procedures, techniques and precautions to be observed when painting a motor vehicle. It is therefore recommended that this section should be studied in its entirety to avoid the possibility of damaging the paintwork on the vehicle even further.

Touching up the paintwork with a brush or carrying out spot repairs with an aerosol can are fairly simple operations which should be within the scope of the amateur repairer.

Spraying of repaired panels or the complete respraying of the vehicle is a fairly involved procedure which requires specialised equipment and knowledge, but even so this is not beyond the scope of the amateur repairer if care and common sense are exercised.

The initial purchase price of the equipment required for respraying a motor vehicle is the factor which will determine its economic feasibility. The purchase of sound second hand equipment or the renting of such equipment from a reputable hire firm should not be overlooked as a means of reducing costs.

The final paint finish is only as good as the surface to which it is applied, automotive paint was never designed to fill scratches or imperfections in the surface.

2. SAFETY

The operators safety is the single most important factor to be considered when carrying out repairs to a motor vehicle.

Never work under a vehicle which is supported only by the vehicle jack, bricks or similar materials as these are seldom stable. Always support the vehicle on chassis stands or use car ramps. When lifting either end of the vehicle ensure that the wheels remaining on the ground are fully chocked in both directions.

Avoid spilling oil or water around or under the working area, apart from the mess, you can easily lose your footing when exerting force on a particularly stubborn component.

When power tools are used make sure that they are correctly fused and earthed with all connections and plugs tight and effectively insulated.

Avoid at all times inhaling any form of body filler dust, paint dust or primer or paint fumes. Certain types of paint fumes can be fatal if inhaled for any length of time. Paint suppliers usually stock suitable breathing masks for most applications.

When using a welder of any type on a vehicle always have a suitable fire extinguisher on hand for emergencies. Never use a welder or have any type of naked flame near paint or thinners.

When working on the damaged portion of a vehicle bodywork always take care to avoid injury on any sharp edges that may be present.

Always take care when working with compressed air or where metal fillings or dust particles are present, wear safety glasses to prevent eye injury.

3. TOOLS, EQUIPMENT AND MATERIALS

TOOLS

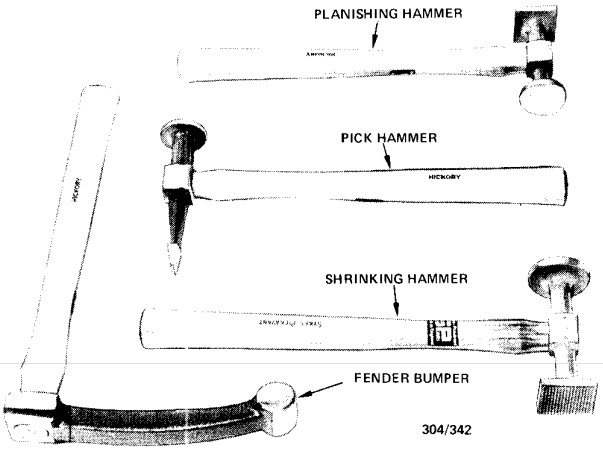
It is obvious that the amateur repairer does not require hundreds of dollars worth of tools to repair a small dent in a fender, therefore the type of repair required should be assessed and the tools required to complete the job should be purchased only. In many instances a tool may be fabricated or adapted from something found around the house or garage.

As sensible selection of tools can greatly influence the ease and quality of work performed, it is good advice to purchase the highest quality of tools that can be afforded. Tools which bear the makers name are usually best. The cheaper variety of tools should be avoided as their useful life can be surprisingly short.

To ensure that all hand tools see out a normal working life tool care is also very important. After each job undertaken all tools should be thoroughly cleaned.

If the tools are to be stored for any length of time it is also good policy to wipe them over with an oily cloth. To prevent hand tools and other equipment from becoming mislaid and to ensure uncluttered working surroundings all tools should be stored in a tool box.

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Assorted panel beating hammers.

The following list of basic tools should familiarize the lay person with the tools used in bodywork repairs:

Planishing hammer — the most commonly used tool in panel beating. This hammer is mainly used with a dolly for the final smoothing process of a panel repair.

Shrinking hammer — this hammer is similar in weight and shape to a planishing hammer except that the faces have a regular patterned rough finish.

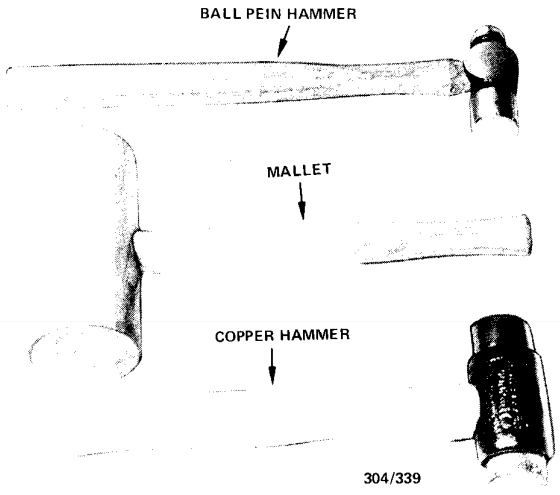
Pick hammer — this hammer can be used in place of a planishing hammer to bring down high spots of a panel surface.

Ball pein hammer — used for general work in conjunction with chisels, drifts etc.

Fender bumper — used for general roughing out of a panel where access is limited.

File hammer — this tool is useful in repairing large areas of damage at one time and is used in conjunction with a hand dolly.

Hand dollies — hand dollies are cast iron or steel blocks which are available in various shapes and sizes. They are used in conjunction with a planishing hammer to remove dents and damage from panels.



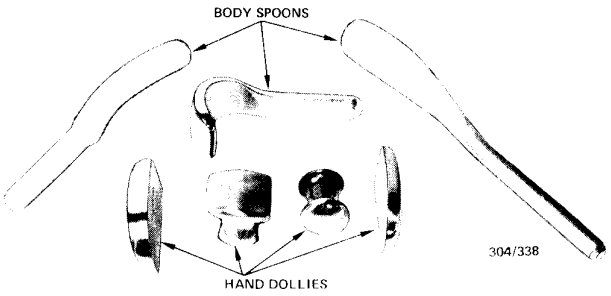
Ball pein hammer, copper hammer and mallet.

Cold chisels — a good range of cold chisels is an advantage when carrying out bodywork repairs. The chisels when used on sheet metal should have a very sharp and drawn out cutting edge.

Caulking chisels — very simply a caulking chisel is a cold chisel with a rounded or blunt end and is used for repairing body creases and sculptured panels.

Tin snips — used for cutting sheet metal and are available in left and right handed types and various sizes.

Flexible panel file — this tool is used for a variety of tasks and the blade can be altered in contour to adapt to the shape of almost any panel. Various replacement blades are available for the file to allow the planishing of a panel or the smoothing of body filler.



Assorted hand dollies and body spoons.

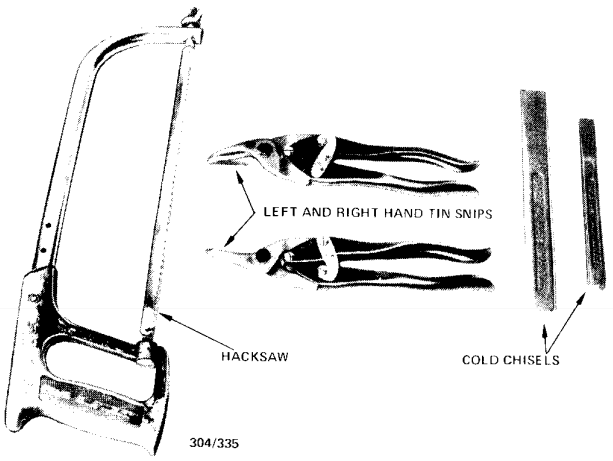
Radius body file — similar in function to the flexible panel file except that the curve of the file blade is fixed.

Hacksaw — used for cutting sheet metal whether it is in sheet form or box sections.

G clamps — available in numerous sizes, ideal for holding pieces of metal or box sections together while welding, brazing or rivetting.

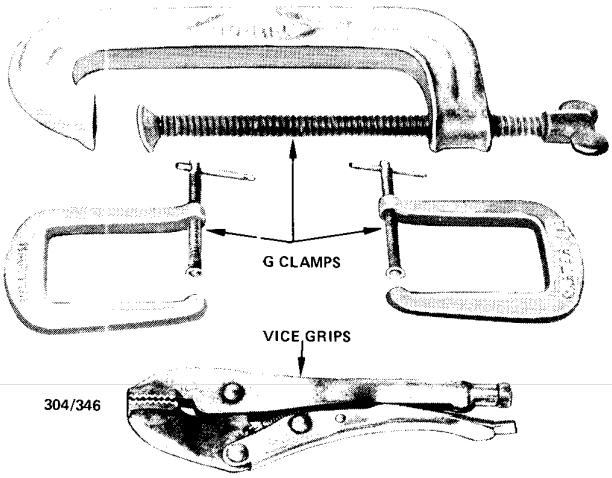
Pry bars — variety of functions, mainly useful for pulling a non structural panel back into its approximate shape. Also known as crow bars.

Scrapers — used for removing old paint after paint stripper has been applied.



Hacksaw, tin snips and cold chisels.

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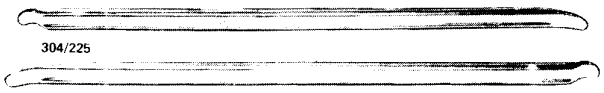
G clamps and vice grips.

Mallet — constructed of wood, useful for working metal while reducing the risk of stretching the metal.

Copper hammer — a useful hammer which can be used preceding a mallet to rough out a damaged panel.

Body spoons — used in the same manner as dollies, but have the advantage of being able to reach into confined areas.

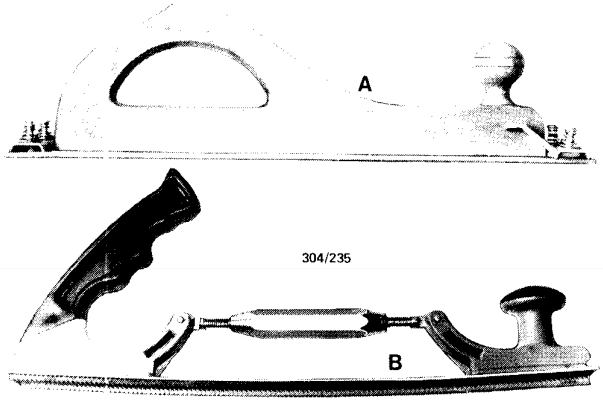
Cheese grater file — used to remove excess body filler before the filler has completely hardened.



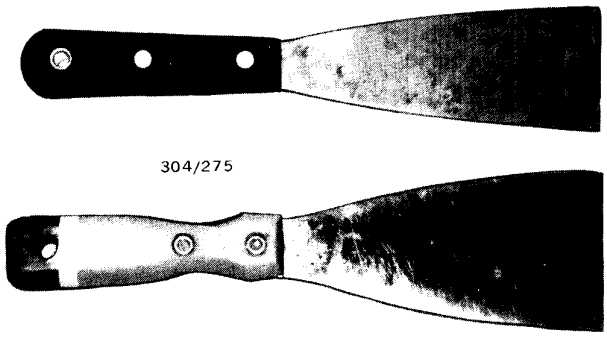
Pry bars.

Speed file — a wooden file to which coarse abrasive paper can be attached.

In bodywork and paintwork repairs it will also be necessary to have a basic kit of hand tools ie: spanners, screwdrivers, pliers etc to remove various body and trim components to facilitate repair procedures. Refer to Tools - Equipment - Safety in the front of this manual.



A. Speed file. B. Flexible panel file.



Scrapers.

EQUIPMENT

The large initial expense of purchasing the equipment required for bodywork and paintwork repairs can be avoided if the equipment can be borrowed from someone or rented from a reputable equipment hire firm. In some instances though the convenience of having the equipment on hand at all times may warrant its purchase.

The following list of equipment is recommended for the efficient repair of bodywork or paintwork:

Air compressor — used for supplying a constant pressure of air to a spray painting gun or various air operated tools eg: air chisel, impact wrenches etc.

Pressure regulator/filter — used in conjunction with the air compressor to regulate the air pressure and rid the air of all impurities.

Oxy/acetylene welding outfit — invaluable when carrying out bodywork repairs, can be used for welding, brazing, soldering, stretching, shrinking, forming and cutting metal.

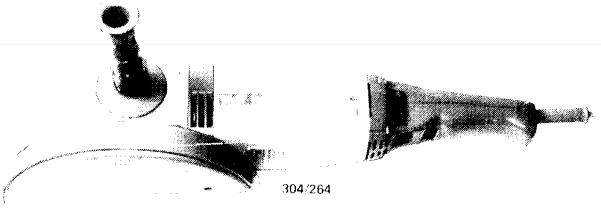
Hydraulic body jack — not an essential piece of equipment and can be successfully substituted by a mechanical lift type jack on minor repairs. Attachments for the body jack can be either purchased separately or fabricated from scrap water pipe and fittings.



Slide hammer and P. K. screw attachment.

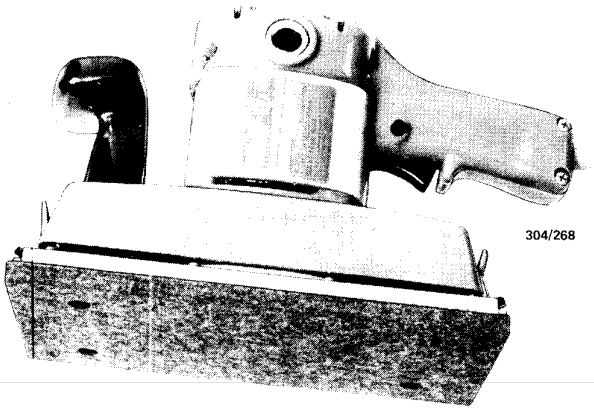
Slide hammers — available as kits or individually and come in a range of sizes and attachments. Particularly useful where access to the rear of a panel is not possible.

Disc sander — used primarily for cleaning the metal surface of old paint and rust and removing excess metal from a weld.

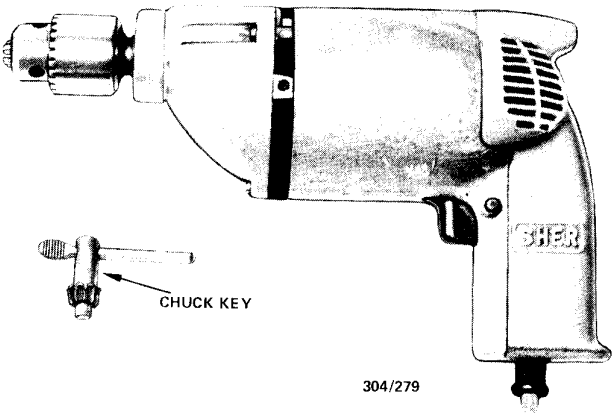


Multi-purpose sanding, grinding or polishing machine.

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Orbital sander.



Power drill and chuck key.

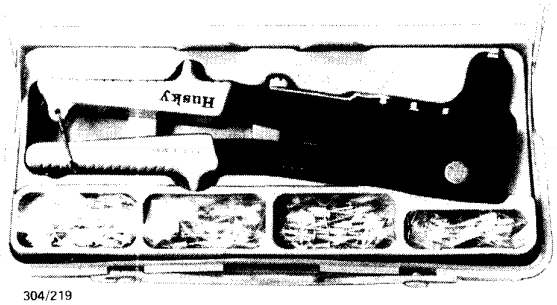
Orbital sander — used primarily for smoothing areas of body filler and as a substitute for the body file.

Power drill — variety of uses including; drilling out spot welds, drilling holes, drilling out rivets, etc.

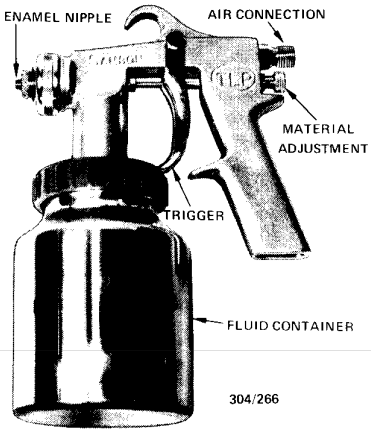
Polisher — used in the final stages of repainting to bring up the lustre of the paint finish, is used in conjunction with a cutting or polishing compound and a lambswool pad.

Riveting gun — when used in conjunction with rivets can prove invaluable for simplifying the joining of metal panels.

Breathing mask — used to prevent the inhaling of body filler dust, paint dust or paint fumes while carrying out bodywork or paintwork repairs.



Riveting gun and kit.



Low pressure spray gun fitted with enamel nipple.

Spray gun — used for applying primer or paint to metal panels.

Spray putty gun — used to apply spray putty to panels. This spray gun is not interchangeable with a conventional spray gun.

In bodywork repairs it will also be necessary to have certain pieces of equipment not directly related to bodywork repairs eg: hydraulic jack, chassis stands etc. Refer to Tools - Equipment - Safety in the front of this manual.

MATERIALS

A large variety of materials are required when carrying out bodywork and paintwork, repairs. The following list covers the common materials required and their applications:

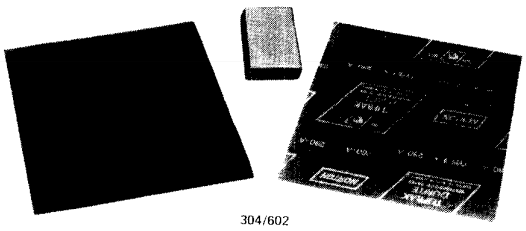
Masking tape and paper — used to protect or cover undamaged body panels or trim during repair or painting operations.

Abrasive papers (Wet or dry paper, sanding discs, etc.) — various types of abrasive paper, sanding sheets and sanding discs are used to carry out bodywork and paintwork repairs.

Paint stripper — used when the complete removal of the paint finish is required.

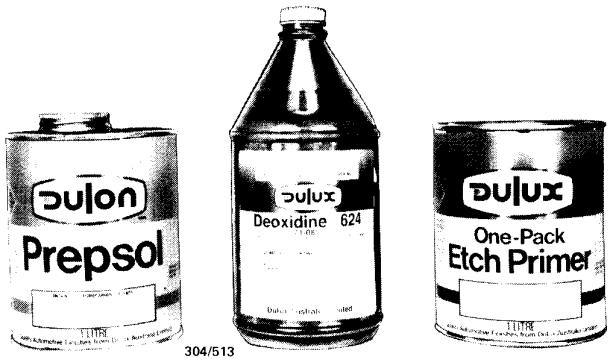
Plain soap — used as a lubricant and cleaning agent when rubbing back the paint surface.

Steel wool — can be useful in the many operations involved in bodywork and paintwork repairs.



Abrasive paper and rubber block.

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Materials used in surface preparation.

Body filler — this material is known by many names, basically it is a two part putty which is used where an indent, crease or scratch in a body panel is too deep to be rectified by using a spray or stop putty.

Deoxidising agent — normally an acid based cleaner and conditioner, which removes rust, eliminates the rust inducing agents and leaves the metal surface clean and ready for painting.

Etch primer — used to promote the adhesion of primer surfacers to bare metal surfaces.

Wax and grease remover — a cleaning solvent used for the removal of wax, grease, tar and silicone polishes from painted surfaces.

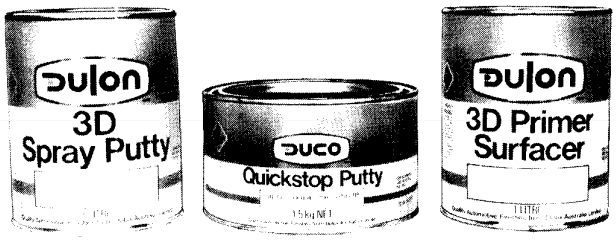
Primer/surfacer — used as a base coat to promote the adhesion of the paint finish to previously painted and small bare metal surfaces. Also used as a base for stop and spray putties as they will not adhere to bare metal surfaces.

Stop putty — used as a filler for removing indentations, disc and file marks and nicks before painting a body panel. Stop putty is applied using a rubber squeegee or flexible putty knife.

Spray putty — serves the same function as stop putty except it is applied using a special spray gun.

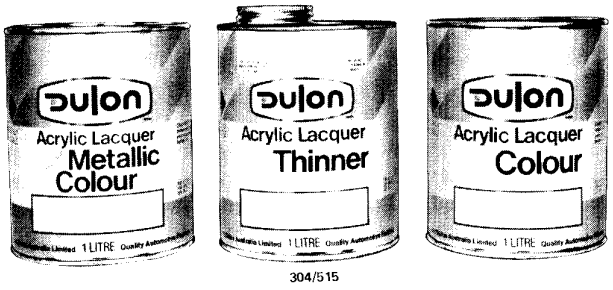
Thinner — used to 'thin down' the various types of paint, primer surfacer and stop putty available. The correct type of thinner must be used for each application.

Paint — numerous types of paints are available which exhibit different dyring and final finish properties. The type of paint used on the original paint finish should be taken into consideration when selecting a paint type for refinishing as some types of paint are not compatible. The subject of paint type is best discussed with your local paint suppliers. For minor paint repairs it may be possible to purchase the correct color and type of paint in an aerosol can.



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Materials used in preparing the surface for the final paint finish.



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Materials used in applying the final paint finish.

Blending clear — used as a base coat where only a part of a panel is to be painted. Blending clear promotes the adhesion of the new paint to the original painted surface without using a primer surfacer.

Clear lacquer — used as a top coat on certain types of paint finishes.

Cutting compound — two types of cutting compound are available, one is used by hand and the other is used with a buffing machine. This product is used to remove orange peel and overspray and to produce a lustrous, glossy finish.

Polish — used after cutting compound to remove the marks from the paint finish caused by the cutting action, polish also provides a protective coating for the paint.



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Materials used for finishing off.

Wax — may be applied after polishing to provide extra protection for the paint finish.

Caulking compound — used as a sealer to prevent the entry of water and dirt into body seams. Preferably a non-hardening compound.

Underbody sealer — used to cover and seal bare surfaces on the underside of the vehicle after the completion of a repair. Acts as an anti-rust agent and a sound deadener.

Glass Reinforced Plastic (GRP) — more commonly known as fibreglass has a multitude of uses. Ideally suited as a filling medium for large holes and tears in metal panels. Consists of a woven glass matting which is impregnated with a polyester resin which hardens when set.

Bleeder Sealer — sprayed over the top of the primer/surfacer when it is applied to maroons and reds. Prevents the pigments present in these colours bleeding through and staining the final paint finish.

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4. RUST REPAIRS

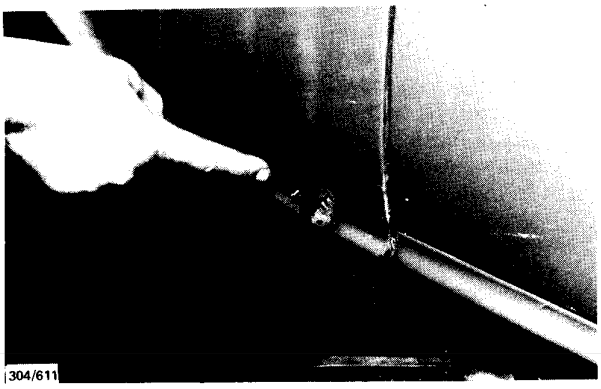
CAUSES AND PREVENTION OF RUST

Rust is the corrosion which attacks the surface of iron and its alloys when it is exposed to oxygen and water.

Modern vehicles with their all steel bodies and unitary body construction are particularly susceptible to rust. The various holes, ledges and recesses etc. which are part of the modern vehicle are traps for road dirt which when wet can retain moisture for several days.

Recently vehicle manufacturers have provided greater protection from rust at the manufacturing stage. The manufacturers have treated the vehicle bodies by varying methods including immersing the entire body in a rust preventing paint. A bitumen based sealer and sound deadener is also a popular method for preventing rust.

To prevent rust, ensure that road dirt is not allowed to build up anywhere on the vehicle and any bare metal caused by accident damage or stones is quickly treated and sealed. Also ensure that all body water drain holes are kept free of any obstructions.



View of fender showing extensive rust penetration.

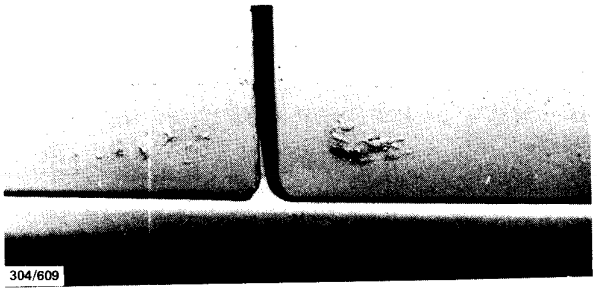
TO REPAIR RUST DAMAGE

Two methods of repairing rust damage can be employed: (1) Cutting away the affected panel and replacing it with a new panel or section. (2) Filling the affected area with plastic body filler, fibreglass matting and resin or a metal patch.

Unless the rust affected panel is only bolted to the vehicle, the amateur repairer should not attempt to repair rust damage by replacing the affected panel or section. The job of welding on a new panel or welding a new section into a panel is best left to a professional panel beater.

For replacement of rust affected panels refer to the appropriate heading later in this manual.

Structural rust in a motor vehicle can render the vehicle unsafe and as such should only be repaired by a professional panel beater.

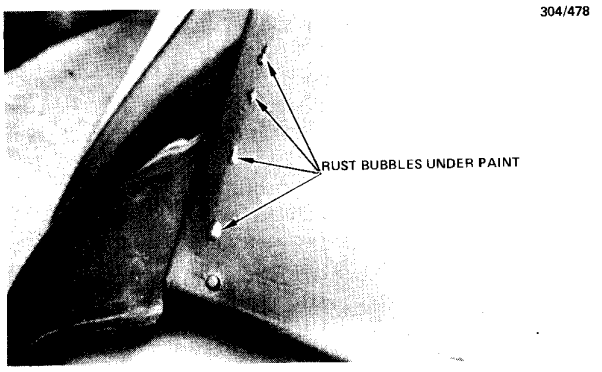


View of panels showing rust penetration in the outer skin.

HOW TO REPAIR RUST DAMAGE USING PLASTIC BODY FILLERS

Light Panel Penetration

Plastic body fillers can be used to repair rust where the panel penetration is not too severe i.e. no large holes in the metal.



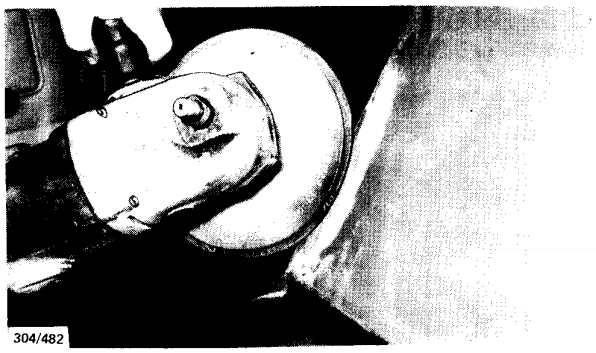
View of rusted area of panel prior to commencing repair operations.

(1) Using a paint stripper, disc sander or scraper remove all traces of paint or underbody sealer from the rusted area and its surrounds on the front and rear of the panel.

(2) Treat the rusted area with a rust converting liquid.

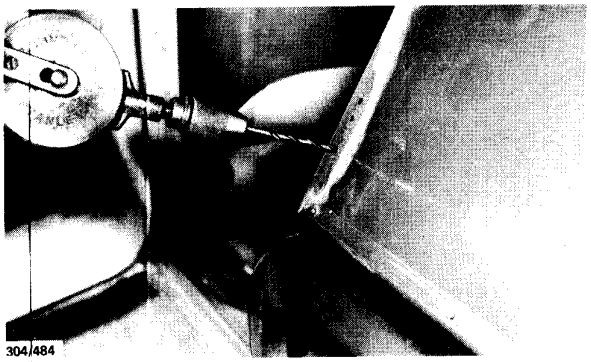
(3) Where necessary, using a ball pein hammer gently tap down the rust affected area of the panel until it is approximately 3mm below the level of the surrounding panel.

(4) Restore the panel to its correct level by using

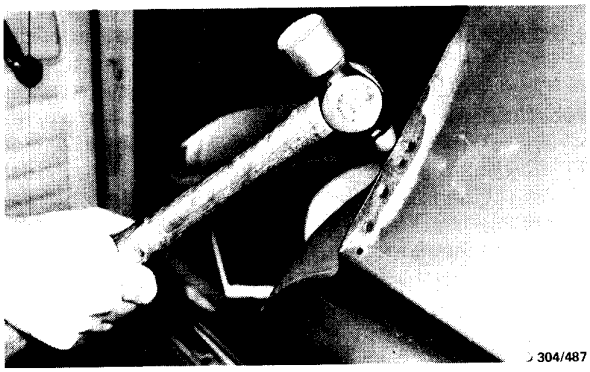


Using a disc sander to remove all traces of paint from the rusted area and its surrounds.

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In some cases a hand drill may be used to remove all traces of rust from the areas of penetration.



Using a ball pein hammer to tap down the rust affected area.



Applying the deoxidising agent/rust convertor to the rusted area.

plastic body filler as described under the appropriate heading later in this manual.

NOTE: Ensure that the body filler is forced through the holes in the affected area of panel to provide a good bond.

Extensive Panel Penetration

Reasonably large holes in a panel can be effectively repaired using the following method:

(1) Using a paint stripper, disc sander or scraper remove all traces of paint or underbody sealer from the rusted area and its surrounds on the front and rear of the panel.

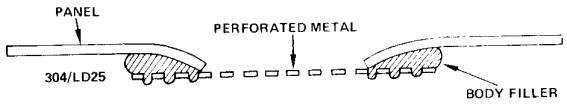
(2) Where necessary, cut any heavily rusted areas from the panel using tin snips.

NOTE: Do not attempt to fill an overly large hole with body filler as the structural strength of the panel could be affected. If the hole is too large to be filled with plastic body filler or a small metal patch as later described, the vehicle should be taken to a competent panel beating shop where a new metal piece can be welded in.

(3) Treat the rusted area with a rust converting liquid.

(4) Using a ball pein hammer tap down the edge of the hole, this will provide a tapering edge to the hole thus promoting the adhesion of the body filler.

(5) Cut a piece of perforated metal or close mesh wire screen to a size approximately 15mm larger than the hole to be filled.



Line drawing showing correct relationship of body filler, perforated metal and panel.

(6) Mixup a small amount of body filler following the manufacturers instructions and apply a small quantities of the filler to the perimeter of the perforated metal or wire screen.

(7) Place the perforated metal or wire screen over the hole, but from the rear of the panel and push it firmly into place.

(8) Allow the body filler to set, mix up a quantity of body filler following the manufacturers instructions and apply it to the affected area of panel and finish off as described under the appropriate heading later in this manual.

NOTE: Ensure that the body filler is forced through the holes in the perforated metal or wire screen to provide a good bond.

HOW TO REPAIR RUST HOLES USING A FILL-IN-ONE TYPE PRODUCT

As an alternative to the previously described methods of repairing rust holes the following procedure may be followed:

(1) Using a paint stripper, disc sander or scraper remove all traces of paint or underbody sealer from the rusted area and its surrounds on the front and rear of the panel.

(2) Where necessary, cut any heavily rusted area from the panel using tin snips.

NOTE: Do not attempt to fill an overly large hole with body filler as the structural strength of the panel could be affected. If the hole is too

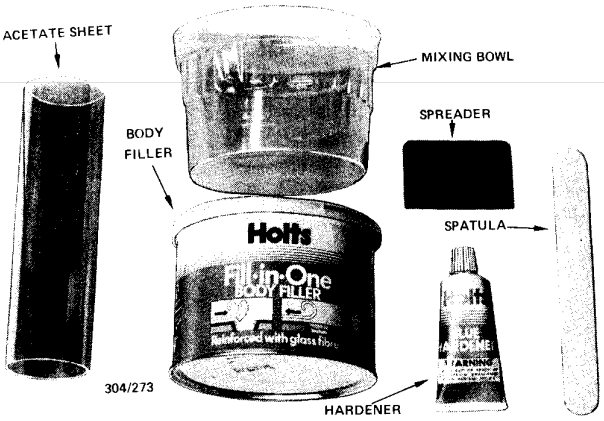
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large to be filled with body filler or a metal patch as later described, the vehicle should be taken to a competent panel beating shop where a new metal piece can be welded in.

(3) Treat the rusted area with a rust converting liquid.

(4) Using a ball pein hammer tap down the edge of the hole, this will provide a tapering edge to the hole thus promoting the adhesion of the body filler.

(5) Using masking tape secure the acetate sheet provided in the repair kit squarely over the hole to be filled.



Contents of Fill-In-One body filler kit.

(6) Using of felt tipped pin draw the outline of the hole on the sheet.

(7) Mix a quantity of filler as described in the manufacturers instructions of the product being used.

(8) Remove the acetate sheet from the panel lay it on flat surface and apply the filler to the sheet ensuring that it is kept within the drawn outline of the hole.

NOTE: Apply the body filler to the sheet on the opposite side to which the outline of the hole has been drawn.

(9) Apply the acetate sheet and filler to the hole ensuring that the drawn outline matches the outline of the hole.

(10) Tape the sheet into position while stretching it gently to ensure a smooth finish.

(11) Allow the filler to dry for the recommended amount of time, then peel off the acetate sheet.

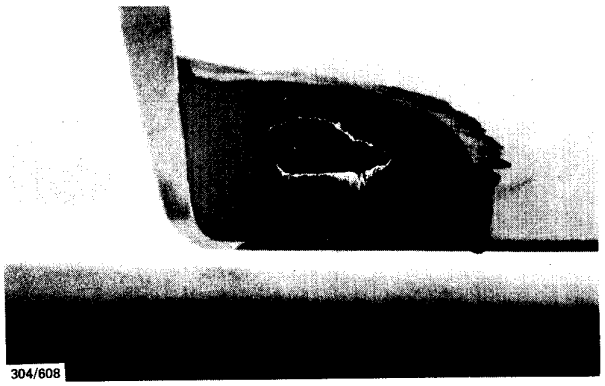
Any excess filler can be removed using a wet or dry abrasive paper and liberal quantities of water.

(12) Any hollows or holes in the filler may be built up using a fresh mixture of body filler applied with a spatula.

HOW TO REPAIR RUST HOLES USING A SOLDERED METAL PATCH

As an alternative to the previously described methods of repairing rust holes the following procedure may be followed:

(1) Using a paint stripper, disc sander or scraper remove all traces of paint or underbody sealer from the



View of rusted panel after it has been cut back using a disc sander.

rusted area and its surrounds on the front and rear of the panel.

(2) Where necessary, cut any heavily rusted areas from the panel using tin snips.

(3) Treat the rusted area with a rust converting liquid and clean the metal thoroughly.

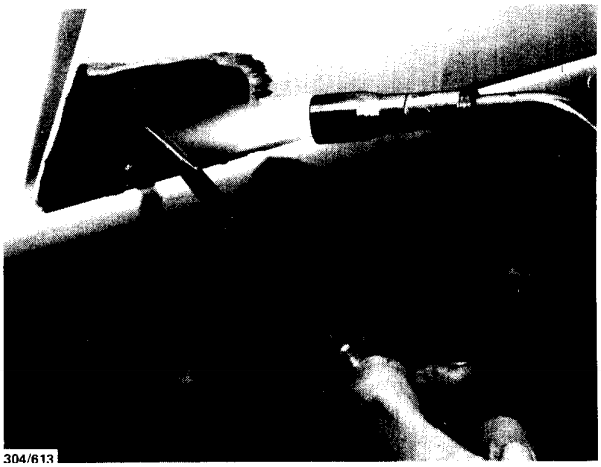
(4) Using tin snips, cut a suitable piece of metal from an old panel or metal sheet ensuring that it is approximately 10 mm larger than the hole to be covered.

(5) Using a suitable acid based flux treat the metal patch and the panel as described in the manufacturers instructions.

(6) Using a blow torch or oxy torch, heat the metal patch and panel in turn and flow a small amount of solder onto the mating surfaces.

(7) Place the metal patch centrally over the hole, hold the patch in place with a screwdriver and heat the patch and panel until the solder melts and bonds the patch to the panel.

NOTE: Hold the patch in place with the screwdriver until the solder has solidified completely.



Apply the heat to the solder coated metal patch while holding it in place with a screwdriver.

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(8) Once the solder and areas of metal have cooled completely, tap down the area of the patch until it is flush with the surrounding area of panel.

(9) Remove all traces of flux and excess solder from the repaired area.

(10) Fill any indentations in the surface using body filler and finish off as described later in this manual.

5. PANEL DAMAGE

WORKING METAL

Introduction

There are many operations required to completely rectify any damage to a body panel. The actual working of the damaged panel with hammers, dollies etc, is an important aspect of any repair job.

The need to analyse the extent of damage and its origin is an important aspect of the repair job. It is a waste of time trying to repair any damage starting at the point of impact, unless the damage is very minor, without relieving any strain in the surrounding metal. In some cases where the damage is minor and the strain around the damaged area is equal the panel may possibly be completely restored by bumping out the damage with the hand.

The various operations required to repair damaged body panels are described under the following headings.



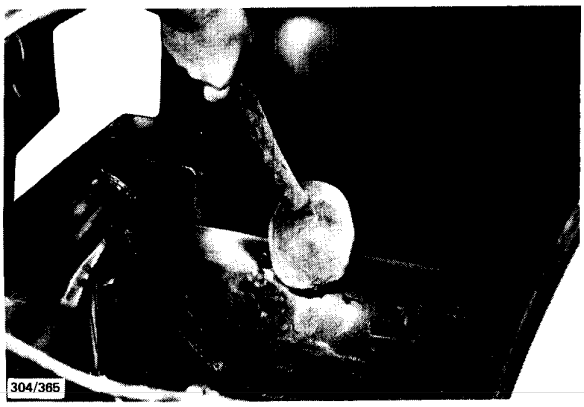
View of vehicle showing extent of panel damage prior to commencing repair operations.

Roughing Out

Roughing out is the first step in the repair of any major panel damage. Its main function is to bring a damaged panel into something resembling its proper shape prior to hand bumping.

A copper hammer is used initially on the areas of severest damage, always taking care not to stretch the metal.

NOTE: Before starting to rough out the panel damage, ensure that there is sufficient space behind the panel in which to work. If necessary, remove all trim and thoroughly clean the underside of the panel to remove all traces of dirt or underseal.



Roughing out the damaged area using a mallet.

Using the copper hammer strike blows from the underside of the panel to the centre of each large dent, but do not attempt to fully repair the damage at this stage as stretching of the metal will result.

Once the panel is starting to form a state resembling its original shape, the copper hammer should be changed for a mallet which can be used to remove even more damage but lessening the chance of stretching the metal.

On sections of damaged panel which normally have a curve it can prove advantageous to use a body spoon in conjunction with the copper hammer to return the metal to its correct shape without causing additional dents.

Having roughed out the areas of greatest damage and the panel is beginning to resemble its original shape the next step in the repair procedure is hand bumping.



Using a caulking chisel to restore the damaged panel to its original contour.

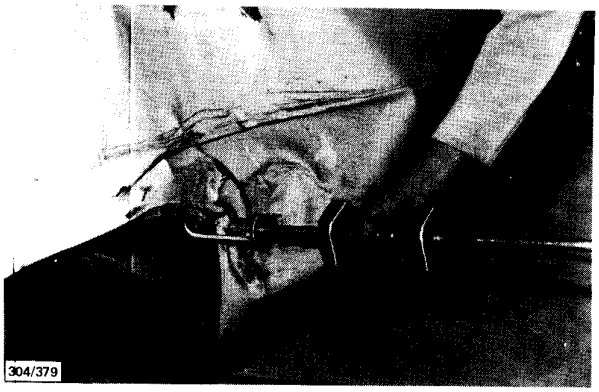
How to Use a Slide hammer

The use of a slide hammer to pull out a damaged panel may prove necessary where access to the rear of the panel is not possible.

Care should be exercised when using a slide hammer as it can be very easy to tear or stretch the metal panel.

Various methods of attachment are possible with the slide hammer, the two most popular methods being; (1) Attaching the slide hammer to the edge or seam of a dam-

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Using a slide hammer with a hook type attachment.

aged panel. (2) Drilling a hole in the damaged panel and screwing a self tapping (P. K.) screw attachment on the slide hammer into the hole.

In the cases where a slide hammer is necessary it may also not be possible to planish the panel to a smooth surface so a body filler will have to be used.

Because of the slide hammers limitations it should only be used to 'rough out' a panel.

Hand Bumping

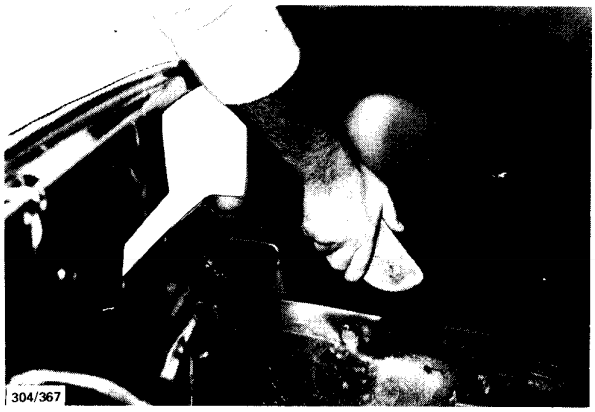
Hand bumping while being a relatively simple operation requires more care to be taken than when roughing out.

The object of hand bumping is to reduce the damaged area still further and at the same time working the panel to the original shape.

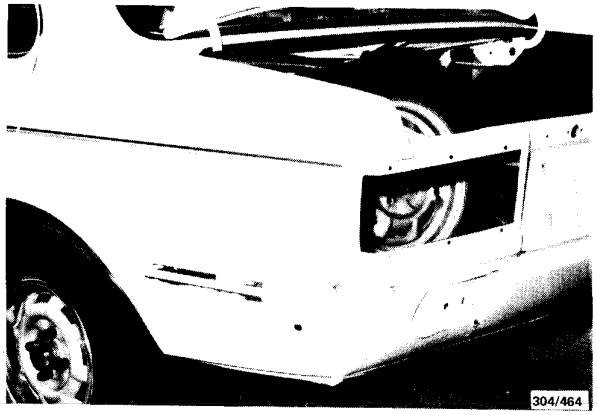
Select a dolly with a head approximately the same shape and of a lesser radius curve than the panel being repaired.

NOTE: It may be necessary to change the type of dolly used during the repair operation if there are different contours in the same panel.

Place the dolly on the underside of the panel with its head pushed hard up against the ridge of a buckle. Using a mallet lightly strike the opposite side of the panel directly over the area supported by the dolly. Using this procedure the dolly is used as an anvil.



Using a hand dolly to hand bump the damaged area.



View of the damaged area after completion of the roughing out and hand bumping operations.

After each blow of the mallet, move the mallet and dolly over and around the area of buckling, ensuring that at all times the dolly is directly below the area struck by the mallet.

Where necessary to raise areas that are below the level of the surrounding panel the dolly can be employed to bump up the depressed area. Where the depressed area is extensive a wide body spoon may be employed.

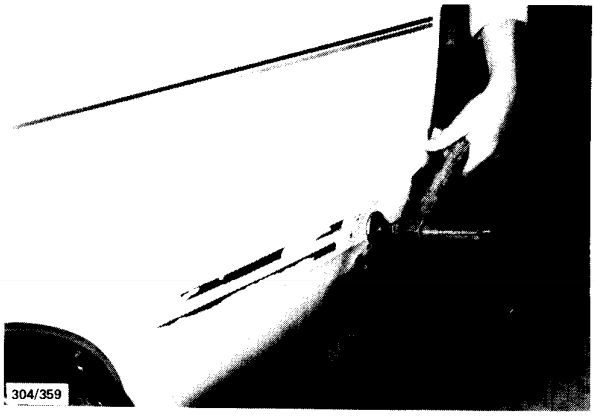
Once the hand bumping operation is completed and the entire panel is beginning to assume its normal shape, the series of minor indentations that remain may be removed by the method called planishing.

Planishing

Planishing is the method used to fully restore a damaged panel to its original shape. Planishing is used after the roughing out and hand bumping operations of an extensively damaged panel or for the repair of minor panel damage.

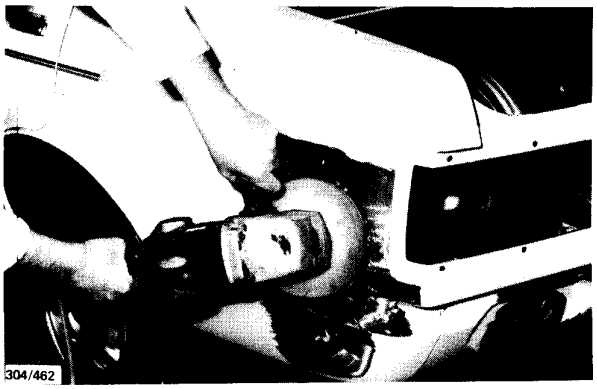
When damaged areas cannot be planished due to limited access, the damaged area may be restored to its original finish using body filler as described under a later heading.

Planishing is similar in procedure to hand bumping



Using the planishing head of a panel beating hammer to repair the damaged area.

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Removing the old paint finish from the damaged area using a disc sander.

except that a specialised type of hammer is used and much lighter blows are struck. Light blows are essential in planishing as heavy blows may cause stretching of the metal which would necessitate hot shrinking.

Place the dolly under the area to be worked and lightly strike the panel directly above the dolly using the planishing hammer. Move the dolly and hammer over the damaged area to reduce the buckles and indentations.

By using the hand to 'feel' the panel during the planishing process any high or low spots can be felt and removed by planishing.

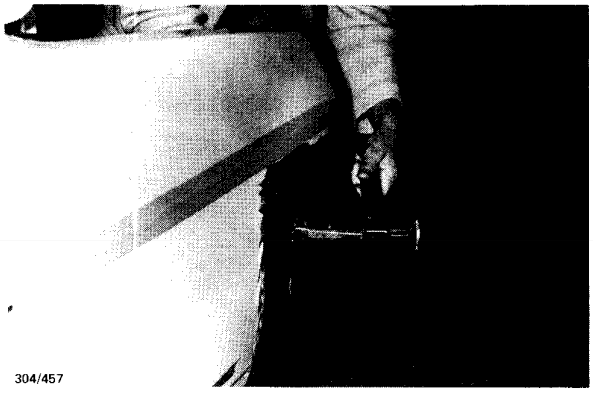
Where necessary to raise areas that are below the level of the surrounding panel the dolly can be employed to bump up the depressed area.

NOTE: It is recommended that only a small section of panel be planished at one time.

When you are satisfied that a section of damaged panel is reasonably smooth, the area should be cleaned with a body file or disc sander until bare metal is showing.

NOTE: Take care when cleaning a section of panel with the body file or disc sander as flat spots can develop. Do not remove more metal than is necessary to clean the section.

The cleaning procedure will also assist in showing up any low spots on the panel. Low spots will show up immediately as areas where the paint has not been removed.



Using a pick hammer to bring down any high spots in the damaged area.

The planishing procedure should be repeated until as many low spots as possible are removed.

To assist in obtaining a good surface finish when planishing, the face of the planishing hammer should be smeared with turpentine or ordinary machine oil.

Ensure that the faces of all hammers and dollies are free from surface blemishes otherwise any imperfections on the tool faces will be transfered to the panel.

When you are satisfied that the panel is returned to its original shape and surface finish it is now ready to be painted.

HOT SHRINKING

Description

Hot shrinking is possibly the single most important operation of any panel repair. Because of the properties of steel any deformation of a panel will cause the metal to be stretched. Hot shrinking is normally the method used to remove any stretching from the metal.

The shrinking process is achieved by bringing the stretched metal into a common area and then, by applying heat to this area, the metal is upset, which reduces the metals surface area causing it to shrink.

Tools and Equipment Required

Before commencing the job all the tools and equipment required to carry out the process should be placed conveniently so that they will fall quickly to hand when required.

The tools and equipment required to carry out the hot shrinking process are as follows:

Oxygen/acetylene welding outfit.
Mallet.
Planishing hammer.
Dolly.
Wire Brush.
Scraper.
Damp cloth.

The oxy/acetylene welding outfit is the medium used to apply the heat.

The mallet is used because its large soft surface avoids stretching the panel unnecessarily.

The planishing hammer is used for the final smoothing process of the metal surface.

The dolly, which should have less of a curved surface than the panel, is used in conjunction with the mallet or planishing hammer.

The wire brush is used to remove any burnt paint which may tend to flake off and burn the operator during the shrinking process.

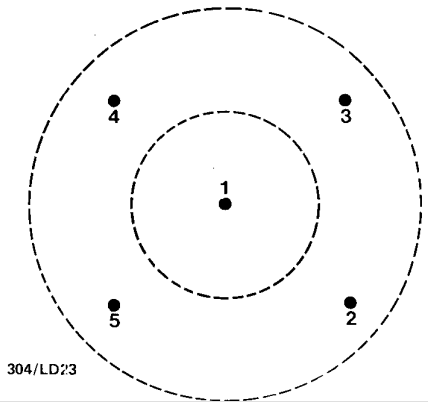
The scraper is used to remove any underbody sealer or sound deadening material from around the area to be heated to prevent it igniting.

The damp cloth is used to localise the heat so preventing warpage of the surrounding undamaged area.

Application of the Heat

When applying heat to the area of the panel to be shrunk care must be exercised to reduce the spread of heat throughout the panel surrounding the 'hot spot'. The

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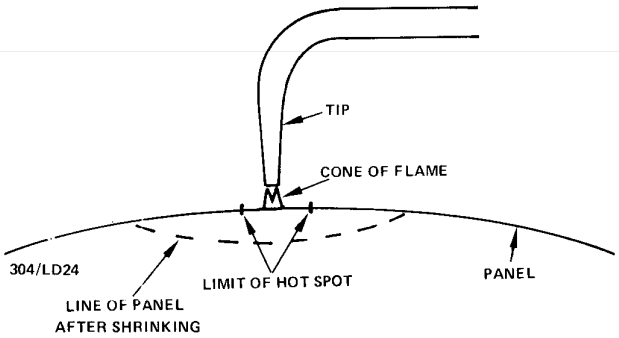
Line drawing showing the suggested sequence of hot spots to shrink a stretched area of panel.

spread of heat is best controlled with a damp cloth applied to the surrounding areas. To minimise the possibility of spreading the heat through the panel a hot flame is required so that the heating is done quickly.

The tip size recommended when using a standard blowpipe is a number 10.

The flame should be held with the cone of the flame not quite touching the panel and at 90 deg. to the surface. Care must be exercised when using this method to heat the panel as it is quite easy to blow a hole in the panel.

The size of the hot spot is critical, for effective shrinking of the metal the hot spot should be no larger than 12 mm in diameter. The area of the hot spot should be heated until it is a bright red.



Line drawing showing correct positioning of oxy/acetylene flame for shrinking a stretched area of panel.

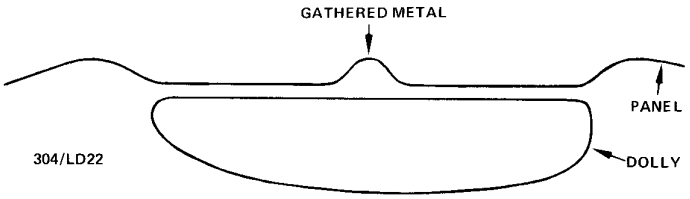
To Shrink Metal

(1) Using the oxy torch make the first hot spot in the centre of the stretched area.

(2) Quickly hold the dolly directly under the hot spot and using the mallet, hammer the area around the hot spot. This will force the surplus metal into the area of the hot spot.

(3) Ensuring that the hot spot is still a dull red, and using the mallet, hammer directly onto the hot spot, thereby upsetting the metal and removing the gathered excess metal.

(4) By repeating the above operations in ever increasing circles around the original hot spot the stretching of the panel can be eliminated.



Line drawing showing dolly correctly positioned for the reduction of the gathered metal in the centre of a shrink area.

NOTE: After each shrinking operation cool the panel using a damp cloth.

(5) Once the shrinking process has been completed planish or fill the remaining surface imperfections.

NOTE: When shrinking areas on panels with a concave surface it is advisable to work from the inside of the panel as the outer surface of the panel will not be marked and a more effective shrink will be obtained.

6. PANEL REPLACEMENT

In some cases of panel damage where the panel is simply bolted to the vehicle it may prove cheaper to purchase a second hand panel from a wreckers yard and replace the panel complete. Ensure that the panel being purchased is in a sound condition ie: no hidden rust or excessive amounts of body filler from a previous repair job.

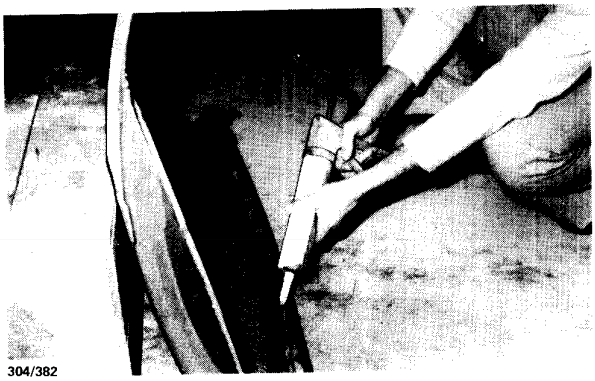
PRECAUTIONS

(1) Remove all trim and lamps etc. from the old panel before removing it from the vehicle.

(2) Take care when removing the retaining nuts or bolts as they may be seized on their threads due to rust. Normally a liberal amount of penetrating oil applied to the nut or bolt will free it up.

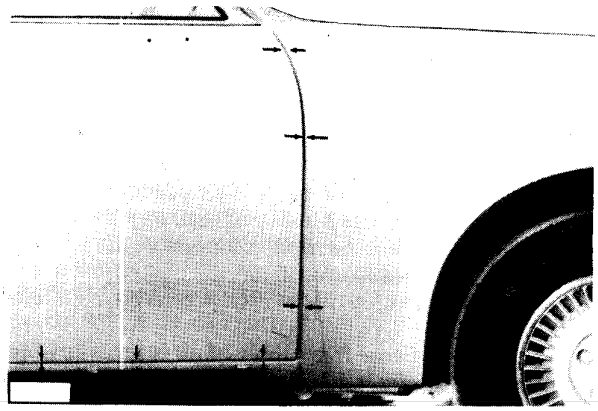
(3) Where possible mark the installed position of the panel, especially in the cases of doors etc, to ensure correct alignment on installation.

(4) Ensure that there is no damage to the underlying structure and supports of the panel being renewed. If



Applying caulking compound to the mounting surface of a replacement panel.

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View of vehicle showing the panels correctly aligned. The gap between the panels should be even at all points.

damage is evident it must be repaired before the replacement panel is fitted.

(5) Before installing the replacement panel, clean all mating surfaces on the vehicle and the panel and apply a suitable sealer to the mating surfaces to prevent the ingress of dirt or water.

(6) Using the surrounding undamaged panels as a guide adjust the position of the panel until the gaps between the adjoining panels are uniform.

7. PLASTIC BODY FILLERS

DESCRIPTION

Plastic body fillers although not as strong as lead have the advantage of ease of application and finishing off.

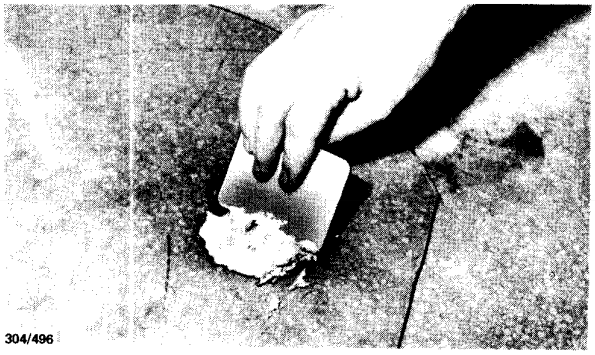
Where heat is necessary to apply lead to a metal surface, plastic body fillers are simply wiped on after the hardening agent is mixed in.

HOW TO USE PLASTIC BODY FILLERS

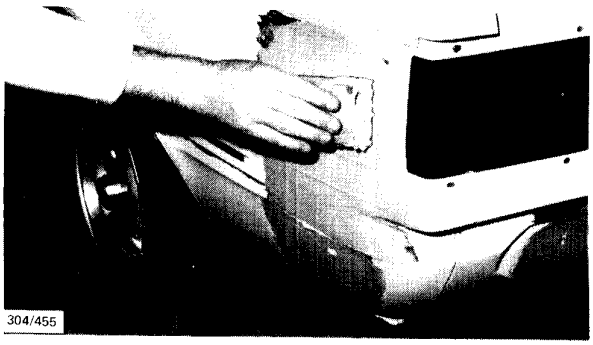
(1) Ensure that the area to the filled is completely cleaned of all paint, dirt, grease and oil etc.

(2) Using a suitable clean, flat area mix the required amount of filler and hardener as per the manufacturers instructions.

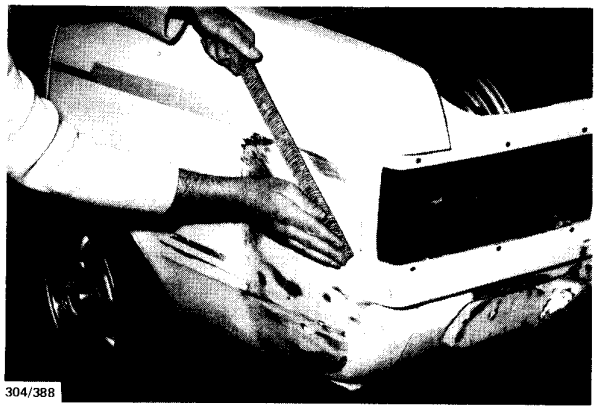
(3) Using a suitable squeegee, and a small amount



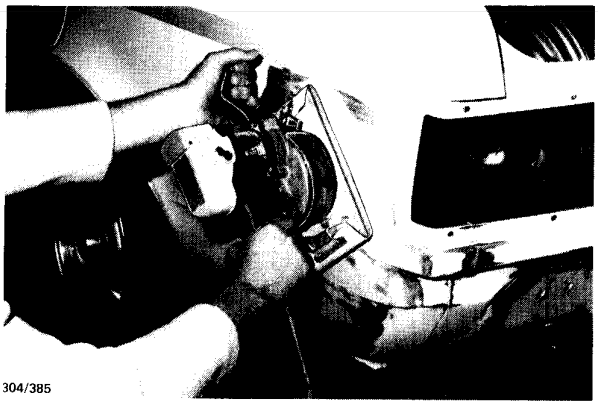
Mixing plastic body filler on a flat pane of glass.



Applying the plastic body filler to the damaged area using a rubber squeegee.



Using the blade from a flexible body file to remove excess plastic body filler.



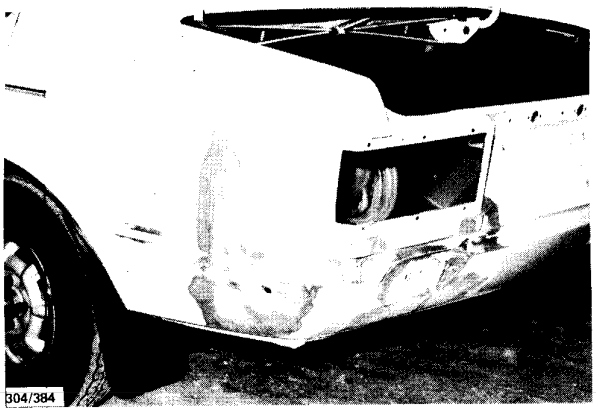
Smoothing the plastic body filler using an orbital sander.

of filler at a time, apply the filler to the panel until the filler is built up slightly above the level of the surrounding panel.

NOTE: The body filler should be applied as quickly as possible as it becomes impossible to work into indentations if it hardens too much before application.

(4) Allow the filler to harden slightly and if necessary remove any excess filler using a cheese grater file or flexible body file blade.

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View of the repaired area prior to applying the primer/surfacer. Note the properly feathered edges.

(5) Allow the filler to harden completely and remove any excess filler using coarse abrasive paper with a wooden block as a backing or alternatively by using a speed file or orbital sander.

NOTE: As body filler shrinks as it hardens it may be necessary to apply a second layer if it sinks below the level of the surrounding panel.

(6) Using 320 grade wet or dry abrasive paper with a rubber block as a backing, and using liberal amounts of water, smooth the body filler until it is level with surrounding panel.

NOTE: The 320 grade paper can also be used to feather the edge between the repair area and the surrounding paintwork.

Where low spots or holes are evident in the finished filler, it will be necessary to apply another coating of filler to raise the surface to the correct level.

