SUZUKI

VITARA

ADDITIONAL SERVICE MANUAL 1.9 T.D. MODEL AND FREE WHEEL HUBS

USE THIS MANUAL IN ADDITION TO THOSE INDICATED IN THE PREFACE OF THIS PUBLICATION

SUZUKI
Caring for Customers
SANTANA MOTOR, S.A.
00000A01251-01E

IMPORTANT

WARNING/CAUTION/NOTE
Please read this manual and carefully follow the instructions. The words **WARNING, CAUTION** and **NOTE** highlight important information and have very specific significance. Please pay great attention to the messages emphasised by these headings.

WARNING
Indicates a potential danger which could result in personal injuries.

CAUTION:
Indicates potential danger which could damage the vehicle.

NOTE:
Provides special information to facilitate maintenance or clarify instructions.

PREFACE

This Manual is a supplement to the Vitara (SE-416) Service Manual Ref.: 99500-60A10-01S and to Supplementary Service Manuals Ref.: 99501-60A70-01S, 99501-61A10-01S and 00000A01231.

This manual describes the differences between the Vitara 1.9 TD. model and the Vitara (SE-416) 3 and 5 doors.

To look up information, initially consult the Vitara 1.9 TD. manual. If the information cannot be found in this Supplement, consult the Service Manual and Supplements previously mentioned.

When servicing, always use parts, special tools and products recommended by Santana Motor S.A.

There may be some discrepancies between specifications, data, figures etc. that appear in this Manual (available at time of publication) and those incorporated in vehicles currently manufactured.

RELATED SERVICE MANUALS:

- **SERVICE MANUAL (SE-416) (99500-60A10-01S)**
- **SUPPLEMENTARY SERVICE MANUAL FOR 5D (99501-60A70-01S) MODEL**
- **SUPPLEMENTARY SERVICE MANUAL (99501-61A10-01S)**
- **SUPPLEMENTARY SERVICE MANUAL FOR AIR BAG AND 1.9 D. (00000A01231) MODEL.**

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SECTION 0A

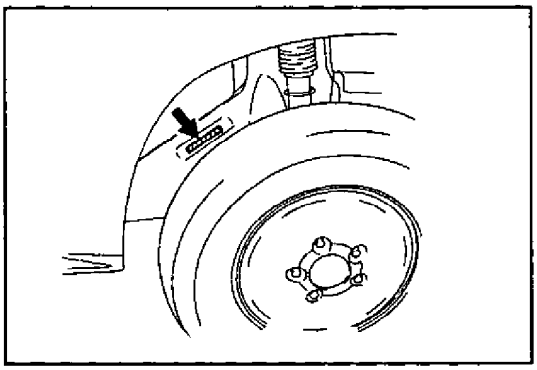
GENERAL INFORMATION

For those sections not contained in this manual, you must consult Service Manual 99500-60A10-01S (VITARA SERVICE MANUAL), 99501-60A70-01S (5P SUPPLEMENTARY SERVICE MANUAL), 99501-61A10-01S (SUPPLEMENTARY SERVICE MANUAL) and 00000A01231 (1.9 D SUPPLEMENTARY SERVICE MANUAL).

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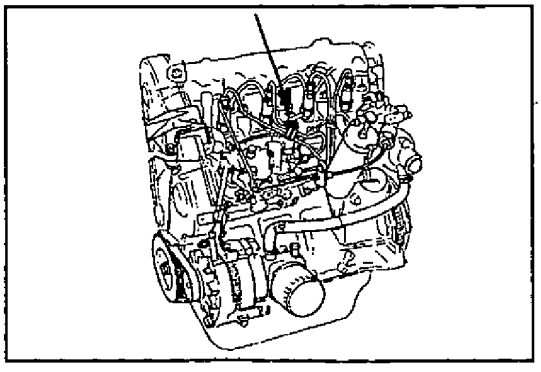
GENERAL INFORMATION
Chassis number identification **0A-1**
Engine number identification **0A-1**

GENERAL INFORMATION



CHASSIS NUMBER IDENTIFICATION

The chassis number is engraved on the front right-hand side, as shown in the figure.



IDENTIFICATION OF ENGINE NUMBER

The engine number is engraved on the plate indicated on the left-hand side, as shown in the figure.

SECTION 0B

MAINTENANCE AND LUBRICATION

NOTE
For topics not covered in this section, please refer to the relevant section of the Vitara Service Manual outlined in the preface.

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MAINTENANCE PROGRAMME

MAINTENANCE IN NORMAL DRIVING CONDITIONS

Interval: This interval must be measured by mileometer readings, or by months, wichever come first.	This table includes programmed servicing up to 90,000 Km. (54,000 miles), subsequently at regular intervals						
	Km. (x1000)	15	30	45	60	75	90
	Miles (x1000)	9	18	27	36	45	54
	Months	12	24	36	48	60	72
1.- ENGINE							
1-1. Drive belt	Vee	I	R	I	R	I	R
	Multi Vee	-	-	I	-	-	R
1-2. Camshaft timing belt		Replace every 80,000 Km. (50,000 miles)					
1-4. Engine oil and filter	CD, CE or CF-4	Replace every 10,000 Km. (6,000 miles) or 8 months					
1-5. Coolant		-	-	R	-	-	R
1-6. Exhaust system (except catalyst)		-	I	-	I	-	I
2.- IGNITION							
2-3. Glow plugs		-	-	-	-	I	-
3.- FUEL SYSTEM							
3-1. Air filter element	Asphalt road	-	R	-	R	-	R
3-2. Fuel types and connections		-	I	-	I	-	I
3-3. Fuel filter	Replace first after 10,000 Km (6,00 miles) and subsequently every 20,000 Km (12,000 miles)						
3-4. Purge lines filter water		Every 10,000 Km (6,000 miles)					
3-5. Fuel Tank		-	-	I	-	-	I
6.- CHASSIS AND BODY							
6-1. Clutch		-	I	-	I	-	I
6-2. Brake discs and pads (front)		I	I	I	I	I	I
Brake drums and shoes (rear)		-	I	-	I	-	I
6-3. Brake hoses and lines		-	I	-	I	-	I
6-4. Brake fluid		-	R	-	R	-	R
6-5. Hand brake lever and cable		I	I	I	I	I	I
6-6. Tyres		I	I	I	I	I	I
6-7. Wheels and free wheeling hubs (it fitted)		I	I	I	I	I	I
6-8. Suspension system		-	I	-	I	-	I
6-9. Propeller shafts		-	-	I	-	-	I
6-10. Transmision oil		I	-	R	I	-	R
6-12. Transfer case oil		I	-	I	-	I	-
6-13. Differential oil (to be changed only after first 15,000 Km)		R or I	-	I	-	I	-
6-14. Steering		-	I	-	I	-	I
6-15. Power assisted steering		I	I	I	I	I	I
6-16. All locks and hinges		-	I	-	I	-	I

NOTES:
"R": Replace or change
"I": Inspect and correct or lubricate if necessary

MAINTENANCE IN SEVERE DRIVING CONDITIONS

If the vehicle is driven in any of the severe conditions outlined below, it is recommended that servicing be performed at the specific intervals indicated in the tables below.

Code of severe conditions.

A – Short frequent journeys
B – Driving on muddy surfaces
C – Driving on dusty surfaces
D – Driving in extremely cold climates.
E – Short frequent journey in extremely cold climates.
G – Use in town/Towing a Trailer/Driving at high speed/At temperatures over 40ºC /Low quality lubricants or fuel.
H – Trailer towing.

Severe conditions code	Maintenance	Maintenance operation	Service interval
- B C D - - -	Drive belts	I	Every 15,000 Km (9,000 miles) or 12 months
		R	Every 45,000 Km (27,000 miles) or 36 months
A - C D E G -	Camshaft drive belts	R	Every 60,000 Km (36,000 miles) or 48 months
A - C D E - H	Engine oil and oil filter	R	Every 5,000 Km (3,000 miles) or 4 months
- B - - - - -	Exhaust pipes and fittings	I	Every 15,000 Km (9,000 miles) or 12 months
- - C - - - -	Air filter element *1	I	Every 2,500 Km (1,500 miles) or 12 months
		R	Every 30,000 Km (18,000 miles) or 24 months
- - C - - G -	Fuel filter	R	Every 10,000 Km (6,000 miles) or 8months
A B - D - - H	Universal joints	I	Every 15,000 Km (9,000 miles) or 12 months
- B - - E - H	Gearbox , transfer and differential oil	I	Every 15,000 Km (9,000 miles) or 12 months
		R	Every 30,000 Km (18,000 miles) or 24 months
- B - - - - -	Suspension nuts and bolts	T	Every 15,000 Km (9,000 miles) or 12 months
- B C D - - H	Wheel bearings	I	Every 15,000 Km (9,000 miles) or 12 months

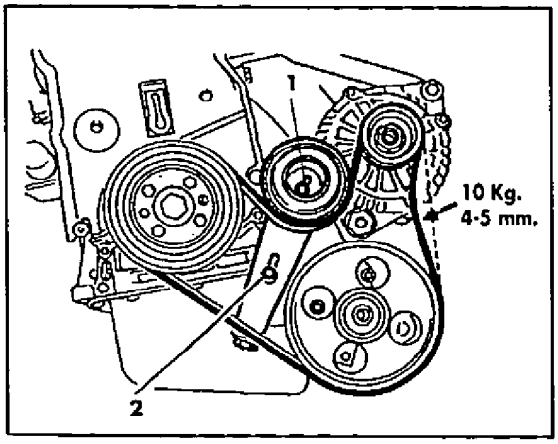
NOTE
"R": Replace or change.
"T": Tighten as specified
"I": Inspect or correct or lubricate if necessary.
***1 : Inspect or replace more frequently if necessary.**

MAINTENANCE SERVICES

ENGINE

ITEM 1-1

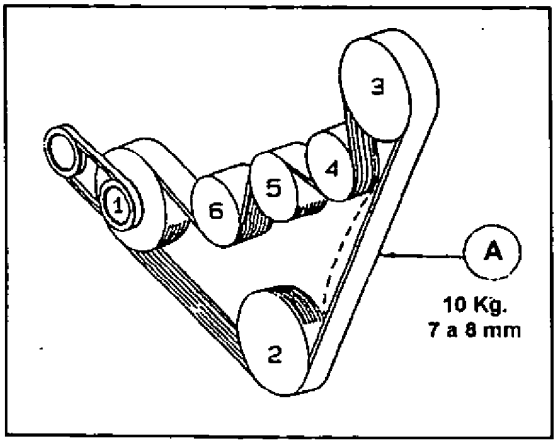
WARNING:
All inspection and replacement work must be carried out with the engine off and the battery disconnected



Drive belt
Inspection:

1) Inspect drive belt to check for splits, distorsion, wear, dirt, etc.
2) In engines without A/C compressor adjust drive belt tension with a deflection of 4 to 5mm.

Belt tension deflection 4 to 5 mm. (0.50 to 0.55 in) with pressure of: 100 N (10 kg, 22 lb).



3) In engines with A/C compressor adjust drivebelt tension with deflection of 7 to 8 mm. in relation to point (A) (belt centre).

Belt tension deflection 7 to 8 mm. with pressure of: 100 N (10 kg, 22 lb).

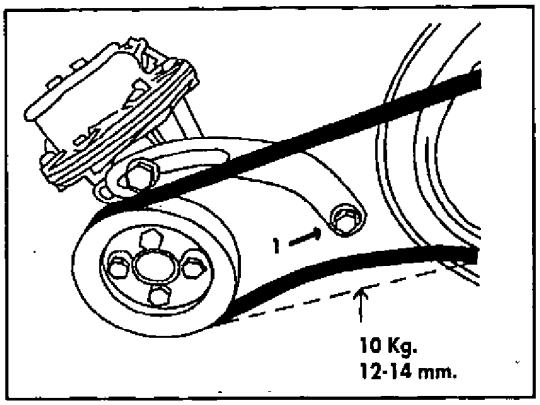
4) If the belt needs to be adjusted, slacken bolts (1) and (2) and tighten adjuster before tightening bolts (1) and (2) once more.

Replacement:

1) Remove lower protective/soundproofing plate.
2) Remove vacuum pump belt
3) Slacken accessory belt with idler belt pulley (4)
4) Remove used belt, fit new one and adjust bolt (3) to tension desired.
5) Tighten bolts (1) and (2). Adjust to final tension with compressor idler pulley.

Idler pulley bolt torque specifications:
18-28 Nm (1.8-2.3 kg.m, 13-20 lb.ft)..

6) Continue assembly reversing disassembly order, assemble and tension vacuum pump belt according to the following instructions.



Vacuum pump belt
Inspect for wear, damage and excess or insufficient tension

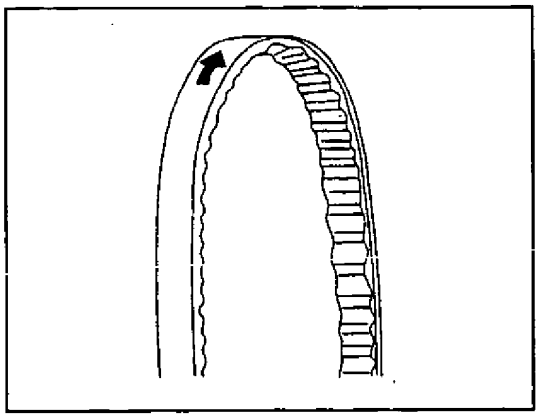
Vacuum pump belt tension: 12 to 14 mm. (0.50 to 0.55 in) with pressure of 100 N (10 kg, 22 lb).

Replacing vacuum pump belt
1) Remove lower protective/soundproof plate.
2) Slacken bolts fixing vacuum pump to bracket and that of idler pulley.
3) Move vacuum pump inwards to remove belt.
4) Fit new belt
5) Move vacuum pump outwards until correct tension is obtained.
6) Tighten bolts attaching vacuum pump to bracket as well as idler pulley bolt.

   Vacuum pump bolts torque specifications: 18-28 Nm (1.8-2.8 kg.m, 13-20 lb.ft).

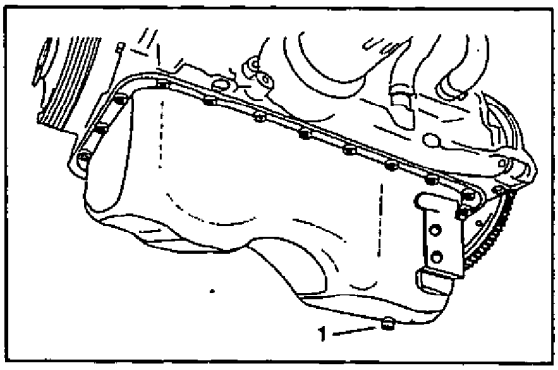
   Idler pulley bolt torque specifications (1): 18-28 Nm (1.8-2.8 kg.m, 13-20 lb.ft).

7) Fit lower protective/soundproofing plate.



ITEM 1-2

Camshaft timing gear.
To replace timing belt, please refer to 6 A1-11.



ITEM 1-4

Engine oil and filter.

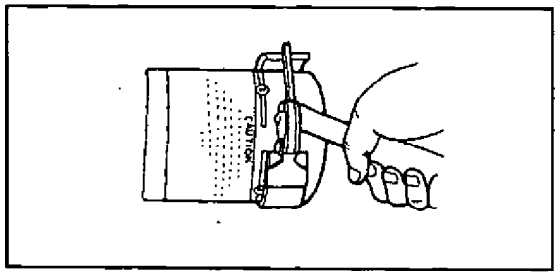
Replacement.

NOTE: This should be undertaken with engine oil hot.

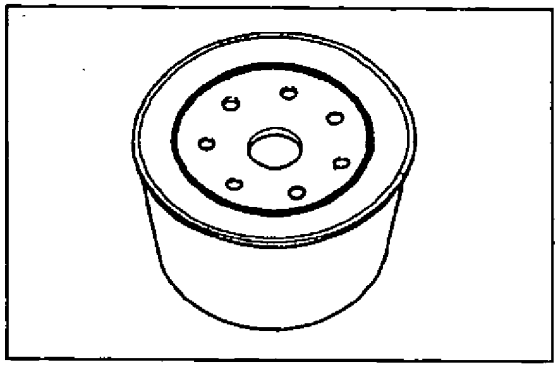
Before draining oil inspect engine to check for leaks. If this is the case, repair defective part before continuing.

1) Remove lower protective/soundproofing plate .
2) Extract motor oil through oil-pan drain plug (1).
3) After draining oil, clean drain plug. Fit once more with new sealing washer and tighten to specified torque.

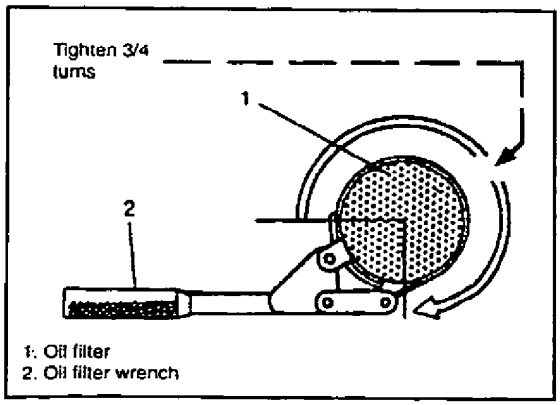
Plug torque specifications:
30-35 Nm (3.0-3.5 kg.m, 22-25 lb.ft).



4) Slacken filter using filter wrench.
5) Apply engine oil to rubber gasket of oil filter.
6) Screw new filter manually onto its support until rubber gasket touches surface of assembly.

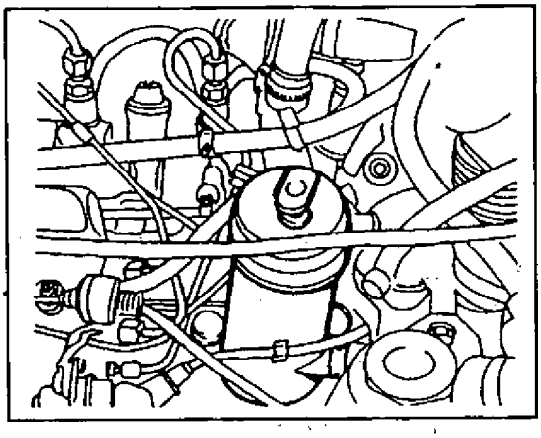


CAUTION:
To tighten oil filter, the point at which the rubber gasket first makes contact with sealing surface must be identified.

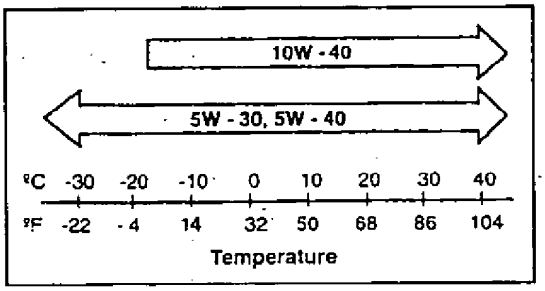


7) Using an oil filter wrench (2), tighten filter (1) finally by specified number of turns or to torque specifications, starting at point where rubber gasket surface and filter support meet.

Tightening: 3/4 turns or 14 Nm (1.4 kg.m, 10 lb.ft).



8) The filler tube and dip stick are located on the left-hand side of engine.

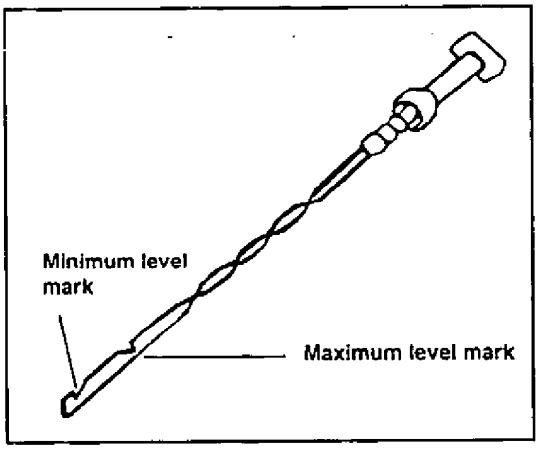


9) Select appropriate CD, CE or CF-4 type oil in accordance with viscosity chart. Use of 20 W-50 oil is only acceptable in those countries where 10 W-40 is not available.

Engine lubricating system oil capacity.

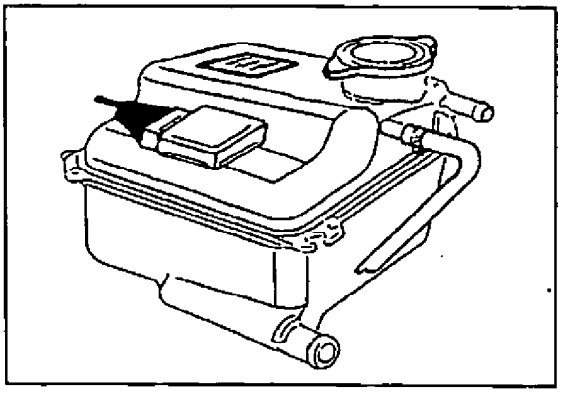
Total system capacity	5.5 litres
Filter capacity	0.5 litres

10) Engine lubricating system capacities are indicated in previous table. When filling, observe the following:
- If filter has not been changed, put in 5 litres.
- If filter has been changed, put in 5.5 litres.



11) Adjust oil level with vehicle horizontal, run engine for 3 mins., switch it off, leave it to settle for 3 mins. and check level with dipstick. Oil level indicated should be at maximum. If it is not, apply small quantities of oil until it reaches maximum.

NOTE:
Point 11 must be carried out in a well-ventilated place or after attaching an exhaust extrator to the exhaust tail pipe.

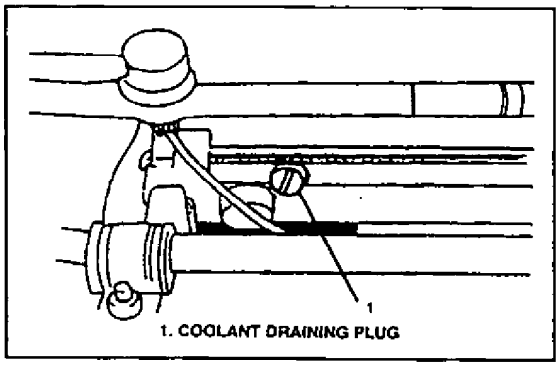


ITEM 1-5

Engine coolant.

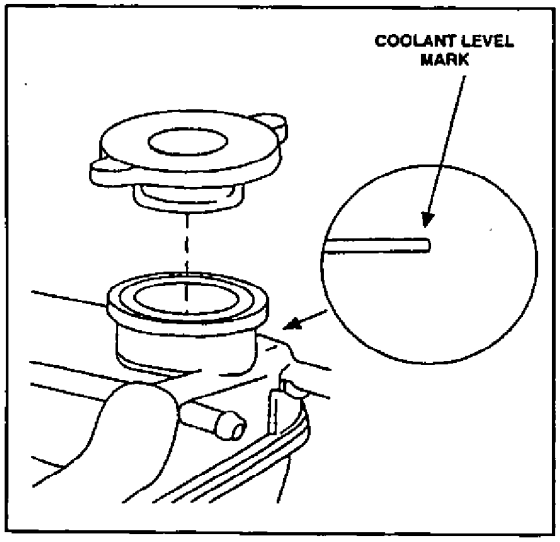
Replacement

WARNING:
To avoid the possibilitis of burns, the expansion reservoir must not be released when engine and radiator are hot. If cap is opened too soon high temperature liquid and vapours could come out.

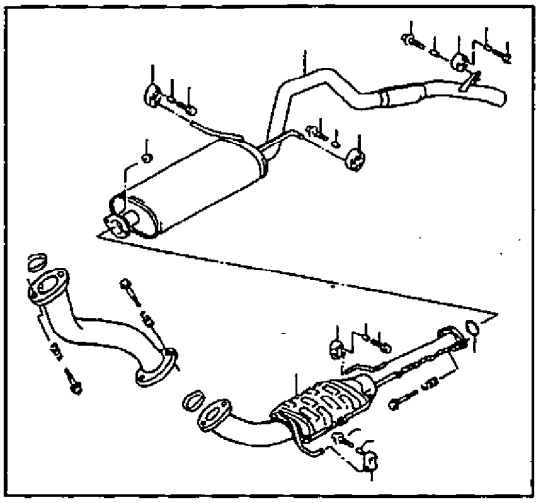


1. COOLANT DRAINING PLUG

1) Open expansion reservoir cap after engine has cooled down.
2) Remove lower protective/ soundproofing plate.
3) Slacken radiator drain plug, let all coolant in system come out and then securely retighten the plug.
4) Remove expansion reservoir, drain and fit once more.
5) Turn on heating controls located inside vehicle.
6) Add fluid to expansion reservoir and start up engine.
7) Add fluid to reservoir as level is reduced.
8) Wait until engine is completely warmed up and continue adding fluid until expansion reservoir level is at maximum. Fit lower protective/soundproofing plate.



CAUTION:
For cooling system use a mix of 50% DINAGEL- 9103 (Dynamic) and 50% distilled or demineralized water. This will provide protection in temperatures of around - 30° C. The coolant mix must be used in both summer and winter, since it provides lubrication and protection against corrosion.



ITEM 1-6

Exhaust system (except catalyst).

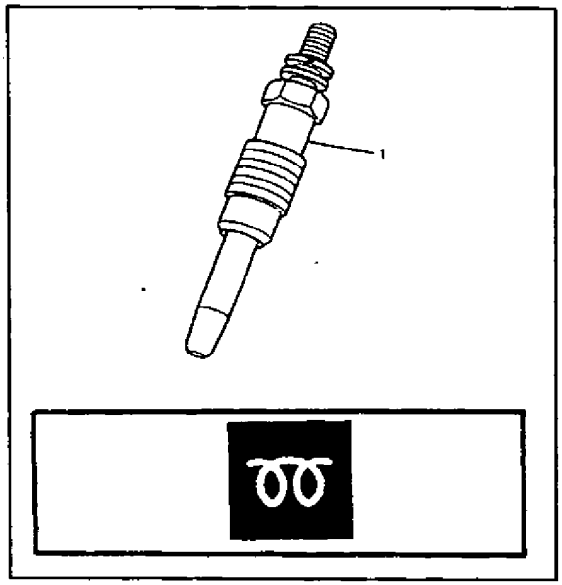
Inspection:

WARNING:
To avoid danger of burns, do not touch exhaust system when hot.

In periodic maintenance work, always inspect exhaust system in following order:

- Inspect rubber mounts for damage, wear or faulty positioning.
- Inspect exhaust system for leaks, weak connections, dents and damage. If nuts and bolts are loose, tighten to specified levels.
- Inspect body exterior for broken or incorrectly situated parts, open seams, holes, loose connections or other defects which may cause exhaust fumes to enter vehicle interior.
- Check that exhaust system components are not touching lower part of vehicle, thereby preventing over heating wel possible damage to floorpan lining and mats.
- All defects must be repaired immediately.

Changing rubber mounts.
Periodically change exhaust pipe rubber mounts.

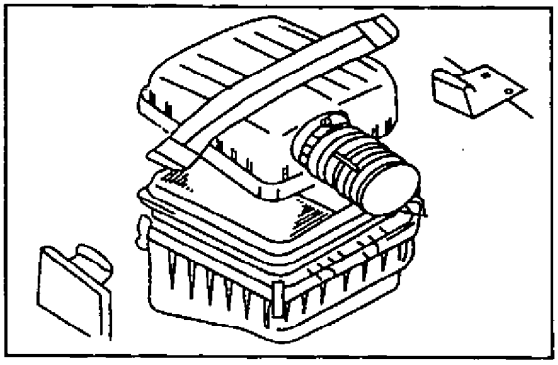


IGNITION SYSTEM

ITEM 2-3

Glow plugs.

Inspection
1) Visually check glow plug function by observing dashboard panel controls.
2) Observe engine running from a cold start. Any difficulty in starting from cold could be a result of problems with glow plug heating system.

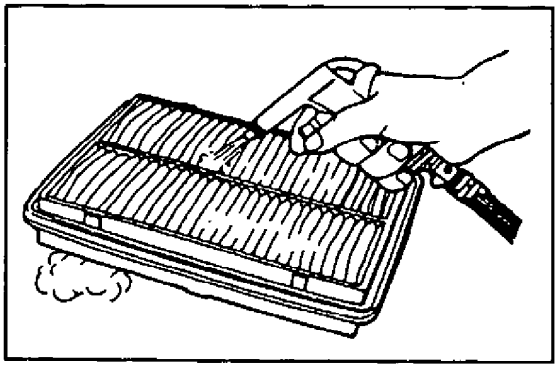


FUEL SYSTEM

ITEM 3-1

Air filter Element.

Inspection
1) Release air filter anchoring strap.
2) Release four clips securing upper housing and extract filter.
3) Remove dust by blowing compressed air onto outlet side of element.



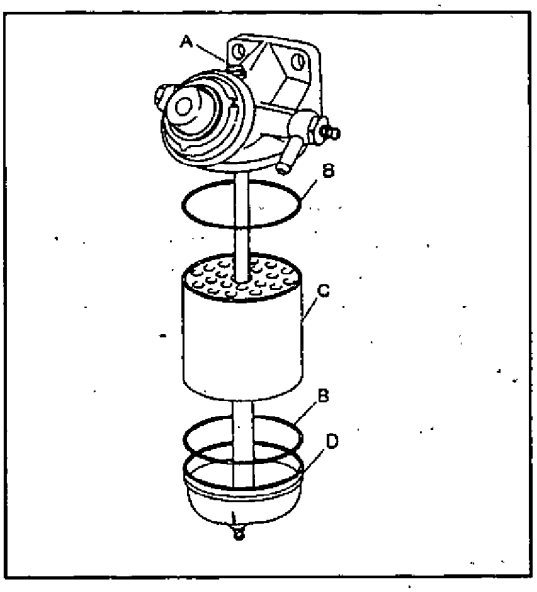
Replacement
1) Release air filter anchoring strap.
2) Release four anchoring clips on upper housing and extract filter.
3) Install new filter in air filter housing.

NOTE:
Replace more frequently in dusty working conditions. Consult OB-3 for maintenance and correct replacement interval in severe driving conditions.

ITEM 3-2

Types of fuel and connections

Inspection
1) Visually inspect fuel inlet and fuel return lines to ensure is there no distortion or friction liable to cause cracks.
2) Check that connections are not damaged and that hose clamps are securely fastened.



ITEM 3-3

Fuel filter.

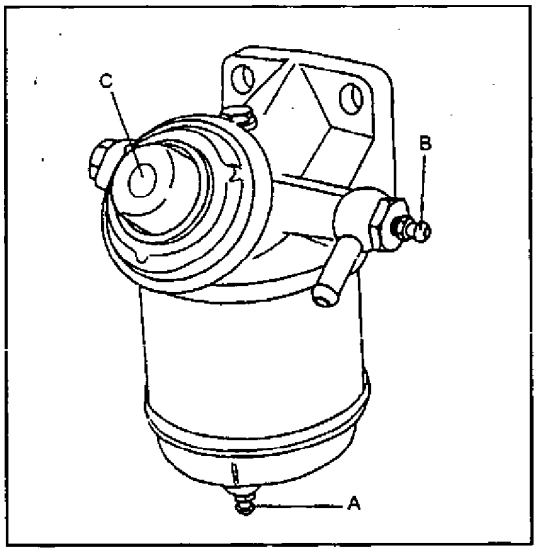
Replacement

WARNING:
This work must be carried out in a well ventilated place away from naked flames or heat.

1) Loosen the filter bolt (A), remove case (D), element (C) and gaskets (B)
2) Clean case with diesel oil and fit new filter and new seals. Tighten (A) as specified.

Filter bolt torque specifications: 15 Nm (1.5 kg.m, 11lb.ft)

NOTE:
The fuel filter is located on the left-hand side of the engine compartment, attached to the bulkhead.



ITEM 3-4

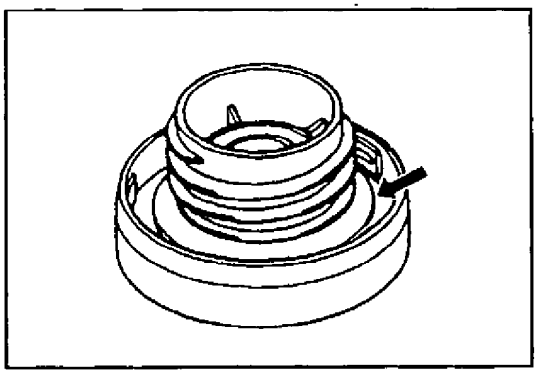
Fuel filter bleed.

Air bleed

NOTE:
This operation should be performed as frequently as indicated in the maintenance chart OB-2 and when the situation demands following an intake of air due to lack of diesel oil with the subsequent difficulties in starting.

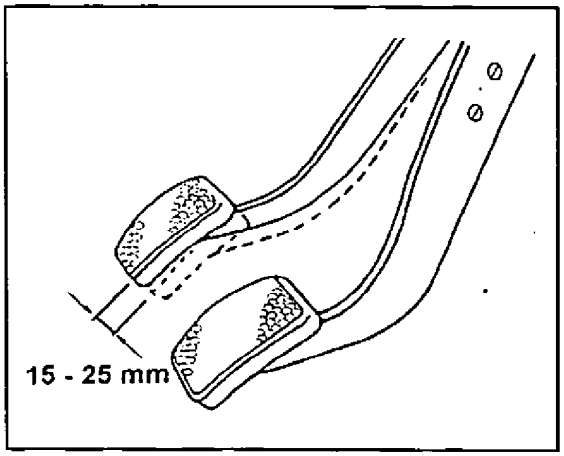
1) Make sure there is sufficient fuel in tank.
2) Slacken bleeder (B). Pump several times pressing button (C) until air ceases to come out of the bleeder. Tighten bleeder (B) when fuel with no air content comes out and when the button stiffens on pumping.

Water and residue bleed.
1) Slacken bleeder (A) and tighten it when water and residue cease to come out.



ITEM 3-5

Fuel tank.
1) Visually inspect fuel tank filler cap seal for damage, distortion or excessive stiffness. If damaged, change it for a new one.
2) Check fuel lines and hoses, making sure they are securely fastened and there are no leaks. Change hoses or pipes damaged in any way.



CHASSIS AND BODY

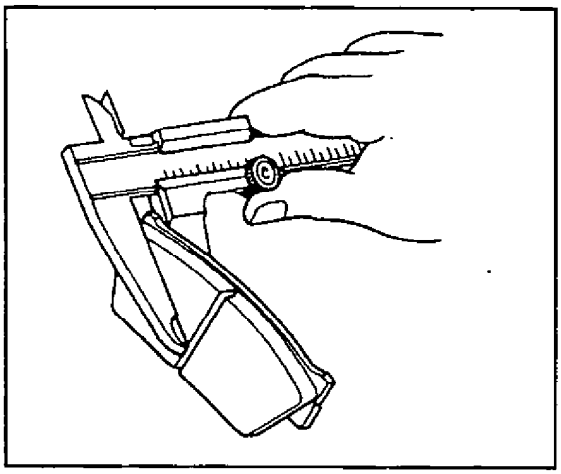
ITEM 6-1

Clutch.

1) Inspect freeplay of clutch pedal.
2) In left-hand drive vehicles the clutch pedal should be 5 mm (0.2 ins.) higher than the brake pedal. On right-hand drive vehicles, the clutch pedal should be set level with the brake pedal.

Clutch pedal freeplay	**15 - 25 mm (0.6-1.0 in)**

For more information, please refer to section 7C.

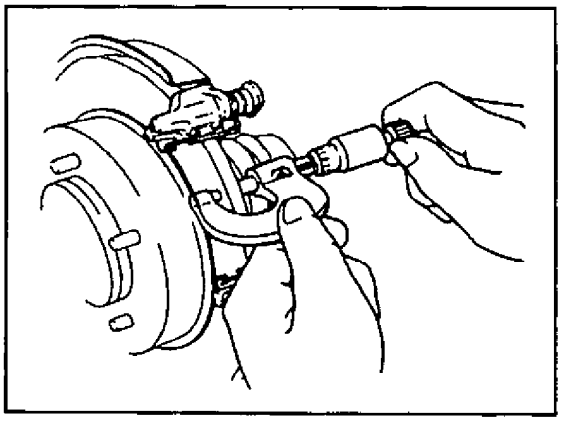


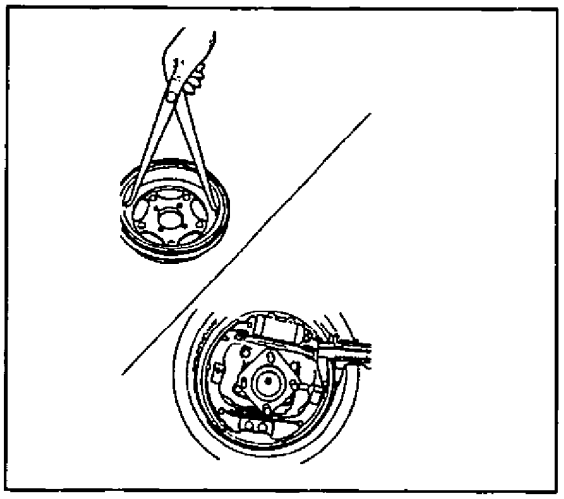
ITEM 6-2

Brake discs and pads (front).
Brake drums and shoes (rear).

Brake discs and pads

1) Remove wheel and brake caliper without disconnecting brake hose
2) Inspect brake pads and discs for excessive wear, damage or distortion.
   Replace any parts necessary.
   Tighten fastening elements as specified. For more information, please refer to section 5 of Service Manual 99500-60A10-01E.





Brake drums and shoes.

1) Remove wheel and brake drum.
2) Check brake drums and brake shoe linings for excessive wear and damage.
3) Check wheel cylinders for leaks, condition of dust covers, etc. Replace parts in bad condition.

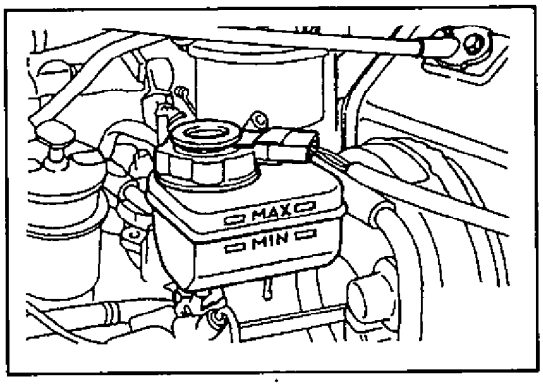
For more information, please refer to section 5 of Service Manual 99500-60A10-01E.

ITEM 6-3

Brake lines and hoses

1) Check brake pipes and hoses for installation problems, leaks, cracks, splits and other damage.

CAUTION:
After changing any pipe or hose, bleed areas in question.



ITEM 6-4

Brake fluid

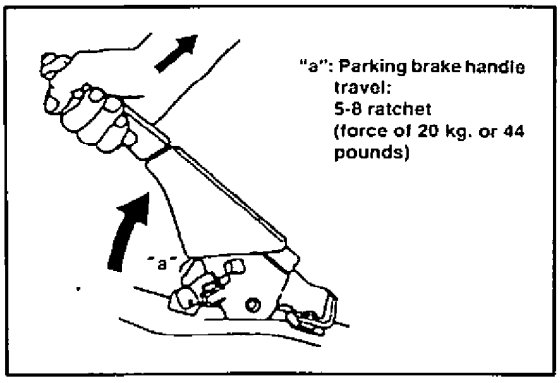
Inspection

1) Inspect master cylinder and reservoir area for fluid leaks. Repair or replace the parts causing any leak.
2) Inspect fluid level. If fluid level is below reservoir minimum, fill to correct level using specified brake fluid.

CAUTION:
Use only glycol-based brake fluid matching the factory fill brake fluid. You could damage braking system if you use or add other types of fluid. Do not use old or used brake fluid, or fluid from an unsealed container.

Changing

Replace brake fluid by draining all braking system fluid and fill system with a recommended fluid before bleeding. For more information please refer to section 5 of Service Manual 99500-60A10-01E .



ITEM 6-5

Handbrake lever and cable.

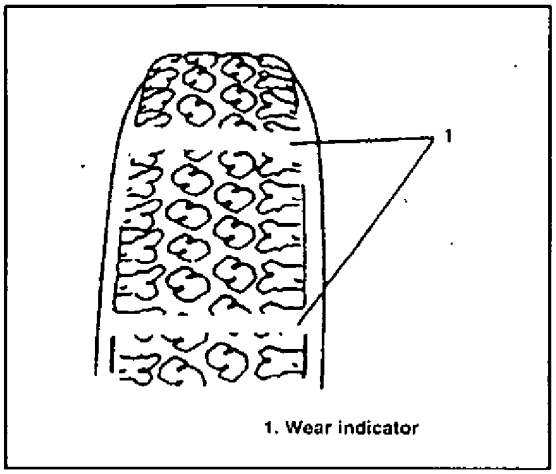
Handbrake lever

1) Inspect points of ratchet teeth for any damage or wear. If damaged or worn, replace lever assembly.
2) Check that brake lever functions correctly and rises to correct height. Adjust if necessary.

Handbrake cable

Carefully inspect brake cable for damage.
Replace if damaged.

For more information, please refer to section 5 of Service Manual 99500-60A1-01 E.



1. Wear indicator

ITEM 6-6

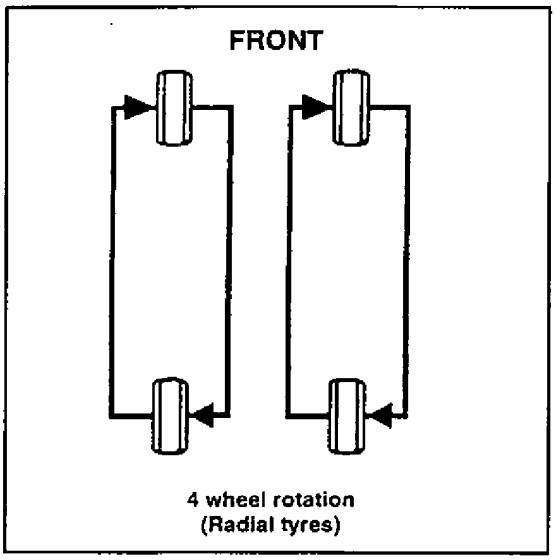
Tyres

1) Inspect tyres for any uneven, excessive wear or damage. Replace if defective.
2) Inspect air pressure in each tyre and adjust to specified pressure if necessary.
3) Rotate wheels in the manner shown.

NOTE:

- **Inspect tyre pressure when cold.**
- **Specific air pressure is indicated in Owner's manual.**
- **Change tyres at recommended intervals.**

For more information, please refer to section 3F of Service Manual 99500-60A10-01E.

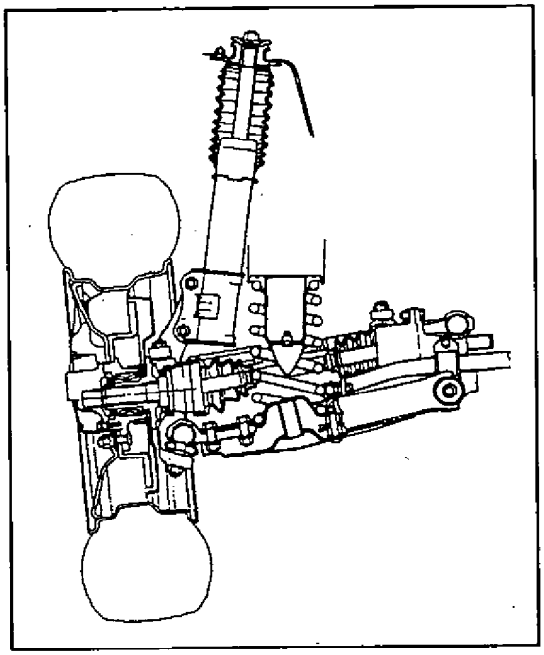


4 wheel rotation
(Radial tyres)

ITEM 6-7

Wheels and free wheeling hubs (if fitted).

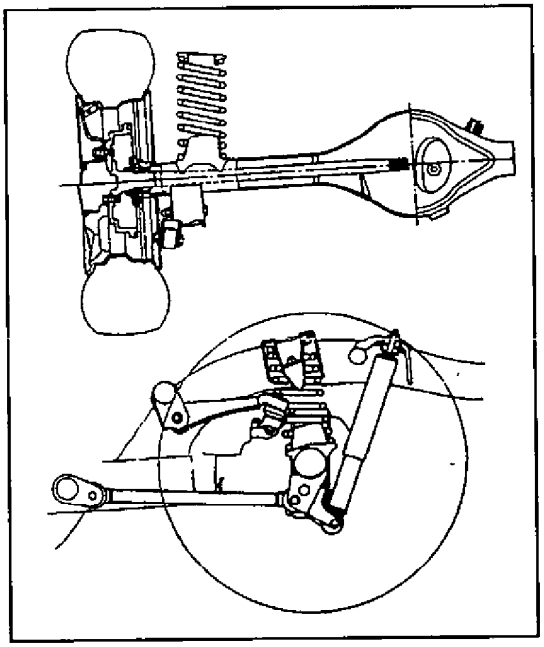
Inspect each rim for dents, distortions or cracks. A rim with any of the above defects should be replaced.



ITEM 6-8

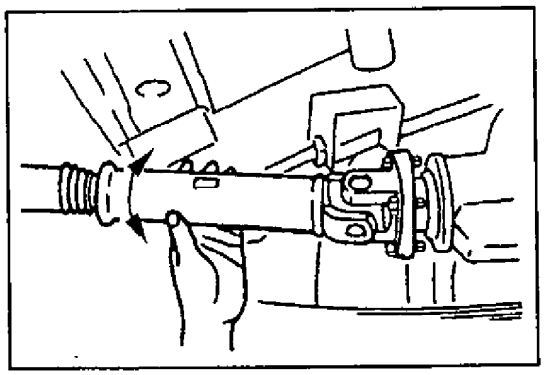
Suspension system.

- Inspect shock absorbers for oil leaks, dents or other damage and inspects their mountings for wear.
  Change shock absorbers if necessary.
- Inspect front rods for leaks, dents or other damage.
- Inspect front control arms, balljoint dust covers for oil loss, loose or broken parts.
  Replace damaged or malfunctioning parts.



- Inspect half-shaft boot dust covers (wheel end and differential end) for cracks or other damage.
  Change boots if necessary.
- Inspect supension system for damaged, loose or missing parts.
  Repair or change defective parts or those that show signs of wear or lack of lubrication.
- Check torque of suspension nuts and bolts and tighten if necessary.
  Repair or change any defective parts.

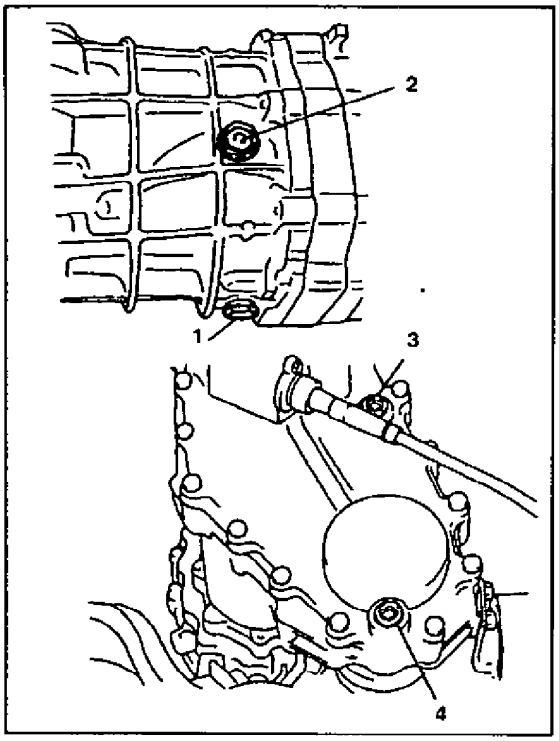
NOTE:
For more informaticn on points to check, please refer to SPECIFICATIONS chart in Service Manual SECTIONS 3D and 3E 99500-60A10-01E .



ITEM 6-9
Propeller shafts.

1) Inspect universal joint and axle shaft knurling for any looseness or knocking when functioning.
   If any of the above anomalies are detected, change the defective part.
2) Check tightness of propeller shaft nuts and bolts and retighten if necessary.

Propeller shaft nut torque specifications:
55 Nm (5.5 kg.m, 40 lb.ft)



ITEM 6-10

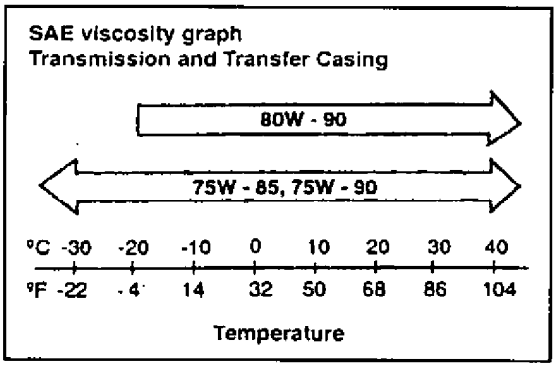
Transmission oil

Inspection
1) Inspect transmission for possible oil leaks.
2) Park vehicle on horizontal ground before checking level.
3) Remove plug (2) to check oil level. The level is correct if a small amount of oil seeps over the of edge of the hole on removing plug. If no oil comes out, add a suitable quantity.

Oil change
1) With vehicle horizontal, drain oil from transmission by removing drain plug (1).
2) Clean oil on plug and housing and apply sealer 99000-31110 to thread. Replace plug and tighten as specified.
3) Add oil to the level of filler plug (2) before replacing the plug and tightening to the specified torque.

Torque specifications:

Plug (1)	**23 Nm (2.3 kg.m, 17 lb.ft).**
Plug (2)	**23 Nm (2.3 kg.m, 17 lb.ft).**
Plug (3 and 4)	**23 Nm (2.3 kg.m, 17 lb.ft).**



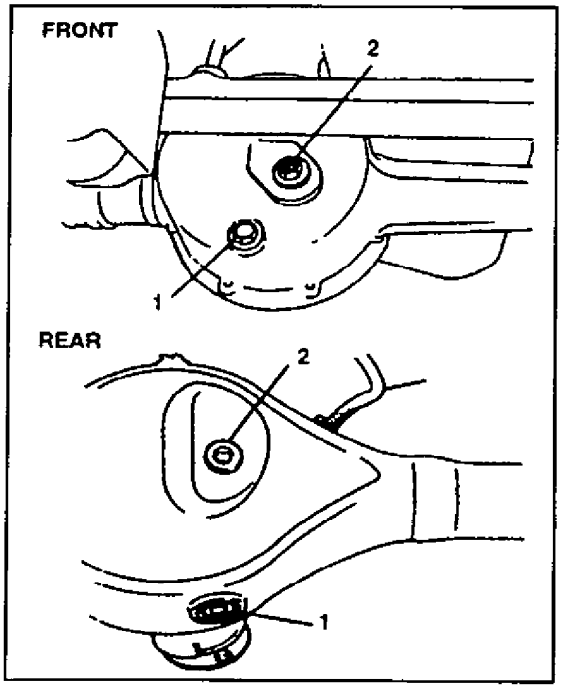
Use of gear oil 75 W - 90, type API GL 4 is strongly recommended

Oil capacity

Transmission: 1,5 litres (2.6 Imp. pints).
Transfer case: 1.7 litres (3.0 Imp. pints).

ITEM 6-12
Transfer case oil.

NOTE:
Proceed as for transmission (previous point), removing oil level (3) and drain, (4) plugs.



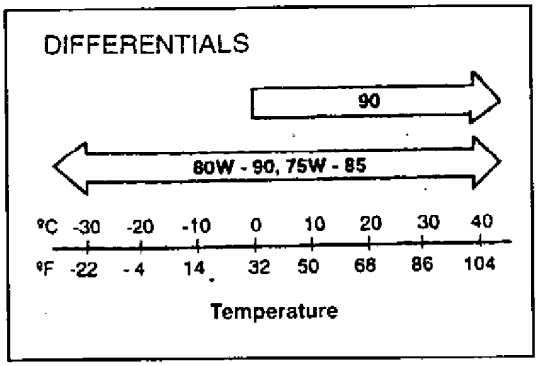
ITEM 6-13

Differential oil.

Inspection
1) Make sure vehicle is situated on horizontal ground.
2) Remove oil level and filler plug (2).

If level is correct, a small amount of oil should seep out of the hole.
If no oil comes out, add a suitable quantity.

Oil change
1) With the vehicle situated horizontally, drain oil by removing plug (1).
2) Clean oil from plug (1) and housing, apply sealer 99000-31110 to thread, fit plug to specified torque. Pour in suitable quantity of oil to reach level and replace filler plug (2), applying sealer indicated as specified.



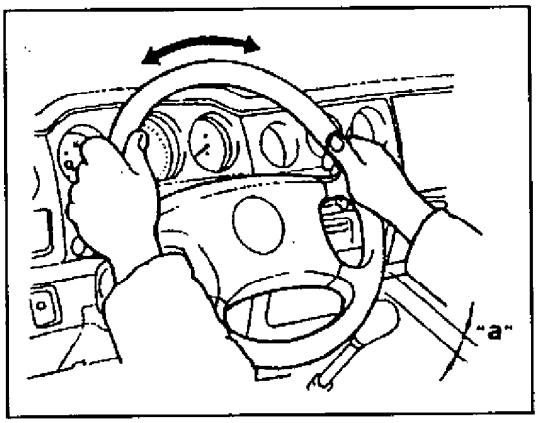
Torque specifications:

Front plug (1)	**23 Nm (2.3 kg.m, 17 lb.ft).**
Rear plug (1)	**22 Nm (2.2 kg.m, 16 lb.ft).**
Front plug (2)	**40 Nm (4.0 kg.m, 29 lb.ft).**
Rear plug (2)	**43 Nm (4.3 kg.m, 31lb.ft).**

Use of hypoid gear oil 80 W - 90, type API GL 5 is strongly recommended.

Oil capacity:

Front axle: 1.0 litres (1.8 Imp. pints).
Rear axle: 2.2 litres (3.9 Imp. pints).



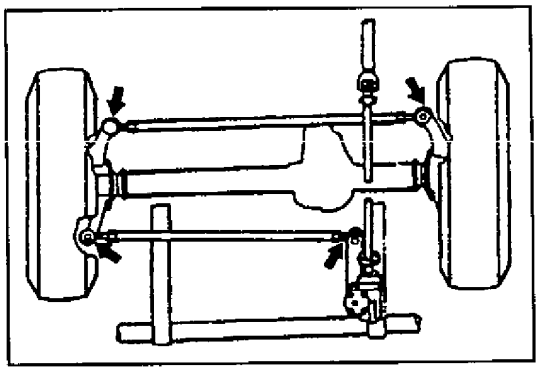
ITEM 6-14

Steering system.

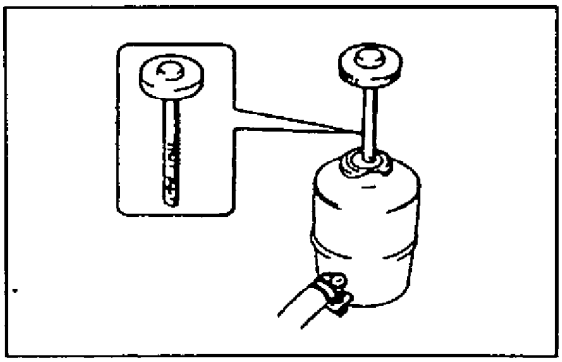
1) Inspect steering wheel for play, noise or looseness while vehicle is maintained on the ground with wheels pointing forward.

   Steering wheel free play: 10 - 30 mm (0.4 -1.1 ins.) at rim.

2) Inspect universal joints on steering axis for noise, looseness or damage. If any problem exists, replace defective part for new one.



3) Check nuts and bolts are correctly tightened and re-tighten if necessary.
4) Inspect steering gear mechanism for any oil leaks. If there are, inspect oil level in gear mechanism.
5) Inspect steering linkage dust covers for damage (leaks, loose elements, breaks, etc). Replace any damaged dust covers.
6) Inspect wheel alignment.



ITEM 6-15

Power assisted steering.

1) Visually check power steering system for liquid leaks and damaged hoses. Replace or change any defective parts.
2) Unscrew filler cap and check level marked by dipstick, which should be between MAX and MIN levels. If it is below MIN level, fill up to MAX level.

NOTE:

- **Ensure P/S, DEXRON-II or equivalent fluid is used.**
- **Fluid level should be checked when cold.**

3) Visually inspect power steering pump belt for cracks or wear.
4) Check belt tension. For further information on this subject, please refer to section 3B3 of Power Steering System Service Manual 99500-60A10-01 S. Adjust or replace belt if necessary.

ITEM 6-16

All locks and hinges.

Lubricate door hinges and inspect locks for correct functioning lubricate as appropriate.

FINAL INSPECTION

Carry out a road test in a safe place.

WARNING:
When carrying out road tests, make sure they are in a safe place with no passing pedestrians or vehicles. This will reduce the possibility of accidents.

1) **Starting engine.**
   Check that engine starts and runs without problem.

2) **Clutch and clutch cable.**
   Check the following points with engine running.
   - Test all six gears and ensure they all change without difficulty or scraping.
   - In 4th gear, engage the hand brake, accelerate a little and try to slowly release the clutch pedal. The engine should stall and the vehicle remain stationary. This means the clutch does not slip. If on releasing the clutch the engine tries to keep running, then the clutch is slipping.

3) **Brakes.**
   Check the following points when driving.
   - There are no abnormal noises when braking.
   - The same brake power is applied to all the wheels.
   - The vehicle does not tend to veer one way when brakes are applied firmly.
   - Wheels do not lock.
   - No one wheel locks up independently of the other wheels on the vehicle.

4) **Hand brake**
   Check hand brake functioning by stopping vehicle on pronounced slope and fully engaging the handbrake. If vehicle moves, adjust the hanbrake.

5) **Engine.**
   - Check that it responds quickly in all gears.
   - Check that engine does not produce abnormal noise or vibration.

6) **Body, wheels and transmission system.**
   Check body, wheels and transmission system for abnormal noise or vibration.

7) **Meters and indicators**
   Check speedometer, mileometer, fuel gauge, temperature gauge, etc. for correct functioning.

8) **Oil pressure and charge lights.**
   Check these lights go off when engine starts. If any come on, with the engine running, there is some problem with the engine lubrication system or the charging system.

9) **Safety belt.**
   Inspect safety belt system, including belts, buckles, latch plates, retractors, anchoring, etc.

10) **Body.**
    Check the following points with the vehicle stationary:
    - Bonnet catch.
    - Door closure.
    - Seat sliding and reclining.
    - Battery electrolyte level.
    - Windscreen wipers.

RECOMMENDED FLUIDS

ENGINE OIL	Multigrade 10W/40 API CD or CE or CF-04
ENGINE COOLANT	DINAMIC - DINAGEL - 9103
BRAKE FLUID	DOT-3 or SAE J-1703
TRANSMISSION	API GL4 SAE 75W-90
TRANSFER CASE	API GL4 SAE 75W-90
DIFFERENTIALS	API GL5 SAE 80W-90
POWER ASSISTED STEERING	Equivalent to DEXRON-II

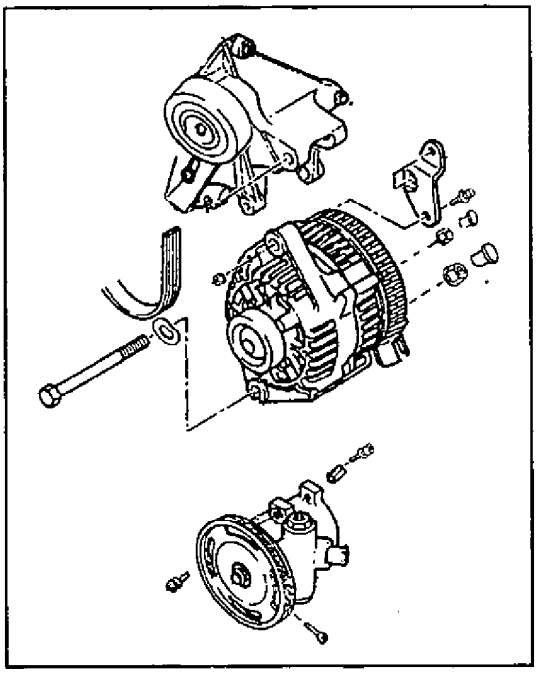
SECTION 3B2

POWER ASSISTED STEERING PUMP

NOTE
For topics not covered in this section, please refer to the relevant section of the Vitara Service Manual outlined in the preface.

TABLE OF CONTENTS

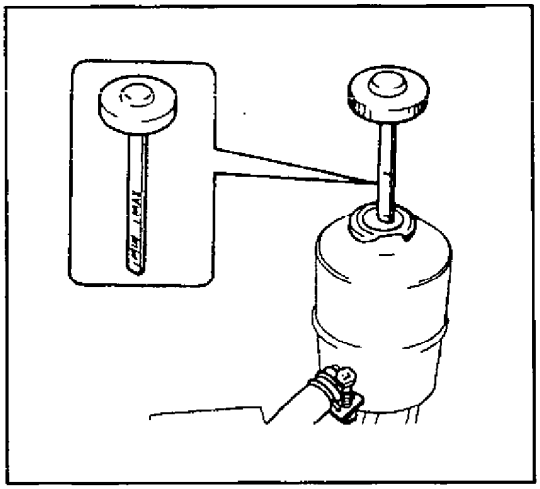
PUMP REPLACEMENT 3B2-2



PUMP REPLACEMENT

Disassembly

1) Disconnect negative cable from battery.
2) Remove inner soundproof plate.
3) Slacken two bolts on the side and lower part of the alternator tensioner and remove belt.
4) Remove attaching bolts and positive and alternator drive cables.
5) Remove lower and upper attaching bolt of the alternator to support.
6) Release inlet and outlet pump lines and collect liquid in a tray.
7) Turn power assisted steering pump pulley and slacken through hole one of the bolts on the side. Remove the other two attaching bolts.
8) Detach power assisted steering pump.



Assembly

1) Reverse order of the disassembly process.
2) Tighten attaching elements to their torque specification.

Torque specification for pump attaching bolts to support: 20 Nm (2.0 kg.m, 15 lb.ft).

Torque specification for power assisted steering pump pressure lines: 50-70 Nm (5.0-7.0 kg.m, 36-51lb.ft).

3) Tighten belt as indicated on page 0B-4.
4) Add power assisted steering fluid in the reservoir. Start engine and turn the steering wheel several times in both directions, adding fluid to the reservoir until the level is maximum.

Power assisted steering fluid DEXRON-II

SECTION 3D

FRONT SUSPENSION

CONTENTS

FREE WHEEL HUBS **3D-2**
General description **3D-2**
Manual free wheel performance **3D-2**
Automatic free wheel performance **3D-2**
Free wheel types description **3D-3**
Installation of "A" type manual free wheel **3D-5**
Installation of "B" type manual free wheel **3D-7**
Installation of "A" type automatic free wheel **3D-9**
Installation of "B" type automatic free wheel **3D-11**
Replacement of "A" type manual free wheel **3D-13**
Replacement of "B" type manual free wheel **3D-14**
Replacement of "A" type automatic free wheel **3D-15**
Replacement of "B" type automatic free wheel **3D-16**

RECOMMENDED TORQUES **3D-17**

SPECIAL TOOLS **3D-17**

FREE WHEEL HUB

GENERAL DESCRIPTION

A free wheel hub disconnects the front wheel from its drive-shaft when two wheel drive is required yet allows reconnection when four wheel drive is used..
This device is located at the end of each front drive shaft where it replaces the normal drive flange.
Using a free wheel hub reduces front tyre wear, and prevents the front wheels fron driving the drive-shafts, differential and front drive. This reduces noise and wear and aids fuel economy.
There are two types of free wheel device. A manual type is operated by hand whilst the automatic types connect and disconnect the drive wihout driver intervention whenever 4H or 4L are selected.

MANUAL FREE WHEEL PERFORMANCE

The manual device is located at both ends of the front drive shafts and has a knob located at the center that can be rotated to either the FREE or LOCK positions.
When the knob is set to its FREE position, the drive shafts and the wheel are disengaged and the front wheel rotation is free. When it is set to its LOCK position the axle and the wheel are engaged. Refer to the Owner's Manual, provided with the vehicle for further information.

AUTOMATIC FREE WHEEL PERFORMANCE

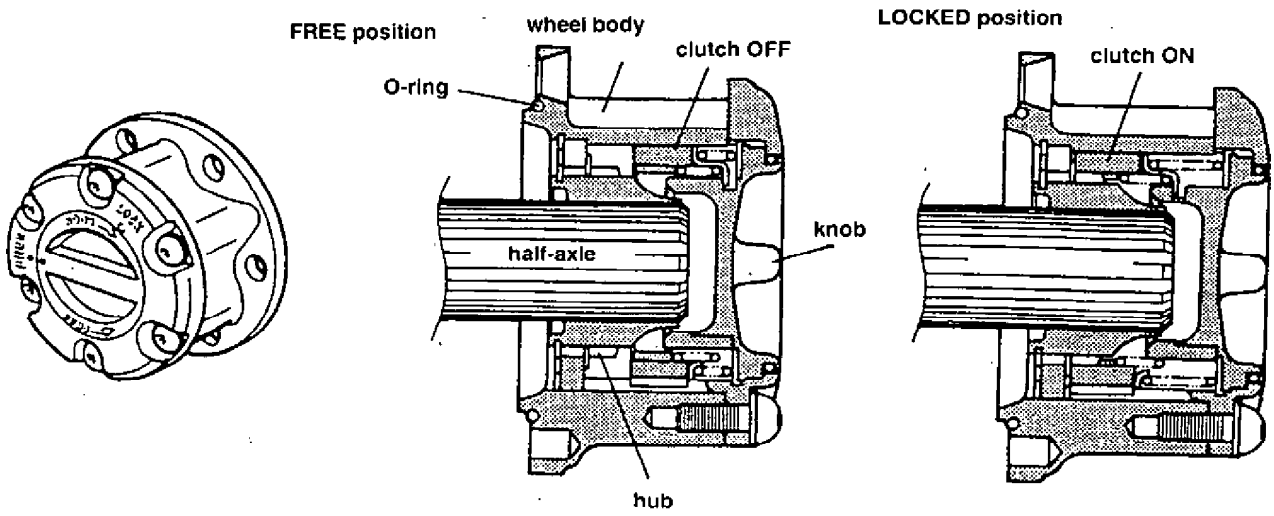
This device is also located at the end of each front drive shaft. Whenever driving torque is trasmitted to the front drive shafts (when 4H or 4L is selected and the vehicle is driven) the internal mechanism automatically connects the drive-shafts with their respective driving wheels.
The initial change from two to four wheel drive must be made with the vehicle stationary although sibsequart changes between 4H and 2H may be made on the move. The initial change takes place within 2 metres of vehicle movement fron stationary.
To disengage the free wheel device set the transfer lever in 2H and the gear lever in reverse position. Approx. 2 metres later the locking device is disconected. To engage the free wheel in reverse, set the transfer lever in 4H or 4L and move backward a short distance. Now the unlocking will be produced by selecting 1st gear, the transfer lever in 2H and moving forward some metres.

FREE WHEEL HUB TYPES DESCRIPTION

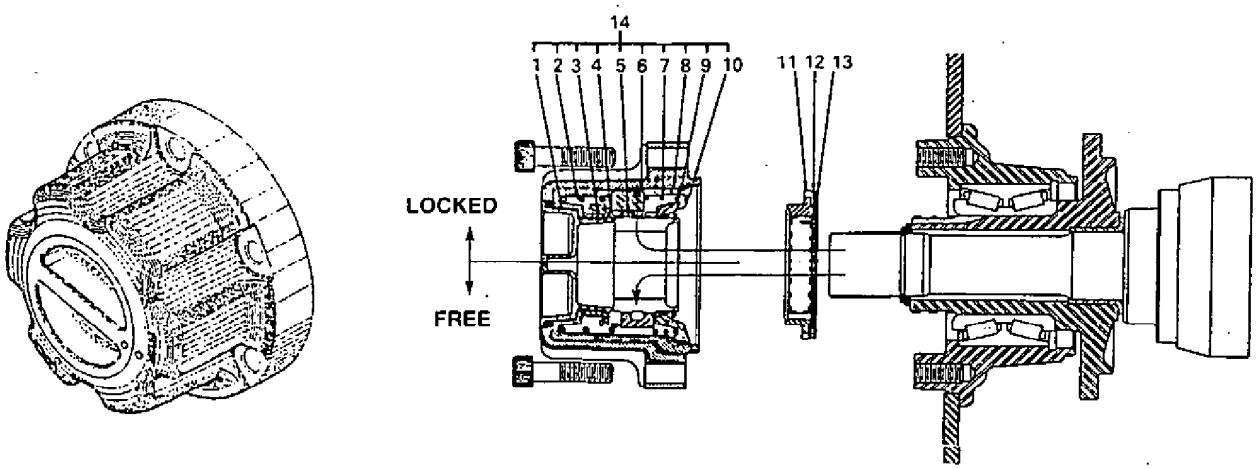
There are two types of free wheel hub, a manual driven one and an automatic one, and for each type there are two versions, so that, in total there are four kinds of free wheels hub.
The installation of one or other type depends on the vehicle specification. The installation and maintenance method changes from one to another; make certain you are using the correct method by consulting the relevant section.

CAUTION:
- **Make certain that the same type of free wheel hub is fitted to each side of the front axle.**
- **If free wheel hubs are fitted, be sure that both are in the "LOCK" or "FREE" position.**
- **Never dismantle a free wheel hub as this may adversely affect its performance. This does not include the removal of the cover to lubricate the hubs splines.**

"A" Type manual free wheel

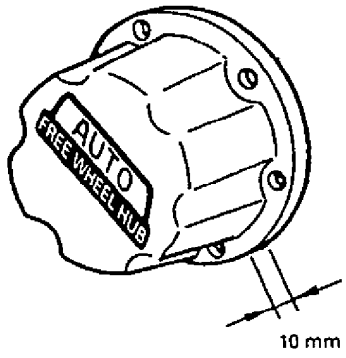


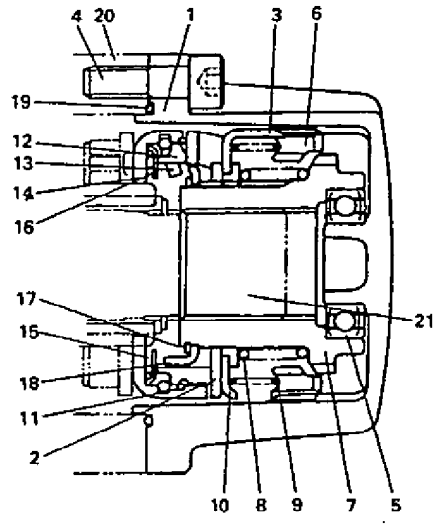
"B" Type manual free wheel



1. Knob
2. Main spring
3. Knob screw
4. Knob nut
5. Internal driving gear
6. Clutch ring
7. Return spring
8. Bearing
9. Retainer ring
10. O-ring
11. Slotted nut
12. Antirotation spring
13. Rear spring plate
14. Free wheel assy

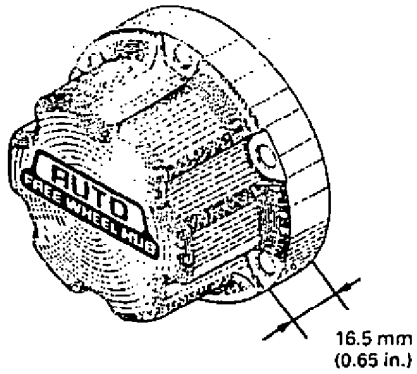
"A" Type automatic free wheel.

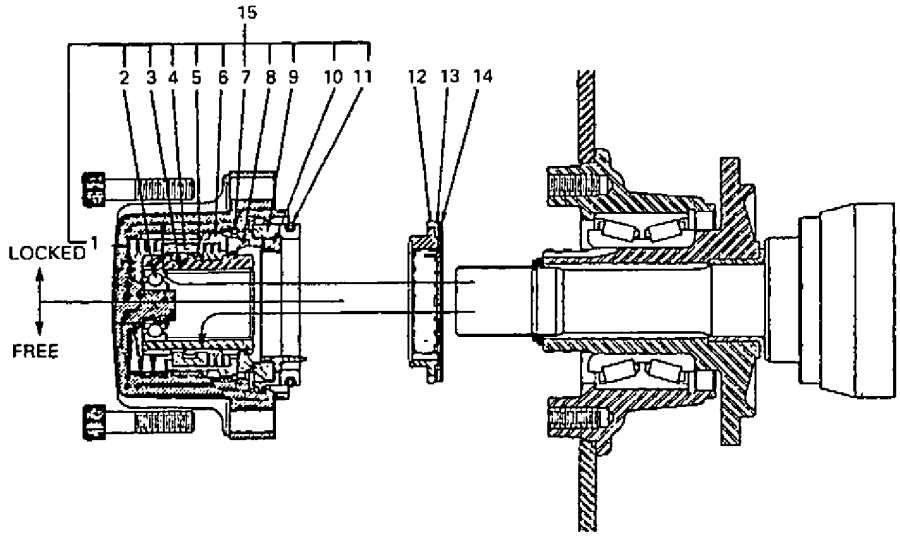




1. Cover
2. Cam
3. Retainer
4. Screw
5. Bearing
6. Sliding gear
7. Driving gear
8. Return spring
9. Change spring
10. Sustaining spring
11. O-ring
12. Internal brake
13. Retaining ring
14. External brake
15. Neddle bearing
16. Driving washer
17. Elastic ring
18. Retaining plate
19. O-ring
20. Wheel hub

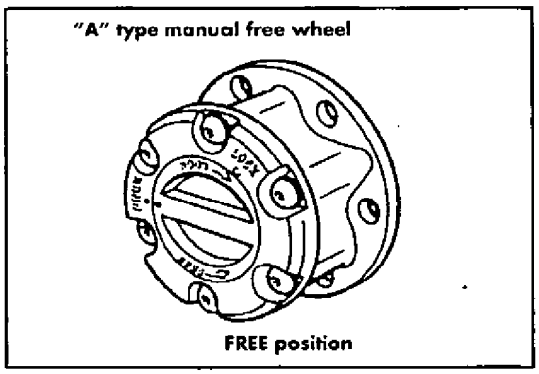
"B" Type automatic free wheel





1. Wavy return spring
2. Bearing
3. Internal driving gear
4. Clutch ring
5. Wavy spring box
6. Clutch box ring
7. Retaining ring
8. Follower cam
9. Mobile cam
10. Fix cam
11. O-ring
12. Slotted nut
13. Check spring
14. Plate
15. Assy

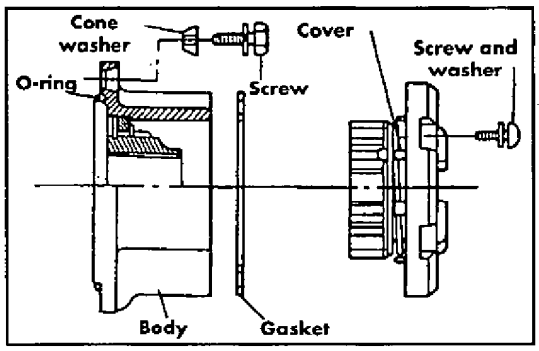
NOTE: Some vehicles may incorporate the hub bearing retaining system consisting of nut (not slotted) and safety washer. This mechanism is compatible with "A" and "B" manual driven free wheels and with "A" type automatic ones. For "B" type automatic free wheel it is essential that a locking system consisting of slotted nut, check spring and plate is used as shown above.



INSTALLATION OF "A" TYPE MANUAL FREE WHEEL HUB

Disassembly

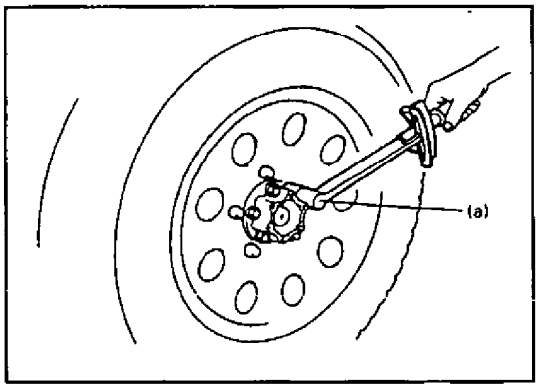
1) Jack the vehicle and remove the wheel, if necessary.
2) Remove the drive-shaft and hub attaching flange.



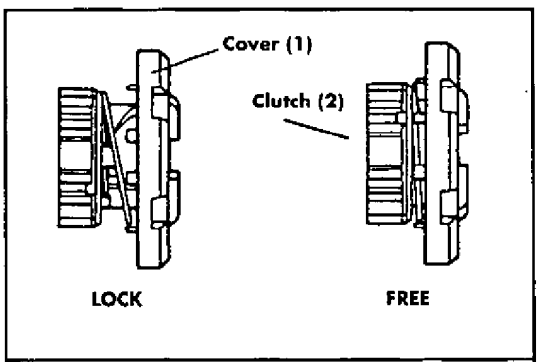
Assembly

1) Align the "O" mark on the free wheel hub knob with **FREE** position. Detach from the hub body the free wheel hub cover assy.
2) Install the free wheel body assy on the wheel hub.

Torque of attaching screws: 25 Nm (2.5 kg.m, 18 lb.ft)

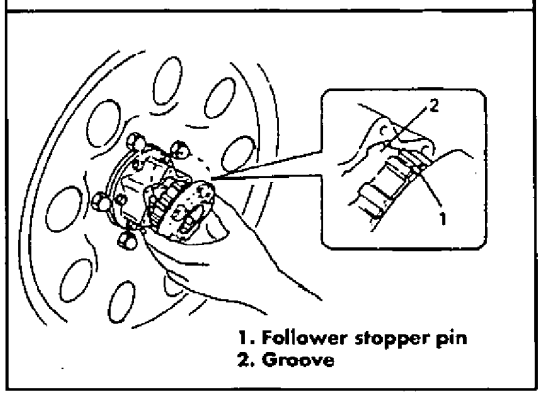


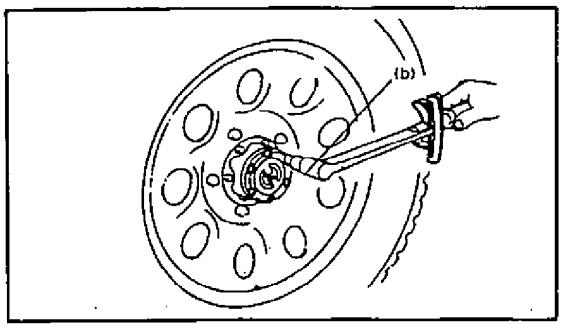
3) Chech that the gasket is aligned correctly and install the cover assy on the body assy, so that follower stopper pins of the driving roller are located in the grooves of the body assy.



NOTE:
Before installing the cover assy check the following points:

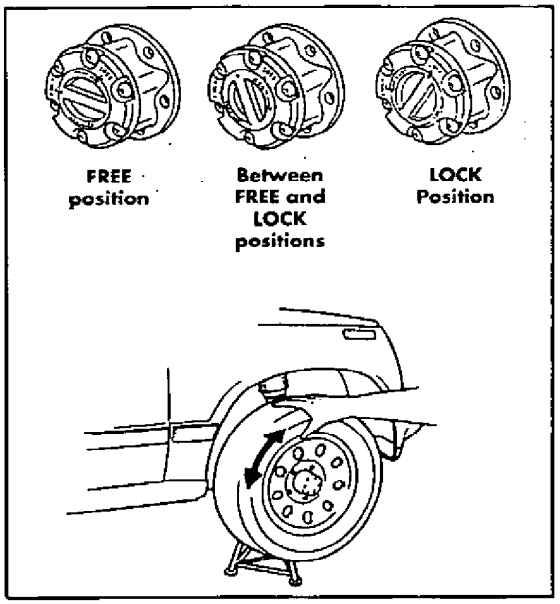
- **The "O" mark of the knob is in FREE position.**
- **The clutch (2) is located toward the cover side (1).**
- **There are only two grooves to accomodate the follower stopper pins.**





4) Attach the cover assy on the body assy by means of cover screws.

Torque of the cover attaching screws:
10 Nm (1.0 kg.m, 7 lb.ft)

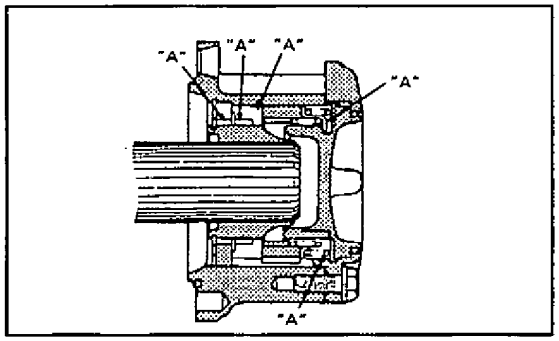


5) To check the performance of the free wheel, jack the front end of the vehicle and move the knob between **FREE** and **LOCK** positions, checking its free movement. Also check, by hand turning, that the wheels remain attached to the half-axle in the **LOCK** position and release in **FREE** position.

MAINTENANCE SERVICE

The vehicles provided with free wheel are subject to the following periodic checks.

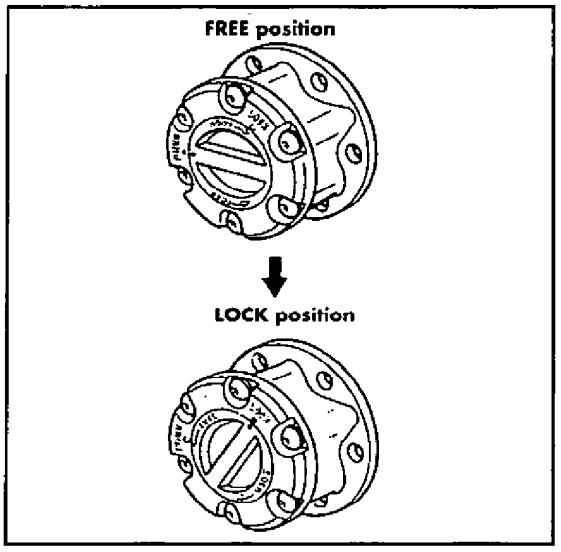
In order to check the performance of the free wheel hub, jack the front end of the vehicle, move the knob between **FREE** and **LOCK** positions, and check its free movement. Also check if the wheel operates correctly with the knob in **FREE** and **LOCK** positions by turning the wheel by hand.



If necessary, remove the free wheel cover and grease each sliding surface using lithium grease or grease after cleaning each sliding part.

LITHIUM GREASE
SUZUKI SUPER GREASE A (99000-25010)

If the performance does not improve after greasing, rework or replace the damaged part.

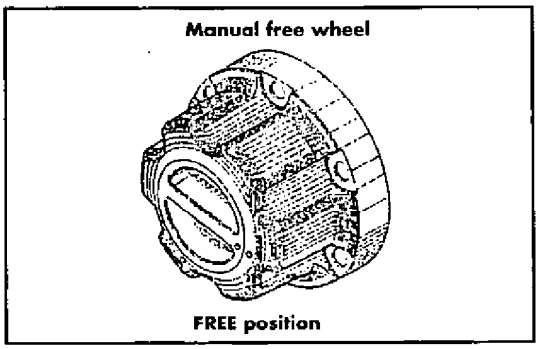


CAUTION
The hubs must not be packed with grease.

INSTALLATION OF "B" TYPE MANUAL FREE WHEEL

Disassembly

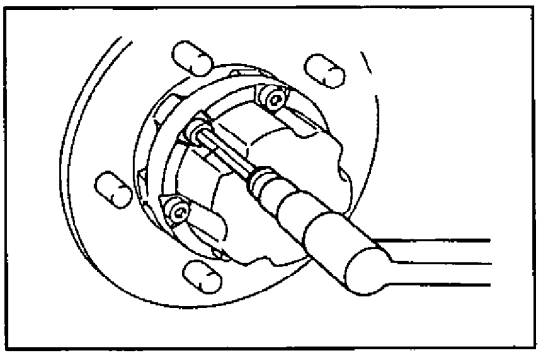
1) Jack the vehicle and remove the front wheels.
2) Undo the six bolts each side and remove the front axle drive flanges.

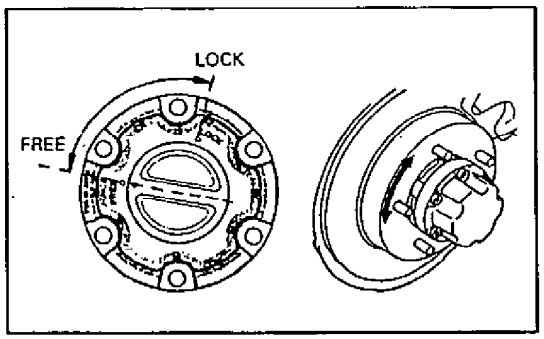


Assembly

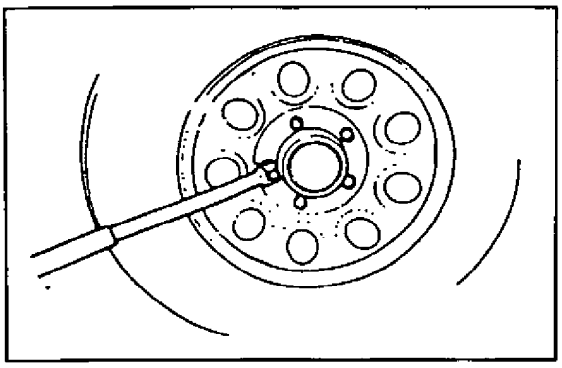
1) Check that O-ring of the free wheel hub is not damaged and is correctly located.
2) Place the free wheel in **FREE** position by rotating the knob.
3) Clean the contact surfaces of the hub and the free wheel hub.
4) Intall the free wheel hub using the screws supplied witch must be tightered to the specified torque.

Torque of the free wheel hub bolts: 33 Nm (3.3 kg.m, 24 lb.ft)





5) Check the following:
   - The knob actuates correctly and changes freely from **FREE** to **LOCK** position and vice-versa.
   - The wheel turns freely and it is not linked to the half-axle when the knob is in its **FREE** position.
   - The free wheel assy is linked to the half-axle when the knob is in its **LOCK** position.



4) Replace the road wheels and torque the nuts to the specified value.

Torque of wheel nuts: 95 Nm (9.5 kg.m, 69 lb.ft)

MAINTENANCE

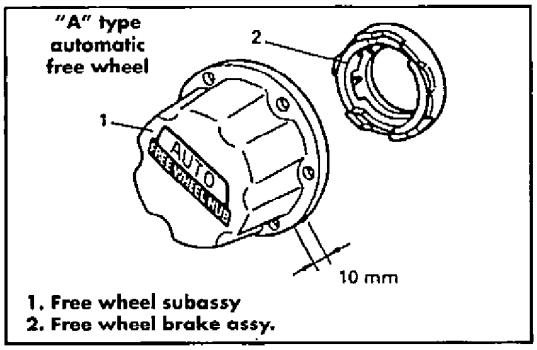
Jack the vehicle and check that the free wheel operates in **FREE** and **LOCK** positions, by turning the wheel. If defective replace the free wheel assy.

CAUTION
Hubs must not be grease packed.

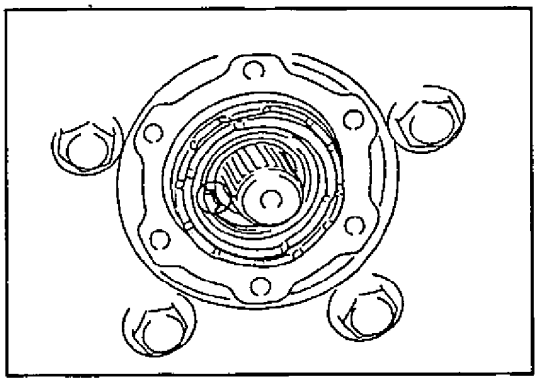
INSTALLATION OF "A" TYPE AUTOMATIC FREE WHEEL

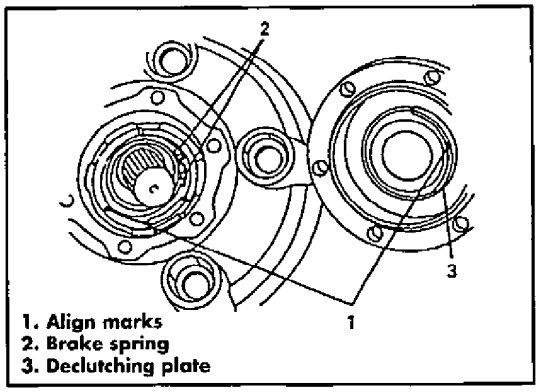
Disassembly

1) Jack the vehicle and remove front wheels.
2) Remove drive-shaft and hub mounted drive flanges.

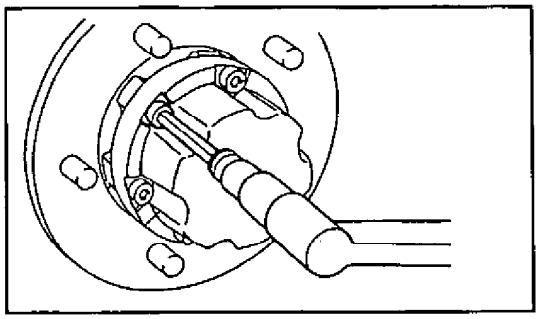


1. Free wheel subassy
2. Free wheel brake assy.





1. Align marks
2. Brake spring
3. Declutching plate



Assembly

1) Check the O-ring of the free wheel hub for damage and correct location.
2) Install the free wheel hub aligning it with free wheel brake assy cotter and with sleeve cotter.
3) Install the free wheel subassy matching the marks of the brake assy and subassy.

CAUTION
Make certain the marks mentioned above are aligned, if not, they may interfere with each other and cause damage.

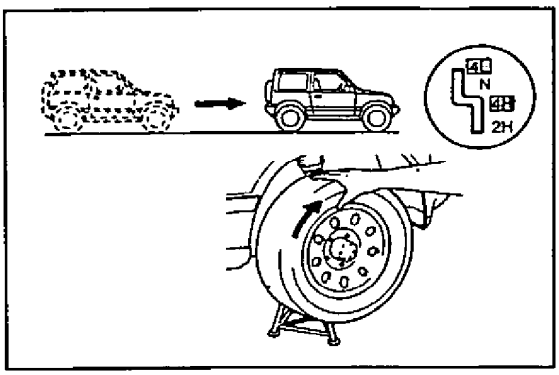
4) Torque the free wheel hub bolts to the specified value.

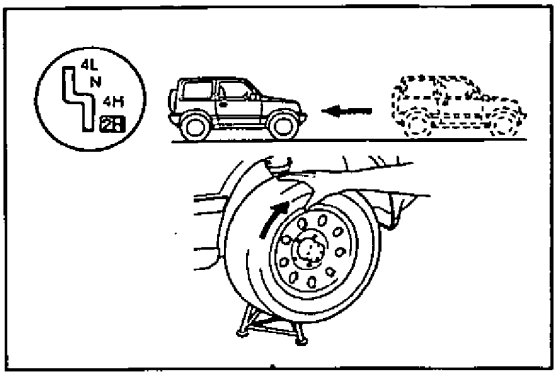
Torque of the bolls: 33 Nm (3.3 kg.m, 24 lb.ft).

5) Install front road wheels, (if removed) and torque the attaching nuts to the specified value.

Torque of wheel nuts: 95 Nm (9.5 kg.m, 69 lb.ft).

6) Lower the vehicle and perform the checks mentioned in the following paragraph.





Performance checking

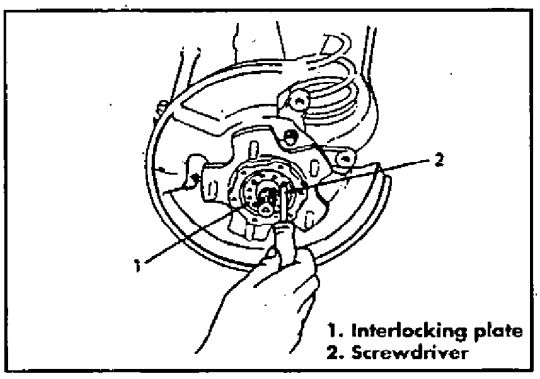
Confirm the performance of the free wheel hub by means of the following tests:

1) Set the transfer box lever in 4H or 4L and slowly move the vehicle 2 metres or more forward.
2) Jack the vehicle front and check that the drive-shaft moves with the wheel when it is turned by hand in a clockwise direction (counterclockwise for the left wheel).
3) Lower the vehicle.
4) Set the transfer lever in 2H and slowly move the vehicle 2 metres or more backwards.
5) Jack the vehicle front and check that the drive-shafts do not move with the wheels when one are turned by hand in a clockwise (counterclockwise for the left wheel) direction.
6) Repeat the steps 1) to 4) when revase gear in selceted in 4H or 4L. In this condition the hub should lock in the reverse direction and unlock when moving forward.

If defective, replace the free wheel hub assy.

MAINTENANCE

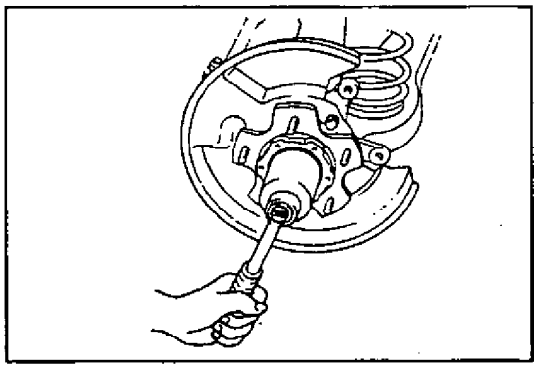
Periodically check the performance of the free wheel hub following the steps above and replace them if required.



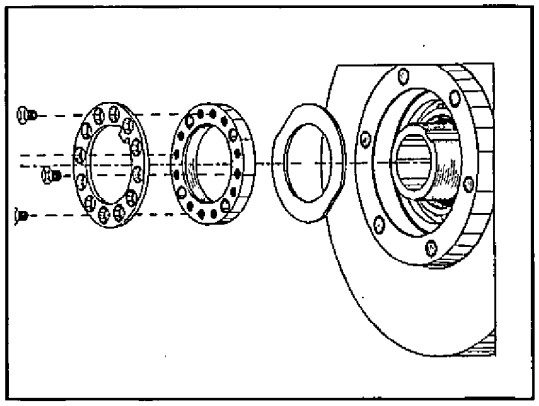
INSTALLATION OF "B" TYPE AUTOMATIC FREE WHEEL

Disassembly

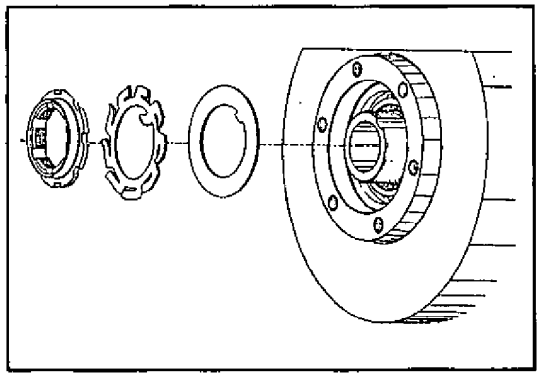
1) Jack the vehicle and remove the wheel.
2) Remove the axle and hub attaching flange.
3) Remove the hub bearing interlocking plate by loosening the four screws.