8. FUNDAMENTALS OF SPRAY PAINTING

PREPARING A WORK AREA

A special area should be set aside for the painting of the vehicle, ideally the area should be under cover, flat, well lit with natural light, dust free, well ventilated and large enough to permit easy access to all areas of the vehicle. Local council regulations and the affect of spray painting on neighbours should also be taken into account. A clean water supply is also desirable to assist in the wet sanding process.

SELECTING AN AIR COMPRESSOR

To carry out satisfactory spray painting, adequate supplies of clean, moisture free compressed air is necessary. The type of compressor required for the job to be undertaken is best discussed with the supplier from whom the compressor is to be purchased or rented.

NOTE: If purchasing an electric motor type compressor, it is recommended that a compressor with an automatic cut out switch be purchased to prevent unnecessary running of the motor and compressor.

The compressor should be drained of water before and after each use.

PRESSURE REGULATOR/FILTER

The pressure regulator/filter is an essential piece of equipment which supplies a constant head of pressure and clean moisture free air. As most compressors are capable of a much higher pressure of air than is required the pressure regulator is used to lower the pressure available to the spray gun.

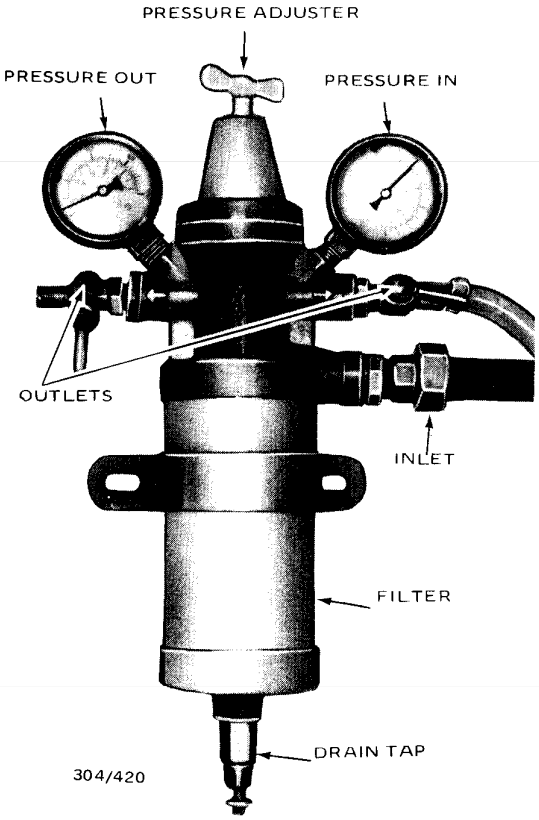
As a clean moisture free supply of air is necessary for spray painting the filter is an essential requirement. The filter should be periodically drained of water and cleaned.

AIR HOSES

An air hose that will reach from the air compressor easily to any part of the vehicle is necessary. Ideally the hose should be reinforced nylon or rubber with an inside diameter of 8 or 9.5 mm.

The inside diameter of the hose should not be less than 8 mm as excessive pressure drop will occur.

The air hose should always be cleaned of all dirt, water and oil etc after each use. Never run over, kink or exert a sharp pull on the hose.



Air pressure regulator/filter.

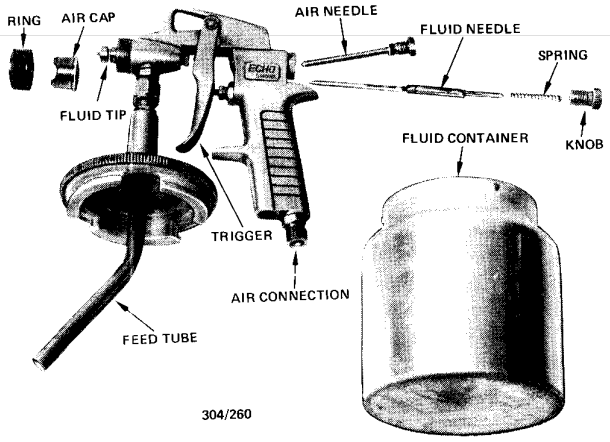
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SPRAY GUNS

Description

The automatic paint spray gun is a delicate piece of equipment and as such should be treated with care.

The spray gun uses air to atomize the paint into a sprayable mixture. The gun can be fed with paint by suction, pressure or gravity. The spray gun normally used for general spray painting is a suction feed type with an underslung one litre paint container. In this type of gun the paint is sucked from the container by the air stream which is directed by the air cap at the front of the gun.



Dismantled view of spray gun main components.

The main component parts of the spray gun are as follows:

(1) The air cap or nozzle which has a variety of functions ie: atomizing the paint, controlling the spray width and pattern and providing the suction to lift the paint from the container.

(2) The fluid tip or nozzle, which is located directly beneath the air cap, metres the correct amount of paint required.

(3) The needle which is located behind and projects into the fluid tip. The needle is connected to and is controlled by the trigger. The needles function is to meter the paint flow through the gun. On some types of spray gun the needle also controls the air flow.

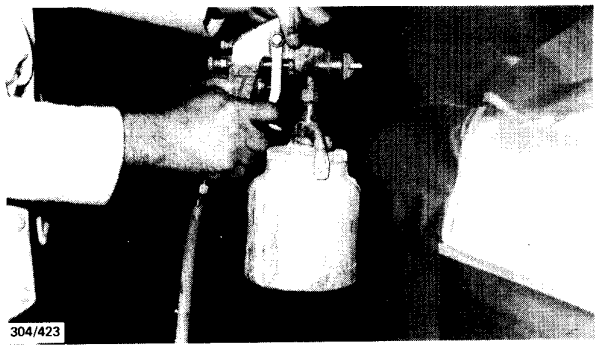
Maintenance

The spray gun must be spotlessly clean if it is to function correctly, as the smallest obstruction can cause the gun to malfunction. The following cleaning procedures should be observed at all times:

(1) After every use of the spray gun the paint container should be emptied and washed out with the correct type of solvent for the paint being used.

(2) Place some clean solvent into the cleaned paint container, instal the container and blow the solvent through the gun until all paint is removed.

(3) Using a solvent damp rag thoroughly clean the air cap. Press the rag up against the air cap and squeeze the trigger, this will force air back through the paint passages in the gun, assisting in the cleaning process.



Sometimes clogging of the spray gun can be cleared by holding a rag over the air cap and squeezing the trigger.

(4) Using the solvent damp rag thoroughly clean the exterior of the gun.

(5) Lightly apply machine oil to all the moving parts.

NOTE: Never completely immerse the spray gun in solvents, as this will cause damage to the packing glands and sealing washers.

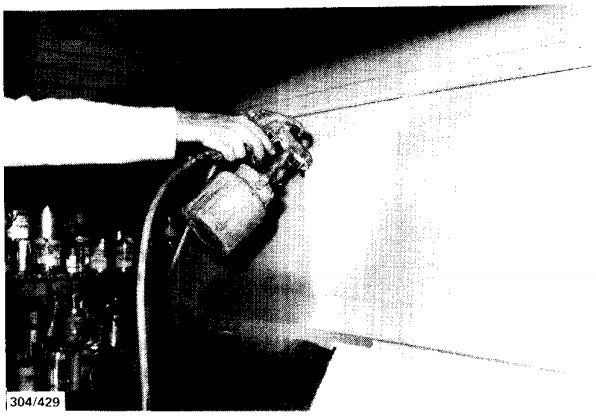
Do not use wire to clean the jets in the air cap if they become blocked as this will enlarge the jets to the detriment of the guns operation.

HOW TO USE A SPRAY GUN

The correct stroke of the spray gun is made by holding the gun 150 to 200 mm from the surface and at right angles. The full stroke of the gun should always be parallel to the surface thus ensuring an even build up of paint over the entire surface.

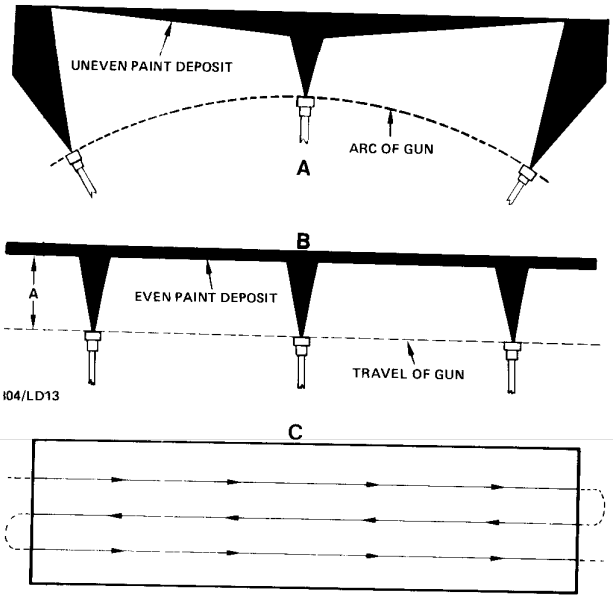
If the gun is held too close to the surface, excessive amounts of paint is deposited causing runs and sags. If the gun is held too far from the surface a dry spray and excessive overspray results.

Each stroke of the gun should overlap the preceding stroke by at least one quarter of its width, as the fan from the gun tends to thin out at the edges.



View of the spray gun held at the incorrect angle when spraying a vertical surface.

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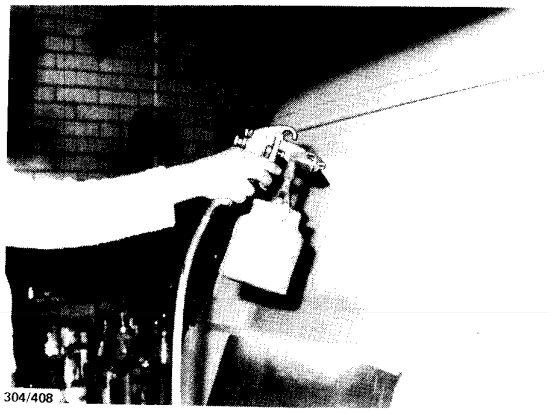


A. Line drawing showing incorrect method of spraying a panel.
B. Line drawing showing correct method of spraying a panel. Dimension A = 150 to 200 mm.
C. Line drawing showing the correct spray gun triggering procedure. Solid lines indicate where trigger is pressed, broken lines indicate where trigger is released. Aim each new stroke at the bottom of the previous stroke.

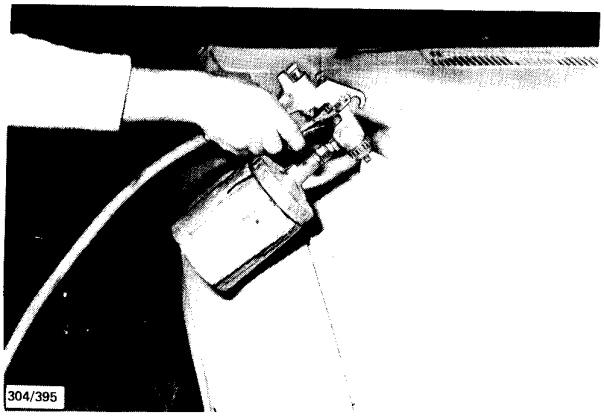
Tilting the gun up or down in relation to the surface produces an uneven spray pattern and paint deposit.

If you are satisfied that you are using the spray gun correctly but the deposit on the surface is too heavy or too light it will be necessary to adjust the fluid feed via the knob on the gun. Turn the knob slowly in the required direction until the correct spray pattern is achieved.

The trigger which controls the gun should be squeezed just after the stroke of the gun has begun and should be released just before the stroke of the gun ends. This method prevents the build up of paint at the start and the finish of each stroke.



View of the spray gun held at the correct angle when spraying a vertical surface.

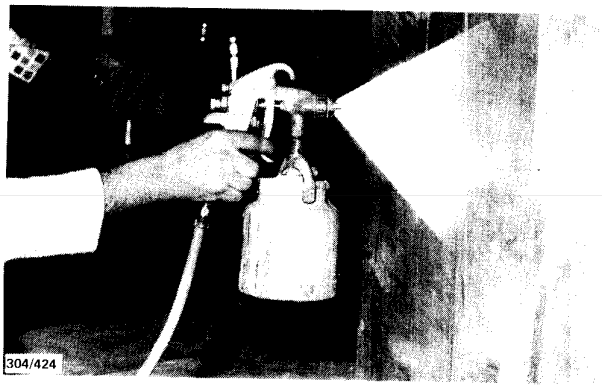


View of the spray gun held at the correct angle when spraying a horizontal surface.

When spraying horizontal surfaces hold the gun at a 45 degree angle in relation to the surface. Start at the edge closest to you and work away from the front edge. But ensure that when holding the gun at an angle paint does not leak from the fluid container seal.

Try your skill with the spray gun on an old unused panel before attempting any work on the vehicle. Any problems with technique can then be easily rectified.

A few marbles placed in the paint container will assist in keeping the paint mixed during the spraying procedures.



Checking the spray gun spray pattern and operation on a test panel. The test panel in this case is a wooden box.

PAINTING WITH AEROSOLS

It is possible, where minor repairs are being carried out, to avoid the cost of purchasing or renting spray painting equipment by using aerosol cans to apply the primer and paint finish.

Although the use of aerosol cans is thought to be a crude method of applying paint, if they are used correctly they can supply a finished surface of comparable quality to that possible with proper spray painting equipment.

Aerosol cans are available in a range of colors matching those of most popular makes of vehicle.

Precautions

(1) Ensure that the aerosol paint is compatible with the original paint finish to which it is applied.

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Using an aerosol spray can.

(2) Ensure that the paint is thoroughly mixed before application. Agitate the can vigorously.

(3) Do not apply the paint too thickly as aerosol paint tends to be very thin and will run or sag easily.

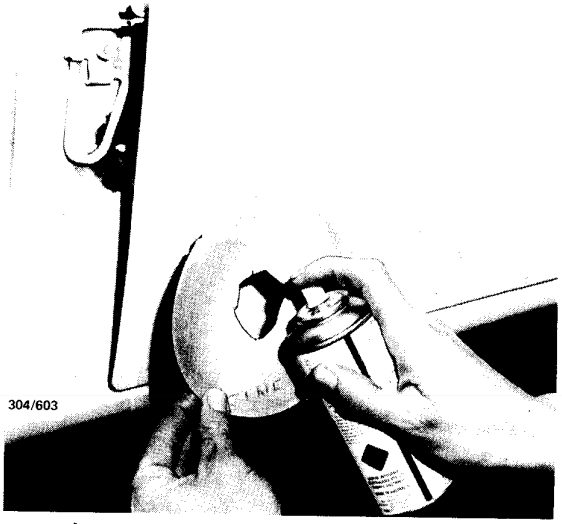
(4) Blend the aerosol paint into the area surrounding the repair by at least 50 mm.

(5) After each use of the aerosol can, invert the can and press the trigger until paint ceases to flow from the nozzle.

(6) Allow at least two weeks drying time before compounding the painted surface to blend it into the surrounding area.

(7) Follow the manufacturers directions fully when using aerosols. Take note of all cautions.

(8) Do not puncture or incinerate aerosol cans, even empty ones.



In some instances a suitable mask can be made to prevent excessive overspray when using an aerosol can for spot repairs.



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Some of the paint products that are available in aerosol cans.

BRUSH TOUCHING

Brush touching is the method used to repair small scratches and chips in a vehicle's paintwork.

Touch up paint if not supplied with the vehicle can be purchased from a new car dealer, paint supplier or automotive accessories outlet. Touch up paint is normally thicker than spraying paint and if thinning is necessary the correct type of thinner must be used otherwise the paint will be rendered useless.

A good quality, thin, camel hair brush should be purchased to apply the paint.

To Brush Touch

(1) Clean the scratch or chip of any rust, accumulated polish or dirt.

(2) Mix the touch up paint thoroughly, and using the brush apply several thin layers of paint to the scratch or chip until it is built up to the same level as the surrounding paintwork.

(3) Allow the new paint to harden for at least two weeks.

(4) After the paint has completely hardened blend it into the surrounding paintwork using a suitable cutting compound.

9. PREPARING FOR PAINTING

TYPES OF PAINT

The most commonly used type of paint currently available is acrylic lacquer as it is easy to apply, durable and quick drying.

NOTE: Acrylic lacquer must never be sprayed over nitro-cellulose lacquer or air dried enamel. Where it is necessary to apply acrylic lacquer over nitro-cellulose lacquer or air dried enamel it will be necessary to strip the old paint from the vehicle completely.

It will also be necessary to strip the entire paint finish from the vehicle if the paint has evidence of humidity blisters, underlying rust, cracks or perishing.

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REMOVING EXTERIOR TRIM

Before starting any spray painting on a vehicle, it is a good policy to remove any lamps, badges, mouldings, rubbers etc from the area to be painted. It will be found that polish, dust and dirt, to which paint cannot adhere, are trapped under and around the edges of the components.

Where exterior trim items are removed from the vehicle it is a good idea to mark each component to ensure that it is installed to its original position.

WASHING THE VEHICLE

After all the necessary exterior trim items have been removed, it is good policy to thoroughly wash the vehicle to remove any dust or dirt which may mar the finished paint surface. It is recommended that only clean water be used to wash the vehicle, but where stubborn stains persist a little detergent may be added to the water to assist in their removal.

NOTE: Where detergent has been used to wash the vehicle ensure that all traces of the detergent are rinsed from the vehicle.

Hosing out the dirt from the fenders is also recommended to assist in preventing the possibility of dust marring the final paint finish.

PAINT STRIPPING

Before stripping the paint from a panel or the entire vehicle the following points should be taken into account:

(1) Any body filler which is present under the paint finish will be softened when it comes into contact with chemical strippers and should therefore be renewed.

(2) After removal of the paint, areas of poor repair or rust may become evident and should be repaired before proceeding further with the repair job.

(3) Of the four methods of stripping paint ie. sand blasting, dry scraping, mechanical sanding and chemical strippers, chemical stripper is the easiest method available to the amateur repairer.

Masking for Paint Stripping

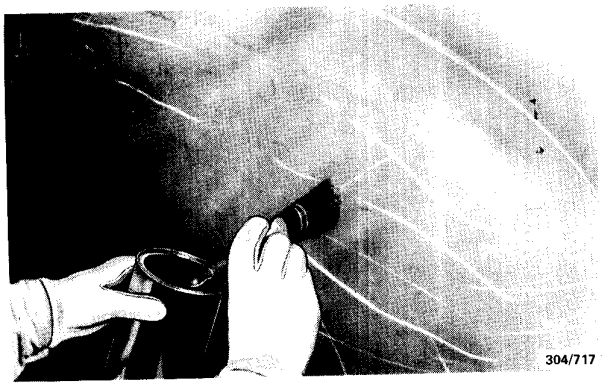
The area around the panel to be stripped or remaining exterior trim on a complete stripping job should be protected from the chemical stripper by the use of masking tape and suitable paper.

It is recommended that a number of layers of masking tape and paper be used to protect the components as the chemical stripper if left on too long will soak through the tape or paper.

The masking tape and paper should be removed and discarded immediately the stripping is completed. Any adhesive that remains after removal of the masking tape can be removed using kerosene or mineral turpentine.

Using Chemical Stripper

(1) Place the vehicle in a shaded area and away from anything that may be damaged by splashes of stripper.



Applying chemical paint striper to the paint surface using a brush.

(2) Mask the areas to be protected from the stripper as previously described.

(3) Read the stripper manufacturers instructions carefully and carry out any operations that are recommended.

(4) Using a suitable brush liberally apply the striper to the panel. Do not cover too large an area at one time as the stripper may tend to dry out.

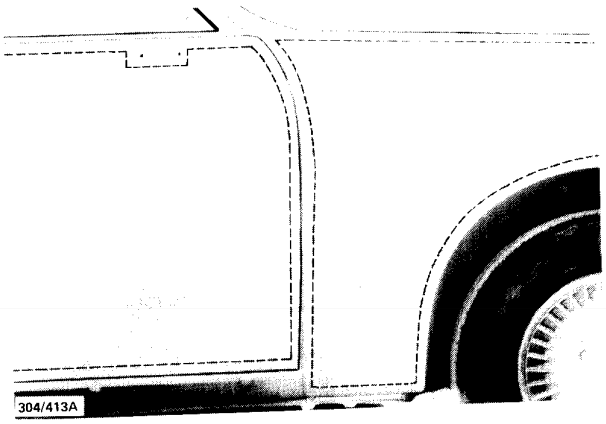
NOTE: Wear rubber gloves, protective clothing and eye protection at all times when handling chemical stripper.

When stripping to the edge of a panel or around a hole allow a border of unstripped paint to remain, to lessen the risk of stripper running inside the hole or the gap between the panels.

(5) Allow the stripper 10 minutes reaction time then apply a second coating.

(6) After allowing the second coat time to soak in, use a square edged paint scraper to remove the loosened paint.

NOTE: Have an old tin ready that will serve as a waste container for the loosened paint and the used stripper.



View of vehicle showing the correct border that should be left after using chemical paint stripper.

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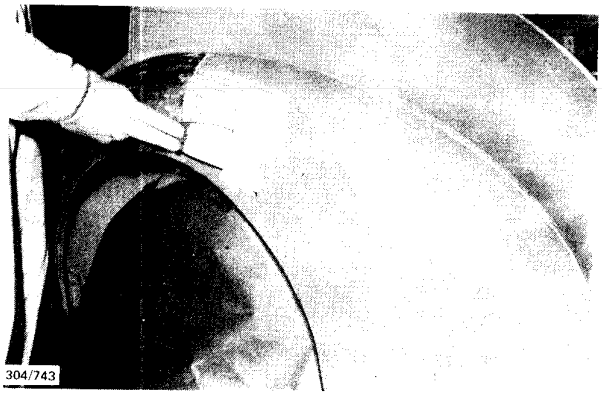
View of panel showing the paint stripper working on the paint finish.

(7) Move on to the next section to be stripped after the paint has been completely removed.

(8) When all the stripping has been completed, any remaining traces of paint or primer surfacer can be removed with steel wool soaked in stripper.

(9) Once all traces of paint, except the paint around the edges of the panel and holes, has been removed, thoroughly wash down the bare metal surface as recommended in the paint stripper manufacturers instructions.

NOTE: Any traces of stripper allowed to remain on the surface will adversely affect the new paint finish.



Using a scraper to remove the softened paint from the panel.

(10) To remove the paint remaining on the edges of the panel and holes, and to ensure a thoroughly cleaned surface, wet rub or dry sand the surface using 120 to 180 grade abrasive paper.

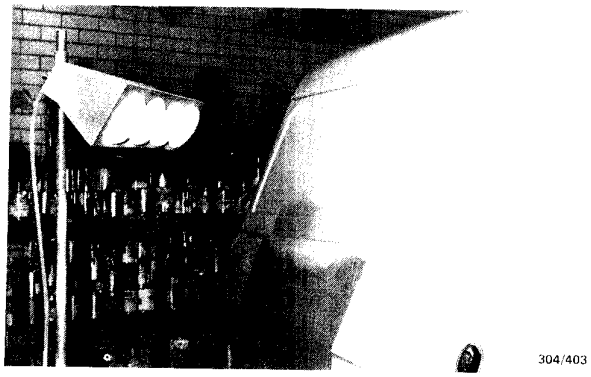
(11) Remove all masking tape and paper from the vehicle and discard.

(12) Wash the entire stripped area using a wax and grease remover as a final precautionary step to prevent contamination. Apply the wax and grease remover liberally, a small area at a time, and remove it from the surface using clean rags before it has a chance to dry.

(13) Using compressed air, blow and wipe all dust, dirt, etc. from panel joins, cracks, and door jamb areas.



Removing any remaining paint or primer surfacer using steel wool soaked in stripper.



Using heat lamps to warm the panel before painting.

(14) Using the manufacturers instructions, treat the bare metal surface with a deoxidising agent to avoid the possibility of rust being hidden in the pores of the metal.

NOTE: The deoxidising agent also etches the surface of the metal and leaves a rust inhibiting phosphate coating which greatly assists in primer adhesion.

(15) Using heat lamps warm the bare metal surfaces in preparation for priming.

(16) Referring to the manufacturers instructions spray one light coat of a suitable etch primer to the entire metal area.



Applying etch primer to the bare metal surface.

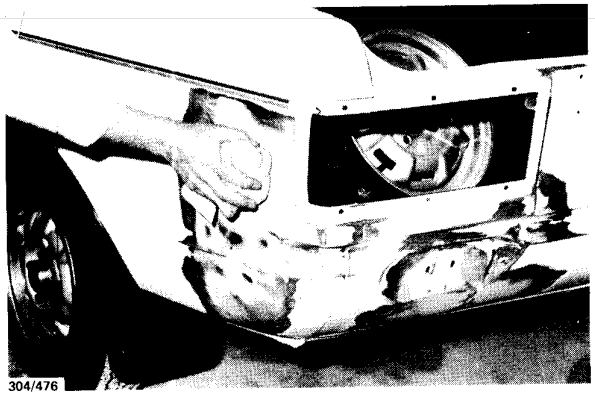
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NOTE: Etch primer should be allowed to dry for 10 to 15 minutes before applying the primer/surfacer and should never be sanded.

(17) Apply primer/surfacer to the panel and apply the paint color coats as described under the appropriate heading.

10. SPRAY PAINTING

At this stage the surface to be worked on should be either a bare metal surface with a coating of etch primer, a repaired surface with a proportion of bare metal, body filler and paint evident or a fully painted surface.



Cleaning down the repaired area prior to applying the primer surfacer using wax and grease remover.

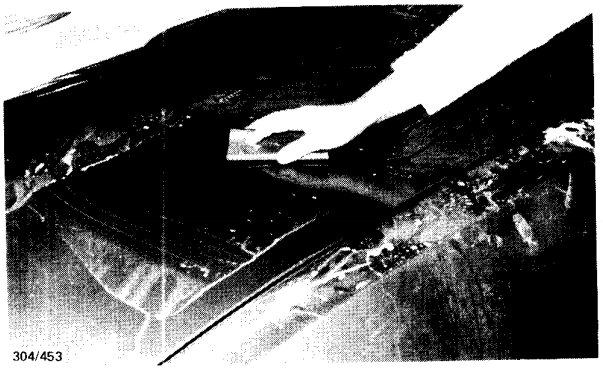
TO PREPARE THE SURFACE FOR THE PRIMER/SURFACER

Bare Metal Surfaces

Bare metal surfaces with a coating of etch primer do not require any further preparation before applying the primer surfacer. Do not sand the etch primer.

Repaired or Fully Painted Surfaces

(1) Using an orbital sander and 120 grade abrasive paper or 120 to 180 grade wet or dry paper with a rubber block as a backing and liberal amounts of water, feather back any paint edges, file marks, chips or scratches until a smooth gradual edge is achieved.



Rubbing back the old paint finish using wet or dry abrasive paper and liberal amounts of water.

(2) Wash the entire area to be painted using a wax and grease remover as a final precautionary step to prevent contamination of the new paint. Apply the wax and grease remover liberally, a small area at a time, and remove it from the surface using clean rags before it has a chance to dry.

MASKING

To Apply

The area around the panel to be painted or any remaining exterior trim or glass area on a complete respray should be protected from any overspray by the use of masking tape and a suitable paper.

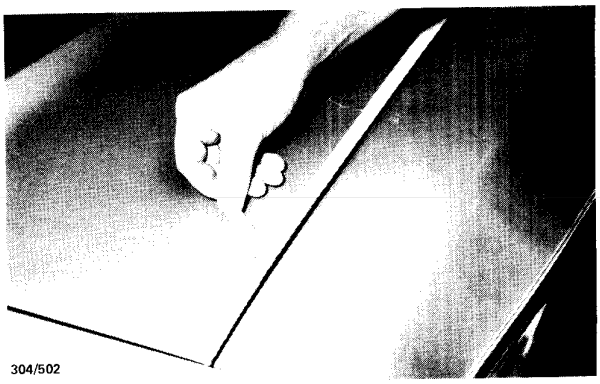
Masking tape is available in a number of widths and should always be firmly pressed into place to ensure that no overspray can contaminate the surrounding surfaces.

To Remove

Allow the paint adequate time to dry, pull on one end of the tape and remove the tape by gently pulling the tape back over itself and away from the painted surface.

Do not allow the tape or paper to touch the freshly painted surface.

Any adhesive that remains after removal of the masking tape can be removed using kerosene or mineral turpentine.



Showing the correct method of masking tape removal.

TO APPLY THE PRIMER/SURFACER

The correct type of primer/surfacer must be used to correspond with the type of paint that will be applied over the top of it, and where applicable, the type of paint to which it is applied. Check with your paint supplier if in doubt as to the type of primer/surfacer to use.

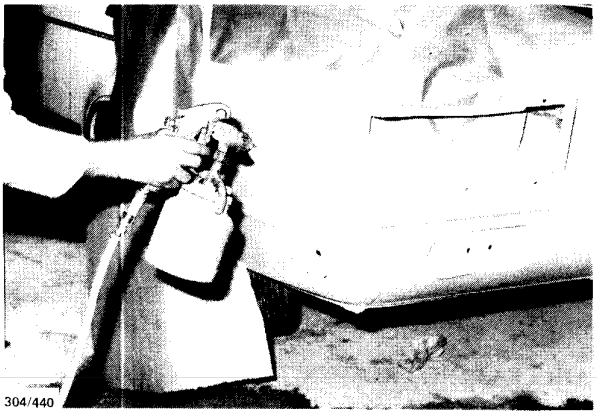
(1) Thin the primer/surfacer according to the manufacturers insructions.

(2) Adjust the feed pressure to the spray gun according to the spray gun manufacturers recommendations for primer/surfacer application.

(3) Apply two or three good heavy coats of the primer/surfacer to the surface and allow them to dry completely.

NOTE: The amount of time a primer/surfacer requires to dry completely is dependent on the type of primer/surfacer being used. Refer to

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Applying the primer/surfacer to the repaired area.

the primer/surfacer tin for the drying time required.

(4) Before sanding back the primer surfacer, it is advisable to apply a light mist coat of black paint over all areas to be sanded. The mist coat will act as a guide when sanding as it will remain in any low spots, marks or chips making these imperfections readily apparent.

(5) Using 320 to 360 grade wet and dry or open cut paper, sand back the primer surfacer until a smooth even finish is produced.

NOTE: Do not sand through the primer/surfacer as the area will have to be reprimed.

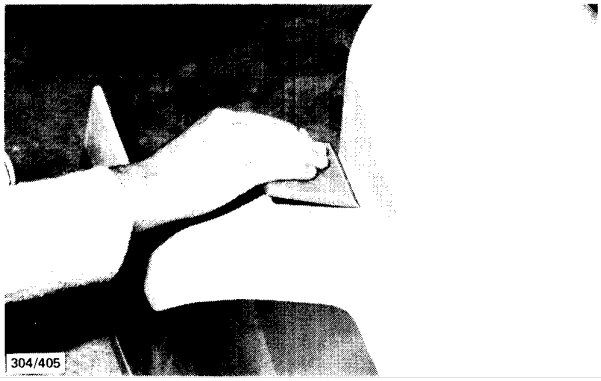
(6) Where any low spots, marks or chips are evident in the primer/surfacer fill the imperfections using a stop or spray putty following the putty manufacturers instructions.

(7) Allow the putty to dry, sand it back using 180 to 220 grade abrasive paper, apply a coat or primer/surfacer to the puttied areas. Allow it to dry and sand it back using the method previously described for the initial coats of primer/surfacer.

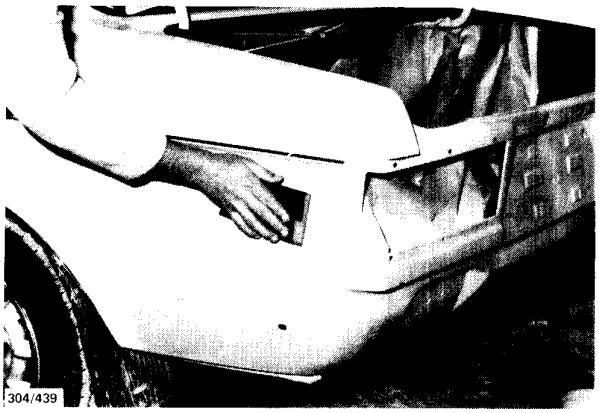
(8) Where painting over maroons or reds it is advisable to apply a few coats of bleeder sealer over the sanded primer/surfacer to prevent the pigments in the paints bleeding through and staining the new paint finish.



Applying spray putty to the repaired area.



Applying stop putty using a rubber squeegee.



Rubbing back the primer/surfacer using wet or dry abrasive paper and liberal amounts of water.

NOTE: Do not sand bleeder sealer.

(9) The area is now ready for the application of the color coats.

TO APPLY THE COLOR COATS

(1) Wash the entire area to be painted using a wax and grease remover as a final precautionary step to prevent contamination of the new paint. Apply the wax and grease remover liberally, a small area at a time, and remove it from the surface using clean rags before it has a chance to dry.

NOTE: The correct type of paint must be used to correspond with the type of primer/surfacer over which the paint is being applied. Check with your paint supplier if in doubt as to the type of paint to use.

(2) Pour the paint into a larger container and thin it according to the manufacturers instructions.

NOTE: Ensure that any pigment that remains in the bottom of the paint tin is removed, added to the paint and thoroughly mixed in.

(3) Strain the paint through muslin or an old stocking to ensure that all dirt and foreign matter is removed.

(4) Spray a small amount of thinners through the

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Straining the paint to remove all impurities.

spray gun to remove any foreign matter and to ensure that it is functioning correctly.

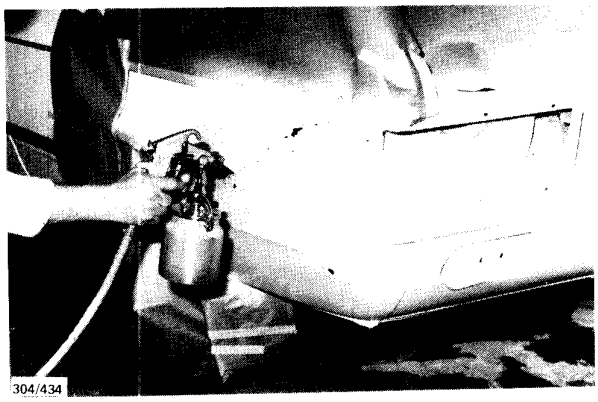
(5) Adjust the feed pressure to the spray gun according the spray gun manufacturers recommendations for the type of paint being used.

(6) Apply the color coats to the vehicle.

NOTE: As each type of paint requires a different spraying procedure and requires a different drying time, each separate procedure is not covered in this manual. The correct procedure for the type of paint being used can be obtained by referring to the paint supplier or manufacturer.

(7) Remove the masking tape and paper from the vehicle as previously described.

(8) After the paint has been allowed sufficient drying time finish off as described under the relevant heading.



Applying the final paint finish to the repaired area.

11. SPRAY GUN AND SPRAY PATTERN TROUBLE SHOOTING

FLUID LEAKING FROM NEEDLE GLAND PACKING

(1) Gland nut loose: Tighten gland nut.

(2) Gland packing dried out: Remove gland packing and soften with a few drops of oil.

(3) Gland packing damaged or worn: Renew gland packing.

FLUID LEAKING FROM FRONT OF GUN

(1) Worn or damaged fluid tip seat: Renew fluid tip.

(2) Clogged fluid tip passage: Clean fluid tip passage.

(3) Needle gland packing too tight: Loosen gland nut.

(4) Needle spring broken: Renew needle spring.

(5) Incorrect needle fitted: Instal correct needle.

AIR LEAKING FROM FRONT OF GUN

(1) Foreign matter on air valve or seat: Clean air valve and seat.

(2) Air valve seat worn or damaged: Renew air valve seat.

(3) Air valve spring broken: Renew air valve spring.

(4) Air valve stem sticking: Lubricate air valve stem.

(5) Air valve stem bent: Renew air valve.

(6) Air valve gland nut too tight: Loosen gland nut until air valve moves freely.

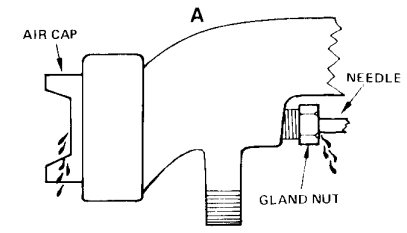
INTERMITTENT SPRAY

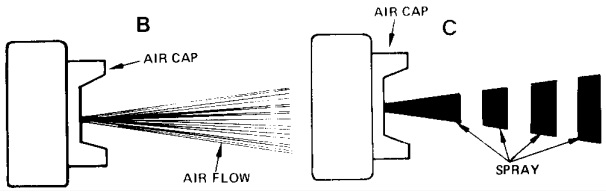
(1) Fluid container empty: Fill container.

(2) Spray gun held at too great an angle – fluid running away from pick up tube: Reduce angle of spray gun.

(3) Obstructed fluid passages: Clean gun as previously described.

(4) Loose or damaged pick up tube: Tighten or renew pick up tube.





A. Line drawing showing possible fluid leakage points from spray gun.
B. Line drawing showing possible air leakage point from front of spray gun.
C. Line drawing showing representation of intermittent spray from gun.

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(5) Loose fluid tip: Tighten fluid tip.
(6) Worn or damaged fluid tip seat: Renew fluid tip.
(7) Loose needle or air valve gland nuts: Tighten gland nut.
(8) Fluid too thick: Thin fluid to correct consistency.
(9) Clogged vent hole in fluid container lid: Remove obstruction from vent hole.
(10) Pick up tube sitting squarely on bottom of fluid container: Carefully bend pick up tube away from bottom of fluid container.

SPRAY GUN STARVING FOR AIR

(1) Air hoses or lines clogged: Clean or renew air hoses or lines.
(2) Air hoses or lines too small: Renew hoses or lines with parts of correct diameter.
(3) Air regulator/filter clogged: Clean air regulator/filler.
(4) Air compressor of insufficient capacity: Use air compressor of larger capacity.

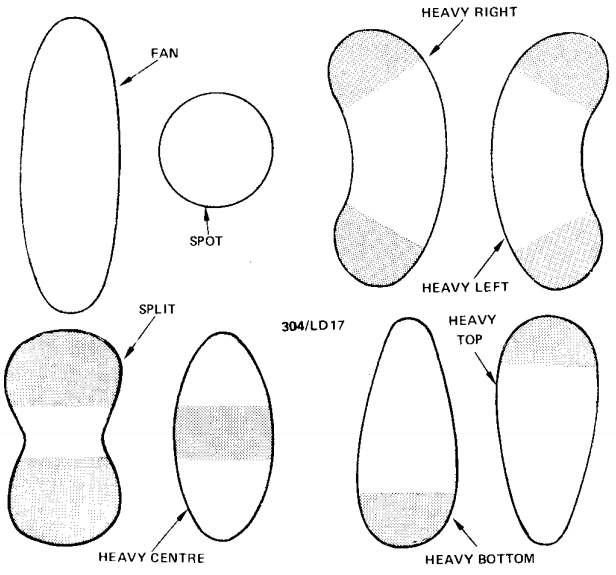
DEFECTIVE SPRAY PATTERNS

Top Heavy or Bottom Heavy Pattern

(1) Air cap jets partially blocked: Clean out air cap jets.
(2) Top or bottom of fluid tip blocked: Clean out fluid tip passage.
(3) Dirt on air cap or fluid tip seat: Clean air cap or fluid top seat.

Heavy Centre Pattern

(1) Atomising pressure too low: Increase atomising pressure.



Line drawings showing various correct and incorrect spray patterns. The fan and spot are the correct patterns.

(2) Fluid too thick: Thin fluid to correct consistency.
(3) Spray gun feed pressure too high for tip size: Reduce feed pressure.
(4) Fluid tip too large: Reduce fluid tip size.
(5) Fan adjustment incorrect: Adjust fan.

Heavy Left or Right Side Pattern

(1) Jets in left or right section of aircap partially blocked: Clean air cap jets.
(2) Dirt in left or right section of fluid tip: Clean fluid tip.

Split Spray Pattern

(1) Air flow and fluid flow incorrectly balanced: Reduce atomising pressure, adjust fluid flow and fan width.

12. PAINT DIFFICULTIES – CAUSES AND CURES

INTRODUCTION

Application and drying processes can provide ample opportunities for even high quality paint materials to misbehave. Paint materials are often blamed for imperfections in the finish, when the real cause may lie in some local condition or incorrect procedure associated with the spray equipment, the method of application or contamination of the material.

It is possible to look at an unsatisfactory paint job and determine the probable cause, but it is more important to be able to locate the source of the trouble before it starts, and so avoid bad results.

The following section is devoted to normal paint faults and some of the difficulties over which you can exercise some control. Most painting problems have simple answers, and this information will help you to rectify the most common troubles and will assist in eliminating the cause before any trouble develops.

BLEEDING

Appearance:

Pink, blue, black or brown stain showing through on the new finishing color.

Cause:

When a light color is applied over colors such as maroon or red which contain soluble dyes, or when the old surface is contaminated with bitumen, the solvents in the new finish sometimes dissolve the old color or bitumen, causing it to come to the surface, resulting in a condition which is known as 'bleeding'. Also caused by contamination of undercoats, or old color, due to overspray when bleeding colors are being used.

Cure:

(a) If bleeding colors are used, clean the spraying area and equipment thoroughly to avoid contamination.

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(b) To repaint over bleeding colors, seal off the old finish with high quality bleeder seal. To eliminate bitumen contamination, wash the surface thoroughly with mineral turps.

BLUSHING

Appearance:

A whitish coat appearing on the surface of lacquer paints only.

Cause:

Blushing and the weather are closely related.

In warm, humid weather the evaporation of the solvents from the paint lowers the surrounding temperature, causing moisture to form as tiny water droplets on the surface. Water and lacquer do not mix, with the result that some of the nitrocellulose is forced out of the solution by the water, leaving the whitish cast called 'blushing'.

The use of poor quality thinner in draughts or cold areas will also promote blushing.

Cure:

Use a higher quality thinner or continue with the present thinner, adding 10 per cent of retarder thinner. The retarder supplies the rich solvents which are necessary to avoid blushing.

To save the job that 'blushed', apply a mist coat of thinner to which retarder has been added. It is possible to apply another coat of the finishing material doped with retarder thinner, but it will be necessary to wait until the atmosphere is drier.

Avoid spraying lacquers in draughts or damp, cold areas.

CHALKING OF LACQUERS

Chalking is a natural failure of pigmented finishes because of the gradual breaking up of the paint film under weathering and exposure to the sun's rays. It results in a gradual loss of gloss and powdering of the surface.

When this condition is encountered, rub and polish the surface to remove 'dead' pigments and expose the 'live' paint film beneath.

COMPOUNDING TOO EARLY

Appearace:

Dull, dirty looking finish.

Cause:

If the lacquer is too soft when rubbed, scratching is excessive, and the compound is imbedded in the paint, cutting down the normal gloss and often giving the appearance of an off shade color. This becomes particularly evident on black, where a grey hazy tone is developed.

Cure:

Compound only after the paint has hardened sufficiently. Allow at least 4 hours or preferably overnight drying before compounding the paint finish. If the paint film is already flat allow to dry for 10 days and recompound to restore lustre.

CRAZING, CRACKING OR CHECKING

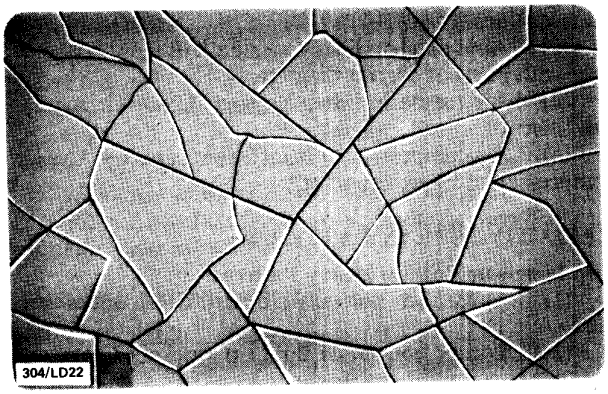
Appearance:

Development of fine irregular lines in the surface of the paint.

Cause:

These conditions, each a degree of the other, result when the top coats are applied before the undercoats are dry. The undercoats contract while drying and pull the top coat, causing it to craze, crack or check.

Also caused by too heavy coats resulting in non uniform drying throughout the paint.



Crazing, cracking or checking.

Cure:

To avoid this condition, always let undercoats dry thoroughly before spraying color coats. Weather conditions will alter drying times, so do not blindly follow a standard drying time. Do not 'pile on' coats.

HANDS ON METAL

No matter how clean the hands may seem, there is always some dirt, grease, oil or perspiration which will cause blistering and poor adhesion. Keep bare hands off the surfaces to be painted.

In motor vehicle assembly plants the vehicle body is never directly touched with human hands after being chemically cleaned, the operators wear cotton gloves. This is good practice for all painters to follow.

HUMIDITY BLISTERING

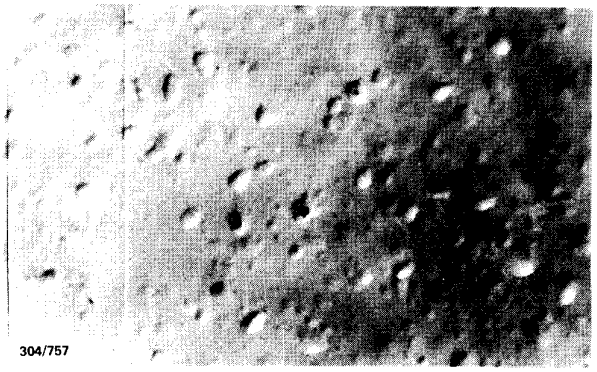
Appearance:

Fine pimply blisters which occur in conditions of extreme humidity and high temperatures. Most common in tropical areas. These blisters will often 'settle back' when atmospheric humidity reduces.

Cause:

Weakness in adhesion of finish to undercoat, alternatively poor adhesion of undercoat to metal. No paint is impervious to moisture which, under extreme conditions

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Blistering.

will permeate the paint as a liquid, and later emerge as a vapour. Any weakness in the paint system will allow the moisture to condense and form a globule which becomes a blister.

Cure:

When the blisters do not break, moisture will evaporate of its own accord, and the paint film will resume its original appearance. Broken blisters must be sanded back to either the undercoat or metal, wherever the blister started, and repainted.

LIFTING

Appearance:

Swelling of the paint finish in sections generally followed by sinking back, leaving dull streaks or patches.

Cause:

(a) Application of paint finish over a surface from which wax, grease, polish or other foreign matter has not been completely removed.

(b) Improper time between coats allowing solvents to feed on soft primers or undercoats.

(c) Heavy initial finishing coats.

Cure:

(a) Always clean the old surface with a wax and grease remover to remove wax, grease, etc., especially from abrasive paper scratches, before painting.

(b) Allow undercoats time to dry thoroughly. Follow the directions and avoid excessively heavy applications which may prevent thorough drying.

(c) Except where specified, the first coats of the paint finish should be light coats which seal off the undercoats.

ORANGE PEEL

Appearance:

Rough, wavy finish, like the peel of an orange.

Cause:

Improper atomisation.

(b) Faulty handling of spray gun.

(c) Insufficiently thinned material.

(d) Poor quality thinner.

(e) Wrong grade of thinner.

Cure:

(a) Ensure correct atomisation of materials.

(b) To avoid a poor spraying technique, use the arm in full long strokes, paralleling the surface with as little wrist action as possible. Hold the gun at right angles to and 150 to 200 mm from the surface.

(c), (d), (e) Reduce the paint with the recommended thinner only, according to the directions.

OVERSPRAY — DRY SPRAY

Appearance:

Dusty appearance on paint finish, giving sandy dotted effect.

Cause:

It is usually found where the paint finish forms a centre line on roof, bonnet and luggage compartment lid surfaces. If the left side of the vehicle is painted first, overspray appears to the left of the centre line; when the right side is sprayed first, overspray appears to the right of the centre line. At this point, the gun is held at an angle and further from the surface than at other points of the stroke.

Also caused by excessive air pressure or thinner being too fast evaporating.

Cure:

Spray side of car on which overspray appears with a wet mist coat. A mist coat is made by adding several parts of thinner to the color left in the paint container, or it may be a coat of quality thinner.

Use slow thinner with synthetic enamel. Always point the gun straight at the surface, moving it at right angles to the line of work.

PINHOLING

Appearance:

Characterised by appearance of minute holes in the paint film.

Cause:

(a) Moisture in air lines and hoses.

(b) Trapped solvents caused by excessive application and quick surface drying.

(c) Insufficient atomisation or breaking up of material.

(d) Fast evaporating thinners and excessive coats.

(e) High humidity and cool draughts.

Cure:

(a) The drain valve on the air compressor and the air regulator/filter should be opened daily to allow the drainage of collected moisture.

(b) Do not apply the materials too heavily, but spray in uniform, normal coats to allow proper evaporation of solvents. Use recommended thinners only.

(c) Increase the pressure of the spray gun for proper

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atomisation so that the overspray on the test panel shows the finest possible texture.

(d) A combination of a fast evaporating thinner and heavy coats should be avoided.

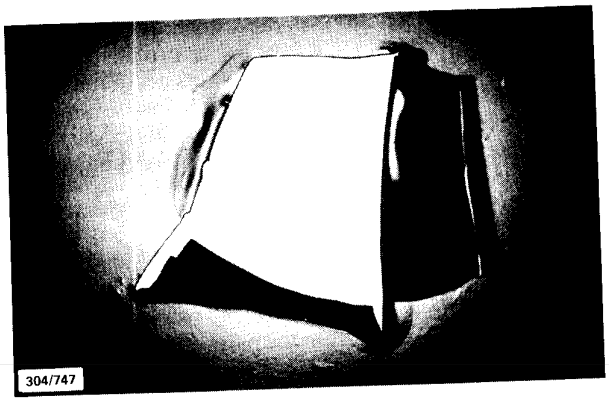
(e) When the humidity is high, avoid cool drying areas.

POOR ADHESION

Appearance:
Evident as peeling or easy removal of the paint finish.

Cause:
(a) Improper surface preparation.
(b) Incorrect undercoats.

Cure:
(a) Thoroughly clean the old finish with a wax and grease remover to remove grease, wax, polish and other foreign matter. Keep the surface clean before painting.



Poor adhesion-peeling.

(b) Use only those undercoats that are recommended for the particular paint finish being used.

NOTE: When painting bare metal surfaces always treat the metal with a high quality de-oxidising agent.

POOR HIDING

The inability of a pigmented or colored finish to completely cover or hide the color of the original surface is usually referred to as 'poor hiding'.

There is a natural tendency for pigmented paints to settle and the pigment cakes in the bottom of the container. This is especially true of products which have had thinner added to them.

If the paint is taken from the top of a paint container, without stirring, it will be lacking in pigment content. Poor hiding will result.

The answer is to stir all materials thoroughly. Do not allow thinned paints to stand any longer than is necessary before using.

Another cause of poor hiding is faulty application. Paint thickness and hiding ability are closely related. In many cases poor hiding results from too thin a paint film and non uniformity of thickness.

A third cause of poor hiding is the addition of excessive amounts of thinner.

ROUGH, DIRTY FINISH

Appearance:
Inclusion of dirt and dust in the paint finish

Cause:
Applying finish over dusty surface.

Cure:
Ensure that the surface to be painted is clean and completely free from dust.

RUNS AND SAGS

Appearance:
Apparent as running or sagging paint finish resulting from too much or too thin paint applied to surface.

Cause:
(a) Too much thinner.
(b) Too heavy coats.
(c) Too wet coats.

Cure:
(a) Thin paint as per manufacturers instructions.



Runs and sags.

(b) Reduce paint flow from spray gun.
(c) Do not hold gun too close and move at a constant speed.

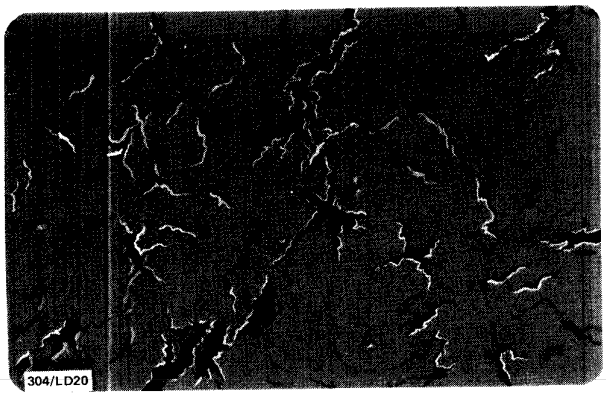
RUST UNDER PAINT FILM

Appearance:
Fine lumps or blisters growing under the paint finish.

Cause:
Presence of rust on the surface before painting. Paint will not adhere to a rusty surface.

Cure:
Ensure that all areas of rust are properly repaired or treated before applying paint finish.

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Shrinking and splitting of primer/surfacer.

SHRINKING AND SPLITTING OF PRIMER/SURFACER

Appearance:
Fine cracks in the undercoat when dry.

Causes:
(a) Improper surface cleaning.
(b) Improper feather edging.
(c) Excessive heavy coats.
(d) Insufficient drying time between coats.
(e) Fanning with air to force the drying time.
(f) Applying on cold surface.

Cure:
(a) Ensure that the surface to be painted is cleaned thoroughly.
(b) Feather edge the old finish about 50 to 100 mm back from the edge of the spot.
(c) Apply in medium wet coats.
(d) Allow sufficient time for coats to dry.
(e) Do not fan with air to force the drying as it causes surface drying only and traps thinner which penetrates scratches in the old paint finish.
(f) In cold weather ensure that the vehicle, primer/surfacer and the painting area are approximately the same temperature.

SHRINKING AND SPLITTING OF PUTTY

Appearance:
Cracks in puttied areas.

Cause:
Because putties usually dry quickly on the surface, they may remain soft underneath when applied too heavily and ultimately shrink and split.

Cure:
Apply the putty in several light coats with adequate drying time between coats.

SINKING

Appearance:
Flat spots over puttied areas.

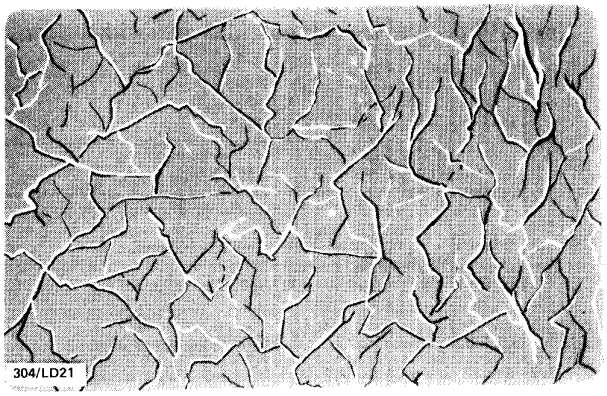
Cause:
Putty is different in porosity to normal primer/surfacers and paints, and unless it is sealed off to give uniform porosity with the remainder of the surface, the finish will sink over the puttied areas.

Cure:
Always apply putty before the last coat of primer/surfacer and sand back level with the surrounding surface. This will produce uniform porosity. If putty is applied after the primer/surfacer, always take the precaution of spot coating the finish over the puttied areas before painting completely.

WRINKLING

Appearance:
Wrinkles appearing in the paint finish.

Cause:
Too rapid surface drying can cause wrinkling. This condition retards the drying of the paint below the surface. As the paint below the surface dries it tends to shrink and thus wrinkle the dry material on top.



Wrinkling.

Cure:
Avoid spraying heavy coats and spraying in draughty or too hot or cold conditions.

13. FINISHING OFF (EXCEPT ENAMEL FINISHES)

HAND COMPOUNDING

(1) Using a 200 to 250 mm square of clean, soft cheesecloth formed into a pad. Dip the pad into a suitable hand rubbing compound, taking care not to apply too much at one time, rub the paint using brisk strokes.

NOTE: Take care not to apply too much pressure on edges or contours as it is possible to cut through the top coats and expose the primer/surfacer underneath.

It is recommended that only an area 450 mm by 450 mm be rubbed at one time until all the compound is removed or the desired finish is achieved.

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(2) Wipe over the compounded area with a clean, soft cloth to remove any excess compound.

(3) Compound all areas of new paint and, if necessary, any surrounding areas of old paint to obtain an even finish.

(4) Polish the entire vehicle to provide a protective coating for all the painted surfaces.

(5) Instal any exterior trim items to the vehicle that were removed to facilitate the repair job.

MACHINE COMPOUNDING

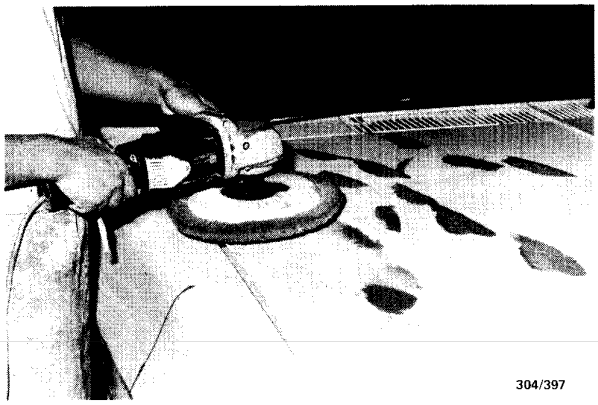
(1) Thin the compound slightly with clean water and wipe or brush it onto a 600 mm by 600 mm area of the paintwork.

(2) Using a polishing machine fitted with a lamb-swool pad, polish the compound until it is removed.

(3) Repeat the above operations until the desired finish is obtained.

NOTE: Take care not to apply too much pressure on edges or contours as it is possible to cut through the top coat and expose the primer/surfacer underneath.

(4) Wipe over the compounded area with a clean, soft cloth to remove any excess compound.



Machine compounding the paint finish.

(5) Compound all areas of new paint and, if necessary, any surrounding areas of old paint to obtain an even finish.

(6) Polish the entire vehicle to provide a protective coating for all painted surfaces.

(7) Instal any exterior trim items to the vehicle that were removed to facilitate the repair job.