4) Withdraw the hub bearing nut using a suitable tool.

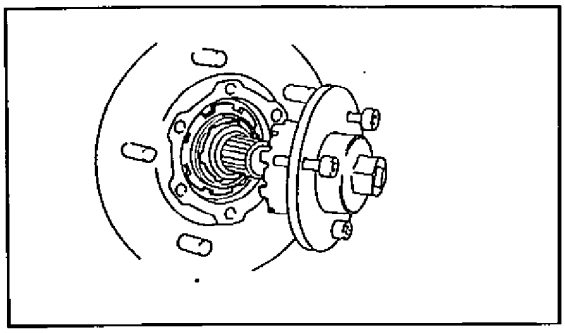


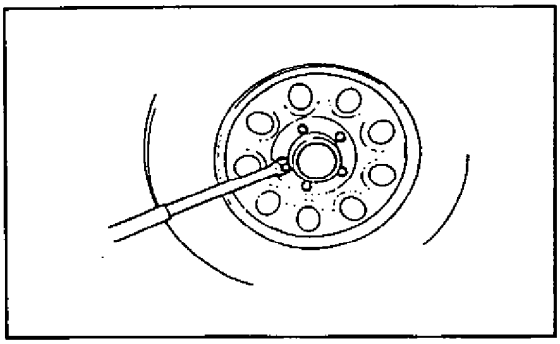
5) Withdraw the hub bearing safety washer



Assembly

1) Install the spring washer (supplied with the free wheel hub assy), on the sleeve; aligning the tab in the groove. This washer may be installed in any position.
2) Install the antirotation spring washer, (supplied with the free wheel hub assy), on the sleeve. The tab of the washer must be located in the groove and point outwards.
3) Install the slotted nut, supplied with the free wheel hub assy, on the sleeve and tighten it by hand.





4) Install the special tool (09943-0610) consisting of two parts attaching it to the hub by means of three bolts and matching the edges of the wrench with the slotted nut grooves.
5) Torque by hand the three tool attaching screws in the previous position.
6) While turning the wheel hub by hand, torque the slotted nut using the special tool to the specified value.

Torque specification for nut: 210 Nm (21.0 kg.m, 152 lb.ft)

7) Check that the O-ring of the free wheel hub is not damaged and is correctly located.
8) Check that the contact surfaces of the free wheel hub and the hub are clean.
9) Install the free wheel hub matching its edges with the groove in of the slotted nut, already installed on the hub.
10) Torque the screws supplied with the free wheel hub to the specified value, using a cross pattern.

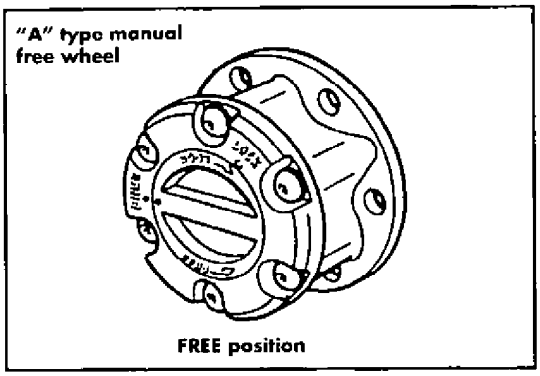
Torque specification for the free wheel attaching screws: 33 Nm (33.0 kg.m, 24.lb.ft)

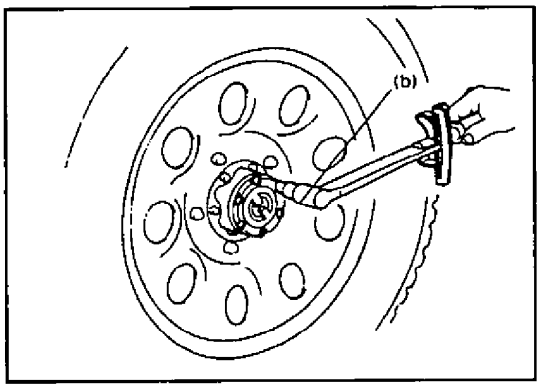
11) Install the wheels and torque the nuts to the specified value.

Torque specification for wheel attaching nuts: 95 Nm (9.5 kg.m, 69 lb.ft)

Performance Checking

Use the same method as previously described for the "A" type automatic free wheel.





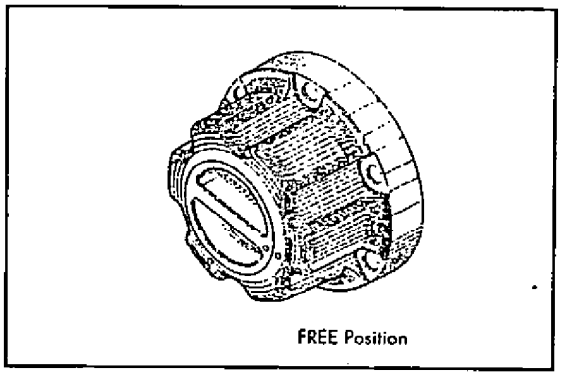
REPLACEMENT OF "A" TYPE MANUAL FREE WHEEL HUB

Disassembly

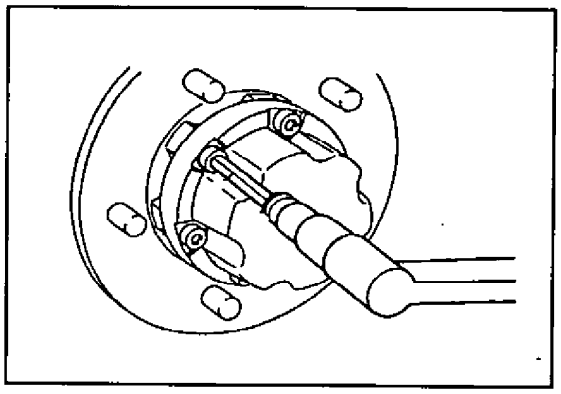
1) Jack the vehicle and remove the wheels if required.
2) Set the actuating knob of the free wheel hub to its **FREE** position.
3) Remove the 6 screws attaching the wheel to the hub.

Assembly

1) Refer to steps 1) to 5) provided for the Installation of "A" type manual free wheel hub, (Section 3D-5)



FREE Position



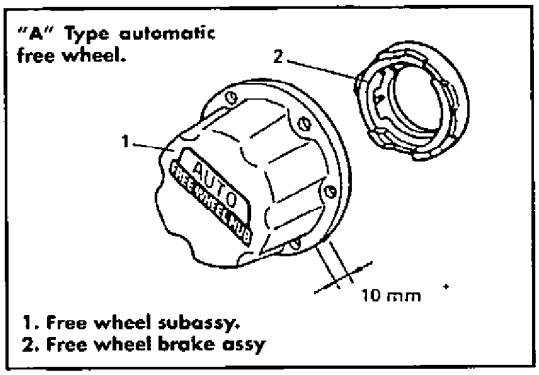
REPLACEMENT OF "B" TYPE MANUAL FREE WHEEL HUB

Disassembly

1) Jack the vehicle and remove the wheels.
2) Set free wheel hub actuating knob to "**FREE**" position.
3) Remove the 6 screws attaching the free wheel to the hub.

Assembly

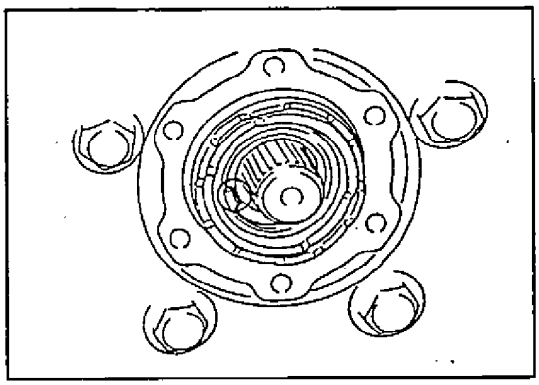
1) Perform the operations 1) to 5) provided for the installation of the "B" type manual free wheel (Section 3D-7).

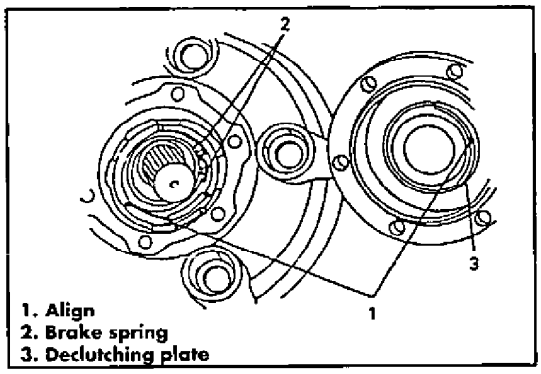


REPLACEMENT OF "A" TYPE AUTOMATIC FREE WHEEL

Disassembly

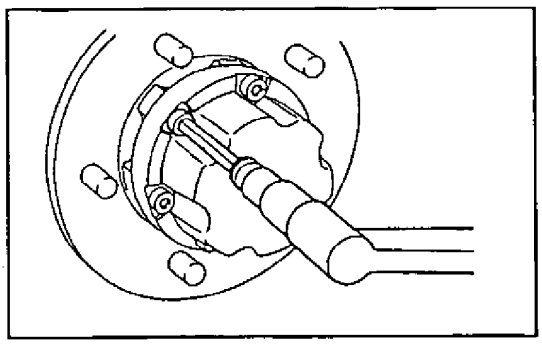
1) Set free wheels in **free** position (transfer lever to 2H position and move the vehicle backwards 2 metres or more).
2) Jack the vehicle and, if necessary, remove the wheel.
3) Remove the free wheel subassy and free wheel assy.





Assembly

1) Refer to steps 1) to 6) of the installation of "A" type automatic free wheel and performance checking. (Pages 3D-9 and 3D-10).

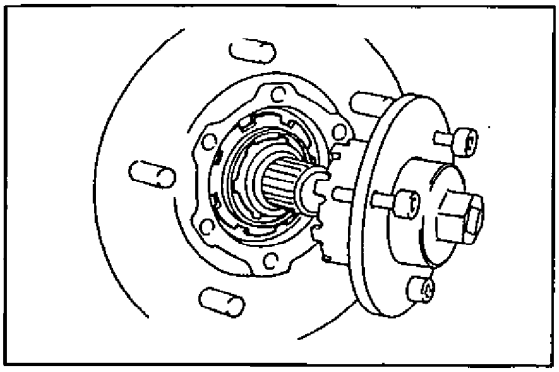


REPLACEMENT OF "B" TYPE AUTOMATIC FREE WHEEL

Disassembly

Free wheel assy

1) Jack the vehicle and remove the wheel.
2) Remove the six screws attaching the free wheel to the hub and withdraw the free wheel.

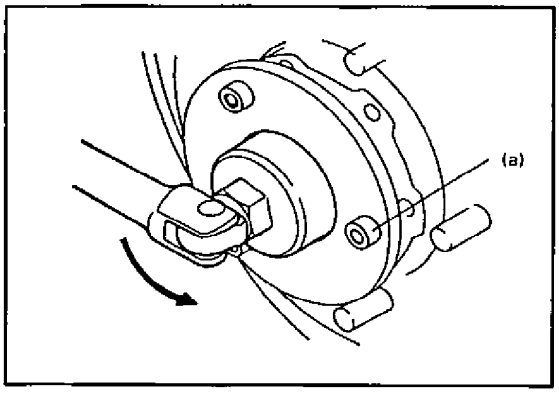


Bearing retaining system

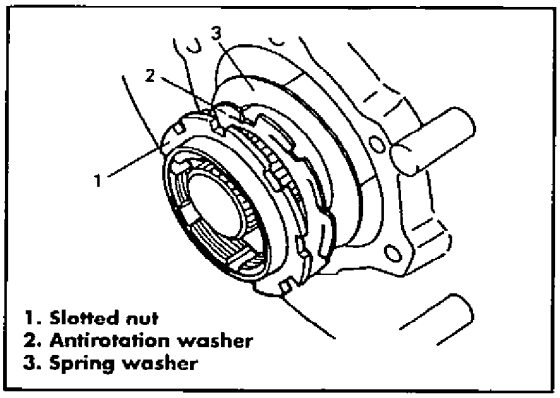
If necessary remove the slotted nut, the antirotation spring washer and the spring washer following the steps below:

1) Install the plate and slotted wrench assy (tool **ref. 09943-06010**) on the wheel hub, aligning the edges of the wrench with the grooves in the slotted nut.
2) Torque the three plate attaching screws.

Torque specification for plate attaching bolts: 2.5 Nm (0.25 kg.m, 2 lb.ft)



3) Turn the slotted nut counterclockwise 2 complete turns in order to loosen it from the antirotation spring washer.
4) Remove the special tool attached to the wheel hub.



1. Slotted nut
2. Antirotation washer
3. Spring washer

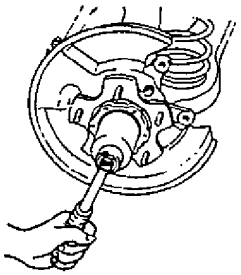
5) Remove the slotted nut, the antirotation spring washer and the spring washer.

Assembly

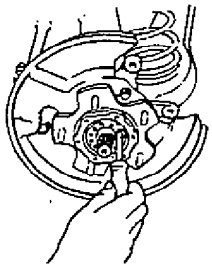
1) Perform the operations 1) to 6) indicated for the installation of the "B" type automatic free wheel (Page 3D-11) (Only if the spring washer, retaining spring washer and slotted nut assy has been replaced).
2) Install the free wheel assy as described in steps 7) to 11) of the installation of "B" type automatic free wheel (page 3D-12).
3) Undertake performance checks described on Page 3D-10.

SPECIFIED TORQUES

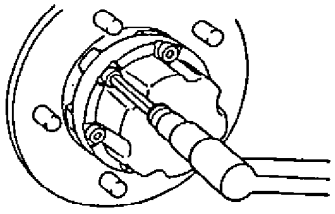
ELEMENT	TORQUE		
	kg.m	Nm.	lb.ft
Hub attaching nut/slotted nut	21	210	152
Fixing plate screws	0.25	2.5	2
Attaching bolts of the free wheel ("B" type manual and "A" and "B" types automatic)	3.3	33	24
Attaching bolts of the flange and "A" type manual free wheel	2.5	25	18



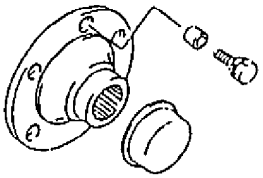
HUB ATTACHING NUT



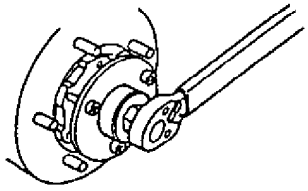
FIXING PLATE SCREWS



FREE WHEEL ATTACHING BOLTS

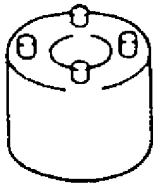


FLANGE ATTACHING BOLTS

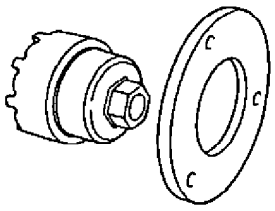


SLOTTED NUT

SPECIAL TOOLS



09951-16050
HUB NUT TORQUE TOOL



09943-0610
SLOTTED NUT TORQUE TOOL

SECTION 5

BRAKES

NOTE:
For topics not covered in this section, please refer to the relevant section of the Vitara Service Manual sections outlined in the preface.

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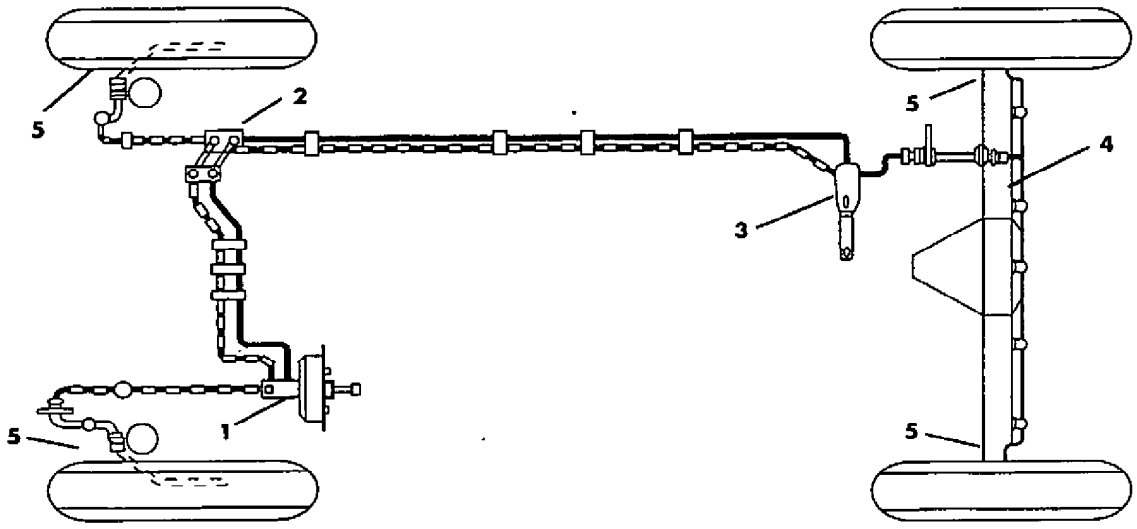
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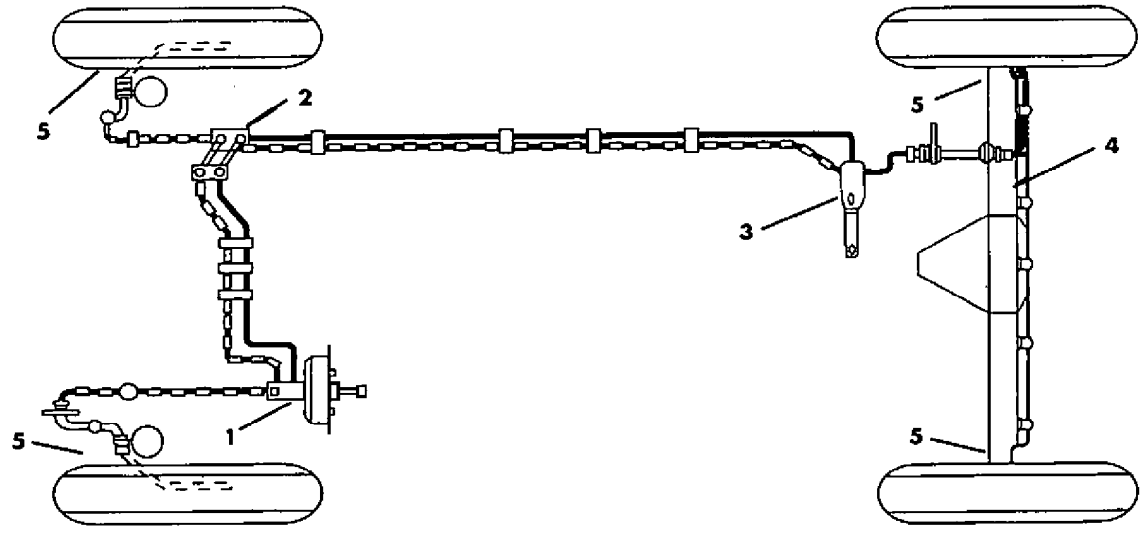
GENERAL OUTLINE

3D VEHICLE

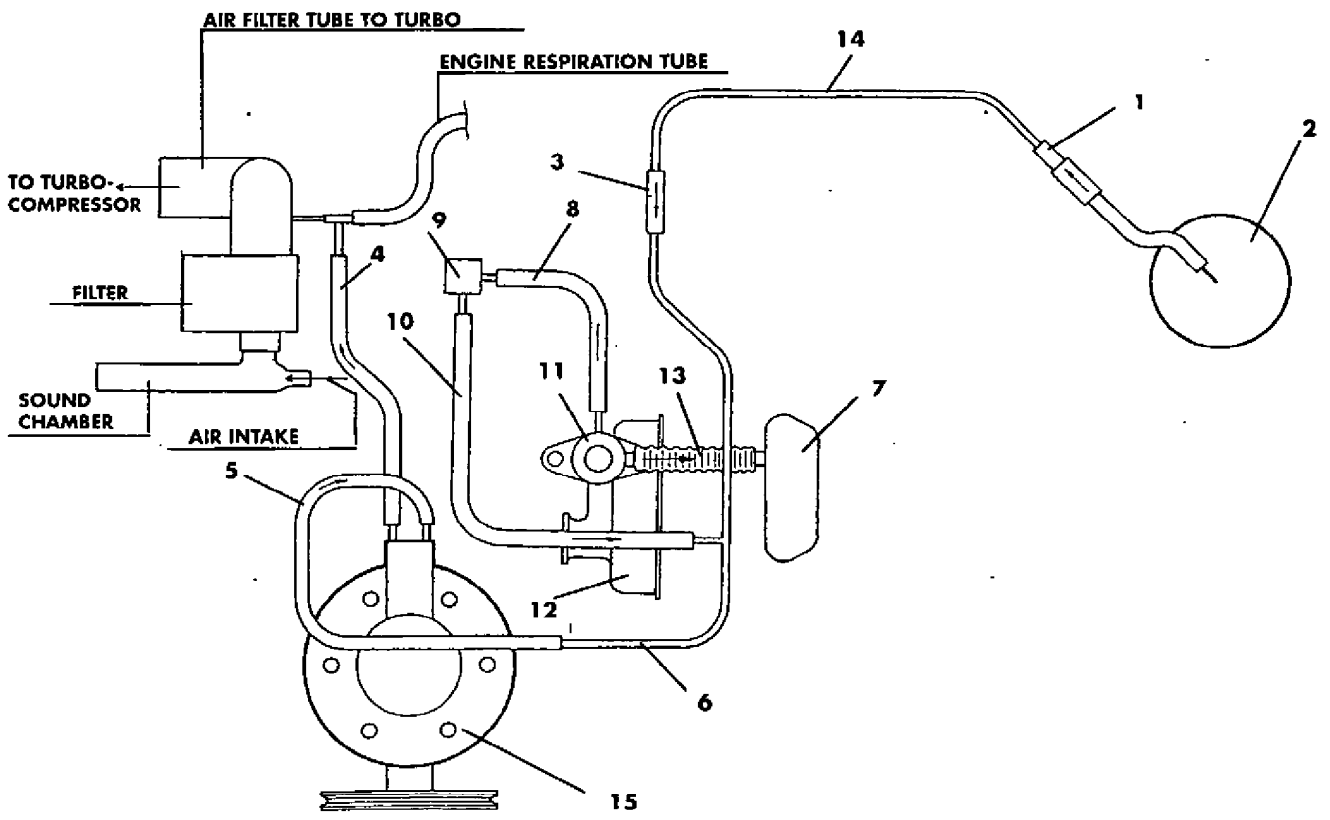


1. Servo brake
2. 5 way valve.
3. L.S.P.V. valve.
4. Rear axle
5. Brake disc and drums.

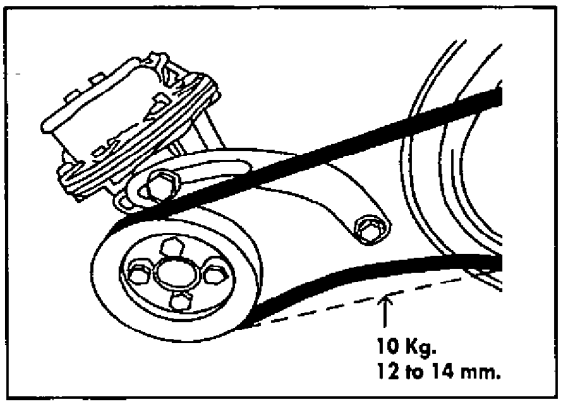
5D VEHICLE



VACUUM PUMP CIRCUIT



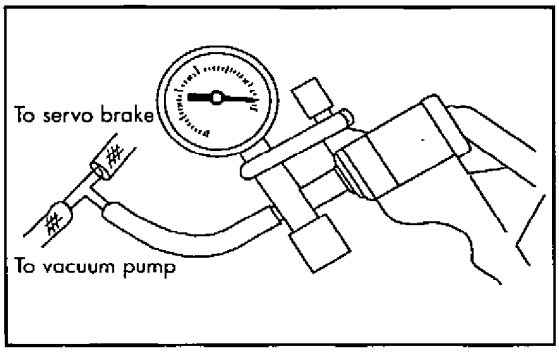
1. SERVO BRAKE VACUUM LINE
2. SERVO BRAKE
3. INTERCONNECTION LINE
4. VACUUM PUMP EXHAUST LINE
5. VACUUM PUMP INTAKE LINE
6. VACUUM LINE No1
7. AIR ADMISSION DIVIDER
8. ELECTRIC EGR VALVE LINE
9. SOLENOID ELECTRIC VALVE
10. ELECTRIC VALVE VACUUM TUBE LINE
11. EGR VALVE
12. EXHAUST MANIFOLD
13. EGR VALVE TO DIVIDER LINE
14. VACUUM LINE Nº2
15. VACUUM PUMP

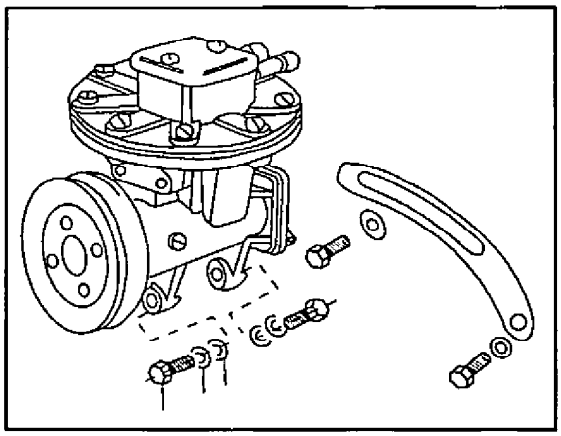


CHECKING VACUUM PUMP

1) Remove lower soundproofing plate of engine.
2) Make sure that belt is correctly tensioned.
3) Run the engine and check, that braking is sufficient.

4) If braking is unsatisfactory, remove suction lines connecting brake servo with vacuum pump and install a bypass vacuum gauge.
5) Rev engine to 1000 rpm and check that vacuum level is close to 570 mm Hg.
6) If it is not, check for:
   - Possible leaks from suction lines.
   - Possible obstruction of pump outlet hose.





REPLACING THE VACUUM PUMP

Removal

1) Remove lower soundproofing plate of engine.
2) Remove suction and outlet lines.
3) Slacken vacuum pump tension and mounting bolts.
4) Rock vacuum pump towards engine and remove belt.
5) Remove bolts and dismount vacuum pump.

Installation

1) Install by reversing order of above operations.
2) Tension vacuum pump belt and tighten attaching bolts.
   - **Belt tension:**
     12-14 mm (0.5-0.55 in), with pressure of 100 N (10 kg, 22 lb)
   - **Idler pulley-depressor torque specifications:**
     18-23 Nm (1.8-2.3 kg.m, 13-17 lb.ft).
   - **Idler pulley-engine attachment bolt torque specifications:**
     18-23 Nm (1.8-2.3 kg.m, 13-17 lb.ft).

SECTION 6

ENGINE

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STARTER SYSTEM 6G
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GENERAL INFORMATION

CLEANING INSTRUCTIONS AND POINTS OF CAUTION

When repairing the engine please pay attention to the following points:

- Order of injection in cylinders is 1,3,4,2.
  Cylinder no. 1 is situated at rear of engine and no. 4 at the front next to the radiator.
- Before carrying out any general repair work, diagnose the engine (compression pressure measurement, leak check, tune up timing, pump setting and fitting, turbocompressor functioning, etc.), to help you isolate the problem.
- Always disconnect negative battery cable, to prevent short circuits.
- All operations related to fuel system must be carried out in well ventilated areas and adopting the appropriate safety measures.
- During disassembly/assembly or when storing parts, protect cylinder heads, cylinder block, fuel distribution pump, turbocompressor, etc to prevent accidental entry of impurities and foreign material.
- On removing engine components, please keep in order so that they are placed in original position during stet reassembly.
- Components like the turbocompressor are non-serviceable and the whole unit must be replaced. The injection pump must be serviced at an Official Lucas Service Centre.
- During installation, use engine oil to lubricate surfaces exposed to friction. This will protect engine during initial functioning.
- When removing electrical connectors do not pull on cables. Remove locking clamps first and pull at both ends.

NOTE:

- **Unless otherwise stated, measurements are expressed in mm. and inches and degrees centigrade.**
- **Unless otherwise stated measurements are expressed in Nm, kg.m and lb.ft.**

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Engine does not start (engine turns over correctly)	**Defective fuel system**	
	• Lack of fuel in tank	Add fuel
	• Dirty fuel filter	Remove
	• Water or air in fuel	Clean
	• Dirty or blocked tank and fuel lines.	Repair
	Fuel distribution pump	
	• Defective fuel cutoff solenoid.	Replace
	• Defective fuel distribution pump adjustment.	Adjust
	• Air intake	Repair
	• Defective fuel distribution pump.	Replace
	• Defective idle adjustment.	Adjust
	• Malfunciton in cold start mechanism.	Adjust
	• Manual stop control locked.	Repair
	Low compression	
	• Incorrect valve clerance	Adjust
	• Loss of compression through valve seat	Grind valve seat
	• Valve stuck	Correct or replace
	• Valve springs damaged or worn	Replace
	• Loss of compression through cylinder head gasket	Repair or replace
	• Piston ring stuck or damaged	Replace
	• Piston, ring or cylinder worn	Replace piston ring or piston or rectify cylinder
	Other	
	• Blocked exhaust pipe	Clean
	• Broken timing belt.	Replace and repair valves
Engine idles erratically	**Defective fuel system**	
	• Lack of fuel in tank	Add fuel
	• Dirty fuel filter	Clean or Remove
	• Water or air in fuel.	Clean
	Fuel distribution pump	
	• Defective fuel cutoff solenoid.	Replace
	• Defective fuel distribution pump adjustment	Adjust
	• Air intake	Repair
	• Defective fuel distribution pump	Replace
	• Idle speed badly adjusted	Adjust
	• Defective throttle cable adjustment	Adjust
	• Loose fuel distribution pump clamps	Tighten
	• Residual flow (antistop) not properly adjusted.	Adjust
	• Defective manual stop control.	Repair
	Injection lines	
	• Cracked fuel lines	Replace
	• Fuel leaks at connections.	Repair
	Injectors	
	• Pressure measurement incorrect	Adjust
	• Needle stuck in one or more nozzles	Replace
	• Incorrect positioning of one or more nozzles in nozzle-holder	Repair
	• Needle nozzle leaks.	Replace nozzle
	• Injector lock washers incorrectly fitted.	Repair
	Engine overheating	See Overheating section
	Other	
	• Valve clearance incorrect	Adjust
	• Low compression	See previous point

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Excessive engine movement (especialtes at idle)	**Defective fuel system**	
	• Air filter elements blocked.	Clean or replace
	• Blocked nozzles, lines or connections.	Clean or replace
	Engine overheating	See Overheating section
	Fuel filter	
	• Water or air in filter.	Repair
	• Blocked filter.	Replace
	Fuel distribution lines	
	• Cracks	Replace
	• Leaks through connections	Repair
	Injectors	
	• Incorrect pressure measurement.	Adjust
	• Needle stuck in nozzle.	Replace nozzle
	• Injector dripping	Replace
	• Lock washers incorrectly fitted.	Repair
	Fuel distribution pump	
	• Loose pump clamps.	Tighten
	• Defective fuel cutoff solenoid.	Replace
	• Defective pump adjustment	Adjust
	• Air intake.	Repair
	• Defective fuel distribution pump.	Replace
	• Idling speed incorrectly adjusted.	Adjust
	• Throttle cable incorrectly adjusted.	Adjust
	• Anti-stall incorrectly adjusted.	Adjust
	• Defective manual stop mechanism.	Repair
	Low compression	Previously described
	Others	
	• Incorrect valve clearance.	Adjust
	• EGR incorrect performance.	Repair
	• Loose engine mounts.	Tighten
	• Timing belt not tensed correctly.	Adjust
Engine accelerates by itself from idle	**Lubrication**	
	• Oil level too high.	Correct
	Fuel distribution pump	
	• Defective fuel distribution pump.	Replace
Engine stalls when decelerating	**Fuel distribution pump**	
	• Idle speed incorrectly adjusted.	Adjust
	• Anti-stall incorrectly adjusted.	Adjust
	• Cold idle incorrectly adjusted.	Adjust
	• Cold idle thermostatic element malfunctioning.	Replace and adjust
	• Defective fuel distribution pump.	Replace

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Engine crawls. Erratic running	**Defective fuel system**	Previously described
	Fuel distribution pump	
	• Incorrect adjustment of idle speed.	Adjust
	• Defective adjustment.	Adjust
	• Defective fuel distribution pump.	Replace
	Injectors	
	• Injection lines leaks.	Correct
	• Defective injectors.	Replace
	• Incorrectly fitted lock washers.	Correct
	Low compression	Previously described
	Others	
	• Valve clearance incorrect.	Adjust
Excessive oil consumption	**Intake system**	
	• Air filter element blocked.	Replace
	• Air intake line blocked.	Repair
	Lubricating system	
	• Excessive oil level.	Adjust
	• Crankcase ventilation blocked.	Repair
	Turbocompressor	
	• Oil drain lines blocked.	Repair
	• Defective turbocompressor.	Replace
	Others	
	• Plungers or guides worn.	Replace
	• Valve guide retainers worn.	Replace
	• Piston, piston ring or cylinders worn.	Replace
Excessive fuel consumption	**Defective fuel system**	
	• Fuel leaks in tank or lines.	Correct
	• Fuel filter blocked.	Replace
	Fuel distribution pump	
	• Defective adjustment.	Adjust
	• Idle speed too high.	Adjust
	Injectors	
	• Incorrect pressure measurement.	Adjust
	• Nozzle stuck.	Replace
	• Incorrect installation of nozzles in holder.	Repair
	• Fuel leak from nozzle needle.	Replace
	Air intake	
	• Air filter blocked.	Replace
	Low compression	Previously described
	Others	
	• Incorrect valve seating.	Grind valves
	• Brakes binding.	Repair
	• Low tyre pressure.	Adjust
	• Clutch slips.	Replace
	• Defective performance of EGR system.	Repair
Blue fumes when hot, idling or decelerating	**Lubrication**	
	• Excessive level of engine oil.	Adjust
	• Crankcase ventilation system blocked.	Repair
	Turbocompressor	
	• Oil drain lines blocked.	Repair
	• Defective turbocompressor.	Replace

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Blue fumes when hot, idling or decelerating	**Intake system**	
	• Air filter element blocked.	Replace
	• Air intake line blocked.	Repair
	Fuel distribution pump	
	• Incorrect fuel distribution pump adjustment.	Adjust
	• Defective fuel distribution pump.	Replace
	Injectors	
	• Defective or incorrectly fitted injector gaskets.	Correct
	• Defective injectors.	Replace
	Fuel circuit	
	• Filter blocked.	Replace
	Low compression	Previously described
	Others	
	• Incorrect distribution adjustment.	Adjust
	• Incorrect valve clearance.	Adjust
Lack of power (Black fume)	**Air intake system**	
	• Air filter blocked.	Replace
	• Intake flexible line chocked.	Replace
	Fuel system	
	• Dirty filter	Replace
	• Air in circuit.	Repair
	Fuel distribution pump	
	• Defective fuel distribution pump adjustment.	Adjust
	• Defective fuel distribution pump.	Replace
	Injectors	
	• Defective injectors.	Replace
	• Crushed lines (connections over tighted).	Replace
	Turbocompressor	
	• Turbo to divider line blocked.	Repair or replace
	• Air leak from turbo divider manifold.	Repair or replace
	• Leaks from intake manifold gasket.	Repair or replace
	• Gas leaks between exhaust manifold and turbo.	Repair
	• Gas leaks from exhaust manifold.	Replace
	• Gas leaks from turbocompressor.	Replace
	• Malfunctioning of relief waste gate.	Replace oil and filter.
	• Dirty turbocompressor turbine.	Replace turbocompressor.
	• Defective turbocompressor.	Replace
	Low compression	Previously described
	Others	
	• Incorrect valve clarance.	Adjust
	• Distribution incorrect adjustment.	Adjust
	• EGR electric valve hoses inverted.	Repair
	• Exhaust pipe blocked.	Repair or replace
Lack of power (no black fume)	**Fued distribution pump**	
	• Lack of travel in throttle cable.	Adjust
	• Maximum revolutions stop bolt incorrectly adjusted.	Adjust
	• Defective fuel distribution pump.	Replace
	Fuel system	
	• Dirty filter.	Replace
	• Air in circuit.	Repair
	Turbocompressor	See lack of power (black fume) Turbocompressor

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Low oil pressure	**Lubrication**	
	• Inadequate oil viscosity.	Change viscosity
	• Defective pressure switch.	Replace
	• Insufficient oil.	Refit
	• Oil pan pickup tubes blocked.	Clean
	• Defective oil pump.	Replace
	• Pressure relief valve stuck.	Repair
	• Excessive wear in engine parts.	Replace defective parts
Noises in engine **Before checking noises in engine, ensure that:** • Injection pump is correctly fitted • Injector pressure measurement is correct. • Correct fuel is used • Correct oil is used	**Valve noises**	
	• Inadequate valve clearance.	Adjust
	• Valve plungers and guides worn.	Repair
	• Valve spring weak or deteriorated.	Replace
	• Valve warped or bent.	Refit
	Piston, piston ring and cylinder noises	
	• Excessive wear in piston, piston ring and cylinders.	Replace affected parts
	Connecting rods noises	
	• Connecting rod bearings worn.	Repair
	• Connecting rod pins worn.	Repair
	• Connecting rod nuts loose.	Repair
	• Low oil pressure.	Previously described
	Crankshaft noises	
	• Low oil pressure.	Previously described
	• Engine main bearings worn.	Repair
	• Crankshaft pins worn.	Repair
	• Engine bedplate bolts loose.	Repair
	• Excessive crankshaft end play.	Repair
Noises in turbocompressor	**Air intake system**	
	• Air intake blocked or leaking.	Repair
	• Turbocompressor divider hoses blocked or leaking.	Repair
	• Intake manifold blocked or leaking.	Repair
	Exhaust system	
	• Exhaust system blocked.	Repair
	• Gas leak from exhaust manifold.	Repair
	Turbocompressor	
	• Gas leak from exhaust and turbo manifold.	Repair
	• Gas leak from exhaust manifold to turbocompressor connection.	Repair
	• Defective turbocompressor.	Replace

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Overheating	**Cooling system**	
	• Front grill blocked.	Eliminate obstacles
	• Defective radiator thermo sensor.	Replace
	• Insufficient coolant.	Refit
	• Thermostat not working or working incorrectly.	Replace
	• Water pump defective.	Relace
	• Radiator blocked or leaking.	Clean, repair or replace
	Electrical system	
	• Electric fan relays defective.	Replace
	• Electric fan defective.	Replace
	Lubrication	
	• Insufficient engine oil.	Refit
	• Inadequate engine oil grade.	Replace
	• Oil filter blocked.	Replace
	• Oil pump defective.	Replace
	Others	
	• Brake drag.	Repair or replace
	• Defective cylinder head gasket.	Replace
	• Air filter blocked.	Clean or replace

SECTION 6A4

ENGINE REPAIR

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6A4

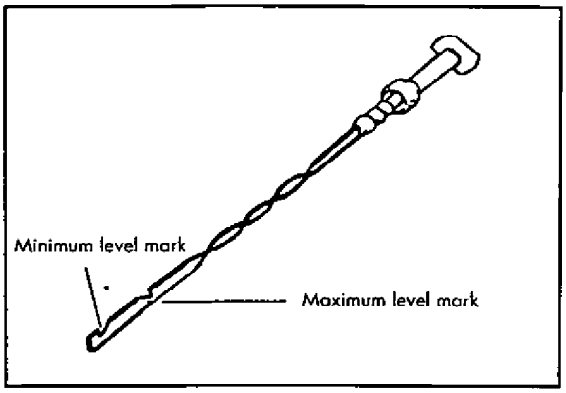
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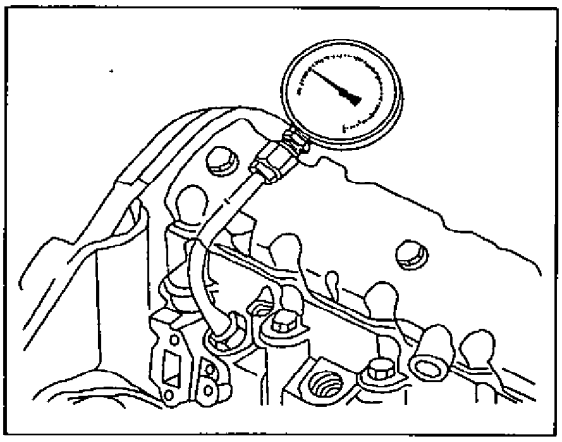


ON VEHICLE CHECKS

OIL LEVEL

1) Ensure that vehicle is on a horizontal surface.
2) Start up engine and wait until it reaches a normal functioning temperature. Stop vehicle and wait 3 minutes.
3) Take out dipstick and check that oil is between maximum and minimum levels.
4) Add any oil if necessary.

NOTE:
The difference between maximum and minimum level is 1.5 litres (2.6 Imp. pints) (approximately).



COMPRESSION PRESSURE CHECK

1) Ensure that battery is fully charged.
2) Start up engine and wait until it reaches a normal functioning temperature and then switch it off.

NOTE:
The compression check can be carried out from injector housing or heater housing, by using a compression gauge adaptor.
The compressor gauge must have a scale of at least 0-3923 K Pa (0-40 kg/cm², 0-570 psi)

3) Disconnect all heaters, remove all injectors and attach compression gauge to first cylinder.
4) Disconnect the cut off solenoid from the jet pump. In vehicles with immobilizer, do not enter the code.
5) Activate ignition directly, without going through heater position and observe compression levels on gauge
6) Repeat this operation in every cylinder.
   The correct level should be between the maximum and minimum indicated.

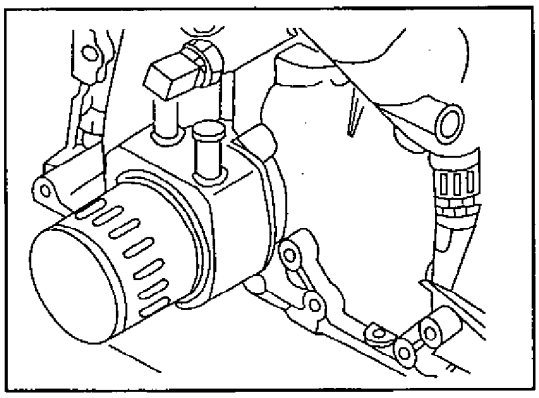
   Maximum compression 2941 K Pa (30 kg/cm², 427 psi)
   Minimum compression 2452 K Pa (25 kg/cm², 356 psi)
   Maximum difference between cylinders
   490 K Pa (5 kg/cm², 71 psi)

7) If compression in one or more cylinders is low, add a small quantity of engine oil to the cylinder and repeat the test.
   1) If the compression level rises when repeating the test, the piston, piston rings or the cylinders are defective.
   2) If the compression level does not alter, the valve seats or valve clearances are defective.
   3) If the compression is low in adjoining cylinders, the cylinder head gasket might be defective, or the cylinder head distorted.

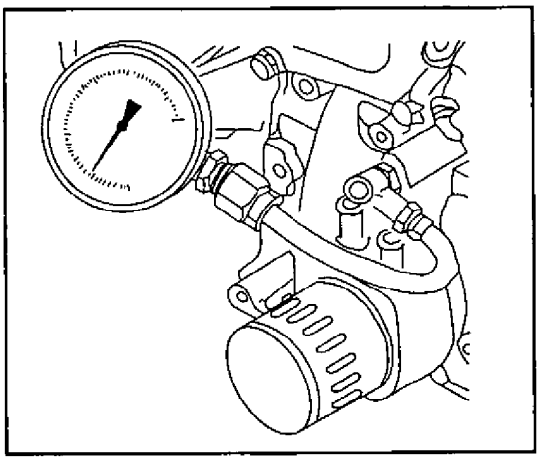
OIL PRESSURE CHECK

NOTE:
Before checking oil pressure, examine the following:

- **Level of oil in oil pan, which should be between maximum and minimum marks.**
- **Oil quality.**
- **Renew oil if discoloured or in deteriorated condition.**
- **Repair if oil leaks observed.**



1) Remove oil pressure switch from cylinder block.
2) Fit pressure gauge with a scale of at least 0-980 K Pa (0-10 kg/cm², 142 psi)
3) Start up engine and heat up to normal functioning temperature.
4) Observe oil pressure level.

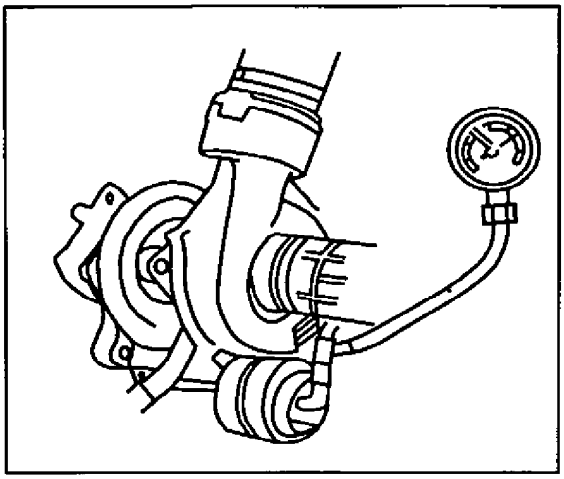


Oil pressure specification	**At 750 rpm 196 K Pa (2.0 kg/cm², 28 psi)**
	At 2.000 rpm 343 K Pa (3.5 kg/cm², 50 psi)
	At 4.000 rpm 441 K Pa (4.5 kg/cm², 64 psi)

5) After checking oil pressure, remove pressure gauge and fit pressure switch with new gasket tightened as specified.

Pressure switch torque specifications:
30 Nm (3.0 kg.m, 22 lb.ft)

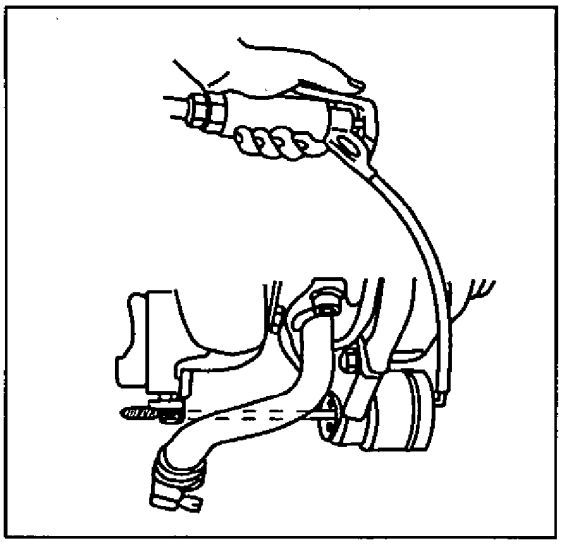
WARNING:
Be careful working when engine is hot, high temperatures can cause burns.



TURBOCOMPRESSOR CHECK

Turbocompressor

1) Remove upper air filter cap and union between filter and turbocompressor.
2) Connect "T" bypass to pipes joining intercooler with relief valve, as shown in figure, and attach pressure gauge
3) Fit air filter and suction hose assembly
4) Set transmission in neutral and warm engine up to normal functioning temperature
5) Road test the vehicle and whilst ascending a slope check that pressure on gauge corresponds to specifield levels.
   At 1,000 r.p.m. 7 K Pa (0.07 kg/cm^2, 1.0 psi)
   At 1,250 r.p.m. 11.5 K Pa (0.12 kg/cm^2, 1.7 psi)
   At 2,250 r.p.m. 30 K Pa (0.31 kg/cm^2, 4.35 psi)
   At 4,600 r.p.m. 40 K Pa (0.41 kg/cm^2, 5.80 psi)
6) If pressure is below specified levels, check the following:
   - Leaks from connection between turbocompressor and exhaust manifold.
   - Air leaks from union between admission turbine and intercooler.



RELIEF VALVE CHECK

1) Carry out operation (1) for checking turbocompressor.
2) Disconnect lines joining intercooler with relief valve and attach a tool to supply pressure as shown in figure.
3) Apply pressure up to maximum of 40 K Pa (0.41 kg/cm^2, 5.80 psi). Observe that relief valve rod terminates travel when pressure is approximately 40 K Pa (0.41 kg/cm^2, 5.80 psi).

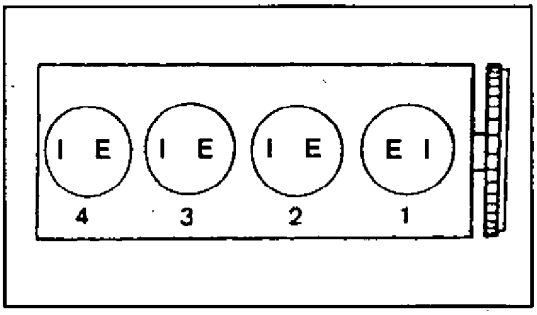
NOTE:
Never exceed 40 K Pa (0.41 kg/cm^2, 5.80 psi) of pressure

4) Replace the turbocooler if the pressure is insufficient or if the relief valve functioning is incorrect.

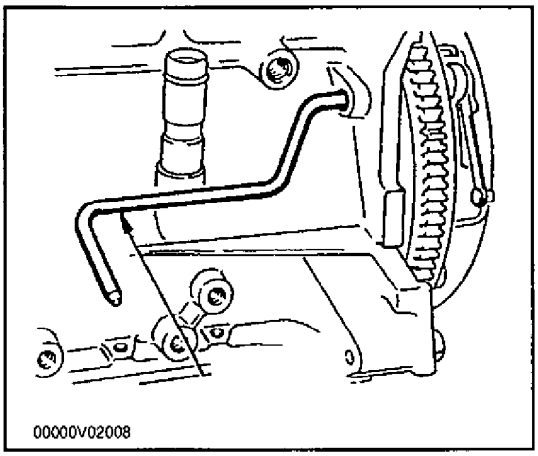
VALVE CLEARANCE (CHECKING)

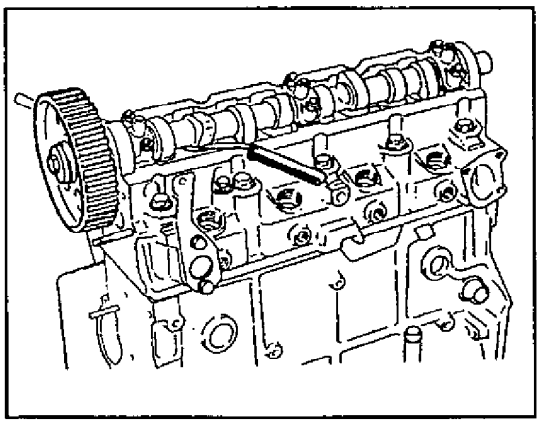
1) Disassemble the following components
   - Negative battery cable.
   - Turbocompressor and intercooler union.
   - Turbocompresor outlet line.
   - Vacuum pump flexible line.
   - Fuel flexible lines.
   - EGR electric valve lines.
   - Rocker arm cover.

NOTE:
Valve clearances should be checked with engine cold.
Cylinder no. 1 is situated in the rear part of engine.



2) Turn engine in normal direction until valves of cylinder no. 4 are both open (cylinder no. 1 compressed).
3) Lock engine flywheel with tool (A) **Ref. 00000V02008**. In this position, check intake valve clearances on cylinders no.1 and 2 and exhaust valves for cylinders no. 1 and 3.
4) Rotate crankshaft 360º (one complete turn) and lock engine flywheel with a tool. **Ref. 00000V02008** At this moment cylinder no. 1 is crossed and no. 4 compressed.
   Check intake valve clearances in cylinders no. 3 and 4, and exhaust valves for cylinders no. 2 and 4.

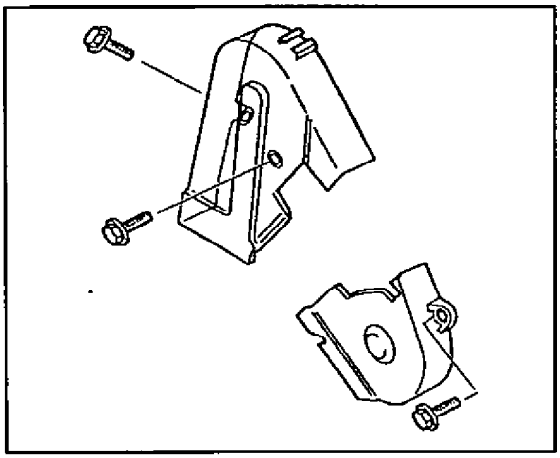


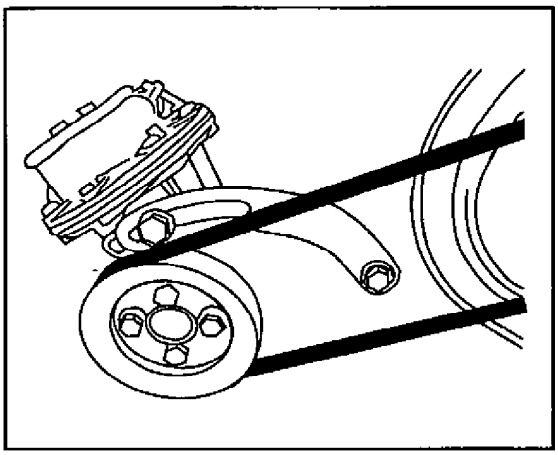


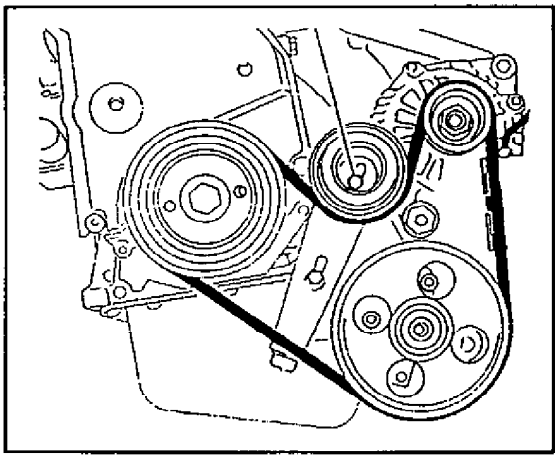
CROSSED	**I4 E4**	**I1 E1**
CONTROL	**I1 E1** **I2 E3**	**I4 E4** **I3 E2**

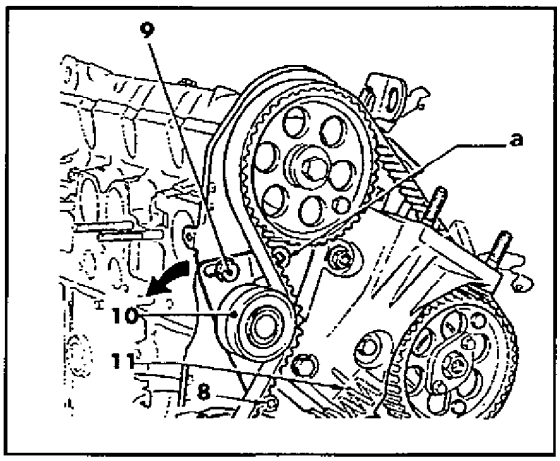
Valve clearance:

Intake	**I**	**0,15 mm (0.006 in)**
Exhaust	**E**	**0,30 mm (0.011 in)**
Tolerance	**T**	**0,08 mm (0.003 in)**









VALVE CLEARANCE ADJUSTMENT

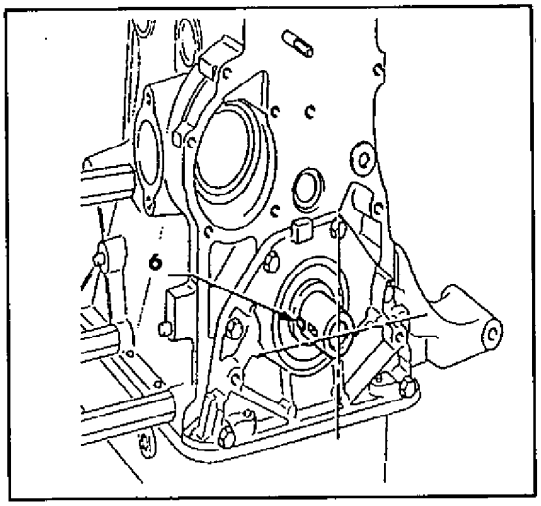
NOTE:
Check valve clearances as indicated in 6ª4-5.

Disassembly

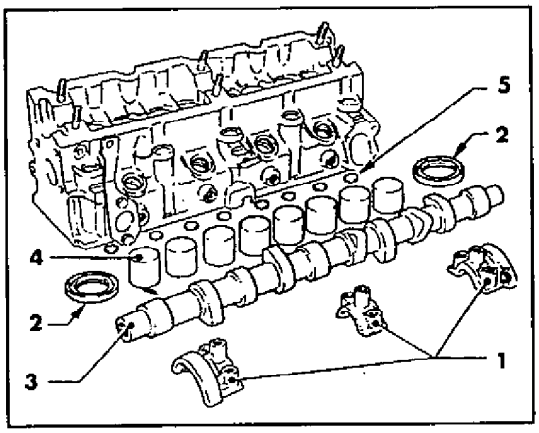
1) Remove negative cable from battery.
2) Remove electric fan connection next to engine
3) Remove the thermocontact connection.
4) Remove the dummy front engine mount.
5) Slacken the two upper fixing bolts of the radiator and move it backwards.
6) Slacken the four bolts of the electric fan and take this out on the upper part.
7) Remove the left and right timing covers.
8) Rotate crankshaft until camshaft pulley and fuel distribution pump pulley with the timing bolt holes are aligned, fix stet with bolt M8 x 125 x 30.
9) Lock fuel distribution pump pulley using bolts TYPE M8 x 125 x 35.
10) Lock engine flywheel with tool **Ref. 00000V02008**.
11) Remove lower soundproof plate.
12) Slacken tensioner and remove the vacuum pump belt.
13) Slacken the tensioner and remove the alternator belt and power steering pump.
14) Slacken the bolt and remove the crankshaft pulley and the lower timing cover.
15) Slacken nut (8) and bolt (9) from the tensioner pulley mounting (10).

NOTE:
Before adjusting valve clearances, the actual clearances should be measured and recorded.

16) Insert a 3/8" driver at point "a" and compress the belt tensioner spring to relax the belt tension. Lock it off with the bolt (9)



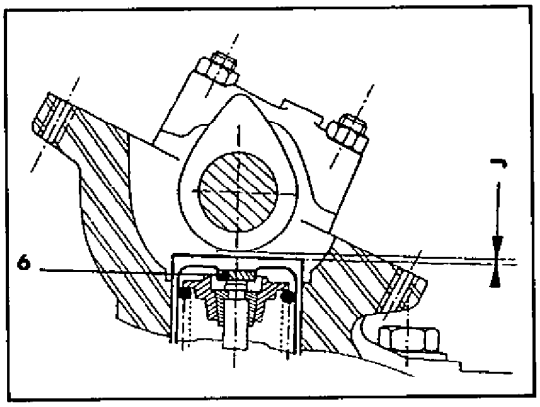
17) Remove timing belt and detach camshaft pinion.
18) Remove engine flywheel locking tool **Ref. 00000V02008** and turn engine flywheel round until crankshaft keyway is at 9 o'clock position.



19) Remove of the following components and place them in the same order for assembly:
- Camshaft bearing caps (1)
- Oil seals (2)
- Camshaft (3)
- Tappets (4)
- Shims (5)

Checking

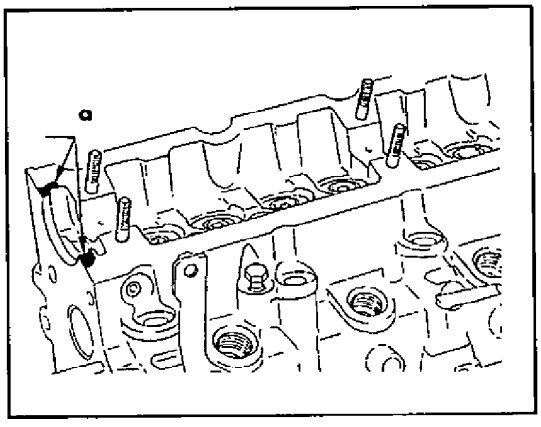
1) Taking account of the clearances obtained and after checking clearance and measuring thickness of each shim removed, determine the correct shim thickness by using the following example:



EXAMPLE

INTAKE VALVE	
Clearance allowed	**0,15**
Clearance measured	**0,25**
Difference	**0,10**
Existing shim	**2,425***
Shim to be fitted	**2,500**
Play obtained	**0,175**

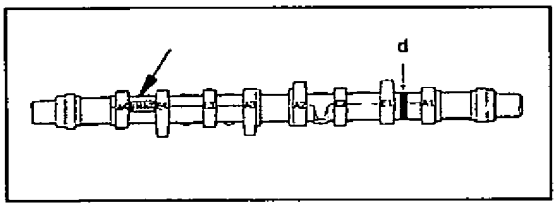
(*) Base shim. (Value in mm)



NOTE:
66 sizes of shim exist. The range of thickness varies from 1.650-4.000 mm (0.065-0.0158 in)

2) Fit shim and tappets previously selected.

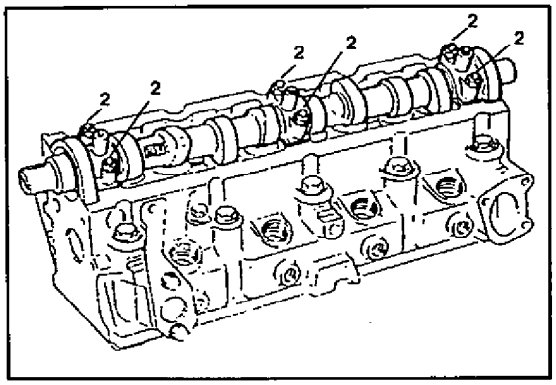
NOTA:
Apply MOLIKOTE G. PLUS RAPID to camshaft covers and recommended products for sealing the front and rear areas (a).

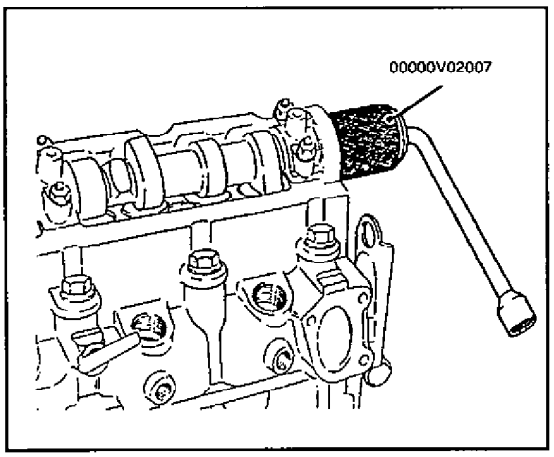


Assembly

1) Fit camshaft (3) with DIST label facing towards timing, and progressively tighten camshaft bearing cap nuts (2) to torque specification.

Torque specification for camshaft cap nuts:
18 Nm (1.8 kg.m, 13 lb.ft)





2) Fit a new oilseal on the tool **Ref. 00000V02007** locating it in the deeper reccess. Instal the rear and front oilseals using the camshaft pulley bolt to press them into place.
3) Replace the woodruff key on the camshaft and fit the drive pulley with an M8 x 125 x 40 bolt, instal the pulley retaining bolt and tighten to the specified torque. Remove the locking bolt.

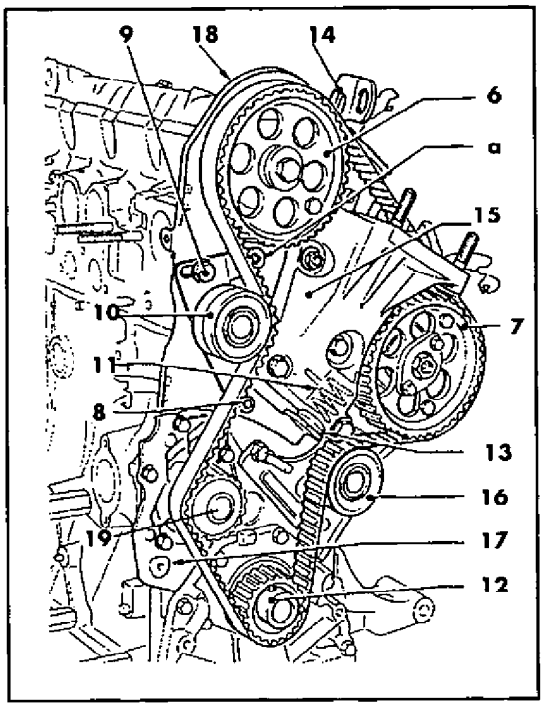
Torque specification for camshaft pully bolt:
40 Nm (4.0 kg.m, 29 lb.ft)

4) Install belt and set timing (see timing Belt (Replacement) (6A4-9)).
5) Assemble the parts in the reverse order.

TIMING BELT (REPLACEMENT)

Disassembly

1) Perform the operations:
   - Op. 1 — Corresponding to valve clearance checking 6A4-5.
   - Op. 1 to 16 — Corresponding to valve clearance adjustment 6A4-6.
2) Remove timing belt.



Inspection

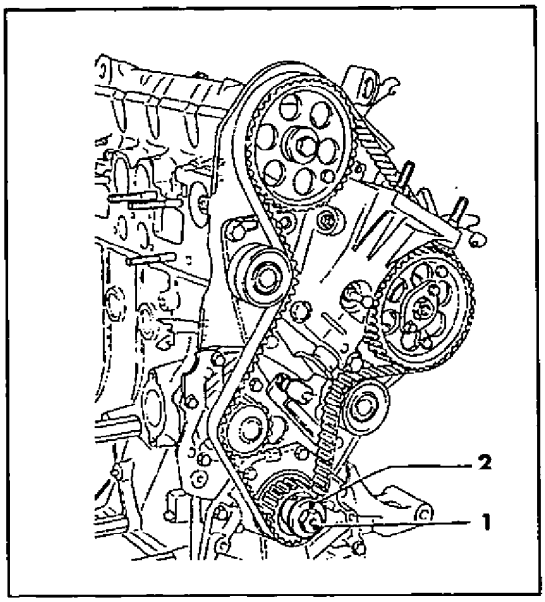
1) Ensure that tensioner pulley, fixed pulley and water pump pulley function correctly. (They should turn freely and without looseness).

Assembly

1) Ensure the engine flywheel, camshaft pulley and fuel distribution pump are locked in their position.
2) Assemble new timing belt, (14) in the following order:
   - Crankshaft (12).
   - Fixed pulley (16).
   - Fuel distribution pump pulley (7).
   - Camshaft pulley (6).
   - Tensioner pulley (10).
   - Water pump pulley (19).
3) Slacken bolt (9) and nut (8) of the tensioner pulley until it works freely and places pressure on the belt.
4) Pinch-tighten tensioner pulley bolt (9) and nut (8).

Timing adjustment

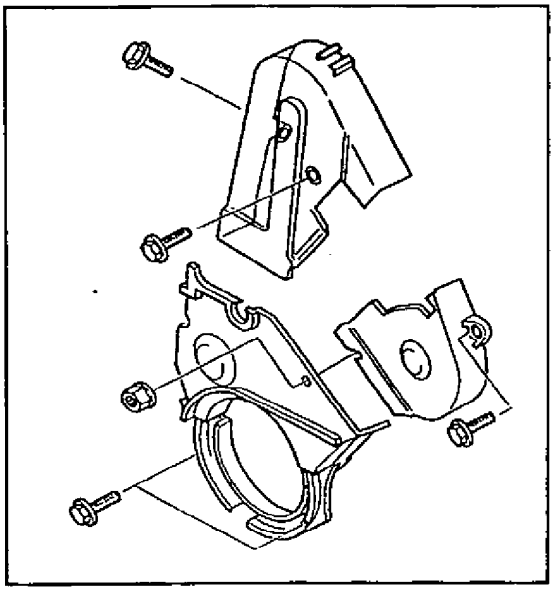
1) Remove fuel distribution pump and camshaft centering bolts, and flywheel locking tool.
2) Assemble bolt (1) and washer (2) at the end of crankshaft and rotate engine two complete turns (in normal engine rotation direction). Upon completion of the second rotation, re-align the fluwheel mark and check the alignment of the camshaft and fuel holen distribution pump pulleys with their locking bolt.
3) Place locking bolts in timing pinion, pump pinion and tool **Ref. 00000V02008** of engine flywheel lock.

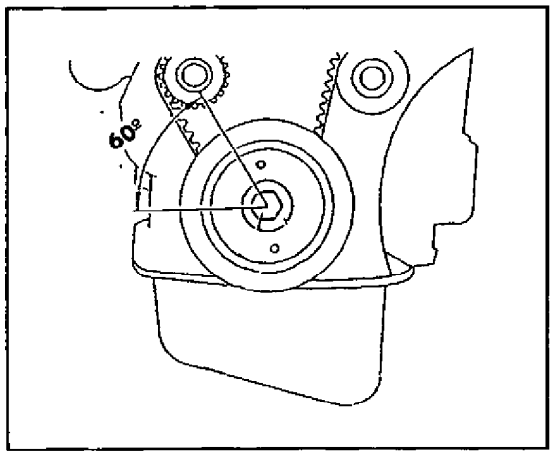


NOTE:
Engine must always be rotated in normal direction. If attaching points do not coincide (camshaft, fuel distribution pump and flywheel), repeat operation.

4) Release timing tensioner attaching bolt and nut and re-torque to their specification.

Tensioner pulley nut and bolt torque specifications:
18 Nm (1.8 kg.m, 13 lb.ft)

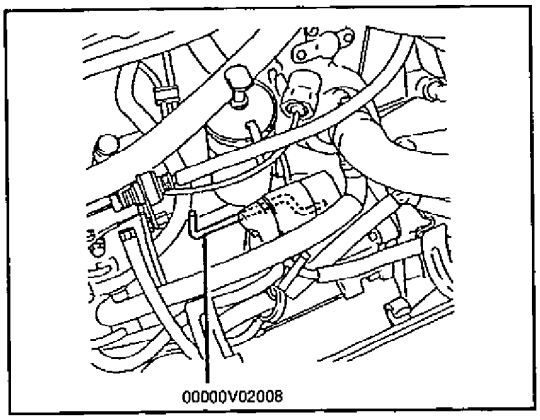




5) Remove camshaft and fuel distribution pump pulley locking bolts. Remove bolt and washer from the crankshaft pulley.
6) Assemble the three timing covers.
7) Clean and degrease the crankshaft pulley lock bolt and washer.
8) Apply **LOCTITE FRENETACH** to thread and friction area on the washer. Instal the pulley and reolace the pulley bolt and washer. Tighten to the specified torque.

Crankshaft pulley bolt torque:
40 Nm (4.0 kg.m, 29 lb.ft) PLUS 60º rotation.

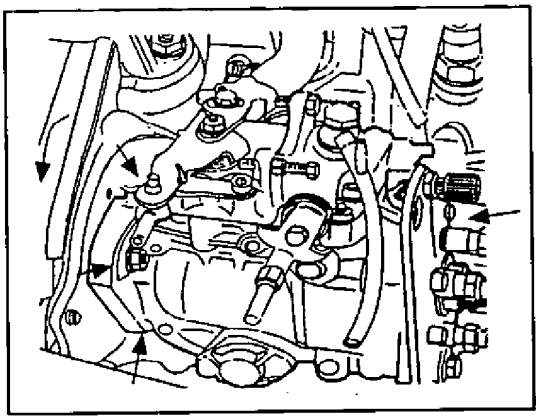
19) Remove engine flywheel retaining tool
Continue assembly operations in reverse order to disassembly.



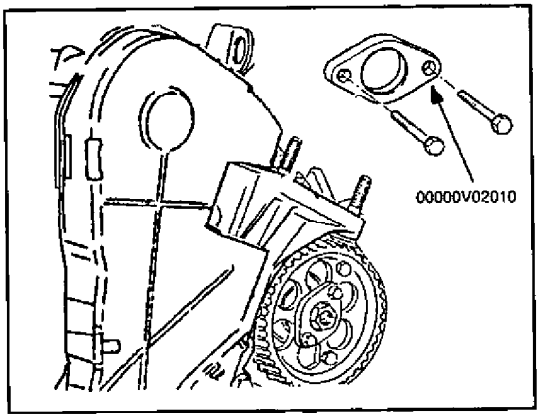
FUEL DISTRIBUTION PUMP REPLACEMENT

Disassembly

1) Remove the following components:
   - Negative battery cable
   - Throttle and fast idle cable.
   - Fuel feed and overflow lines.
   - Torque electric valve connection.
   - Timing cover of (fuel distribution pump side).
2) Remove injection lines.
3) Rotate crankshaft until position is fixed with tool **00000V02008** and it is possible to lock fuel distribution pump pulley with two bolts type M8x125x35.



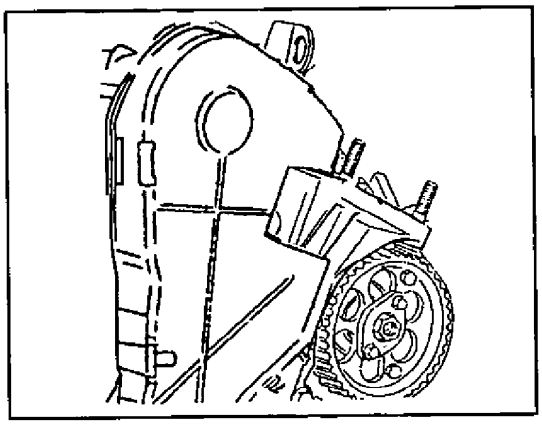
4) Remove the bolts holding the pump to the support, including back bolt, and move the pump to maximum rear position (away from the engine).



5) Slacken lock bolt from the pump to the pinion.
6) Place tool **Ref. 00000V02010** and fit it to the pump pinion with two bolts, slackening the bolt until it is completely moved.

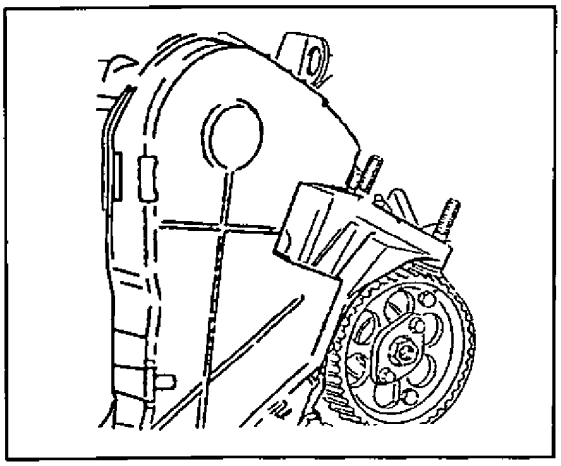
NOTE:

For pump removal and replacement it is not necessary to time the engine.



Assembly

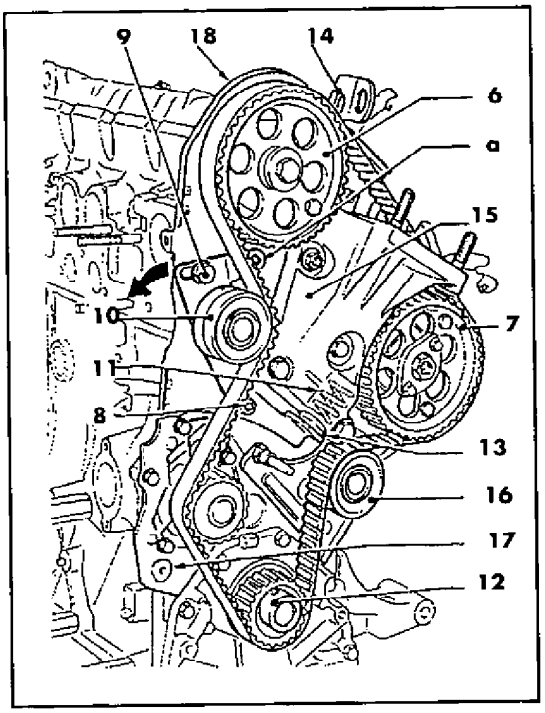
1) Disassemble tool **Ref. 00000V02010**
2) Fit pump on the support and enter the drive shaft through the pulley placing the key in the keyway.

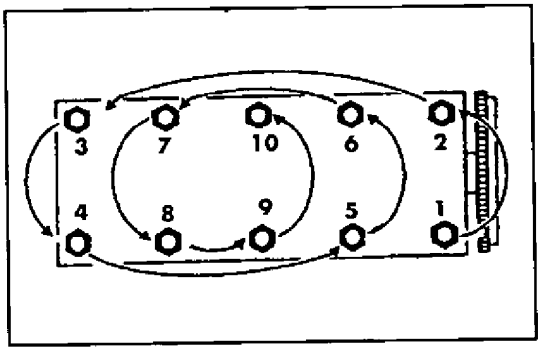


3) Fit nut to fix pinion to pump.

   Pinion to fuel distribution pump lock nut torque:
   50 Nm (5.0 kg.m, 36 lb.ft)

4) Fit the three pump lock nuts to the pinion and the back bolt using tool **Ref. 00000V02017.**
5) Remove the two pinion lock nuts from the pump.
6) Perform pump tuning up, as indicated by points 1) to 10) of fuel distribution pump overhaul and 1) to 3) checking. Adjustment revision (pages 6E3-2 and 6E3-3).
7) Carry out assembly in reverse order to disassembly.
8) Bleed system and start engine.





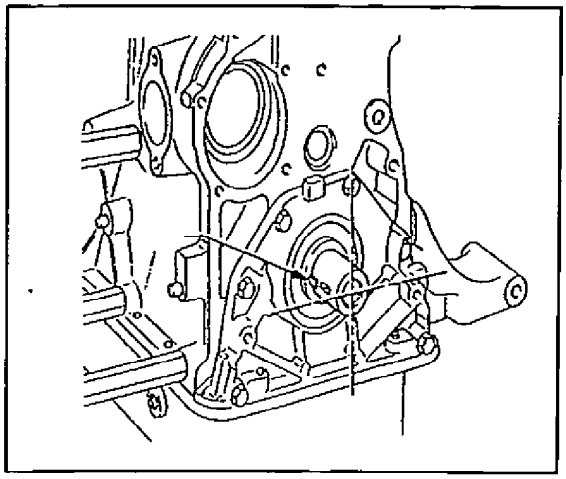
CYLINDER HEAD GASKET REPLACEMENT

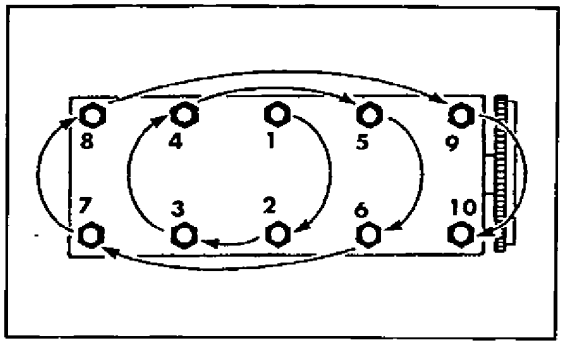
Disassembly

1) Carry out operations 1) to 9), indicated for Air Intake System, 6A4-18.
2) Carry out operations 2) to 14), indicated for Valve clearance adjustment, 6A4-6.
3) Disconnect, unclip and separate hoses and pipes connected to cylinder head.
4) Remove the collection bowl outlet of the first part of exhaust.
5) Remove the injection lines.
6) Slacken tensioner pulley (10) backplate bolt (8) and nut (9).
7) Insert a 3/8″ drive into the recess in the tension pulley backing plate (10) at the point "a". Lever the plate against the tensioning spring (11) to relax the belt tension.
8) Re-fit the bolt (9) to lock off the tension.
9) Remove the following elements:
   - Timing belt.
   - Camshaft pulley fastening bolt
   - Tensioner pulley (10), recovering the follower (13) and spring (11).
10) Remove the tensioner spring lock upper bolt.
11) Slacken the cylinder head bolts, progressively, following the order shown opposite.
12) Remove the cylinder head and remove the gasket, using tools **Ref. 00000V2015** and **00000V02016**.

Inspection

1) Please refer to engine assembly repair 6A4-25 and next section.



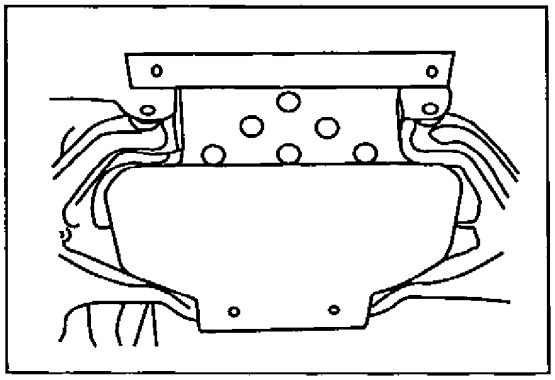


Assembly

1) Turn crankshaft until the pistons are midway up the cylinder bores and the crankshaft pinion key is at 9 o'clock position.
2) Once the inspection and repair is completed, fit new gasket and the cylinder head on the block.
3) Check the lengths of each cylinder head bolts (as indicated in engine general repair section) and apply **MOLICOTE G PLUS RAPID** on threads and washers (washers must always be replaced with new parts) Fit the bolts.
4) Tighten head bolts using tools **Ref. 00000V02015 and 00000V02016.** Apply as specified in sequence indicated.

   - **Initial torque: 20 Nm (2.0 kg.m, 14.5 lb.ft)**
   - **Subsequent torque: 60 Nm (6.0 kg.m, 13.5 lb.ft)**
   - **Angular: 180º**

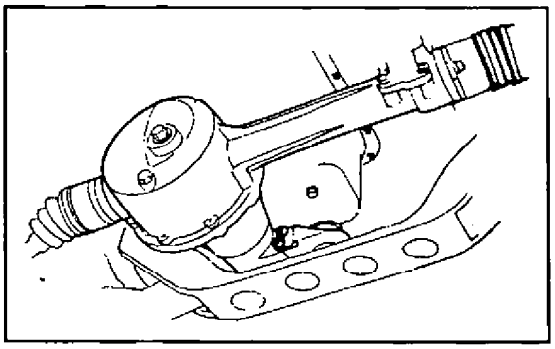
5) Continue assembly in reverse order to disassembly.
6) Time the engine (pages 6A4-9)



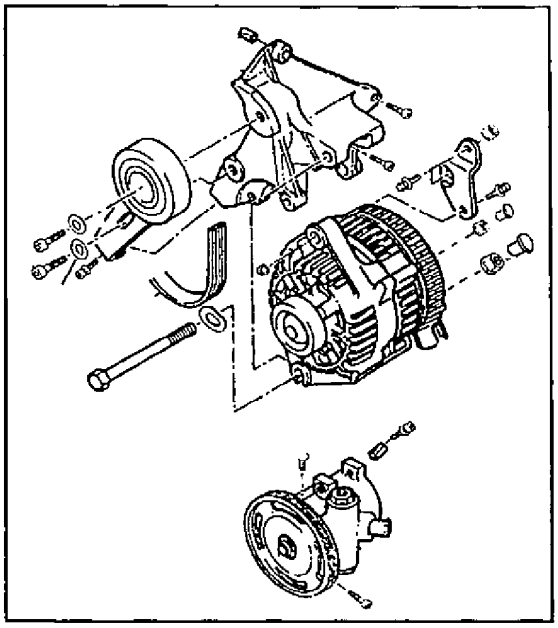
OIL SUMP AND OIL PUMP

Disassembly

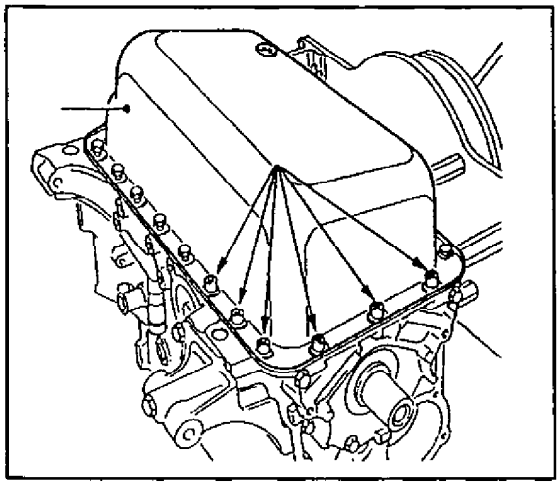
1) Disconnect negative battery cable.
2) Lift the vehicle.
3) Remove lower engine soundproof cover.



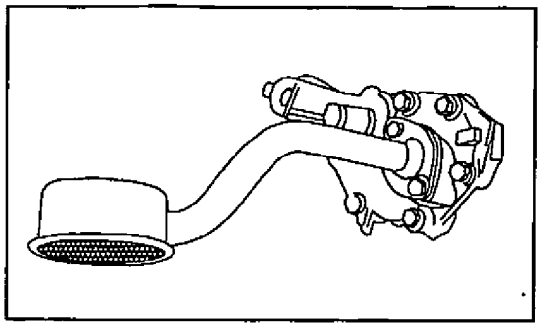
4) Drain the front differential oil.
5) Disconnect front axle assembly, and remove.



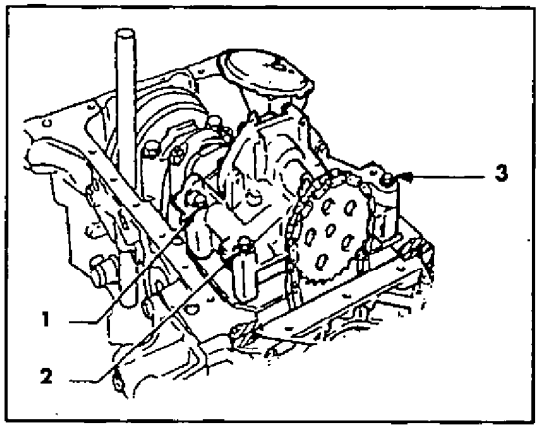
6) Loosen alternator tensioner and disassemble:
   - Belt.
   - Alternator.
   - Power steering pump.
   - Alternator mount and pump.



7) Remove plug and drain oil sump.
8) Loose bolts attaching sump to block and remove sump.



9) Loosen two attaching bolts and remove the oil pick up.



10) Take out two oil pump attaching bolts (1), (2) and (3), noting that bolt No.1 is different and serves to align the pump.
11) Remove oil pump.
12) Disassemble oil baffle attaching bolts and extract if necessary.

Assembly

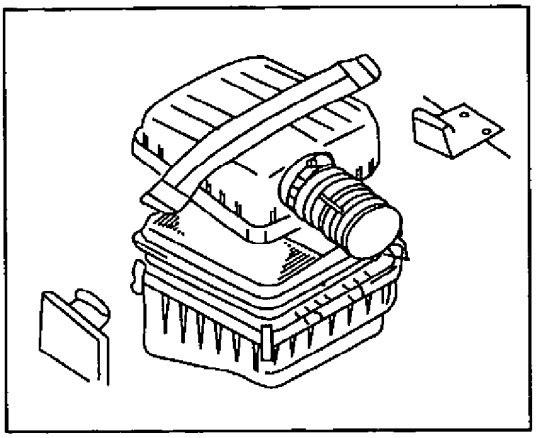
1) Replace pump and chain.
2) Attach pump with bolts.

NOTE:
Bolt No.1 is different and aligns the pump.

Torque specifications for oil pump attaching bolts:
20 Nm (2.0 kg.m, 15.5 lb.ft).

3) Continue assembly in reverse order to disassembly, applying sealing to oil sump and providing all elements with the corresponding torque specification.

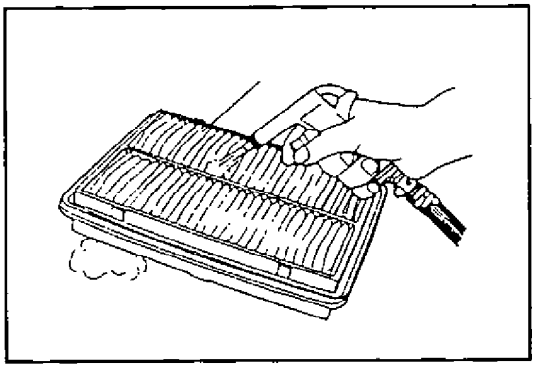
Torque specifications for oil sump attaching bolts:
20 Nm (2.0 kg.m, 15.5 lb.ft).



AIR FILTER

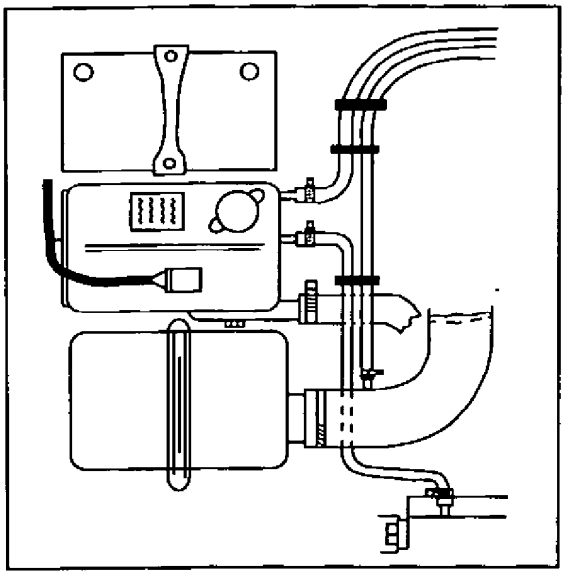
Cleaning

1) Release air filter attaching strap.
2) Disconnect four clips attaching upper body and extract filter.
3) Remove dust by blowing compressed air onto outlet side of element.



Replacement

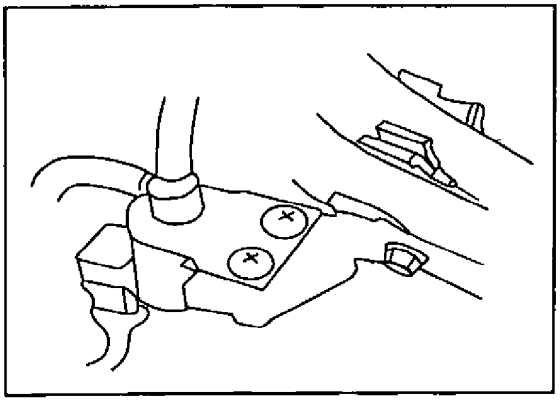
1) Release air filter attaching strap.
2) Disconnect four clips securing upper body and extract filter element.
3) Install a new element in the air filter box.



OF AIR INTAKE SYSTEM

Inspection

1) Disconnect battery.
2) Remove air filter assembly and turbocompressor hose.
3) Remove the expanding cylinder, joining bolt and cooler gauge connector hoses.
4) Remove coolant expander reservoir.
5) Disassemble turbocompressor and exhaust manifold.
6) Disassemble EGR electric valve and its hoses.
7) Slacken flexible hose clamps at the EGR side and the timing frame.
8) Disconnect turbocompressor oil drain line from its union with the block, and then remove the turbocompressor.
9) Slacken the 7 attaching bolts to intake manifold and remove this.

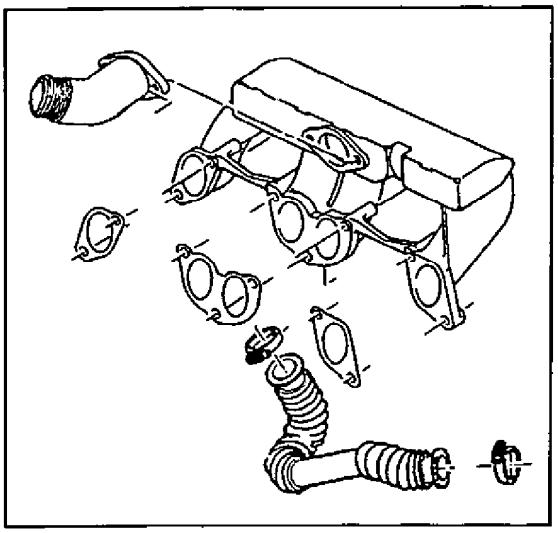


Inspection

1) Check cylinder head intake manifold mating surfaces for flatness and evenness, replacing if necessary.
2) If the inlet manifold is not being replaced, clean surfaces and apply sealant before assembling to cylinder head.
3) Renew inlet manifold gaskets with new ones.

Assembly

1) Assemble in reverse order to disassembly, following specified torque specifications and following recommendations given.

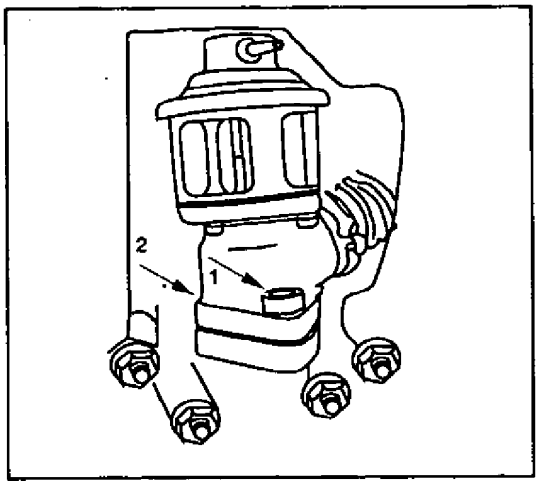


NOTE:
Use jubillee clips for fixing EGR valve flexible hose.

Torque specifications for intake manifold bolts:
25 Nm (2.5 kg.m, 18 lb.ft).

Torque specifications for exhaust manifold nuts:
15 Nm (1.5 kg.m, 11 lb.ft).

Torque specifications intake manifold flange nuts:
15 Nm (1.5 kg.m, 11 lb.ft).

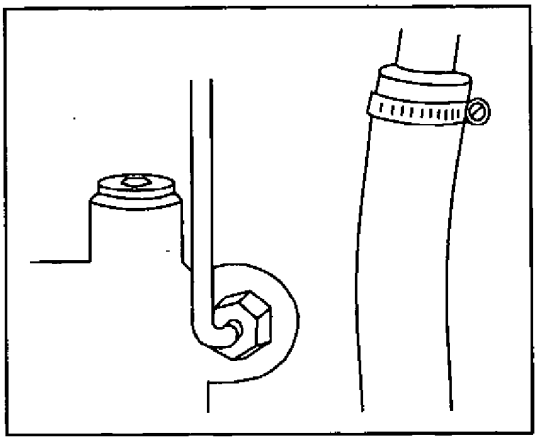


TURBOCOMPRESSOR REPLACEMENT

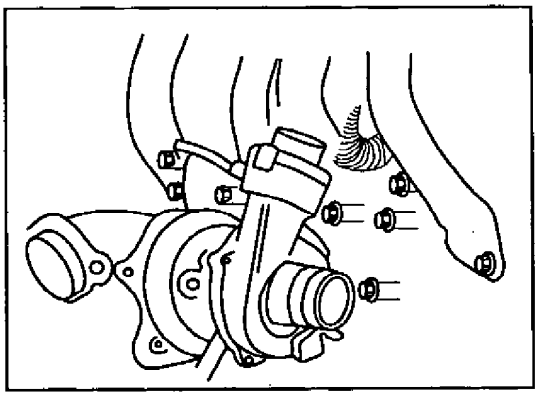
Disassembly

Perform the following operations:

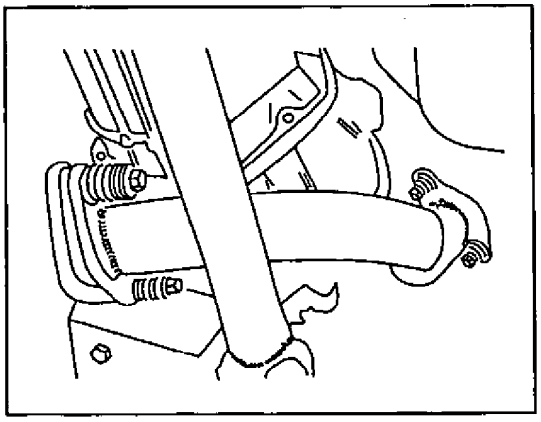
1) Remove battery, coolant expander reservoir and air filter assembly and inlet line.
2) Disconnect bolts (1) connecting EGR (2) to exhaust manifold.