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CONVERSION TABLES

Quantity	*Imperial Unit*	*Metric Unit*	*Conversion Factors (Approximate)*	
			Imperial to Metric Units	*Metric to Imperial Units*
LENGTH	inch (in)	millimetre (mm) or centimetre (cm)	1 in = 25·4 mm	1 cm = 0·394 in
	foot (ft)	centimetre or metre (m)	1 ft = 30·5 cm	1 m = 3·28 ft
	yard (yd)	metre (m)	1 yd = 0·914 m	1 m = 1·09 yd
	furlong (fur)	metre (m) or kilometre (km)	1 fur = 201 m	1 km = 4·97 fur
	mile	kilometre (km)	1 mile = 1·61 km	1 km = 0·621 mile
	(for navigation)	international nautical mile (n mile)	1 n mile = 1852 m	
MASS	ounce (oz)	gram (g)	1 oz = 28·3 g	1 g = 0·0353 oz
	pound (lb)	gram (g) or kilogram (kg)	1 lb = 454 g	1 kg = 2·20 lb
	stone	kilogram (kg)	1 stone = 6·35 kg	1 kg = 0·157 stone
	ton	tonne (t)	1 ton = 1·02 t	1 t = 0·984 ton
AREA	square inch (in^2)	square centimetre (cm^2)	1 in^2 = 6·45 cm^2	1 cm^2 = 0·155 in^2
	square foot (ft^2)	square centimetre (cm^2) or square metre (m^2)	1 ft^2 = 929 cm^2	1 m^2 = 10·8 ft^2
	square yard (yd^2)	square metre (m^2)	1 yd^2 = 0·836 m^2	1 m^2 = 1·20 yd^2
	perch (p)	square metre (m^2)	1 p = 25·3 m^2	1 m^2 = 0·0395 p
	rood (rd)	hectare (ha)	1 rd = 0·101 ha	1 ha = 9·88 rd
	acre (ac)	hectare (ha)	1 ac = 0·405 ha	1 ha = 2·47 ac
	square mile	square kilometre (km^2)	1 square mile = 2·59 km^2	1 km^2 = 0·386 square mile
VOLUME	cubic inch (in^3)	cubic centimetre (cm^3)	1 in^3 = 16·4 cm^3	1 cm^3 = 0·0610 in^3
	cubic foot (ft^3)	cubic metre (m^3)	1 ft^3 = 0·0283 m^3	1 m^3 = 35·3 ft^3
	cubic yard (yd^3)	cubic metre (m^3)	1 yd^3 = 0·765 m^3	1 m^3 = 1·31 yd^3
	bushel (bus)	cubic metre (m^3)	1 bus = 0·0364 m^3	1 m^3 = 27·5 bus
VOLUME (fluids)	fluid ounce (fl oz)	millilitre (ml)	1 fl oz = 28·4 ml	1 ml = 0·0352 fl oz
	pint (pt)	millilitre (ml) or litre (ℓ)	1 pt = 568 ml	1 litre = 1·76 pt
	gallon (gal)	litre (ℓ) or cubic metre (m^3)	1 gal = 4·55 litre	1 m^3 = 220 gal
	acre foot	cubic metre (m^3) or megalitre (Ml)	1 acre foot = 1230 m^3 = 1·23 Ml	1 Ml = 0·811 acre foot
FORCE	pound-force (lbf)	newton (N)	1 lbf = 4·45 N	1 N = 0·225 lbf
	ton-force (tonf)	kilonewton (kN)	1 tonf = 9·96 kN	1 kN = 0·100 tonf
PRESSURE	pound per square inch (psi)	kilopascal (kPa)	1 psi = 6·89 kPa	1 kPa = 0·145 psi
	atmosphere (atm)	kilopascal (kPa) or megapascal (MPa)	1 atm = 101 kPa	1 MPa = 9·87 atm
	ton per square inch (ton/in^2)	megapascal (MPa)	1 ton/in^2 = 15·4 MPa	1 MPa = 0·0647 ton/in^2
	psi	kg/cm^2	1 psi-0.070 kg/cm^2	1 kg/cm^2=14.22 psi
VELOCITY	mile per hour (mph)	kilometre per hour (km/h)	1 mph = 1·61 km/h	1 km/h = 0·621 mph
	(for navigation)	knot (kn)	1 kn = 1·85 km/h	
TEMPERATURE	temperature (°F)	temperature (°C)	$°C = \frac{5}{9}(°F - 32)$	$F = \frac{9}{5}C + 32$
DENSITY	pound per cubic inch (lb/in^3)	gram per cubic centimetre (g/cm^3) = tonne per cubic metre (t/m^3)	1 lb/in^3 = 27·7 t/m^3	1 t/m^3 = 0·0361 lb/in^3
	ton per cubic yard	tonne per cubic metre (t/m^3)	1 ton/yd^3 = 1·33 t/m^3	1 t/m^3 = 0·752 ton/yd^3
ENERGY	British thermal unit (Btu)	kilojoule (kJ)	1 Btu = 1·06 kJ	1 kJ = 0·948 Btu
	therm	megajoule (MJ)	1 therm = 106 MJ	1 MJ = 9·48 × 10 therm
	(for electrical energy)	kilowatt hour (kWh)	1 kWh = 3·60 MJ	
POWER	horsepower (hp)	kilowatt (kW)	1 hp = 0·746 kW	1 kW = 1·34 hp
TIME		second (s)		
		minute (min)	1 min = 60 s	
		hour (h)	1 h = 3600 s	
FREQUENCY	cycle per second (c/s)	hertz (Hz)	1 c/s = 1 Hz	1 Hz = 1 c/s
ANGULAR VELOCITY	revolution per minute (rpm)	radian per second (rad/s) revolution per minute (rpm)	1 rpm = 0·105 rad/s	1 rad/s = 9·55 rpm
TORQUE	lb-ft	Nm	1 lb-ft = 1.35582 Nm	1 Nm = 0.737562 lb-ft
VACUUM	inches of mercury (in Hg)	kilopascal (kPa)	1 in Hg = 3.386 kPa	1 kPa = 0.295 in Hg

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INCHES	DECIMALS	MILLI-METRES	INCHES TO MILLIMETRES		MILLIMETRES TO INCHES		FAHRENHEIT & CELSIUS E			
			Inches	m.ms.	m.ms.	Inches	°F	°C	°C	°F
1/64	.015625	.3969	.0001	.00254	0.001	.000039	−20	−28.9	−30	−22
1/32	.03125	.7937	.0002	.00508	0.002	.000079	−15	−26.1	−28	−18.4
3/64	.046875	1.1906	.0003	.00762	0.003	.000118	−10	−23.3	−26	−14.8
1/16	.0625	1.5875	.0004	.01016	0.004	.000157	−5	−20.6	−24	−11.2
5/64	.078125	1.9844	.0005	.01270	0.005	.000197	0	−17.8	−22	−7.6
3/32	.09375	2.3812	.0006	.01524	0.006	.000236	1	−17.2	−20	−4
7/64	.109375	2.7781	.0007	.01778	0.007	.000276	2	−16.7	−18	−0.4
1/8	.125	3.1750	.0008	.02032	0.008	.000315	3	−16.1	−16	3.2
9/64	.140625	3.5719	.0009	.02286	0.009	.000354	4	−15.6	−14	6.8
5/32	.15625	3.9687	.001	.0254	0.01	.00039	5	−15.0	−12	10.4
11/64	.171875	4.3656	.002	.0508	0.02	.00079	10	−12.2	−10	14
3/16	.1875	4.7625	.003	.0762	0.03	.00118	15	−9.4	−8	17.6
13/64	.203125	5.1594	.004	.1016	0.04	.00157	20	−6.7	−6	21.2
7/32	.21875	5.5562	.005	.1270	0.05	.00197	25	−3.9	−4	24.8
15/64	.234375	5.9531	.006	.1524	0.06	.00236	30	−1.1	−2	28.4
1/4	.25	6.3500	.007	.1778	0.07	.00276	35	1.7	0	32
17/64	.265625	6.7469	.008	.2032	0.08	.00315	40	4.4	2	35.6
9/32	.28125	7.1437	.009	.2286	0.09	.00354	45	7.2	4	39.2
19/64	.296875	7.5406	.01	.254	0.1	.00394	50	10.0	6	42.8
5/16	.3125	7.9375	.02	.508	0.2	.00787	55	12.8	8	46.4
21/64	.328125	8.3344	.03	.762	0.3	.01181	60	15.6	10	50
11/32	.34375	8.7312	.04	1.016	0.4	.01575	65	18.3	12	53.6
23/64	.359375	9.1281	.05	1.270	0.5	.01969	70	21.1	14	57.2
3/8	.375	9.5250	.06	1.524	0.6	.02362	75	23.9	16	60.8
25/64	.390625	9.9219	.07	1.778	0.7	.02756	80	26.7	18	64.4
13/32	.40625	10.3187	.08	2.032	0.8	.03150	85	29.4	20	68
27/64	.421875	10.7156	.09	2.286	0.9	.03543	90	32.2	22	71.6
7/16	.4375	11.1125	.1	2.54	1	.03937	95	35.0	24	75.2
29/64	.453125	11.5094	.2	5.08	2	.07874	100	37.8	26	78.8
15/32	.46875	11.9062	.3	7.62	3	.11811	105	40.6	28	82.4
31/64	.484375	12.3031	.4	10.16	4	.15748	110	43.3	30	86
1/2	.5	12.7000	.5	12.70	5	.19685	115	46.1	32	89.6
33/64	.515625	13.0969	.6	15.24	6	.23622	120	48.9	34	93.2
17/32	.53125	13.4937	.7	17.78	7	.27559	125	51.7	36	96.8
35/64	.546875	13.8906	.8	20.32	8	.31496	130	54.4	38	100.4
9/16	.5625	14.2875	.9	22.86	9	.35433	135	57.2	40	104
37/64	.578125	14.6844	1	25.4	10	.39370	140	60.0	42	107.6
19/32	.59375	15.0812	2	50.8	11	.43307	145	62.8	44	112.2
39/64	.609375	15.4781	3	76.2	12	.47244	150	65.6	46	114.8
5/8	.625	15.8750	4	101.6	13	.51181	155	68.3	48	118.4
41/64	.640625	16.2719	5	127.0	14	.55118	160	71.1	50	122
21/32	.65625	16.6687	6	152.4	15	.59055	165	73.9	52	125.6
43/64	.671875	17.0656	7	177.8	16	.62992	170	76.7	54	129.2
11/16	.6875	17.4625	8	203.2	17	.66929	175	79.4	56	132.8
45/64	.703125	17.8594	9	228.6	18	.70866	180	82.2	58	136.4
23/32	.71875	18.2562	10	254.0	19	.74803	185	85.0	60	140
47/64	.734375	18.6531	11	279.4	20	.78740	190	87.8	62	143.6
3/4	.75	19.0500	12	304.8	21	.82677	195	90.6	64	147.2
49/64	.765625	19.4469	13	330.2	22	.86614	200	93.3	66	150.8
25/32	.78125	19.8437	14	355.6	23	.90551	205	96.1	68	154.4
51/64	.796875	20.2406	15	381.0	24	.94488	210	98 9	70	158
13/16	.8125	20.6375	16	406.4	25	.98425	212	100.0	75	167
53/64	.828125	21.0344	17	431.8	26	1.02362	215	101.7	80	176
27/32	.84375	21.4312	18	457.2	27	1.06299	220	104.4	85	185
55/64	.859375	21.8281	19	482.6	28	1.10236	225	107.2	90	194
7/8	.875	22.2250	20	508.0	29	1.14173	230	110.0	95	203
57/64	.890625	22.6219	21	533.4	30	1.18110	235	112.8	100	212
29/32	.90625	23.0187	22	558.8	31	1.22047	240	115.6	105	221
59/64	.921875	23.4156	23	584.2	32	1.25984	245	118.3	110	230
15/16	.9375	23.8125	24	609.6	33	1.29921	250	121.1	115	239
61/64	.953125	24.2094	25	635.0	34	1.33858	255	123.9	120	248
31/32	.96875	24.6062	26	660.4	35	1.37795	260	126.6	125	257
63/64	.984375	25.0031	27	690.6	36	1 41732	265	129.4	130	266

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ENGINE

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3-1. Specifications and Service Data

1. Entire Engine Specifications

		Non-TURBO				TURBO
		1600	1800			1800
			MT	AT		AT
			Non-4WD	4WD	Non-4WD	4WD	4WD
ENGINE	Type	Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine				
	Valve arrangement	Overhead type				
	Bore × Stroke mm (in)	92 × 60 (3.62 × 2.36)	92 × 67 (3.62 × 2.64)			
	Piston displacement cm^3 (cc, cu in)	1,595 (1,595, 97.33)	1,781 (1,781, 108.68)			
	Compression ratio	9.0	8.7			7.7
	Compression pressure (at 350 rpm) kPa (kg/cm^2, psi)	1.206 (12.3, 175)	1,177 (12.0, 171)			1,079 (11.0, 156)
	Number of piston rings	Pressure ring: 2, Oil ring: 1				
	Intake valve timing — Opening	20° BTDC				16° BTDC
	Intake valve timing — Closing	60° ABDC		64° ABDC		68° ABDC
	Exhaust valve timing — Opening	60° BBDC		64° BBDC		68° BBDC
	Exhaust valve timing — Closing	20° ATDC				
	Valve clearances (when engine is cold) mm (in) — Intake	0.25 (0.010)		0 (0)		
	Valve clearances (when engine is cold) mm (in) — Exhaust	0.35 (0.014)		0 (0)		
	Idling speed (At neutral (or N) or P position) rpm	650 ± 100 (4-speed) 700 ± 100 (5-speed)	700 ± 100	800 ± 100		
	Engine dimensions mm (in) — Length	419 (16.50)	422 (16.61)	411 (16.18)		523 (20.59)
	Engine dimensions mm (in) — Width	701 (27.60)	712 (28.03)			736 (28.98)
	Engine dimensions mm (in) — Height	607 (23.90)				594 (23.39)
	Weight of engine without transmission kg (lb) (Oil and coolant are included)	*1: 104 (229) *2: 101 (223)	*1: 108 (238) *2: 104 (229) *3: 104 (229)	*2: 104 (229) *4: 104 (229)	*1: 99 (218) *2: 95 (209) *3: 95 (209)	*2: 95 (209) *4: 95 (209)	107 (236)
	Air cleaner element	Viscous type				
	Emission control system	*1 ① ② ③ ④ *2 ① ② ③ ④	*1 ① ② ③ ④ *2 ① ② ③ ④ *3 ② ③ ④	*2 ① ② ③ ④ *4 ② ③ ④	*1 ① ② ③ ④ *2 ① ② ③ ④ *3 ② ③ ④	*2 ① ② ③ ④ *4 ② ③ ④	*2 ① ① *4 ① ③
	Firing order	1 – 3 – 2 – 4				
	Ignition timing	BTDC 8°/650 rpm (4-speed) BTDC 8°/700 rpm (5-speed)	BTDC 8°/700 rpm	BTDC 8°/800 rpm		BTDC 15°/800 rpm

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2. Lubrication System Specifications

			SUBARU 1800	SUBARU 1600
Lubrication method			Forced feed, full flow filtration, splash type	
Oil pump	Pump type		Trochoid type	
	Discharge performance I	Discharge – Pressure	4.0 ℓ/min (4.2 US qt/min, 3.5 Imp qt/min) or more – 343 kPa (3.5 kg/cm², 50 psi)	3.0 ℓ/min (3.2 US qt/min, 2.6 Imp qt/min) or more – 245 kPa (2.5 kg/cm², 36 psi)
		Speed	500 rpm	
		Oil temperature	75 – 85°C (167 – 185°F)	
	Discharge performance II	Discharge – Pressure	21.0 ℓ/min (22.2 US qt/min, 18.5 Imp qt/min) or more – 392 kPa (4.0 kg/cm², 57 psi)	15.0 ℓ/min (15.9 US qt/min, 13.2 Imp qt/min) or more – 392 kPa (4.0 kg/cm², 57 psi)
		Speed	2,500 rpm	
		Oil temperature	75 – 85°C (167 – 185°F)	
	Oil relief valve	Pressure at which valve starts to open	392 – 441 kPa (4.0 – 4.5 kg/cm², 57 – 64 psi)	
	Oil by-pass valve	Pressure at which valve starts to open	147 kPa (1.5 kg/cm², 21 psi)	98 kPa (1.0 kg/cm², 14 psi)
Oil filter		Type	Paper, cartridge type	
		Filtration area	0.15 m² (1.6 sq ft)	
Engine oil capacity		Upper level	4.0 ℓ (4.2 US qt, 3.5 Imp qt)	3.5 ℓ (3.7 US qt, 3.1 Imp qt)
		Lower level	3.0 ℓ (3.2 US qt, 2.6 Imp qt)	2.5 ℓ (2.6 US qt, 2.2 Imp qt)

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3. Engine Oil Flow Diagram

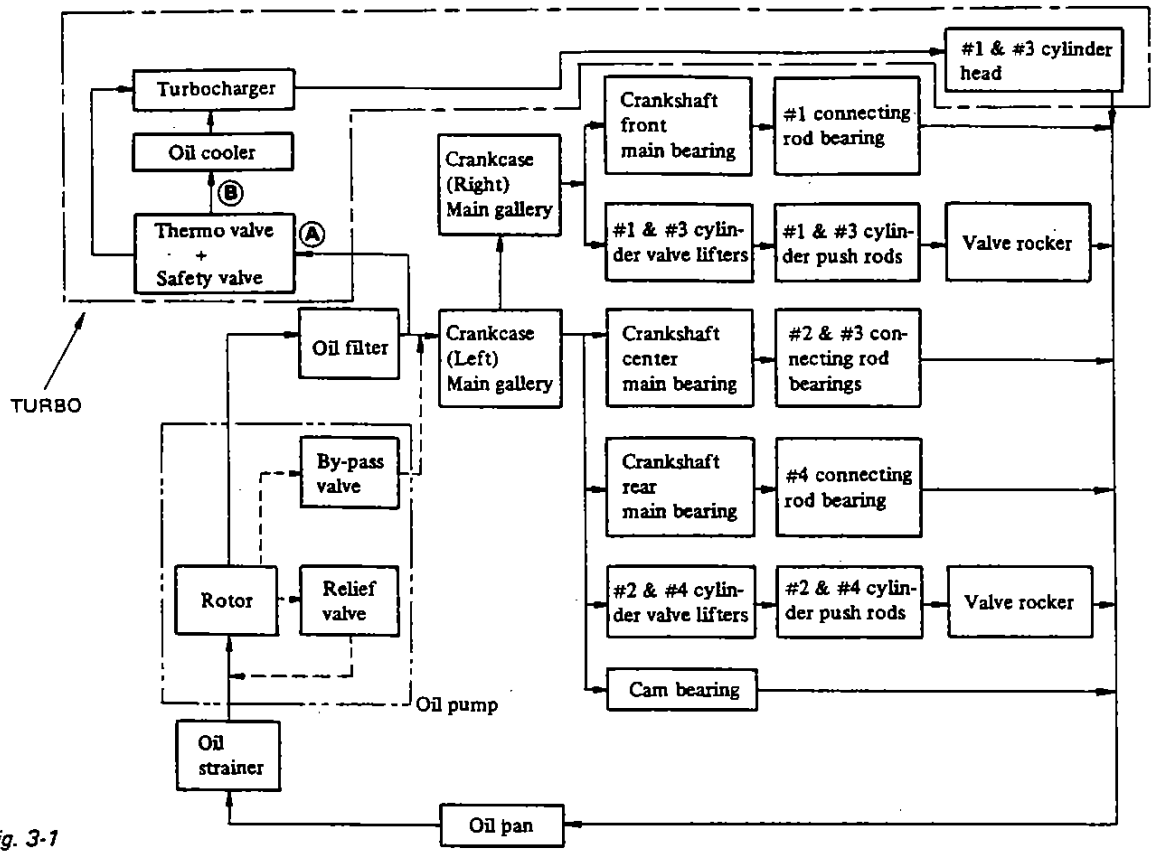


Fig. 3-1

A5-789

4. Engine Oil Cooling System

1) Specifications of Oil Cooler

- Core size : 200 x 55 x 32 mm (7.87 x 2.17 x 1.26 in)
- Core pitch : 2 mm (0.08 in)
- Fins : Corrugated fin type
- Radiation capacity : 2.326 kW (2,000 kcal/h, 7,936 BTU/h)

at
- Oil flow 10ℓ/min (2.6 US gal/min, 2.2 Imp gal/min)
- Wind velocity 8 m/sec (26 ft/sec)
- Temperature difference between oil and air 75°C (167°F)
- Oil temperature 110°C (230°F)

2) Component Parts

Tightening torque: N·m (kg-cm, in-lb)
T1: 29.4 ± 4.9 (300 ± 50, 260 ± 43)
T2: 34.3 ± 4.9 (350 ± 50, 304 ± 43)
T3: 7.4 ± 2.0 (75 ± 20, 65 ± 17)
T4: 2.5 ± 0.5 (25 ± 5, 21.7 ± 4.3)

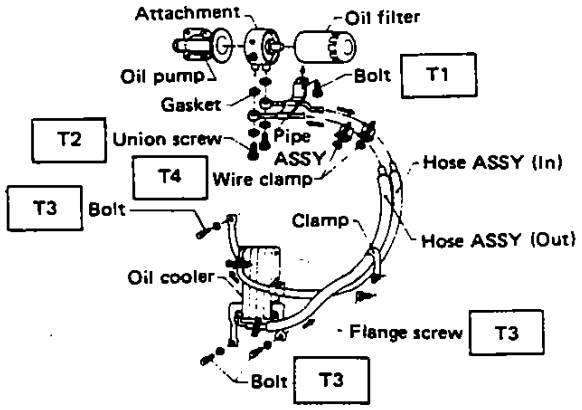


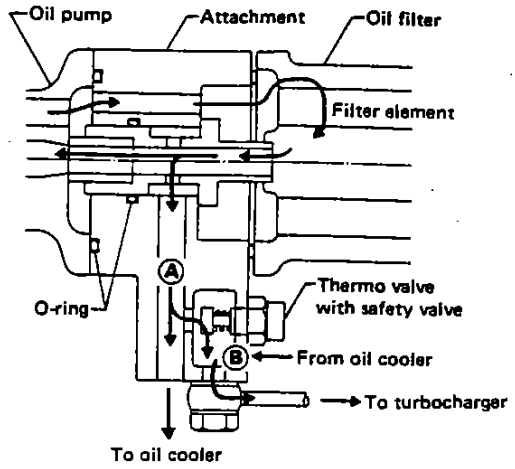
Fig. 3-2

A5-790

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4) Description

Engine oil passing through the filter is branched before it is supplied.
When the temperature of engine oil is lower than a certain value, the thermo valve opens the circuit allowing engine oil to lubricate the working parts of the turbocharger and return to the engine.
When the temperature of engine oil reaches a certain value, the thermo valve closes. At this point, the engine oil pass through the oil cooler to lubricate the working parts of the turbocharger, returning to the engine.
Although the temperature of engine oil rises to operate the cooler, if a pressure difference between Ⓐ and Ⓑ is higher than the certain value, the safety valve will open. At this point, engine oil bypasses the cooler and is supplied to the turbocharger.



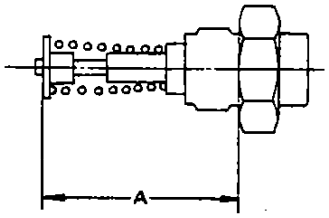
A5-781

Fig. 3-3

Thermo valve characteristics	Valve lifting amount is 5 mm (0.20 in) at 67 – 73°C (153 – 163°F)
Safety valve characteristics	Starts operating at oil temperature of 100°C (212°F) and at pressure difference of 226 kPa (2.3 kg/cm², 33 psi)

5) Inspection of Thermo Valve

Checking method
Measure dimension A shown in figure on the right when thermo valve reaches room temperature.
Next, dip thermo valve in hot water [67 – 73°C (153 – 163°F)] and, while holding it, measure dimension A.
Check the difference between the two measurements above to make sure it is approximately 5 mm (0.20 in). If it is too different, replace thermo valve.



A5-782

Fig. 3-4

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5. Cooling System Specifications

			Non-TURBO		TURBO
			1600	1800	1800
Cooling system			Electric fan + Forced cooling water circulation system		
Total coolant capacity			5.3ℓ (5.6 US qt, 4.7 Imp qt)	5.5ℓ (5.8 US qt, 4.8 Imp qt)	
Water pump	Type		Centrifugal impeller type		
	Discharge performance I	Discharge	7ℓ/min (7.4 US qt/min, 6.2 Imp qt/min) or more		
		Pump speed – total water head	1,000 rpm – 0.29 m Aq (0.95 ft Aq)		
		Water temperature	75 – 85°C (167 – 185°F)		
	Discharge performance II	Discharge	50ℓ/min (13.2 US gal, 11.0 Imp gal) or more		
		Pump speed – total water head	4,000 rpm – 5.0 m Aq (16.4 ft Aq)		
		Water temperature	75 – 85°C (167 – 185°F)		
	Impeller diameter		64 mm (2.52 in)		
	Number of impeller vanes		5		
	Pump pulley diameter		84 mm (3.31 in)		90 mm (3.54 in)
Thermostat	Type		Wax pellet type		
	Starts to open		88 ± 1.5°C (190 ± 3°F)		
	Fully opens		100°C (212°F)		
	Valve lift		8 mm (0.31 in)		
	Valve bore		31 mm (1.22 in)		
Thermo valve	Type		Wax pellet type		–
	Fully closes		27 ± 2°C (81 ± 3.6°F)		–
	Fully opens		25 ± 2°C (77 ± 3.6°F)		–
Thermo-switch	ON		95 ± 2°C (203 ± 3.6°F)		
	OFF		91 ± 2°C (196 ± 3.6°F)		
Electric fan	Motor		120 W or less		
	Fan dia.		280 mm (11.02 in)		
Radiator	Type		Cross flow, pressure type		
	Total radiation area		4.82 m² (51.9 sq ft)	AT & 4WD-AT: 7.83 m² (84.3 sq ft) 4WD: 7.29 m² (78.4 sq ft) Others: 5.90 m² (63.5 sq ft)	7.83 m² (84.3 sq ft)
	Radiation capacity •		31.7 kW (455 kcal/min, 1,805 BTU/min)	AT & 4WD-AT: 47.3 kW (678 kcal/min, 2,690 BTU/min) 4WD: 42.9 kW (615 kcal/min, 2,440 BTU/min) Others: 37.8 kW (542 kcal/min, 2,151 BTU/min)	47.3 kW (678 kcal/min, 2,690 BTU/min)
			at • Water flow: 45ℓ/min (11.9 US gal/min, 9.9 Imp gal/min) • Temperature difference between coolant and ambient atmosphere: 65°C (149°F) • Air velocity: 8 m/sec (26 ft/sec)		
	Core dimensions mm (in)		SUBARU 1800 AT & 4WD-AT: 625 x 334 x 32 (24.61 x 13.15 x 1.26) Others: 580 x 334 x 32 (22.83 x 13.15 x 1.26)		625 x 334 x 32 (24.61 x 13.15 x 1.26)
	Radiator capacity		1.9ℓ (2.0 US qt, 1.7 Imp qt)		
	Pressure range in which cap valve is open		Above 88 ± 10 kPa (0.9 ± 0.1 kg/cm², 13 ± 1.4 psi) Below -4.9 to -10 kPa (-0.05 to -0.1 kg/cm², -0.7 to -1.4 psi)		
	Fins		Corrugated fin type		

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6. Coolant

It is recommended to use "SUBARU genuine coolant" when replacing or refilling the engine coolant.

SUBARU COOLANT
(net 18 liter)
Parts No. 000016218

This coolant is anti-freeze, anti-corrosive ethylene glycol coolant, and is especially made for SUBARU vehicle.

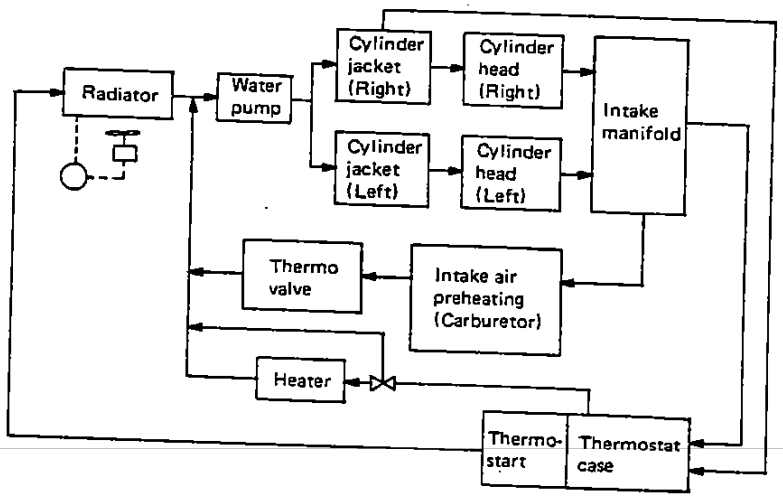
NOTE:
a. Avoid using any coolant or only water other than this designated type to prevent corrosion.
b. SUBARU's engine is aluminum alloy, and so special care is necessary.

SUBARU Coolant specifications are as follows:

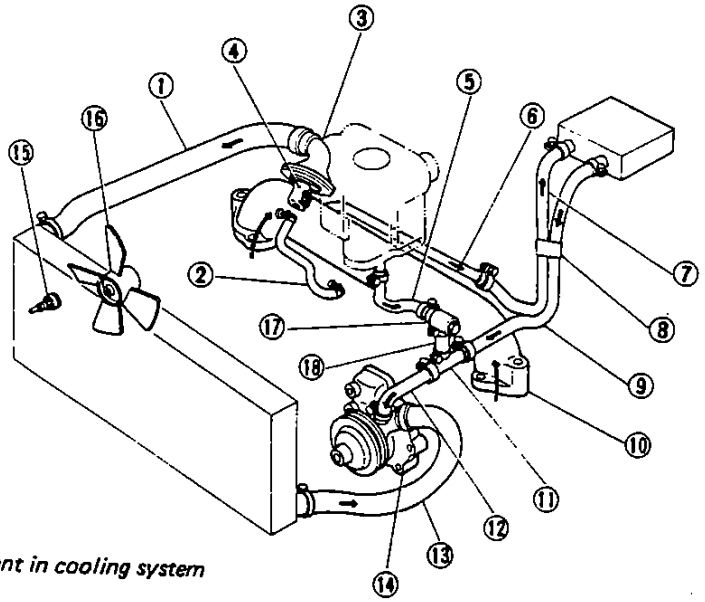
Coolant Specifications							
Lowest atmospheric anticipated temperature	SUBARU coolant-to-*water ratio (Volume) %	Specific gravity					Freezing point
		at 10°C (50°F)	at 20°C (68°F)	at 30°C (86°F)	at 40°C (104°F)	at 50°C (122°F)	
Above -30°C (-22°F)	50 – 50	1.078	1.072	1.067	1.058	1.055	-36°C (-33°F)

* It is recommended that distilled water be used.

7. Coolant Flow Diagram



A5-658



1 Radiator inlet hose
2 Water by-pass hose
3 Thermostat cover
4 Thermostat
5 Water by-pass hose
6 Water by-pass pipe
7 Water by-pass hose
8 3-way cock
9 Water by-pass hose
10 Intake manifold
11 Water by-pass pipe
12 Water by-pass hose
13 Radiator outlet hose
14 Water pump
15 Thermo switch
16 Electric fan
17 Thermo valve
18 Water by-pass hor

Fig. 3-5 Flow of coolant in cooling system

A5

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The operation of the cooling system is as follows:

1) Cooling with thermostat closed

When the coolant temperature is under the specified degrees, coolant flows only through the by-pass passage. This limited coolant circulation reduces cooling action, thus shortening engine warm-up time.

By-pass passage:

a. Intake manifold → Carburetor → Thermo valve → Water by-pass base and pipe → Water pump

When the environmental temperature around thermo valve exceeds the specified degrees, the coolant passage from carburetor to water by-pass pipe is shut off by means of thermo valve so that the fuel in carburetor is not heated.

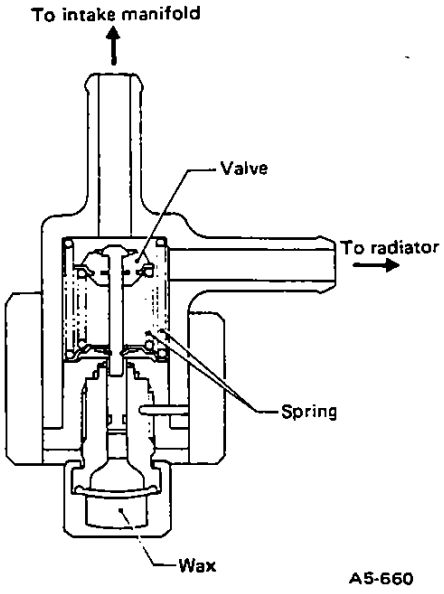


Fig. 3-6 Cross section of thermo valve

b. Intake manifold → Thermostat case → 3-way cock → Water by-pass hose and pipe → Water pump
3-way cock → Heater

2) Cooling with thermostat open

When the coolant temperature exceeds the specified degrees, thermostat begins to open and coolant flows through radiator and by-pass passage, increasing the cooling function.

3) Cooling with electric fan in operation

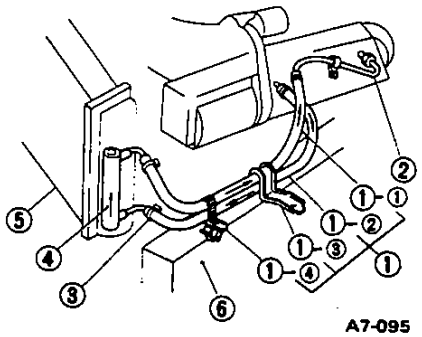
When the coolant temperature exceeds the specified degrees, the thermo-switch turns on to operate the electric fan.

8. Automatic Transmission Fluid Cooling System

Automatic transmission fluid cooling system (SUBARU 1800 AT & 4WD-AT)	Radiation capacity	1.570 kW (1,350 kcal/h, 5,357 BTU/h)
		at • Oil flow: 6ℓ/min (1.6 US gal/min, 1.3 Imp gal/min) • Water flow: 20ℓ/min (5.3 US gal/min, 4.4 Imp gal/min) • Temperature difference between water inlet and oil inlet: 30°C (86°F)

The fluid cooling system of automatic transmission consists of an cooler built in radiator, pipes and hoses to circulate fluid between torque converter and cooler.

Heated fluid circulating through torque converter returns to cooler and is cooled by coolant, thereby being maintained at an adequate temperature.



1	Hose assembly	2	Pipe complete
1-1	Outlet hose	3	Hose clamp
1-2	Inlet hose	4	Cooler
1-3	Clamp	5	Radiator
1-4	Clip	6	Side frame

Fig. 3-7 Component parts of automatic transmission fluid cooling system

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9. Service Data

Cylinder head	Head surface warpage		Limit	0.05 mm	(0.0020 in)
	Head surface grinding		Limit	0.5 mm	(0.020 in)
	Standard height	1600		89.6 mm	(3.528 in)
		1800		90.6 mm	(3.567 in)
	Valve seat	Refacing angle		90°, 150°	
		Contacting width	Intake	0.7 – 1.3 mm	(0.028 – 0.051 in)
			Exhaust	1.0 – 1.8 mm	(0.039 – 0.071 in)
		Wear limit		0.5 mm	(0.020 in)
	Valve guide	Inner diameter		8.000 – 8.015 mm	(0.3150 – 0.3156 in)
		Protrusion	Intake	17.5 – 18.5 mm	(0.689 – 0.728 in)
			Exhaust	22.5 – 23.5 mm	(0.886 – 0.925 in)
Valve	Valve overall length	Intake		109.5 mm	(4.31 in)
		Exhaust		109.3 mm	(4.30 in)
	Valve head edge thickness	Intake	STD	1.5 mm	(0.059 in)
			Limit	0.5 mm	(0.020 in)
		Exhaust	STD	1.3 mm	(0.051 in)
			Limit	0.8 mm	(0.031 in)
	Stem diameter	Intake		7.950 – 7.965 mm	(0.3130 – 0.3136 in)
		Exhaust		7.945 – 7.960 mm	(0.3128 – 0.3134 in)
	Stem oil clearance	Intake	STD	0.035 – 0.065 mm	(0.0014 – 0.0026 in)
			Limit	0.15 mm	(0.0059 in)
		Exhaust	STD	0.040 – 0.070 mm	(0.0016 – 0.0028 in)
			Limit	0.15 mm	(0.0059 in)
Valve spring	• With solid valve lifter				
	Free length		Outer spring	45.3 mm	(1.783 in)
			Inner spring	48.8 mm	(1.921 in)
	Tension/spring height		Outer spring	146.1 – 169.7 N/39.5 mm (14.9 – 17.3 kg/39.5 mm, 32.9 – 38.1 lb/1.555 in) 500.2 – 568.8 N/30.5 mm (51.0 – 58.0 kg/30.5 mm, 112.5 – 127.9 lb/1.201 in)	
			Inner spring	84.3 – 98.1 N/37.5 mm (8.6 – 10.0 kg/37.5 mm, 19.0 – 22.1 lb/1.476 in) 185.4 – 214.8 N/285 mm (18.9 – 21.9 kg/28.5 mm, 41.7 – 48.3 lb/1.122 in)	
	Squareness		Outer spring	2.0 mm or less	(0.079 in or less)
			Inner spring	2.1 mm or less	(0.083 in or less)
	• With hydraulic valve lifter				
	Free length		Outer spring	48.5 mm	(1.909 in)
			Inner spring	53.0 mm	(2.087 in)

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Valve spring (continued)	Tension/spring height	Outer spring	228.5 – 261.8 N/39.5 mm (23.3 – 26.7 kg/39.5 mm, 51.4 – 58.9 lb/1.555 in)	
			518.8 – 599.2 N/32.0 mm (52.9 – 61.1 kg/32.0 mm, 116.6 – 134.7 lb/1.260 in)	
		Inner spring	115.7 – 133.4 N/37.5 mm (11.8 – 13.6 kg/37.5 mm, 26.0 – 30.0 lb/1.476 in)	
			201.0 – 230.5 N/30.0 mm (20.5 – 23.5 kg/30.0 mm, 45.2 – 51.8 lb/1.181 in)	
	Squareness	Outer spring	2.1 mm or less	(0.083 in or less)
		Inner spring	2.3 mm or less	(0.091 in or less)
Valve rocker	Inner diameter of rocker arm		18.016 – 18.034 mm	(0.7093 – 0.7100 in)
	Outer diameter of rocker shaft		17.982 – 18.003 mm	(0.7080 – 0.7088 in)
	Rocker arm to rocker shaft clearance		0.013 – 0.052 mm	(0.0005 – 0.0020 in)
Valve lifter	• Solid valve lifter			
	Lifter hole inner diameter of crankcase		21.000 – 21.021 mm	(0.8268 – 0.8276 in)
	Outer diameter of lifter		20.949 – 20.970 mm	(0.8248 – 0.8256 in)
	Lifter to lifter hole clearance	STD	0.030 – 0.072 mm	(0.0012 – 0.0028 in)
		Limit	0.100 mm	(0.0039 in)
	• Hydraulic valve lifter			
	Lifter hole inner diameter of crankcase		20.988 – 21.040 mm	(0.8263 – 0.8283 in)
	Outer diameter of lifter		20.950 – 20.968 mm	(0.8248 – 0.8255 in)
	Lifter to lifter hole clearance	STD	0.020 – 0.090 mm	(0.0008 – 0.0035 in)
		Limit	0.100 mm	(0.0039 in)
Push rod	Overall length	1600 (Knurling: 2)	219 – 219.4 mm	(8.62 – 8.64 in)
		1800 with solid valve lifter (Knurling: 1)	230.7 – 231.1 mm	(9.08 – 9.10 in)
		1800 with hydraulic valve lifter (Knurling: nothing) (Steel tube)	231.7 – 232.2 mm	(9.12 – 9.14 in)
	Deflection at center		0.4 mm	(0.016 in) or less
Crankcase	Cylinder bore (Both 1800 and 1600)	Diameter	91.985 – 92.015 mm	(3.6214 – 3.6226 in)
		Taper STD	0.015 mm	(0.0006 in)
		Limit	0.050 mm	(0.0020 in)
		Out of roundness STD	0.010 mm	(0.0004 in)
		Limit	0.050 mm	(0.0020 in)
		Cylinder to piston clearance STD	0.010 – 0.040 mm	(0.0004 – 0.0016 in)
		Limit	0.060 mm	(0.0024 in)
		Enlarging limit of cylinder inner diameter	0.50 mm	(0.0197 in)
		Inner diameter difference limit between cylinders	0.05 mm	(0.0020 in)
	Case surface warpage (mating with head)	Limit	0.05 mm	(0.0020 in)
	Protrusion of stud bolt from mating surface	1800	91.5 – 93.5 mm	(3.602 – 3.681 in)
		1600	90.5 – 92.5 mm	(3.563 – 3.642 in)

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Piston and Piston pin	Piston outer diameter		STD	91.960 – 91.990 mm	(3.6205 – 3.6216 in)
		0.25 mm (0.0098 in) OS		92.210 – 92.240 mm	(3.6303 – 3.6315 in)
		0.50 mm (0.0197 in) OS		92.460 – 92.490 mm	(3.6402 – 3.6413 in)
	Piston pin hole inner diameter of piston			20.999 – 21.009 mm	(0.8267 – 0.8271 in)
	Piston pin outer diameter			20.992 – 21.000 mm	(0.8265 – 0.8268 in)
	Piston pin to hole in piston clearance			0.004 – 0.010 mm	(0.0002 – 0.0004 in)
Piston ring	Piston ring gap	Top ring	STD	0.20 – 0.35 mm	(0.0079 – 0.0138 in)
			Limit	1.0 mm	(0.039 in)
		Second ring	STD	0.20 – 0.35 mm	(0.0079 – 0.0138 in)
			Limit	1.0 mm	(0.039 in)
		Oil ring rail	STD	0.20 – 0.90 mm	(0.0079 – 0.0354 in)
			Limit	1.5 mm	(0.059 in)
	Piston ring to piston ring groove clearance	Top ring	STD	0.04 – 0.08 mm	(0.0016 – 0.0031 in)
			Limit	0.15 mm	(0.0059 in)
		Second ring	STD	0.03 – 0.07 mm	(0.0012 – 0.0028 in)
			Limit	0.15 mm	(0.0059 in)
		Oil ring		0	
Connecting rod	Distance between big end and small end hole		1800	116.95 – 117.05 mm	(4.6043 – 4.6083 in)
			1600	109.95 – 110.05 mm	(4.3287 – 4.3327 in)
	Bend or twist per 100 mm (3.94 in) in length		Limit	0.10 mm	(0.0039 in)
	Thrust clearance		STD	0.070 – 0.330 mm	(0.0028 – 0.0130 in)
			Limit	0.40 mm	(0.0157 in)
	Piston pin to bushing clearance			0 – 0.022 mm	(0 – 0.0009 in)
	Bushing bore			21.000 – 21.016 mm	(0.8268 – 0.8274 in)
Connecting rod bearing	Thickness at center		STD	1.477 – 1.485 mm	(0.0581 – 0.0585 in)
		0.05 mm (0.0020 in) US		1.505 – 1.510 mm	(0.0593 – 0.0594 in)
		0.25 mm (0.0098 in) US		1.605 – 1.610 mm	(0.0632 – 0.0634 in)
Crankshaft	Bend limit			0.035 mm	(0.0014 in)
	Crankpin and crank journal	Out-of-roundness		0.03 mm or less	(0.0012 in or less)
		Taper limit		0.07 mm	(0.0028 in)
		Grinding limit		0.25 mm	(0.0098 in)
	Thrust clearance		STD	0.01 – 0.095 mm	(0.0004 – 0.0037 in)
			Limit	0.30 mm	(0.0118 in)
	Crank journal outer diameter	1800	STD	54.955 – 54.970 mm	(2.1636 – 2.1642 in)
		0.03 mm (0.0012 in) US		54.925 – 54.940 mm	(2.1624 – 2.1630 in)
		0.05 mm (0.0020 in) US		54.905 – 54.920 mm	(2.1616 – 2.1622 in)
		0.25 mm (0.0098 in) US		54.705 – 54.720 mm	(2.1537 – 2.1543 in)
		1600 Front & rear	STD	49.957 – 49.970 mm	(1.9668 – 1.9673 in)
		0.03 mm (0.0012 in) US		49.927 – 49.940 mm	(1.9656 – 1.9661 in)
		0.05 mm (0.0020 in) US		49.907 – 49.920 mm	(1.9648 – 1.9654 in)
		0.25 mm (0.0098 in) US		49.707 – 49.720 mm	(1.9570 – 1.9575 in)
		Center	STD	49.970 – 49.982 mm	(1.9673 – 1.9678 in)
		0.03 mm (0.0012 in) US		49.940 – 49.952 mm	(1.9661 – 1.9666 in)
		0.05 mm (0.0020 in) US		49.920 – 49.932 mm	(1.9654 – 1.9658 in)
		0.25 mm (0.0098 in) US		49.720 – 49.732 mm	(1.9575 – 1.9579 in)

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Crankshaft (continued)	Crank journal oil clearance	1800	Front & rear	STD	0.010 – 0.030 mm (0.0004 – 0.0012 in)
				Limit	0.055 mm (0.0022 in)
			Center	STD	0.010 – 0.025 mm (0.0004 – 0.0010 in)
				Limit	0.045 mm (0.0018 in)
		1600	Front & rear	STD	0.010 – 0.035 mm (0.0004 – 0.0014 in)
				Limit	0.055 mm (0.0022 in)
			Center	STD	0.010 – 0.030 mm (0.0004 – 0.0012 in)
				Limit	0.045 mm (0.0018 in)
	Crankpin outer diameter			STD	44.995 – 45.010 mm (1.7715 – 1.7720 in)
			0.05 mm (0.0020 in) US		44.945 – 44.960 mm (1.7695 – 1.7701 in)
			0.25 mm (0.0098 in) US		44.745 – 44.760 mm (1.7616 – 1.7622 in)
	Crankpin oil clearance			STD	0.020 – 0.070 mm (0.0008 – 0.0028 in)
				Limit	0.1 mm (0.0039 in)
Crankshaft bearing	Thickness at center	1800	Front & rear	STD	2.015 – 2.019 mm (0.0793 – 0.0795 in)
			0.03 mm (0.0012 in) US		2.030 – 2.034 mm (0.0799 – 0.0801 in)
			0.05 mm (0.0020 in) US		2.040 – 2.044 mm (0.0803 – 0.0805 in)
			0.25 mm (0.0098 in) US		2.140 – 2.144 mm (0.0843 – 0.0844 in)
			Center	STD	2.015 – 2.028 mm (0.0793 – 0.0798 in)
			0.03 mm (0.0012 in) US		2.030 – 2.043 mm (0.0799 – 0.0804 in)
			0.05 mm (0.0020 in) US		2.040 – 2.053 mm (0.0803 – 0.0808 in)
			0.25 mm (0.0098 in) US		2.140 – 2.153 mm (0.0843 – 0.0848 in)
		1600	Front & rear	STD	2.001 – 2.008 mm (0.0788 – 0.0791 in)
			0.03 mm (0.0012 in) US		2.017 – 2.030 mm (0.0794 – 0.0799 in)
			0.05 mm (0.0020 in) US		2.022 – 2.035 mm (0.0796 – 0.0801 in)
			0.25 mm (0.0098 in) US		2.122 – 2.135 mm (0.0835 – 0.0841 in)
			Center	STD	2.003 – 2.015 mm (0.0789 – 0.0793 in)
			0.03 mm (0.0012 in) US		2.017 – 2.030 mm (0.0794 – 0.0799 in)
			0.05 mm (0.0020 in) US		2.022 – 2.035 mm (0.0796 – 0.0801 in)
			0.25 mm (0.0098 in) US		2.122 – 2.135 mm (0.0835 – 0.0841 in)
Camshaft	Cam lobe height			STD	*1: 32.24 – 32.34 mm (1.2693 – 1.2732 in)
					*2: 35.90 – 36.00 mm (1.4134 – 1.4173 in)
				Wear limit	0.15 mm (0.0059 in)
	Bend limit				0.05 mm (0.0020 in)
	Thrust clearance			STD	0.020 – 0.090 mm (0.0008 – 0.0035 in)
				Limit	0.20 mm (0.0079 in)
	Camshaft journal outer diameter		Front & center	1600	25.959 – 25.975 mm (1.0220 – 1.0226 in)
				1800	31.959 – 31.975 mm (1.2582 – 1.2589 in)
			Rear		35.959 – 35.975 mm (1.4157 – 1.4163 in)
	Camshaft journal to cam bore clearance			STD	0.025 – 0.059 mm (0.0010 – 0.0023 in)
				Limit	0.100 mm (0.0039 in)
Camshaft gear	Run out			Limit	0.25 mm (0.0098 in)
	Crankshaft gear to cam gear backlash			STD	0.010 – 0.050 mm (0.0004 – 0.0020 in)
				Limit	0.10 mm (0.0039 in)

*1: With solid valve lifter
*2: With hydraulic valve lifter

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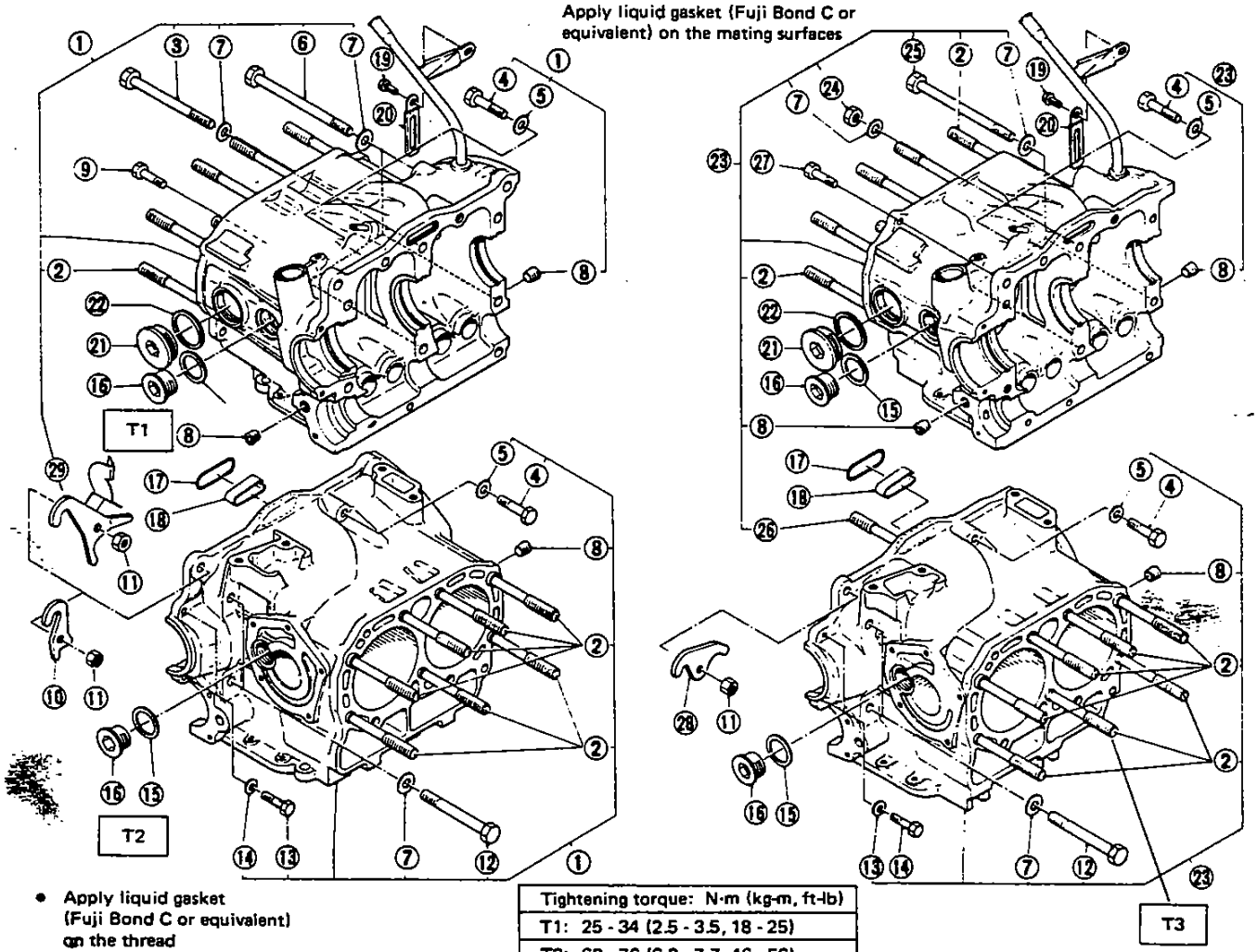
Oil pump	Drive gear outer diameter			29.70 – 29.74 mm	(1.1693 – 1.1709 in)
	Rotor outer diameter			40.53 – 40.56 mm	(1.5957 – 1.5968 in)
	Drive gear to rotor tip clearance		STD	0.02 – 0.12 mm	(0.0008 – 0.0047 in)
			Limit	0.2 mm	(0.008 in)
	Rotor to case and gear to case axial clearance		STD	0.03 – 0.13 mm	(0.0012 – 0.0051 in)
			Limit	0.2 mm	(0.008 in)
	Rotor to case radial clearance		STD	0.15 – 0.21 mm	(0.0059 – 0.0083 in)
			Limit	0.25 mm	(0.0098 in)
	Relief valve spring		Free length	47.1 mm	(1.854 in)
			Installed length	33.5 mm	(1.319 in)
			Load when installed	38.05 – 41.97 N (3.88 – 4.28 kg, 8.56 – 9.44 lb)	
	By-pass valve spring	Free length	1600	40.7 mm	(1.602 in)
			1800	37.1 mm	(1.461 in)
		Installed length	1600	31.1 mm	(1.224 in)
			1800	25.1 mm	(0.988 in)
		Load when installed	1600	3.580 – 3.972 N (0.365 – 0.405 kg, 0.805 – 0.893 lb)	
			1800	5.178 – 6.159 N (0.528 – 0.628 kg, 1.164 – 1.385 lb)	
	Oil filter filtration area			0.15 m^2	(1.6 sq ft)

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3-2. Component Parts

1. Crankcase

Thread size	Torque
10 mm	39 - 47 N·m (4.0 - 4.8 kg-m, 29 - 35 ft-lb)
8 mm	23 - 26 N·m (2.3 - 2.7 kg-m, 17 - 20 ft-lb)
6 mm	4.4 - 5.4 N·m (0.45 - 0.55 kg-m, 3.3 - 4.0 ft-lb)



• Apply liquid gasket (Fuji Bond C or equivalent) on the thread

Tightening torque: N·m (kg-m, ft-lb)
T1: 25 - 34 (2.5 - 3.5, 18 - 25)
T2: 62 - 76 (6.3 - 7.7, 46 - 56)
T3: 34 - 44 (3.5 - 4.5, 25 - 33)

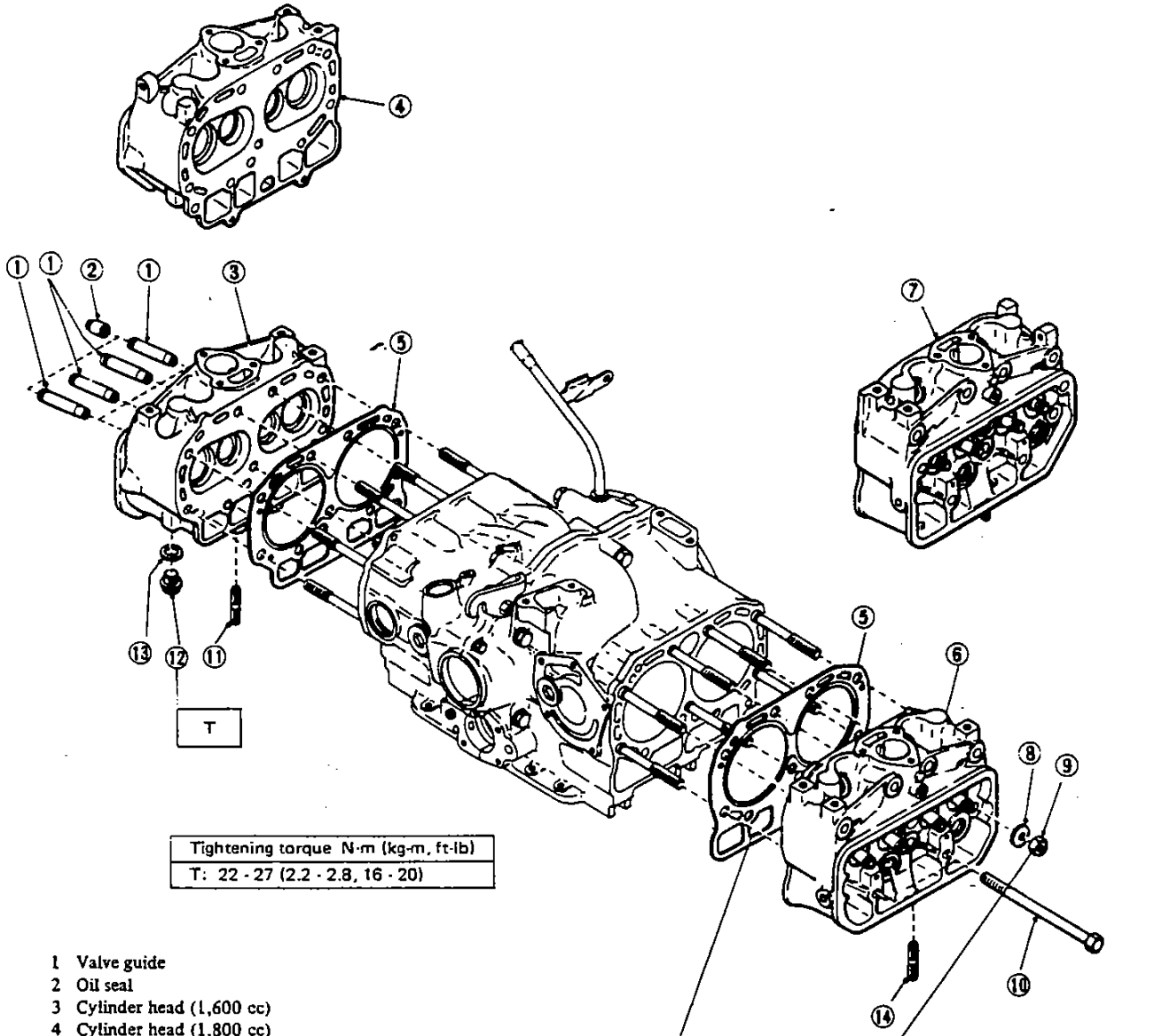
1 Crankcase assembly
2 Stud bolt
3 Bolt (10 x 108 x 28 mm)
4 Bolt
5 Washer
6 Bolt (10 x 145 x 28 mm)
7 Washer (10.5 x 18 x 2 mm)
8 Main gallery plug
9 Bolt
10 Crankcase front hanger (Hitachi carburetor)
11 Nut
12 Bolt (10 x 70 x 28 mm)
13 Bolt
14 Washer
15 Gasket (26.2 x 31.5 x 1 mm)
16 Crankcase plug
17 Crankcase O-ring
18 Back up ring
19 Bolt & washer (6 x 13 x 13 mm)
20 Clip
21 Crankcase plug
22 Gasket (36.2 x 44 x 1 mm)
23 Crankcase assembly
24 Nut (10 x 8 mm)
25 Bolt (10 x 135 x 28 mm)
26 Stud bolt (10 x 120 x 26 mm)
27 Bolt
28 Crankcase front hanger
29 Crankcase front hanger (C-W carburetor)

Fig. 3-8 Crankcase

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2. Cylinder Heads



Tightening torque N·m (kg-m, ft-lb)
T: 22 - 27 (2.2 - 2.8, 16 - 20)

1st step	29 N·m (3.0 kg-m, 22 ft-lb)
2nd step	59 N·m (6.0 kg-m, 43 ft-lb)
3rd step	64 N·m (6.5 kg-m, 47 ft-lb)

1 Valve guide
2 Oil seal
3 Cylinder head (1,600 cc)
4 Cylinder head (1,800 cc)
5 Cylinder head gasket
6 Cylinder head 2 (1,600 cc)
7 Cylinder head 2 (1,800 cc)
8 Washer
9 Nut
10 Bolt (11 x 162 x 34 mm)
11 Stud bolt
12 Plug
13 Gasket
14 Stud bolt

Apply sealant "Three Bond 1201" or equivalent evenly to both sides of cylinder head gasket with a brush.

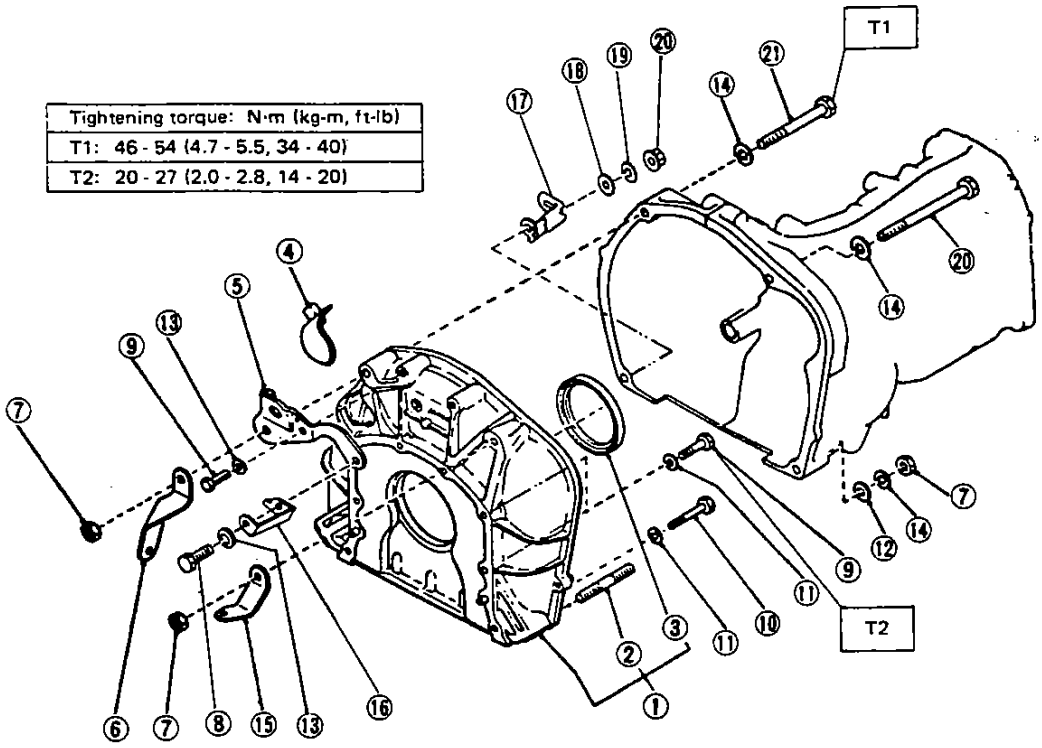
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Fig. 3-9 Cylinder heads

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3. Flywheel Housing and Fittings

Tightening torque: N·m (kg-m, ft-lb)
T1: 46 - 54 (4.7 - 5.5, 34 - 40)
T2: 20 - 27 (2.0 - 2.8, 14 - 20)



Coat with liquid gasket (Three Bond 1215 or equivalent) on mating surface and dry the coated surface for 5 to 10 minutes before installation.