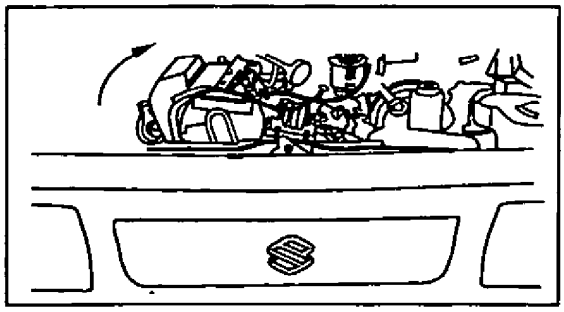
3) Disconnect turbocompressor oil drain pipe at its union with engine block.
4) Disconnect turbocompressor flexible oil drain pipe.



5) Disconnect turbocompressor gas outlet elbow and plug its inlet and exhaust nozzles.
6) Slacken the six nuts attaching exhaust manifold to cylinder head.



7) Remove the fist exhaust section.



8) Disconnect the three bolts from the right side and the left side engine mount silentblock.
9) Lift the engine with a crane towards the left, until the exhaust manifold assembly and turbocompressor can be removed from the right side.

Inspection and replacement

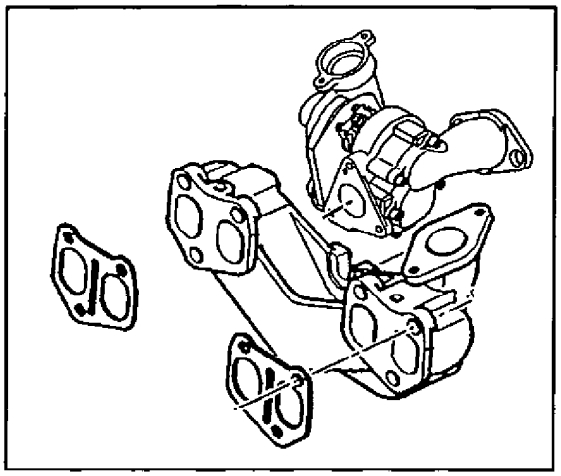
1) Separate turbocompressor from the exhaust manifold by disconnecting the three joining bolts.
2) Check the evenness of exhaust manifold.
3) Replace turbocompressor if it is defective.

NOTE

Turbocompressor attaching nuts must always be replaced with new ones.

Assembly

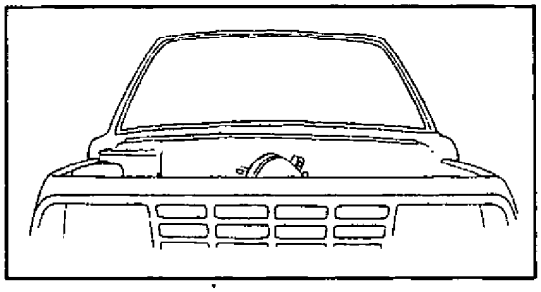
1) Carry out assembly in reverse order to disassembly, applying the torque specifications stated in the table at the end of this section.

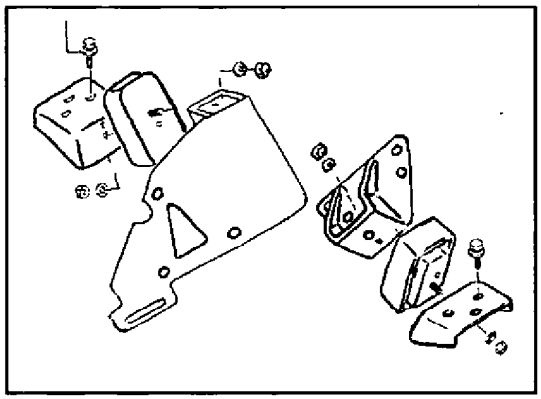


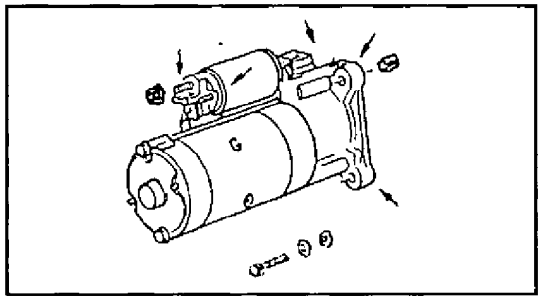
NOTE:

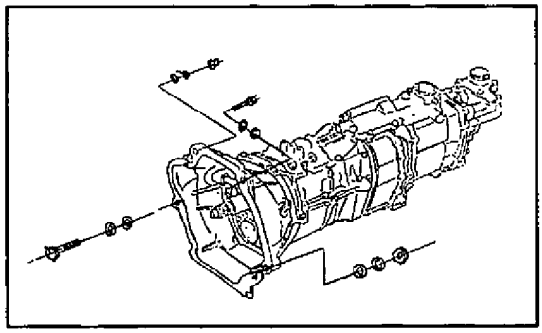
When starting up engine, the following procedure is essential:

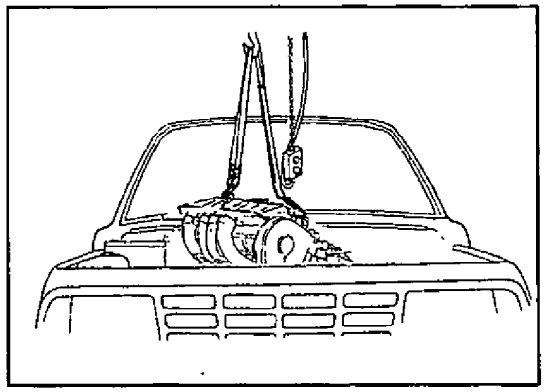
- **Disconnect the torque electric valve fuel at-off valve connection an the fuel distribution pump connection.**
- **Switch on until engine oil pressure light goes off.**
- **Connect again the torque electric valve fuel at-off valve connection an the fuel distribution pump connection.**
- **Start the engine and let it turn at idle speed for 30 seconds, approximately.**
- **Check the tightness of the different connectors.**











REMOVAL OF ENGINE ASSEMBLY

Disassembly

Perform the following operations:

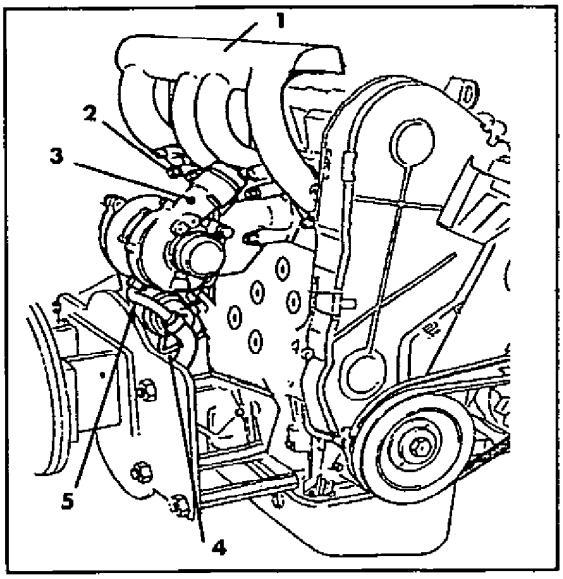
1) Remove battery.
2) Drain out cooling system.
3) Remove engine bonnet.
4) Remove section No.1 of the exhaust manifold.
5) Remove flexible air pipe between filter and turbocompressor.
6) Remove fuel filter.
7) Remove cooling pipes, fuel, power steering lines and electrical connections of the engine room.
8) Remove coolant header tank and air filter.
9) Remove throttle and clutch cables.
10) Slacken right side engine mount three attaching bolts to chassis and rubber silentblock attaching bolt.
11) Slacken left side engine mount three attaching bolts to chassis and rubber silentblock attaching bolt.
12) Remove starter motor.
13) Remove the fasteners between the bell housing and the engine.
14) Take out engine with a crane.

Assembly

1) Carry out assembly in reverse order to disassembly, applying the corresponding torque specifications.

Torque specification engine mount to chassis:
40-50 Nm (4.0-5.0 kg.m, 29-36 lb.ft).

Torque specification silentblock to mount:
50-60 Nm (5.0-6.0 kg.m, 36-43 lb.ft).



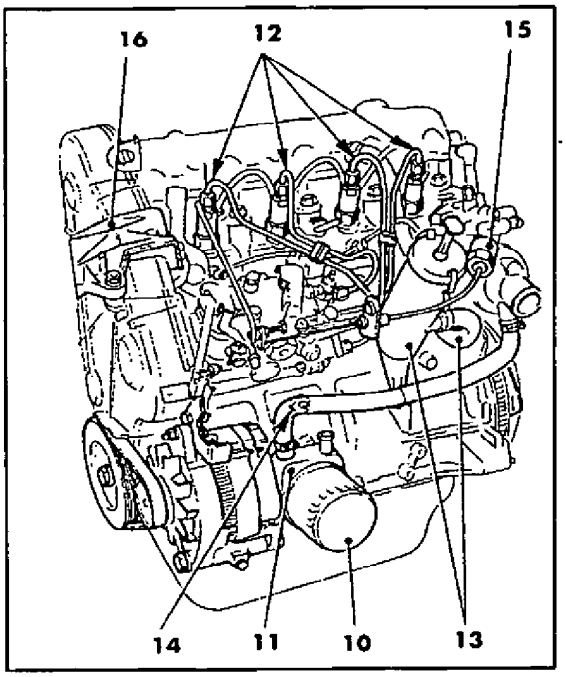
ENGINE BLOCK REPAIR

ENGINE DISASSEMBLY

Exterior components

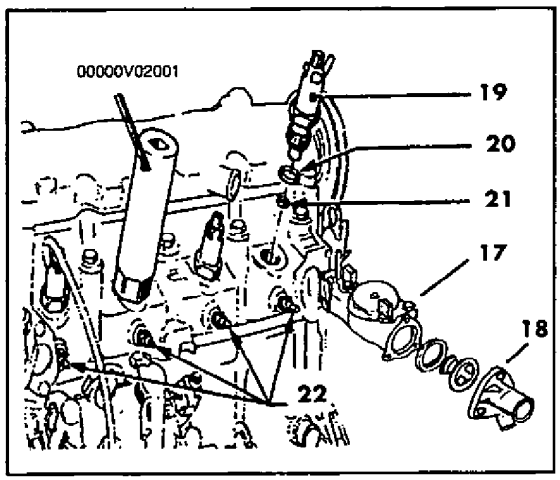
Remove the following components:

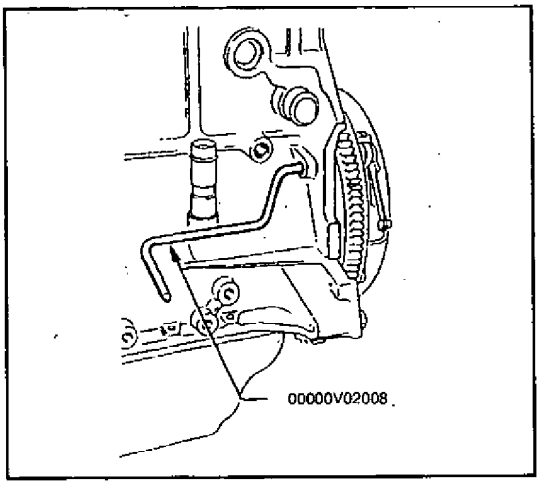
1) TDC pickup.
2) Vacuum pump belt.
3) Vacuum pump and pump mount.
4) Alternator.
5) Power steering pump.
6) Alternator and power steering pump brachets.
7) Turbocompressor oil feed and return lines (4) and (5).
8) Inlet and exhaust manifolds together with the turbocompressor (1), (2) and (3).

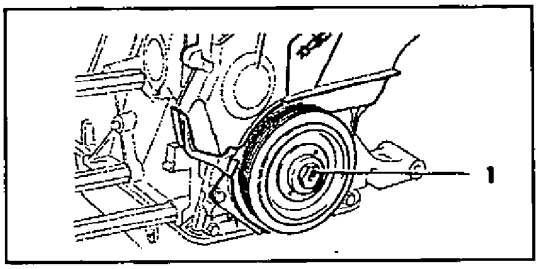


Continue removing the following components:

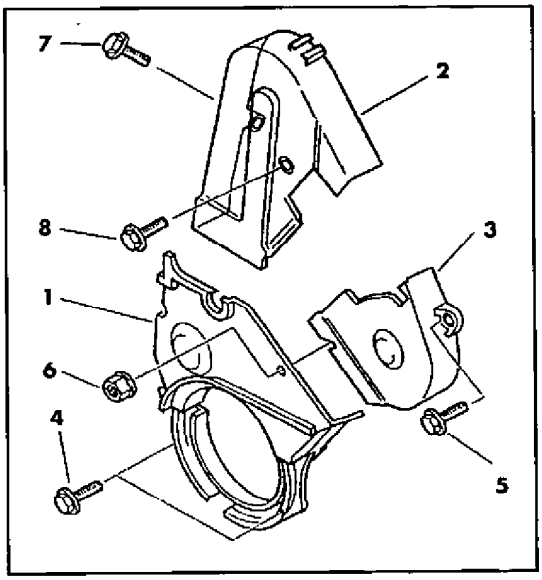
1) Oil filter (10).
2) Oil cooler (11).
3) Fast idle control (15).
4) Injectors lines (12).
5) Pre-heating plug lines.
6) Oil filler neck and blowby gas separator assy (13).
7) Oil pressure switch (14).
8) Dummy engine mount (16).
9) Thermostat housing (17) and (18).
10) Injectors using tool **Ref 00000V02001**, (and recovering the fire cutoff and sealing washers (20) and (21)).
11) Glow plugs (22).

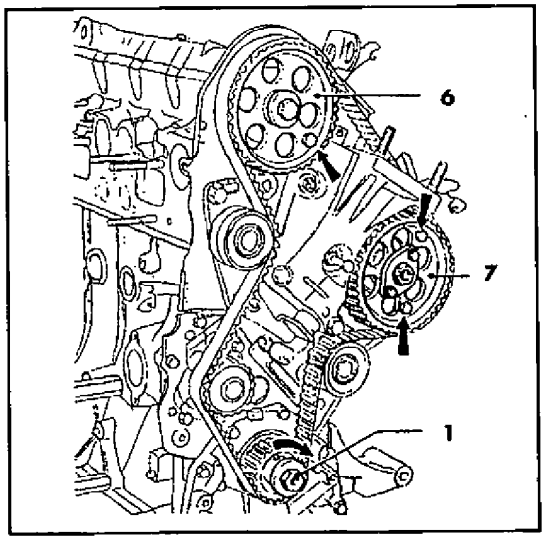






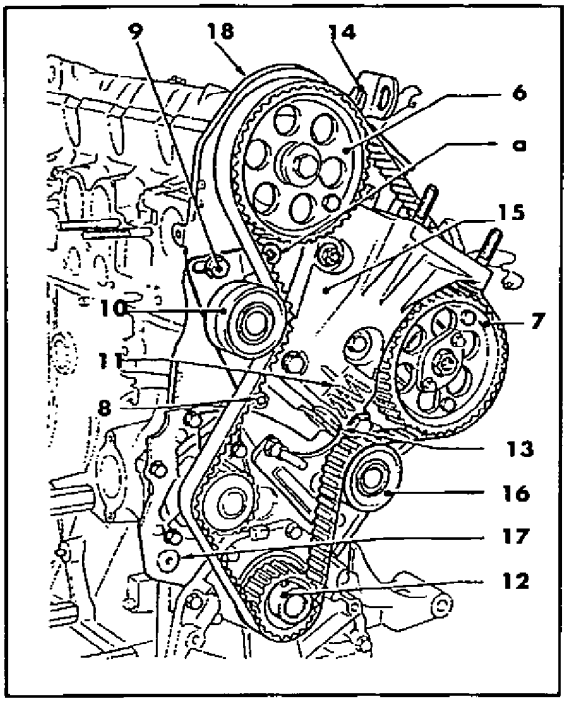
Lock the flywheel using tool **Ref. 00000V02008.**
Remove the following components:
1) Pulley attaching bolt (1).
2) Clutch mechanism.
3) Cranhshaft pulley.
4) Flywheel locking tool **Ref. 00000V02008.**
5) Right cam belt cover bolt (5) and nut (6).
6) Left cam belt cover (2) bolts (7) and (8).
7) Lower cam belt cover (1) bolts (4).



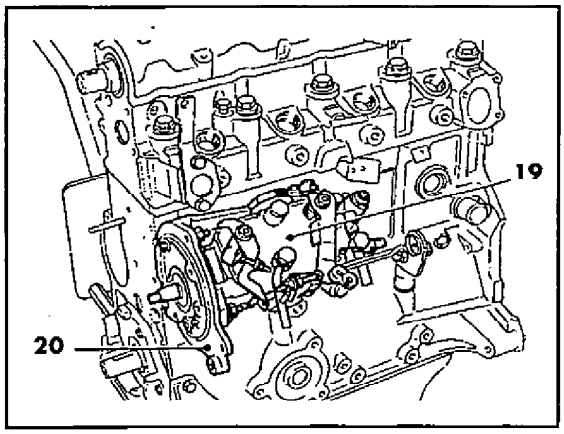


Timing belt disassembly.
1) Fit bolt (1) and washer at crankshaft pinion.
2) Rotate engine until camshaft (6) and fuel distribution pump (7) pulleys align with the lock bolt tapping.
3) Lock camshaft using bolt M8 x 125 x 40 and the fuel distribution pump with two bolts M8 x 125 x 35.

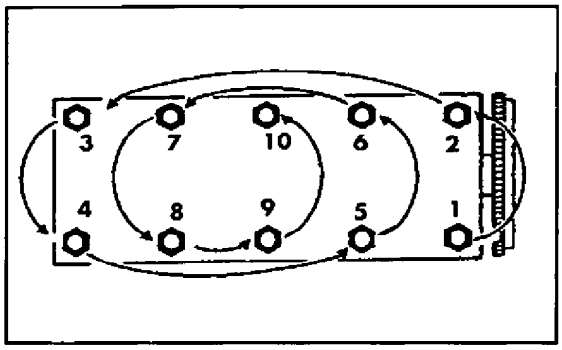
NOTE:
Bolts should be tightened by hand.



4) Slacken nut (8) and bolt (9) of tensioner pulley mount (10).
5) Insert a 3/8" drive into the recess in the tensioner pulley backing plate (10) at the point "a". Lever the tensioner against the spring (11) to relax the belt tension.
6) Tighten the bolt (9) again.
7) Remove timing belt.
8) Take out the camshaft (6), fuel distribution pump (7) and crankshaft (12) pulleys and recover the keys.
9) Take out the tensioner pulley (10) and recover the thruster (13) and spring (11).
10) Remove the dummy engine mount (15) and the fixed pulley (16).
11) Remove water pump (17).

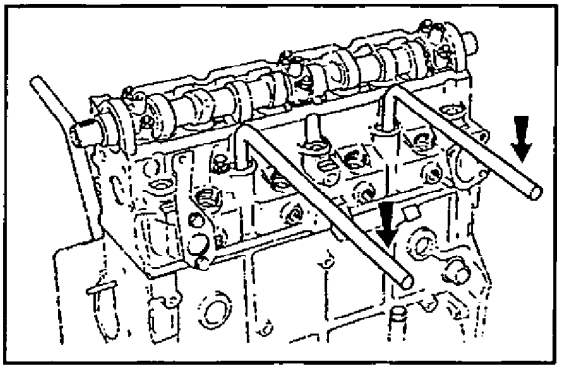


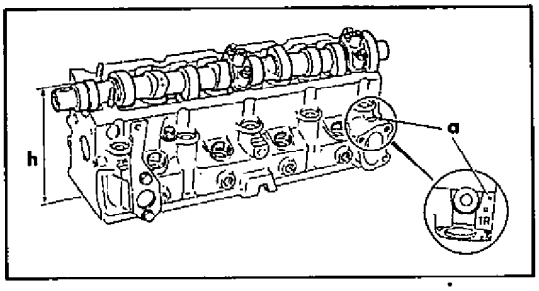
12) Remove fuel distribution pump (19) and housing (20).



Cylinder head disassembly

1) Remove rocker arm cover.
2) Slacken the cylinder head bolts progressively, following the order shown opposite.
3) Dismount cylinder head and remove gasket.



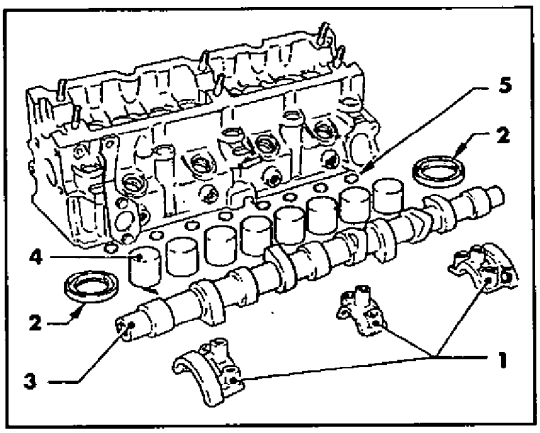


CYLINDER HEAD INSPECTION

1) Measurement of cylinder head height should be carried out with camshaft in position and secured by two caps (h) measurement being taken of the oilseal diameter (the larger diameter).

(h). Nominal: from 157.40 to 157.75mm (6.197 to 6.211 ins).

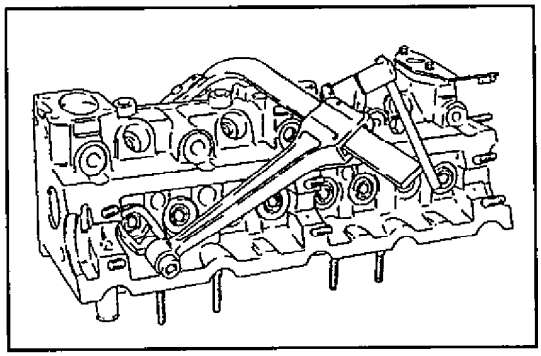
2) The maximum distortion permitted for the camshaft is **0.07 mm (0.003 in),** (the camshaft should turn freely on cylinder head).
3) Maximum admitted rectification of cylinder head gasket face is **0.40 mm (0.016 in)** with respect to nominal height measure (h).
4) Rectified cylinder heads should be marked by stamping an **R** in the area (a).

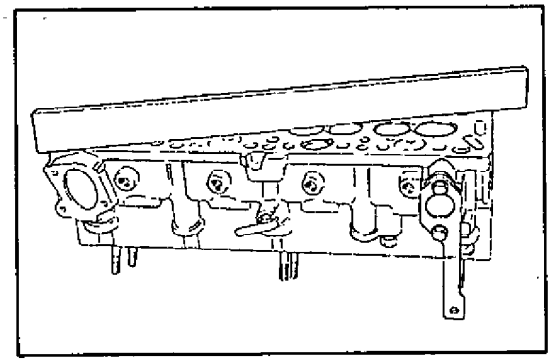


5) When the head gasket face of the cylinder head is rectified the following operations should be carried out:
   - **Rectify valve seats to ensure they are correctly levelled.**
   - **Replace turbulence chambers (pre-chambers) with oversize chambers and level up correctly.**
   - **Fit compensating washers of 0.4 mm (0.016 in) below valve springs**

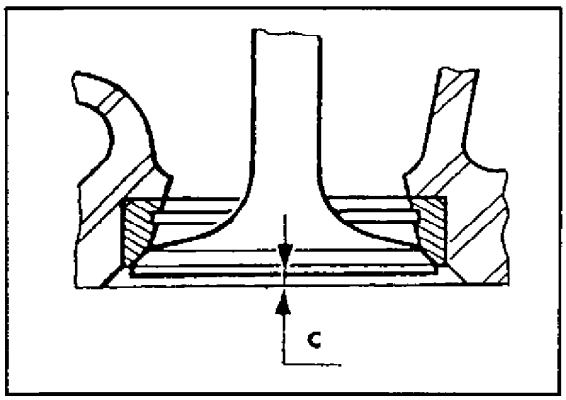
6) Cylinder heads with under-size camshaft bearings **(+0.5 mm)** are marked with a (1) in the area indicated (a).
7) Remove the following components from cylinder head and place them in same order as that for assembly.
   - Camshaft covers (1).
   - Oilseals (2).
   - Camshaft (3).
   - Tappets (4).
   - Shims (5).
8) With the aid of a valve extractor, remove the following components from cylinder head:
   - The 8 valves.
   - Turbulence chambers.
9) Clean cylinder head using **DECAPLOC 88.**
10) Check cylinder head distortion.

Maximum distortion = 0.07 mm (0.003 in).





11) Check condition as indicated in section on cylinder head repair:
   - Valve seats and guides.
   - Valves.
   - Valve springs.
   - Turbulence canisters.
   - Camshaft.
   - Camshaft supports.
   - Threads

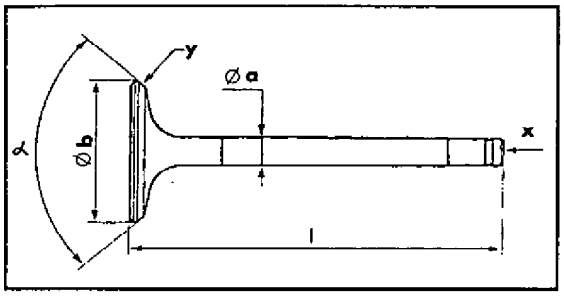


CYLINDER HEAD REPAIR

1) If after checking the cylinder head gasket face level, rectifications have to be made, it is necessary to check valve depth after rectification and rectify seats to establish correct depth (c).

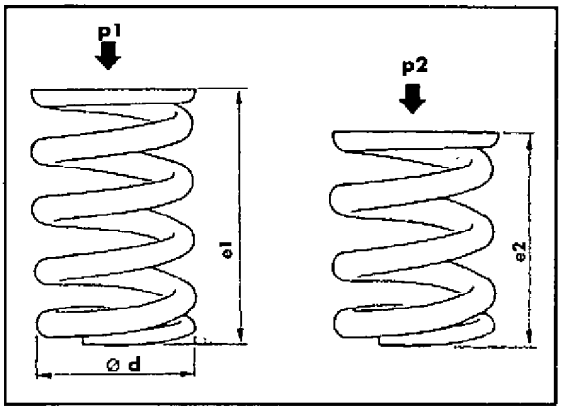
Valve depth (dimension c)
Intake 0.5 a 1.05 mm (0.020-0.041 in).
Exhaust 0.9 a 1.45 mm (0.020-0.041 in).

2) Checking valves.



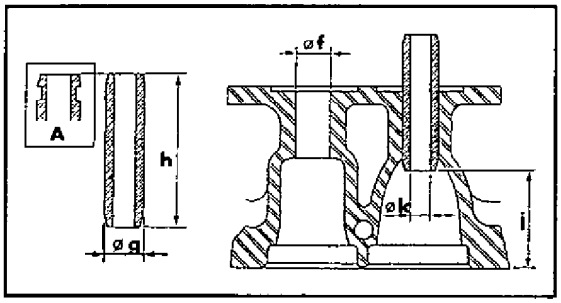
	Intake	Exhaust
L min.	112.5	
Øa + 0 - 0.015	8.005	7.985
Øb. + /-0'1	38.5	33
Angle	90º	90º

3) Checking valve springs.



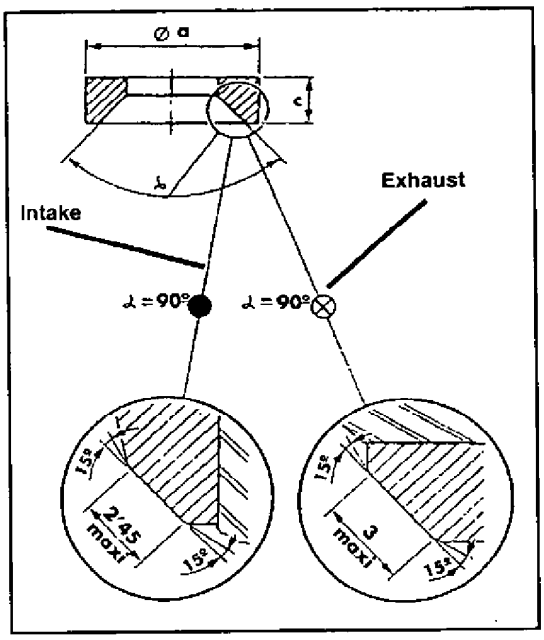
DIAMETER d : 29	
P1: kg/N	18/180
e1	42.4
P2: kg/N	45/450
e2	33.3

4) Valve guides.
When valve guides are removed, and oversize guides are to be inserted, the valve guide bores in the cylinder head must be machined to suit the oversize the guides according to the dimensions shown.



	Ø: g	Ø: f	h	j	Ø: k
Tolerance	0	0.032	0.25	0.5	0
	-0.011	0	-0.25	-0.5	+0.2
Original value	14.02	13.981	52.00	36.5	8.02
	14.13	14.051			
1st Repair	14.29	14.211			
2nd Repair	14.59	14.511			

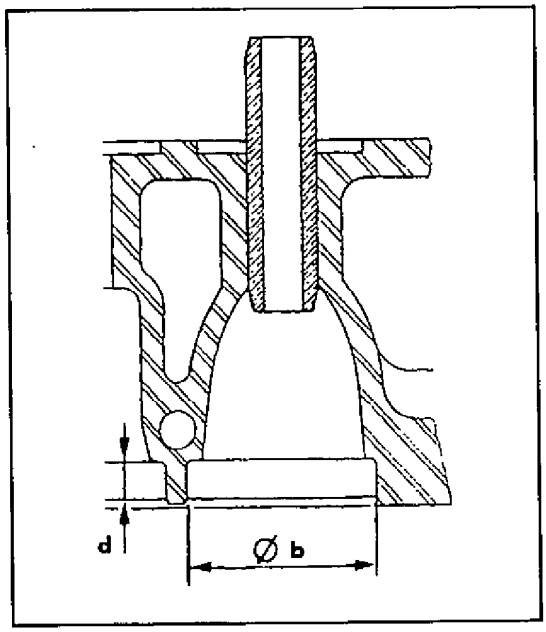
NOTE:
Value K is achieved once guides have been fitted in cylinder head.



5) **Valve seats.**
When valve seats are removed, the housing must be machined to accept a new oversize seat.

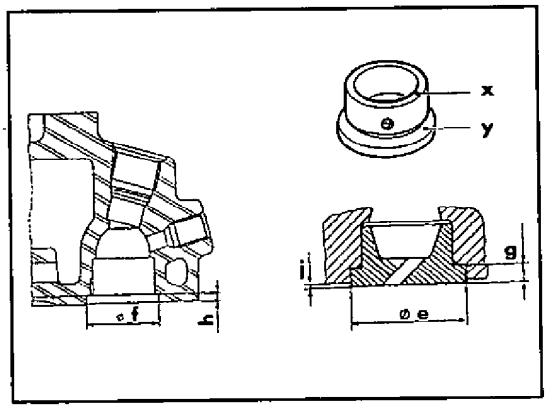
The required measurements are shown in the tables below.

	INTAKE			
	Ø: a	Ø: b	c	d
Tolerance	0 - 0.025	+/- 0.025	0 - 0.01	+/- 0.15
Value original	40.161 40.361	40 40.2	6.25 6.45	8.267 8.467
1st Repair	40.461	40.3	6.45	8.467
2nd Repair	40.661	40.5	6.45	8.467



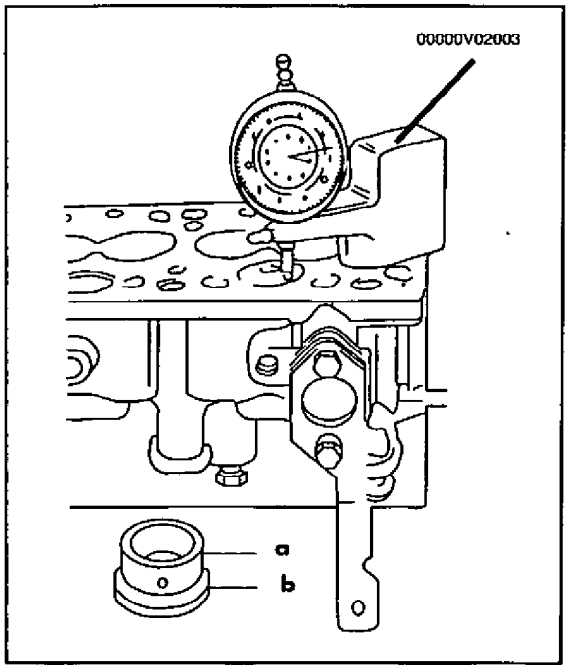
	EXHAUST			
	Ø: a	Ø: b	c	d
Tolerance	0 - 0.025	+/- 0.025	0 - 0.01	+/- 0.15
Value original	34.137 34.337	34 34.2	6.05 6.25	8.15 8.35
1st Repair	34.437	34.3	6.25	8.35
2nd Repair	34.637	34.5	6.25	8.35

6) Turbulence canisters.
When it is necessary to machine the cylinder head surface, it is important to remove the pre-chambers first. To fit new ones, it necessary to machine the housing and then machine new canisters in areas (x) and (y) so that they remain level with the cylinder head surface.



Machining of turbulence canister housing.

	Ø: e	Ø: f	g	h
Tolerance	0.099 - 0.06	0.039 0	0.02 - 0.025	0.02 -0.04
Value original	32.05 32.25	32 32.2	4.00 4.1	3.90 4.0
1st Repair	32.45	32.4	4.2	4.1
2nd Repair	32.65	32.6	4.3	4.2

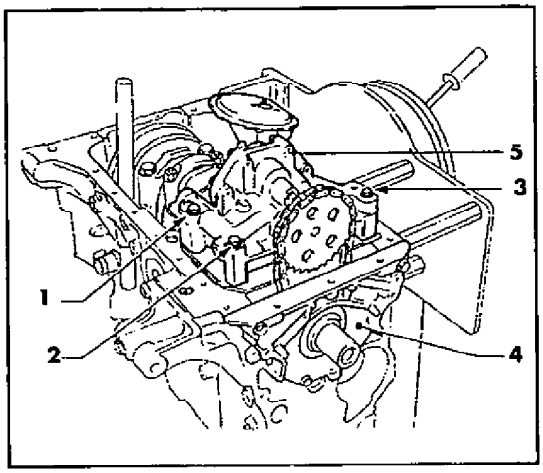


Use dial gauge special tool 00000V2003 to check the level of the canisters to me tolerance below:

Pre-chamber leve tolerance:
from 0.00-0.03 mm (0.000-0.001 in)

NOTE:
When major fissures (over 2 mm.) are noted in pre-chamber window, this should be replaced.

7) Assembling cylinder head.
Fit the valves, springs, new valve guide retainers (using tool **Ref.00000V02009**), tappets, adjustment plates and camshaft to the cylinder head.
Adjust the valve clearances as described in sections 6A4-5 and 6A4-6 "Valve clearance checking and adjustment".



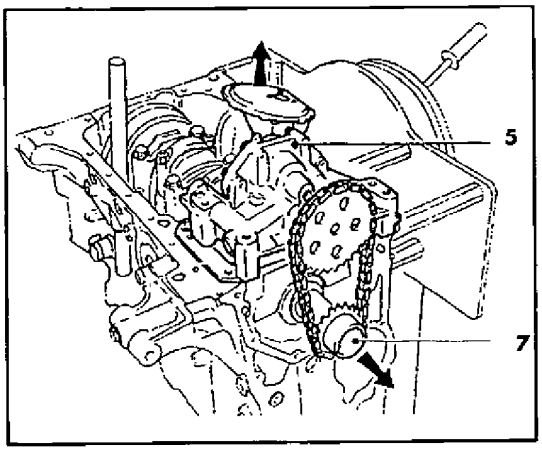
ENGINE BLOCK DISASSEMBLY

From the underside of engine remove the following components:

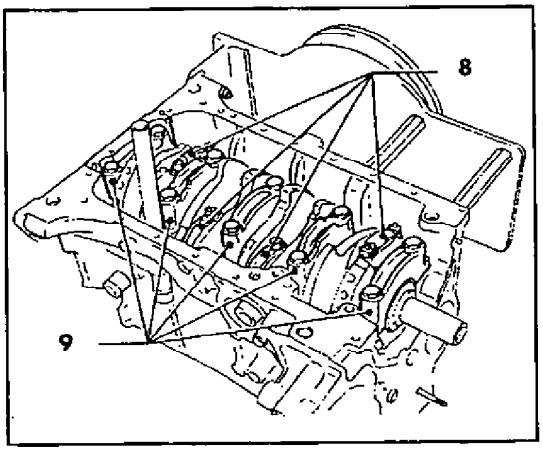
1) Oil pan.
2) Two oil pump pickup bolts, removing the pick-up.
3) Oil pump (5) bolts (1), (2) and (3) and retainer holder (4).

NOTE:
Bolt no. 1 is special since it serves to align the pump.

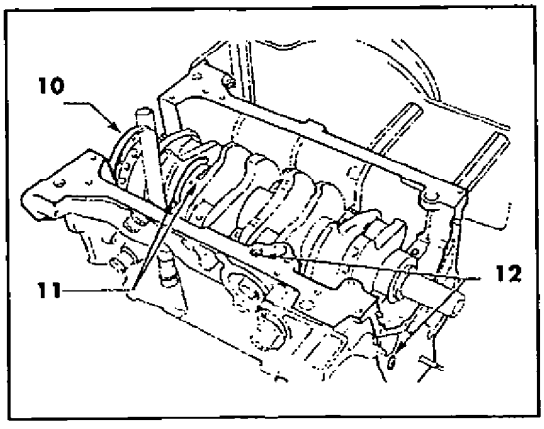
4) Remove the four baffle attaching bolts, removing the baffle.

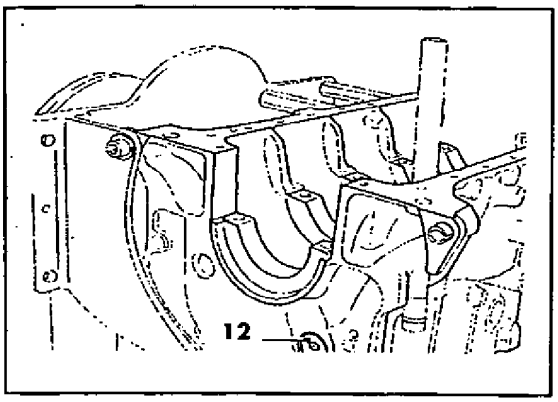


5) Prise the pump (5) and remove with chain and crankshaft pinion (7), recovering the key.

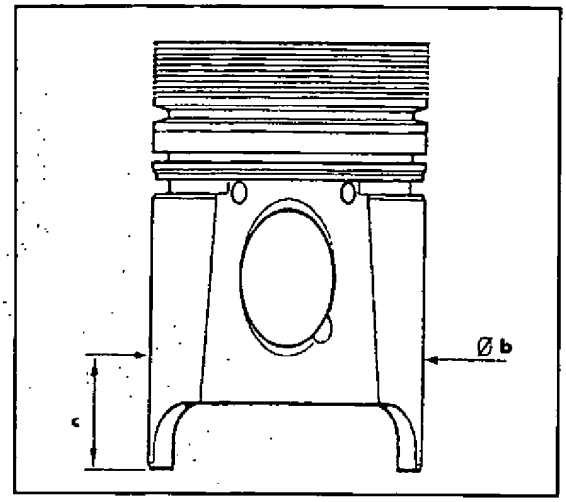


6) Remove the following components:
   - Connecting rod caps (8), marking them with a marker pen.
   - Main bearing caps (9), (welding mark).
   - Crankshaft shims installed in crankshaft support no. 2.
   - Oilseal (10) and shims adjusting axial play (11).
   - Crankshaft, main bearing shells and connecting rod assemblies.





7) Unfasten connecting rods by releasing circlips.
8) Remove oil gallery caps. (12).

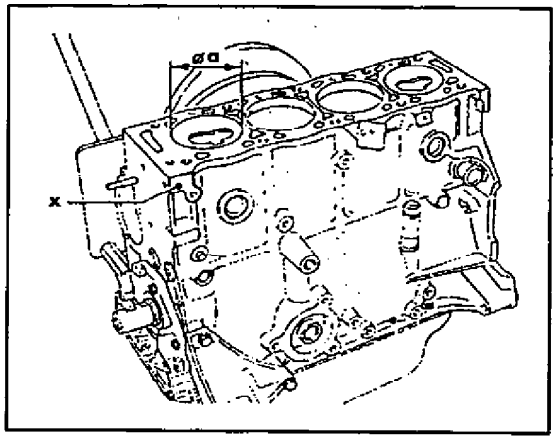


CYLINDER BLOCK REPAIR

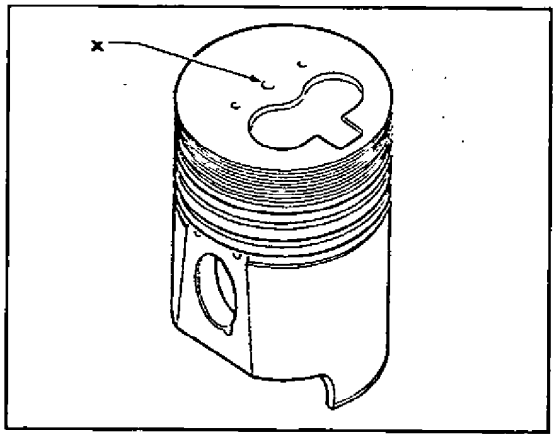
1) Matching up cylinder and piston.
Measure internal diameter of cylinders and external diameter of the pistons and determine the rectification that is necessary according to the following table. The piston diameter "b" must be measured at a distance "c" from the base.

Distance (c) = 25.00 mm (1.00 in).

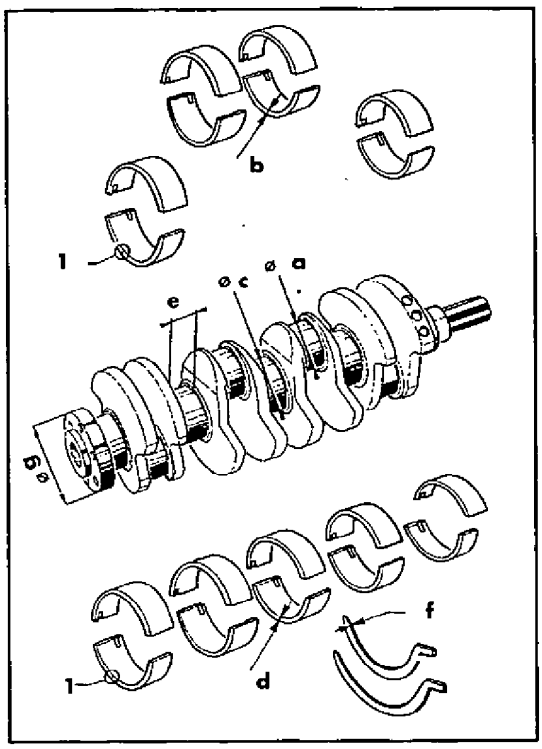
Scribe the relevant rectification mark (R1, R2 or R3) on the block in position (x).



		CYLINDER		PISTON	
	Mark (x)	Diameter (a)	Tolerance	Diameter (b)	Tolerance
Value original	NONE	83		82.93	
	A1	83.03	+ 0.018	82.96	+ 0.009
1st Repair	R1	83.2	- 0	83.13	- 0.009
2nd Repair.	R2	83.5		83.43	
3rd Repair.	R3	83.8		83.73	



Diameter of piston pin: 28 mm.



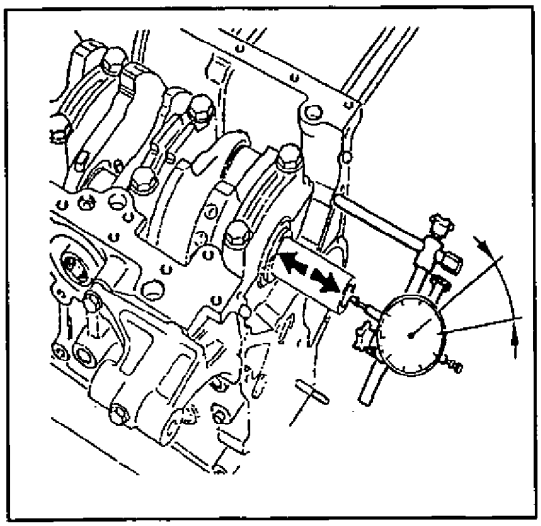
2) Cranhshaft repairs
Measure the main bearing and big-end journals. Machine to undersize if necessary. If machining is necessary (see the table below) use oversize shell bearings. These are marked with white paint on the side.

The following dimension are in mm:

	Ø: a	b	Ø: c	d
Tolerance	0	0.003	0	0.003
	- 0.016	- 0.003	- 0.019	- 0.003
Original	50	1.827	60	1.842
1st Repair	49.7	1.997	59.7	1.992

NOTE:
Connecting rod and main bearing shells in first repair should be identified with a white paint marking on the edges.

3) Crankshaft thrust clearance adjustment.
Crankshaft thrust play should be between **0.07-0.32 mm (0.003-0.012 in)** It is secured by four crescent shims, two located on the block and two on the main bearing cap no.2. They should be fitted with their copper side facing towards crankshaft.



The following dimension are in mm:

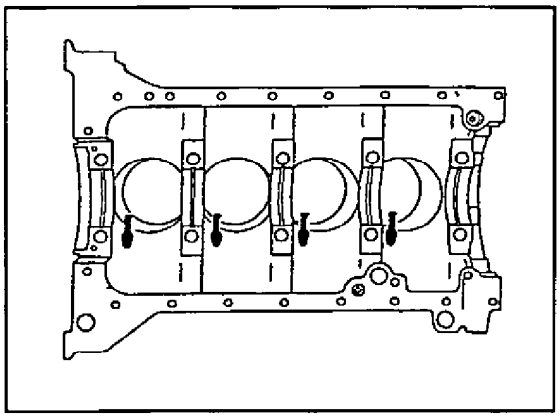
	Main bearing No. 2		Axial shim thickness	
	e	Tolerance	f	Tolerance
Value original	26.6	+ 0.05 - 0	2.305	+ 0.025 - 0.025
1st Repair	26.8		2.405	
2nd Repair.	26.9		2.455	
3rd Repair.	27		2.505	

4) Rear retainer seat.
Check diameter of crankshaft wrist pin and rectify if necessary.