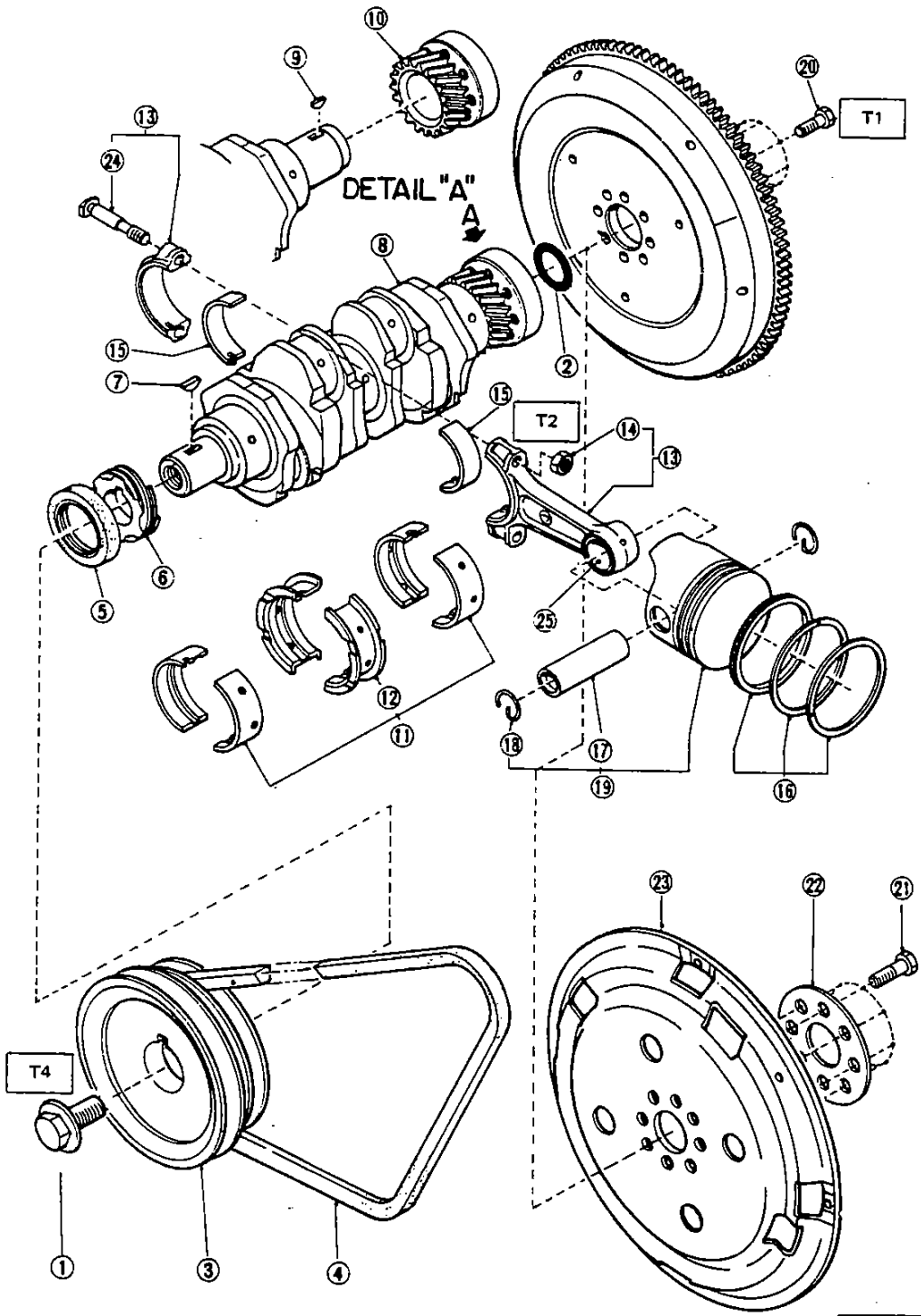
1 Flywheel housing CP
2 Stud
3 Oil seal (70 x 87 x 8.5 mm)
4 Timing hole plug
5 Crankcase rear hanger
6 Stiffener
7 Nut
8 Bolt
9 Bolt
10 Bolt
11 Washer
12 Washer
13 Spring washer
14 Spring washer
15 Stiffener 2
16 Accelerator cable bracket (C-W carburetor)
17 Clip
18 Washer
19 Spring washer
20 Nut
21 Bolt

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Fig. 3-10 Flywheel housing and fittings

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4. Crankshaft and Related Parts



1 Bolt
2 O-ring
3 Crankshaft pulley
4 Drive belt
5 Oil seal
6 Distributor drive gear
7 Woodruff key
8 Crankshaft
9 Woodruff key
10 Crankshaft gear
11 Crankshaft bearing set
12 Center bearing set
13 Connecting rod CP
14 Nut
15 Connecting rod bearing set
16 Piston ring set
17 Piston pin
18 Circlip
19 Piston set
20 Bolt (MT)
21 Bolt (AT)
22 Converter back plate (AT)
23 Converter drive plate (AT)
24 Connecting rod bolt
25 Connecting rod bushing

Tightening torque: N·m (kg-m, ft-lb)
T1: 41 - 45 (4.2 - 4.6, 30 - 33)
T2: 39 - 42 (4.0 - 4.3, 29 - 31)
T3: 49 - 53 (5.0 - 5.4, 36 - 39)
T4: 64 - 74 (6.5 - 7.5, 47 - 54)

- Apply engine oil on the thread.
- Apply liquid gasket (Three Bond 1215 or equivalent) on the flange seat.

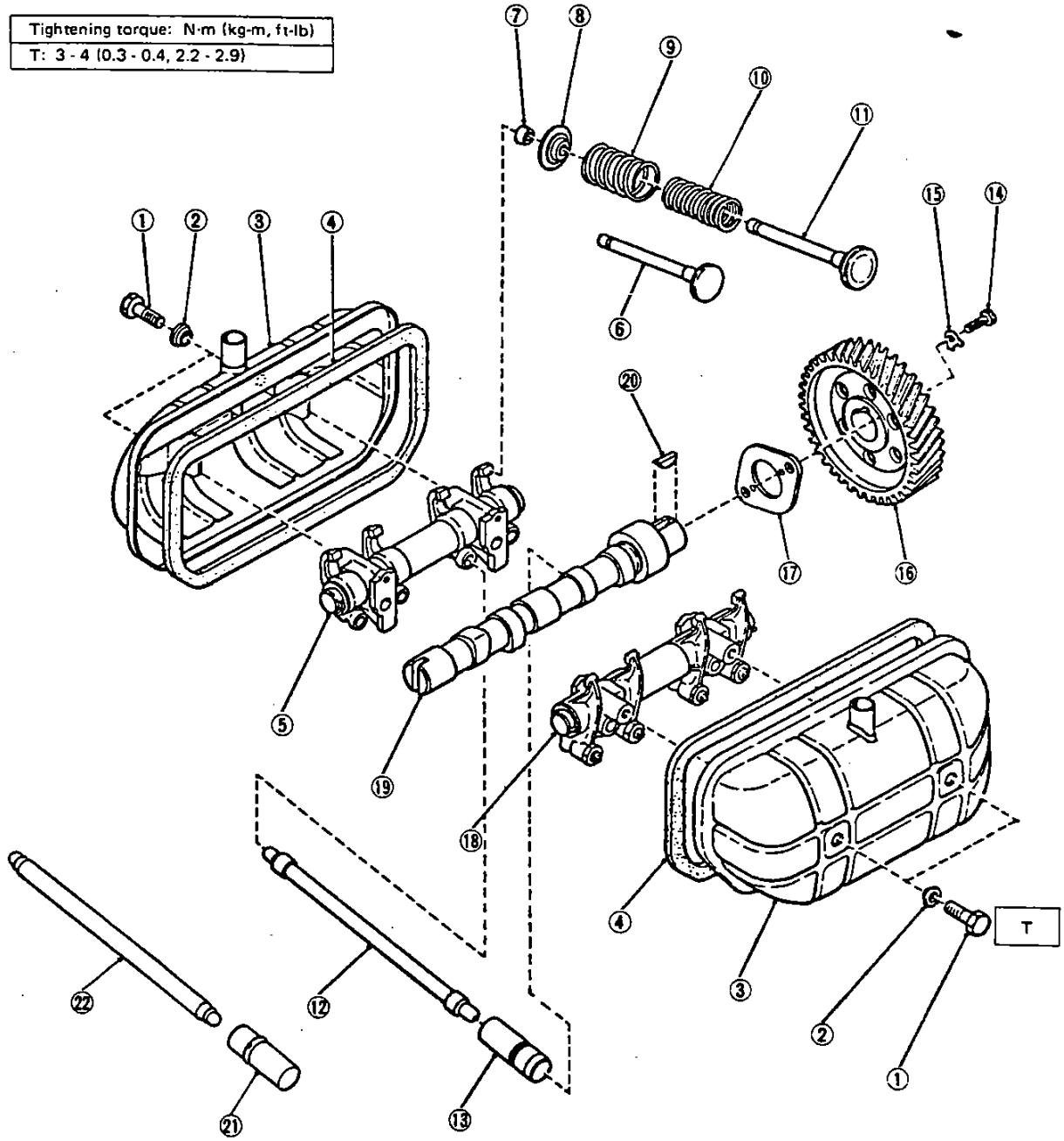
Fig. 3-11 Crankshaft and related parts

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5. Valve System

Tightening torque: N·m (kg-m, ft-lb)
T: 3 - 4 (0.3 - 0.4, 2.2 - 2.9)



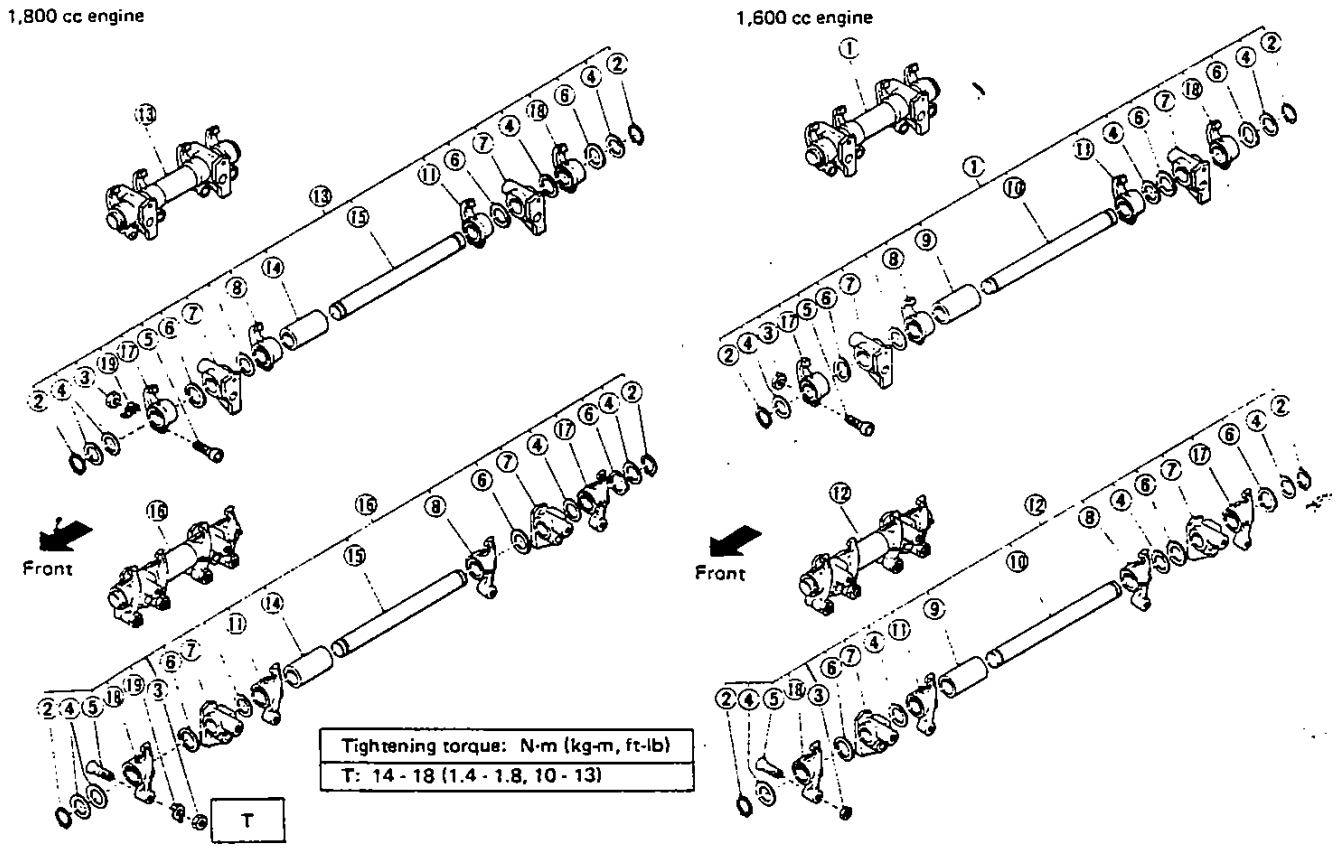
1 Bolt
2 Valve rocker cover seal washer
3 Valve rocker cover
4 Valve rocker cover gasket
5 Valve rocker ASSY (R.H.)
6 Exhaust valve
7 Valve spring retainer key
8 Valve spring retainer
9 Valve spring
10 Valve spring 2
11 Intake valve
12 Valve push rod
13 Valve lifter
14 Bolt
15 Lock washer
16 Camshaft gear
17 Camshaft plate
18 Valve rocker ASSY
19 Camshaft
20 Woodruff key
21 Hydraulic valve lifter
22 Push rod (for hydraulic valve lifter)

Fig. 3-12 Valve system

A5-668

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6. Valve Rocker



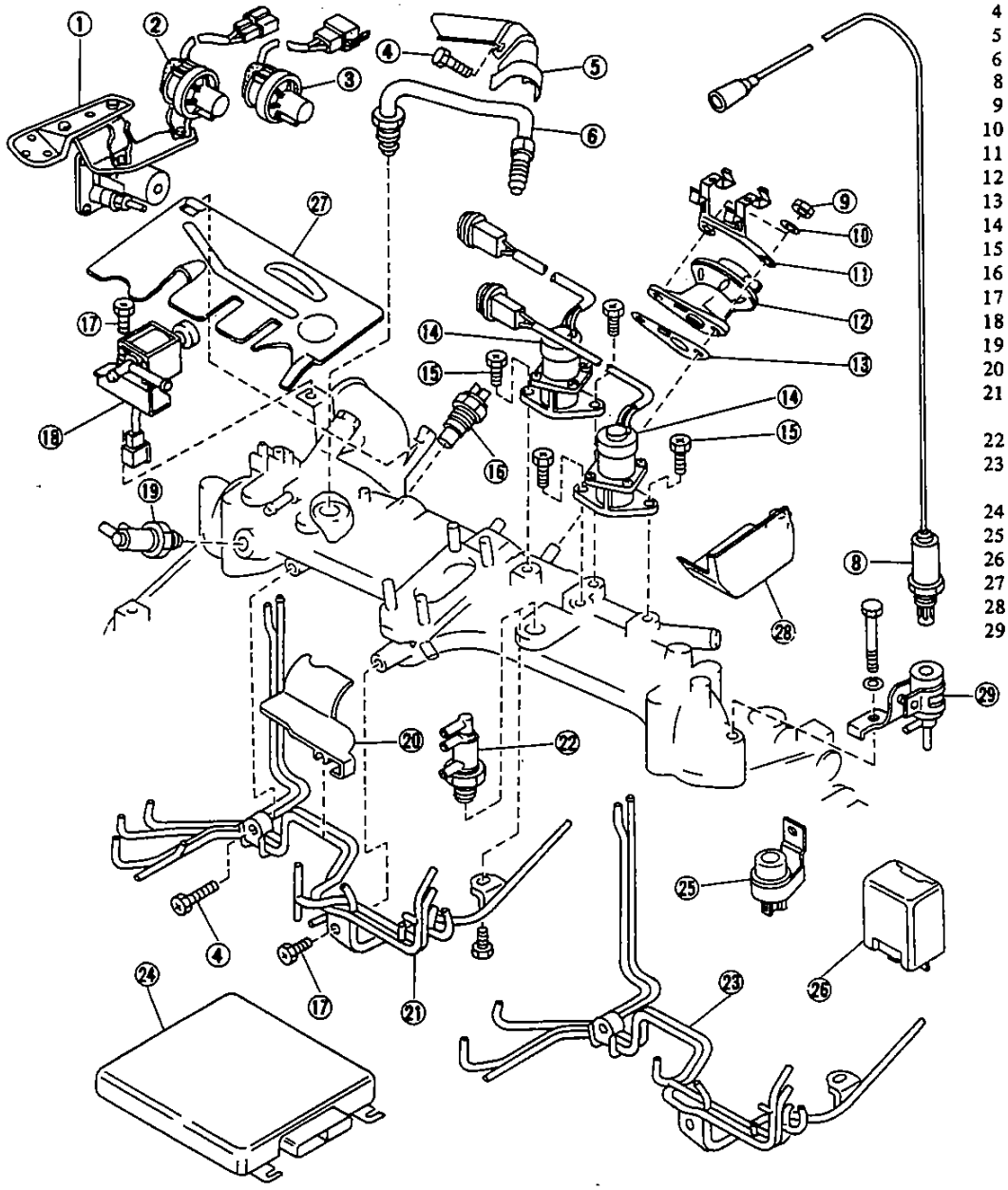
1 Valve rocker ASSY (R.H.)
2 Snap ring
3 Nut
4 Washer
5 Valve rocker screw
6 Rocker shaft spring washer
7 Rocker shaft supporter
8 Valve rocker arm CP
9 Rocker shaft spacer
10 Valve rocker shaft
11 Valve rocker arm CP 2
12 Valve rocker ASSY (L.H.)
13 Valve rocker ASSY (R.H.)
14 Rocker shaft spacer
15 Valve rocker shaft
16 Valve rocker ASSY (L.H.)
17 Valve rocker arm
18 Valve rocker arm 2
19 Lock washer (only for hydraulic valve lifter)

Fig. 3-13 Valve rocker

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7. Emission Control Equipment

1) Hitachi Carburetor Type (1) (California and 49-state non-4WD)



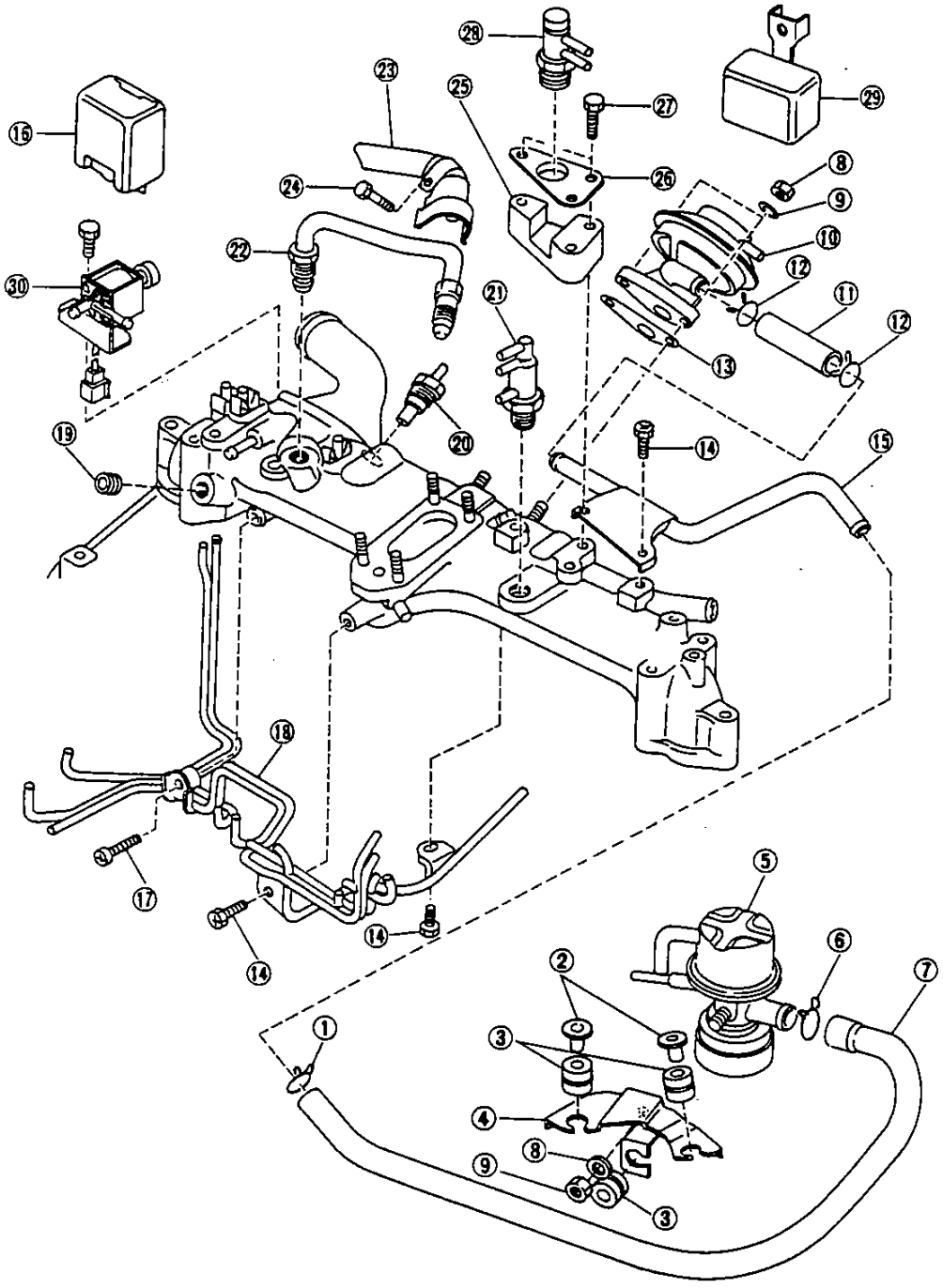
1 Altitude compensator (49-state non-4WD)
2 Vacuum switch I
3 Vacuum switch II
4 Bolt & washer
5 EGR pipe cover
6 EGR pipe
8 Oxygen sensor
9 Nut
10 Washer
11 Clamp
12 EGR valve
13 Gasket
14 Duty solenoid valve
15 Bolt & washer
16 Thermosensor
17 Bolt & washer
18 Solenoid valve I
19 Thermo vacuum valve II
20 Carburetor protector 3
21 Vacuum pipe CP (Except 4WD and AT)
22 Thermo vacuum valve I
23 Vacuum pipe CP (4WD and AT)
24 Electronic control module
25 Ignition relay
26 Revolution sensor
27 Carburetor protector
28 Carburetor protector 2
29 Solenoid valve II (49-State only)

A5-792

Fig. 3-14-1

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2) Hitachi Carburetor Type (2) (Canada and 49-state 4WD)



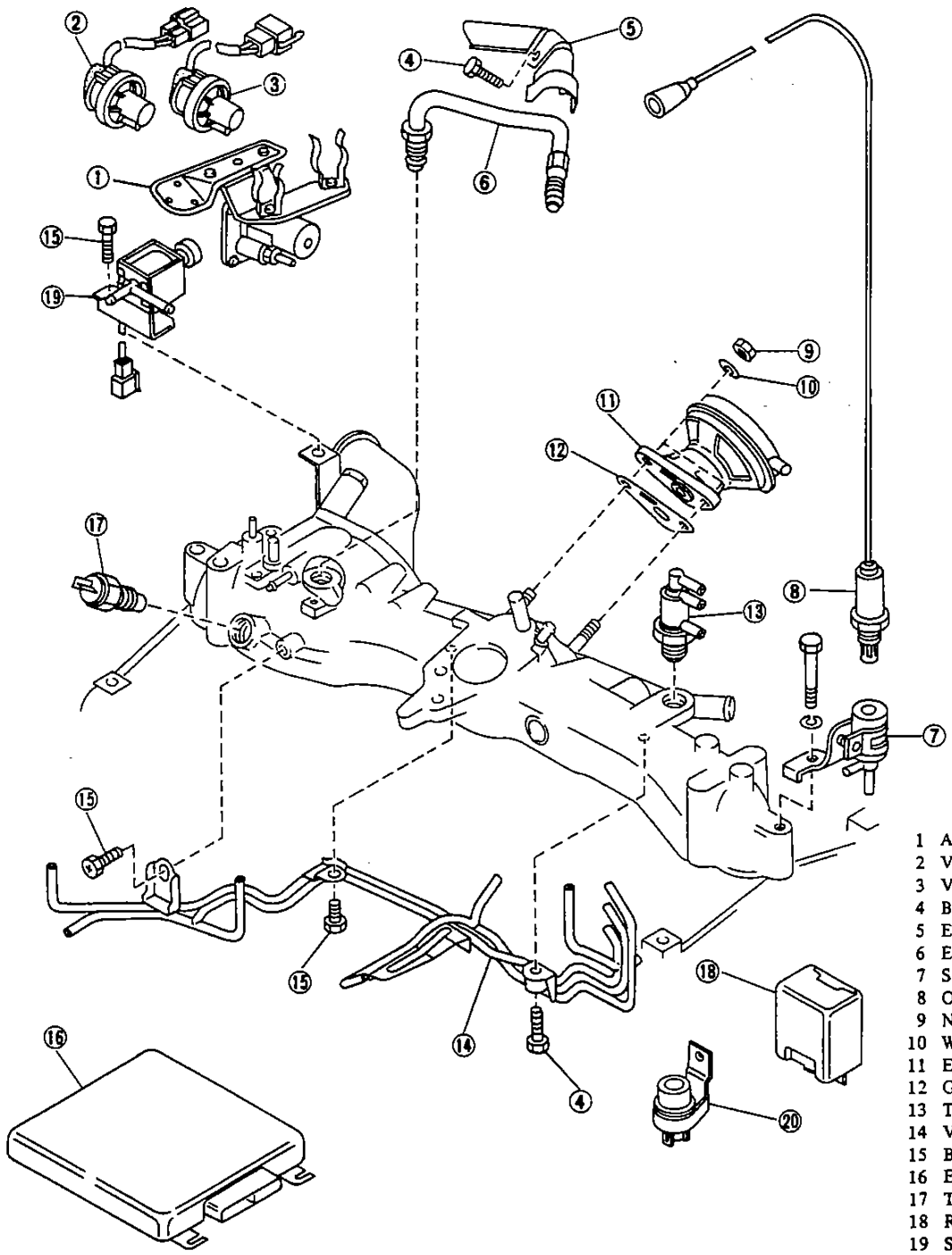
1 Hose clamp
2 Bush
3 Grommet
4 Bracket
5 Anti-after burning valve
6 Hose clamp
7 Hose
8 Nut
9 Spring washer
10 EGR valve ASSY
11 Hose
12 Hose clamp
13 Gasket
14 Bolt & washer
15 Pipe
16 Revolution sensor
17 Bolt & washer
18 Vacuum pipe CP
19 Plug
20 Thermometer CP
21 Temperature valve ASSY
22 EGR pipe CP
23 EGR pipe cover
24 Bolt & washer
25 Insulator
26 Bracket
27 Bolt & washer
28 Temperature valve ASSY
29 Revolution sensor
30 Solenoid valve I

A5-802

Fig. 3-14-2

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3) C-W Carburetor Type



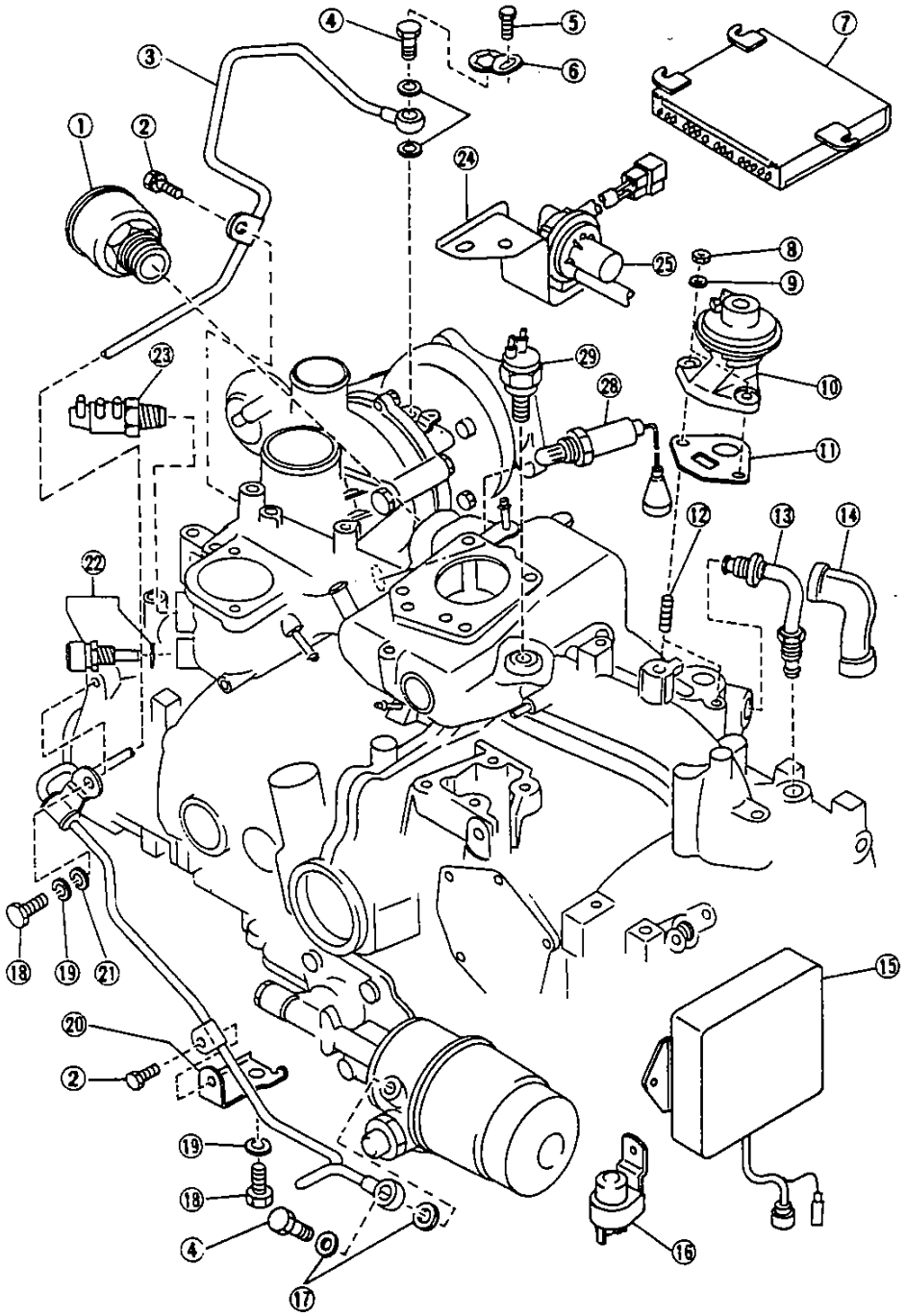
1 Altitude compensator
2 Vacuum switch I
3 Vacuum switch II
4 Bolt & washer
5 EGR pipe cover
6 EGR pipe
7 Solenoid valve II
8 Oxygen sensor
9 Nut
10 Washer
11 EGR valve
12 Gasket
13 Thermo vacuum valve I
14 Vacuum pipe CP
15 Bolt & washer
16 Electronic control module
17 Thermosensor
18 Revolution sensor
19 Solenoid valve I
20 Ignition relay

A5-793

Fig. 3-15 Emission control equipment (C-W carburetor type)

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4) EGI–TURBO Engine System (1)



1 Air relief valve ASSY
2 Bolt and washer
3 Oil delivery pipe CP
4 Union screw
5 Bolt
6 Union screw lock plate
7 Fuel injection control unit
8 Nut
9 Spring washer
10 EGR valve ASSY
11 EGR valve gasket
12 Stud
13 EGR pipe CP
14 EGR pipe cover
15 Knock control unit
16 Relay ASSY
17 Gasket
18 Bolt
19 Spring washer
20 Oil pipe stay
21 Washer
22 Temperature sensor ASSY
23 Thermo vacuum valve
24 Bracket
25 Pressure switch
28 O_2 sensor
29 Knock sensor

A5-794

Fig. 3-16

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5) EGI-TURBO Engine System (2)

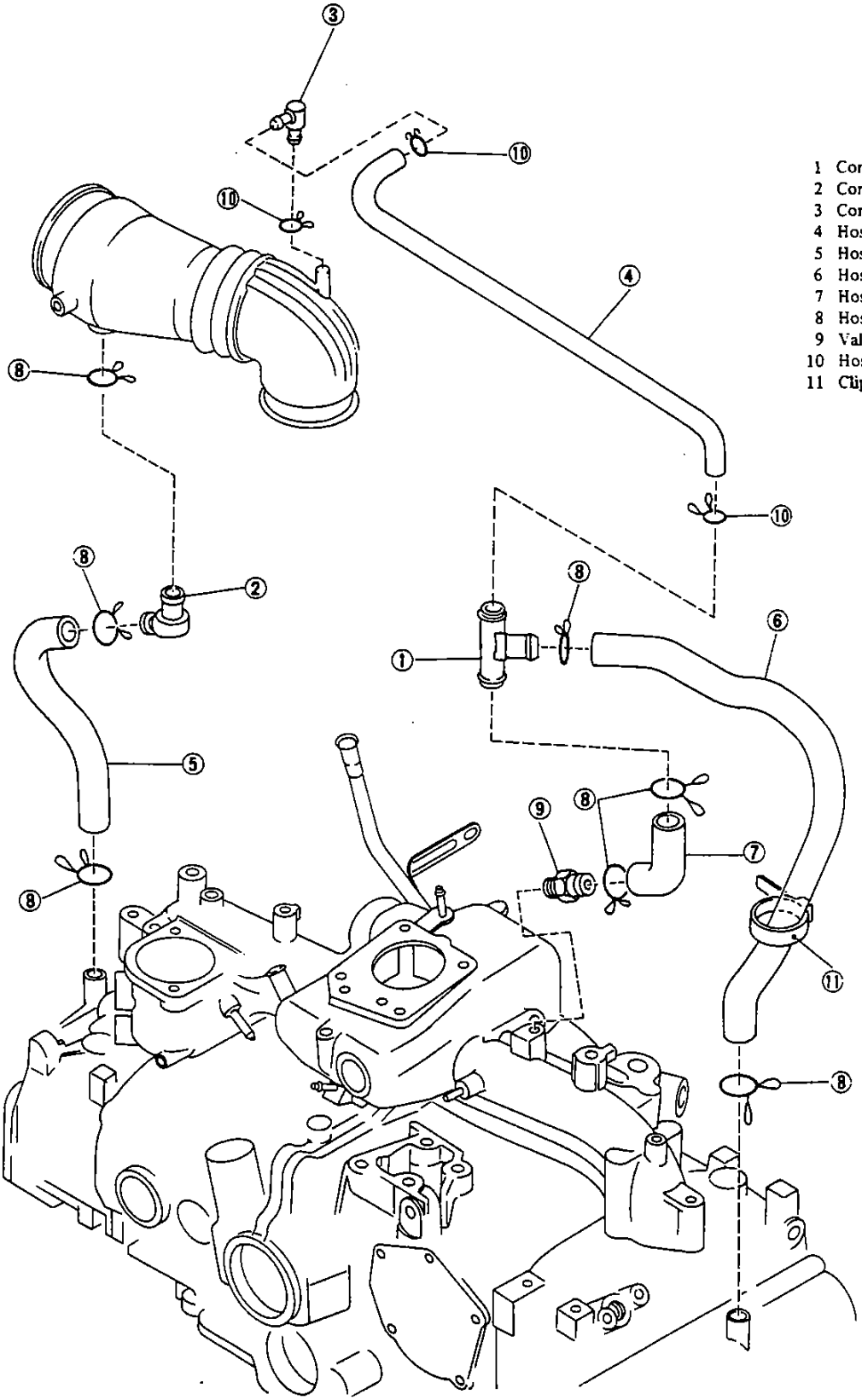


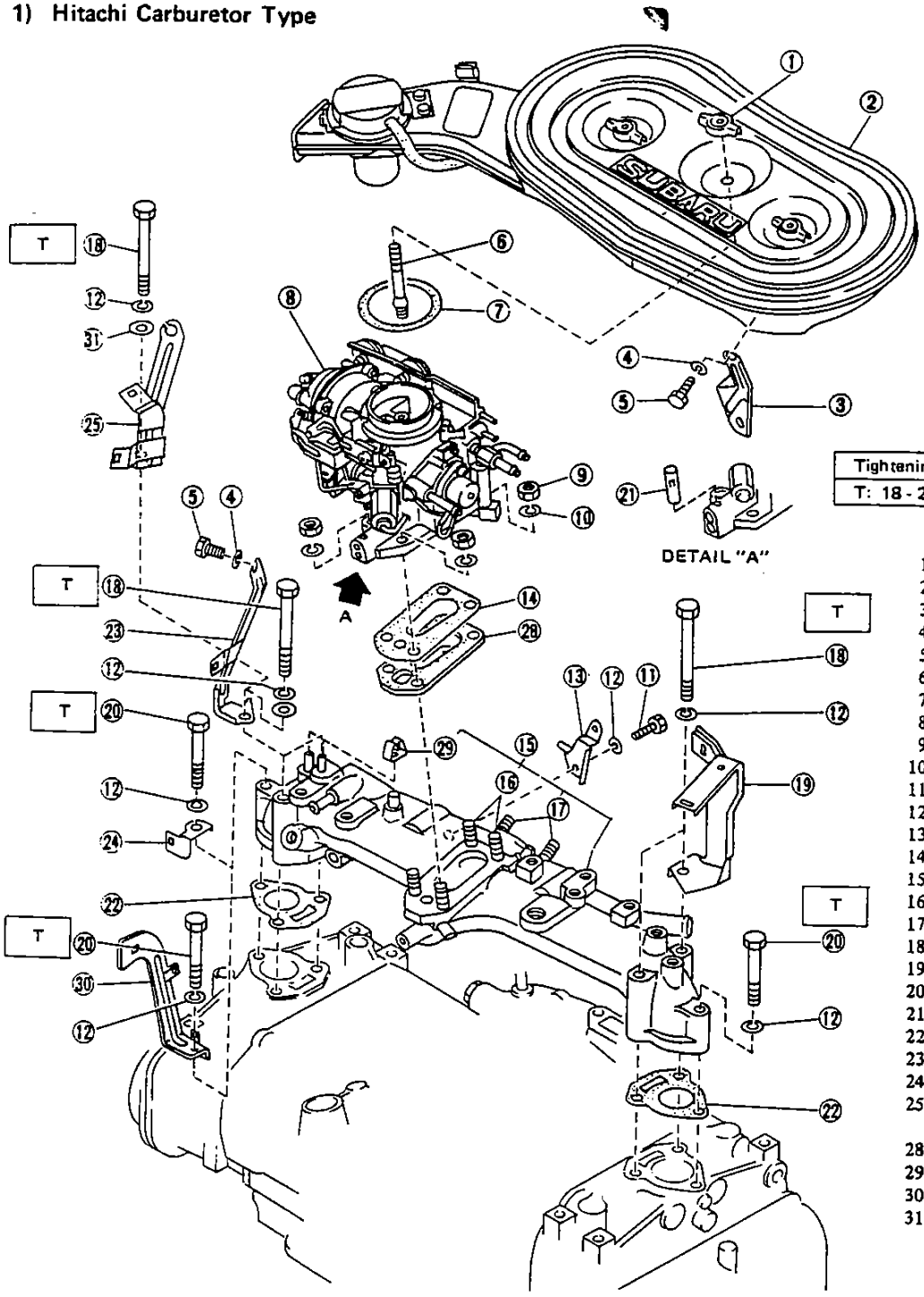
Fig. 3-17

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8. Intake Manifold

1) Hitachi Carburetor Type



Tightening torque: N·m (kg-m, ft-lb)
T: 18 - 22 (1.8 - 2.2, 13 - 16)

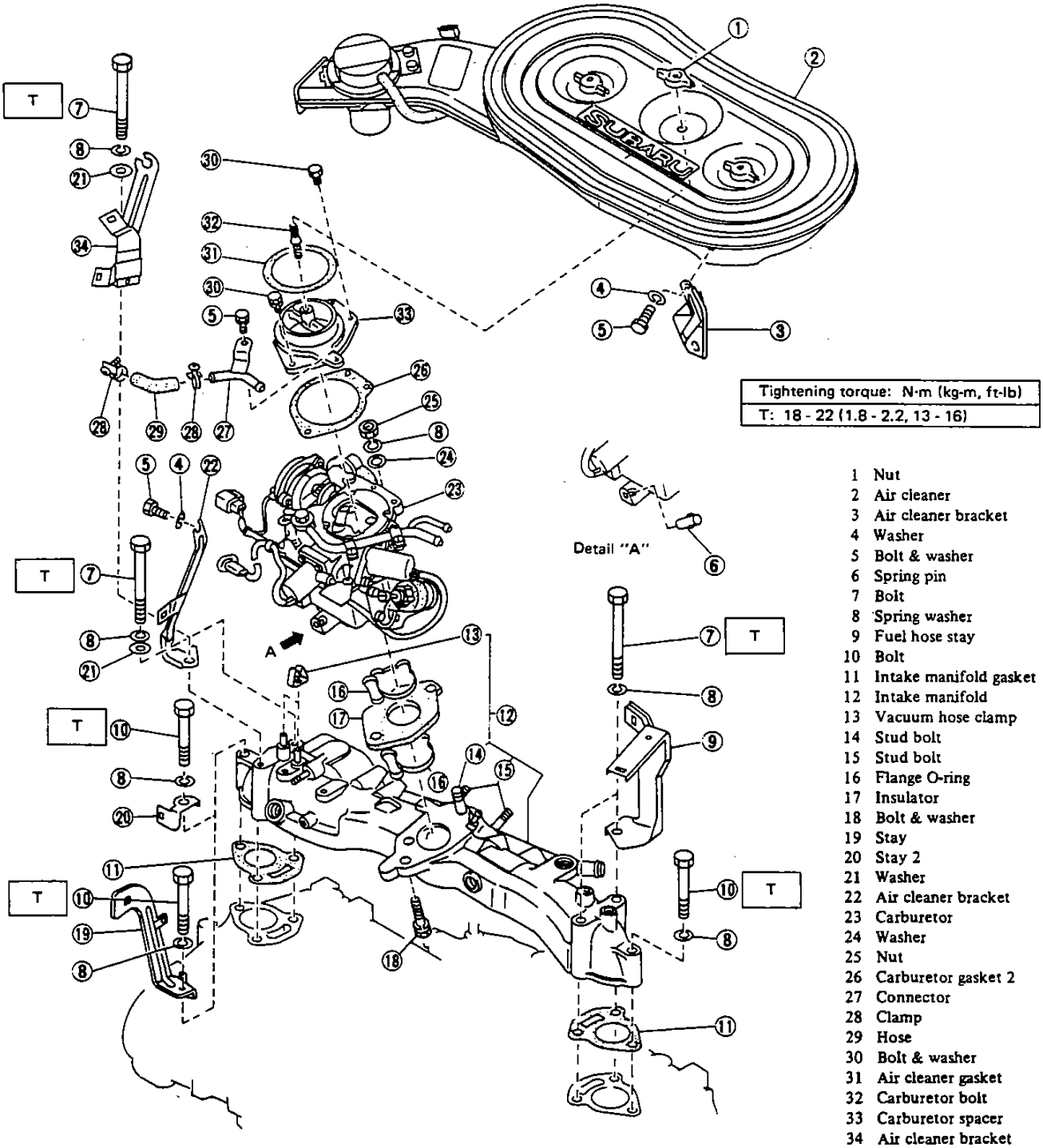
1 Nut
2 Air cleaner
3 Air cleaner bracket
4 Washer
5 Bolt & washer
6 Carburetor bolt
7 Air cleaner gasket
8 Carburetor
9 Nut
10 Spring washer
11 Bolt
12 Spring washer
13 Accelerator cable bracket
14 Carburetor gasket
15 Intake manifold
16 Stud bolt
17 Stud bolt
18 Bolt
19 Fuel hose stay
20 Bolt
21 Spring pin
22 Intake manifold gasket
23 Air cleaner bracket
24 Stay 2
25 Air cleaner bracket (for power steering vehicle)
28 Insulator
29 Vacuum hose clamp
30 Stay
31 Washer

AS-796

Fig. 3-18 Intake manifold (Hitachi carburetor type)

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2) C-W Carburetor Type



Tightening torque: N·m (kg-m, ft-lb)
T: 18 - 22 (1.8 - 2.2, 13 - 16)

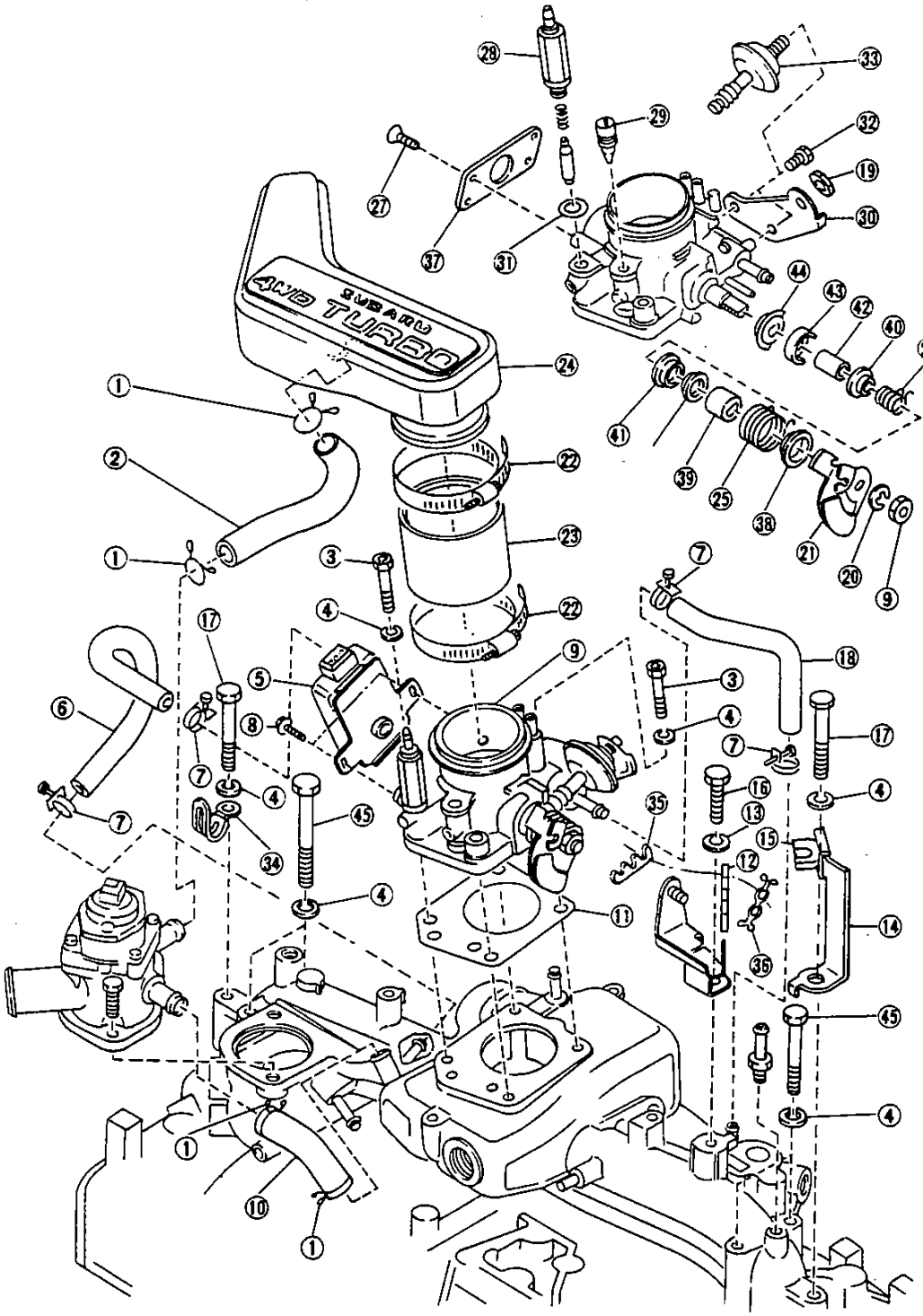
1 Nut
2 Air cleaner
3 Air cleaner bracket
4 Washer
5 Bolt & washer
6 Spring pin
7 Bolt
8 Spring washer
9 Fuel hose stay
10 Bolt
11 Intake manifold gasket
12 Intake manifold
13 Vacuum hose clamp
14 Stud bolt
15 Stud bolt
16 Flange O-ring
17 Insulator
18 Bolt & washer
19 Stay
20 Stay 2
21 Washer
22 Air cleaner bracket
23 Carburetor
24 Washer
25 Nut
26 Carburetor gasket 2
27 Connector
28 Clamp
29 Hose
30 Bolt & washer
31 Air cleaner gasket
32 Carburetor bolt
33 Carburetor spacer
34 Air cleaner bracket (for power steering)

A5-596

Fig. 3-19 Intake manifold (C-W carburetor type)

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3) EGI-TURBO Engine System (1)

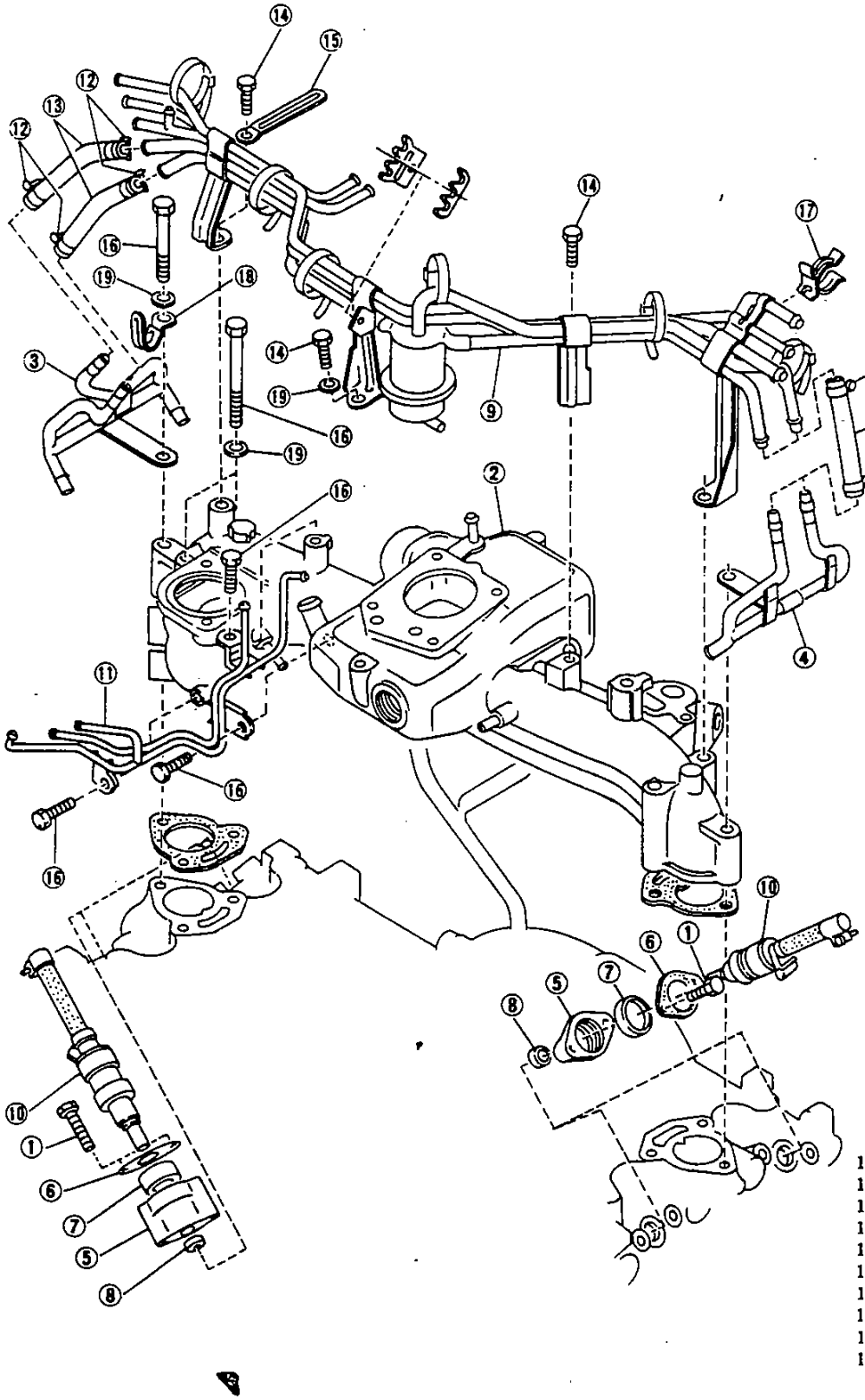


1 Hose clamp
2 Hose
3 Socket bolt
4 Spring washer
5 Throttle switch ASSY
6 Hose
7 Hose clamp
8 Screw & washer ASSY
9 Throttle body ASSY
10 Hose
11 Throttle body gasket
12 Spark plug cord supporter
13 Spring washer
14 Spark plug cord stay
15 Spark plug cord supporter
16 Bolt
17 Bolt
18 Hose
19 Nut
20 Spring washer
21 Throttle lever
22 Hose clamp
23 Hose
24 Air intake duct CP
25 Throttle return spring
26 Assist spring
27 Screw
28 Solenoid valve
29 Idle adjusting screw
30 Dash put holder
31 Washer
32 Screw & washer ASSY
33 Dash pot
34 Clip
35 Spark plug cord supporter
36 Clip
37 Plate
38 Collar C
39 Spring holder B
40 Collar A
41 Collar B
42 Sleeve
43 Spring collar
44 Spring holder A
45 Bolt

Fig. 3-20

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4) EGI-TURBO Engine System (2)



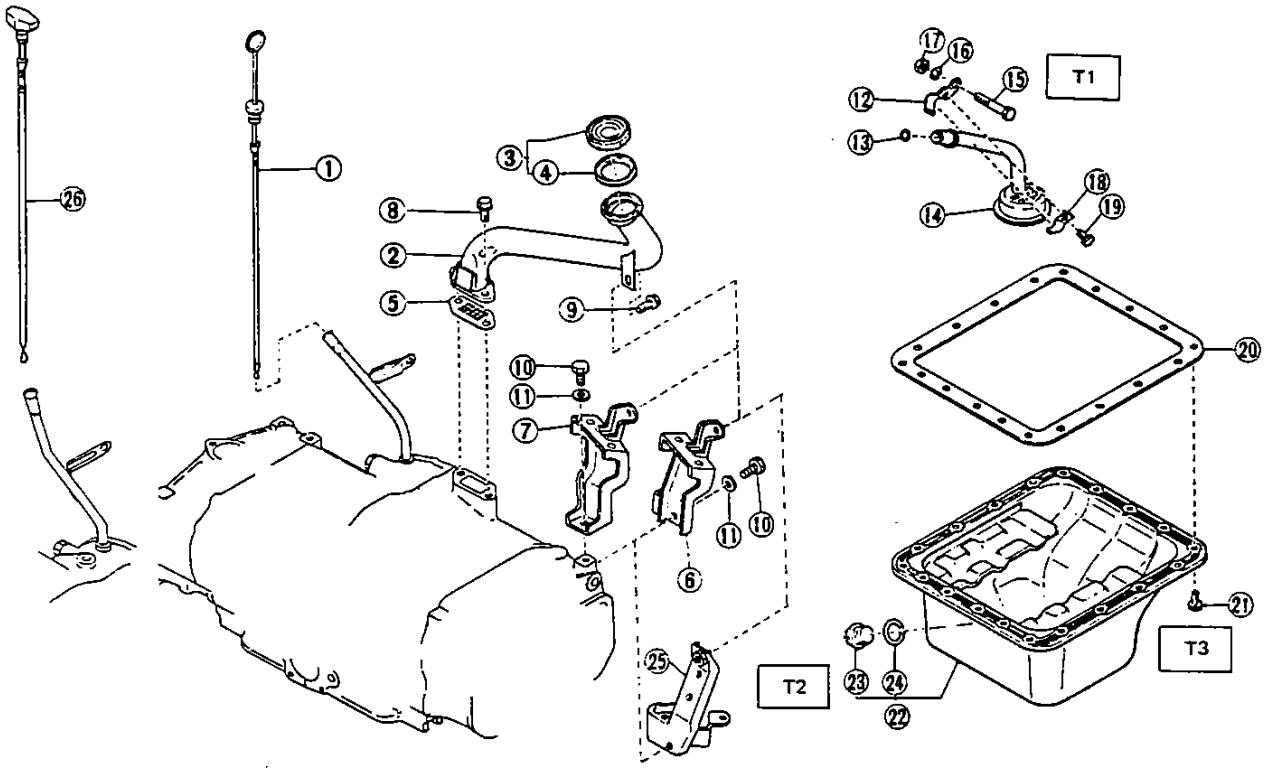
1 Bolt & washer ASSY
2 Intake manifold CP
3 Fuel pipe CP (RH)
4 Fuel pipe CP (LH)
5 Fuel injector holder
6 Fuel injector plate
7 Fuel injector insulator
8 Fuel injector seal
9 Fuel pressure regulator ASSY
10 Fuel injector ASSY
11 Vacuum pipe CP
12 Hose clamp
13 Hose
14 Bolt & washer ASSY
15 Clip
16 Bolt & washer ASSY
17 Clip
18 Clip
19 Washer

A5-738

Fig. 3-21

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9. Oil Pan, Oil Filler Duct and Fittings



Tightening torque: N·m (kg-m, ft-lb)
T1: 23 - 26 (2.3 - 2.7, 17 - 20)
T2: 22 - 27 (2.2 - 2.8, 16 - 20)
T3: 4.4 - 5.4 (0.45 - 0.55, 3.3 - 4.0)

1 Oil level gauge
2 Oil filler duct
3 Oil filler cap CP
4 Gasket
5 Air breather duct gasket
6 Oil filler duct stay (SUBARU 1800)
7 Oil filler duct stay (SUBARU 1600)
8 Bolt and washer
9 Bolt and washer
10 Bolt
11 Spring washer
12 Oil strainer stay
13 O-ring
14 Oil strainer
15 Bolt
16 Spring washer
17 Nut
18 Oil strainer stay 2
19 Bolt & washer
20 Oil pan gasket
21 Bolt & washer
22 Oil pan CP
23 Plug
24 Gasket
25 Oil filler duct stay (TURBO)
26 Oil level gauge (TURBO)

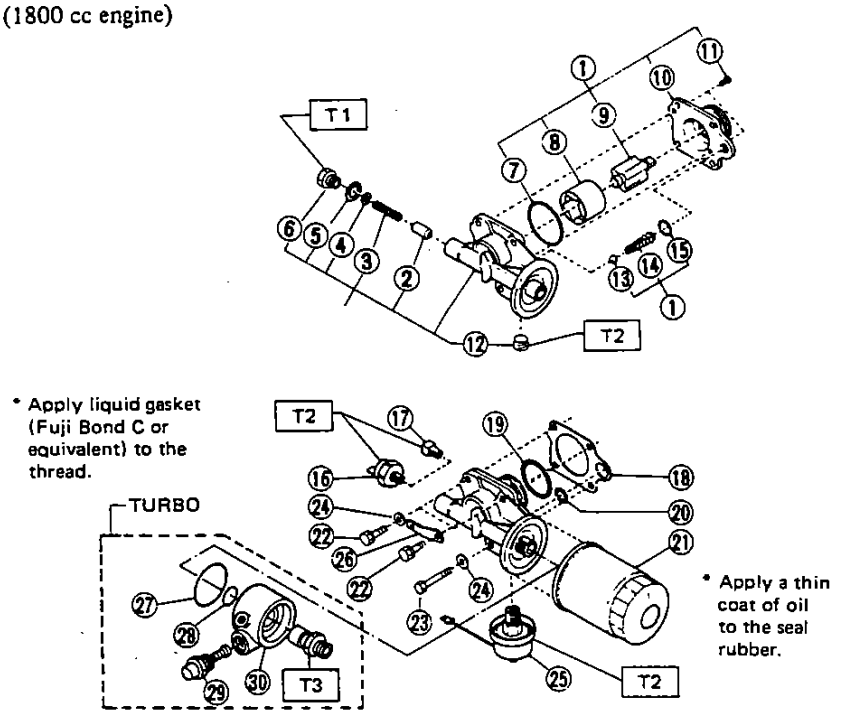
Fig. 3-22

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10. Oil Pump

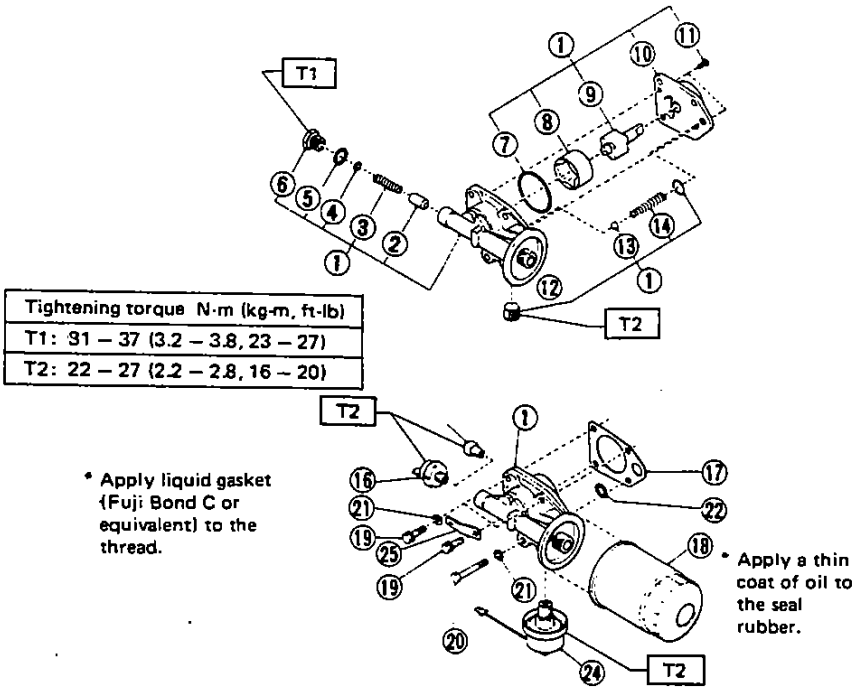
(1800 cc engine)



Tightening torque N·m (kg-m, ft-lb)
T1: 31 - 37 (3.2 - 3.8, 23 - 27)
T2: 22 - 27 (2.2 - 2.8, 16 - 20)
T3: 29 (3.0, 22)

1 Oil pump assembly
2 Oil relief valve
3 Relief valve spring
4 Washer
5 Washer
6 Plug
7 O-ring
8 Oil pump rotor
9 Oil pump drive gear
10 Oil pump body holder
11 Pan head screw
12 Plug (Models without pressure gauge)
13 Ball
14 By-pass valve spring
15 O-ring
16 Oil pressure switch (Models without pressure gauge)
17 Plug (1/8") (Models with pressure gauge)
18 Oil pump body gasket
19 O-ring
20 O-ring
21 Oil filter
22 Bolt
23 Bolt
24 Washer
25 Oil pressure gauge (Models with pressure gauge)
26 Stay
27 O-ring
28 O-ring
29 Thermo valve
30 Attachment
31 Connector

(1600 cc engine)



Tightening torque N·m (kg-m, ft-lb)
T1: 31 – 37 (3.2 – 3.8, 23 – 27)
T2: 22 – 27 (2.2 – 2.8, 16 – 20)

1 Oil pump assembly
2 Oil relief valve
3 Relief valve spring
4 Washer
5 Washer
6 Plug
7 O-ring
8 Oil pump rotor
9 Oil pump drive gear
10 Oil pump body holder
11 Pan head screw
12 Plug (Models without pressure gauge)
13 Ball
14 By-pass valve spring
15 O-ring
16 Oil pressure switch (Models without pressure gauge)
17 Oil pump body gasket
18 Oil filter
19 Bolt
20 Bolt
21 Washer
22 O-ring
23 Plug (Models with pressure gauge)
24 Oil pressure gauge (Models with pressure gauge)
25 Stay

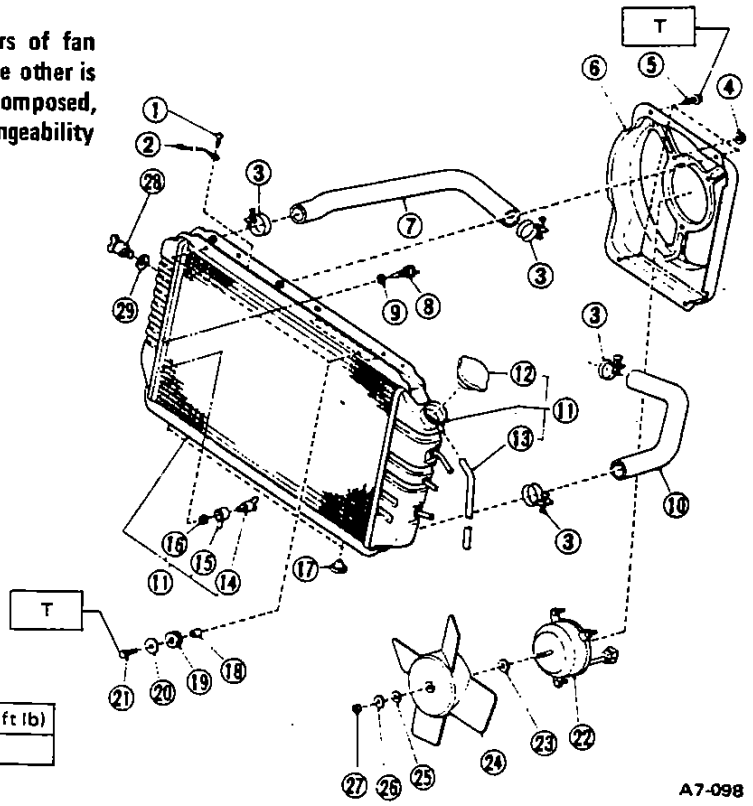
Fig. 3-23

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11. Engine Cooling System

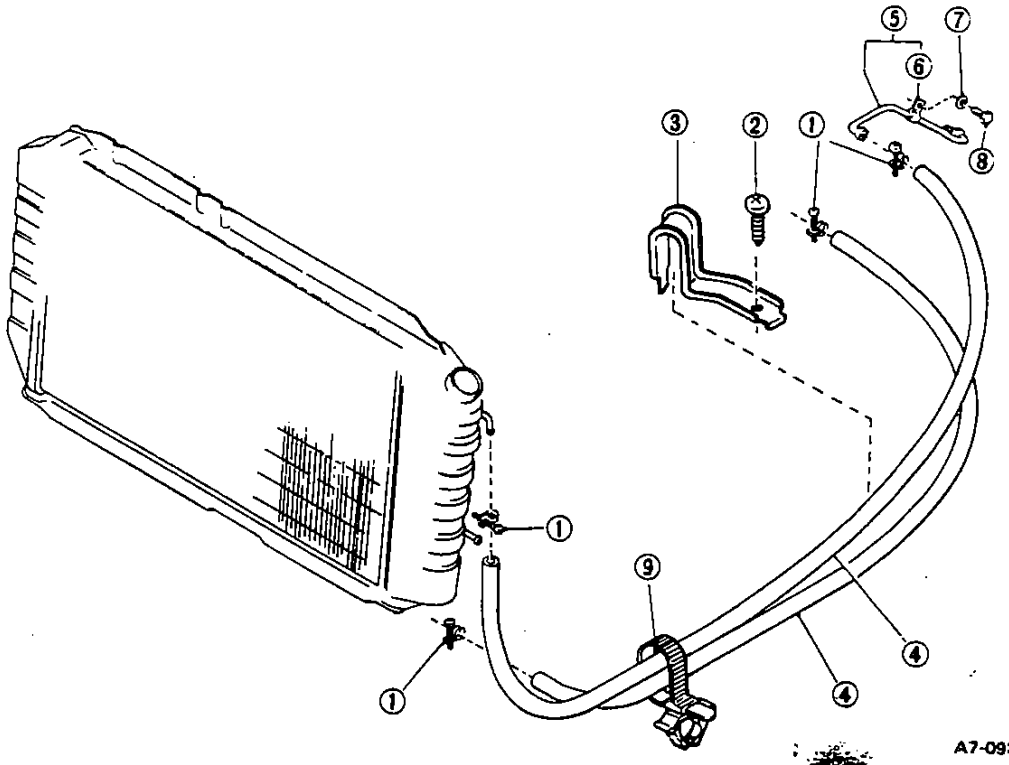
NOTE:
There are two manufacturers of fan ASSY. One is Hitachi and the other is Mitsuba. Each is exclusively composed, so there is no interchangeability between two manufacturers.



1 Ground cord
2 Tapping screw
3 Hose clamp
4 Flange nut
5 Flange bolt
6 Shroud
7 Radiator inlet hose
8 Thermo switch
9 Packing
10 Radiator outlet hose
11 Radiator assembly
12 Radiator cap
13 Overflow tube
14 Drain plug
15 Water drain
16 Packing
17 Cushion
18 Spacer
19 Grommet
20 Washer
21 Bolt & washer
22 Motor
23 Washer
24 Fan
25 Fan washer
26 Washer
27 Nut
28 Plug (AT only)
29 Gasket

Tightening torque: N·m (kg-m, ft lb)
T: 10 – 18 (1.0 – 1.8, 7 – 13)

Fig. 3-24 Engine cooling system (Radiator ASSY and electric fan)



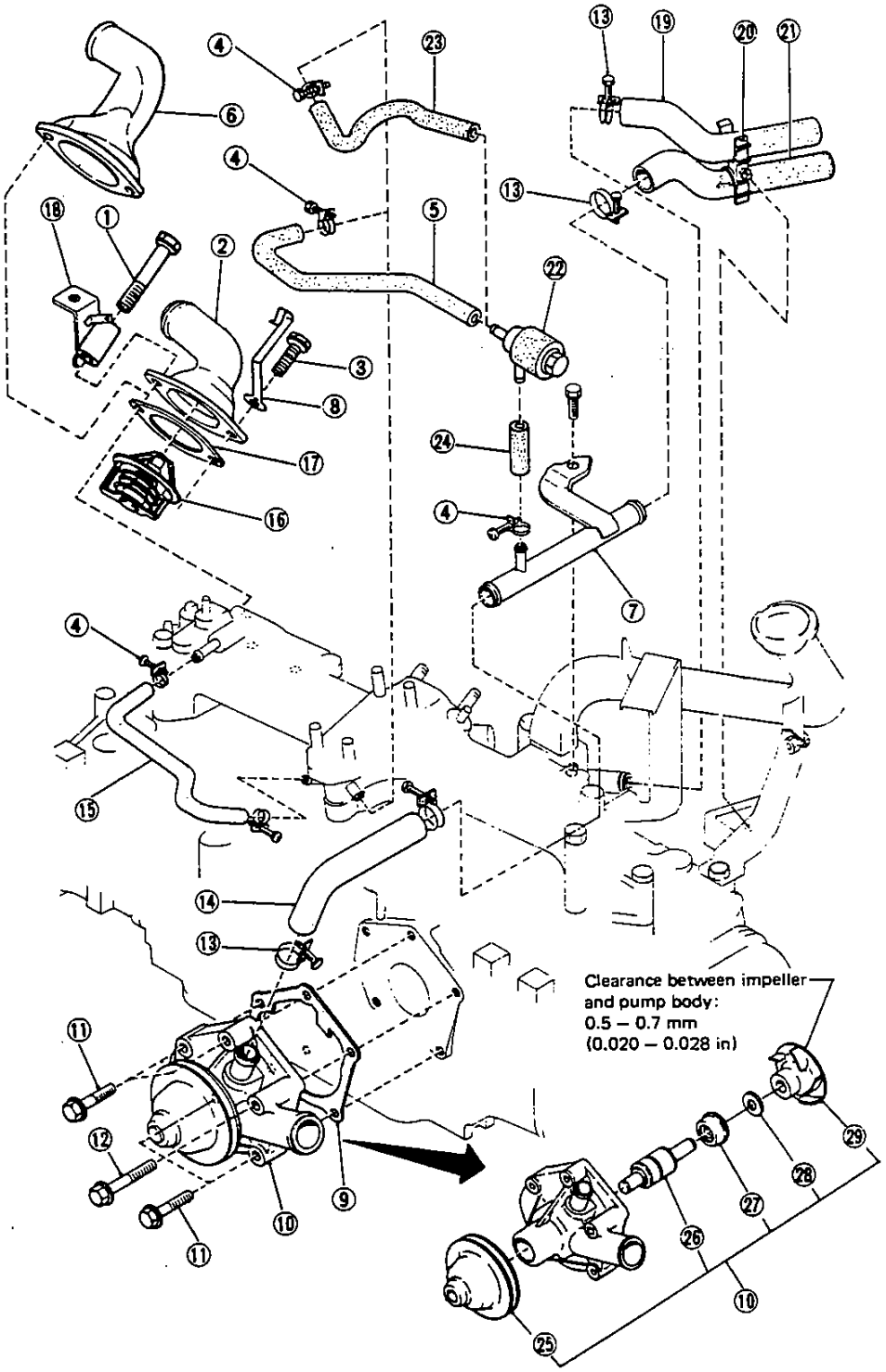
1 Hose clamp
2 Tapping screw
3 Oil cooler pipe clamp
4 Oil cooler hose
5 Oil cooler pipe complete
6 Oil cooler pipe clamp
7 Spring washer
8 Bolt
9 Clip

Fig. 3-25 Engine cooling system [Oil cooler (AT)]

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12. Water Pump and Relative Fittings

1) Non-TURBO Vehicle



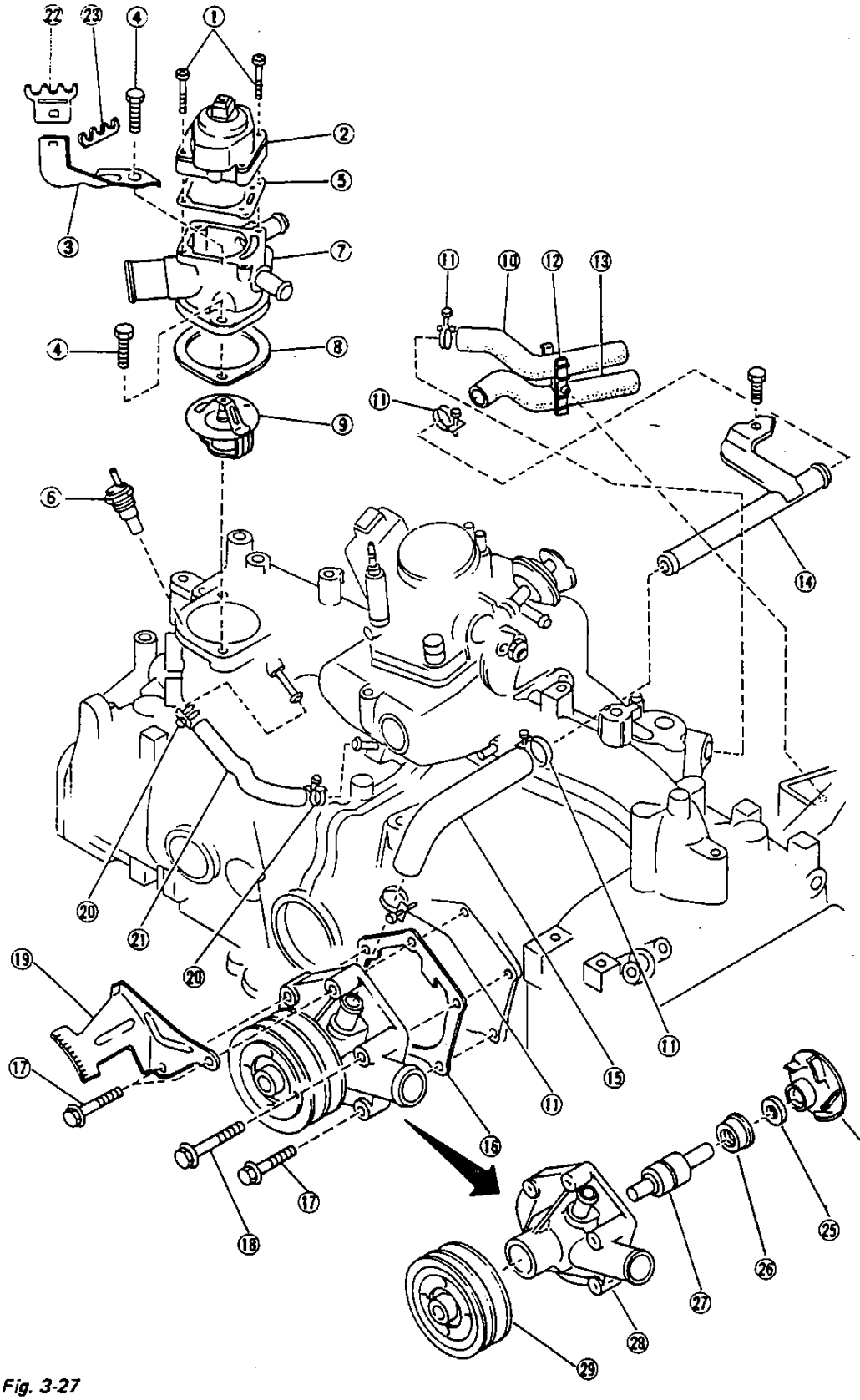
1 Bolt & washer
2 Thermostat cover
3 Bolt & washer
4 Hose clamp
5 Hose (For C-W carburetor)
6 Thermostat cover (For power steering)
7 Water by-pass pipe
8 Protector stay
9 Water pump gasket
10 Water pump
11 Bolt & washer
12 Bolt & washer
13 Hose calmp
14 Hose
15 Hose
16 Thermostat
17 Thermostat cover gasket
18 Solenoid valve bracket
19 Hose
20 Heater hose clamp
21 Hose
22 Thermo valve
23 Hose (For Hitachi carburetor)
24 Hose
25 Water pump pulley
26 Water pump shaft
27 Water pump mechanical seal
28 Water pump plate CP
29 Water pump impeller

Fig. 3-26 Engine cooling system (Water pump and relative fittings)

A5-676

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2) TURBO Vehicle



1 Screw & washer ASSY
2 Auxiliary air valve
3 Spark plug cord stay
4 Bolt & washer ASSY
5 Gasket
6 Thermometer CP
7 Thermo case cover CP
8 Gasket
9 Thermostat
10 Hose
11 Hose clamp
12 Heater hose clamp
13 Hose
14 Water by-pass pipe CP
15 Hose
16 Gasket
17 Bolt & washer ASSY
18 Bolt & washer ASSY
19 Timing plate
20 Hose clamp
21 Hose
22 Spark plug cord supporter
23 Spark plug cord supporter
24 Water pump impeller
25 Plate
26 Mechanical seal
27 Water pump shaft
28 Water pump case
29 Water pump pulley

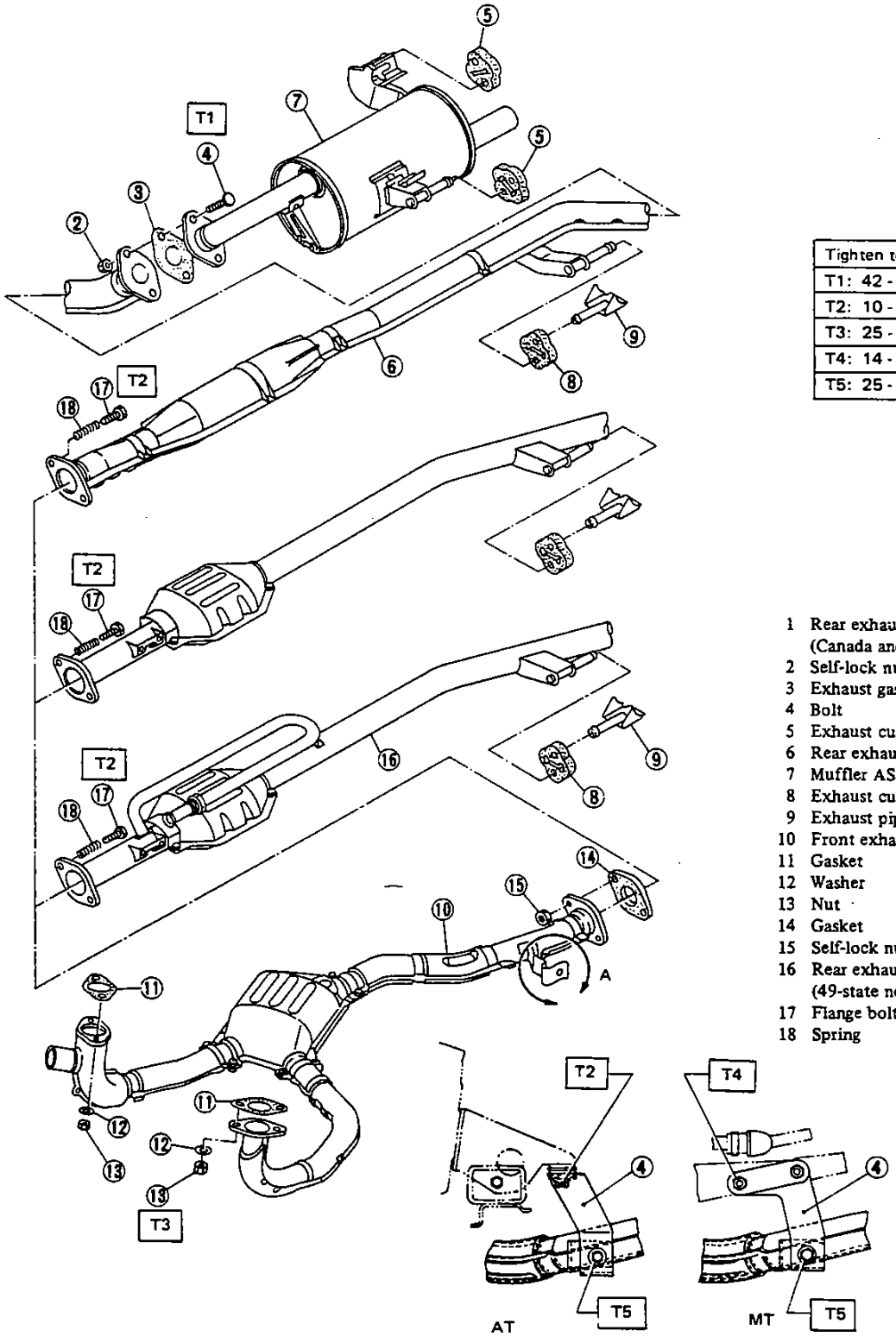
A5-740

Fig. 3-27

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13. Exhaust System

1) Non-TURBO Vehicle



Tighten torque: N·m (kg-m, ft-lb)
T1: 42 - 52 (4.3 - 5.3, 31 - 38)
T2: 10 - 18 (1.0 - 1.8, 7 - 13)
T3: 25 - 29 (2.6 - 3.0, 19 - 22)
T4: 14 - 22 (1.4 - 2.2, 10 - 16)
T5: 25 - 34 (2.5 - 3.5, 18 - 25)

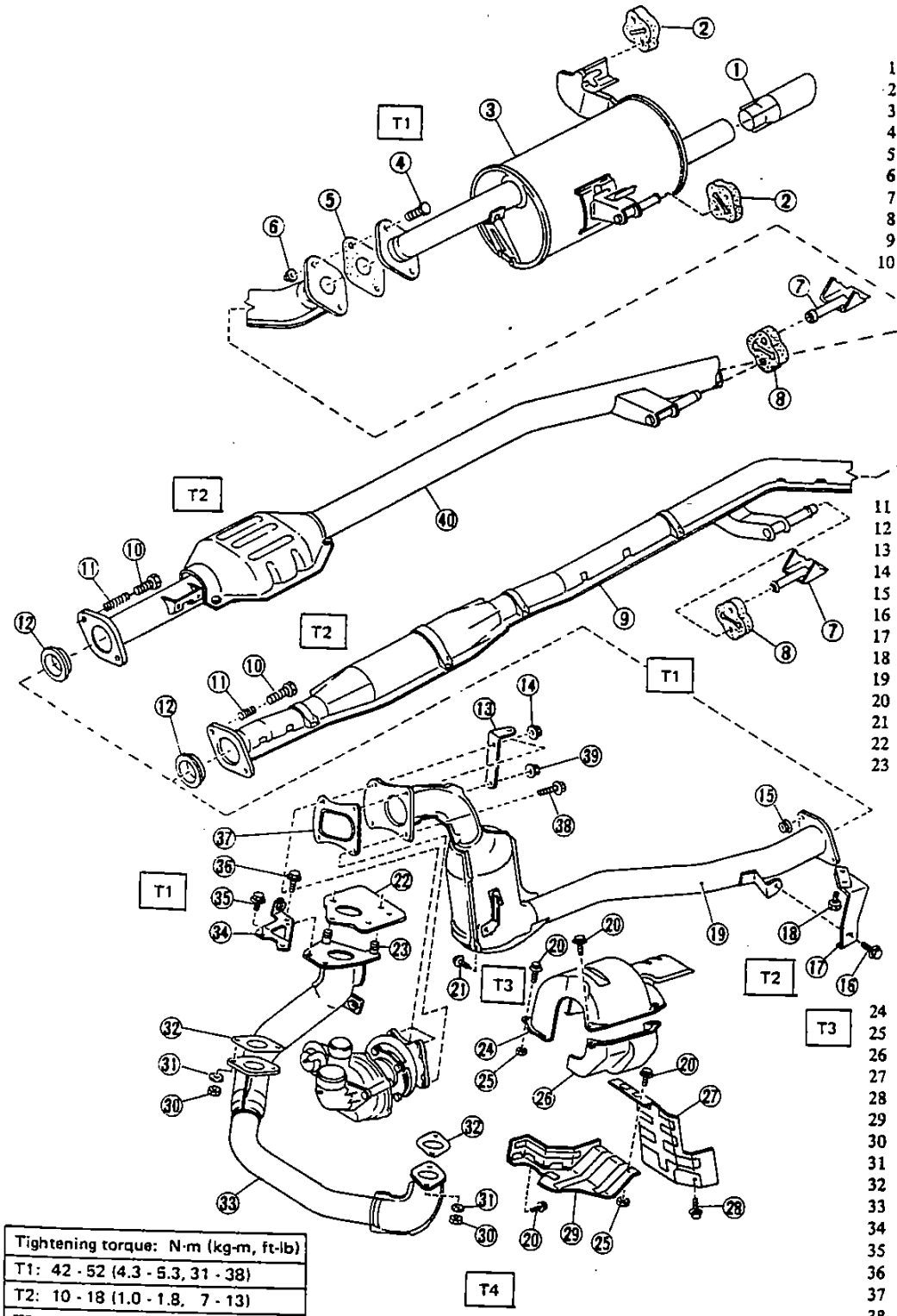
1 Rear exhaust pipe ASSY (Canada and 49-state 4WD)
2 Self-lock nut
3 Exhaust gasket
4 Bolt
5 Exhaust cushion
6 Rear exhaust pipe ASSY (California)
7 Muffler ASSY
8 Exhaust cushion
9 Exhaust pipe hanger bracket
10 Front exhaust pipe ASSY
11 Gasket
12 Washer
13 Nut
14 Gasket
15 Self-lock nut
16 Rear exhaust pipe ASSY (49-state non-4WD)
17 Flange bolt
18 Spring

FA 3-28

AS-800

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2) TURBO Vehicle



1 Tail pipe cutter
2 Exhaust cushion
3 Muffler ASSY
4 Bolt
5 Exhaust gasket
6 Self lock nut
7 Exhaust pipe hanger bracket
8 Exhaust cushion
9 Rear exhaust pipe ASSY
10 Flange bolt
11 Spring
12 Exhaust gasket
13 Cover T bracket
14 Flange nut
15 Self lock nut
16 Bolt & washer ASSY
17 Bracket
18 Bolt
19 Center exhaust pipe ASSY
20 Flange bolt
21 Flange bolt
22 Turbo IN gasket
23 Stud bolt
24 Upper cover CP
25 Flange nut
26 Lower cover
27 Converter cover
28 Flange bolt
29 Under cover
30 Nut
31 Washer
32 Gasket
33 Front exhaust pipe ASSY
34 Bracket
35 Flange bolt
36 Flange bolt
37 Turbo OUT gasket
38 Flange bolt
39 Flange nut
40 Rear exhaust pipe ASSY (California model)

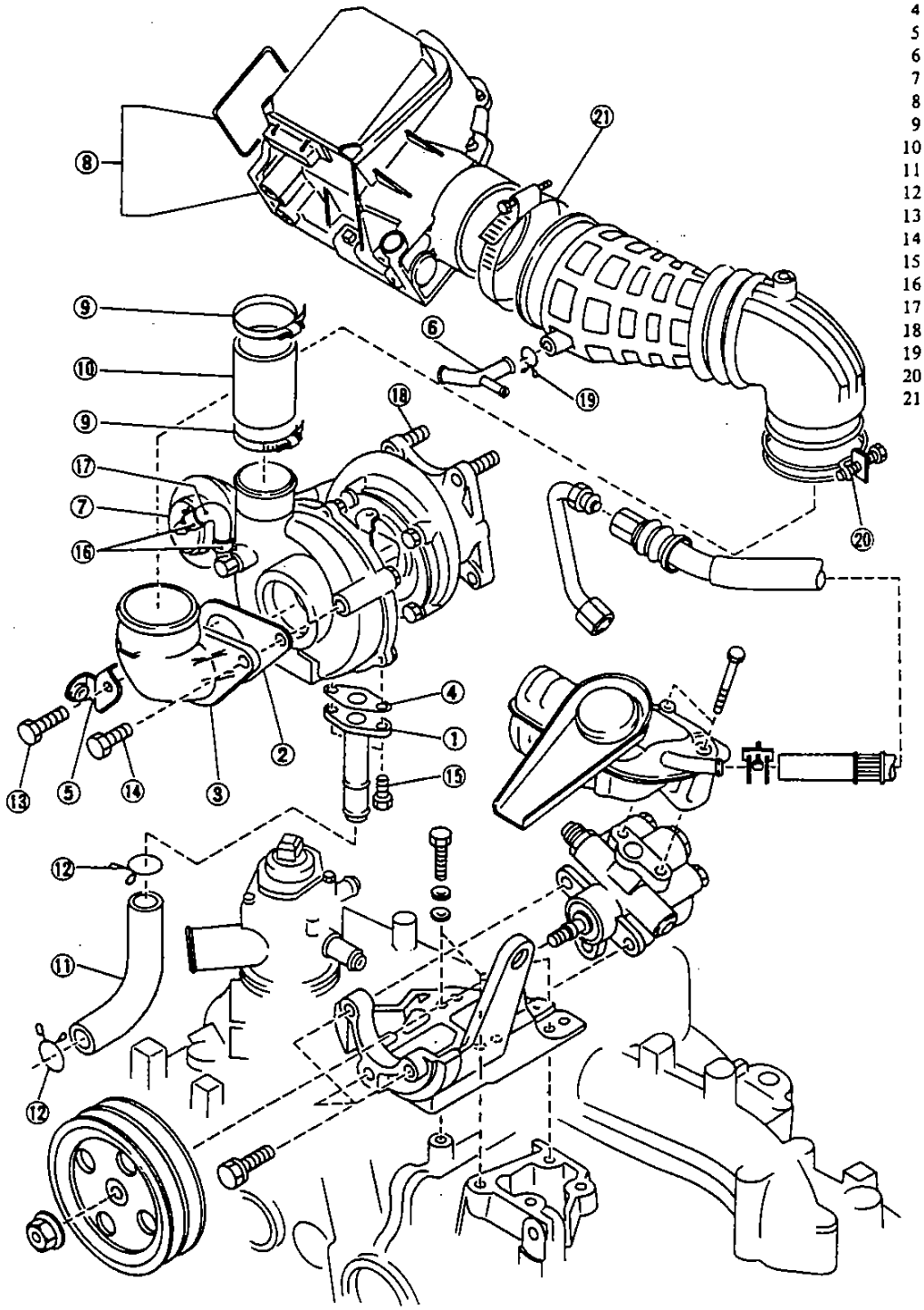
Tightening torque: N·m (kg-m, ft-lb)
T1: 42 - 52 (4.3 - 5.3, 31 - 38)
T2: 10 - 18 (1.0 - 1.8, 7 - 13)
T3: 25 - 34 (2.5 - 3.5, 18 - 25)
T4: 25 - 29 (2.6 - 3.0, 19 - 22)

Fig. 3-29

A5-801

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14. Turbocharger



1 Oil return pipe CP
2 Blower inlet gasket
3 Blower inlet elbow
4 Oil return pipe gasket
5 Oil pipe stay 2
6 Vacuum hose connector
7 Turbo charger CP
8 Air flow meter ASSY
9 Hose clamp
10 Hose
11 Hose
12 Hose clamp
13 Bolt & washer ASSY
14 Bolt & washer ASSY
15 Bolt & washer ASSY
16 Hose clamp
17 Vacuum hose
18 Turbo charger stud
19 Hose clamp
20 Hose clamp
21 Hose clamp

A5-742

Fig. 3-30

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3-3. On-car Services

Also after reassembling and remounting the engine, perform the following checks and adjustments.

NOTE:

a. Upon completion of the engine adjustments, check the oil and coolant level. Add up the oil and coolant if necessary.
b. Check to see if there is any leakage of the engine oil or coolant.
c. Check the wiring cords, pipes, hoses, etc. for undesirable interference.
d. If one or both of the cylinder heads are removed in engine disassembly, never fail to perform the retightening of the cylinder head nuts & bolts and intake manifold bolts and the adjustment of the valve clearances after the engine has been run for about 10 minutes and cooled down to ambient temperature.

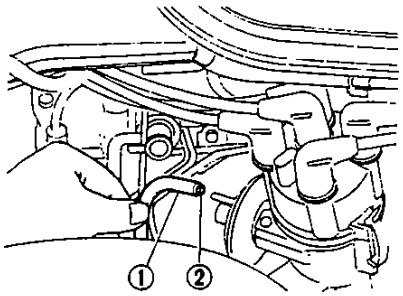
1. Ignition Timing

Perform inspection and/or adjustment of ignition timing according to the following procedures.

Ignition timing (BTDC)			
Without vacuum advance function, and with gear in neutral position (MT) or N or P position (AT), and lights off.			
Non-TURBO	1600	4-speed	8 ± 2°/650 rpm
		5-speed	8 ± 2°/700 rpm
	1800	MT	8 ± 2°/700 rpm
		AT	8 ± 2°/800 rpm
TURBO	1800	AT	15 ± 2°/800 rpm

1) Checking Ignition Timing

Before adjusting ignition timing, disconnect the pressure hose of advancer from the distributor to stop the vacuum advance function of the distributor, and, while checking ignition timing, plug the end of the pressure hose with small rod.



1 Vacuum hose
2 Rod
A5-507

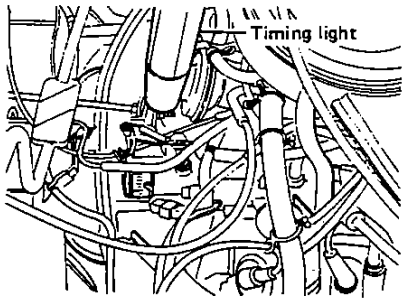
Fig. 3-31 Plugging vacuum hose

For TURBO vehicles, disconnect the black connector (2-pole connector) between distributor and knock control unit.

To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, adjust the engine idle speed to the specification and illuminate the timing mark with the timing light.

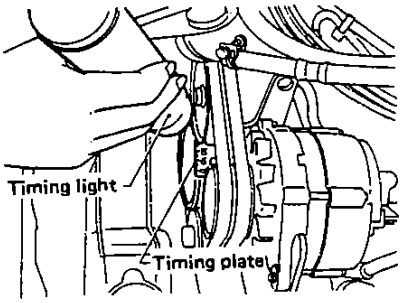
If the timing is not correct, proceed to the next paragraph for adjustment.

Non-TURBO



A5-377

TURBO

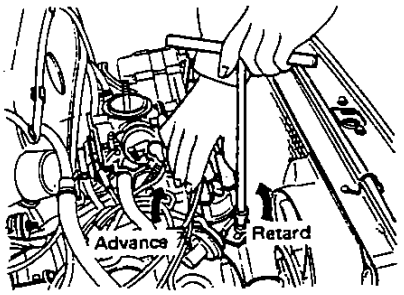


A5-743

Fig. 3-32 Checking ignition timing

2) Adjusting Ignition Timing

1) Loosen the 6 mm bolt on the mounting plate of the distributor.
2) Turn the distributor housing. The timing is advanced when the distributor housing is turned clockwise and is retarded when turned counterclockwise.
3) Tighten the bolt and make sure that the timing is correct.



A5-379

Fig. 3-33 Adjusting ignition timing

2. Engine Compression

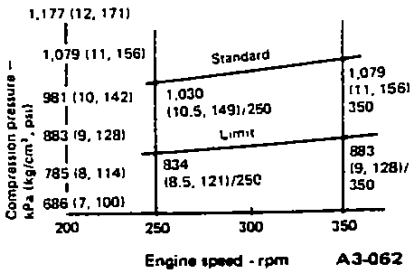
1) After warming up the engine, turn off the ignition-starter switch.
2) Make sure that the battery is fully charged.
3) Remove all the spark plugs.
4) Fully open the throttle valve.
5) Check the starter motor for satisfactory performance and operation.
6) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.

NOTE:

Hold the compression gauge tight against the spark plug hole.

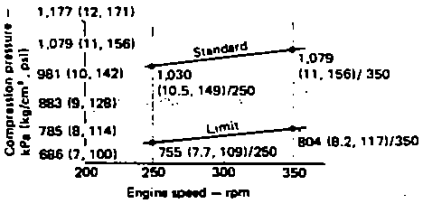
7) Perform at least two measurements per cylinder, and make sure that the values are correct.

Non-TURBO



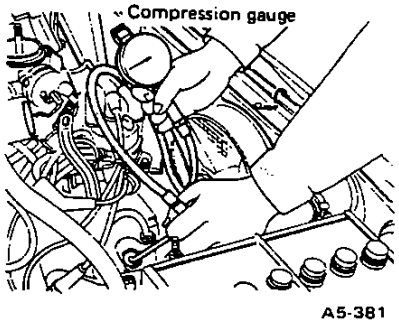
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TURBO



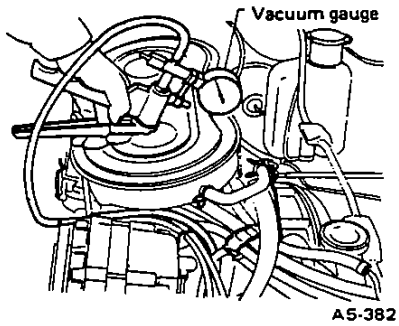
A5-744

Fig. 3-34 Compression pressure



A5-381

Fig. 3-35 Measuring compression



A5-382

Fig. 3-36 Measuring vacuum

Difference between cylinders	196 kPa (2.0 kg/cm², 28 psi) or less

3. Intake Manifold Vacuum

1) Warm up the engine.
2) Disconnect the vacuum hose and install the vacuum gauge to the hose fitting on the manifold.
3) Keep the engine at the idle speed and read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of the engine can be diagnosed as described in Table below.

Diagnosis of engine condition by measurement of manifold vacuum

Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or carburetor gasket.
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust muffler clogged.
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder.
4. Needle is steady but slightly lower than normal position.	Retarded ignition timing or insufficient valve clearances.
5. Needle is steady but slightly higher than normal position.	Advanced ignition timing.
6. Needle drops slightly and intermittently from normal position.	Leaking valves or irregular valve clearances.
7. Needle drops suddenly and intermittently from normal position.	Sticky valves.
8. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs.
9. Needle vibrates above and below normal position in narrow range.	Defective ignition system or incorrect carburetor idle adjustment.

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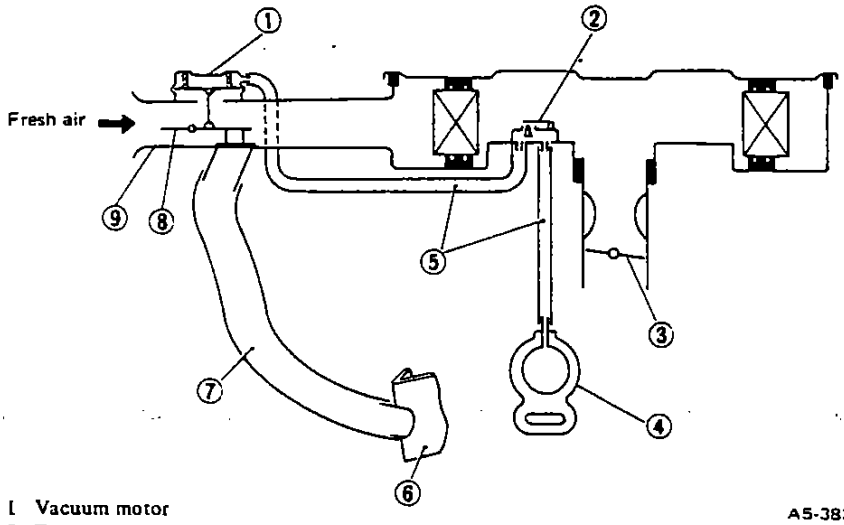
4. Hot Air Control System

Inspect the hot air control system periodically as follows:

In warm weather, it is difficult to find out malfunction of the hot air control system. In cold weather, however, malfunction of the air control valve due to disconnection or deterioration of the vacuum hose between the intake manifold and vacuum motor and insufficient durability of the air control valve will cause insufficient automatic control operation for intake air, and result in engine disorders:

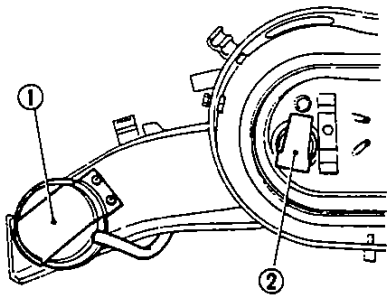
1) Stall or hesitation of engine operation,
2) Increase in fuel consumption, and
3) Lack of power.

These phenomena reveal malfunction of hot air control system. If these phenomena should occur, check the hot air control system for the following items before carrying out inspection of the carburetor.



1 Vacuum motor
2 Temperature sensor
3 Throttle valve
4 Intake manifold
5 Vacuum hose
6 Air stove
7 Air intake hose
8 Air control valve
9 Air horn (Snorkel tube)

A5-383



1 Vacuum motor
2 Temperature sensor

A5-508

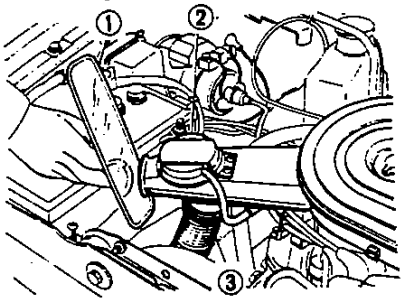
Fig. 3-37 Hot air control system

1) Vacuum Hoses

Check each hose for cracks and proper connections.

2) Vacuum Motor

1) With the engine stopped, place a mirror at the end of the air cleaner inlet pipe as shown in the figure, and check to see if the air control valve is in correct position.



1 Mirror
2 Vacuum motor
3 Air intake hose

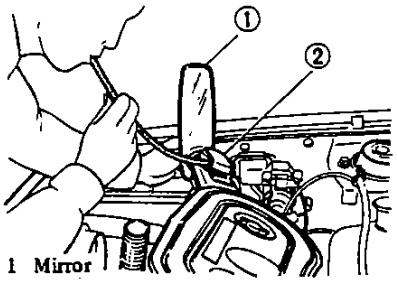
A5-385

Fig. 3-38 Inspecting valve position

The air control valve is in correct position if its under hood air inlet is open and hot air inlet is closed. Check the condition of the air control valve linkage.

2) Disconnect the vacuum motor inlet vacuum hose, and connect another hose to the inlet to apply vacuum to the vacuum motor. Vacuum can be applied by sucking at the hose end as shown in the figure.

Place a mirror at the end of the air cleaner inlet pipe, and check to see if the air control valve is in correct position.



1 Mirror
2 Vacuum motor

A5-386

Fig. 3-39 Inspecting valve position

Correct position of the air control valve is the reverse of that described in 1) above. The air control valve is in correct position if the under hood air inlet is closed, and the hot air inlet is open.

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3) With the hot air inlet in open position, as described in 2), pinch the vacuum hose with fingers so that the air does not enter the vacuum motor. In this condition, check that the air control valve maintains the condition described in 2) for more than 30 seconds, and that the hot air inlet is open. If the diaphragm spring actuates the air control valve by its spring force to open the under hood air inlet within 30 seconds, replace the vacuum motor as an assembly since this may have resulted from air leak at the vacuum motor diaphragm.

3) Temperature Sensor

Check temperature sensor for proper function by proceeding as follows. Be sure to keep the engine cold before starting this test.

1) With the engine stopped, check the position of the air control valve. In this case, underhood air inlet should be open. Use a mirror for inspection as 2) – 1).

2) Start the engine and keep it idling. Immediately after engine starting, check the air control valve for correct position as described above. In this case, the correct position of the air control valve is the reverse of 2)–1); the under hood air inlet is closed, and the hot air inlet is open.

3) Check that the air control valve gradually moves to open the under hood air inlet as the engine warms up. When the environmental temperature around the temperature sensor is low, spend more time for engine warming up operation to facilitate smooth operation of the air control valve.

4) Rubber Plate

Check the rubber plate for stickiness.

5) Air Intake Hose

Check the air intake hose for damage and its connections for leaks.

Operation of air control valve and sensor valve			
Under hood air temperature	Vacuum on vacuum motor diaphragm	Air control valve operation	Sensor valve operation
Below 38°C (100°F)	Below 5.3 kPa (40 mmHg, 1.57 inHg)	Cool air admission	Close
	Above 16.0 kPa (120 mmHg, 4.72 inHg)	Hot air admission	
38 – 53°C (100 – 127°F)	———	Cool and hot air mixture admission	Open
Above 53°C (127°F)	———	Cool air admission	Open

5. Engine Idle Speed and Idle Mixture

1. ENGINE IDLE SPEED

NOTE:

a. Make sure that the ignition timing and valve clearances are correctly adjusted prior to this inspection.

b. Set the gear position at "Neutral" for MT, or "P" or "N" for AT.

c. Before inspecting the engine idle speed, ensure that:

(1) Vacuum hoses, blow-by hoses, rocker cover, oil filler cap, etc. which are connected to the intake system, are tight and secure.

(2) The engine has warmed up sufficiently and O_2 sensor has also been warmed up at an engine speed of 2,500 rpm for approximately one minute after engine warm-up.

(3) Clog the purge hose to the intake manifold after disconnecting it.

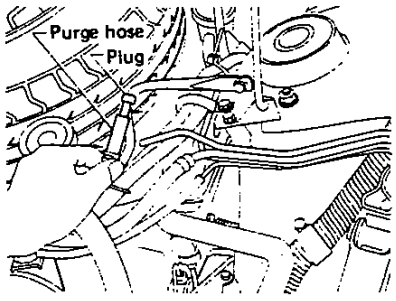


Fig. 3-40

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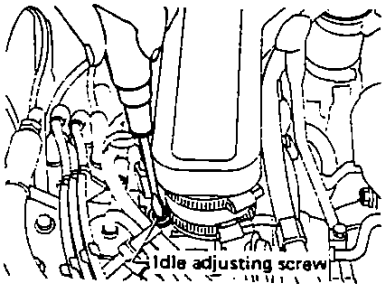
Non-TURBO vehicle

Engine idle speed (rpm)		
1600	4-speed	650 ± 100
	5-speed	700 ± 100
1800	MT	
	AT	800 ± 100

TURBO vehicle

1) Before inspection, ensure that the auxiliary air valve is completely closed.
2) Adjust the idle speed by using the idle adjusting screw located on the throttle body.

Idle speed (rpm)	800 ± 100
CO contents (%)	0.1, max.
HC contents (ppm)	200, max.



A3-282

Fig. 3-41

3) Inspecting the exhaust gas.
a. After adjusting both ignition timing and idling speed, check both the idle CO and HC contents in the exhaust gas.

NOTE:
The CO content adjusting screw of the air flow meter need not be adjusted as the air-fuel ratio is feedback controlled.

b. If the CO and HC contents are outside specifications, check and correct the problem using the following chart as a guide.

• Troubleshooting

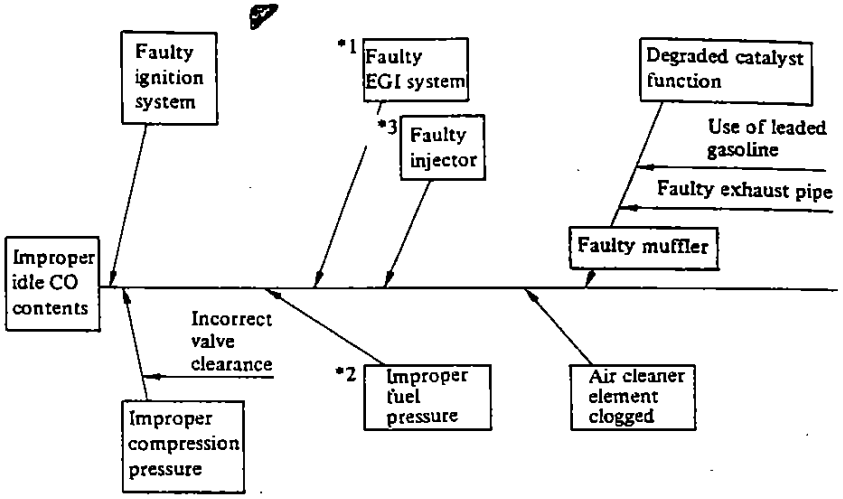


Fig. 3-42

A3-289

*1: Check the EGI system.
Connect a jumper wire and check to see if the ECS lamp flickers with the engine at idle. If it does, the EGI system is functioning properly.
*2: Check the fuel pressure.
*3: Check fuel injectors.
a: Remove the fuel injector and direct air at a pressure of approximately 196 kPa (2 kg/cm^2, 28 psi) to see if air leaks at the nozzle tip. If air leaks, replace the injector.
b: The injector is faulty.

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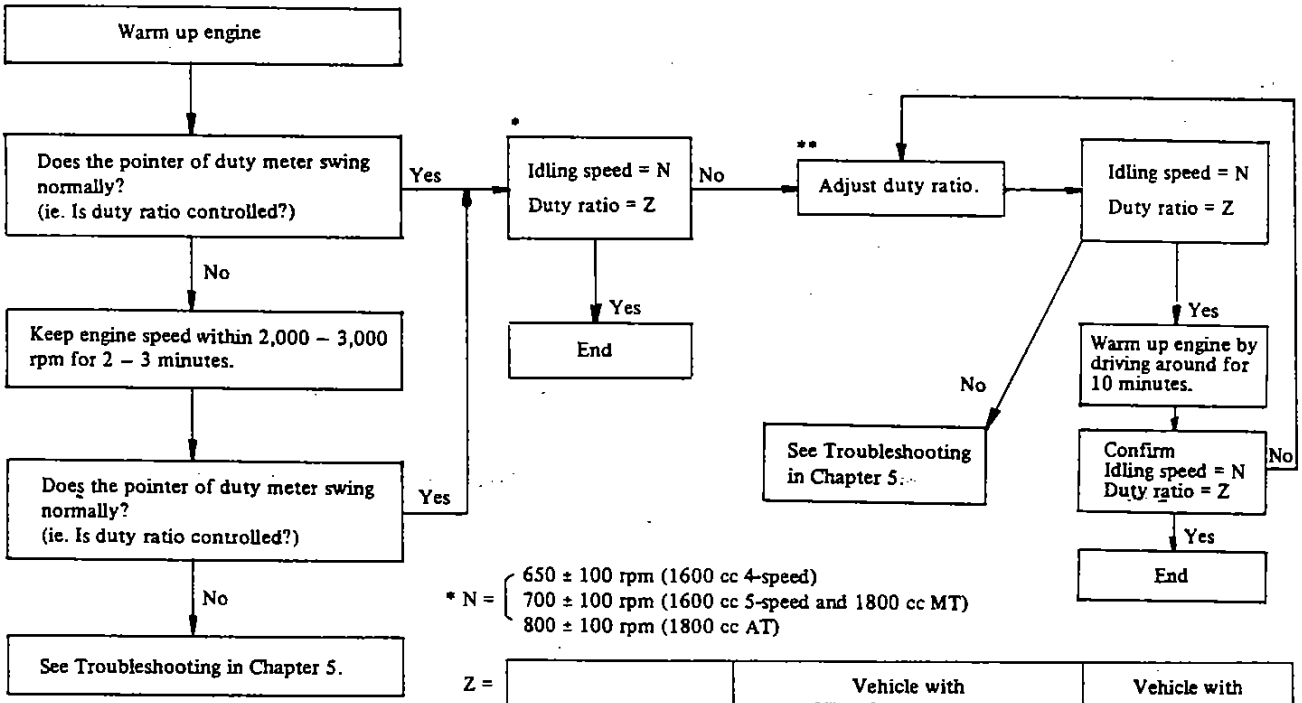
2. ENGINE IDLE MIXTURE

Non-TURBO

NOTE:
Perform the idle mixture adjustment only when dismounting carburetor from engine or disassembling carburetor. And after completion of adjustment, be sure to press spring pin into the hole in throttle chamber.

1) For 49-state Non-4WD and California

Perform the engine idle mixture adjustment according to the following diagram.



* N = { 650 ± 100 rpm (1600 cc 4-speed) / 700 ± 100 rpm (1600 cc 5-speed and 1800 cc MT) / 800 ± 100 rpm (1800 cc AT)

Z =

		Vehicle with HITACHI carburetor	Vehicle with C-W carburetor
Standard value		Duty ratio = Z 55% (49.5 deg) 35% (31.5 deg) 50 m (164 ft) 1,600 m (5,250 ft) (Z is determined according to the altitude.)	Z = 35% (31.5 deg) (Z is constant regardless of the altitude.)
Allowance	At adjusting	±5% (±4.5 deg)	
	At checking	±20% (±18 deg)	

** Adjust idle adjusting screw so that duty meter indicates 35 ± 10%.

NOTE:
a. Perform the above adjustment on both main and slow duty solenoid valve by using check terminal.
b. Adjustment method by using dwell meter is as follows.
(1) Set the range switch to 'four cycle – four cylinder'.
(2) Adjust the idle adjusting screw so that the needle points out according to the following calculation.

$$\text{Dwell (deg)} = \frac{90}{100} \times \text{Duty (\%)}$$

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2) For 49-state 4WD and Canada

Adjust engine idle mixture as follows:
1) Start engine and warm up sufficiently.
2) Inspect idle speed and CO percentage in exhaust gas with secondary air.

		Other than AT	AT & 4WD-AT	1600 2-Door Hatchback STD
Idle speed (rpm)		700 ±100	800 ±100	650 ±100
CO percentage (%)	Without secondary air	2.0 ±1.0	1.5 ±1.0	2.0 ±1.0
	With secondary air	0 – 0.4		

3) Disconnect air suction hose between air suction valve and secondary air cleaner.
4) Clog air suction pipe with rubber cap or the like.
5) Inspect idle speed and CO percentage in exhaust gas without secondary air.
6) If necessary, adjust idle speed and CO percentage in exhaust gas while clogging air suction pipe.
a. Adjust both throttle adjusting screw and idle mixture adjusting screw to obtain the specified idle speed and CO percentage without secondary air.
b. Remove the plug clogging air suction pipe, and connect the pipe to secondary air cleaner hose.
c. With secondary air, recheck that idle speed and CO percentage satisfy the specifications.

TURBO

This adjustment is not recommendable.

6. Radiator

Check radiator, hoses and their connections for damage, clogging or leakage.

A. Testing of radiator cap

Check the valve, spring and packing in the cap for damage.
Check rubber seal on cap for tears, cracks or deterioration after cleaning it.
Install the cap on a tester and if cap does not hold or does not release the specified pressure, replace cap.

Standard pressure at which valve starts to open	88 kPa (0.9 kg/cm², 13 psi)

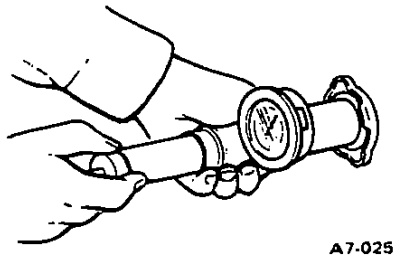


Fig. 3-43 Testing the cap

B. Testing of radiator leakage

Inspect radiator for leakage using a cap tester and applying a pressure of 157 kPa (1.6 kg/cm², 23 psi).
If a leakage is detected, repair or replace the radiator.

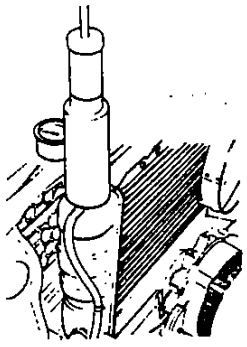


Fig. 3-44 Testing the radiator

7. Hydraulic Valve Lifter

1) Replacement

The hydraulic valve lifter can be replaced even when the engine is mounted on the vehicle as follows:

1) Disconnect both the blow-by and PCV hoses.
2) Remove the valve rocker cover.
3) Using the special tool (Socket Wrench: 899988607), loosen the valve rocker ASSY and remove the push rod.
4) Raise the vehicle body with a jack and support it on a safety stand.
5) Remove the nuts which secure the front engine mounting and slightly raise the engine using a floor crane.
6) Remove the drain plug to drain the engine oil completely. Detach the oil pan.
7) Remove the hydraulic valve lifter. Use of a magnet facilitates removal.

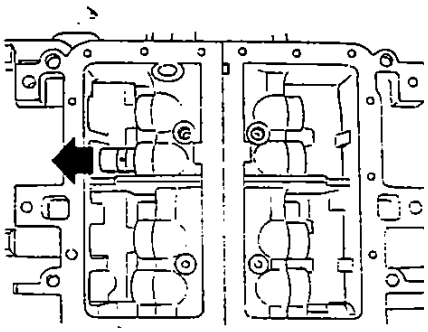


Fig. 3-45

8) The valve lifter can be installed in the reverse order.

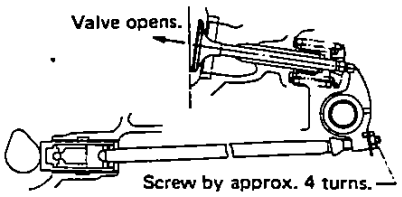
2) Adjustment

1) Perform adjustment in cold condition [coolant temperature: 20 to 40°C (68 to 104°F)].
2) Retighten cylinder head nuts and bolts previously if necessary.
3) Adjust hydraulic valve lifter with the following procedures:
a. Perform adjustment in two (2) sequences.
Sequence (I) ————————
Position #1 cylinder at TDC (compression), and adjust the valve lifters for intake and exhaust valves on #1 cylinder, for exhaust valve on #3 cylinder and for intake valve on #4 cylinder.

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Sequence (II) ——————
Position #2 cylinder at TDC (compression), and adjust all the others, i.e. for intake and exhaust valves on #2 cylinder, for intake valve on #3 cylinder and for exhaust valve on #4 cylinder.

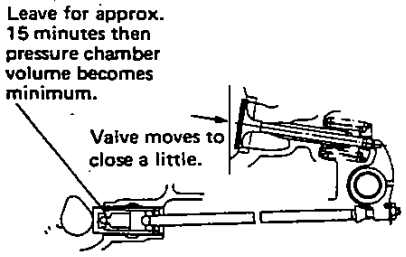
b. Raise up the bend of lock washer, loosen the lock nut, and then turn the valve rocker screw clockwise by approx. four (4) turns using Valve Clearance Adjuster 498767000.



A5-700

Fig. 3-46

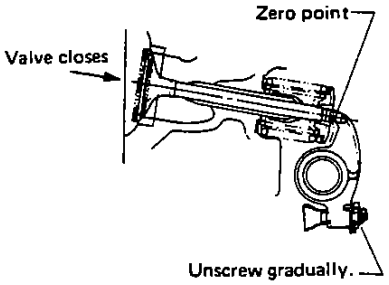
c. Leave it with the valves opened for approx. 15 minutes.



A5-701

Fig. 3-47

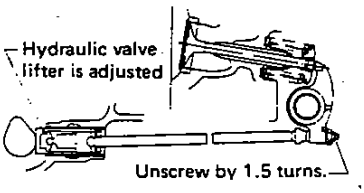
d. Unscrew the valve rocker screw gradually. Then, the rocker arm stops moving due to the closing of valve. This condition is called "Zero Point".