The following dimension are in mm:

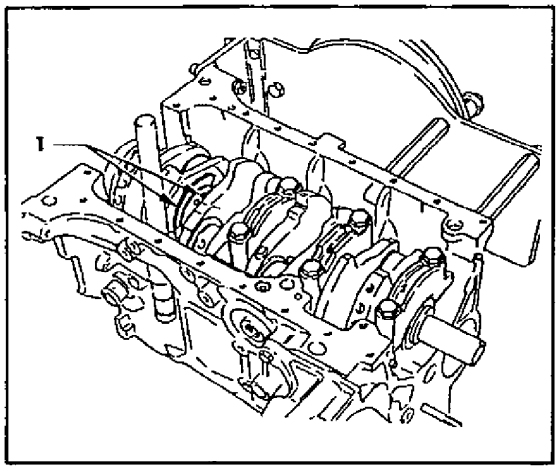
Dimension	Ø = g	Tolerance
Value original	90	+ 0 - 0.087
1st Repair	89.80	

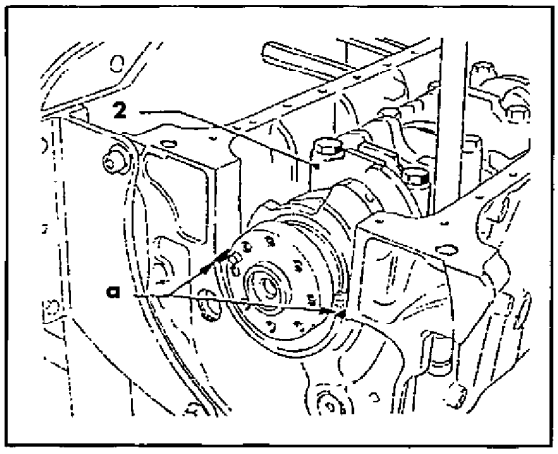
5) Cleaning block and crankshaft.
Clean with degreasing product, inserting a suitable brush in internal holes of cylinder block and crankshaft.



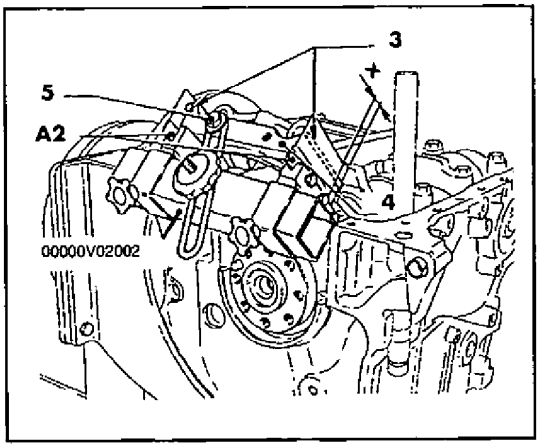
CYLINDER BLOCK ASSEMBLY

1) Crankshaft assembly.
   - Replace oil gallery plugs using thread lock an their threads.
   - Replace the oil nozzles in the cylinder block.
   - Instal the shell bearings in the block main bearings and their caps, having applied lubricant to the shell face.
   - Instal the crankshaft and loosly install the main bearing caps on journals no. 3. 4. 5.
   - Fit two thrust bearing into no. 2 journal, applying lubricant to the thrust faces.



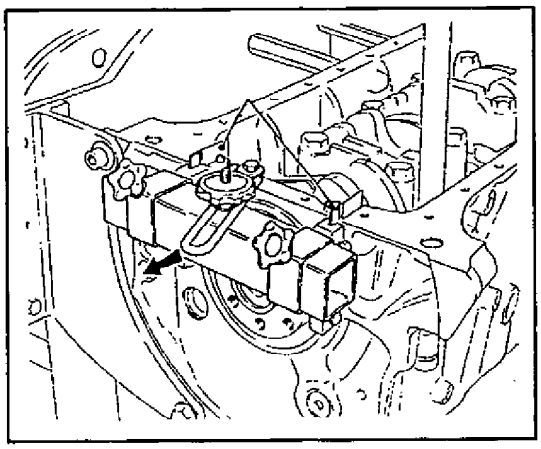


- Instal the main bearing cap no. 2 journal, ensuring that the thrust faces an lubricated.



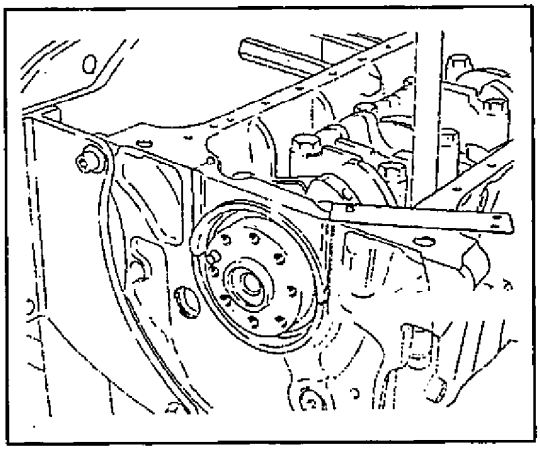
- Fit two new lateral seals (3) to main bearing cap no.1.
- Fix tool **Ref. 00000V02002** equipped with metal centering plates **A2 Ref. 00000V02005**, to main bearing cap no. 1 (4), by means of a bolt and washer (5).
- Adjust height (x) of metal centering plates.
- Grease metal plates and housing.

NOTE:
So as not to elongate lateral seals, fit main bearing cap no. 1 as indicated below.

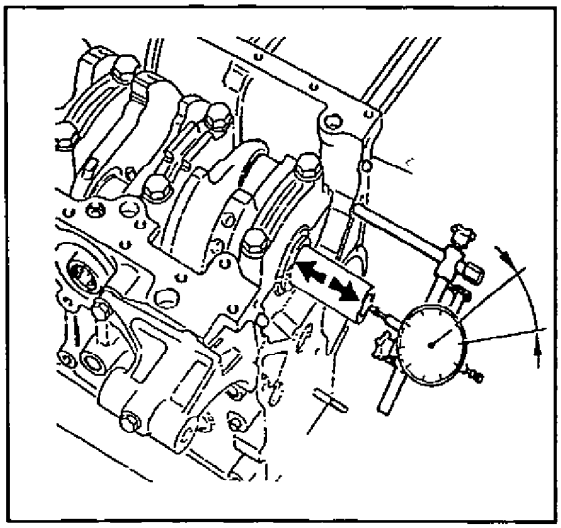


- Insert in housing at an inclination of 45º.
- Straighten up once inserted.
- Slowly lower.
- Tighten main bearing cap bolts as specified.

Main bearing bolt torque specifications:
70 Nm (7.0 Kg-m. 50.5 lb.ft).



- Remove tool horizontally.
- Cut lateral seals so they project out 2 mm.

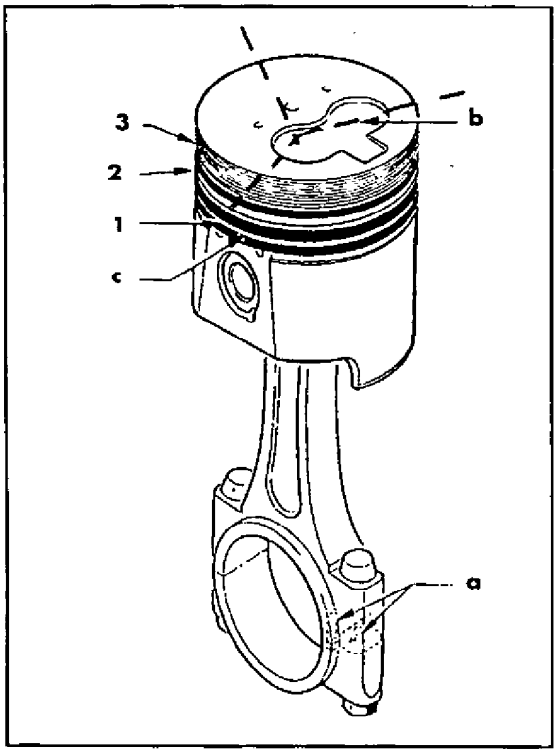


2) Check crankshaft thrust clearance.

Crankshaft thrust clearance:
0.07 to 0.32 mm. (0.003-0.012 in)

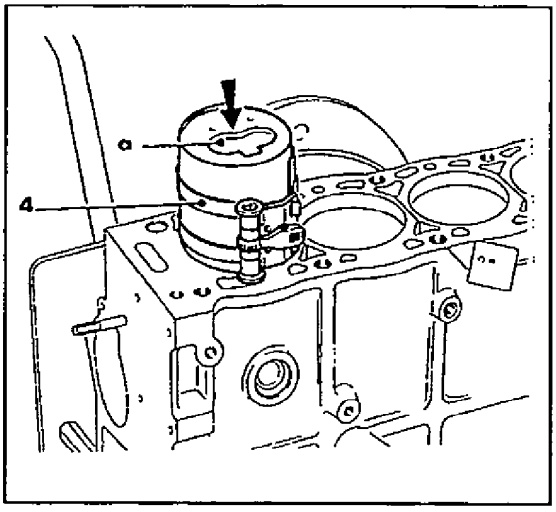
If the clearance is out of specification adjust by reference to the section in 6A4-31.

3) Installation of connecting rods and pistons.
- Assemble connecting rods and pistons aligning the connecting rod notches (a) towards the recesses (b) of the pistons.
- Fit piston ring using expander, in the following order:
  (1) Oil control ring.
  (2) Tapered section compression ring.
  (3) Chrome/convex section compression ring.



NOTE:
The side marked (TOP) of the tapered ring should face the combustion chamber.

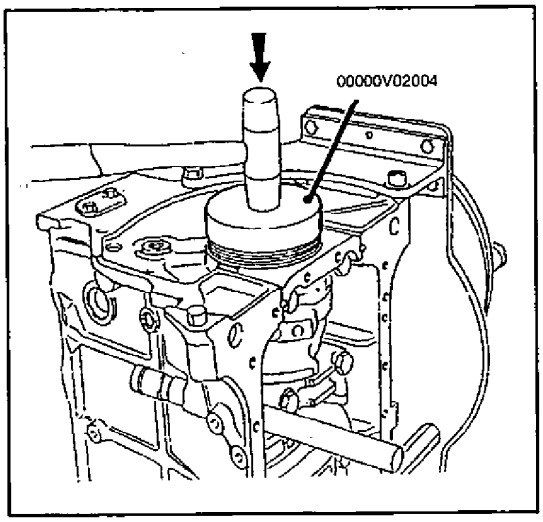
- Align piston ring gaps at 120º, taking the clearance (c) of oil control ring for reference.
- Lubricate piston and compress the piston rings with a compressor (4).



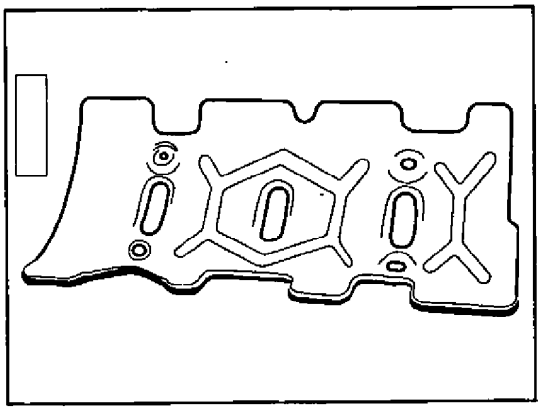
- Remove connecting rod caps, install pistons in block, respecting the marks made during disassembly and pointing the recess (a) of the piston towards the oil filter. Fit caps with their shell bearings and tighten to specified torque.

Connecting rod caps torque specifications:
20 Nm (2.0 kg.m, 14.5 lb.ft) PLUS 70º ± 5º rotation

NOTE:
For selection of connecting rod shell bearing please refer to "ENGINE REPAIR".

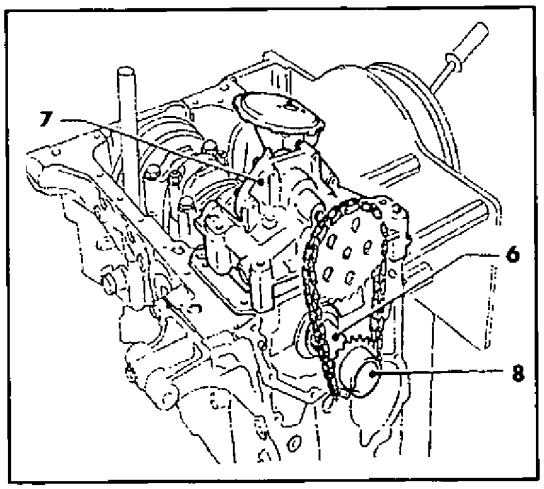


- Fit new oil seal on tool **Ref.00000V02004.**
- Insert oil seal by hitting with a mallet until it fits snug.
- Rotate tool to remove
- Check that oil seal lip is correctly positioned.

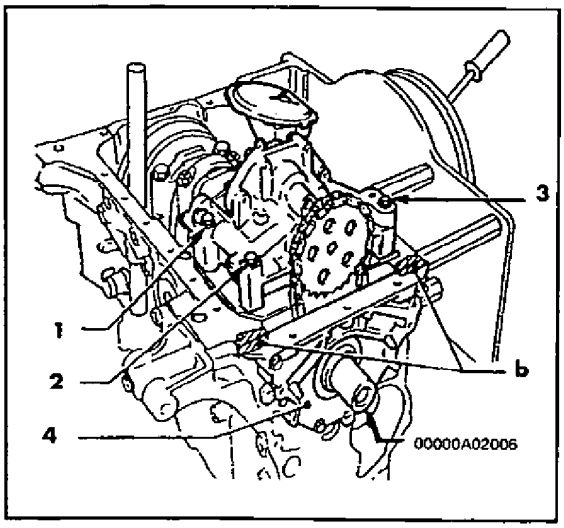


- Fit sump baffle with 4 attaching bolts.
- Tighten the bolts to the specified torque

Sump baffle bolt torque specification:



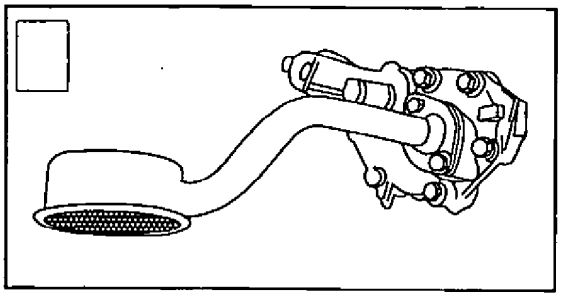
4) Assembly of oil pump and pan.
   Install components in following order:
   - Woodruff key (6).
   - Pump assembly (7), chain and drive gear (8).



NOTE:
Bolt no. 1 is special and serves to align pump.

- Tighten to specified torque pump bolts numbers (1), (2) and (3).

Torque specifications for bolts: 20 Nm (2.0 kg.m, 14.5 lb.ft)

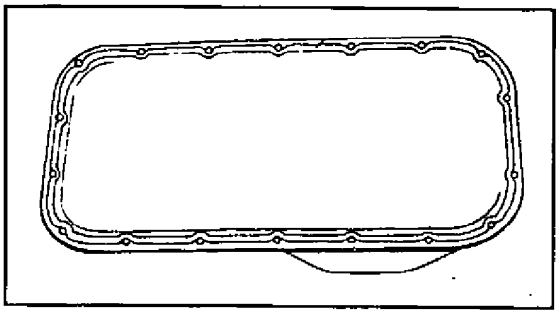


- Fit a new front oilseal on tool **Ref.00000A02006** and insert in housing by knocking with a mallet until it is snug.
- Tighten attaching cover bolts as specified

Torque specifications for cover bolts:
15 Nm (1.5 kg.m, 11 lb.ft)

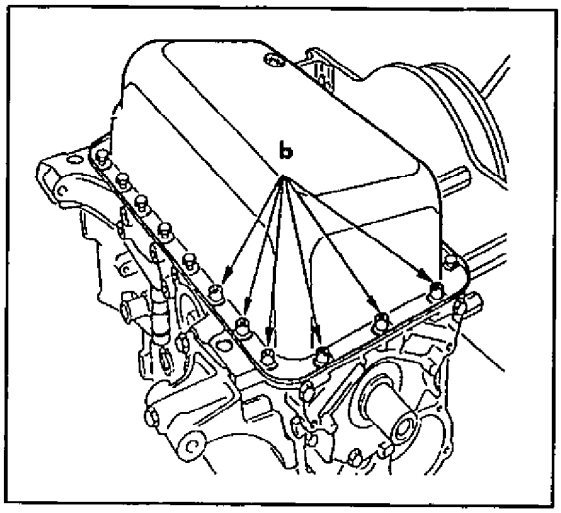
- Install oil pickup tube and attach with two bolts to specified torque.

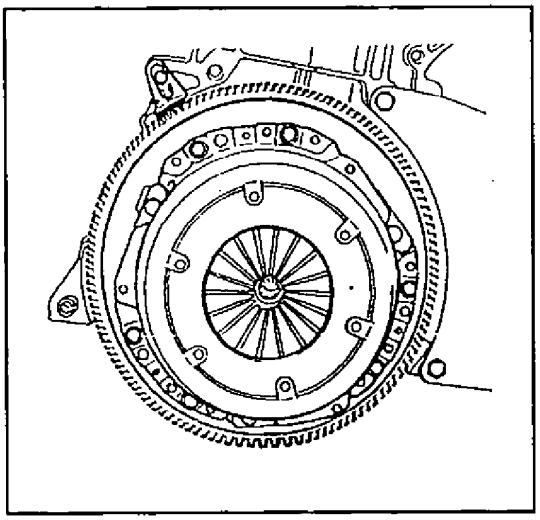
Pickup tube bolts torque specifications:
20 Nm (2.0 kg.m, 14.5 lb.ft)



- Apply line of **AUTO JOINT BLEU** sealant to edges of bolt housing in oil pan.
- Fit oil pan on engine and tighten bolts to specified torque.

Torque specifications for oil pan attaching bolts:
20 Nm (2.0 kg.m, 14.5 lb.ft)





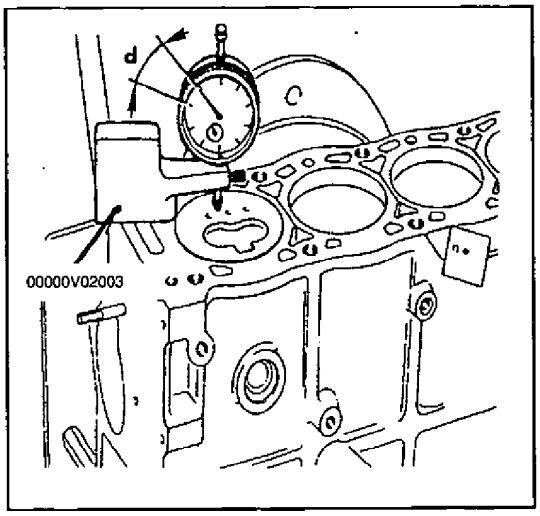
5) Clutch assembly installation.
   - Fit engine flywheel and insert bolts smeared with **LOCTITE FRENETANCH.**
   - Fit locking tool **Ref. 00000V02008** on the engine flywheel and tighten attaching bolts.

Engine flywheel attaching bolts torque specifications:
50 Nm (5.0 kg.m, 36 lb.ft)

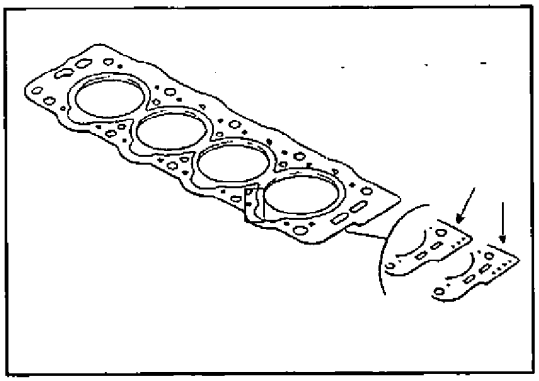
   - Fit pressure disc and plate and tighten attaching bolts.

Torque specifications for pressure plate bolts:
25 Nm (2.5 kg.m, 18 lb.ft)

   - Remove locking tool from engine flywheel.

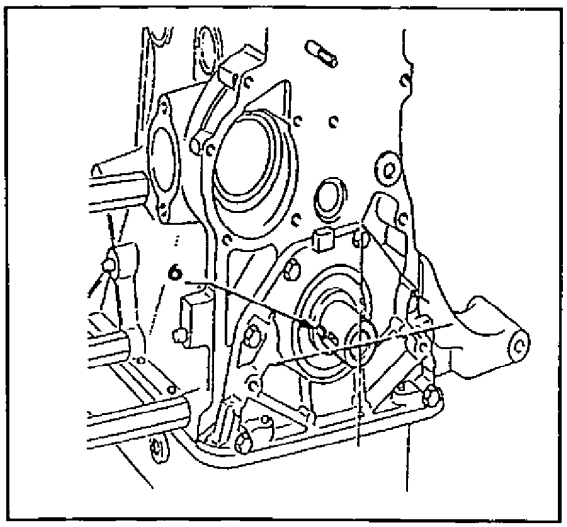


6) Cylinder head gasket assembly.
   Fit dial indicator on support **Ref. 00000V02003** and set to zero on flat surface
   - Turn crankshaft until pistons no. 1 and 4 are at T.D.C. using detent tool **Ref.00000V02008.**
   - Measure maximum projection of piston.
   - Repeat operation with pistons No.2 and 3.
   - With measurements obtained choose gasket thickness as in the table below.

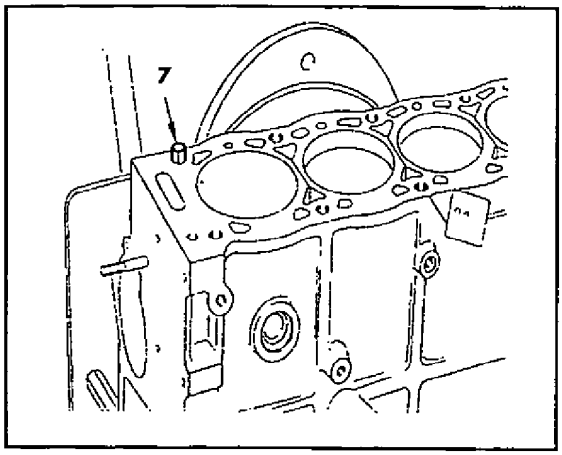


All dimension shun are in mm:

PISTON PROTRUSION	THICKNESS	I. D. MARKS ON GASKET
0.56 - 0.71	1.46	2
0.72 - 0.75	1.50	3
0.76 - 0.79	1.54	4
0.80 - 0.83	1.58	5



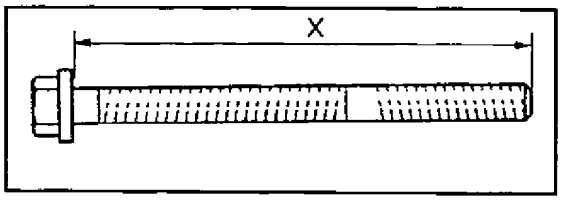
7) Installing cylinder head.
   - Turn crankshaft until pistons are midway in their cylinder bores and the crankshaft woodruff key (6) is at 9 o'clock position.



- Clean cylinder head fixing holes with M - 12 x 150 tap.
- Fit dowel (7) on engine block.
- Assemble cylinder head gasket (dry).
- Place cylinder head on block.
- Measure length (x) of cylinder head bolts from the underside of the bolt head flange to the tip of the threaded post.

- **Bolt maximum length without tip 121.25 mm.**
- **Bolt maximum length with tip 124.5 mm.**

NOTE:
Screws longer than indicated measurement must not be used.

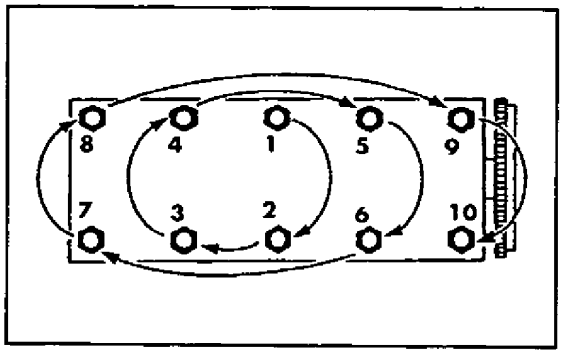


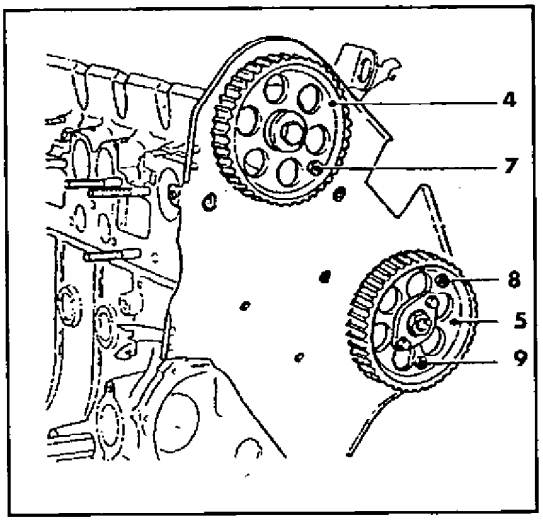
- Clean screw threads and replace washers with new ones.
- Apply **MOLIKOTE G RAPID PLUS** to screw threads and washer contact surfaces.
- Tighten cylinder head bolts in order indicated following the steps below:

Initial tightening: 20 Nm (2.0 kg.m, 14.5 lb.ft)

Subsequent tightening: 60 Nm (6.0 kg.m, 43 lb.ft)

Final angular tightening: PLUS 180º rotation.



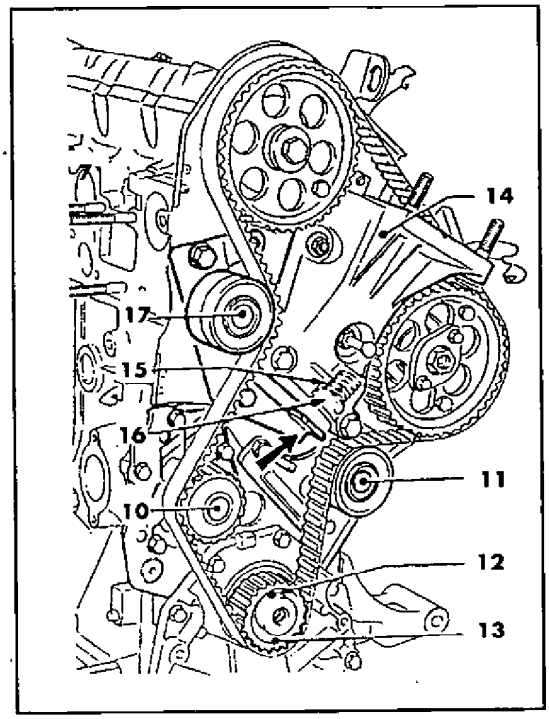


8) Timing belt assembly.
   - Fit fuel distribution pump bracket and pump.
   - Fit fuel distribution pump pulley (5).
   - Instal pulley timing bolts (7), (8) and (9), tightening by hand.
   - Tighten nut attaching pulley to fuel distribution pump to its torque specification.

Torque specifications for nut attaching pulley to fuel distribution pump: 50 Nm (5.0 kg.m, 36 lb.ft)

- Rotate crankshaft in its normal rotation and lock flywheel at Nº 1 TDC with tool **Ref. 00000V02008.**
- Assemble the following components in the order indicated:
  - Water pump (10) with a new gasket.

Torque specifications for nut sealing to fuel distribution pump: 15 Nm (1.5 kg.m, 11 lb.ft)



- Lower pulley (11).

Torque specification for lower pulley attaching bolts: 18 Nm (1.8 kg.m, 13 lb.ft)

- Woodruff key (12) and crankshaft pulley (13).
- Dummy engine mount (14) with screws with **LOCTITE FRENETANCH** and tightened to its torque specification.

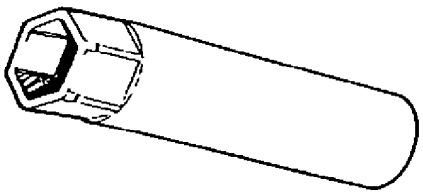
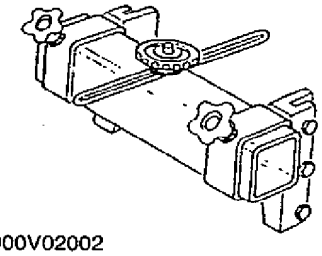
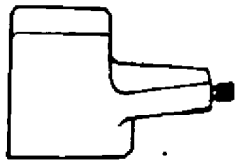
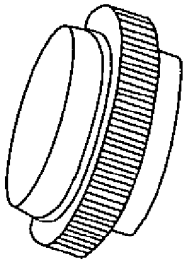
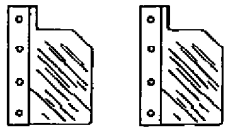
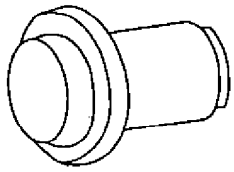
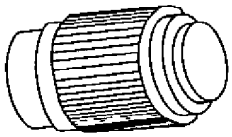
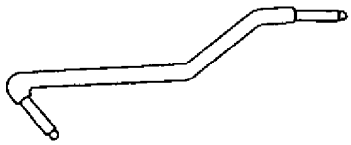
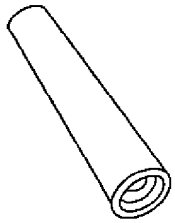
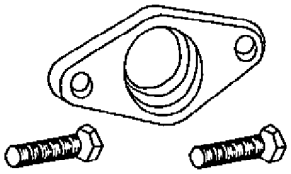
Torque specification for crankshaft pulley bolt: 40 Nm (4.0 kg.m, 29 lb.ft)

- Spring (15), retainer (16) and tensioner pulley (17).

- Immobilise pulley (17) at tappet compressed position.
- Continue with operations (1) to (4) (assembly) (1) to (10) (timing adjustment) from "section 6A4-9 Timing Belt" (Replacement).

Torque specification for tensioner bolts: 20 Nm (2.0 kg.m, 14.5 lb.ft)

SPECIAL TOOLING

 00000V02001 INJECTOR EXTRACTOR WRENCH	 00000V02002 MAIN BEARING CAP MOUNT	 00000V02003 DIAL INDICATOR SUPPORTS
 00000V02004 RETAINER MOUNT	 00000V02005 CENTERING PLATES	 00000V02006 FRONT RETAINER MOUNT
 00000V02007 CAMSHAFT RETAINER MOUNT	 00000V02008 T.D.C. ATTACHING ELEMENT	 00000V02009 VALVE RETAINER INSTALLATION TUBE
 00000V02010 INJECTION PUMP FLANGE	 00000V02015 SOCKET	 00000V02016 HEXAGONAL SOCKET
 00000V02017 SEMI CIRCLE WRENCH		

TORQUE SPECIFICATION

SYSTEM	ELEMENT	VALUES		
		Nm.	kg.m	lb.ft
ENGINE	Camshaft cover locknuts	18	1.8	13.0
	Main bearing bolts	70	7.0	50.5
	Connectjng rod nuts	20 +.70º	2.0 + 70º	14.5 + 70º
	Oil sump attaching bolts	20	2.0	14.5
	Front retainer mount plate	15	1.5	11.0
	Oil pump attaching bolt	20	2.0	14.5
	Engine flywheel case attaching bolts	25	2.5	18.0
	Clutch disc pressure plate bolts	50	5.0	36.0
	Engine flywheel bolts	40	4.0	29.0
	Camshaft pulley attaching bolts	50	5.0	36.0
	Fuel distribution pump/pulley locknut	20	2.0	14.5
	Spring tensioner support/cylinder head attaching bolts	45	4.5	32.5
	Timing tensioner attaching nut and bolt	18	1.8	13.0
	Lower timing cover support fittings	15	1.5	11.0
	Left timing cover attaching fittings	15	1.5	11.0
	Right timing cover attaching bolt	10	1.0	7.0
	Right timing cover locknut	5	0.5	3.5
	Crankshaft pulley attaching bolt	40 + 60º	4 + 60º	29.0 + 60º
	Injectors	90	9.0	65.0
	Glow plugs	22	2.2	16.0
	Thermostat housing attaching bolt	15	1.5	11.0
	Fuel filter fitting	15	1.5	11.0
	Rocker arm cover fitting	15	1.5	11.0
	Oil pressure switch	30	3.0	21.5
	Alternator tensioner attaching bolts	22	2.2	16.0
	Engine mounts attaching bolts	40 - 50	4.0 - 5.0	29.0-36.0
	Engine silentblock/support union	40 - 60	4.0 - 6.0	29.0-43.0
	Oil pan drain plug bolt	30 - 35	3.0 - 3.5	21.5-25.0
	Fuel lines/filter fitting	30 - 40	3.0 - 4.0	21.5-29.0
	Power steering pressure pump lines	50 - 70	5.0 - 7.0	36.0-50.5
	Engine/transmission union	40 - 60	4.0 - 6.0	29.0-43.0
	Power assisted steering pump and alternator to engine block	18 - 28	1.8 - 2.8	13.0-20.0
	Vacuum pump mount fitting/engine block	30 - 40	3.0 - 4.0	21.5-29.0
	Vacuum pump/mount attaching bolts	18 - 28	1.8 - 2.8	13.0-20.0
	Vacuum pump tensioner	18 - 28	1.8 - 2.8	13.0-20.0
	Vacuum pump tensioner (engine block side)	18 - 23	1.8 - 2.3	13.0-17.0
	Oil pickup tube bolts	15	1.5	11.0
	E.G.R. valve attaching bolts	20	2.0	14.5
	Exhaust collector tap bolts	18 - 28	1.8 - 2.8	13.0-20.0
	Intake manifold connections - first section	18 - 28	1.8 - 2.8	13.0-20.0
	Starter motor fitting	20 - 30	2.0 - 3.0	14.5-21.5
	Intake manifold locknuts	25	2.5	18.0
	Intake manifold attaching bolts	25	2.5	18.0
	Turbocompressor attaching bolts	30	3.0	21.5
	Turbocompressor drain pipe attaching bolts	15	1.5	11.0

SECTION 6B

COOLING SYSTEM

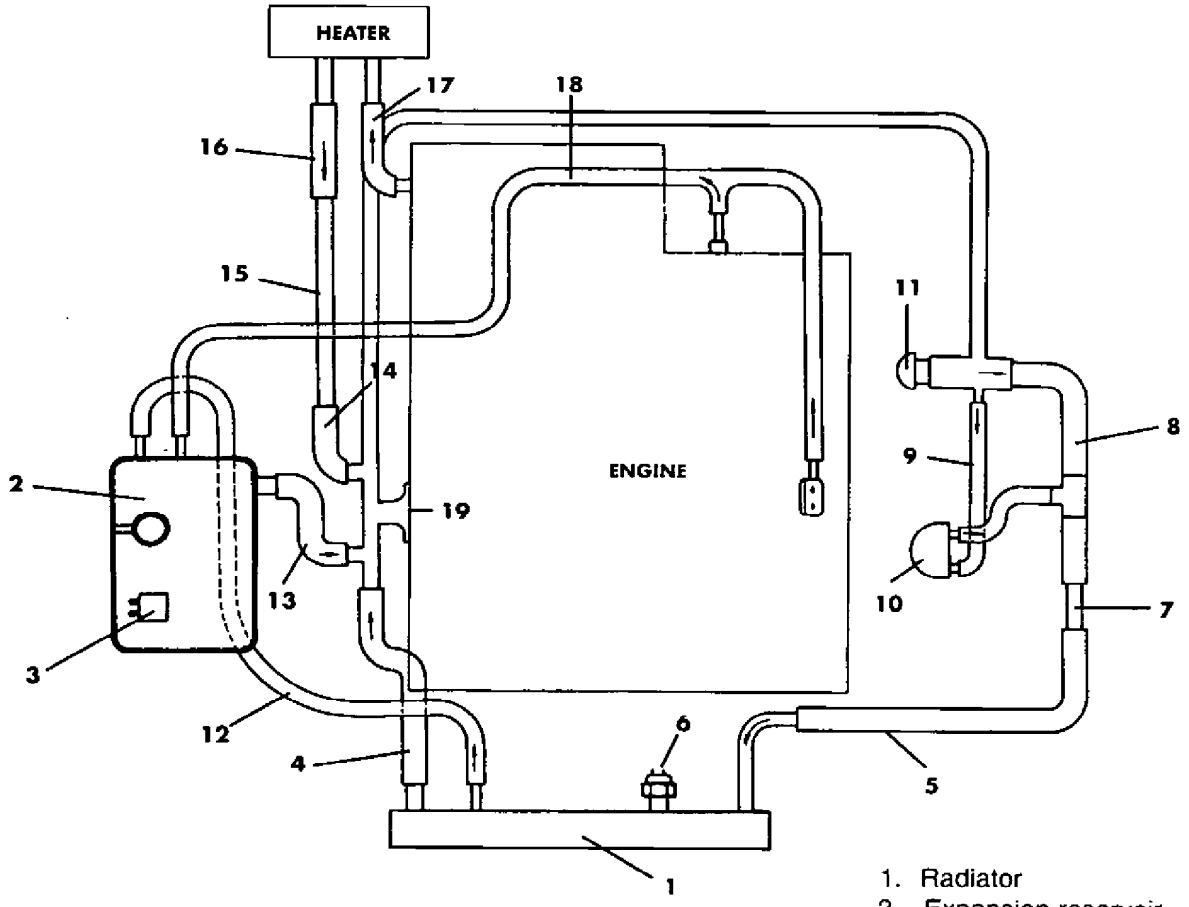
NOTE:
For topics not covered in this section, please refer to the relevant section of the Vitara Service Manual outlined in the PREFACE.

CONTENS

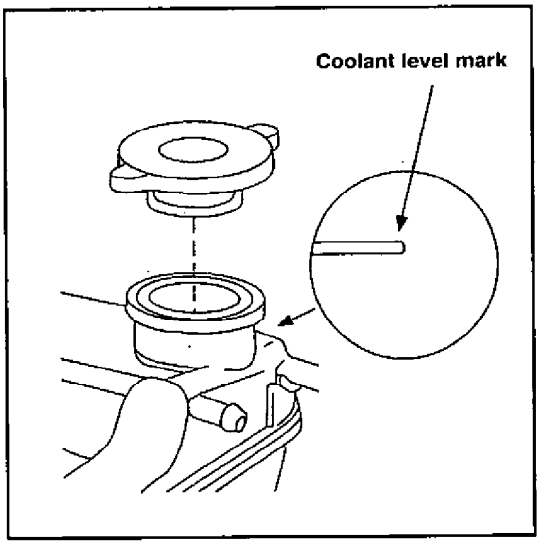
GENERAL OUTLINE **6B-2**
Cooling circuit **6B-2**
MAINTENANCE **6B-3**
Coolant level **6B-3**
Replacing coolant **6B-3**
Inspection and cleaning **6B-4**
IN THE VEHICLE **6B-5**
Checking and components **6B-5**

GENERAL OUTLINE

The cooling system comprises up of the following components: radiator, degassing reservoir, coolant sensor, oil cooling, thermostat, heater, heat relay thermocontact and electric fan.



1. Radiator
2. Expansion reservoir
3. Coolant level sensor
4. Outlet hose-radiator
5. Intake hose-radiator (no. 1)
6. Thermo sensor
7. Interconnecting hose
8. Intake hose-radiator (no. 2)
9. Intake hose-oil cooler
10. Oil cooler
11. Thermostat
12. Radiator expansion hose
13. Filler hose
14. Heater outlet hose (no. 2)
15. Heater outlet lines
16. Heater outlet hose (no. 1)
17. Heater intake hose
18. Engine expansion hose
19. Bypass hose



MAINTENANCE

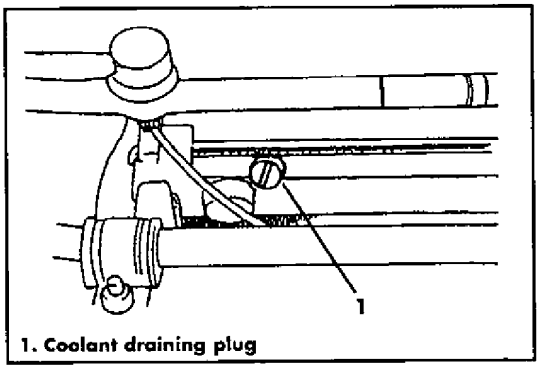
COOLANT LEVEL

Remove coolant expansion reservoir cap and check coolant is reaching upper part.

WARNING:
To avoid the possible risk of burns do not remove cap while engine and radiator are hot, pressurised vapour and boiling water could come out.

If coolant level is low, fill with coolant to maximum level.

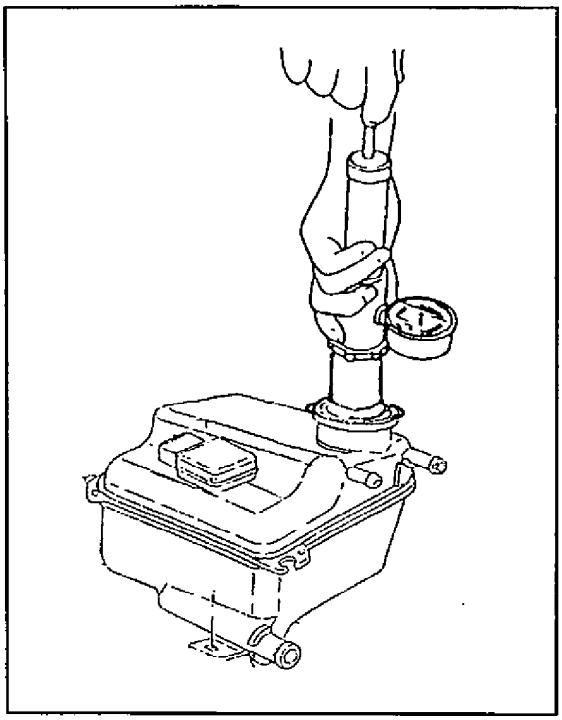
NOTE:
Ensure that filler cap is totally closed.

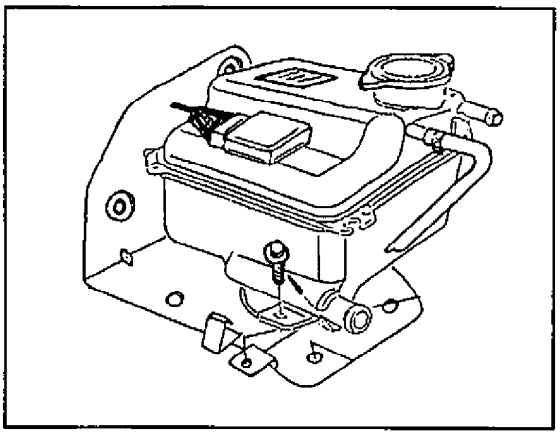


1. Coolant draining plug

COOLANT REPLACEMENT

1) Remove lower engine soundproofing plate.
2) With engine cold, unscrew expansion reservoir filler cap.
3) Open draining plug in lower part of radiator until all fluid has flown out.
4) Close draining plug.
5) Add coolant to expansion reservoir, until it reaches upper part.
6) Turn on heater controls and start up engine.
7) Continue adding coolant as reservoir level reduces, until the engine is completely warmed up.





7) Ensure that coolant stabilises at maximum level in expansion reservoir.
8) Fit cap on coolant expansion reservoir.
9) Fit lower engine soundproofing plate.

NOTE:
Cooling system capacity is 8 litres.
Use a mix of 50% DYNAMIC DYNAGEL 9103 antifreeze and 50% distilled or demineralized water.

INSPECTION AND CLEANING

Inspection.
1) Remove upper cover of coolant expansion reservoir.
2) Fit pressure gauge and create pressure of 137 K Pa (1.4 kg/cm^2, 20 psi).
3) Check that pressure does not fall from above level. If it does, check for existence of leaks and correct if necessary.

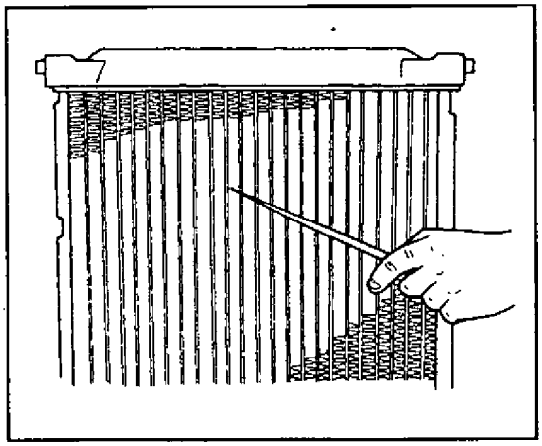
Cleaning.
1) Remove lower engine soundproofing plate.
2) Remove coolant expansion reservoir cap.
3) Start up engine and run until thermostat outlet hose is warm.
4) Turn off engine and remove radiator draining plug, thereby evacuating coolant.
5) Fit filler cap and wait for engine to cool down.
6) Add water to coolant expansion reservoir and wait again for engine to warm up until proceeding to drain..
7) Repeat this operation 3 or 4 times until water coming out of drain hole is almost transparent.
8) Remove and eliminate interior dirt.
9) Fit once more and securely tighten radiator draining plug.
10) Fill system with mixture of water and antifreeze, as specied above.

IN THE VEHICLE

COMPONENT REPLACEMENT

Radiator removal

1) Remove lower soundproof plate.
2) Drain radiator by removing coolant expansion reservoir and radiator draining plug.
3) After draining, be sure to replace and tighten radiator draining plug.
4) Disconnect radiator hoses and the electric connections to the electric fan adjacent to the engine (rear).
5) Remove radiator support fittings to engine.
6) Remove rear electric fan from the radiator.

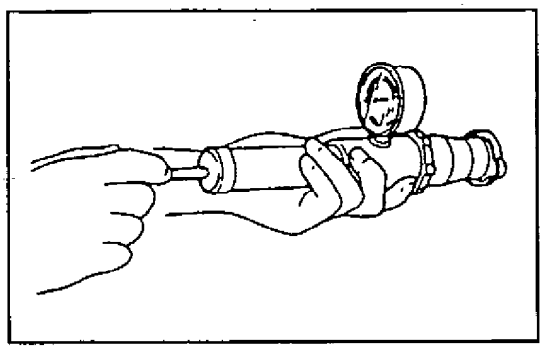


NOTE:
Be careful not to damage radiator fins.

Radiator inspection

Perform the following revisions, and repair or replace if necessary:

1) Cracks or breaks.
2) Cooling fins (straighten them with a screwdriver).
3) Inlet and outlet radiator hoses (for distortion).

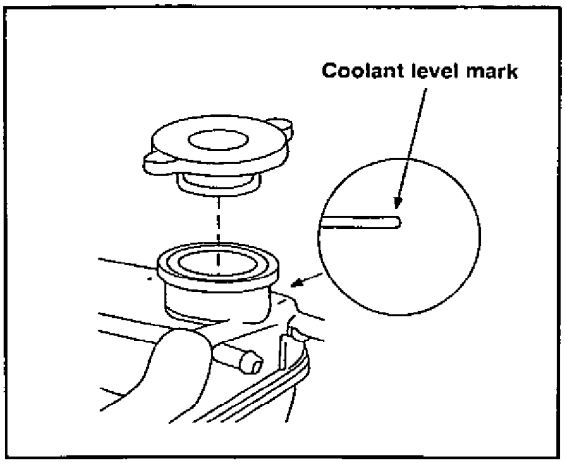


Inspection of expansion reservoir cap

1) Clean expansion reservoir cap.
2) Install pressure testing tool and apply pressure of approximately 137 K Pa (1.4 kg/cm^2, 20psi). This pressure should be maintained for at least 10 s. If not the cap should be replaced.

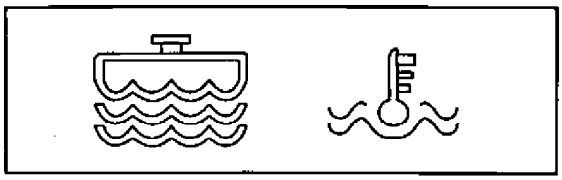
Radiator assembly

1) Carry out disassembly operations in reverse order.
2) Fill and bleed system as outlined above.
3) Fit lower engine soundproofing plate.