A5-702

Fig. 3-48

e. Moreover, unscrew the valve rocker screw counterclockwise by 1.5 turns.



A5-703

Fig. 3-49

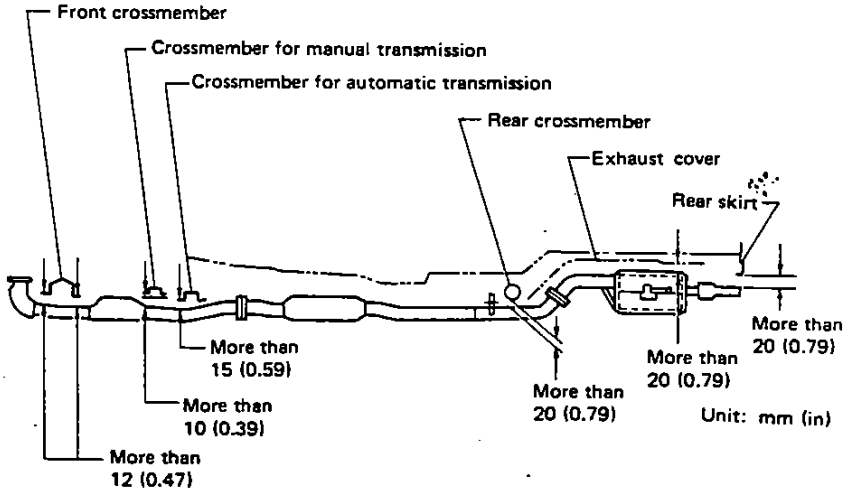
f. Tighten the lock nut, and bend the lock washer.

8. Exhaust System

1) After installing the exhaust system, check all clearances to ensure that they exceed the specified values.
2) If a clearance is small at any particular point, loosen all connections, then readjust clearances by utilizing free play existing at each bolt location until correct clearances are obtained. Finally, tighten all connections to the specified value.

NOTE:
If muffler or exhaust pipe clearance is excessively small due to a deformed or broken exhaust cover, repair or replace the cover, and adjust the clearance correctly.

Non-TURBO



A22-065

Fig. 3-50

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TURBO

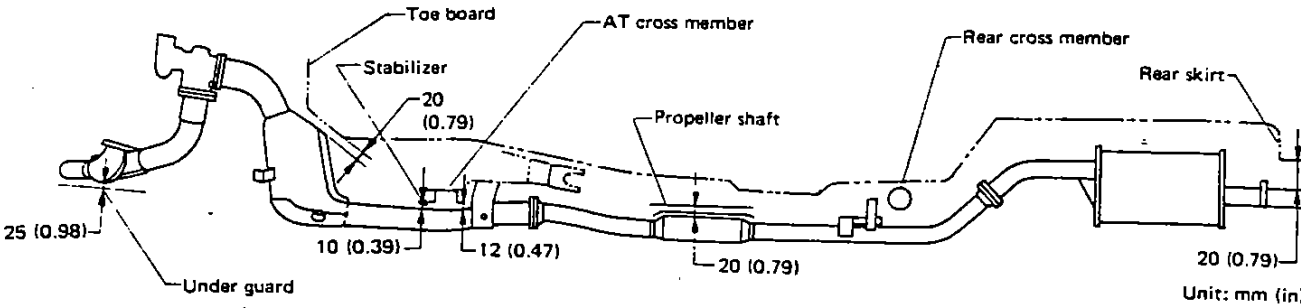


Fig. 3-51

NOTE:
Observe the following precautions when removing and installing the front, center, and rear exhaust pipes.

a. **After a gasket is removed it must never be reused. Always use Subaru genuine parts for replacement.**
   (When the center exhaust pipe is replaced, the gasket in the joint between the center and rear exhaust pipes should also be replaced. During ordinary servicing, this gasket should not be separated from the center exhaust pipe.)
b. **The bolts and nuts should be the specified genuine parts. Self-locking nuts cannot be reused.**
c. **To loosen the bolts and nuts holding the turbocharger, first apply a lubricant such as CRC to them while the engine is cold.**
d. **When installing the front exhaust pipe, ensure that the pipe is free of foreign matter and then join it to the turbocharger.**
   (If foreign matter enters the turbocharger, it can cause damage to the impeller.)

9. Oxygen (O_2) Sensor

Oxygen (O_2) sensor is one of the important emission control parts. Therefore, replace it as follows only when it is damaged by external force, or if it seems to be out of order according to troubleshooting etc.

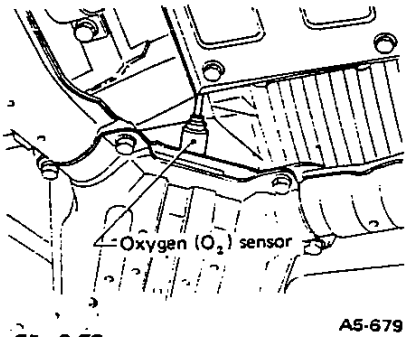


Fig. 3-52

1) Removal

1) Disconnect O_2 sensor cord.
2) Apply SUBARU GUARD (000902821) or its equivalent to threaded portion of oxygen (O_2) sensor, and leave it for one minute or more.
3) Loosen oxygen (O_2) sensor by turning it 10 to 40 degrees with special tool (Socket: 499990100 for Non-TURBO or 926040000 for TURBO) and wrench.

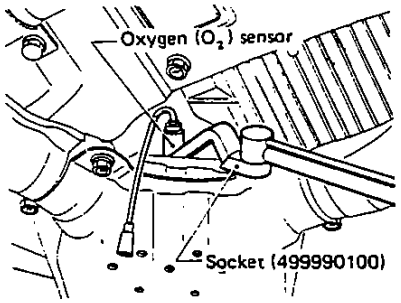


Fig. 3-53

4) Apply SUBARU GUARD (000902821) to threaded portion of oxygen (O_2) sensor again, and leave it for one minute or more.
5) Remove oxygen (O_2) sensor by using socket and wrench.

NOTE:
When removing, do not force oxygen (O_2) sensor especially when exhaust pipe is cold; otherwise it will damage the exhaust pipe.

2) Installation

1) Apply anti-seize compound ("SS-30" made by JET-LUBE Inc. in U.S.A. or its equivalent) only to threaded portion of oxygen (O_2) sensor to make the next removal easier.

NOTE:
Never apply anti-seize compound to protector of oxygen (O_2) sensor.

2) By using socket and torque wrench, install oxygen (O_2) sensor onto front exhaust pipe by tightening it to the specified torque.

Torque [oxygen (O_2) sensor]	25 – 34 N·m (2.5 – 3.5 kg-m, 18 – 25 ft-lb)

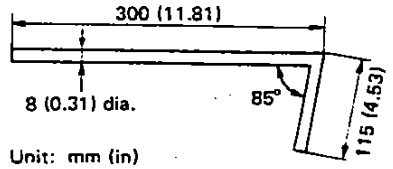
3) Securely connect oxygen (O_2) sensor cord.

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10. Removal and Installation of Crank Pulley

1) Removal

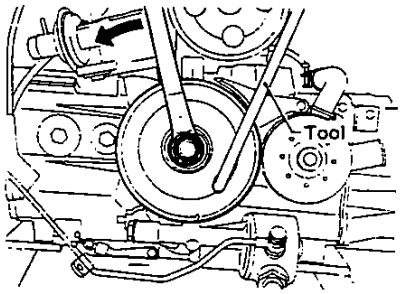
1) Loosen the two bolts which secure the alternator ASSY and remove the V-belt.
2) Place the tool shown in the figure in the hole of the crank pulley to hold it stationary, loosen the bolt, and remove the crank pulley. (The above tool can be prepared by modifying a large screwdriver.)



A5-746

Fig. 3-54-1

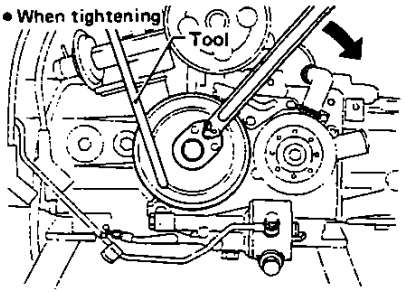
• When loosening



A5-747

Fig. 3-54-2

• When tightening



A5-748

Fig. 3-55

2) Installation

1) Insert the tool in the hole of the crank pully to stop it from turning, and tighten the bolt.

Tightening torque	64 – 74 N·m (6.5 - 7.5 kg-m, 47 - 54 ft-lb)

NOTE:
Apply Three Bond #1215 or the like to the bolt seat.

2) Install the V-belt.

Tension of V-belt	Without air conditioner	7 – 9 mm (0.28 – 0.35 in) /98 N (10 kg, 22 lb)
	With air conditioner	6 – 8 mm (0.24 – 0.31 in) /98 N (10 kg, 22 lb)

11. Turbocharger System Inspection

1) Inspecting the Turbocharger System Piping for Damage and Installation

Check the waste gate valve control rubber hose for disconnection, slackness, cracks and damage.

2) Inspecting the Function of the Supercharging Pressure Controller

1) Disconnect the waste gate valve control rubber hose at the actuator side and connect the inspection hose. Seal the disconnected hose with a blind plug.
2) Using an air gun, apply a pressure of 49 to 59 kPa (0.5 to 0.6 kg/cm^2, 7 to 9 psi) to the inspection hose to see if the waste gate link operates.

NOTE:
The waste gate control diaphragm may break if excessive pressure is applied. Before applying the air pressure, check that it is between 49 to 59 kPa (0.5 to 0.6 kg/cm^2, 7 to 9 psi) with a pressure gauge.

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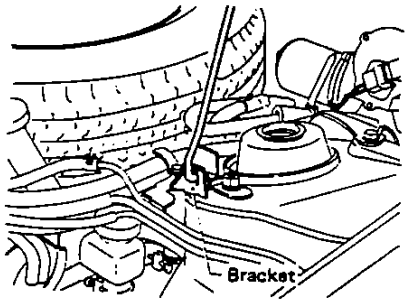
3-4. Dismounting and Remounting

1. Precautions

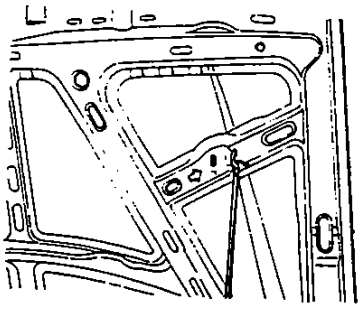
1) Perform the job at a place where a chain hoist or a floor crane is available. If possible, it is desirable to perform the job over a pit together with a chain hoist or a floor crane.
2) Be careful not to soil the vehicle interior (particularly windows and seats).
3) Be careful not to allow brake fluid and coolant to come in contact with the painted surfaces of the vehicle body. It is desirable to cover the fenders with covers during the work, if possible.

2. Dismounting

1) Open engine hood and set its stay in the correct position.



A1-063



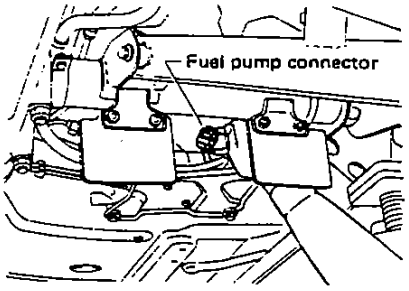
A4-161

Fig. 3-56 Opening engine hood

2) Detach spare tire.

NOTE:
Be careful not to damage adjacent parts.

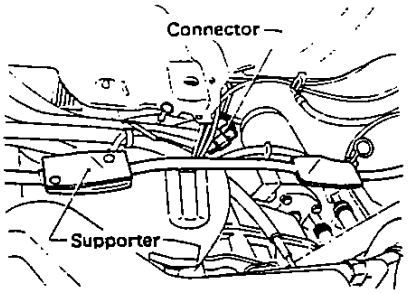
3) Decrease the fuel pressure (TURBO).
a. Disconnect the fuel pump connector and stop its operation.
b. Crank the engine for at least 5 seconds.
c. If the engine starts, leave it unattended until it stalls.
d. Connect the fuel pump connector.



A5-749

Fig. 3-57

4) Remove the battery ⊖ terminal and ground cable.
5) Disconnect the air temperature sensor connector in the engine room (TURBO), and remove the spare tire supporter, or raise supporter upward (TURBO).



A5-750

Fig. 3-58

6) Disconnect hoses and electric wiring from air cleaner. Remove bolts and nuts, and take out air cleaner (Non-TURBO).

NOTE:
Plug the carburetor opening to prevent dirt or dust from entering carburetor.

7) Remove the fuel hoses and the evaporation hoses.

NOTE:
Gasoline remaining in delivery hose may flow out. Therefore receive this gasoline with an appropriate container.

8) Remove vacuum hoses.
a. Cruise control
b. Master-Vac
c. Air intake shutter
d. Vacuum control diaphragm
e. Carburetor vent hose (Non-TURBO)
f. Purge hose (Non-TURBO)
9) Remove the harness, etc. (TURBO)
a. High-tension cord
b. Ignition cord connector
c. Alternator harness connector
d. Engine ground wire
e. Connector of concentration wires
f. EGI harness connector
g. Thermoswitch harness connector and electric fan harness connector
h. Condenser harness
i. Ignition coil harness cord (both ⊕ and ⊖)
10) Disconnect electric wiring, hoses, etc. (Non-TURBO)
a. Engine wiring harness
b. High tension cords
c. Alternator wiring
d. Starter wirings
e. Vacuum switch hose(s)
11) Remove link ASSY.
12) Disconnect cables, pitching stopper, etc.
- Accelerator cable
- Clutch cable
- PHV cable
- Pitching stopper

13) Remove window washer tank (TURBO), and put it behind the RH strut tower.
14) Remove power steering pump (Non-TURBO).
Remove oil pump ASSY and bracket as follows:
a. Detach idler cap with pliers with waste cloth around it in order not to damage it.

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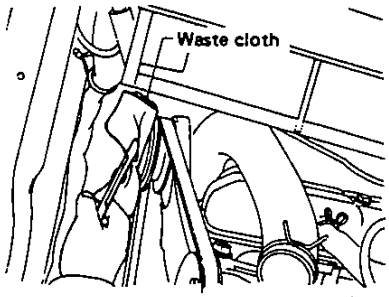


Fig. 3-59 Removing cap

b. Loosen lock bolts and adjust bolt of idler pulley, and then detach oil pump belt.
c. Remove bolts and nut, and put oil pump ASSY on bulkhead.

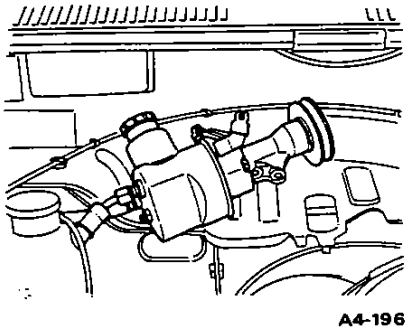


Fig. 3-60 Removing oil pump ASSY

NOTE:
a. Be careful that the oil does not flow out.
b. Be careful that the two oil hoses does not damage.

d. Detach bracket.

15) Remove power steering pump (TURBO).

a. Loosen the alternator adjustment bolt and lock bolt, then remove the V-belt.
b. Remove the pump pulley and bolts holding the pump.

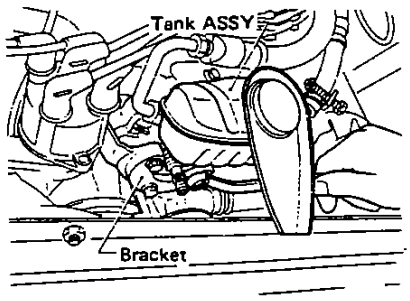


Fig. 3-61

c. Remove clamp D.
d. Remove the stay for the engine oil filler pipe.

NOTE:
Place the power steering pump on the bulkhead.

16) Remove air duct (TURBO).

NOTE:
Cover the openings where air duct is installed to keep out dirt and dust after removal.

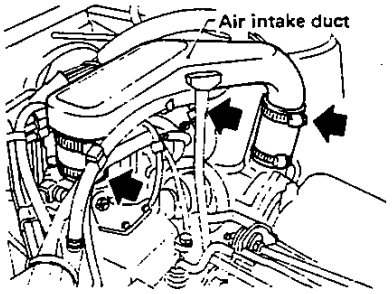


Fig. 3-62

17) Remove air flowmeter boot (TURBO).

NOTE:
Cover the openings where air flowmeter boot is installed to keep out dirt and dust after removal.

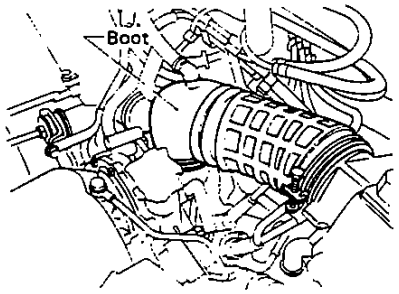


Fig. 3-63

18) Remove upper cover (TURBO)

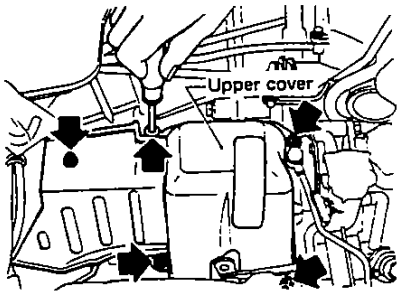


Fig. 3-64

19) Remove center exhaust pipe (TURBO).

NOTE:
See NOTE in 21).

a. Disconnect the thermo sensor connector.
b. Separate the pipe from the turbocharger body.
c. Remove the rear cover.

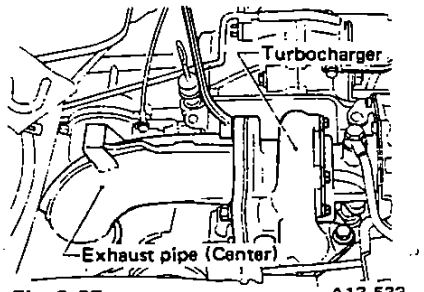


Fig. 3-65

d. Remove the joint bolt with the transmission.

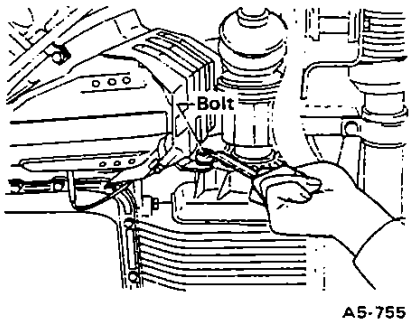


Fig. 3-66

e. Remove the center exhaust pipe from the rear exhaust pipe.
f. Remove the hanger bolts (center exhaust pipe) and then the center exhaust pipe.

NOTE:
There is limited space around the pipe. Be careful not to damage the pipe during removal.

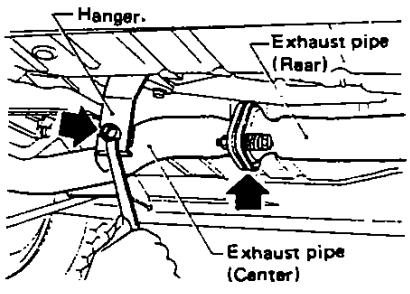
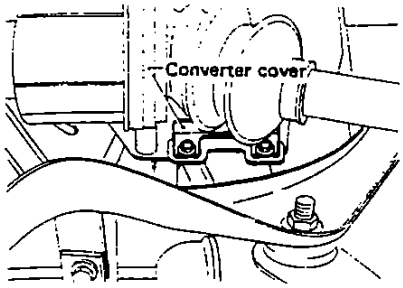


Fig. 3-67

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20) Remove the converter cover (TURBO).
The bolts need not be removed, only be loosened.



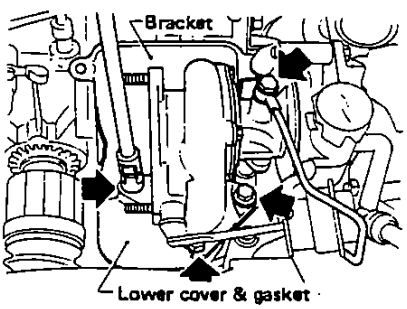
A5-756

Fig. 3-68

21) Remove the turbocharger body (TURBO).

NOTE:
a. Perform the removal of turbo unit after it has cooled off sufficiently.
b. Seizure prevention procedure:
1) Apply SUBARU GUARD (000902821) or the equivalent to threaded portion of bolts and nuts, and leave them for one minute or more.
2) Loosen bolts and nuts by turning them 10 to 40 degrees.
3) Apply SUBARU GUARD (000902821) or the equivalent to the threaded portion of bolts and nuts again, and leave them for one minute or more.
4) Remove bolts and nuts.
c. When stud bolt is pulled out, flange bolt (901000032) can be used instead.

a. Remove the oil pipe.
b. Remove the turbocharger body, lower cover and gasket. Disconnect the lubricating hose for the turbocharger.



A13-531

Fig. 3-69

22) Disconnect the O_2 sensor connector (TURBO).
23) Remove the bolt connecting the torque converter to the drive plate.
24) Remove the bolts and nuts from the upper joint of the engine with the transmission.

NOTE:
The starter must not be removed.

25) Drain coolant
Install a commercially available vinyl hose [inner diameter of 8 to 9 mm (0.31 to 0.35 in) dia.] on the drain plug, and drain the coolant.
26) Remove the radiator ASSY
a. Disconnect the inlet and outlet radiator hoses from the radiator.
b. Disconnect the inlet and outlet oil cooler hoses from the radiator.
c. Remove the ground wire.
d. Remove the radiator.

NOTE:
Drain the remaining coolant into a container.

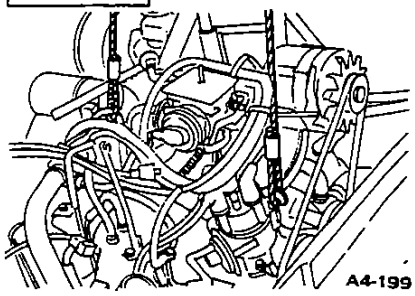
27) Disconnect oil cooler hoses (IN and OUT) from pipe ASSY (TURBO). Drain the oil into a container.
28) Disconnect heater hoses (IN and OUT) from the engine side.

NOTE:
Drain the remaining coolant into a container.

29) Separate front exhaust pipe from engine as follows (Non-TURBO):
a. Disconnect oxygen (O_2) sensor cord.
b. Remove nuts securing front exhaust pipe to the exhaust ports of engine.
c. Loosen bolt connecting front exhaust pipe to bracket of body.
30) Remove the front engine mount.
31) Remove the lower nuts joining the engine to the transmission.
32) Lift up the engine with a wire rope.

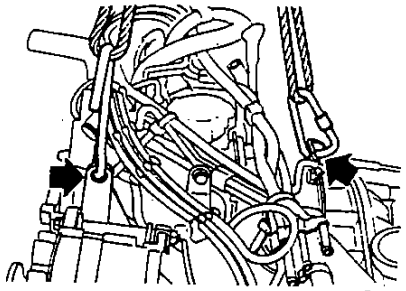
NOTE:
a. Make sure that the lifting wire hook is securely attached to the hanger.
b. Take care so that a lifting wire does not damage the engine parts.

Non-TURBO



A4-199

TURBO



A5-757

Fig. 3-70

33) Remove the engine
a. Raise the engine to some height.
b. Raise the transmission to some height by using a jack.
c. Move the engine horizontally.
d. Pull the engine out of the engine room carefully.

3. Remounting

1) Position the engine in the engine compartment.

NOTE:
a. While engine is lowered, be careful to prevent engine from striking any adjacent parts or car body.
b. Apply grease to splines of mainshaft in advance (MT).

2) Connect the engine with transmission.
3) Install nuts and bolts to secure both units.
a. Temporarily tighten the upper bolts.
b. Remove the wire cable and jack.
c. Tighten the lower nuts securely.
d. Tighten the nuts that secure the engine mount.

Torque	20 – 24 N·m (2.0 – 2.4 kg-m, 14 – 17 ft-lb)

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e. Tighten the upper bolts securely.
4) Connect the torque converter.
a. Align the torque converter with the holes in the drive plate.
b. Tighten all bolts – one bolt at a time.

Torque	23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)

NOTE:
Be careful not to drop any bolts into the torque converter housing.

5) Connect the O_2 sensor connector (TURBO).
6) Install the turbocharger (TURBO).
a. Place the lower cover and gasket onto the front exhaust pipe.
b. Attach the turbocharger while inserting its lubricating hose into place.
c. Connect the oil pipe.

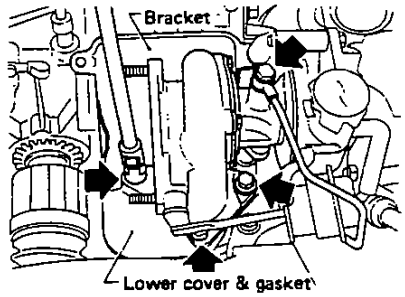


Fig. 3-71 A13-531

7) Install the converter cover (TURBO).
8) Install the center exhaust pipe (TURBO).
a. Put the gasket in between the turbocharger and center exhaust pipe.
b. Install the center exhaust pipe and temporarily tighten the hanger bolt (transmission bottom).
c. Temporarily tighten the joint of the turbocharger with the pipe.

NOTE:
Do not forget to install the cover bracket.

d. Temporarily tighten the joint bolt with the transmission.

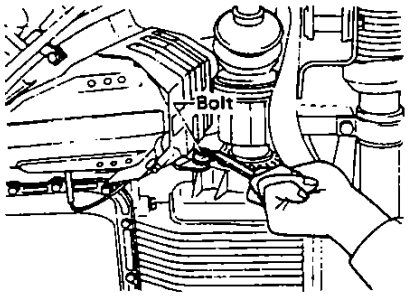


Fig. 3-72 A5-755

e. Temporarily tighten the joint with the rear exhaust pipe.
f. Tighten the joint with the turbocharger regularly.

NOTE:
a. After wiping off oxide scale on the threaded portion of bolts and nuts which attach turbo unit to exhaust pipe, coat them with lubricants.
b. Replace the gasket with a new one at every disassembly.

Tightening torque	25 – 34 N·m (2.5 – 3.5 kg-m, 18 – 25 ft-lb)

g. Tighten the joint bolt with the transmission regularly.

Tightening torque	25 – 34 N·m (2.5 – 3.5 kg-m, 18 – 25 ft-lb)

h. Tighten the hanger bolt regularly.

Tightening torque	10 – 18 N·m (1.0 – 1.8 kg-m, 7 – 13 ft-lb)

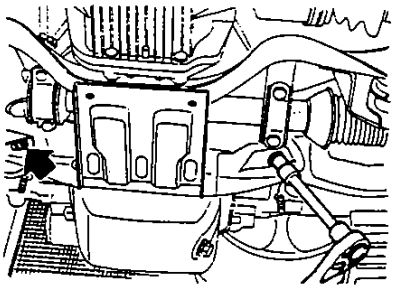
i. Tighten the joint with the rear exhaust pipe regularly.

Tightening torque	22 – 33 N·m (2.2 – 3.4 kg-m, 16 – 25 ft-lb)

j. Install the rear cover.
k. Connect the thermo sensor connector.

Securely tighten engine mount cushion rubbers on the crossmember.

Torque	20 – 33 N·m (2.0 – 3.4 kg-m, 14 – 25 ft-lb)

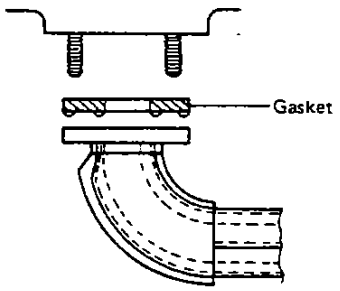


A4-095

Fig. 3-73 Tightening cushion rubber nuts

10) Connect front exhaust pipe to engine as follows (Non-TURBO).
a. Attach new gaskets to the engine exhaust ports, and temporarily tighten nuts.

NOTE:
Place the flat surface of the gasket to the engine exhaust port.

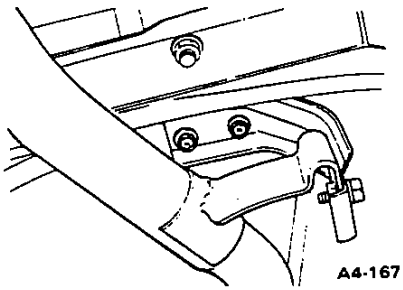


A22-031

Fig. 3-74 Installing gasket

b. Tighten bolt at bracket of body.

Torque	25 – 34 N·m (2.5 – 3.5 kg-m, 18 – 25 ft-lb)



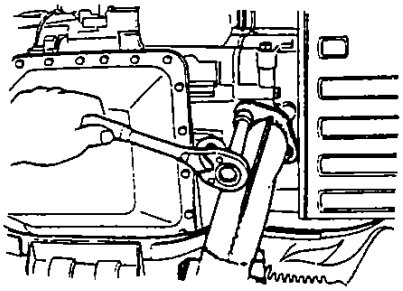
A4-167

Fig. 3-75 Installing front exhaust pipe

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c. Then tighten four nuts to the specified torque.

Torque	25 – 29 N·m (2.6 – 3.0 kg-m, 19 – 22 ft-lb)



A4-093

Fig. 3-76

d. Connect O_2 sensor cord.

11) Install pitching stopper as follows:

a. Insert pitching stopper rod into the bracket on the engine side, and tighten it at the car body side.

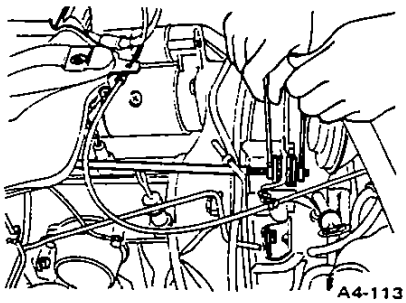
b. Tighten the rear nut on pitching stopper or the engine side so that the specified clearance exists between rubber cushion and washer.

Specified clearance	
MT	0.8 – 1.2 mm (0.031 – 0.047 in)
AT	1.8 – 2.2 mm (0.071 – 0.087 in)

c. Attach a wrench to the rear nut on pitching stopper of the engine side to prevent it from turning, and tighten the front nut securely.

Torque	10 – 18 N·m (1.0 – 1.8 kg-m, 7 – 13 ft-lb)

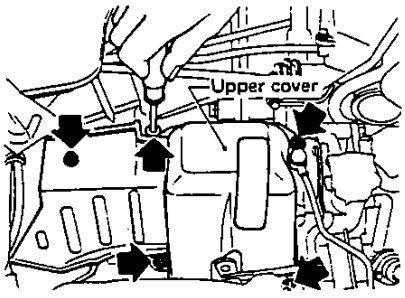
NOTE:
Always make a precise adjustment of pitching stopper to prevent engine from vibrating during operation.



A4-113

Fig. 3-77 Installing pitching stopper

12) Install the turbocharger upper cover (TURBO).



A13-546

Fig. 3-78

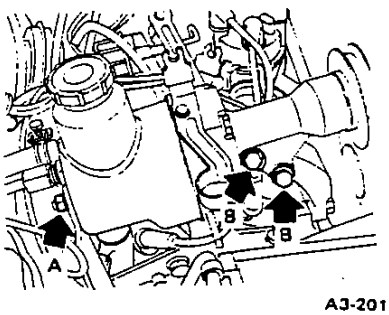
13) Install the inlet and outlet heater hoses.

14) Install power steering oil pump ASSY and oil pump belt.

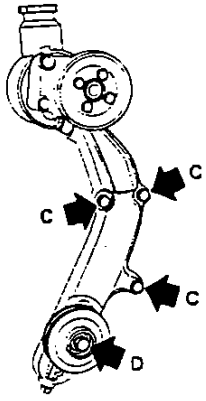
After adjusting the belt tension, tighten lock bolt and attach idler cap (Non-TURBO).

Belt tension
15 – 20 mm (0.59 – 0.79 in)/ 98 N (10 kg, 22 lb)

Torque	
Nut A (one)	44 – 54 N·m (4.5 – 5.5 kg-m, 33 – 40 ft-lb)
Bolt B (two)	44 – 54 N·m (4.5 – 5.5 kg-m, 33 – 40 ft-lb)
Bolt C (three)	25 – 34 N·m (2.5 – 3.5 kg-m, 18 – 25 ft-lb)
Bolt D (one)	20 – 29 N·m (2 – 3 kg-m, 14 – 22 ft-lb)



A3-201



A5-581

Fig. 3-79 Fitting bolts and nuts

15) Install the power steering pump (TURBO).

a. Install the engine oil filler pipe stay.

b. Tighten the pump mounting bolts and install the pump pulley.

Tightening torque
Pump mounting bolt: 25 – 34 N·m (2.5 – 3.5 kg-m, 18 – 25 ft-lb) Pump pulley: 33 – 41 N·m (3.4 – 4.2 kg-m, 25 – 30 ft-lb)

c. Install the clamp D.

d. Install the V-belt and adjust its tension.

Belt tension	With air conditioner	7.5 – 8.5 mm (0.295 – 0.335 in)/ 98 N (10 kg, 22 lb)
	Without air conditioner	7 – 9 mm (0.28 – 0.35 in)/ 98 N (10 kg, 22 lb)

16) Attach supporter of spare wheel & tire (Non-TURBO).

17) Connect cables as before (Non-TURBO).

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a. Connect clutch cable to release fork with free play.

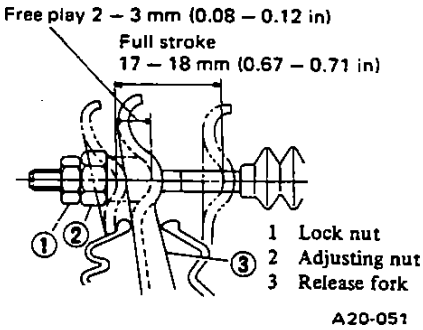


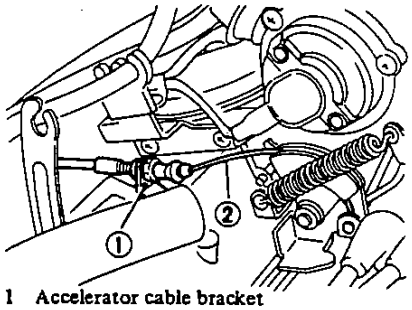
Fig. 3-80 Adjusting clutch release fork

b. (Vehicle with Hill-holder) Connect P.C.V. cable, and adjust Hill-holder system.

c. Connect accelerator cable, and adjust its tension by adjusting nuts.

NOTE:
After making the accelerator cable adjustment, depress the accelerator pedal to ensure that the throttle valve fully opens.

• Hitachi carburetor



• C-W carburetor

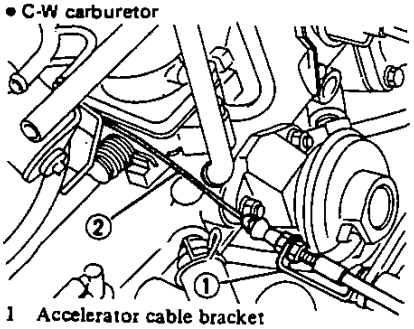


Fig. 3-81 Installing accelerator cable.

18) Install the accelerator cable (TURBO).

NOTE:
Check to see if the throttle valve can be opened completely by means of the cable.

19) Install the link ASSY.

a. Adjusting the accelerator pedal play
- Adjust so that there is a gap of 1 to 3 mm (0.04 to 0.12 in) between the pin and stopper.
- Adjust the accelerator cable end at the throttle body side.

Cable end play	0 – 2 mm (0 – 0.08 in)

b. Adjusting the actuator play
- Adjust the cable end play, caused by slackness, so that it is 0 to 2 mm (0 to 0.08 in) on the actuator side.

20) Install the radiator ASSY.

a. Install the radiator.
b. Connect the oil cooler hose.
c. Install the radiator hoses.
d. Make the ground connection.
e. Connect thermoswitch and fan motor.
f. Connect inlet and outlet hoses to heater unit.
g. Pour coolant into the radiator.

NOTE:
Before installing the radiator, put hoses into it to facilitate the work.

21) Install the window washer tank (TURBO).

NOTE:
Install the motor harness securely.

22) Install the air flowmeter boot (TURBO).

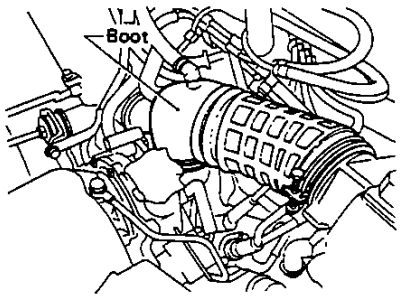


Fig. 3-82

23) Install the air intake duct (TURBO).

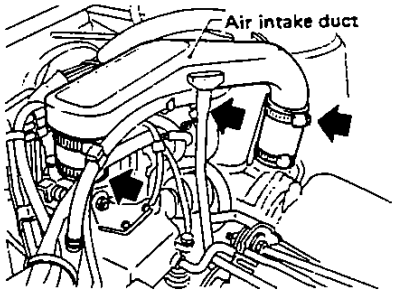


Fig. 3-83

24) Install the harness, etc. (TURBO).

a. High-tension cord (from the ignition coil to the distributor).
b. Ignition cord connectors.
c. Alternator harness connector and ground wire.
d. Concentration-wire harness connector.
e. EGI harness connector.
f. Thermoswitch harness connector and electric fan harness connector.
g. Condenser ground.
h. Ignition coil cord harness (⊕ and ⊖ sides).

25) Connect electric wiring as before (Non-TURBO).

a. Two multiple connectors for engine wiring harness

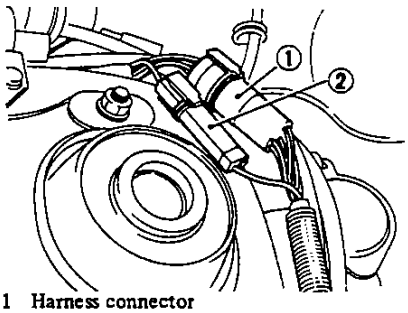


Fig. 3-84

b. High tension cords
c. Connectors for alternator

NOTE:
(Vehicle with power steering) Securely fit cord supporter onto blow-by hose paint marking and high tension cord.

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26) Connect hoses as before (Non-TURBO).
a. (AT) Vacuum hose to vacuum pipe for kick-down solenoid

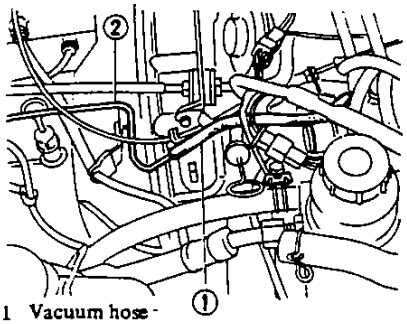


Fig. 3-85

b. Vacuum hose to intake manifold for brake booster (Master-vac)

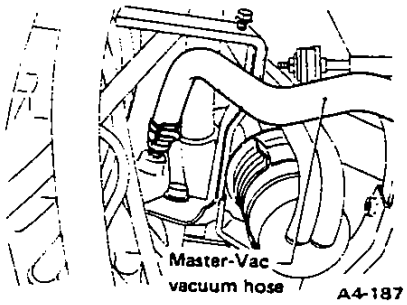


Fig. 3-86 Connecting master-vac vacuum hose

c. Vacuum hose, carburetor vent hose and purge hose to pipe complete

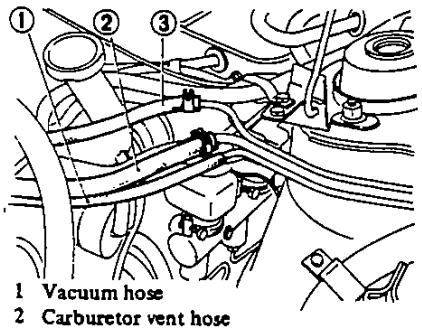


Fig. 3-87 Connecting hoses

d. Fuel delivery hose and fuel return hose to carburetor

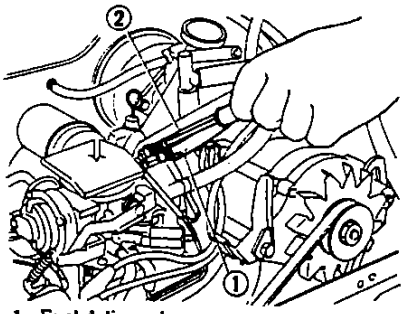


Fig. 3-88 Connecting fuel hoses

27) Attach air cleaner onto carburetor and connect the following hoses (Non-TURBO).
① Air intake hose
② P.C.V. hose
③ P.C.V. vacuum hose
④ A.T.C. vacuum hose
⑤ Vacuum hose to thermo vacuum valve II (Hitachi carburetor) or thermo vacuum valve III (C-W carburetor)
⑥ Vacuum hose to thermo vacuum valve I
⑦ Hose to A.S.V.

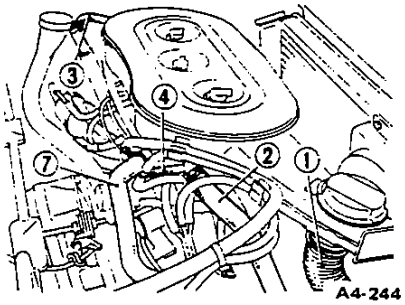


Fig. 3-89 Connecting hoses

Then, tighten bolts and wing nuts securely.
28) Put hoses onto stay, and hold them with hose clamp (Non-TURBO).
① Vacuum hose
② Carburetor vent hose
③ Fuel delivery hose
④ Fuel return hose
⑤ Purge hose

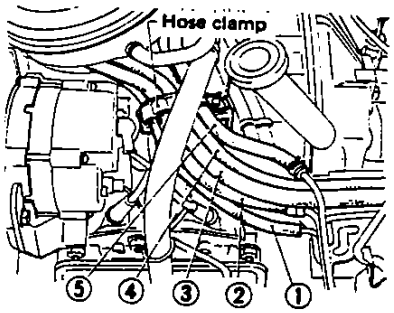


Fig. 3-90

29) Connect hoses (TURBO).
a. Cruise control
b. Master-Vac
c. Air intake shutter
d. Vacuum control diaphragm
e. Fuel hose
f. Canister evaporator hose
30) Install the spare tire support and make the air temperature sensor connection in the engine room (TURBO).
31) Connect the battery (-) terminal and ground cable.
32) Mount the spare tire and install the jack (TURBO).
33) Close the front hood.

4. Inspection and Test

1) Check both the engine oil and coolant levels to ensure that they are even with the specified marks. Start the engine and check for the condition of various parts. If necessary, take corrective action.
Check the exhaust pipe connection to make sure that there is no sign of gas leakage.
2) Stop the engine and allow it to rest for some length of time. Check the engine oil and coolant levels again. If the levels are below the specified marks, replenish as necessary.

NOTE:
The radiator is a high pressure type. Never open the radiator cap while the engine is hot. Doing so may burn your hand. Allow the engine to cool off before checking the coolant level.

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3-5. Removal

1. Non-TURBO Vehicle

1) Install Engine Stands (399814300 x 2) and drain the engine oil and coolant by removing engine oil drain plug and coolant drain plug. After draining, install plugs in place.

NOTE:
Take care not to allow oil or water to come in contact with the clutch cover or disc. (MT)

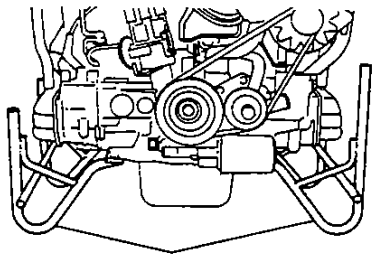


Fig. 3-91 Installing engine stand

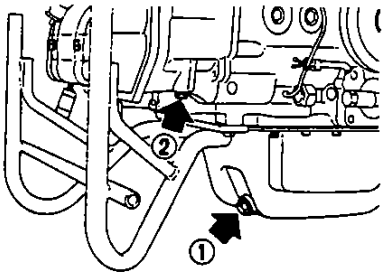


Fig. 3-92 Position of drain plugs

2) Carburetor protector. [For 49 States (except 4WD & 4WD-AT) and California]
3) Distributor.
a. Disconnect vacuum hose from distributor.
b. Unclamp distributor lead wire.
c. Disconnect spark plug cords from spark plugs and cord supporters, and distributor cord from cord supporter.
d. Remove distributor and distributor plate.
4) Alternator with air cleaner bracket, spark plug cord stay and drive belt.
5) E.G.R. pipe cover.
6) ASV pipe and ASV.
7) Battery cable bracket and ASV bracket [vehicle without power steering for 49 States (except 4WD & 4WD-AT)] or oil pump bracket (vehicle with power steering).
8) Loosen the connectors of E.G.R. pipe at intake manifold and cylinder head.
9) Disconnect the wiring harness lead of oil pressure switch or oil pressure gauge.
10) Disconnect connecting hoses from rocker covers.
11) Unclamp heater hose.
12) Disconnect two water by-pass hoses and heater hose from intake manifold.
13) Intake manifold ASSY and E.G.R. pipe.
14) Generator bracket complete and generator bracket 3 as an ASSY, and bracket 2.
15) Oil filler duct and oil filler duct stay as an ASSY.
* Remove stiffener 2 at this time (4WD).
16) Pulley by tapping it lightly.

NOTE:
a. Insert a screwdriver or the like into a hole in the drive plate (AT) or the flywheel (MT) through the timing hole to prevent the crankshaft from turning.
b. Use Puller Set (899524100) in such a case of pulley fitted tightly.

17) Oil pump together with oil filter.
18) Water pump, hose, pipe complete and by-pass hose as an ASSY and another by-pass hose.
19) Clutch cover and clutch disc.

NOTE:
a. Insert a screwdriver or the like into a hole in the flywheel through the timing hole to prevent the flywheel from turning.
b. Take care not to allow oil or water to come in contact with the clutch disc.

20) Flywheel with O-ring (MT) or converter drive plate with back plate and O-ring (AT).

NOTE:
Insert a screwdriver or the like into a hole in the converter drive plate through the timing hole to prevent it from turning.

21) Invert engine.
22) Crankcase oil pan, oil pan gasket and transmission cover II (MT).
23) Invert engine.
24) Flywheel housing.
25) Spark plugs.
26) Valve rocker covers and gaskets.
27) After loosening valve rocker lock nuts and adjusting screws for other than hydraulic valve lifters, remove the valve rocker assemblies and valve push rods.

NOTE:
a. Never loosen valve rocker lock nuts and adjusting screws for hydraulic valve lifters.
b. If the push rods are to be reused, keep them in order, so that they are installed in the original positions.

28) Cylinder head attaching nuts.

NOTE:
Loosen nuts according to the sequence below.

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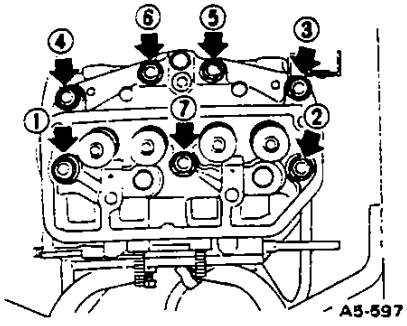


Fig. 3-93 Loosening sequence of cylinder head nuts

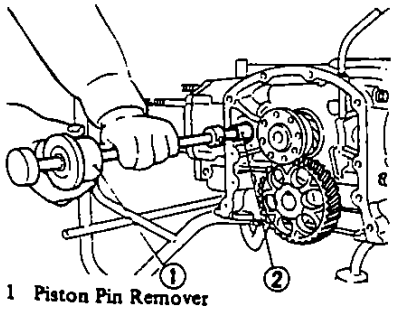
29) Cylinder heads and cylinder head gaskets.
30) Remove bolt and nut retaining oil strainer stay.
If necessary, drive out oil strainer together with stay as a unit.

NOTE:
a. Use a chisel when removing the oil strainer.
b. Never attempt to remove the strainer unless it is really necessary.

31) Piston pin circlip on the rear side of each #3 and #4 piston;
Set piston to its bottom dead center by turning crankshaft and insert long nose pliers through the rear service hole to reach circlip.

NOTE:
To turn the crankshaft with a wrench, install the crankshaft pulley bolt on the crankshaft front end.

32) Piston pins for #3 and #4 pistons, using Piston Pin Remover (39909431 0) inserted through the rear service hole.



1 Piston Pin Remover (399094310)
2 Piston pin

Fig. 3-94 Removing piston pin

33) Crankcase plugs from crankcase with an Allen wrench 14 mm (0.55 in) wide across flats.

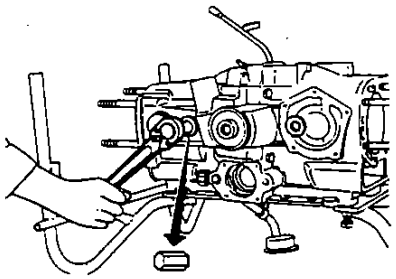


Fig. 3-95 Removing crankcase plug

34) Piston pin circlips and piston pins for #1 and #2 pistons in the same way as before, but use the front service holes (crankcase plug holes) this time.
35) Straighten lockwashers for camshaft attaching bolts, working through the camshaft gear holes, and remove bolts.
36) Tilt crankcase, and take out hydraulic valve lifters.

NOTE:
Keep them in order so that they are not mixed up.

37) Separate crankcase by removing bolts and nuts with #1 and #3 cylinders facing upward.

NOTE:
a. Use Valve Lifter Clips (899804100) to prevent the lifters (other than hydraulic valve lifter) in the upper crankcase from dropping off.
b. Before separating the crankcase, pull the camshaft toward the rear so that is does not interfere with the crankcase.
c. Also remove the crankcase hanger (F) and stiffener (4WD).

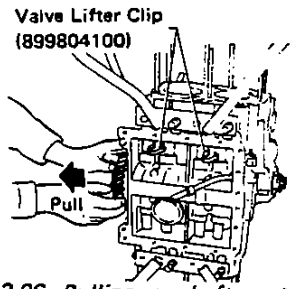


Fig. 3-96 Pulling camshaft

38) Oil seal at the front of crankcase, O-ring and back-up ring.
39) Oil seal at the front of crankcase, O-ring and back-up ring.
40) Crankshaft together with connecting rods, distributor gear and crankshaft gear as a unit.
41) Camshaft together with camshaft gear and camshaft plate.
42) Solid valve lifters and keep them in order, so that they can be reinstalled into their original holes.
43) Pistons from crankcase.

NOTE:
a. Keep the pistons and piston pins together for each cylinder so that they are not mixed up.
b. Make marks on the pistons so as not to change their installed positions.

44) Crankshaft bearings.

NOTE:
If the bearings are to be used again, do not mix them up.

45) Oil pressure switch (Vehicle without pressure gauge) or plug (Vehicle with pressure gauge).
46) Engine Stands (399814300 x 2) from the crankcase halves.

2. TURBO Vehicle

NOTE:
The condition of the engine before disassembly is as shown in the figure below.

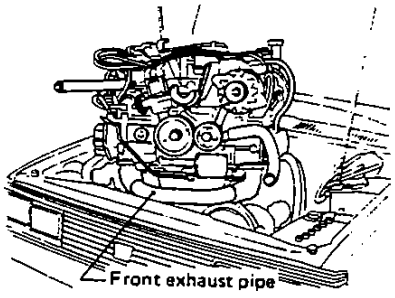


Fig. 3-97

1) Removing the front exhaust pipe.
Loosen the four nuts securing the front exhaust pipe to the cylinder head.

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2) Removing the oil pipe stay.
Remove the bolt fitting the stay to the crankcase bottom (#1 and #3 sides).
3) Installing the engine stand.
Install the ENGINE STAND (399814300) to the engine ASSY.
4) Removing the distributor ASSY.
a. Remove the high-tension cords from the spark plugs and supporters.
b. Remove the lead wires. ... Clips in four places, ground terminal on the intake manifold (6 mm bolt) and knock sensor.
c. Disconnect the vacuum hose.
d. Remove the bolts holding the distributor ASSY, and pull it up.
5) Removing the alternator ASSY.
Remove the two bolts holding the alternator ASSY.
6) Removing the intake manifold ASSY.
a. Remove the oil pressure switch and injector lead wires.
b. Remove the air vent hose from the intake manifold side.
c. Remove the EGR cover (insertion type), and remove the EGR pipe plug at the cylinder head side.
d. Disconnect the blow-by hose.
e. Disconnect the fuel pipe from the injector.
(a) Loosen the hose clamps in four places.
(b) Remove the two bolts holding the fuel pipe (together with the intake manifold ASSY).
f. Disconnect the vacuum hose.
g. Remove the intake manifold ASSY by loosening the four bolts holding it.
7) Removing brackets.
a. Remove the alternator bracket 2.
b. Remove the alternator bracket.
c. Remove the pump bracket for the power steering.
8) Removing the knock sensor ASSY.
Use a 27 mm deep socket for removal.

NOTE:
a. Use of a shallow socket damages the terminals. Be sure to use the above deep socket.
b. Do not tilt or lay down the socket during removal.

9) Removing the fuel injector.
Use a Phillips-head screwdriver for removal.
10) Removing the oil filler duct CP.
Remove the two bolts holding the oil filler duct CP.
11) Removing oil pump with attachment & oil filter.

NOTE:
The operations that follow hereunder should be carried out by the same procedures used for Non-TURBO vehicles.

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3-6. Disassembly

1. Intake Manifold Assembly

1. NON-TURBO VEHICLE

1) Hitachi Carburetor Type for 49-state Non-4WD and California

1) Disconnect wiring harness.
2) Remove vacuum hoses, hoses and related parts.
a. Thermostat cover, solenoid valve I and bracket, protector stay, gasket and thermostat.
b. Actuator ASSY (A/C only), clip and stay & clip.
c. E.G.R. valve, gasket and duty solenoid valve connector clamp.
d. Carburetor, two gaskets and an insulator.
e. P.C.V. hose.
f. Heater hose.
g. Duty solenoid valves (slow and main) and carburetor protector 2.
h. Vacuum pipe CP and carburetor protector 3.
i. Thermo vacuum valve III.
j. P.C.V. valve.
k. Thermo vacuum valve I.
l. Accelerator cable bracket.
m. Thermosensor.
n. Solenoid valve II (except for California).

2) Hitachi Carburetor Type for 49-state 4WD and Canada

1) Disconnect wiring harness.
2) Remove (vacuum) hoses and related parts.
a. Thermostat cover, stay, gasket and thermostat
b. Actuator ASSY (A/C only), clip and stay & clip
c. Thermo vacuum valve IV, bracket and insulator.
d. E.G.R. valve, gasket and AAV pipe & hose
e. Carburetor, two gasket and insulator
f. P.C.V. hose
g. Heater hose
h. Vacuum pipe
i. P.C.V. valve
j. Thermo vacuum valve I
k. Accelerator cable bracket
l. Thermosensor

3) C-W Carburetor Type

1) Disconnect wiring harness.
2) Remove vacuum hoses, hoses, and related parts.
a. Thermostat cover, gasket and thermostat.
b. Solenoid valve I.
c. Actuator ASSY (A/C only).
d. E.G.R. valve and gasket.
e. Carburetor, two gaskets and an insulator.
f. P.C.V. hose.
g. Heater hose.
h. Stay & clip.
i. Clip.
j. P.C.V. valve.
k. Thermo vacuum valve I.
l. Thermosensor.
m. Vacuum pipe CP.
n. Solenoid valve II.

2. TURBO VEHICLE

1) Remove the wiring harness from the intake manifold.
- Auxiliary air valve
- Throttle switch
- FICD solenoid valve
- Thermometer CP
- Coolant thermosensor
- Ground terminal ... Tightened along with the pressure regulator stay

2) Remove the pressure regulator.
3) Remove the following parts from the intake manifold and throttle body.
- Each vacuum hose
- Blow-by hose
- Heater hose
- Throttle body hot water preheat hose
- EGR pipe

4) Remove the following parts from the intake manifold.
- Throttle body ASSY ... Use a "Torx" wrench.
- Auxiliary air valve
- Thermostat cover, thermostat and hose
- EGR valve
- Thermo valve
- Thermometer CP
- Coolant thermosensor
- PCV valve
- Air relief valve ASSY
- Vacuum pipe CP

2. Valve Rocker Assembly

Disassemble valve rocker ASSY to each component part.

NOTE:
a. Keep the disassembled parts in order.
b. Never loosen rocker arm screws for hydraulic valve lifter. In addition, be sure not to mix rocker arms since their screws are adjusted with every cylinder.

3. Cylinder Head

1) Remove valves, springs, spring retainers, and retainer keys from cylinder head, by using Spring Press (899724100).

NOTE:
Put a mark on the individual valves, and be careful not to mix them up.

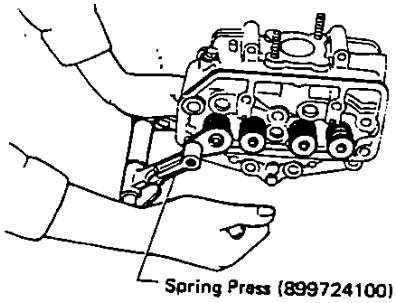


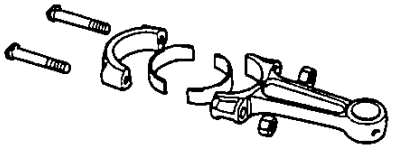
Fig. 3-98 Removing valve and spring

2) Remove spacer with gasket.

4. Crankshaft

Remove connecting rods from crankshaft by unscrewing connecting rod nuts.
Remove bearings from connecting rod.

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A5-039

Fig. 3-99 Disassembled connecting rod

NOTE:
Arrange the disassembled parts in order and be careful not to mix them up.

5. Camshaft

Remove cam gear from camshaft using Remover Set (899714110) and press. Then remove woodruff key and camshaft plate.

6. Piston

Remove piston rings with a piston ring expander. Also remove circlip.

NOTE:
Arrange the removed piston rings in order and be careful not to mix them up.

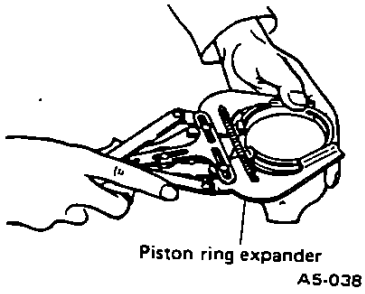


Fig. 3-100 Removing position rings

7. Oil Pump

Disassemble oil pump to each component part.
a. Oil filter
b. Two screws
c. Oil pump body holder, drive gear, rotor and O-ring
d. O-ring, by-pass valve spring and ball
e. Oil pressure gauge or plug
f. Relief valve plug, two washers, spring and relief valve

8. Water Pump

Disassemble water pump to each component part.
a. Water pump pulley
b. Water pump shaft

NOTE:
Do not press the shaft, or the bearings will be damaged. Press the bearing outer race.

c. Impeller
d. Mechanical seal

3-7. Inspection and Adjustment

1. Precautions

1) Before cleaning parts, make sure that no leakage exists in parts which carry coolant or oil.
2) Clean all parts carefully and make sure that adhering gaskets and other substances are removed.
3) Blow compressed air into the oil passages to make sure that they are not clogged.
4) When removing deposits such as carbon, be careful not to damage the part surface.
5) Arrange all relative parts in order, so that they are not mixed up.

2. Cylinder Head

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red check.
2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge and thickness gauge.

If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit		0.05mm (0.0020 in)
Grinding limit		0.5mm (0.020 in)
Standard height of cylinder head	1600 cc Engine	89.6 mm (3.528 in)
	1800 cc Engine	90.6 mm (3.567 in)

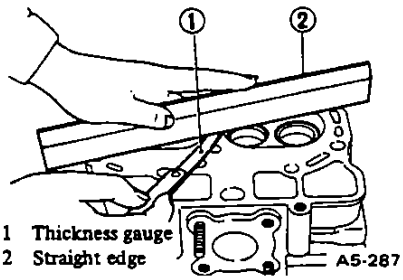


Fig. 3-101 Measuring cylinder head for warping

NOTE:
Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.

3) Inspect intake and exhaust valve seats, and correct the contact surfaces if they are defective or when valve guides are replaced.

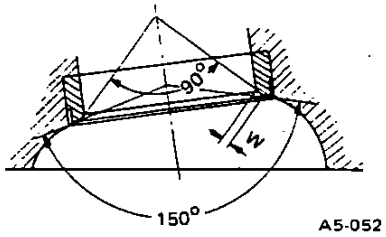


Fig. 3-102 Dimensions of intake and exhaust valve seats

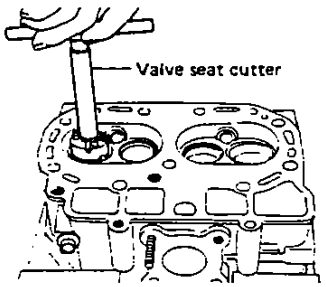
W	Intake	0.7 – 1.3 mm (0.028 – 0.051 in)
	Exhaust	1.0 – 1.8 mm (0.039 – 0.071 in)
Wear limit of valve seat (measured in direction of valve axis)		0.5 mm (0.020 in) for both intake and exhaust valves

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The correction procedure is as follows:

a. Precautions
   (1) When valve seat correction is required, check intake and exhaust valve stems and valve guides for wear, and the springs for squareness, tension, etc. If defective, replace them before proceeding the valve seat correction work.
   (2) When reconditioning valve and valve seat surfaces, remove intake valve oil seals. Install new oil seals with oil after completing the work.

b. Reface valve seat with valve seat cutters or grinders to the dimensions shown in the above figure.



A5-288

Fig. 3-103 Refacing valve seat with valve seat cutter

NOTE:
Refacing of the valve seat should be closely coordinated with the refacing of the valve face, so that the finished seat and valve face will be concentric and specified interference angle will be maintained.

c. Apply a thin coat of Prussian blue or red lead to the contacting surface of valve to see the contacting condition of valve and valve seat.

d. Rotate valve with light pressure. If the blue or red lead is transferred to the center of the valve seat surface, the contact is satisfactory.

e. In case of improper contact, apply a small amount of grinding compound (about #400) on the valve surface and lap the valve and seat surface so that they obtain proper fit.

NOTE:
The above is important because the valve and seat must have a gastight fit.

f. Clean valves and valve seats to remove chips.

4) Inspect exhaust pipe stud bolts installed on the cylinder head, and replace if defective.

Protrusion length of stud bolts
54 mm (2.13 in)

3. Valve Guide

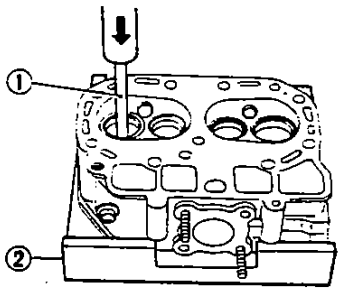
Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

If the clearance between valve guide and stem exceeds the specification, replace guide as follows:

Specifications for valve stem and valve guide		
Standard clearance between valve guide and valve stem	Intake	0.035 – 0.065 mm (0.0014 – 0.0026 in)
	Exhaust	0.040 – 0.070 mm (0.0016 – 0.0028 in)
Limit of clearance between valve guide and valve stem	Intake	0.15 mm (0.0059 in)
	Exhaust	0.15 mm (0.0059 in)
Standard inside diameter of valve guide		8.000 – 8.015 mm (0.3150 – 0.3156 in)
Standard diameter of valve stem	Intake	7.950 – 7.965 mm (0.3130 – 0.3136 in)
	Exhaust	7.945 – 7.960 mm (0.3128 – 0.3134 in)

a. Place cylinder head on Cylinder Head Table (399765101) with the combustion chamber upward so that valve guides enter the holes in Cylinder Head Table.

b. Insert Valve Guide Remover (899764104) into valve guide and press it down to remove valve guide.

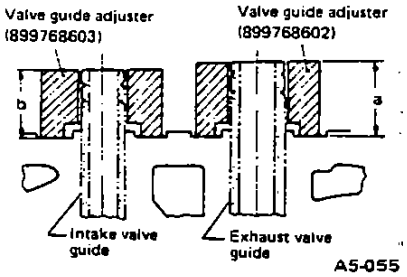


1 Valve Guide Remover (899764104)
2 Cylinder head table (399765101)

A5-289

Fig. 3-104 Removing valve guide

c. Turn cylinder head upside down and place Valve Guide Adjuster (899768602 for exhaust valve guide, 899768603 for intake valve guide) as shown in the figure.



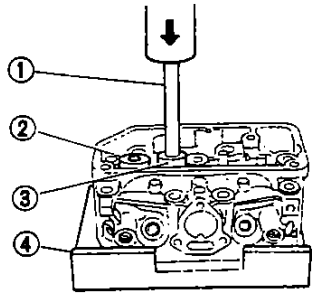
A5-055

Fig. 3-105 Valve guide adjusters

d. Before installing new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

e. Put new valve guide, coated with sufficient oil, in cylinder, and insert Valve Guide Remover (899764104) into valve guide. Press in until the valve guide upper end is flush with the upper surface of Valve Guide Adjuster.

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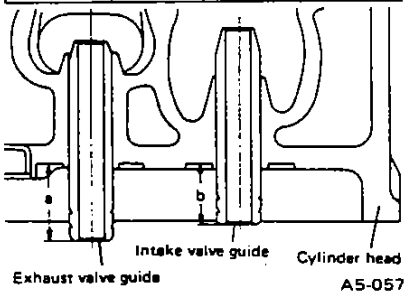
1 Valve Guide Remover (899764104)
2 Valve Guide Adjuster (899768603)
3 Valve Guide Adjuster (899768602)
4 Cylinder Head Table (399765101)

A5-290

Fig. 3-106 Installing valve guide

f. Check the valve guide projection.

Valve guide projection	Intake (b)	17.5 – 18.5 mm (0.689 – 0.728 in)
	Exhaust (a)	22.5 – 23.5 mm (0.886 – 0.925 in)



A5-057

Fig. 3-107 Valve guide projection

g. Ream the inside of valve guide with Valve Guide Reamer (899764105). Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming clean valve guide to remove chips.

NOTE:

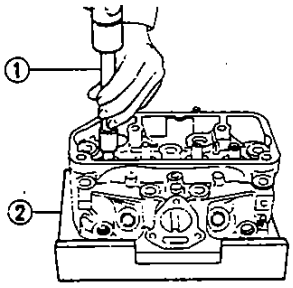
a. The outside diameter of the reamer should be adjusted to 8.004 to 8.010 mm (0.3151 to 0.3154 in).
b. Apply engine oil to the reamer when reaming.
c. If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
d. If the inner surface of the valve guide becomes lustrous and the reamer does not cut chips, use a new reamer or remedy the reamer.

h. Recheck the contact condition between valve and valve seat after replacing valve guide.

4. Intake Valve Oil Seal

Replace oil seal with new one, if lip is damaged or spring is out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.

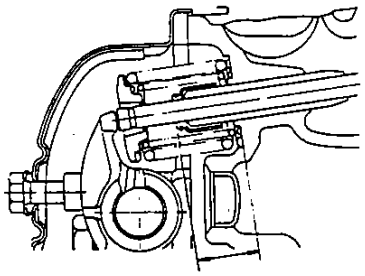
Press in oil seal to the specified dimension indicated in the figure, using Oil Seal Installer (898858600).



1 Oil Seal Installer (898858600)
2 Cylinder Head Table (399765101)

A5-291

Fig. 3-108 Installing oil seal



A5-292

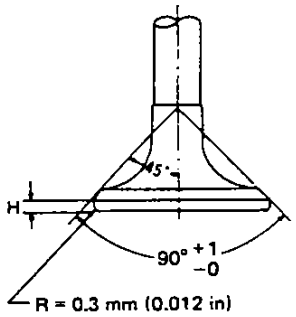
Fig. 3-109 Installed position of oil seal

NOTE:
Apply oil to the oil seal prior to pressing.

5. Intake and Exhaust Valves

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

	H	
	Standard	Limit
Intake	1 mm (0.039 in)	0.5 mm (0.020 in)
Exhaust	1.3 mm (0.051 in)	0.8 mm (0.031 in)



A5-293

Fig. 3-110 Valve head dimensions

	Intake valve	Exhaust valve
Angle of valve surface that contacts valve seat	90° +1° −0	
Valve overall length	109 mm (4.29 in)	109.3 mm (4.30 in)

2) If the contact surface of valve is damaged, or if the stem end is recessed, correct with a valve refacer, grinding as little as possible. The contact surface should be at right angle with the valve axis.

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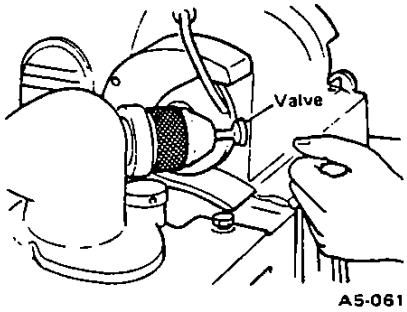


Fig. 3-111 Grinding valve

3) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Also refer to 2. Cylinder Head 3) at this time. Install a new intake valve oil seal after lapping.

6. Valve Springs

Check valve springs for damage, free length, and tension. Replace valve spring if it is not to the specifications presented below.

NOTE:
To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

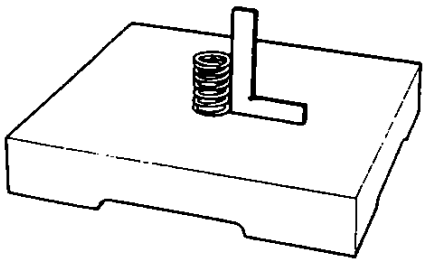


Fig. 3-112 Checking spring squareness

Specifications of valve spring with solid valve lifter		
	Outer spring	Inner spring
Free length	45.3 mm (1.783 in)	48.8 mm (1.921 in)
Tension/spring height	146.1 – 169.7 N (14.9 – 17.3 kg, 32.9 – 38.1 lb)/ 39.5 mm (1.555 in)	84.3 – 98.1 N (8.6 – 10.0 kg, 19.0 – 22.1 lb)/ 37.5 mm (1.476 in)
	500.2 – 568.8 N (51.0 – 58.0 kg, 112.5 – 127.9 lb)/ 30.5 mm (1.201 in)	185.4 – 214.8 N (18.9 – 21.9 kg, 41.7 – 48.3 lb)/ 28.5 mm (1.122 in)
Squareness	2.0 mm (0.079 in) or less	2.1 mm (0.083 in) or less

Specifications of valve spring with hydraulic valve lifter		
	Outer spring	Inner spring
Free length	48.5 mm (1.909 in)	53.0 mm (2.087 in)
Tension/spring height	228.5 – 261.8 N (23.3 – 26.7 kg, 51.4 – 58.9 lb)/ 39.5 mm (1.555 in)	115.7 – 133.4 N (11.8 – 13.6 kg, 26.0 – 30.0 lb)/ 37.5 mm (1.476 in)
	518.8 – 599.2 N (52.9 – 61.1 kg, 116.6 – 134.7 lb)/ 32.0 mm (1.260 in)	201.0 – 230.5 N (20.5 – 23.5 kg, 45.2 – 51.8 lb)/ 30.0 mm (1.181 in)
Squareness	2.1 mm (0.083 in) or less	2.3 mm (0.091 in) or less

7. Valve Rocker

1) Inspect the inner surface of valve rocker arm and the outer surface of rocker shaft for wear.

Clearance between rocker arm and shaft	0.013 – 0.052 mm (0.0005 – 0.0020 in)
Inner diameter of rocker arm	18.016 – 18.034 mm (0.7093 – 0.7100 in)
Outer diameter of shaft	17.982 – 18.003 mm (0.7080 – 0.7088 in)

Replace valve rocker arm or shaft if defective.

2) If the rocker arm surface that contacts the stem head is noticeably worn, replace the rocker arm. If worn slightly in a stepped shape, use a valve refacer and correct the surface, grinding as little as possible.

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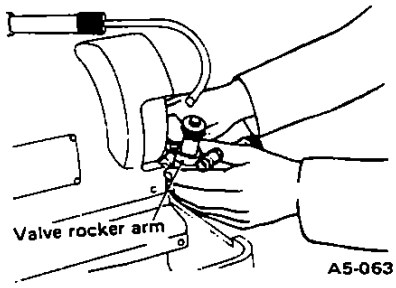


Fig. 3-113 Correcting valve rocker arm

3) Replace rocker shaft spring washers if worn excessively.

8. Valve Lifter

1) Solid Valve Lifter

Specifications for lifter and lifter hole		
Standard inner diameter of lifter hole		21.000 – 21.021 mm (0.8268 – 0.8276 in)
Standard outer diameter of lifter		20.949 – 20.970 mm (0.8248 – 0.8256 in)
Clearance between lifter and lifter hole	Standard	0.030 – 0.072 mm (0.0012 – 0.0028 in)
	Limit	0.100 mm (0.0039 in)

1) Check valve lifters for wear and damage, and replace or correct if defective.
2) Check the lifter holes in the crankcase for damage, etc., and correct or replace as necessary.

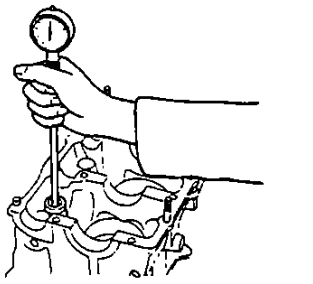


Fig. 3-114 Checking lifter hole

NOTE:
Be extremely careful to prevent any foreign matter from getting into the valve lifter as it is machined to a high degree of precision.

1) Measure the outer diameter of the valve lifter. If it is outside the specified value, replace it. Also check it for wear or damage and replace it as necessary.
2) Measure the bore diameter in the crankcase at the valve lifter location.
If the clearance between the bore diameter and outer diameter of the lifter exceeds the specified limit, replace the lifter.
3) Forcibly insert the push rod seat with push rod to see if the seat moves into the valve body. If it does, check the following reasons and repair it as follows:

- Air is sucked into the pressure chamber.
- Plunger-to-body clearance is too large.
- Foreign matter and/or damage exists around check ball and plunger.

a. Remove the following parts in the order indicated.
   - Clip
   - Push rod seat
   - Plunger
   - Check ball, check ball spring and check ball retainer
   - Plunger spring

NOTE:
a. Never mix up plunger, push rod seat and valve body amoung valve lifters.
b. Use a wire to facilitate removal of the plunger.

2) Hydraulic Valve Lifter

Hydraulic valve lifter and lifter hole		
Standard inner diameter of lifter hole		20.988 – 21.040 mm (0.8263 – 0.8283 in)
Standard outer diameter of lifter		20.950 – 20.968 mm (0.8248 – 0.8255 in)
Lifter to lifter hole clearance	Standard	0.020 – 0.090 mm (0.0008 – 0.0035 in)
	Limit	0.100 mm (0.0039 in)

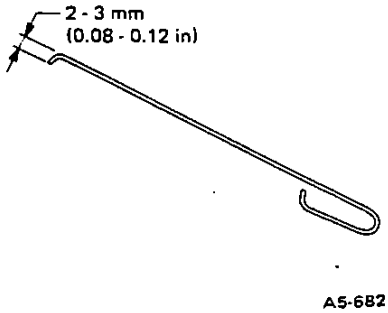


Fig. 3-115

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b. Clean all disassembled parts.
c. Install the check ball, check ball spring and check ball retainer on the plunger, being careful not to tilt them.

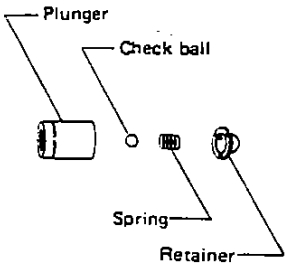


Fig. 3-116 A5-683

d. Install the plunger spring in the valve body and fill the body with clean engine oil.
e. Insert plunger into valve body and push check ball with drift pin [outer 3.2 mm (1/8 in) dia.] until the plunger comes into contact with the body while making an opening between the check ball and plunger.
f. Insert a suitable pin into the oil hole in the body and remove the drift pin.

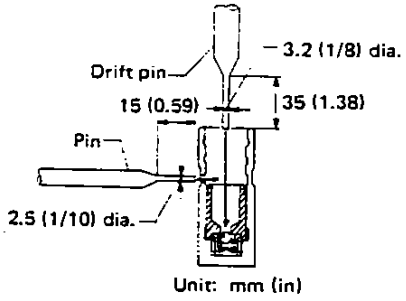


Fig. 3-117 A5-684

g. After refilling with clean engine oil, insert the push rod seat, install the clip in place and remove the pin.
h. Again make sure that the push rod seat does not move into the valve body when forcibly pushing the seat with the push rod.
If it does, replace the valve lifter with a new one.

9. Push Rod

1) Check for any sign of bending or damage, and replace if defective.

2) Check the oil hole in push rod for clogging and clean if necessary.

Deflection of center		0.4 mm (0.016 in) or less
Overall length	For 1600 (Knurling: 2)	219 – 219.4 mm (8.62 – 8.64 in)
	For 1800 with solid valve lifter (Knurling: 1)	230.7 – 231.1 mm (9.08 – 9.10 in)
	For 1800 with hydraulic valve lifter (Knurling: nothing)	231.7 – 232.2 mm (9.12 – 9.14 in)

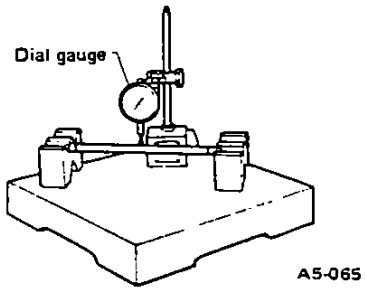


Fig. 3-118 Checking push rod for bending

10. Crankcase

Check crankcase for the following items, and correct or replace if defective.
1) Check for cracks and damage visually. Especially, inspect important parts by means of red check.
2) Check the oil passages for clogging.
3) Check stud bolts on the crankcase for looseness. If any stud bolt is loose, correct or replace. If it is bent, correct so that the cylinder head can be installed smoothly.

Use Stud Bolt Wrench (898878600) to screw the stud bolt into crankcase.

NOTE:
Coat the stud bolt threads with a torque-holding sealant (Loctite 270 or 271, or equivalent) before installation.

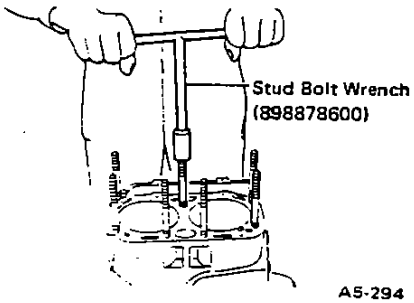


Fig. 3-119 Installing cylinder head stud bolt

4) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

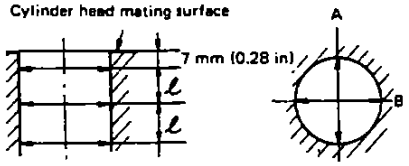
Warping limit	0.05 mm (0.0020 in)

Stud Bolt		
	1,800 cc	1,600 cc
Length	91.5 – 93.5 mm (3.602 – 3.681 in)	90.5 – 92.5 mm (3.563 – 3.642 in)
Torque	34 – 44 N·m (3.5 – 4.5 kg-m, 25 – 33 ft-lb)	

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11. Cylinder and Piston

1) Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.



A: Thrust direction
B: Piston pin direction
A5-068

	ℓ
1,600 cc	30 mm (1.18 in)
1,800 cc	33.5 mm (1.319 in)

Fig. 3-120 Positions for cylinder bore measurement

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

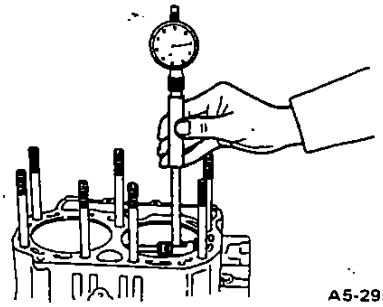


Fig. 3-121 Measuring cylinder bore

2) Boring and honing

a. If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

NOTE:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

b. Get four of the oversize pistons and measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

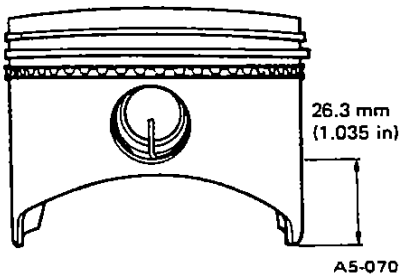


Fig. 3-122 Position for measuring piston diameter

Cylinder bore		
Standard diameter (Both 1800 and 1600)		91.985 – 92.015 mm (3.6214 – 3.6226 in)
Taper	Standard	0.015 mm (0.0006 in)
	Limit	0.050 mm (0.0020 in)
Out-of roundness	Standard	0.010 mm (0.0004 in)
	Limit	0.050 mm (0.0020 in)
Cylinder to piston clearance at 20°C (68°F)	Standard	0.010 – 0.040 mm (0.0004 – 0.0016 in)
	Limit	0.060 mm (0.0024 in)

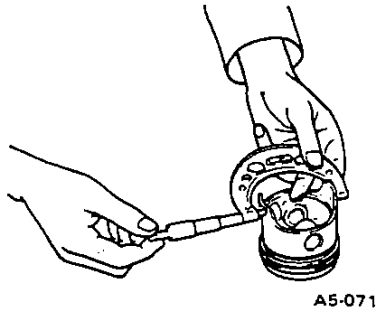


Fig. 3-123 Measuring piston diameter

Piston outer diameter	
Standard	91.960 – 91.990 mm (3.6205 – 3.6216 in)
0.25 mm (0.0098 in) oversize	92.210 – 92.240 mm (3.6303 – 3.6315 in)
0.50 mm (0.0197 in) oversize	92.460 – 92.490 mm (3.6402 – 3.6413 in)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

c. If the cylinder inner diameter exceeds the following enlarging limit after boring and honing, replace the crankcase.

Enlarging limit of cylinder inner diameter	0.50 mm (0.0197 in)

NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

d. Inspect the cylinder bore for taper, out-of-roundness, and diameter differences.

Diameter difference between cylinders	0.050 mm (0.0020 in) or less

NOTE:
Measure the inner diameter of the cylinder when the temperature is 20°C (68°F).

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12. Piston and Piston Pin

1) Check pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder as instructed in 11. Cylinder and Piston. If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.
3) Make sure that piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Specifications for piston and piston pin	
Standard outer diameter of piston pin	20.992 to 21.000 mm (0.8265 to 0.8268 in)
Standard inner diameter of piston pin hole	20.999 to 21.009 mm (0.8267 to 0.8271 in)
Standard clearance between piston pin and hole in piston	0.004 to 0.010 mm (0.0002 to 0.0004 in)
Standard clearance between piston pin and hole in connecting rod	0.005 to 0.040 mm (0.0002 to 0.0016 in)

13. Piston Ring

1) If piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace piston ring with a new one of the same size as the piston.

NOTE:
a. "R" or "N" is marked on the end of the top and second rings. When installing the rings to the piston, face this mark upward.

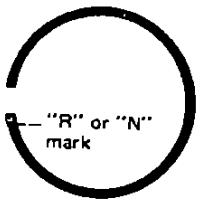


Fig. 3-124 Mark on piston ring

b. The oil ring is a combined ring consisting of two rails and a spacer in between. When installing, be careful not to make misassembly.

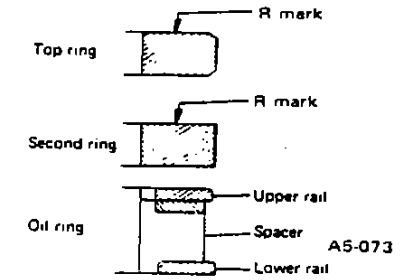


Fig. 3-125 Cross section of piston rings (Riken Piston Ring)

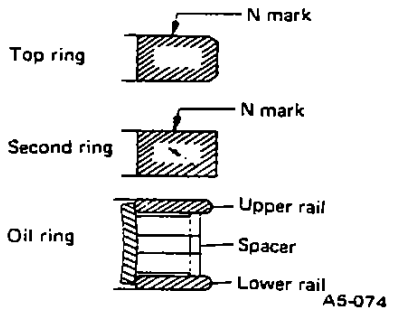


Fig. 3-126 Cross section of piston ring (Nippon Piston Ring)

2) Squarely place piston ring in cylinder and measure the piston ring gap with a thickness gauge.

NOTE:
If the cylinder is not corrected or replaced one, measure the piston ring gap at the bottom of the cylinder, where the wear is little.

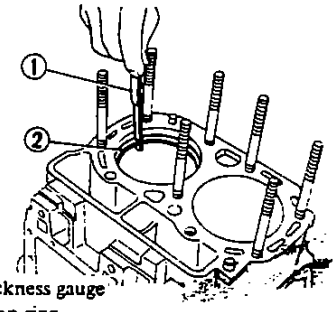


Fig. 3-127 Measuring piston ring gap

3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

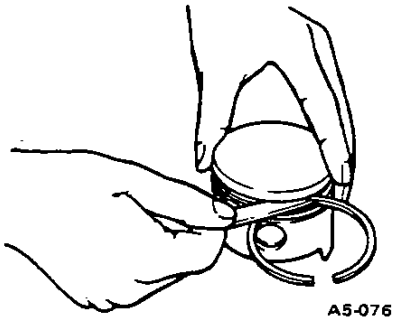


Fig. 3-128 Measuring piston ring groove clearance

		Standard	Limit
Piston ring gap	Top ring	0.20 – 0.35 mm (0.0079 – 0.0138 in)	1.0 mm (0.039 in)
	Second ring	0.20 – 0.35 mm (0.0079 – 0.0138 in)	1.0 mm (0.039 in)
	Oil ring rail	0.20 – 0.90 mm (0.0079 – 0.0354 in)	1.5 mm (0.059 in)

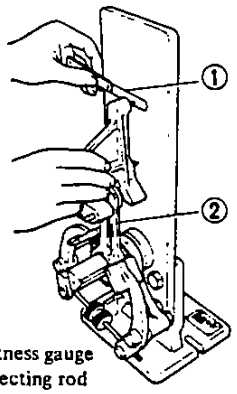
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		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.04 – 0.08 mm (0.0016 – 0.0031 in)	0.15 mm (0.0059 in)
	Second ring	0.03 – 0.07 mm (0.0012 – 0.0028 in)	0.15 mm (0.0059 in)
	Oil ring	0	0

14. Connecting Rod

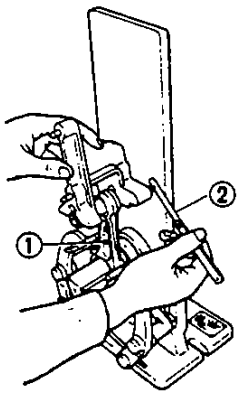
1) Replace connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length	0.10 mm (0.0039 in)



1 Thickness gauge
2 Connecting rod

A5-077

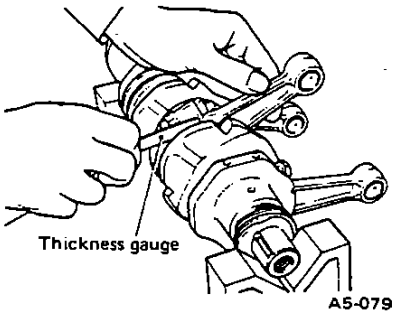


A5-078

1 Connecting rod
2 Thickness gauge

Fig. 3-129 Measuring piston ring groove clearance

3) Install connecting rod fitted with bearing to crankshaft and measure the side clearance (thrust clearance). Replace connecting rod if the side clearance exceeds the specified limit.

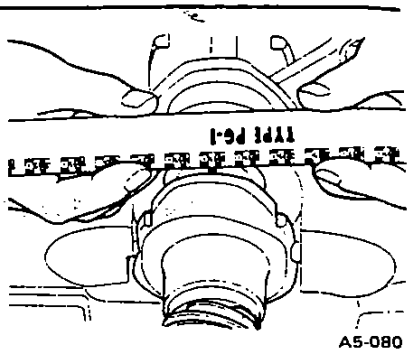


A5-079

Fig. 3-130 Measuring side clearance

Connecting rod side clearance	
Standard	0.070 – 0.330 mm (0.0028 – 0.0130 in)
Limit	0.4 mm (0.016 in)

4) Inspect connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge according to the following procedure.



A5-080

Fig. 3-131 Measuring connecting rod oil clearance

a. Wipe off oil, dust, etc. on the surfaces to be measured.
b. Cut the plastigauge to the width of the bearing, place it on the crankpin parallel with the crankshaft axis, and install connecting rod. Tighten connecting rod nuts to 41 N·m (4.2 kg-m, 30 ft-lb).

NOTE:
During this measurement, do not allow relative movement between the crankpin and connecting rod.

c. Remove connecting rod and measure the width of the plastigauge with the scale printed on the plastigauge case.

If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary, and replace or recondition the crankshaft as necessary. (See the table below.)

6) Inspect bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the connecting rod small end.

Standard clearance between piston pin and bushing in connecting rod	0 – 0.022 mm (0 – 0.0009 in)

Connecting rod oil clearance	
Standard	0.020 – 0.070 mm (0.0008 – 0.0028 in)
Limit	0.10 mm (0.0039 in)

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Replacement procedure is as follows.

a. Remove bushing from connecting rod with Remover & Replacer (499037000) and press.
b. Press bushing with Remover & Replacer (499037000) after applying oil on the periphery of bushing.
c. Make two 3 mm (0.12 in) holes in bushing.
d. Ream the inside of bushing.

Bushing bore	21.000 – 21.016 mm (0.8268 – 0.8274 in)

Distance between big end and small end hole	1800 cc	116.95 – 117.05 mm (4.6043 – 4.6083 in)
	1600 cc	109.95 – 110.05 mm (4.3287 – 4.3327 in)

e. After completion of reaming, clean bushing to remove chips.

NOTE:
When measuring, place both the front and rear journals on blocks located on a surface plate, and apply a dial gauge to the center journal.

15. Crankshaft and Crankshaft Bearing

1) Clean crankshaft completely and check for cracks by means of red check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

Crankshaft bend limit	0.035 mm (0.0014 in)

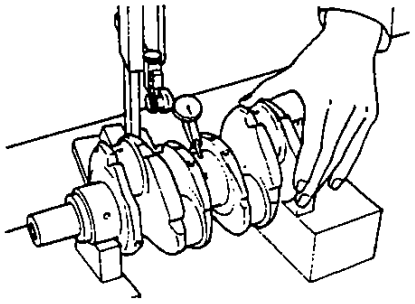


Fig. 3-132 Checking crankshaft bend

3) Inspect the crank journal and crankpin for wear. If not to specifications, replace bearing with an undersize one, and replace or recondition crankshaft as necessary. When grinding crank journal or crankpin, finish them to the specified dimensions according to the undersize bearing to be used. (See the table.)

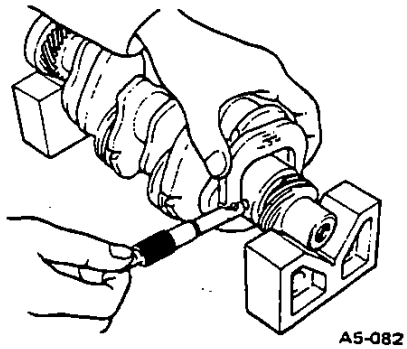


Fig. 3-133 Checking wear of crank journal

Crankpin and crank journal	
Out-of-roundness	0.03 mm (0.0012 in) or less
Taper limit	0.07 mm (0.0028 in)
Grinding limit	0.25 mm (0.0098 in)

Dimensions of crankpin, bearing and bearing bore

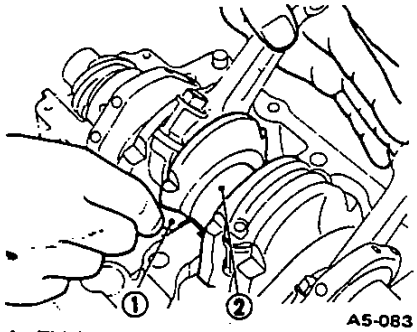
Part / Size	Crankpin diameter	Connecting rod bearing thickness at center	Connecting rod bearing bore diameter
Standard	44.995 – 45.010 mm (1.7715 – 1.7720 in)	1.477 – 1.485 mm (0.0581 – 0.0585 in)	48.000 – 48.019 mm (1.8898 – 1.8905 in)
0.05 mm (0.0020 in) undersize	44.945 – 44.960 mm (1.7695 – 1.7701 in)	1.505 – 1.510 mm (0.0593 – 0.0594 in)	
0.25 mm (0.0098 in) undersize	44.745 – 44.760 mm (1.7616 – 1.7622 in)	1.605 – 1.610 mm (0.0632 – 0.0634 in)	

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Dimensions of crankpin, crank journal and bearing				
Bearing size	Crankpin outer diameter	Crank journal outer diameter		
		1,800 cc engine	1,600 cc engine	
		Front, Center and Rear	Front and Rear	Center
Standard	44.995 – 45.010 mm (1.7715 – 1.7720 in)	54.955 – 54.970 mm (2.1636 – 2.1642 in)	49.957 – 49.970 mm (1.9668 – 1.9673 in)	49.970 – 49.982 mm (1.9673 – 1.9678 in)
0.03 mm (0.0012 in) undersize	–	54.925 – 54.940 mm (2.1624 – 2.1630 in)	49.927 – 49.940 mm (1.9656 – 1.9661 in)	49.940 – 49.952 mm (1.9661 – 1.9666 in)
0.05 mm (0.0020 in) undersize	44.945 – 44.960 mm (1.7695 – 1.7701 in)	54.905 – 54.920 mm (2.1616 – 2.1622 in)	49.907 – 49.920 mm (1.9648 – 1.9654 in)	49.920 – 49.932 mm (1.9654 – 1.9658 in)
0.25 mm (0.0098 in) undersize	44.745 – 44.760 mm (1.7616 – 1.7622 in)	54.705 – 54.720 mm (2.1537 – 2.1543 in)	49.707 – 49.720 mm (1.9570 – 1.9575 in)	49.720 – 49.732 mm (1.9575 – 1.9579 in)

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

Crankshaft thrust clearance	
Standard	0.010 – 0.095 mm (0.0004 – 0.0037 in)
Limit	0.3 mm (0.0118 in)



1 Thickness gauge
2 Center bearing part

Fig. 3-134 Checking thrust clearance

5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge as follows:

a. Wipe off oil, dust, etc. on the surfaces to be measured.
b. Install bearings in crankcase and set crankshaft in position.
c. Cut the plastigauge to the bearing width and place it on journal parallel with the crankshaft axis. Be careful not to put it on the oil hole or groove. Bring together the crankcase halves and tighten bolts to the specified torque.

NOTE:
During the work, the crankshaft must not be turned nor the crankcase inverted.

Thread size	Torque
10 mm	39 – 47 N·m (4.0 – 4.8 kg-m, 29 – 35 ft-lb)
8 mm	23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)
6 mm	4.4 – 5.4 N·m (0.45 – 0.55 kg-m, 3.3 – 4.0 ft-lb)

d. Remove all bolts and separate crankcase. Measure the plastigauge width with the scale printed on the plastigauge case.

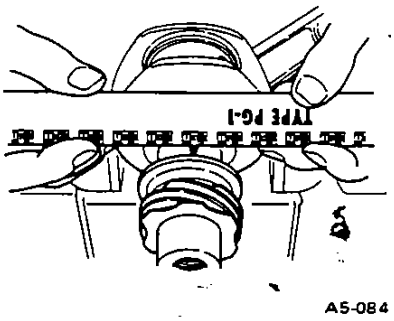


Fig. 3-135 Measuring oil clearance of crank journal

If the measurement is not within the specification, replace defective bearing with an undersize one, and replace or recondition crankshaft as necessary.

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- In case that the oil clearance of crankshaft bearings does not reach the limit and the engine knocking noise is generated, select under size bearings in suitable size to minimize the oil clearance within the standard range as shown in the following table "Crankshaft oil clearance".

NOTE:

a. When selecting crankshaft bearings, the following combination can be made as well as using same size bearings for both right and left crankcase halves:
The following table summarizes the amounts of reduction in oil clearance for various combination of bearing halves.

b. If you use undersize bearings, please confirm that the crankshaft can be turned smoothly by hand [at a torque of 15 N-m (1.5 kg-m, 11 ft-lb) or less], to prevent the bearings from seizuring after assembling the crankcase just before installing the pistons.

Combination of crankshaft bearing

Crankshaft bearing size		Left side crankcase		
		Standard	0.03 mm (0.0012 in) undersize	0.05 mm (0.0020 in) undersize
Right side crankcase	Standard	0 mm (0 in)	0.015 mm (0.0006 in)	Not recommended
	0.03 mm (0.0012 in) undersize	0.015 mm (0.0006 in)	0.03 mm (0.0012 in)	0.04 mm (0.0016 in)
	0.05 mm (0.0020 in) undersize	Not recommended	0.04 mm (0.0016 in)	0.05 mm (0.0020 in)

Crankshaft oil clearance			
Engine		1,800 cc	1,600 cc
Standard	Center	0.010 – 0.025 mm (0.0004 – 0.0010 in)	0.010 – 0.030 mm (0.0004 – 0.0012 in)
	Front & Rear	0.010 – 0.030 mm (0.0004 – 0.0012 in)	0.010 – 0.035 mm (0.0004 – 0.0014 in)
Limit	Center	0.045 mm (0.0018 in)	
	Front & Rear	0.055 mm (0.0022 in)	

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Dimensions of bearing				
Crankshaft bearing size	Thickness of bearing at center			
	1,800 cc engine		1,600 cc engine	
	Front & Rear	Center	Front & Rear	Center
Standard	2.015 – 2.019 mm (0.0793 – 0.0795 in)	2.015 – 2.028 mm (0.0793 – 0.0798 in)	2.001 – 2.008 mm (0.0788 – 0.0791 in)	2.003 – 2.015 mm (0.0789 – 0.0793 in)
0.03 mm (0.0012 in) undersize	2.030 – 2.034 mm (0.0799 – 0.0801 in)	2.030 – 2.043 mm (0.0799 – 0.0804 in)	2.017 – 2.030 mm (0.0794 – 0.0799 in)	2.017 – 2.030 mm (0.0794 – 0.0799 in)
0.05 mm (0.0020 in) undersize	2.040 – 2.044 mm (0.0803 – 0.0805 in)	2.040 – 2.053 mm (0.0803 – 0.0808 in)	2.022 – 2.035 mm (0.0796 – 0.0801 in)	2.022 – 2.035 mm (0.0796 – 0.0801 in)
0.25 mm (0.0098 in) undersize	2.140 – 2.144 mm (0.0843 – 0.0844 in)	2.140 – 2.153 mm (0.0843 – 0.0848 in)	2.122 – 2.135 mm (0.0835 – 0.0841 in)	2.122 – 2.135 mm (0.0835 – 0.0841 in)

7) Inspect the crankshaft gear teeth and the surface on which oil seal slides for wear, damage, etc., and replace if defective.
8) Inspect distributor drive gear for tooth surface damage, and proper fit of woodruff key, and replace if defective.

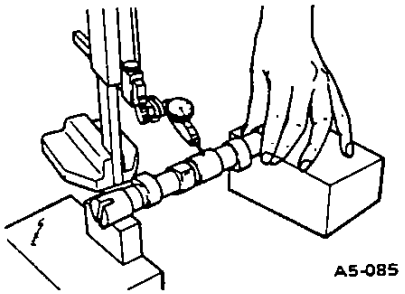
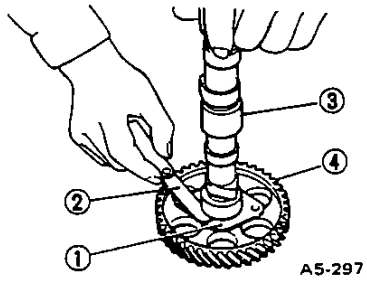


Fig. 3-136 Checking camshaft bend



1 Camshaft plate
2 Thickness gauge
3 Camshaft
4 Cam gear

Fig. 3-137 Measuring thrust clearance

16. Camshaft

1) Measure the camshaft bend, and correct or replace if it exceeds the limit.

NOTE:
When the camshaft is replaced, the valve filters also must replaced.

Bend limit	0.05 mm (0.0020 in)

2) Measure the thrust clearance between camshaft and camshaft plate. If it exceeds the limit, remove cam gear and replace plate.

Camshaft thrust clearance	
Standard	0.020 – 0.090 mm (0.0008 – 0.0035 in)
Limit	0.2 mm (0.008 in)

3) Inspect the journals, and replace if damaged or worn.
4) Inspect the cam surface for damage, and measure the total height of the cam. Replace camshaft, if damaged noticeably or worn beyond the limit. If damaged only to a minor degree, grind and correct with an oil stone.

NOTE:
a. The cam lobe is provided with taper of 4 minutes to cause the valve lifter to rotate. Be sure to retain this taper.

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Specifications of cam lobe height (intake and exhaust)		
Standard (Dimension "H")	With solid	32.24 – 32.34 mm (1.2693 – 1.2732 in)
	With solid	35.90 – 36.00 mm (1.4134 – 1.4173 in)
Wear limit		0.15 mm (0.0059 in)

Dimension "D"	With conventional valve lifter	27 mm (1.06 in)
	With hydraulic valve lifter	31 mm (1.22 in)

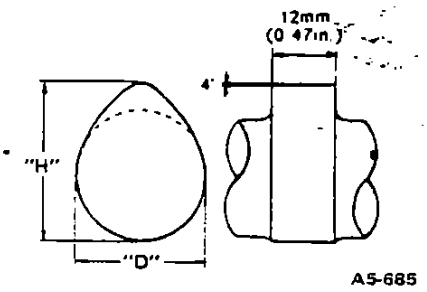


Fig. 3-138 Cam lobe shape

b. If a new cam is used, check its identification mark and groove.

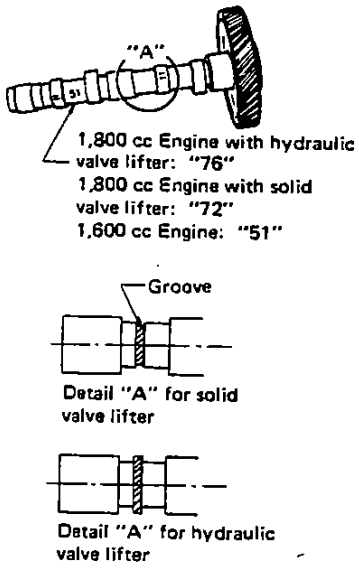


Fig. 3-139 Cam identification

c. Whenever the camshaft is replaced because of its abnormality, replace the valve lifters with new ones too.

5) Inspect the fit of woodruff key (5 x 6.5 x 20 mm) in the camshaft key groove and cam gear key groove, and if defective replace key or gear, or correct the key groove.

6) Inspect camshaft and cam gear contact surfaces for cracks or other damage, and the cam gear tooth surface for wear. Replace cam gear if defective.

7) Measure the cam gear run-out, and replace cam gear if the run-out exceeds the limit.

Limit of run-out	0.25 mm (0.0098 in)

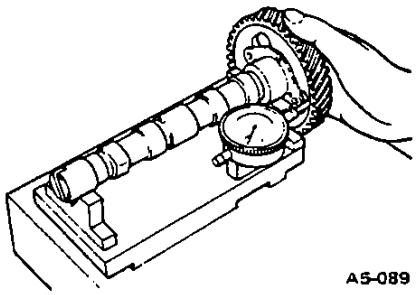


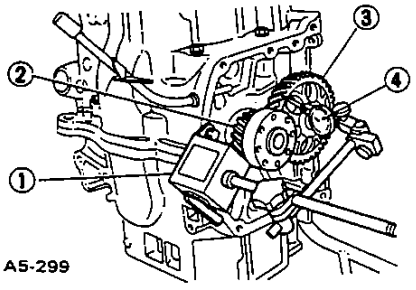
Fig. 3-140 Checking cam gear run-out

8) Measure the backlash between cam gear and crankshaft gear, by using Magnet Base (498247001) and Dial Gauge (498247100). Replace cam gear if the measurement exceeds the specified limit.

Backlash between crankshaft gear and cam gear	
Standard	0.010 – 0.050 mm (0.0004 – 0.0020 in)
Limit	0.10 mm (0.0039 in)

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Standard inner diameter of camshaft journal bores	Front & Center	1,800 cc	32.000 – 32.018 mm (1.2598 – 1.2605 in)
		1,600 cc	26.000 – 26.018 mm (1.0236 – 1.0243 in)
	Rear	36.000 – 36.018 mm (1.4173 – 1.4180 in)	
Standard outer diameter of camshaft journal	Front & Center	1,800 cc	31.959 – 31.975 mm (1.2582 – 1.2589 in)
		1,600 cc	25.959 – 25.975 mm (1.0220 – 1.0226 in)
	Rear	35.959 – 35.975 mm (1.4157 – 1.4163 in)	
Clearance between camshaft journal and journal bore	Standard	0.025 – 0.059 mm (0.0010 – 0.0023 in)	
	Limit	0.100 mm (0.0039 in)	



1 Magnet Base (498247001)
2 Crankshaft gear
3 Cam gear
4 Dial Gauge (498247100)

Fig. 3-141 Measure backlash

NOTE:
When replacing the cam gear, use Remover Set (899714110).
Measure the thrust clearance as described in 2) after replacement, and adjust to the specification.

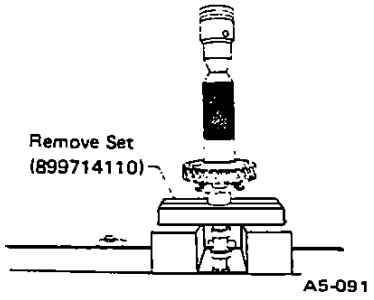
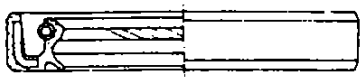


Fig. 3-142 Installing cam gear

17. Oil Seals

Inspect oil seal fitted in flywheel housing and the oil seal fitted at the crankshaft front end for lip wear, damage, hardening, etc., and replace if defective.

Oil seal	1,800 cc	1,600 cc
Front	38 x 59 x 9 mm (1.50 x 2.32 x 0.35 in)	38 x 55 x 9 mm (1.50 x 2.17 x 0.35 in)
Rear	76 x 93 x 10 mm (2.99 x 3.66 x 0.39 in)	70 x 87 x 8.5 mm (2.76 x 34.3 x 0.335 in)



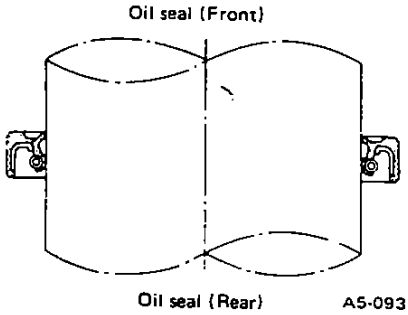


Fig. 3-143 Oil seal

NOTE:
The oil seal (Front) can be detached by separating the crankcase. Reinstallation is performed by using Oil Seal Installer (499067000).

18. Oil Pump

Wash the disassembled parts, check them for the following items, and repair or replace if defective.

1) Oil pump drive gear and rotor

a. Check the outside diameter of the shaft portion, and replace oil pump drive gear if worn or damaged considerably.

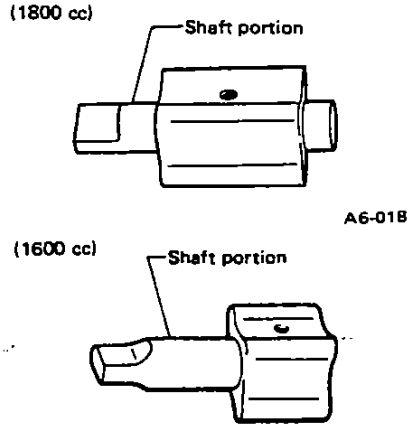


Fig. 3-144

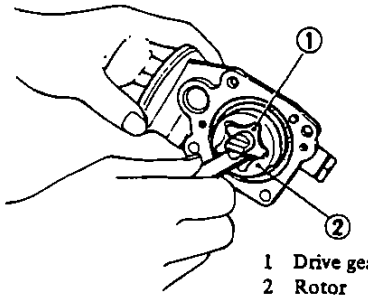
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b. Check both the gear and rotor and replace if worn or damaged considerably.

Outside diameter of drive gear	29.70 – 29.74 mm (1.1693 – 1.1709 in)
Outside diameter of rotor	40.53 – 40.56 mm (1.5957 – 1.5968 in)

c. Tip clearance between pump drive gear and pump rotor
Measure the tip clearance and replace both the drive gear and rotor as a set if the clearance exceeds the limit.

Drive gear-to-rotor tip clearance	Standard	0.02 – 0.12 mm (0.0008 – 0.0047 in)
	Limit	0.2 mm (0.008 in)



1 Drive gear
2 Rotor

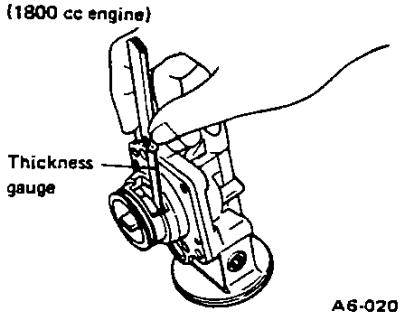
A6-019

Fig. 3-145 Measuring drive gear-to-rotor clearance

d. Side clearance between pump case and pump rotor and between pump case and drive gear
Measure the side clearance and replace either the rotor or case as necessary if the clearance exceeds the limit.

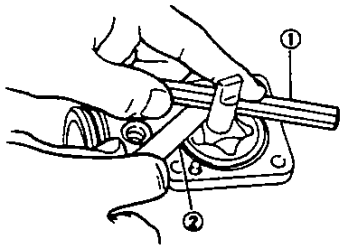
Rotor-to-case and gear-to-case clearance	Standard	0.03 – 0.13 mm (0.0012 – 0.0051 in)
	Limit	0.2 mm (0.008 in)

(1800 cc engine)



A6-020

(1600 cc engine)



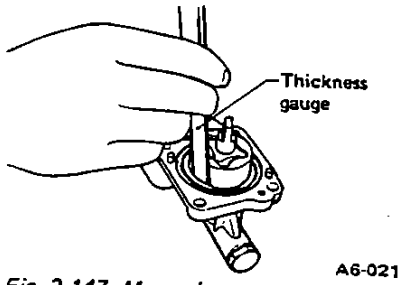
A6-006

1 Straight edge
2 Thickness gauge

Fig. 3-146 Measuring rotor-to-case and gear-to-case clearance

e. Radial clearance between pump rotor and pump case
Replace either the rotor or case as necessary if the clearance exceeds the limit.

Rotor-to-case radial clearance	Standard	0.15 – 0.21 mm (0.0059 – 0.0083 in)
	Limit	0.25 mm (0.0098 in)

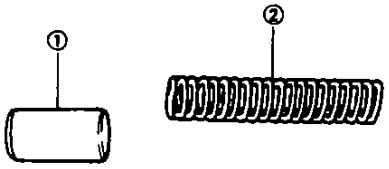


A6-021

Fig. 3-147 Measuring rotor-to-case clearance

2) Oil relief valve and relief valve spring
Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring	
Free length	47.1 mm (1.854 in)
Installed length	33.5 mm (1.319 in)
Load when installed	38.05 – 41.97 N (3.88 – 4.28 kg, 8.56 – 9.44 lb)



A6-008

1 Oil relief valve
2 Relief valve spring

Fig. 3-148 Oil relief valve and spring

3) By-pass valve and spring
The checking method is as same as that of paragraph 2).

By-pass valve spring		
	1,800 cc	1,600 cc
Free length	37.1 mm (1.461 in)	40.7 mm (1.602 in)
Installed length	25.1 mm (0.988 in)	31.1 mm (1.224 in)
Load when installed	5.178 – 6.159 N (0.528 – 0.628 kg, 1.164 – 1.385 lb)	3.580 – 3.972 N (0.365 – 0.405 kg, 0.805 – 0.893 lb)

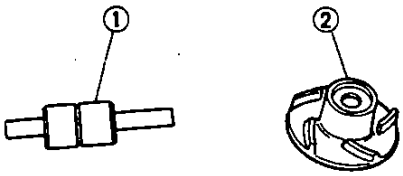
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4) Oil pump holder
Check the pump shaft hole for wear, and other surfaces for damage.
5) Oil pump case
Check the oil pump case for clogged oil passage, worn rotor chamber, cracks, and other faults.

19. Water Pump

NOTE:
Clean all the disassembled parts thoroughly.

1) Inspect the pump shaft for wear, damage, and operation.



1 Water pump shaft
2 Water pump impeller

Fig. 3-149 Shaft and impeller

2) Inspect the impeller surface that contacts the mechanical seal for wear and damage.
3) Inspect the other parts for crack, wear and damage, and replace if defective.

20. Thermostat

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

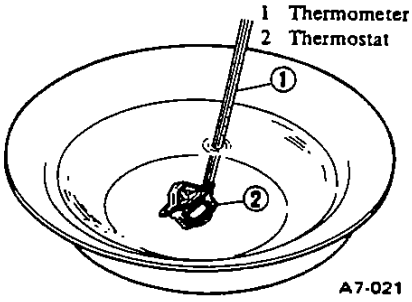


Fig. 3-150 Temperature test for thermostat

21. Thermo Valve

Connect vinyl tubes to output ports of thermo valve.
Soak the valve in cool water [approx. 10°C (50°F)] for some time, and then heat the water.
Blow air into the valve through one vinyl tube, and confirm that the valve opens or closes in response to the specified temperature. (Refer to page 3-5)

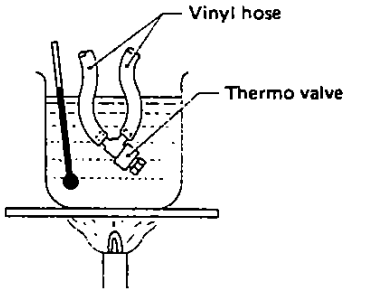


Fig. 3-151

3-8. Assembly

1. Precautions

1) All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
2) Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to ASSY.
3) All removed parts, if to be reused, should be reinstalled in the original positions and directions.
4) Gaskets and lock washers must be replaced with new ones. Liquid gasket should be used where specified to prevent leakage.
5) Bolts, nuts and washers should be replaced with new ones as required.
6) Even if necessary inspections have been made in advance, proceed with ASSY work while making rechecks.

NOTE:
In the following procedures, items with ★ mark should be rechecked.

2. Intake Manifold Assembly

1. NON-TURBO VEHICLE

1) Hitachi Carburetor Type

1) Install thermostat and thermostat cover with new gasket.

NOTE:
Install it with the jiggle pin upward.

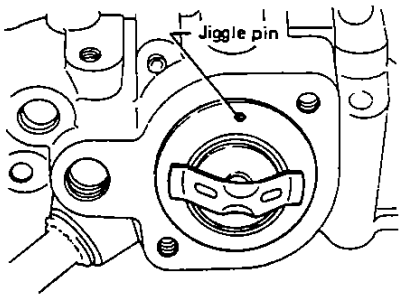


Fig. 3-152

2) Install the following parts.
a. Thermo vacuum valve II.

Torque	23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)

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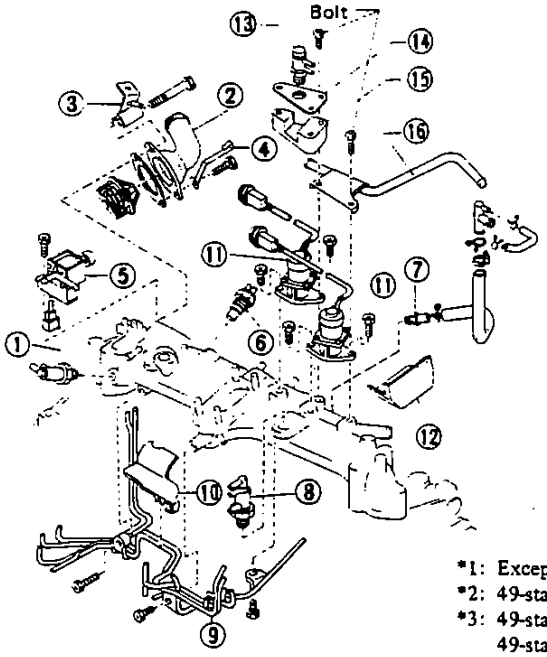
NOTE:
a. Apply liquid gasket (Three Bond 1201 –P/N 004403008, or equivalent) on the thread.
b. Install thermo valve with its pipe outlet facing outside.

b. Stay & clip, clip and actuator ASSY (A/C only).
c. Solenoid valve I, bracket and protector stay.
d. Thermosensor.

NOTE:
Be careful not to bend the terminal.

e. Accelerator cable bracket.
f. P.C.V. valve.

Torque	23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)



1 Thermo vacuum valve II*1
2 Thermostat cover
3 Solenoid valve bracket*3
4 Protector stay*1
5 Solenoid valve I*3
6 Thermosensor
7 PCV valve
8 Thermo vacuum valve I
9 Vacuum pipe CP
10 Carburetor protector 3*1
11 Duty solenoid valve*1
12 Carburetor protector 2*1
13 Thermo valve IV*2
14 Bracket*2
15 Insulator*2
16 Anti-afterburning pipe*2

*1: Except 49-state 4WD and Canada
*2: 49-state 4WD and Canada
*3: 49-state non-4WD and California, 49-state 4WD, Canada AT and 4WD AT

A5-803

Fig. 3-153

3) Install carburetor with two gaskets and an insulator, and connect hoses.
4) Install E.G.R. valve with gasket and connector clamp, and connect hose.

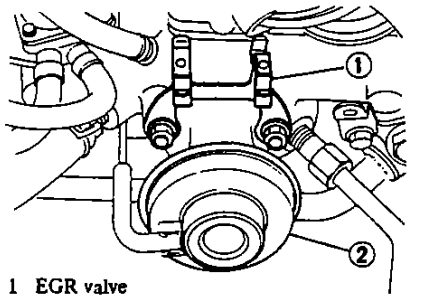
NOTE:
Apply liquid gasket (Fuji Bond C or equivalent) on the thread.

g. Thermo vacuum valve I.

Torque	23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)

NOTE:
Install thermo valve with its pipe outlet facing forward.

h. Vacuum pipe CP with carburetor protector 3, and vacuum hoses.
i. Control air cleaner, P.C.V. hose, duty solenoid valves, carburetor protector 2 and hoses.
j. Heater hose and purge hose.



1 EGR valve
2 Connector clamp

A5-689

Fig. 3-154

5) Attach electric wiring harness, connect electric connectors, and then clip harness.

2) C-W Carburetor Type

1) Install thermostat and thermostat cover with new gasket.

NOTE:
Install it with the jiggle pin upward.

2) Install the following parts.
a. Stay & clip.
b. Clip.
c. Gasket, thermostat cover, solenoid valve I and bracket, and connect hose.
d. Thermosensor.

NOTE:
Be careful not to bend the terminal.

e. P.C.V. valve.

Torque	23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)

NOTE:
Apply liquid gasket (Fuji Bond C or its equivalent) on the thread.

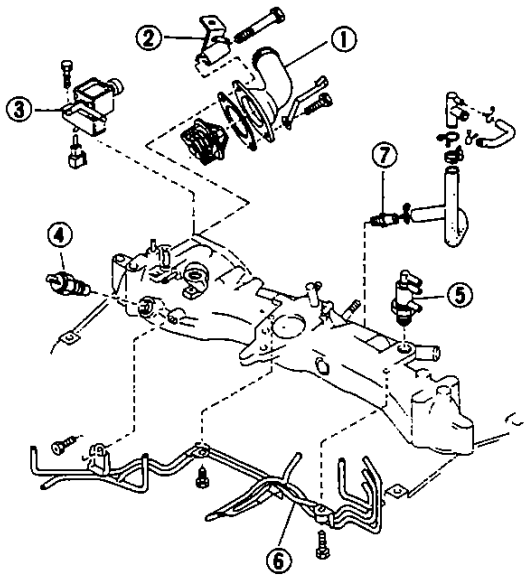
f. Thermo vacuum valve I.

Torque	23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)

NOTE:
Install the valve with its pipe facing outside.

g. Vacuum pipe CP and vacuum hoses.

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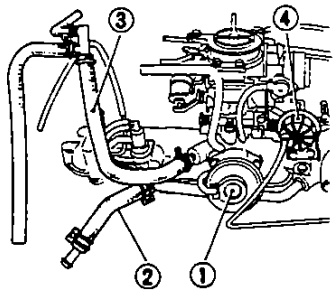


1 Thermostat cover
2 Solenoid valve bracket
3 Solenoid valve I
4 Thermosensor
5 Thermo vacuum valve 1
6 Vacuum pipe CP
7 PCV valve

A5-804

Fig. 3-155

3) Install carburetor with two gaskets and an insulator, and connect hoses.
4) Install the following parts.
a. E.G.R valve with gasket, and hose.
b. Heater hose.
c. P.C.V. hose ASSY.
d. (A/C only) FICD actuator and hose.



1 Heater hose
2 EGR valve
3 PCV hose ASSY
4 Actuator (A/C only)

A5-691

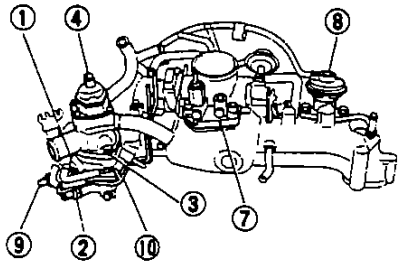
Fig. 3-156

5) Attach electric wiring harness, connect electric connectors, and then clip harness.