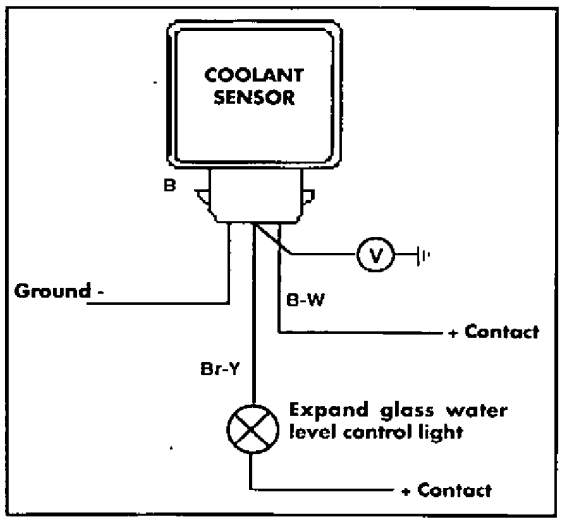


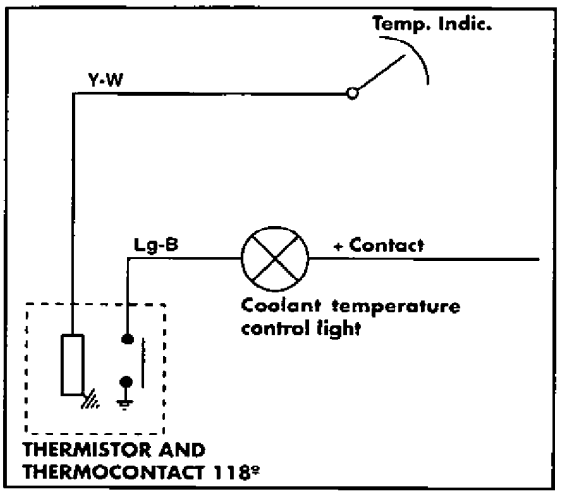
Coolant temperature sensor

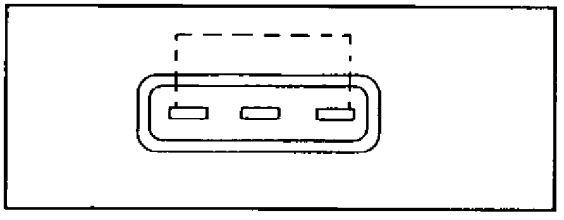
1) Ensure that coolant reaches upper part of coolant expansion reservoir.



2) Check that the coolant level and temperature warning lamps light up when the starter motor is engaged. This should happen before the engine starts. Once the engine has fired the lights should go out.
3) If lights remain on after starting up, check:
   - Condition of diodes on instrument panel, replacing if defective.
   - Connect voltmeter between coolant sensor terminal Br-Y and ground. When engine is running the reading should be similar to battery voltage. If not, check for possible grounding fault in the above circuit. If no defect is found, replace sensor.
   - Connect voltmeter between coolant sensor cable B-W and ground. When engaging starter motor the reading should be similar to battery voltage. If not, check possible grounding fault of above cable.
4) If lights do not come on when engaging starter motor, check:
   - Condition of bulbs.
   - Condition of diodes.
5) Perform the following final inspections:
   - Disconnect the thermo probe sensor, start the engine and short-circuit the Br-Y cable to carth. The coolant level indicator must light up. If the contrary, check cable continuity.
   - Disconnect Lg-B cable from the termperature indicator thermo sensor and short-circuit it to earth. The indicator must light up, if the contrary, check the cable continuity.

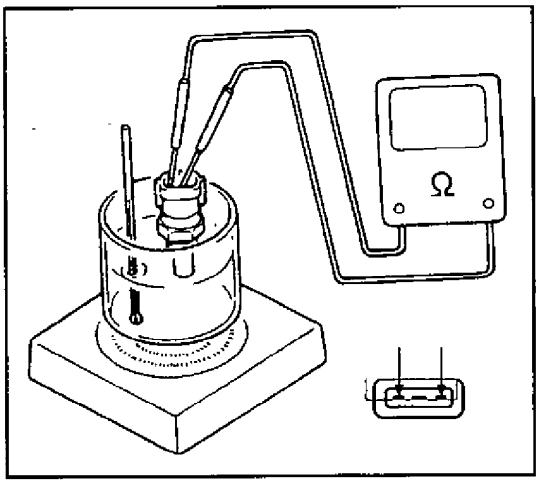






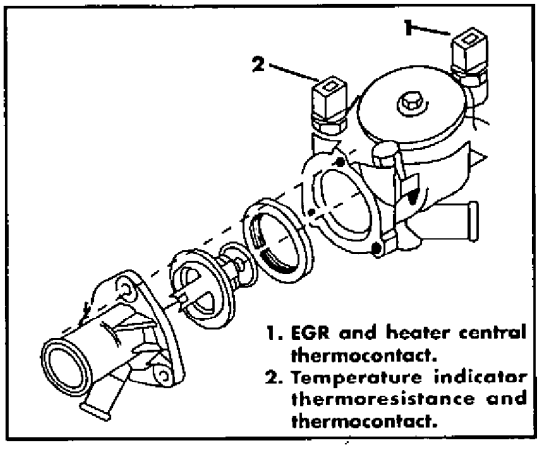
Inspection of electric fans.

1) Turn ignition key in ON position.
2) Disconnect thermo sensor connector and link connector ends with a wire as shown in diagram (left). Check that both fans work.
3) If they do not, check electrical fitting, fuses, relays and electric fans.



Inspection of electric fans thermo sensor

1) Remove radiator thermo sensor.
2) Insert it in a container with water and a thermometer.
3) Apply heat to the water.
4) Check that on reaching a temperature of approximately 95º C there is continuity between the terminals at the ends. Check that when temperature drops to 86º C (approx.) no continuity exists.
   Replace thermo sensor if necessary.



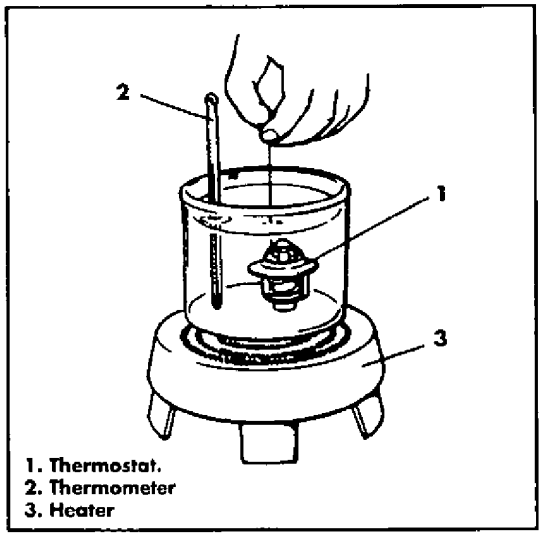
1. EGR and heater control thermocontact.
2. Temperature indicator thermoresistance and thermocontact.

Inspection of thermostat

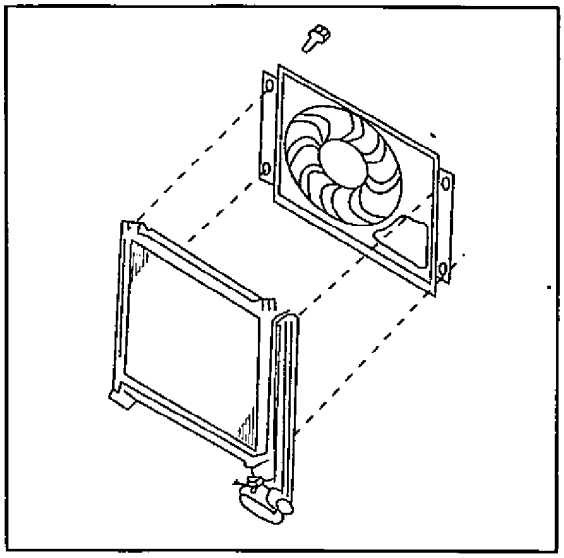
1) Release hose attaching radiator to thermostat housing.
2) Remove rear thermostat cover and extract thermostat.
3) Place thermostat in a container with water and heat up, check that at beginning and end of aperture the following values show:

Starting open: 86º C
Fully open: 95º C
Movement: 7.5 mm (0.30 in)

Replace thermostat if it does not perform to these values.

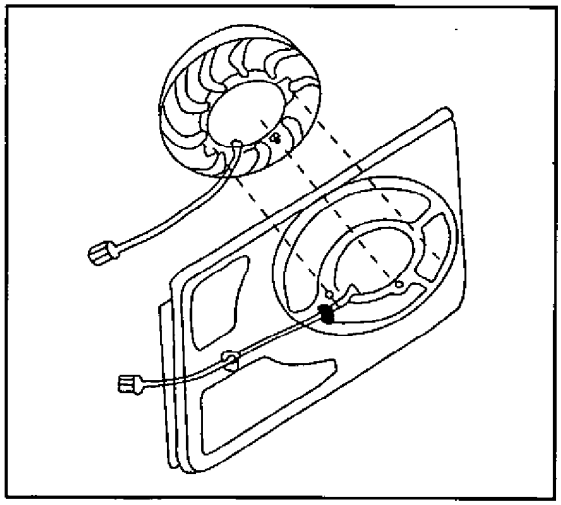


1. Thermostat.
2. Thermometer
3. Heater

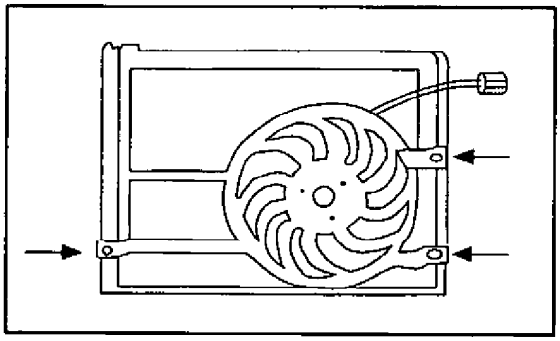


Replacement of rear electric fan

1) Remove electric fan electric connection.
2) Remove the four bolts attaching the fan hood to radiator.

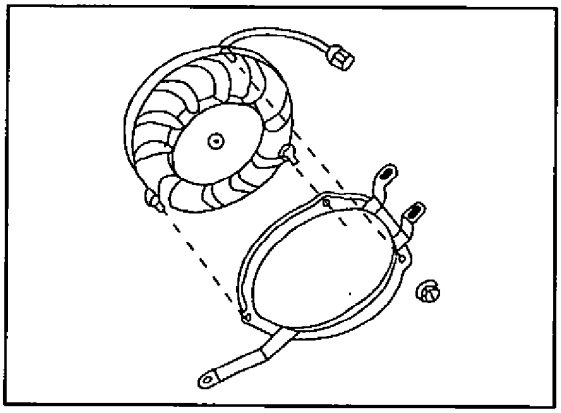


3) Detach electric fan cable from the circlips.
4) Remove nuts and separate electric fan from hood.
5) For assembly perform, reverse order of disassembly.



Replacement of front electric fan

1) Remove front grill.
2) Remove electric fan connector.
3) Remove three bolts attaching hood to radiator support.



4) Remove three bolts attaching electric fan to hood and separate them.
5) For assembly, reverse order of disassembly.

SECTION 6E3

ENGINE AND EMISSIONS CONTROL SYSTEM

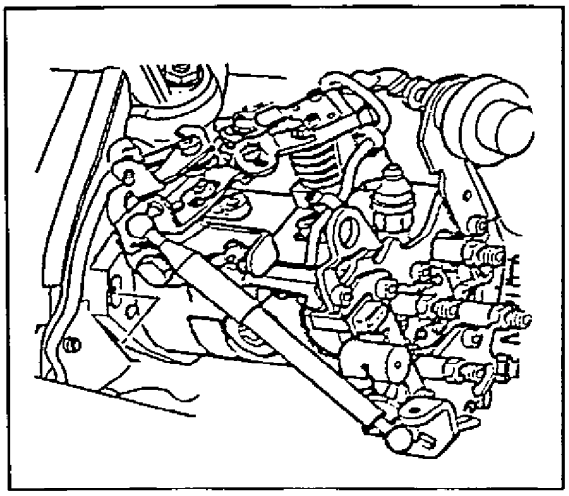
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- Checking adjustments 6E3-3
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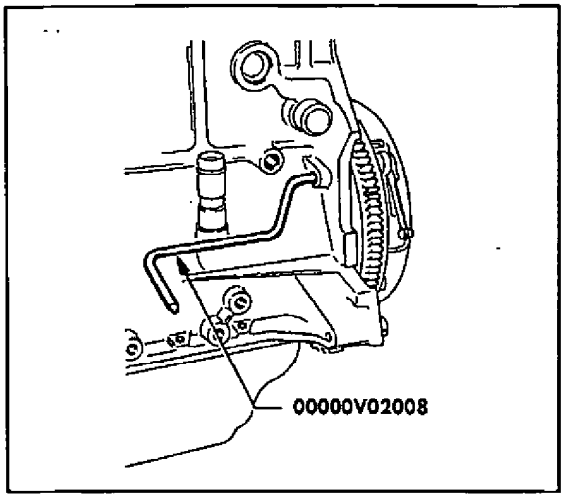
ON THE VEHICLE

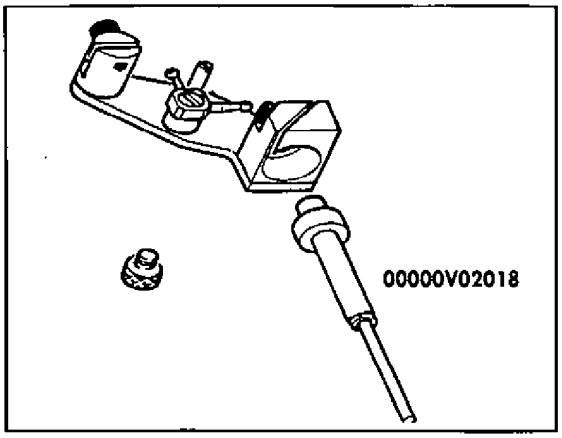
NOTE:
Internal adjustments and repairs to fuel distribution pump must be carried out at an official Lucas Service Centre.

FUEL DISTRIBUTION PUMP OVERHAUL (LUCAS)

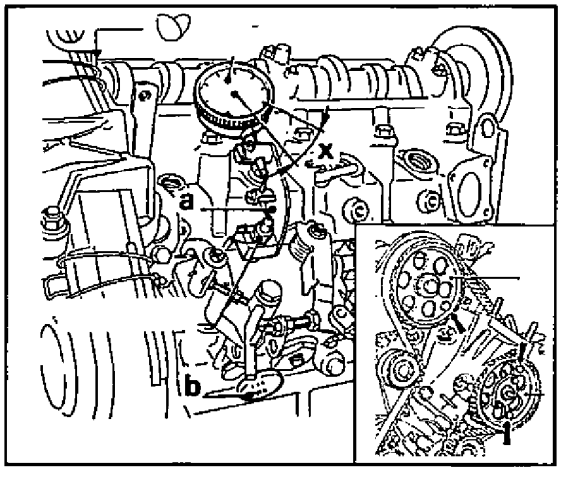
Adjustment

1) Remove the tap from the pump port hole.
2) To ease engine rotation remove glow plugs.
3) Remove injection lines, loosen pump attachings and swing this to the maximum retrieve position (away from the engine).
4) Set crankshaft to TDC of cylinder No.1, setting engine flywheel with tool **Ref. 00000V02008.**

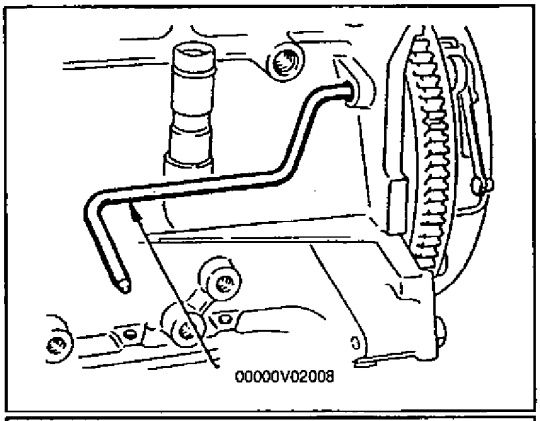




5) Install centering rod of tool **Ref. 00000V02018** in its housing.

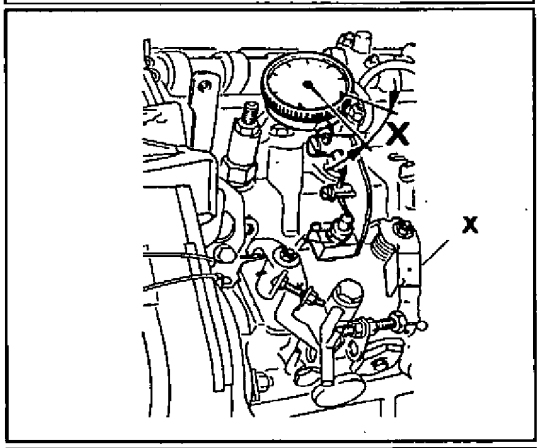


6) If the engine is in injection position in cylinder No.1 rotate engine a complete turn and set flywheel with tool **Ref. 00000V02008**, in this position cylinder No.4 will be in injection.
   This position can be confirmed because the cylinder No.4 cams are not in contact with tappets, or because the camshaft pulleys and injection pump align with those of the cylinder block.
7) Set the dial indicator support **Ref. 00000V02018** on the pump and to this attach a universal dial indicator provided with plain point (b).
8) From the TDC centering position turn the crankshaft in reverse movement to rotation until the dial indicator needle stops. In this position adjust the dial indicator to zero (0º).



9) Slowly turn crankshaft in normal rotating direction, until flywheel is locked by tool **Ref. 00000V02008**.
   Observe the dial indicator reading.
10) Slowly turn fuel distribution pump in advance direction (towards engine), until dial indicator shows the **(X)** travel indicated on the plate on the throttle lever **0.04 mm (0.0016 in).**

NOTE:
If the dimension is exceeded, turn the pump back until a reading less man (X) is obtained and adjust again.



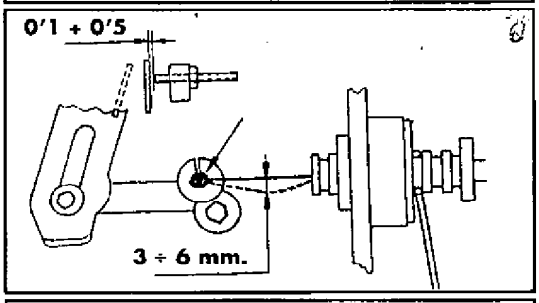
CHECKING ADJUSTMENT

1) Turn engine, from the previous position, a quarter turn in the opposite direction.
2) Turn engine in rotating direction and center engine flywheel with tool **Ref. 00000V028008.**

   At this position, dial indicator must show **X 0.04 mm (0.0016 in).**

3) Tighten pump attachings and remove dial indicator.

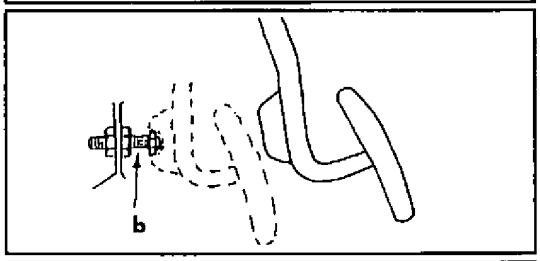
Torque specifications for jet pump attaching bolts: 20 Nm (2.0 kg.m, 14.5 lb.ft).



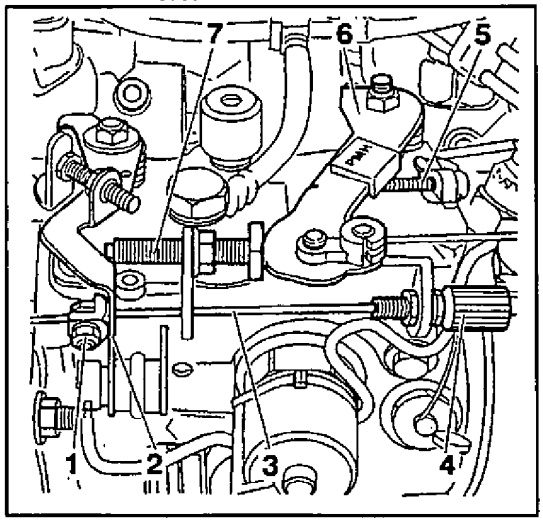
ADJUSTING JET PUMP

Throttle cable adjustment

1) Attach throttle cable to the lever.
2) Fit cable cover to mount with the retention clip, leaving **3-6 mm (0.12-0.24 in)** of slack.

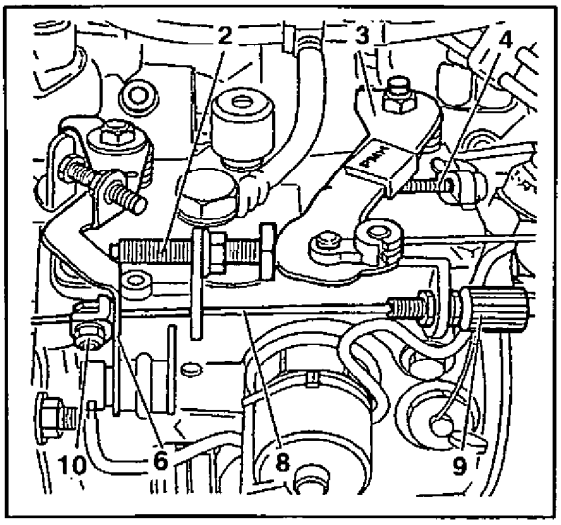


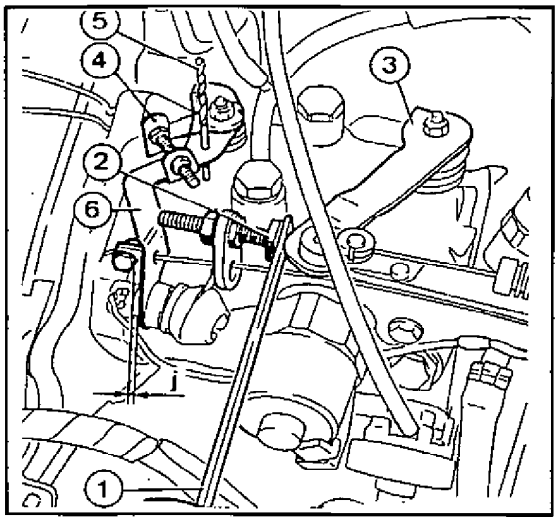
3) Adjust throttle pedal height using stop bolt (b), in such a way that when pushing the pedal and stopping the bolt on the pedal there is **0.1-0.5 mm (0.004-0.020 in)** between the throttle lever (6) and the revolutions stop bolt (5).

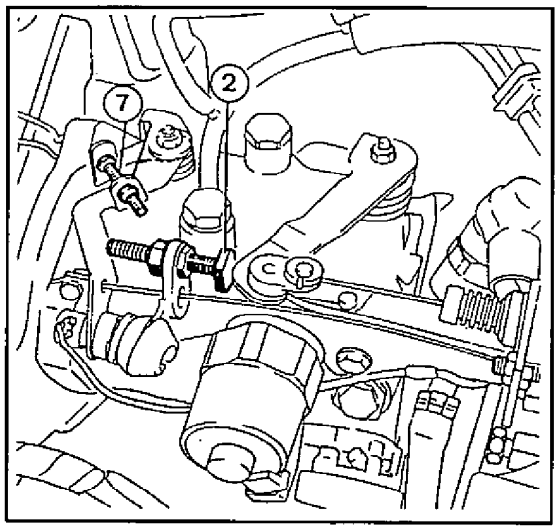


4) Ensure that in idle position, throttle lever upper end (6) contacts the stop bolt (7).

NOTE:
Do not change maximum r.p.m. of the engine via the stop bolt.







Adjusting fast idle cable

Cold engine

1) Verify that when the lever (6) is pressed right, cable (8) is completely tightened. If not, tighten the cable using on the clamp (10).
2) Adjust cable tension with tensioner (9).

NOTE
Idle r.p.m. must be 950±50.

Hot engine (thermostat open)
1) Verify cable (8) is not tight.
2) Place the thermostatic probe on the thermostat housing and check engine temperature.

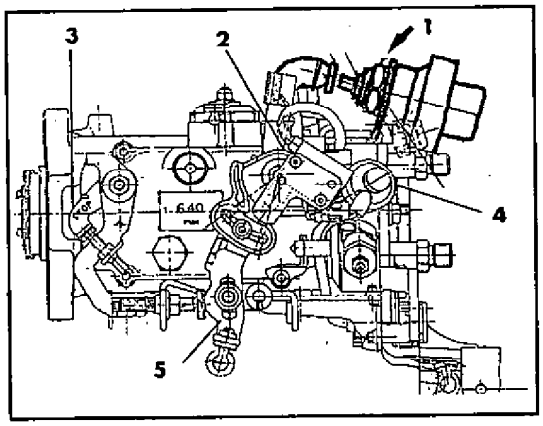
NOTE
Between cold engine and hot engine there must be a maximum cable movement of 6 mm (0.24 in) and the play (J) must be between 0.5-1.0 mm (0.020-0.040 in).

Adjusting throttle lever
1) Ensure throttle lever idle is on the adjustment stop bolt (2).

Adjusting rigging
1) Place a **3 mm (0.012 in)** gauge (1) between throttle lever (3) and adjustable bolt (2).
2) Move the manual stop lever (4) to the left.
3) Place a **3 mm (0.012 in)** drill (5) in the fast idle lever (6).
4) Adjust engine to **900±50** r.p.m. by adjusting the screw (2).
5) Remove gauge (1) and drill (5).

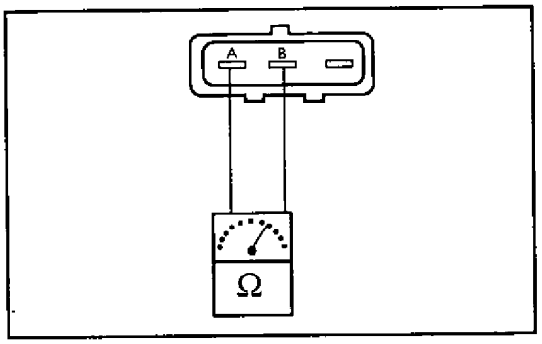
Idle adjustment
1) Adjust idle by adjusting the idle screw (7).

Fast idle r.p.m. (800^{+0}_{-50}).



Engine deceleration control

1) Move throttle lever (5) until **3.000 r.p.m.** is obtained. Deceleration time must be about 3 to 4 sec. after throttle lever is released.
2) Adjust deceleration time by adjusting the dashpot bolt (1).

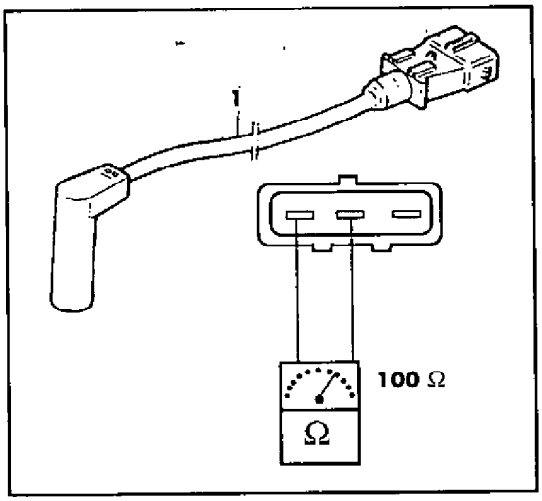


E.G.R. system driving microswitch.

1) To check its performance use an ohmmeter and measure resistance between pump connector terminals A and B. From idle position, up to about, **30 mm (1.2 in)** of throttle cable movement the ohmmeter must show continuity. Beyond that position, resistance must be infinite.

NOTE

Valve adjustment or replacement must be accomplished by a Lucas Service Centre.



Manual stop control

1) With engine at idle, pull the lever (3) backwards. Engine must stop.

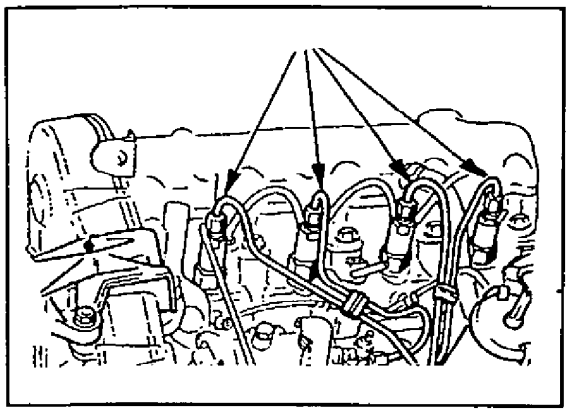
Electric stop control

1) Measure resistance (between earth and output terminal) of the fuel shutoff electric valve (4). This must be about **8Ω** .

r.p.m. sensor

1) Check resistance on the connector as shown at left.

Pickup coil resistance: 100 Ω (approx.)



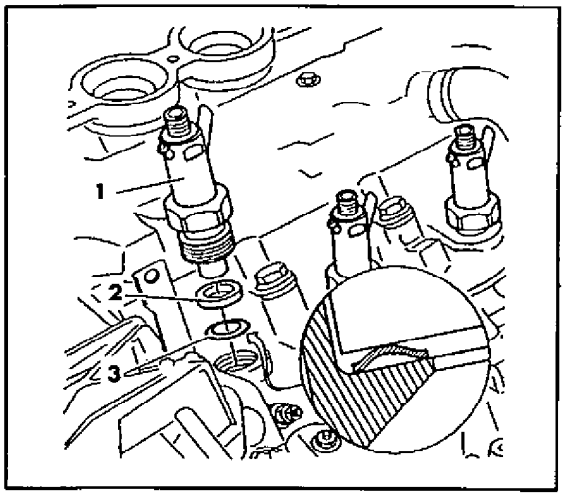
REPLACEMENT OF INJECTORS

Disassembly

1) Disconnect injector and return lines.
2) Remove injectors using tool **Ref.00000V02001.**
3) Extract washers (2) and (3).

NOTE:

Injector checks and repairs should be performed by a Lucas Service Centre.



Assembly

1) Insert new fire cutoff washer in housing (3) with convex area facing outwards.
2) Fit a new sealing washer (2).
3) Fit injectors and tighten to specified torque with tool **Ref.00000V02001.**

Torque specifications for injector:
90 Nm (9.0 kg.m, 65 lb.ft).

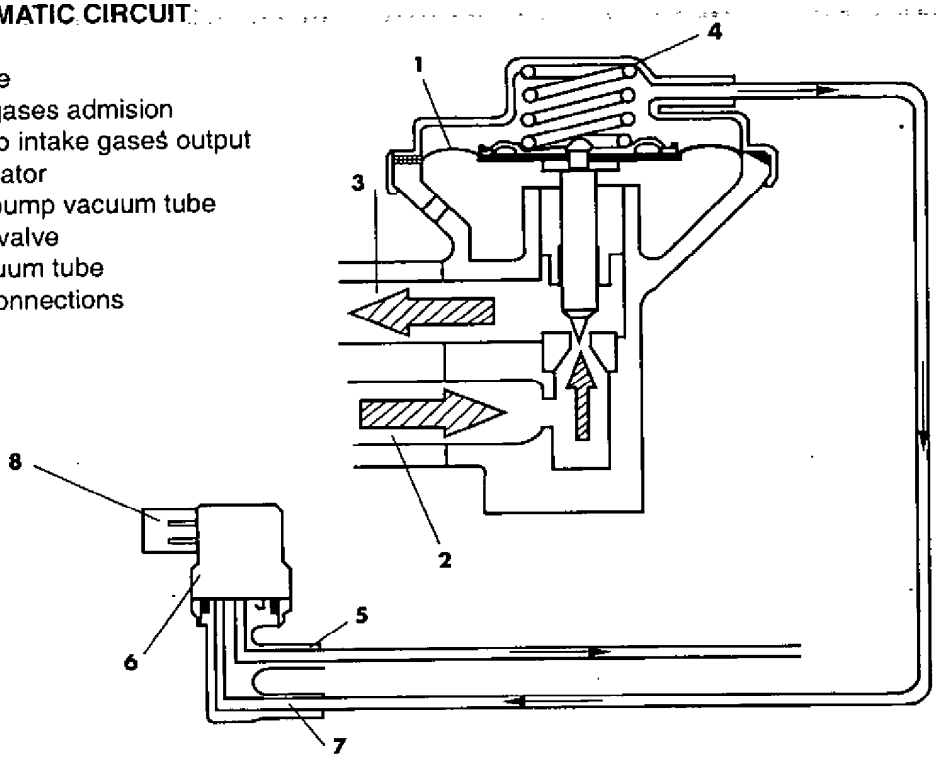
4) Fit injection lines.
5) Check they are not blocked and fit injector return lines.

ENGINE AND EMISSIONS CONTROL

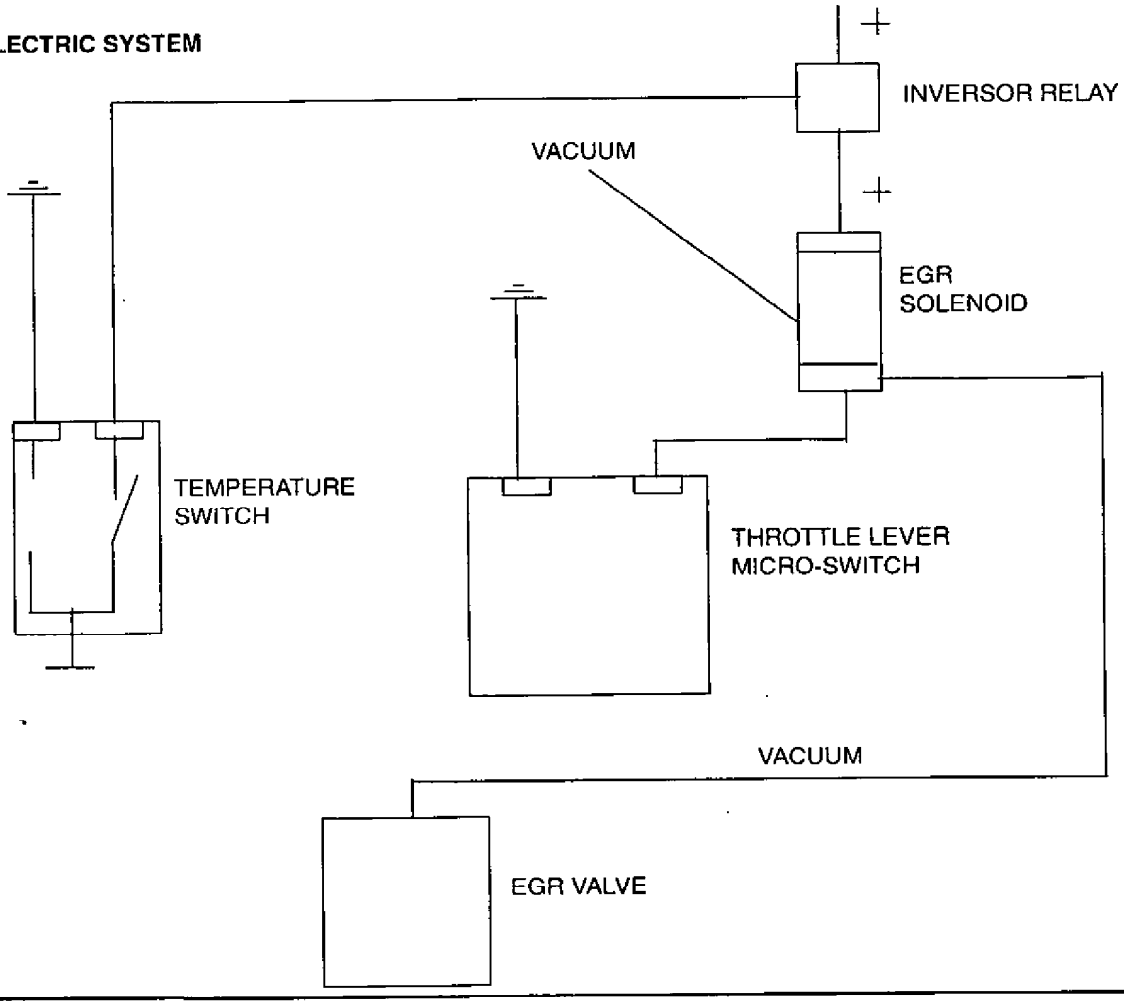
EGR SYSTEM DIAGRAM

EGR PNEUMATIC CIRCUIT

1. EGR valve
2. Exhaust gases admision
3. Exhaust to intake gases output
4. EGR actuator
5. Vacuum pump vacuum tube
6. Solenoid valve
7. EGR vacuum tube
8. Electric connections



EGR ELECTRIC SYSTEM



E.G.R. SYSTEM (COMPONENTS)

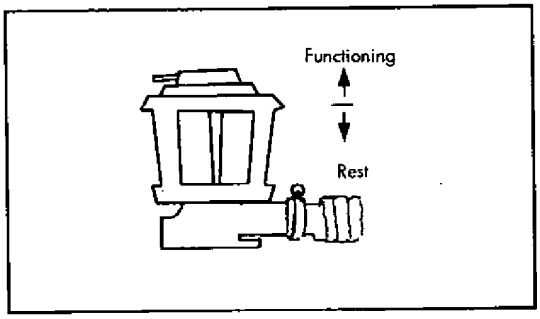
The E.G.R. system is designed to reduce pollution levels. This is why it allows a certain amount of exhaust gases to enter the engine under certain operating conditions. It's made up of the following components.

- **Temperature switch**
  This has two funcitons, one is to make EGR operative when coolant temperature is over 60º C and the other is to control the performance time of glow plugs. Its contact, is normally closed and it earths the circuit when temperature exceeds 60º C.
- **Throttle lever switch**
  This control the system when the throttle lever is moved from rest position to a position between **25-30 mm (1.00-1.20 in)**. From that position the electrical circuit is interrupted and EGR system stops.
- **EGR electric valve**
  When it receives current, it allows a vacuum to pass from vacuum pump to EGR valve.
- **EGR valve**
  This allows exhaust gases to pass into the inlet manifold when the valve is separated from its seat. This happens when vacuum is transmitted through EGR solenoid.
- **Relay**
  This cuts current to electro valve when starting, even when coolant temperature exceeds 60º C and throttle lever movement is under **25-30 mm (1.00-1.20 in)**.
- **Inversor relay**
  This supplies current to electric valve when the temperature switch is closed at 60º C.

EGR SYSTEM FUNCTIONING

When coolant temperature is under **60º C**, temperature switch is open, not earthing the inversor relay and preventing EGR electric valve from functioning. When temperature is over **60º C**, temperature switch is closed activating inversor relay, which will supply current to EGR electric valve, allowing vacuum to pass to EGR valve, this will be lifred from its seat allowing exhaust gases to flow into the intake manifold.

When throttle lever is moved from idle position to a driving of **25-30 mm (1.00-1.20 in)**, EGR system functions as previously described, but at that point **25-30 mm (1.00-1.20 in)** micro-switch placed on fuel distribution pump is opened and interupts the earth that activated the electric valve. In this way, vacuum to EGR valve is not present and exhaust gases are prevented from entering the engine's intace system.



EGR SYSTEM (INSPECTIONS)

If the E.G.R. system does not work, the driver will not notice a fault, but pollution levels will increase and could damage the exhaust catalyst.

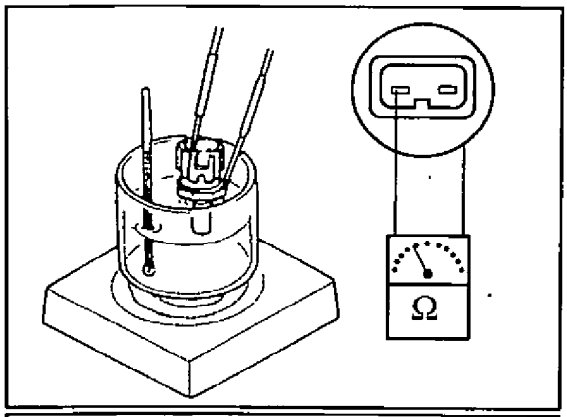
If the E.G.R. system functions incorrectly or permanently. the level of fumes will increase and engine performance will be affected. This is why the EGR system should be checked regularly in the following way:

General inspection

1) With cold engine (temperature under **60º C**) check that EGR membrane does not move independently of the throttle lever position.
2) Ensure the engine temperature is over **60º** C. Slowly move throttle lever and observe membrane which should return to rest position when throttle lever has moved between **25-30 mm (1.00-1.2 in)**.

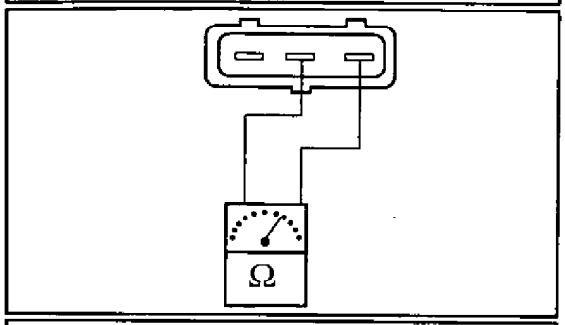
Electric cables

1) With engine running and hot, check one of the electric valve terminals for (+) and (-) earth in the other.
2) Check that when the thermocontact terminal is released, (+) disappears from the electric valve.
3) Check that when moving throttle over the first **25-30 mm (1.00-1.2 in)** earth (-) is disconnected on the other side of the electric valve.



Electric switch

1) Insert switch in a container of cold water and connect an ohmmeter as shown. In this condition, ohmmeter must indicate open circuit.
2) Raise temperature of the water and check at **60º C** that ohmmeter shows continuity.

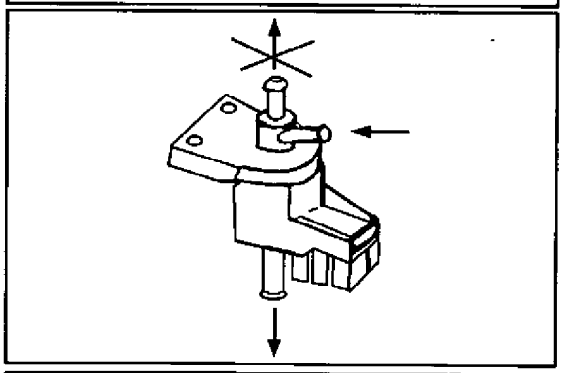


Throttle lever switch

1) Fit ohmmeter probes as indicated on the micro-switch connector.
2) Move throttle lever. In the first part from idle to **25-30 mm (1.00-1.2 in)**. the ohmmeter must indicated continuity. Beyond that point, resistance must be infinite.

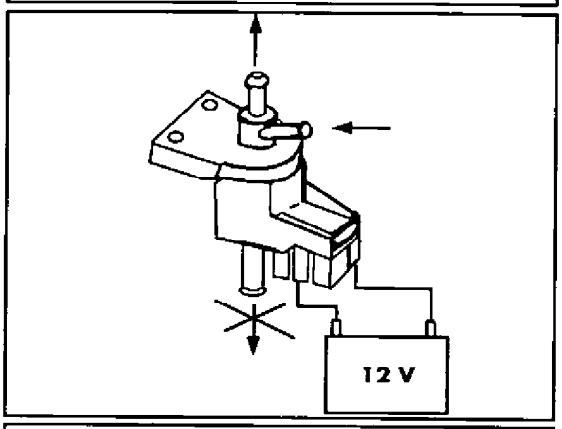
NOTE

Throttle lever switch can only be adjusted by a Lucas Service Centre.



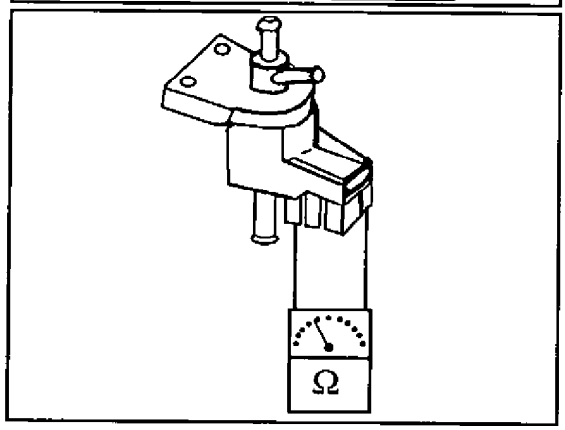
Electric valve

1) Blow through electric valve as shown and check that air comes out of the lower pipe.
2) Block lower exit and check no air comes out from the upper pipe.



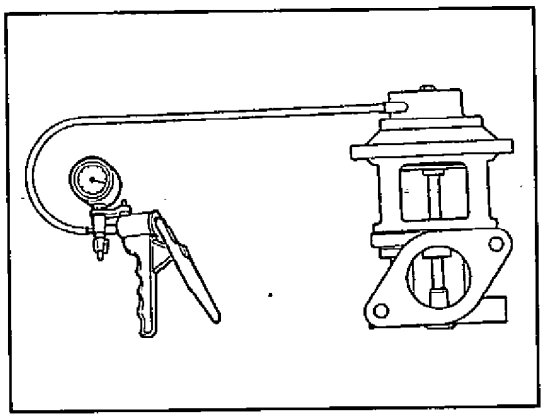
3) Connect the electric valve to a 12v power surce and check no air comes pipe from the lower pipe and it only comes out from the upper.
4) Check electric valve lower resistance at 20º C.

Electric valve resistance at 20º: 30 Ω approx.



NOTE

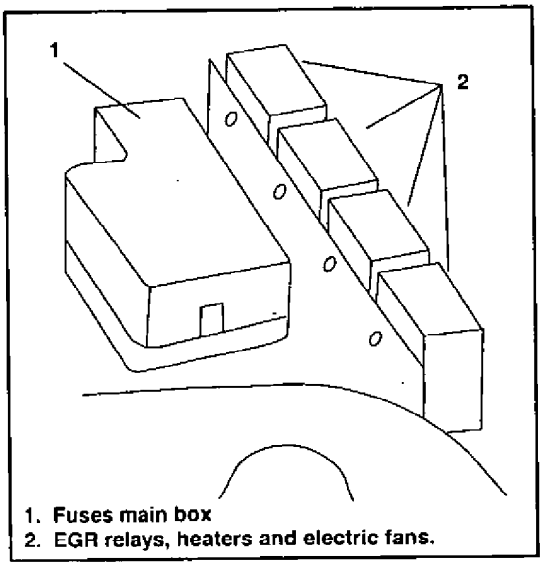
The electric valve upper tube must be connected to the vacuum pump and the EGR valve to its horizontal pipe. Reversing these connections will cause engine and braking malfunctions.



EGR valve

Asuming EGR system works correctly, if the valve upper tube is removed when the engine is at idle, the sound of the engine will slightly change. If this does not occur, check its functioning, by applying the following procedure:

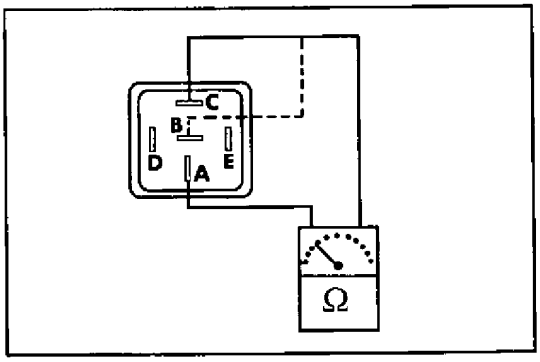
1) Check the valve is closed.
2) Apply vacuum as shown at left, and check that the valve opens.
3) Maintain vacuum for **10 sec.** with vacuum pump and ensure the reading does not drop.