2. TURBO VEHICLE

1) Attach the following parts to the intake manifold:

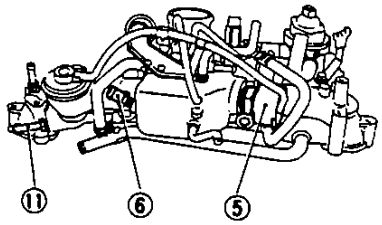
Front view



1 Thermometer CP
2 Coolant thermosensor
3 Thermostat cover and gasket
4 Auxiliary air valve and gasket
7 Throttle body and gasket
8 EGR valve and gasket
9 Thermo valve
10 Vacuum pipe CP

A5-759

Rear view



5 Air relief valve
6 PCV valve
11 EGR pipe

Fig. 3-157

A5-760

- Thermometer

Torque	25 ± 2 N·m (2.5 ± 0.2 kg-m, 18.1 ± 1.4 ft-lb)

- Coolant thermosensor

Torque	25 ± 5 N·m (2.5 ± 0.5 kg-m, 18.1 ± 3.6 ft-lb)

- Thermostat
- Thermostat cover and gasket

NOTE:
Also attach the spark plug cord stay and hose.

- Auxiliary air valve and gasket
- Air relief valve

Torque	69 – 98 N·m (7 – 10 kg-m, 51 – 72 ft-lb)

NOTE:
Apply a coat of liquid packing to threaded areas.

- PCV valve

Torque	25 ± 2 N·m (2.5 ± 0.2 kg-m, 18.1 ± 1.4 ft-lb)

NOTE:
Apply a coat of liquid packing to threaded areas.

- Throttle body and gasket

Torque	15.7 ± 1.5 N·m (1.6 ± 0.15 kg-m, 11.6 ± 1.1 ft-lb)

- EGR valve and gasket

Torque	15.7 ± 1.5 N·m (1.6 ± 0.15 kg-m, 11.6 ± 1.1 ft-lb)

- Thermo valve

Torque	25 ± 2 N·m (2.5 ± 0.2 kg-m, 18.1 ± 1.4 ft-lb)

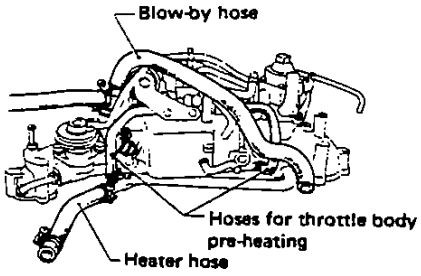
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NOTE:
Always install the valve with its nipple facing 45-degree upward.

- Vacuum pipe
- EGR pipe

2) Connect the various hoses.

- Water preheating hose of throttle body



A5-761

Fig. 3-158

- Heater hose
- Blow-by hose.
- Vacuum hoses

NOTE:
Refer to the label for piping instructions or parts catalogue.

3) Installing the pressure regulator.

NOTE:
a. Install the harness clip.
b. Do not use bolt to fasten the stay together with the ground terminal.
c. Connect hoses with pressure regulator.

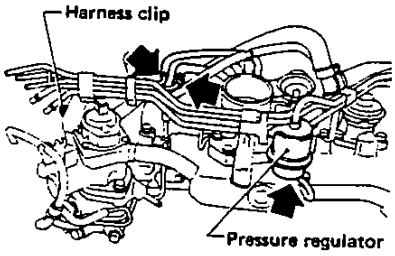
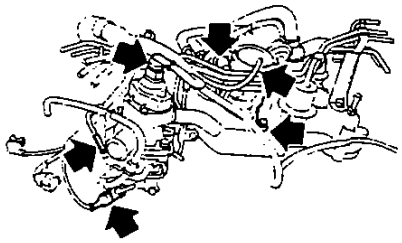


Fig. 3-159 A5-762

4) Connect the wiring harness.

- Auxiliary air valve
- Throttle switch
- FICD solenoid valve
- Thermometer
- Coolant thermosensor
- Ground terminal ... Tighten together with the pressure regulator stay.



A5-763

Fig. 3-160

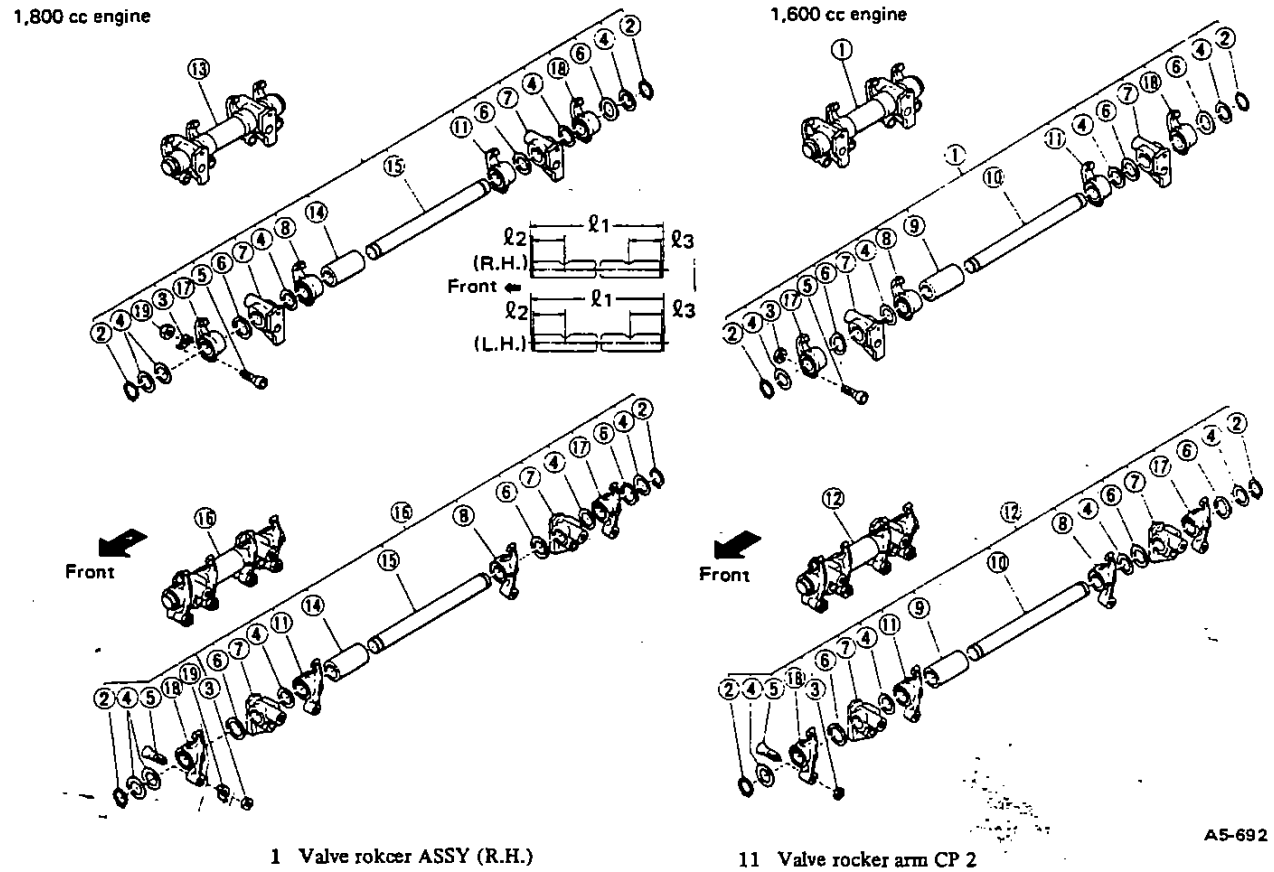
NOTE:
See Parts catalogue for the clip positions and clip band facings of the wiring harness.

3. Valve Rocker Assembly

NOTE:
a. Pay special attention to the direction of the rocker shaft, the position of the spring washers, the number of plain washers, the difference between the rocker arms, and the marks on the spacer.
b. Before assembling, apply a generous amount of oil to the sliding surface of each part.

Valve rocker assembly		
	1,800 cc	1,600 cc
ℓ_1	180.6 mm (7.11 in)	176.9 mm (6.96 in)
ℓ_2	35.8 mm (1.409 in)	34.2 mm (1.346 in)
ℓ_3	34.8 mm (1.370 in)	33.2 mm (1.307 in)
Mark on spacer (RH)	$\overline{\text{RH}}$	RH
Mark on spacer (LH)	$\overline{\text{LH}}$	LH

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1 Valve rokcer ASSY (R.H.)
2 Snap ring
3 Nut
4 Washer
5 Valve rocker screw
6 Rocker shaft spring washer
7 Rocker shaft supporter
8 Valve rocker arm CP
9 Rocker shaft spacer
10 Valve rocker shaft
11 Valve rocker arm CP 2
12 Valve rocker ASSY (L.H.)
13 Valve rocker ASSY (R.H.)
14 Rocker shaft spacer
15 Valve rocker shaft
16 Valve rocker
17 Valve rocker arm
18 Valve rocker arm 2
19 Lock washer (only for hydraulic valve lifter)

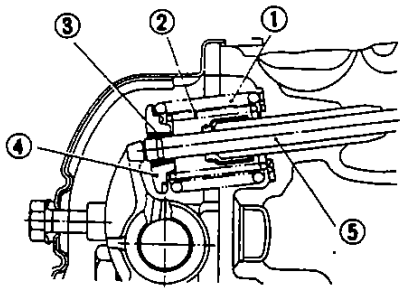
Fig. 3-161 Assembling valve rocker parts

4. Cylinder Head

1) Press oil seal onto intake valve guide.

NOTE:
Apply oil to the oil seal prior to pressing.

2) Apply oil to stems of intake and exhaust valves prior to installation.
3) Install intake and exhaust valves with inner and outer valve springs, valve spring retainers and retainer keys on cylinder head by using Valve Spring Press (899724100).

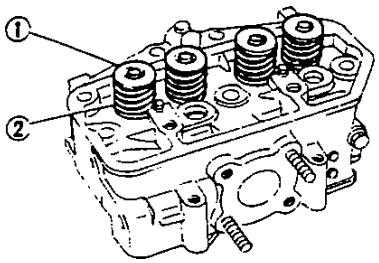


1 Outer valve spring
2 Inner valve spring
3 Retainer key
4 Valve spring retainer
5 Valve stem

Fig. 3-162 Installing valve and related parts

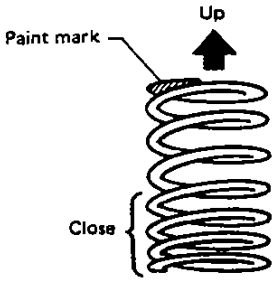
NOTE:
a. Take care not to damage the lips of the intake valve oil seals when installing the intake valves.
b. Place the inner and outer valve springs with the paint mark toward the valve spring retainer, or with the close coil side toward the cylinder head.
c. After installing all the parts, tap the spring top lightly with a plastic hammer or the like to give better seating of the valve.

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1 Valve spring retainer
2 Close coil side

A5-325



A5-326

Fig. 3-163 Installed direction of valve spring

4) Insta[illegible]acer with gasket for air injection [illegible]m.

Discrimination mark on spacer		
* For right-hand side (#1 & #3) cylinder head	1600 Engine	7
	1800 Engine	8
For left-hand side (#2 & #4) cylinder head		LH

* Only for 49-state (except 4WD & 4WD-AT)

5. Crankshaft

1) Install connecting rod bearings on connecting rods and connecting rod caps.

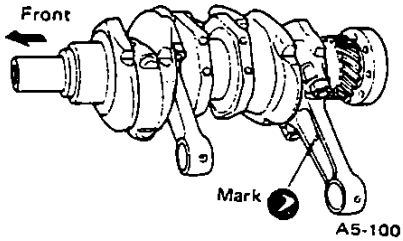
NOTE:
Apply oil to the surfaces of the connecting rod bearings.

2) Install connecting rods and connecting rod caps on crankshaft with connecting rod bolts and nuts.

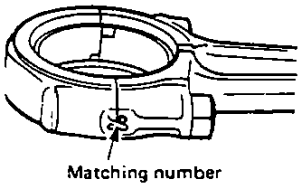
Torque (Connecting rod nut)	39 – 42 N·m (4.0 – 4.3 kg-m, 29 – 31 ft-lb) with oil on threads

NOTE:
a. Position each connecting rod with the side marked ❼ facing forward.
b. Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
c. When tightening the connecting rod nuts, apply oil on the threads.

★ Side clearance and oil clearance



A5-100

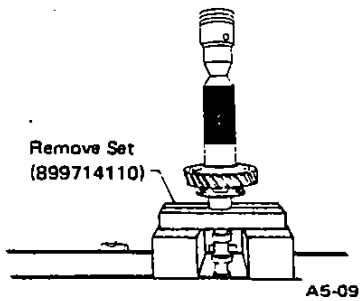


A5-101

Fig. 3-164 Installing connecting rods

6. Camshaft

Install woodruff key on camshaft. Place camshaft plate in position and install cam gear by using Remover Set (899714110).

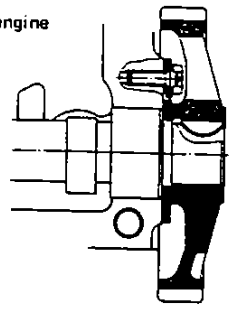


A5-091

Fig. 3-165 Installing cam gear

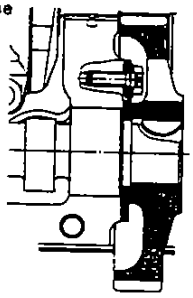
NOTE:
a. Pay attention to the assembling direction of camshaft plate and cam gear.

1,800 cc engine



A5-328

1,600 cc engine



A5-329

Fig. 3-166 Camshaft plate and cam gear

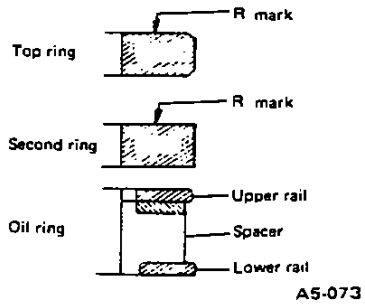
b. Place the camshaft journal on Remover Set (899714110) when pressing the cam gear.

★ Thrust clearance

7. Piston

1) Install piston rings on pistons as follows.

Install oil ring spacer, upper rail and lower rail in this order by hand. Then install second ring and top ring with a piston ring expander.



A5-073

Fig. 3-167 Cross section of piston rings (Riken Piston Ring)

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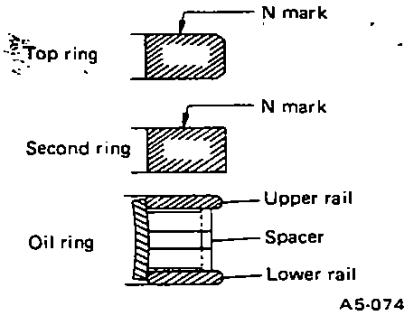


Fig. 3-168 Cross section of piston rings (Nippon Piston Ring)

NOTE:

a. Position the gaps of the piston rings.

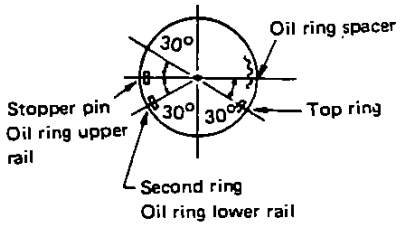
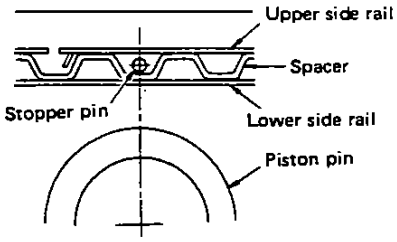


Fig. 3-169 Piston ring gap position

b. Install oil ring as shown in the figure.

(Riken Piston Ring)



(Nippon Piston Ring)

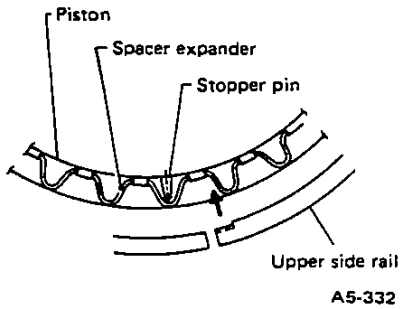


Fig. 3-170 Installation of oil ring

c. Position stopper pins.

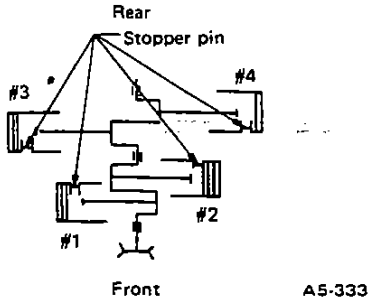


Fig. 3-171 Stopper pin position

d. The top and second rings are provided with "R" or "N" mark as shown in Figs. 5-84 and 5-85. Be sure to install the rings with this mark facing upward.

★ Ring to groove clearance

2) Insert piston pin circlip into the stopper pin side of the piston.

NOTE:

a. The installed circlip should be directed as shown in the figure.

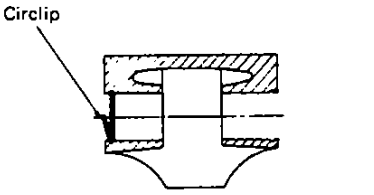


Fig. 3-172 Installed direction of circlip

b. If the piston pin hole has burrs made by the circlip end during its removal, correct so that the piston pin can be inserted smoothly into the piston pin hole with fingers.

8. Oil Pump

NOTE:

Replace washers and O-rings with new ones.

1) Assemble oil relief valve, spring, two washers and plug in pump body.

2) Assemble ball, by-pass valve spring and O-ring in pump body.

3) Assemble oil pump rotor, drive gear, O-ring and pump body holder in pump body.

4) Install oil filter.

9. Water Pump

NOTE:

a. Replace the mechanical seal with a new one.

b. Apply liquid gasket where required.

1) Install the water pump shaft into pump body with a press.

NOTE:

a. Before pressing, heat the pump body to 80 to 100°C (176 to 212°F).

b. Do not press the shaft, or the bearings will be damaged. Press the bearing outer race.

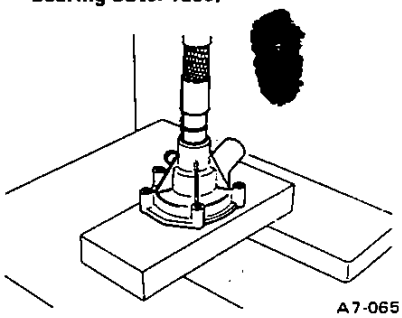


Fig. 3-173 Pressing water pump shaft

2) Apply liquid gasket (Fuji Bond D or equivalent) to the periphery of the mechanical seal and press the seal into the pump body with the carbon washer of the seal facing the impeller.

3) With a thin coat of oil on the shaft surface, install the impeller onto the pump shaft with a press.

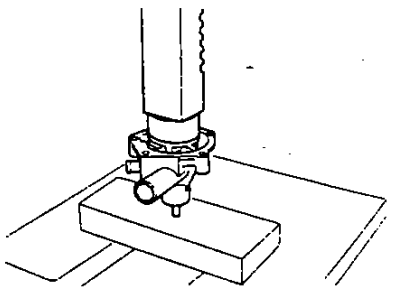


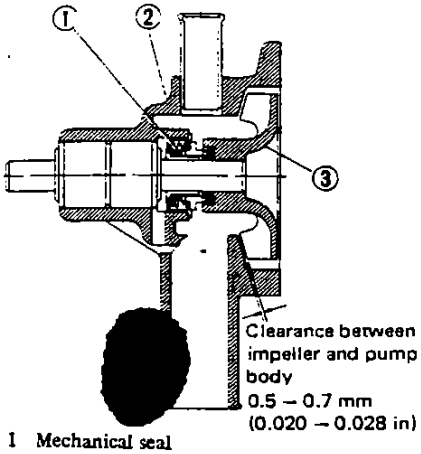
Fig. 3-174 Installing impeller

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NOTE:
Apply coolant on the sliding surface between mechanical seal and impeller.

Check for the following clearance after installation and correct if defective.

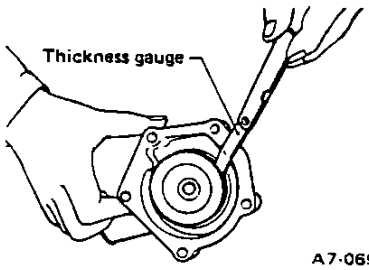
Clearance between impeller and pump body	0.5 – 0.7 mm (0.020 – 0.028 in)



1 Mechanical seal
2 Pump body
3 Impeller

A7-089

Fig. 3-175 Impeller clearances

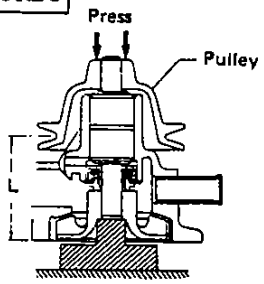


A7-069

Fig. 3-176 Checking impeller-to-pump body clearance

4) Support the impeller side of the pump shaft end and install the pulley by using a press until the distance "L" between the pump body surface, which mates with the gasket, and the center of belt groove of the pulley becomes specified value.

Non-TURBO



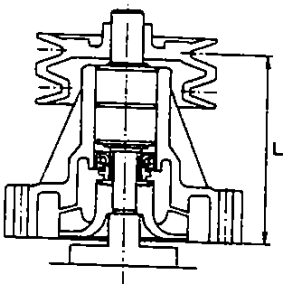
A7-101

Fig. 3-177

L	
1800 cc Engine	1600 cc Engine
61.1 – 61.7 mm (2.406 – 2.429 in)	64.1 – 64.7 mm (2.524 – 2.547 in)

NOTE:
Before pressing, apply oil on the pump shaft.

TURBO



A5-767

Fig. 3-178

L	92.1 – 92.7 mm (3.626 – 3.650 in)

NOTE:
In the following procedures, items with ★ mark should be rechecked.

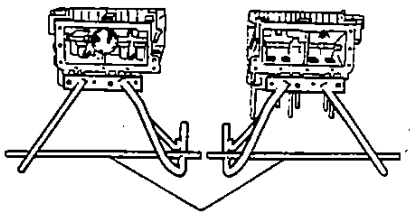
3-9. Installation

1. Precautions

1) All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons, cylinders and bearings.
2) Rotating parts and sliding parts such as the piston, cylinder, bearing and gear should be coated with oil prior to reinstallation.
3) All removed parts, if to be reused, should be reinstalled in the original positions and directions.
4) Oil seal lips should be coated with grease before reinstallation.
5) Gaskets and lock washers must be replaced with new ones. Liquid gasket should be used where specified to prevent leakage.
6) Bolts, nuts, washers, and cotter pins should be replaced with new ones as required.
7) Even if necessary inspections have been made in advance, proceed with reinstallation work while making rechecks.
8) If one or both of the cylinder heads are removed in engine disassembly, perform the retightening of the cylinder head nuts and intake manifold bolts and the adjustment of the valve clearances (except engine with hydraulic valve lifter) after the engine has been assembled, mounted on the car, run for about 10 minutes, and cooled down to ambient temperature.

2. Non-TURBO Vehicle

1) Install Engine Stand (399814300) to each crankcase half.



Engine Stand (399814300)

A5-335

Fig. 3-179 Installing engine stand

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2) Install oil pressure switch (Vehicle without pressure gauge) or plug (Vehicle with pressure gauge) on crankcase. Before installation, apply liquid gasket (Fuji Bond C or equivalent) to the threads of pressure switch body or plug body.

Torque	22 – 27 N·m (2.2 – 2.8 kg-m, 16 – 20 ft-lb)

3) Install crankshaft bearings on crankcase.

★ Oil passage.

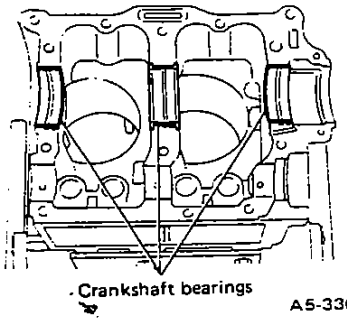


Fig. 3-180 Installing crankshaft bearings

4) Insert valve lifters into the lifter holes in crankcase and hold them on #1 and #3 cylinder side by using Valve Lifter Clip 899804100 (only for hydraulic valve lifter).

NOTE:
Apply oil to the valve lifters before installation.

5) Install crankshaft and camshaft on the crankcase half having #2 and #4 cylinders.

NOTE:
a. Apply oil to the camshaft and crankshaft bearings before installation.
b. One of the bolt holes in the crankshaft gear has a larger chamfer than others. Install the crankshaft so that the punch mark on the cam gear can be seen through this bolt hole in the crankshaft gear.
c. Whenever the camshaft is replaced because of its abnormality, replace the valve lifters with new ones too.

★ Oil clearance of crankshaft

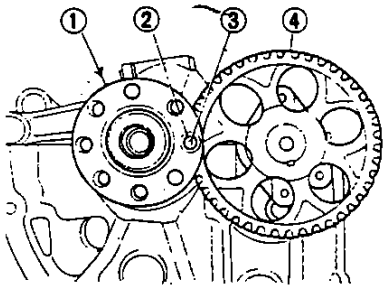


Fig. 3-181 Aligning crankshaft and camshaft gears

6) Install O-ring and backup ring on the crankcase half having #2 and #4 cylinders.

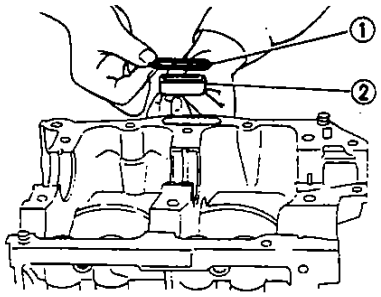


Fig. 3-182 Installing O-ring and backup ring

7) Apply liquid gasket (Fuji Bond C or equivalent) on the mating surface of crankcase.

NOTE:
Before applying liquid gasket, clean the mating surfaces of the crankcase so that they are free of oil, grease and dust by using thinner or the like.

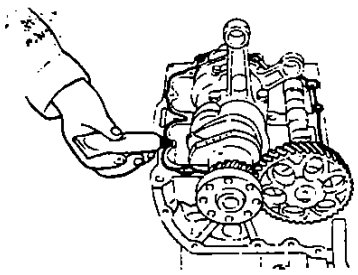


Fig. 3-183 Applying liquid gasket

8) Put Valve Lifter Clips (899804100) between valve lifters in the crankcase half having the #1 and #3 cylinders, to prevent lifters from dropping off (for solid valve lifter).

9) Bring together the crankcase halves and tighten the crankcase bolts and nut with a plain washer to the specified torques and in the specified sequence.

Torque for crankcase bolts and nut	
Thread size	Torque
10 mm 6	39 – 47 N·m (4.0 – 4.8 kg-m, 29 – 35 ft-lb)
8 mm 2	23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)
6 mm 2	4.4 – 5.4 N·m (0.45 – 0.55 kg-m, 3.3 – 4.0 ft-lb)

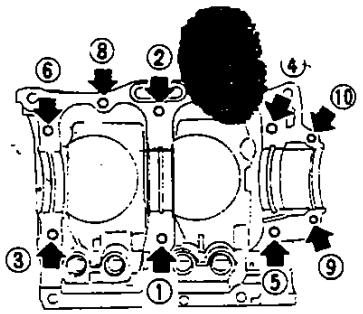


Fig. 3-184 Tightening sequence for crankcase bolts and nut

NOTE:
a. Install the front hanger at this time.
b. Pull cam gear fully.
c. Make sure that the O-ring is installed exactly.
d. Install stiffener (4WD) at this time temporarily.
e. Take out Valve Lifter Clips (only for solid valve lifter).

10) Secure camshaft plate on crankcase with the two bolts and lock washers, working through the hole in cam gear.

NOTE:
Bend the lock washers to securely lock the bolts.

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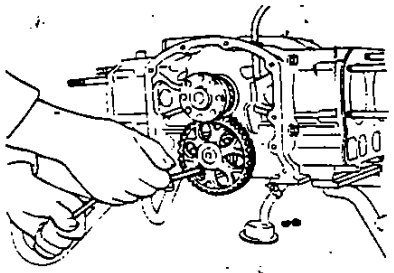

A5-278

Fig. 3-185 Installing camshaft plate

★ Backlash of cam gear
★ Thrust clearance of crankshaft

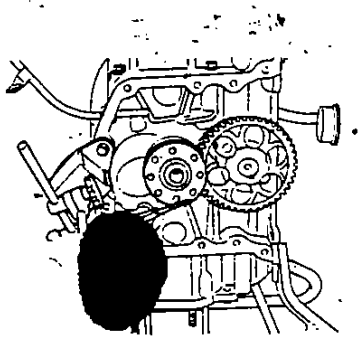

A5-342

Fig. 3-186 Checking crankshaft thrust clearance

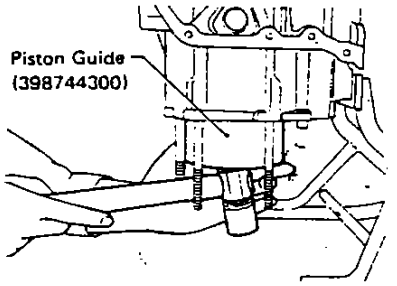
NOTE:
When measuring the backlash of cam gear and thrust clearance of crankshaft, use an appropriate plate as an attachment.

11) Install pistons in cylinder as follows.

a. Apply oil to the circumference of piston and the inner surface of cylinder.

b. With the #2 and #4 cylinders facing downwards, turn crankshaft until the #2 connecting rod comes to the bottom dead center. Then insert the #2 piston into cylinder by using Piston Guide (398744300).

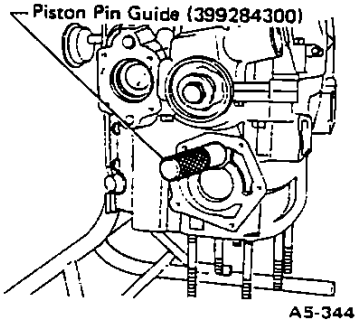
NOTE:
If any of the pistons are reused, be sure to direct them in the same way as before they were disassembled.



A5-343

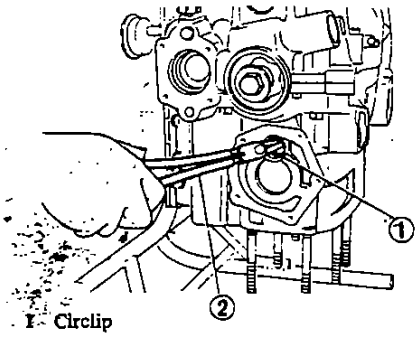
Fig. 3-187 Installing piston

c. Install piston pin and circlip through the front service hole after aligning the service hole, piston pin hole, and connecting rod small end with Piston Pin Guide (399284300).



A5-344

Fig. 3-188 Inserting piston pin



1 Circlip
2 Long nose pliers
A5-345

Fig. 3-189 Installing circlip

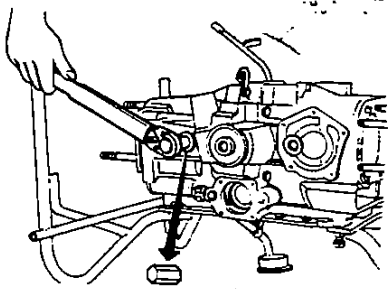
d. Install #4 piston, piston pin, circlip into cylinder in the same manner, but carry out this job from the flywheel housing side.

e. Turn the crankcase upside down so that #1 and #3 cylinder face downward and perform the same job as described in a) to b).

12) Bring crankcase to horizontal position and check whether piston pins are completely installed or not by turning crankshaft and watching piston movement.

13) Apply liquid gasket (Fuji Bond C or equivalent) on crankcase plugs and tighten them with aluminum gasket.

Torque (Crankcase plug)	62 – 76 N·m (6.3 – 7.7 kg-m, 46 – 56 ft-lb)



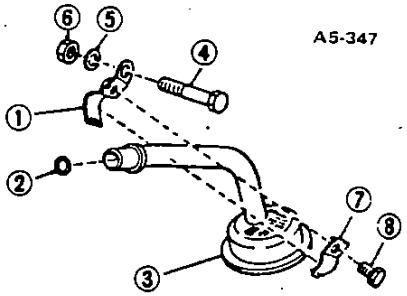
A5-346

Fig. 3-190 Installing crankcase plugs

14) If oil strainer has been removed, install it with a new O-ring by driving with an aluminum bar.

15) Install oil strainer stay with 8 mm bolt, nut and spring washer.

Torque (Oil strainer stay)	23 – 26 N·m (2.3 – 2.7 kg-m, 17 – 20 ft-lb)



A5-347

1 Oil strainer stay
2 O-ring
3 Oil strainer
4 Bolt
5 Spring washer
6 Nut
7 Oil strainer stay 2
8 Bolt and washer

Fig. 3-191 Installing oil strainer stay

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16) Install a new cylinder head gasket, #2 – #4 cylinder head, valve push rods and also valve rocker as follows.

a. Install a new cylinder head gasket.

NOTE:

a. Before installing the cylinder head gasket, clean the mating surfaces of the cylinder head and crankcase so that they are free of oil, grease and dust by using thinner or the like.

b. Apply head gasket sealant THREE BOND 1201 (004403008) or DOW CORNING #92–024 evenly to both sides of the new cylinder head gasket with a brush. Do not apply excessive sealant. Install the gasket on to the crankcase quickly after applying sealant.

b. Install #2 – #4 cylinder head.

NOTE:

The cylinder head installing direction is as in the figure.

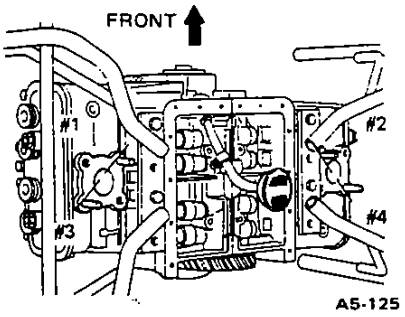


Fig. 3-192 Installed position of cylinder heads

c. Take out Valve Lifter Clip 899804100 (for hydraulic valve lifter), and insert valve push rods in alignment with valve lifters.

NOTE:

Do not misuse the push rod.

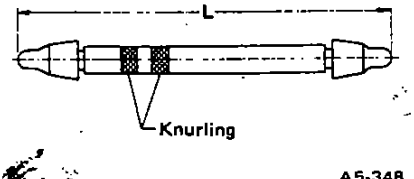


Fig. 3-193 Discrimination of push rod

Number of Knurlings	
1600	2
1800 with solid valve lifter	1
1800 with hydraulic valve lifter	Nothing

d. Install valve rocker.

When tightening nuts and bolts, apply oil to the threads and tighten them in two or three successive steps until the final tightening is at the specified torque.

In each step, tighten them in the specified sequence.

1st step	29 N·m (3.0 kg-m, 22 ft-lb)
2nd step	59 N·m (6.0 kg-m, 43 ft-lb)
3rd (final) step	64 N·m (6.5 kg-m, 47 ft-lb)

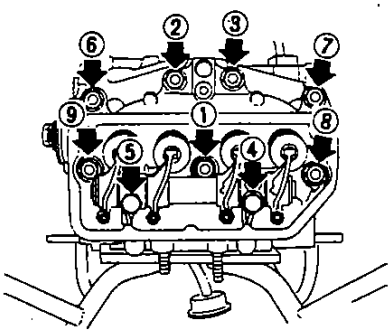


Fig. 3-194

NOTE:

a. When tightening ①, ⑨ nuts, use Socket Wrench (499987006).

b. After tightening all the cylinder head nuts and bolts, retighten the center nut ① to insure it is correctly torqued.

c. Do not use washers in installing valve rocker.

d. Make sure that the valve rocker is correctly assembled.

17) Install #1 – #3 cylinder head with a new gasket and push rods and valve rocker assembly (RH) in the same way as instructed in 16).

18) Press oil seal (Rear) into the flywheel housing if oil seal has been removed.

NOTE:

a. Apply oil on the circumference of the oil seal prior to pressing.

b. Oil seal dimensions.

1,800 cc .... 76 x 93 x 10 mm (2.99 x 3.66 x 0.39 in)
1,600 cc .... 70 x 87 x 8.5 mm (2.76 x 3.43 x 0.335 in)

19) Install flywheel housing to crankcase with the mating surface coated with liquid gasket [THREE BOND 1215 (P/N 004403007) or equivalent].

Torque	20 – 27 N·m (2.0 – 2.8 kg-m, 14 – 20 ft-lb)

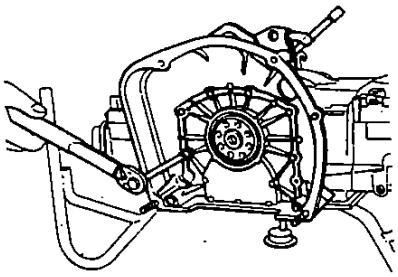


Fig. 3-195 Installing flywheel housing

NOTE:

a. Clean the mating surfaces of the flywheel housing and crankcase so that they are free of oil, grease and dust by using thinner or the like before applying liquid gasket.

b. Be careful not to damage the oil seal lip and not to detach the spring when installing the flywheel housing.

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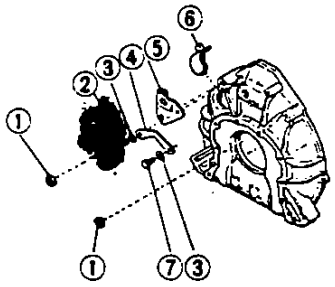
c. When using THREE BOND 1215, dry the coated surface for 5 to 10 minutes before installation.

d. Remove Valve Lifter Clips (899804100) before installing oil pan.

20) Install crankcase oil pan, oil pan gasket and transmission cover II (MT).

Torque (Oil pan)	4.4 – 5.4 N·m (0.45 – 0.55 kg-m, 3.3 – 4.0 ft-lb)

(SUBARU 1600)



(SUBARU 1800)

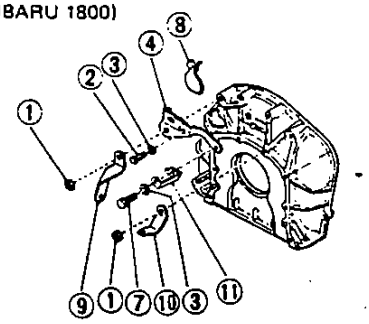
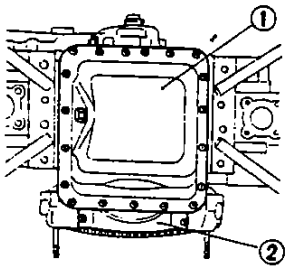


Fig. 3-197 Installing crankcase hanger

22) Install flywheel with O-ring (MT) or converter drive plate with back plate and O-ring (AT) on the crankshaft gear.

Apply liquid gasket [THREE BOND 1215 (P/N 004403007)] to the threads of the bolts.

	AT	MT
Torque	49 – 53 N·m (5.0 – 5.4 kg-m, 36 – 39 ft-lb)	41 – 45 N·m (4.2 – 4.6 kg-m, 30 – 33 ft-lb)



1 Transmission cover II (MT)
2 Oil pan

A5-271

Fig. 3-196 Installing oil pan

21) Install pitching stopper bracket and crankcase rear hanger, if it has been removed, to flywheel housing. On C-W carburetor, install accelerator cable bracket with hanger.

NOTE:
Do not misplace the washer.

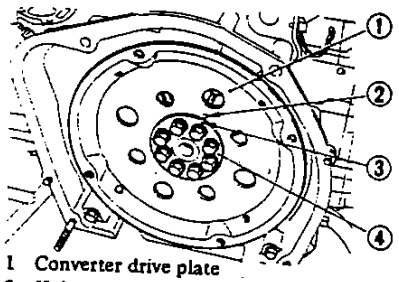
1 Nut
2 Bolt
3 Spring washer
4 Crankcase rear hanger
5 Pitching stopper bracket
6 Timing hole hanger
7 Bolt
8 Timing hole hanger
9 Stiffener RH (4WD)
10 Stiffener LH (4WD)
11 Accelerator cable bracket (C-W carburetor)

A5-693

NOTE:

a. The flywheel or drive plate and back plate can be installed only in one position since not all the bolt holes are positioned at equal intervals.

b. When installing back plate, align the mark on back plate and the hole in drive plate. (AT)



1 Converter drive plate
2 Hole
3 Mark
4 Back plate

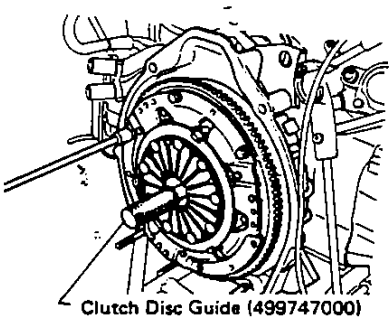
A5-353

Fig. 3-198 Installing drive plate and back plate (AT)

c. When using THREE BOND 1215, dry the bolts coated with it for 5 to 10 minutes before screwing them in.

23) Install clutch disc and clutch cover with bolts and spring washers, aligning clutch disc with flywheel by inserting Clutch Disc Guide (499747000) into needle bearing fitted in flywheel. (MT)

Torque (Clutch cover)	16 N·m (1.6 kg-m, 12 ft-lb)



Clutch Disc Guide (499747000)

A5-354

Fig. 3-199 Installing clutch cover

NOTE:
Position the clutch cover so that the "0" marks on the flywheel and clutch cover are spaced 120° or more.

24) Install water pump, hose, pipe compl. and heater hose as an assembly and install another hose.

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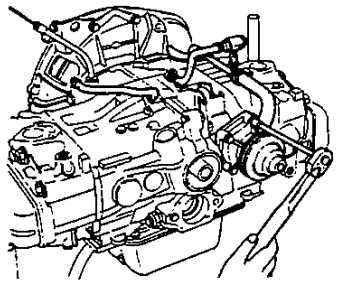

A5-694

Fig. 3-200 Installing water pump

25) After assembling oil filter and oil pump, install it with O-ring and oil pump gasket.

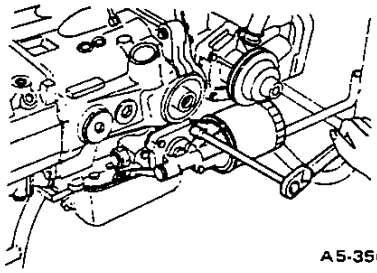

A5-356

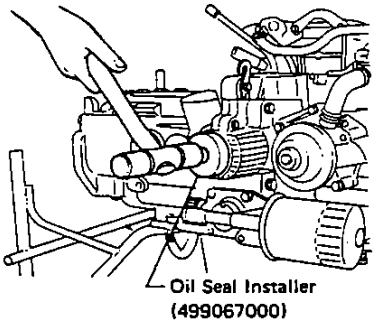
Fig. 3-201 Installing oil pump

NOTE:

a. Use new gaskets and O-rings.

b. When installing, align the rotor shaft with the groove in the camshaft end.

26) Install oil seal (Front) on the crankshaft front end by using Oil Seal Installer (499067000).



A5-357

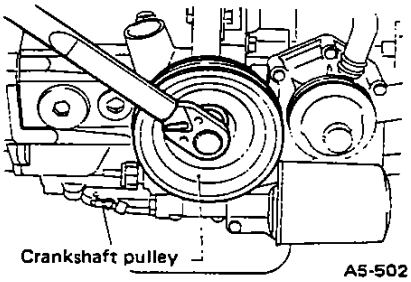
Fig. 3-202 Installing oil seal

27) Install crankshaft pulley on crankshaft with flange bolt.

Torque	64 – 74 N·m (6.5 – 7.5 kg-m, 47 – 54 ft-lb)

NOTE:

a. When tightening the bolt, insert a screw driver through the timing hole into the hole in the drive plate (AT) or flywheel (MT) to prevent the crankshaft from turning.



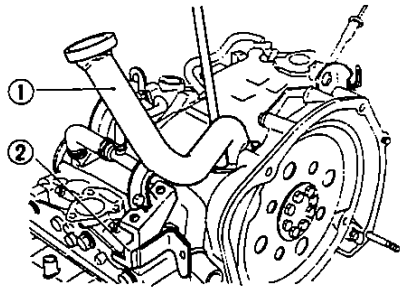
A5-502

Fig. 3-203 Installing crankshaft pulley

b. Apply engine oil on the thread, and liquid gasket (THREE BOND 1215 or the equivalent) on the flange seat.

c. Pulley dia. is as follows.
1600 cc: 109 mm (4.29 in)
1800 cc: 119 mm (4.69 in)

28) Install oil filler duct, oil filler duct stay and gasket on crankcase. On 4WD, install oil filler duct, stiffener 2, and gasket on crankcase.



1 Oil filler duct
2 Oil filler duct stay
A5-695

Fig. 3-204 Installing oil filler duct

29) Install generator bracket compl., bracket 2 and bracket 3 as follows.

a. Temporarily connect bracket compl. ① and bracket 3, ② until the spring washer is deformed a little.

b. Install the sub-assembled bracket prepared in a onto the engine by tightening bolts ③ ④ temporarily.

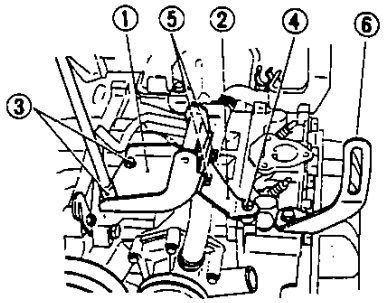
c. At first tighten fully the two bolts ③ and after that tighten the bolt ④ to the specified torque.

d. Tighten fully the two bolts ⑤ to the specified torque.

e. After loosening the bolt ④ by two turns or more, tighten it again to the specified torque.

f. Temporarily install bracket 2. ⑥ .

Torque	13 – 19 N·m (1.3 – 1.9 kg-m, 9 – 14 ft-lb)



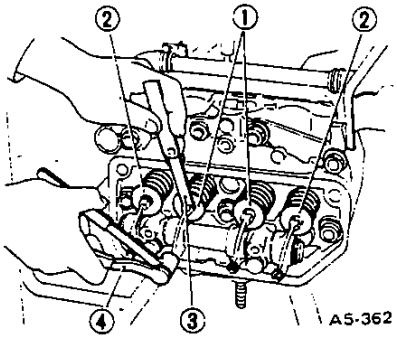
1 Bracket CP
2 Bracket 3
3 Bolts
4 Bolt
5 Bolts
6 Bracket 2
A5-696

Fig. 3-205 Installing generator brackets

NOTE:

Be sure to use the ⑨ bolt for the generator bracket 2.
Others are ⑦ ones.

30) (Except engine with hydraulic valve lifter) Adjust the valve clearances.



A5-362

1 Exhaust valves
2 Intake valves
3 Thickness gauge
4 Valve Clearance Adjuster (498767000)

Fig. 3-206 Adjusting valve clearance

Valve clearance (Cold)	
Intake	0.23 – 0.27 mm (0.009 – 0.011 in)
Exhaust	0.33 – 0.37 mm (0.013 – 0.015 in)

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NOTE:
Use T.D.C. marking on pulley.

31) Install valve rocker covers with valve rocker cover gaskets, seal washers and bolts.

Torque	2.9 – 3.9 N·m (0.30 – 0.40 kg-m, 2.2 – 2.9 ft-lb)

32) Install spark plugs with gaskets.

Torque	18 – 24 N·m (1.8 – 2.4 kg-m, 13 – 17 ft-lb)

33) Install the intake manifold assembly prepared before as follows.
a. Install the intake manifold assembly with intake manifold gasket, air cleaner bracket, fuel hose stay, and EGR pipe. And connect water by-pass hoses.

Torque	18 – 22 N·m (1.8 – 2.2 kg-m, 13 – 16 ft-lb)

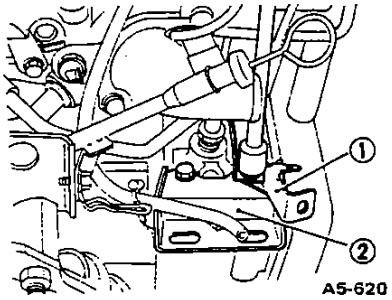
NOTE:
Discrimination knurling for E.G.R. pipe.

Vehicle	Knurling
1600 cc	2
C-W carburetor type	3
Except the above	Nothing

b. Connect the harness lead to oil pressure gauge or oil pressure switch, and clip it.
c. Connect the P.C.V. hose to rocker cover and clip it at the upper portion.

NOTE:
a. For further particulars of vacuum hose, wiring harness, water hose and P.C.V. hose, refer to label behind engine hood, and Parts Catalogue.
b. Be sure to connect E.C.M. (Electronic Control Module) earth at right front bolt.

34) Tighten E.G.R. pipe.
35) Install battery cable bracket and A.S.V. bracket [vehicle without power steering for Canada and 49-state (except 1600 cc)] or oil pump bracket (vehicle with power steering).



1 Battery cable bracket
2 A.S.V. bracket

Fig. 3-207

36) Install A.S.V. pipe and A.S.V.

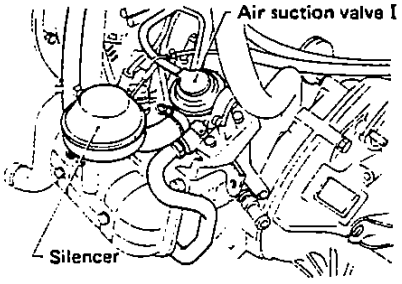


Fig. 3-208

37) Install E.G.R. pipe cover.

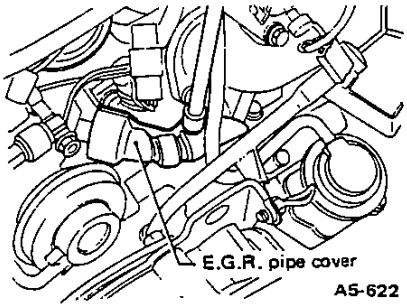


Fig. 3-209

38) Install alternator on the generator brackets with air cleaner bracket, spark plug cord stay and drive belt.

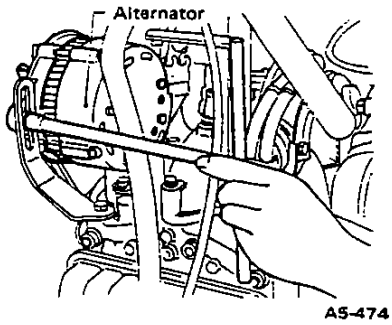


Fig. 3-210 Installing alternator with relative parts

NOTE:
a. After aligning the air cleaner bracket and air cleaner, secure the bracket.
b. Do not forget tightening fully the bolt for generator bracket 2.

Drive belt tension
13 – 14 mm (0.51 – 0.55 in)/ 98 N (10 kg, 22 lb)

When replacing with new one, the tension is 10 mm (0.39 in)/98 N (10 kg, 22 lb).

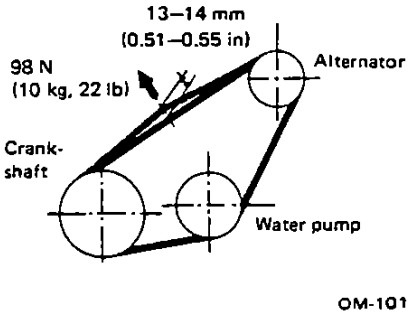


Fig. 3-211 Drive belt tension

39) Install distributor as follows.
a. Set #1 piston at its top dead center in the compression stroke.

b. Align the distributor matching marks.

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c. Install distributor plate on crankcase with bolt.

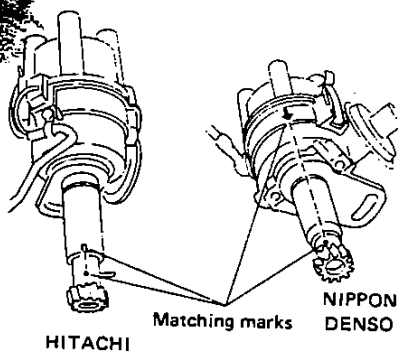


Fig. 3-212 Aligning distributor matching marks

d. Apply oil to the circumference of distributor shaft and gear.
e. Install distributor into crankcase taking care not to damage distributor gear and O-ring.
f. Connect vacuum hoses to distributor.
g. Clip the distributor lead wire.

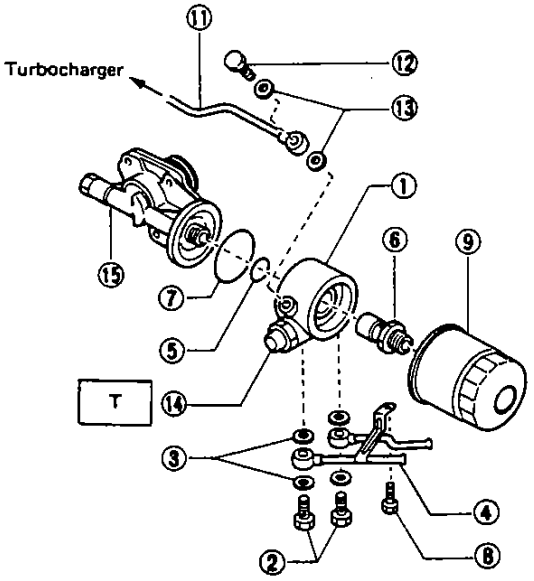
NOTE:
Be careful that the holes in the distributor plate and crankcase are correctly lined up.

40) Connect spark plug cords to spark plugs and cord supporters and distributor cord to cord supporter.
41) Install oil level gauge if it has been removed.
42) Install carburetor protector. [For 49 States (except 4WD & 4WD-AT) and California]
43) Remove Engine Stands (399814300).

3. TURBO Vehicle

NOTE:
The procedures for assembling the engine as far as 28) are the same as those for Non-TURBO vehicles except 25) installing the oil pump.

25) Install oil pump together with attachment and oil filter as follows:



1 Attachment
2 Union screw
3 Gasket
4 Pipe
5 O-ring
6 Connector
7 O-ring
8 Bolt & washer
11 Delivery pipe
12 Union screw
13 Gasket
14 Thermo valve
15 Oil pump

Tightening torque: N·m (kg-m, ft-lb)
T: 59 N·m (6 kg-m, 43 ft-lb)

Fig. 3-213

a. Install pipe ④ to attachment ① with union screws ② and gaskets ③.

Torque	34 N·m (3.5 kg-m, 25 ft-lb)

b. Set O-ring ⑤ in attachment ①. (Apply oil)
c. Install connector ⑥ into attachment ①.
d. Set O-ring ⑦ in attachment ①. (Apply oil)
e. Assemble oil pump ⑮ and attachment ① by temporarily tightening connector ⑥.
f. Install pipe ④ to crankcase by temporarily tightening bolt ⑧.
g. Tighten connector ⑥ to the specified torque.

Torque	29 N·m (3 kg-m, 22 ft-lb)

h. Tighten bolt ⑧ to the specified torque.

Torque	26 N·m (2.7 kg-m, 20 ft-lb)

i. Install oil filter ⑨.
j. Install oil delivery pipe ⑪ with union screw ⑫ and gaskets ⑬.

Torque	16 N·m (1.6 kg-m, 12 ft-lb)

NOTE:
Replace union screw and gasket with new ones.

29) Installing the injector

Tightening torque	1.03 – 1.52 N·m (0.105 – 0.155 kg-m, 0.76 – 1.12 ft-lb)

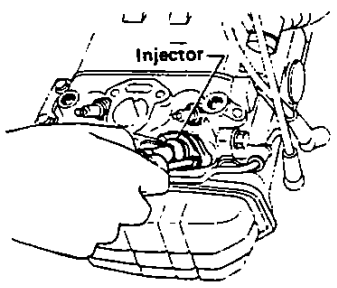


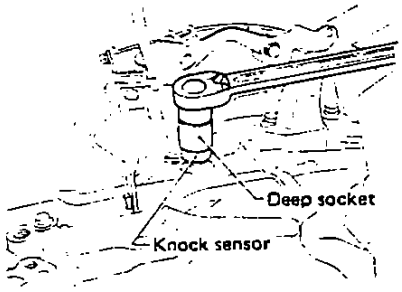
Fig. 3-214

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30) Installing the knock sensor.
Use a 27 mm deep socket.

Tightening torque	22 – 27 N·m (2.2 – 2.8 kg-m, 16 – 20 ft-lb)

NOTE:
Do not lay down the socket when tightening.



A5-769

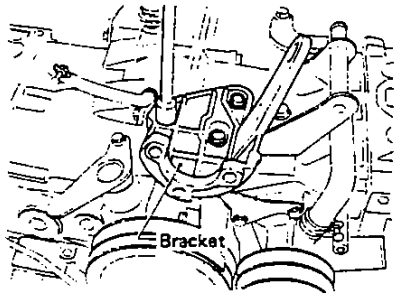
Fig. 3-215

31) Installing the alternator bracket.

Tightening torque	30 – 36 N·m (3.1 – 3.7 kg-m, 22 – 27 ft-lb)

32) Installing the power steering pump bracket.

Tightening torque	18 – 22 N·m (1.8 – 2.2 kg-m, 13 – 16 ft-lb)



A5-771

Fig. 3-216

33) Installing the intake manifold.
a. Use four longer bolts to install.

Tightening torque	18 – 22 N·m (1.8 – 2.2 kg-m, 13 – 16 ft-lb)

b. Install the fuel pipe to the injector.

NOTE:
Replace the fuel hose clamp with a new one.

c. Tighten the fuel pipe along with the intake manifold.

Tightening torque	18 – 22 N·m (1.8 – 2.2 kg-m, 13 – 16 ft-lb)

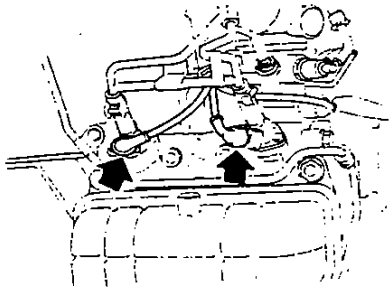
NOTE:
Mount the spark plug cord stays on sides #2 and #4.

d. Tighten the EGR pipe plug.

Tightening torque	31 – 37 N·m (3.2 – 3.8 kg-m, 23 – 27 ft-lb)

e. Connect the air vent hose.
f. Connect the lead wires of the oil pressure switch and injector.

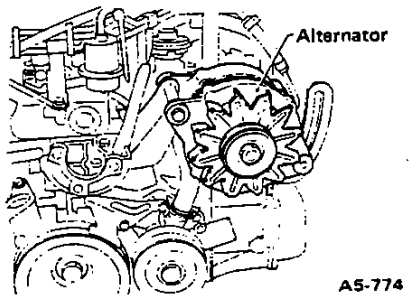
NOTE:
Clamp the lead wires after connecting them.



A5-773

Fig. 3-217

g. Connect the blow-by hose and vacuum hose.
h. Put the EGR pipe cover in place.
34) Installing the alternator.
Temporarily install the alternator ASSY to the bracket.

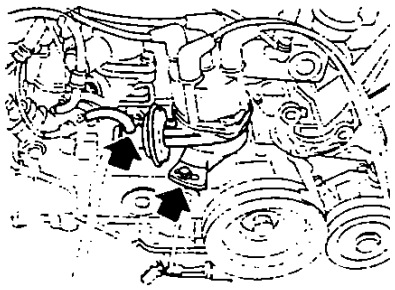


A5-774

Fig. 3-218

NOTE:
a. If the alternator ASSY is hard to install, drive out the slide bush.
b. The V-belt should be installed after the engine has been mounted on the vehicle.

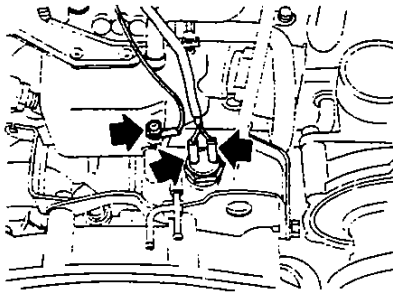
35) Installing the distributor.
a. Install the plate.
b. Bring #1 cylinder to TDC on the compression stroke.
c. Put #1 cylinder in an electrified state.
Adjust the notch to the punched mark on the pinion.
d. Install the distributor and fix it to the plate with 6 mm bolt.



A5-775

Fig. 3-219

e. Connect the vacuum hose.
f. Connect the lead wires.
- Knock sensor
- Ground terminal



A5-776

Fig. 3-220

g. Connect the plug cords and high-tension cord.
36) Removing the ENGINE STAND.
37) Installing the front exhaust pipe.

NOTE:
Before installation, ensure that the exhaust pipe is free of all foreign matter.

38) Install the oil pipe stay.

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