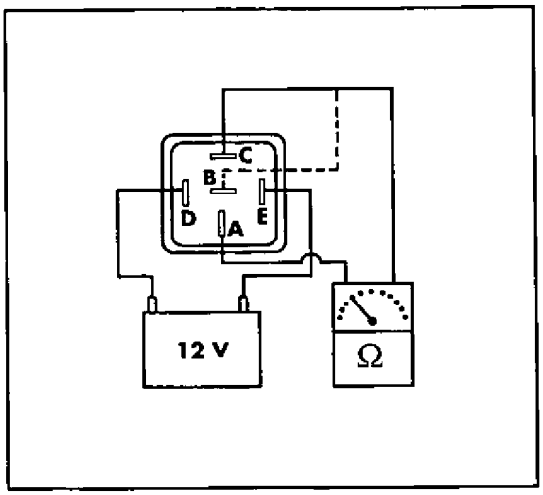


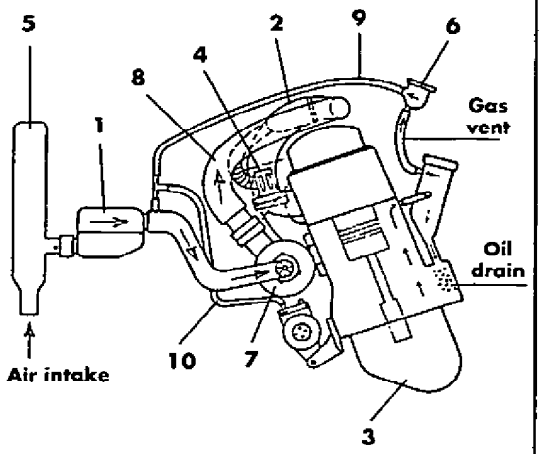
1. **Fuses main box**
2. **EGR relays, heaters and electric fans.**

Relays

1) Remove the four relays placed next to the fuse main box.
2) Identify the EGR system relays and central heaters according to the line colours and the electrical diagram.
3) Separate relay from its connector and perform the following tests:
   - Use an ohmmeter to confirm an open circuit between A and C.
   - Check, for a closed circuit between A and B.
   - Feed points D and E with a 12v supply.
   - Check for continuity in this situation between A and C and open circuit between A and B.
   - Replace those relays not performing as above.







1. Air filter
2. Intake collector
3. Oil sump
4. EGR valve
5. Air-resonator intake
6. Regulator
7. Turbocompressor
8. Turbo line – intake collector
9. Engine ventilation line
10. Vacuum pump outflow lines

TURBO-DIESEL INTAKE SYSTEM

POSITIVE CRANKCASE VENTILATION SYSTEM (PVC)

Functioning

1) Gases generated in the oil sump rise through ventilation pipes, through the valve, and into the turbocompressor where they are sucked into the engine by the cylinders.

Maintenance

1) Check and replace valve whenever the following are observed:
   - Bluish exhaust fumes.
   - Excess pressure in the crankcase which can cause oil loss through front and rear crankshaft retainer.

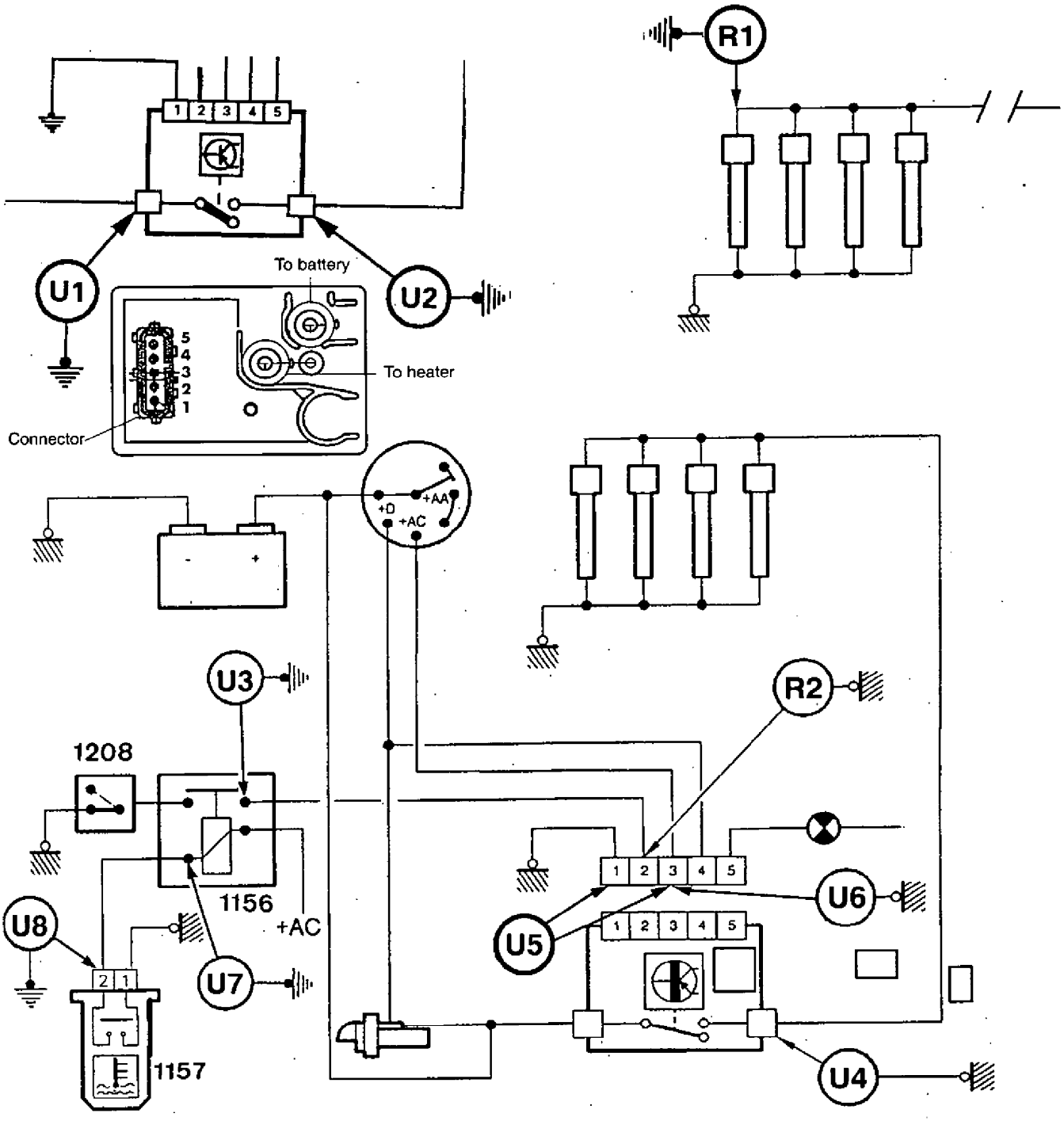
GLOW PLUG CIRCUIT

FUNCTIONING

Pre-heating system supplies the necessary temperature to combustion pre-chamber which facilitates cold start. It consists of:

- Four glow plugs, connected in parallel, which provides the proper temperature to combustion pre-chambers.
- Pre-heating control which controls current feeding time to heaters for 9 seconds from initial start-up, when engine is cold.
- Thermocontact (the same as for EGR). Under **60º C** it is kept open and its relay remains deactivated. Over **60º C** thermocontact closes and relay activates earthing the heater control, considerably reducing heaters feeding time.

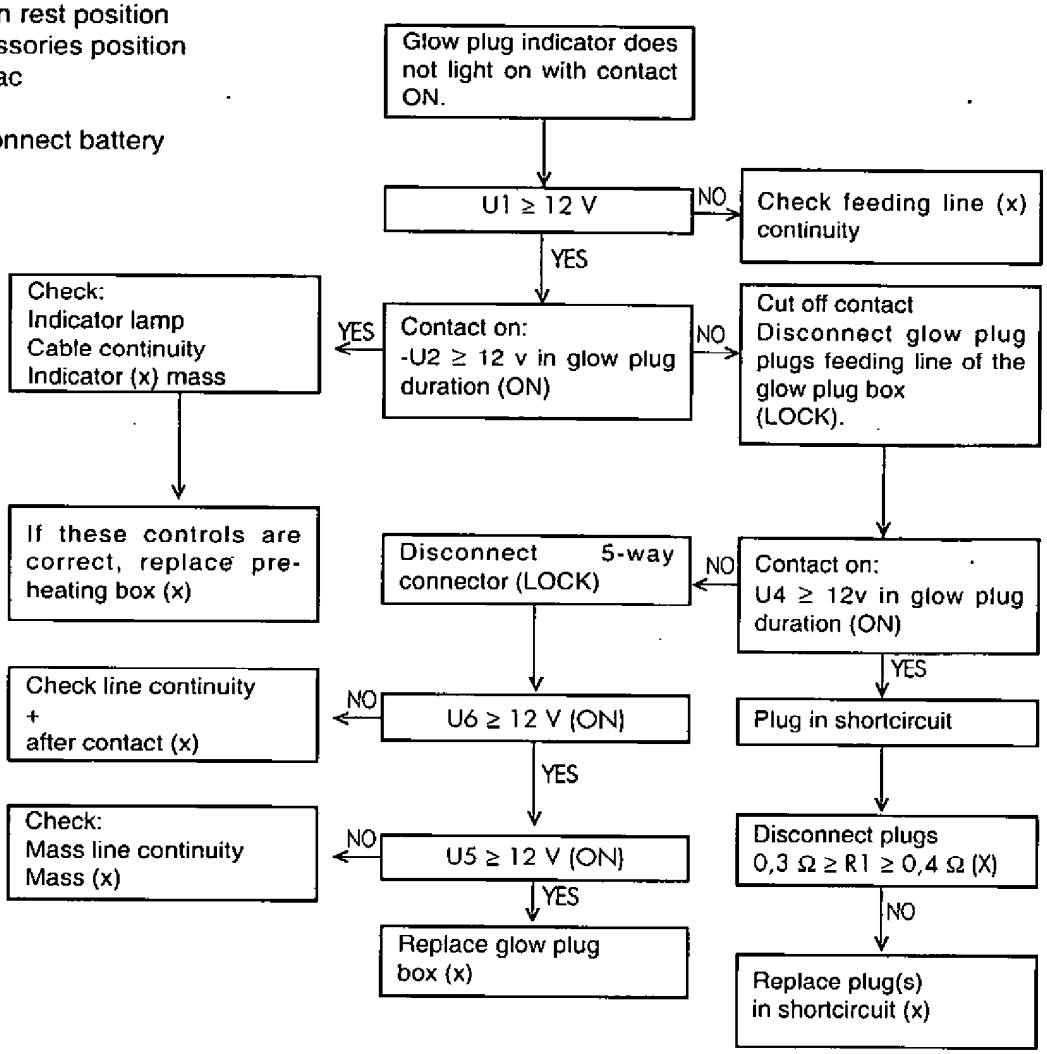
INSPECTIONS



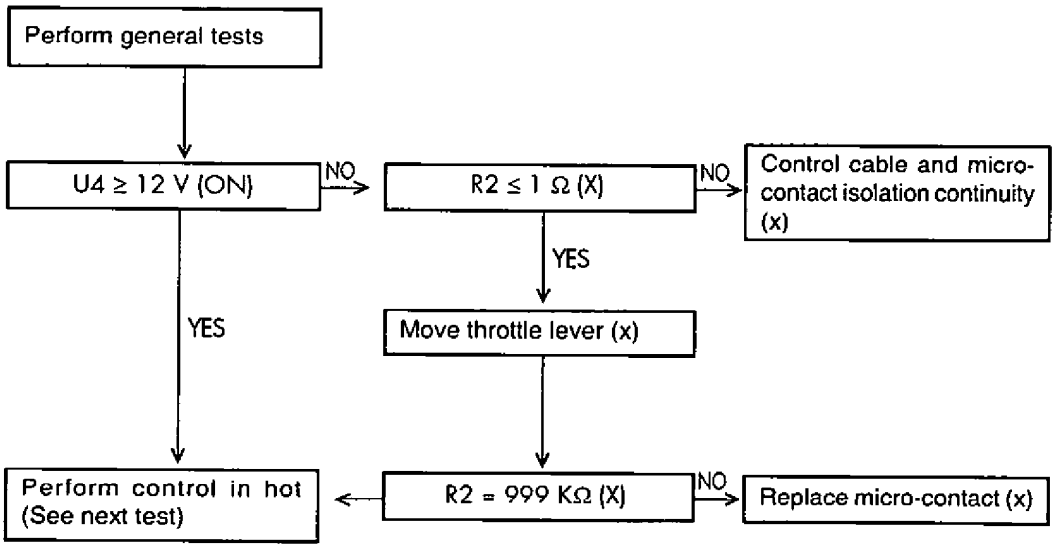
GENERAL TESTS

NOTE: When using multimeter as ohmmeter, ensure there is no voltage in the circuit. Fit ignition key in the indicated position.

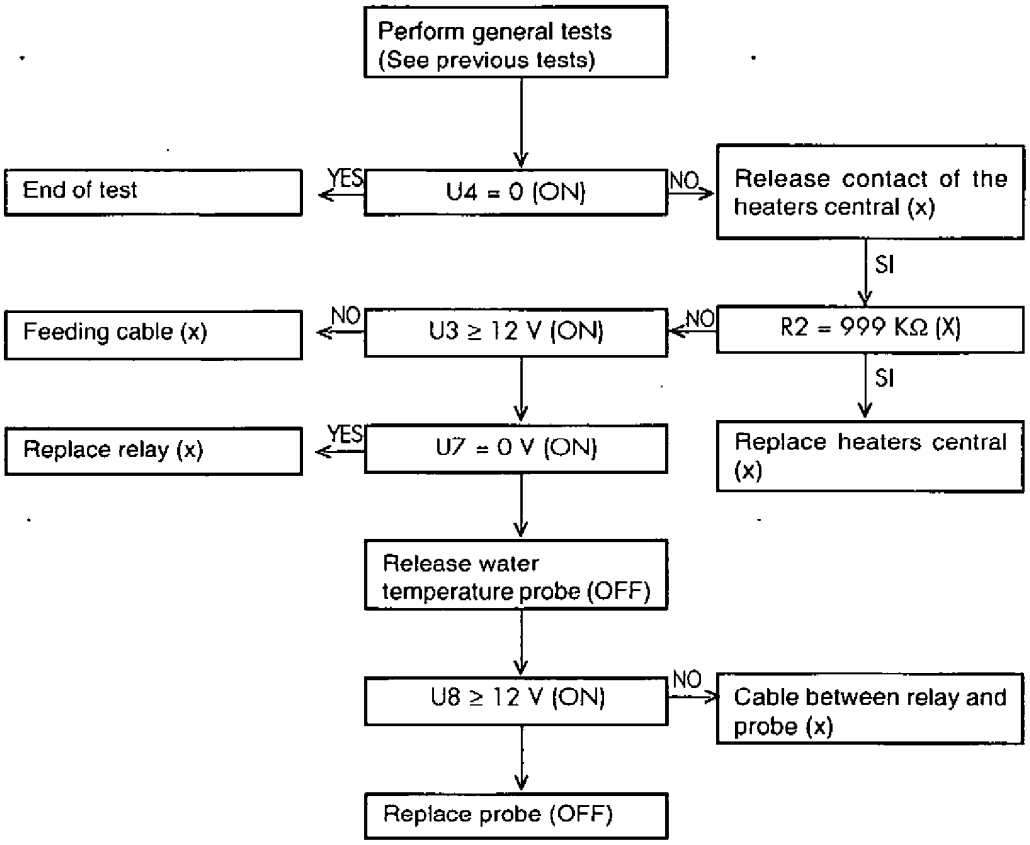
Abbreviations:
LOCK = Key in rest position
ACC = Accessories position
ON = Contac
START = Start
X = Disconnect battery



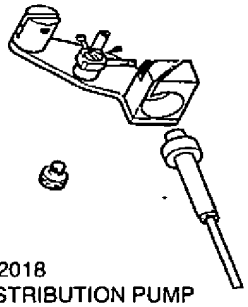
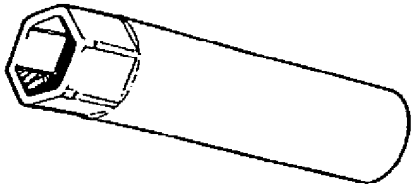
CONTROLS WITH HOT ENGINE (TEMPERATURE OVER 60º)



CONTROLS WITH COLD ENGINE (TEMPERATURE UNDER 60º)



SPECIAL TOOLING

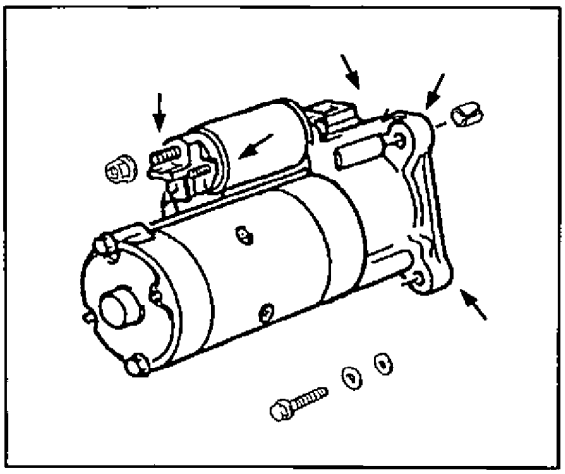
 00000V02008 T.D.C. FIXER	 00000V02018 FUEL DISTRIBUTION PUMP COMPARATOR SUPPORT	 00000V02013 INJECTORS EXTRACTION WRENCH
 00000V02017 SEMI-CIRCLE WRENCH	 00000V02001 INJECTORS EXTRACTION WRENCH	

SECTION 6G

STARTER SYSTEM

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STARTER MOTOR REPLACEMENT 6G-1



STARTER MOTOR REPLACEMENT

Characteristics

Brand: **BOSCH**
Voltage: **12 v**
Power: **1.7 Kw**
No. of teeth in pinion: **11**

Disassembly

1) Disconnect the battery negative cable
2) Release positive cable and relay cable from the starter motor.
3) Slacken and remove the starter motor three attaching bolts.

Assembly

1) Perform assembly in reverse order as disassembly.
2) Tighten starter motor bolts according to its to specifications.

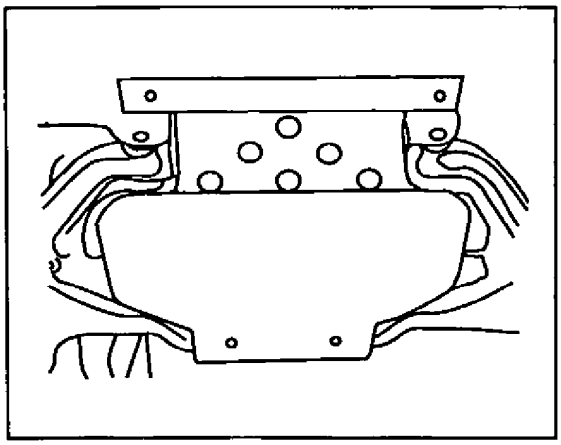
Torque specification for starter motor attaching bolts: 20-30 Nm (2.0-3.0 kg.m, 14.5-21.0 lb.ft).

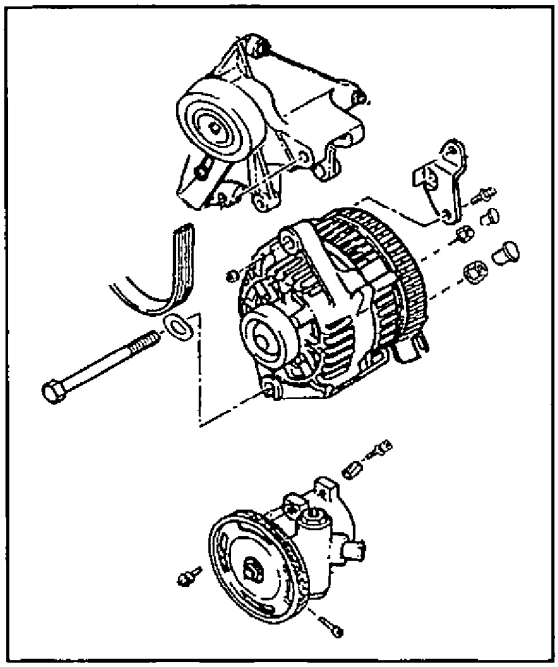
SECTION 6H

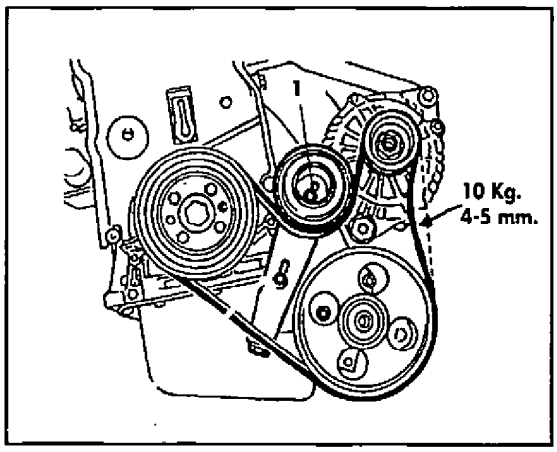
CHARGING SYSTEM

LIST OF CONTENTS

ALTERNATOR REPLACEMENT 6H-1







ALTERNATOR REPLACEMENT

Characteristics

Brand: **BOSCH**
Nominal voltage: **14 v**
Maximum outflow: **70A**
Polarity: **Ground negative**
Vacuum speed: **r.p.m. 1,200**
Regulated voltage: **14.5 ± 0.3 v**
Maximum speed allowed: **r.p.m.18,000**

Disassembly

1) Remove lower soundproof plate.
2) Remove negative cable from battery.
3) Slacken vacuum pump tensioner and extract vacuum pump belt.
4) Slacken two bolts at the sides and at the lower part of the alternator tensioner and remove belt.
5) Remove attaching nuts and remove alternator positive and drive cables.
6) Remove lower and upper alternator support bolts.

Assembly

1) Reverse the order of disassembly, tightening bolts to their torque specification.

Torque specification for alternator tensioner bolts:
11-22 Nm (1.1-2.2 kg.m, 8.0-16.0 lb.ft).

Alternator belt tension:
10 mm (0.40 in) with 100 N (10 kg, 22 lb).

Vacuum pump belt tension:
10 mm (0.40 in) with 100 N (10 kg, 22 lb).

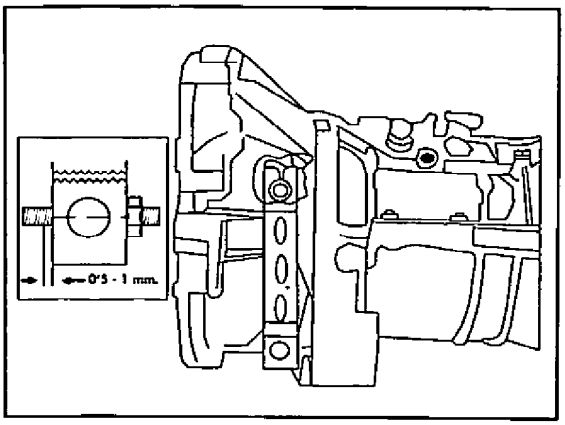
SECTION 7C

CLUTCH

NOTE
For topics not covered in this section, please refer to the corresponding section of the Vitara Service Manual outlined in the PREFACE.

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Adjustment of clutch cable 7C-2
GENERAL REPAIRS OF THE ASSEMBLY 7C-3
Clutch system. 7C-3
Operation Shaft Disassembly. 7C-3



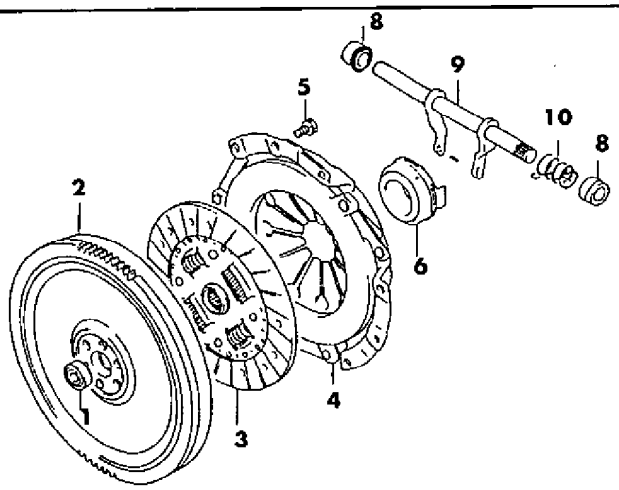
IN THE VEHICLE

ADJUSTMENT OF CLUTCH CABLE

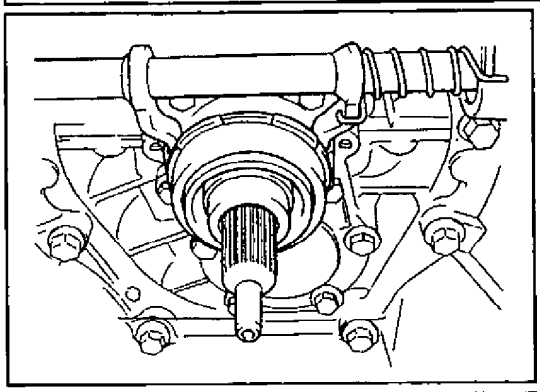
1) Lightly depress the clutch lever to remove the free play.
2) This required a force of **10 Nm (1.0 kg.m, 7.5 lb.ft).**
3) Adjust cable free-play to **0.5-0.10 mm (0.020-0.040 in)** using the adjusting nut.

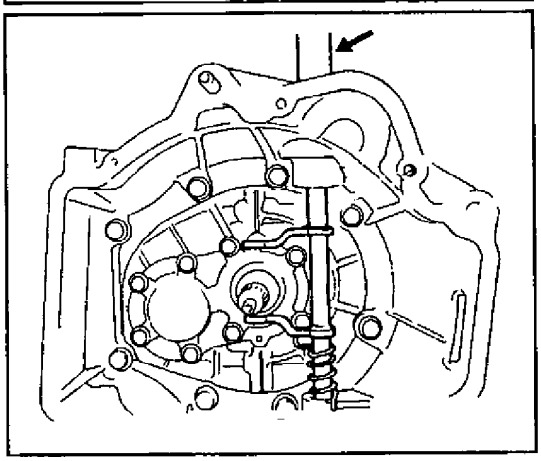
GENERAL REPAIR OF ASSEMBLY

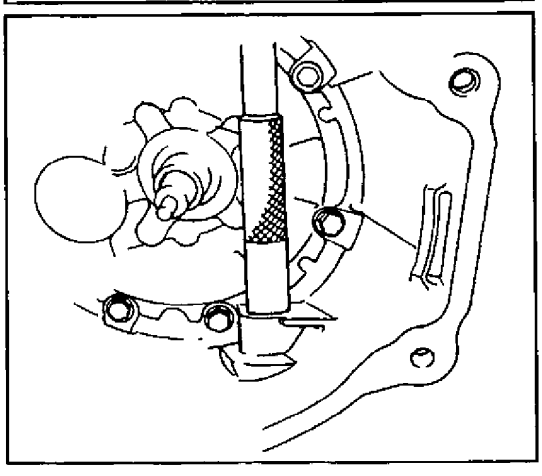
CLUTCH SYSTEM



1. Input shaft bearing.
2. Flywheel
3. Clutch disc
4. Clutch cover
5. Bolt
6. Thrust bearing
7. Shaft sealing
8. Bushing
9. Clutch shaft
10. Return spring







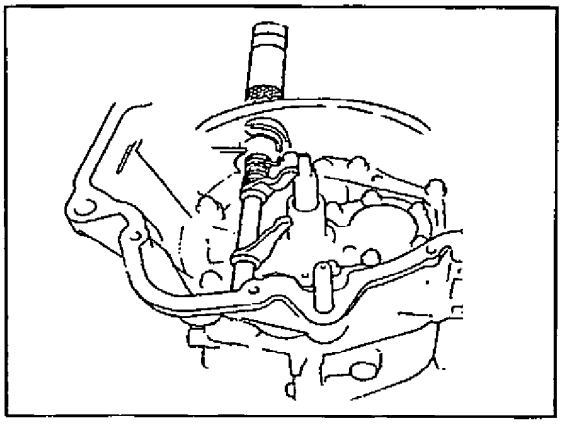
OPERATION SHAFT DISASSEMBLY

Disassembly

1) Remove transmission and transfer case from vehicle.
2) Remove thrust bearing.
3) Disconnect return spring, sliding clutch shaft outwards.
4) Push downwards the bushing on the right side with special tool until the shaft and bushing are out of their housing.
5) Extract bushing on the right side and move clutch shaft upwards, until the lower end is disconnected from the bushing, and then extract shaft of the clutch case.
6) Knock from outside, to remove bushing on the left side.

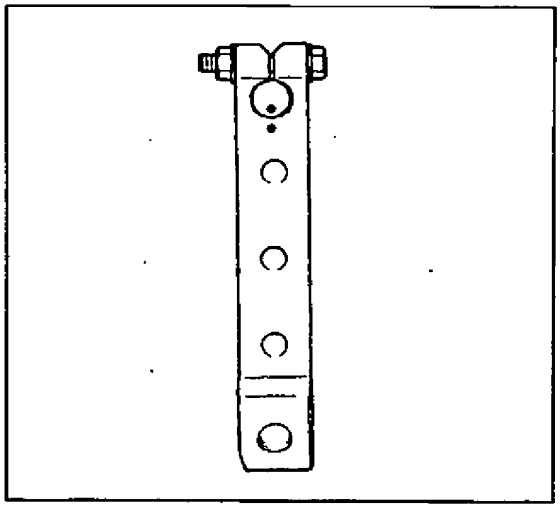
Inspection

1) Check clutch bearing turns smoothly.



Assembly

1) Press the right-hand bush into the housing until it stops. Apply grease to the inner surface.
2) Insert the clutch actuating shaft complete with spring into the housing having greased the right hand end.
3) Grease the inside of the left hand bush and its complementary surface on the shaft.
4) Press the left hand bush into position ensuring that the chamfered end is out board until the chamfer ridge is level with the casing.
5) Position the spring ends, one on the casing and the other on the fork.

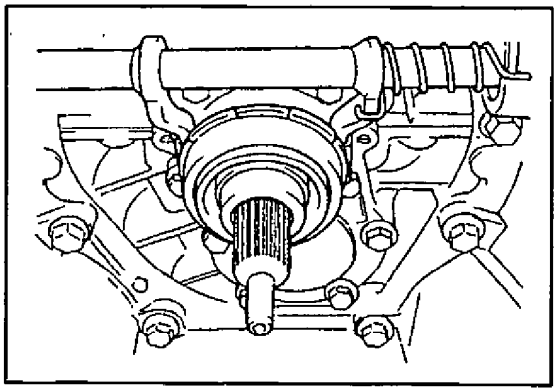


CAUTION
Do not wash thrust bearing, this could cause grease to leak and consequently damage the bearing.

Assembly

1) Fit clutch lever so that it aligns with center punch marks and tighten bolt and nut.

Torque specification: from 10-16 Nm (1.0-1.6 kg.m, 7.0-11.5 lb.ft).



2) Apply graphite grease inside the sliding surface of the thrust bearing, assembly it and check it is properly fitted in the fork.
3) Assemble transmission and transfer case on the vehicle.
4) Assemble clutch cable and perform adjustment as previously described.

SECTION 8

ELECTRICAL SYSTEM

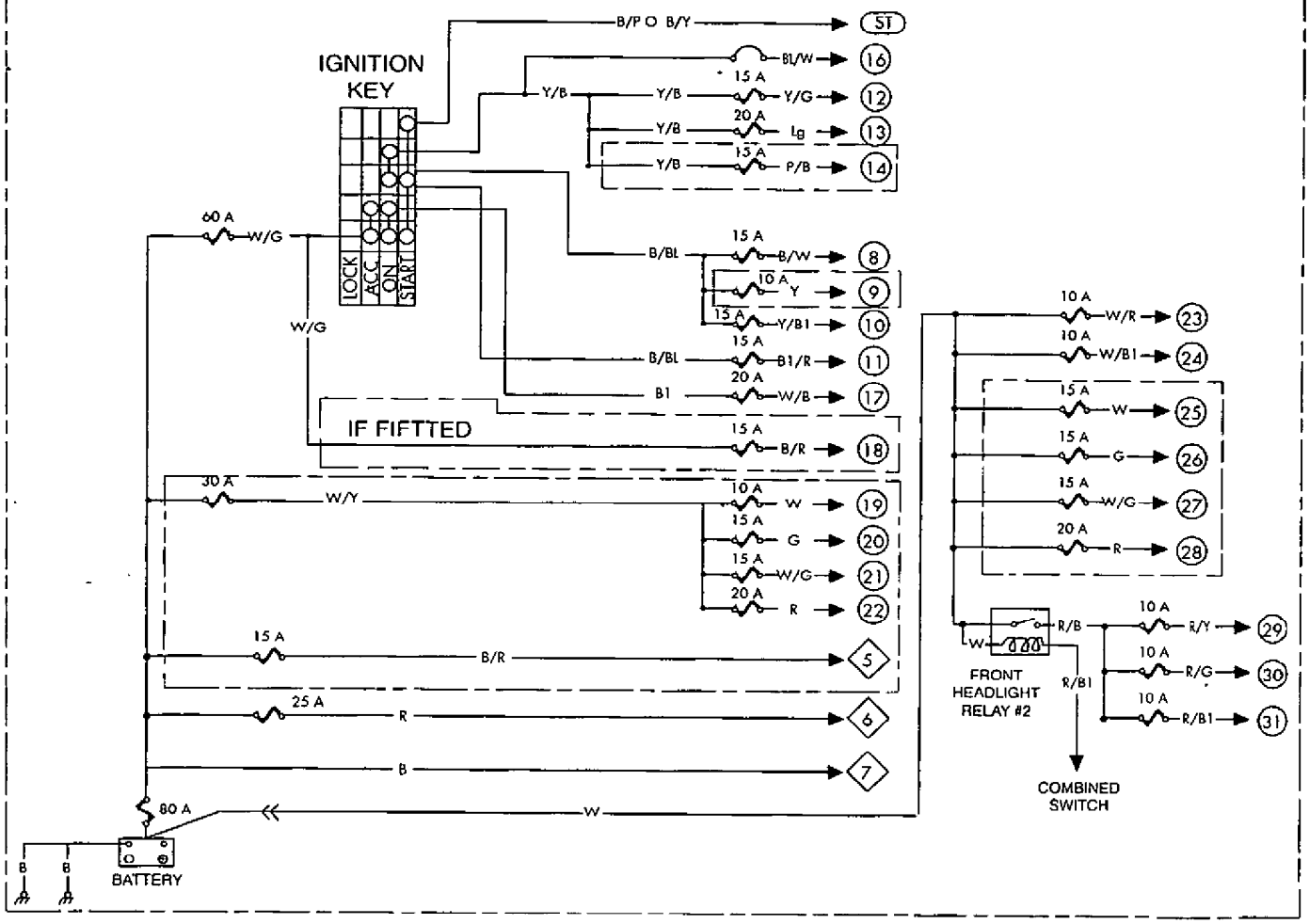
NOTE
For topics not covered in this section please refer to the corresponding section of the Vitara Service Manual in the PREFACE.

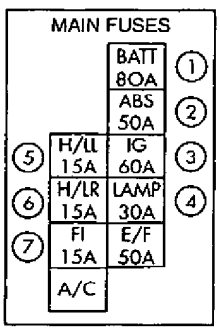
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CHASSIS ELECTRICAL SYSTEM

FUSES

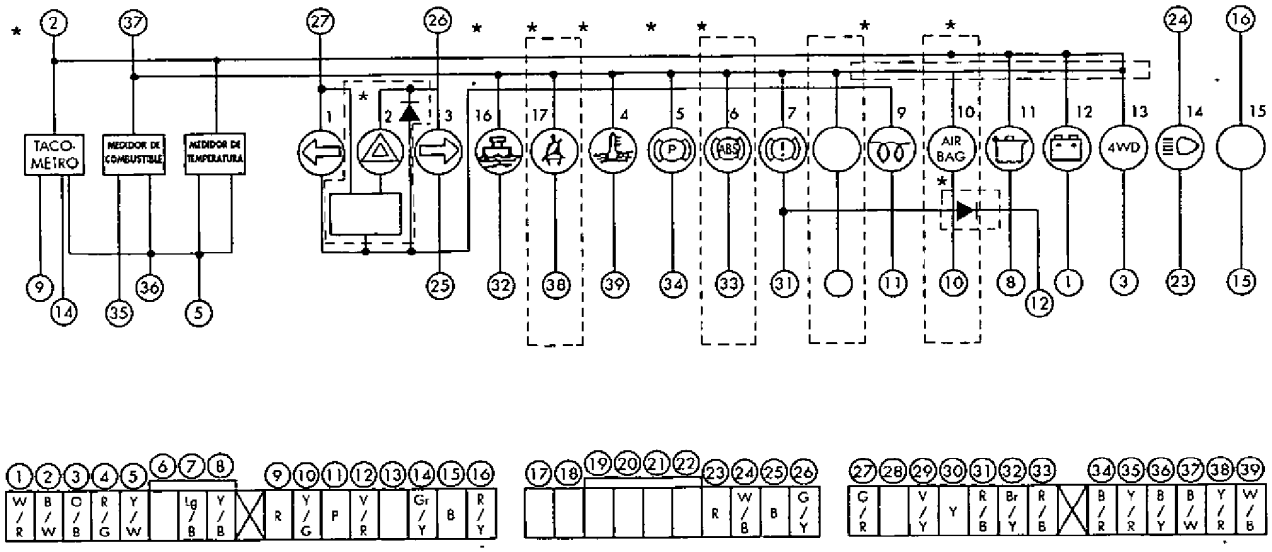




ONLY USE INDICATED FUSES						
10A	10A	10A	15A	15A	15A	20A
RIGHT AND LEFT HEADLIGHTS		INTERIOR LIGHTS	BRAKE AND HORN LIGHTS	HAZARD LIGHTS	WINDSCREEN DEMISTING AND DEFROSTING	ENGINE HEATER
10A	10A	10A	20A	15A	10A	15A
NUMBER PLATE LIGHT	POSITION LIGHTS (RIGHT)	POSITION LIGHTS (LEFT)	CIGARETTE LIGHTER AND RADIO	RPM METER	REVERSE AND INDICATOR LIGHT	WINDSCREEN WIPERS
SUZUKI						

INSTRUMENTS AND DIALS

INSTRUMENT PANEL



1. Turn signal dial (left side)
2. Hazard light
3. Turn signal (right side)
4. Temperature gauge
5. Parking light
6. ABS light (if fitted)
7. Brake wear warning light
9. Heater light
10. "AIR BAG" light
11. Oil pressure gauge
12. Alternator charge gauge
13. 2WD light
14. Road lamp
15. Instrument panel light
16. Coolant temperature warning
17. Seat belt warning lamp (if fitted)

①	To alternator	White/Red
②	To ignition	Black/White
③	To 4WD switch	Orange/Black
⑤	To water temperature sensor	Yellow/White
⑧	To pressure switch	Yellow/Black
⑨	To r.p.m. sensor	Brown/White
⑩	To AIR BAG unit	Yellow/Green
⑪	Heaters relay	Pink
⑫	To ignition	Violet/Red
⑮	To light key	Black
⑯	To light relay	Red/Yellow
㉓	To headlamps	Red
㉔	To fuse box	White/Blue
㉕	To ground	Black
㉖	To indicator light (left side)	Green/Yellow
㉗	to indicator light (right side)	Green/Red
㉛	To Brake fluid level switch	Red/Black
㉜	To cooling level switch	Light Green/Red
㉝	To ABS control unit	Red/Blue
㉞	To parking brake switch	Black/Red
㉟	To fuel gauge	Yellow/Red
㊱	To ground	Black/Yellow
㊲	To ignition	Black/White
㊳	To seat belt switch	Yellow/Red
㊴	To temperature switch	White/Black

SECTION 8B

CODED VEHICLE IMMOBILIZER

NOTE
For topics not covered in this section, please refer to the corresponding section of the Vitara Service Manual outlined in the PREFACE.

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Activating lock (on opening and closing driver's door) **8B-18**
Wiring diagrams and identification symbols **8B-19**

GENERAL OUTLINE

The coded vehicle immobilizing system is a mechanism designed to lock the fuel injection system, as long as the access code established by the owner is not entered. It consists of the following components.:

- **Engine control module (ECM)**
- **Injection relay (IR)**
- **Coded immobilizing keypad (CIK)**

It functions in the following way:

STARTING THE ENGINE

When the ignition key is entered and turned to ON position:

- If the green light on keypad comes on, the engine can be started directly.
- If the red light on keypad comes on, the immobilizing system is activated and it is necessary to enter the personal access code.

To start up the engine with the red light on, it is necessary to key in your personal four-digit number. The green light will come on and the red light will go off.

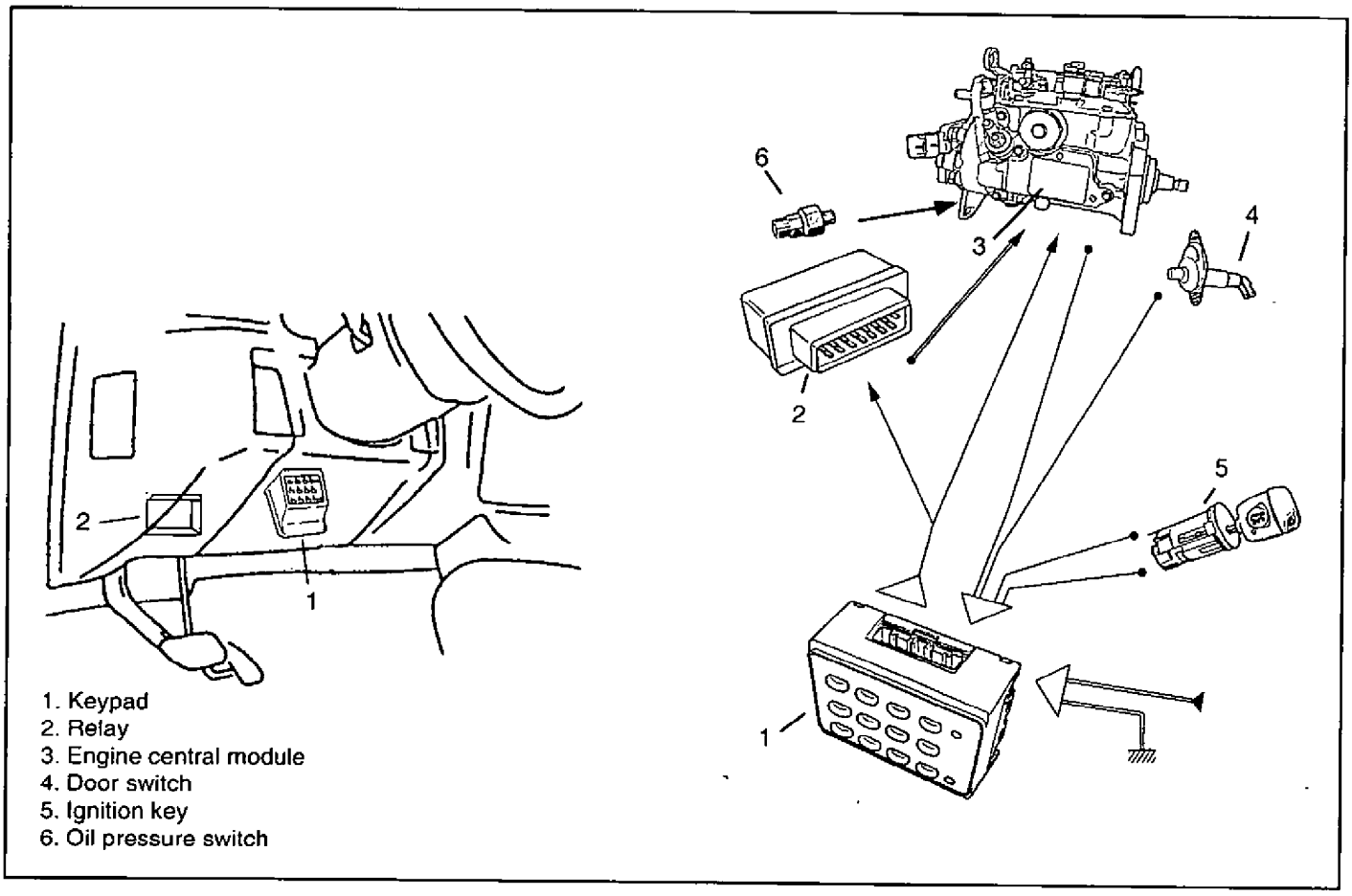
On leaving the Factory all vehicles have the code 1111 entered, which the customer may use if they do not wish to change it.

If you key in the wrong number, key in the correct four-digit code again. Each time a key is pressed a "beep" is heard. If an error is made on entering a code or in the process for changing a code, this is signalled by a two second warning sound.

With the ignition on, a "beep" sound is made if an attempt is made to start the engine up with the immobilizing system activated. This becomes permanent if the attempt to start continues.

NOTE

If the incorrect code is entered three times in succession, the keypad is rendered immobilized for thirty minutes.



1. Keypad
2. Relay
3. Engine central module
4. Door switch
5. Ignition key
6. Oil pressure switch

ENTERING PERSONAL CODE FOR FIRST TIME

This should be effected in the following way:

1). Turn ignition key to ON position.
2). Enter code 1111.
3). Press key C.
4). Enter a personal four-digit code.
5). Press key C to validate operation. This operation is confirmed by four green flashes and four "beep" sounds.

MODIFYING PERSONAL CODE

This operation should be effected in the following way:

1). Turn the ignition key to ON position.
2). Enter memorized code.
3). Press key C.
4). Enter new four-digit code.
5). Press key C to validate operation. This operation is confirmed by four green flashes and four "beep" sounds.

SECURITY MEASURES

The two codes (the old one preserved or new one validated) remain present until one of them is used, automatically anulling the other.
If the code is not confirmed, take out the key, enter once more and repeat the operation.
Simultaneous flashing of red and green lights indicates an incorrect operation or a malfunction. If this occurs, wait for approximately a minute, switch off and then on again. If the problem persists, a diagnosis of the fault should be effected as indicated below.

SETTING IN SERVICE MODE

This process allows the customer to let a garage or another person use the vehicle without knowing their personal code.
This mode allows the use of inmobilizer function with a variable code, regardless your own code (four digits).
This operation should be effected in the following way:

1. Enter personal code and press S.
2. Enter service code (the code 1111 is recommended) and press S.

Six green flashes accompanied by six "beep" sounds confirm the operation.
The service code is automatically anulled when the personal code is entered again, it being unnecessary to go through the code modification process again.

LOCKING SYSTEM

Locking is effected automatically on switching off in the following cases.

1.Thirty seconds after opening and closing of driver's door.
2.Ten minutes after switching off.

NOTE:

The oil pressure gauge switch is responsible for informing the engine control module, if the engine is off or running.
If the driver leaves the vehicle without turning off the engine, on opening the door the latter's switch sends a locking signal via the engine control module keypad. At the same time, the oil pressure gauge sends another signal to the running engine. This signal reaches the coded immobilizing module control so that the order received from door switch to lock doors is not effected.

IDENTIFICATION OF SYSTEM

System locking can be checked after thirty seconds by observing the red keypad light. This light comes on for ten seconds after system locking and then flashes until the starter motor is engaged again.

NOTE

In the event of a malfunction or the battery current being cut off, the personal code remains in the memory. In the event of the personal code being lost, it is necessary to replace the coded ignition engine control module.

DIAGNOSIS

INTRODUCTION

To effect a correct diagnosis and repair of the coded immobilizing mechanism the following steps should be taken:

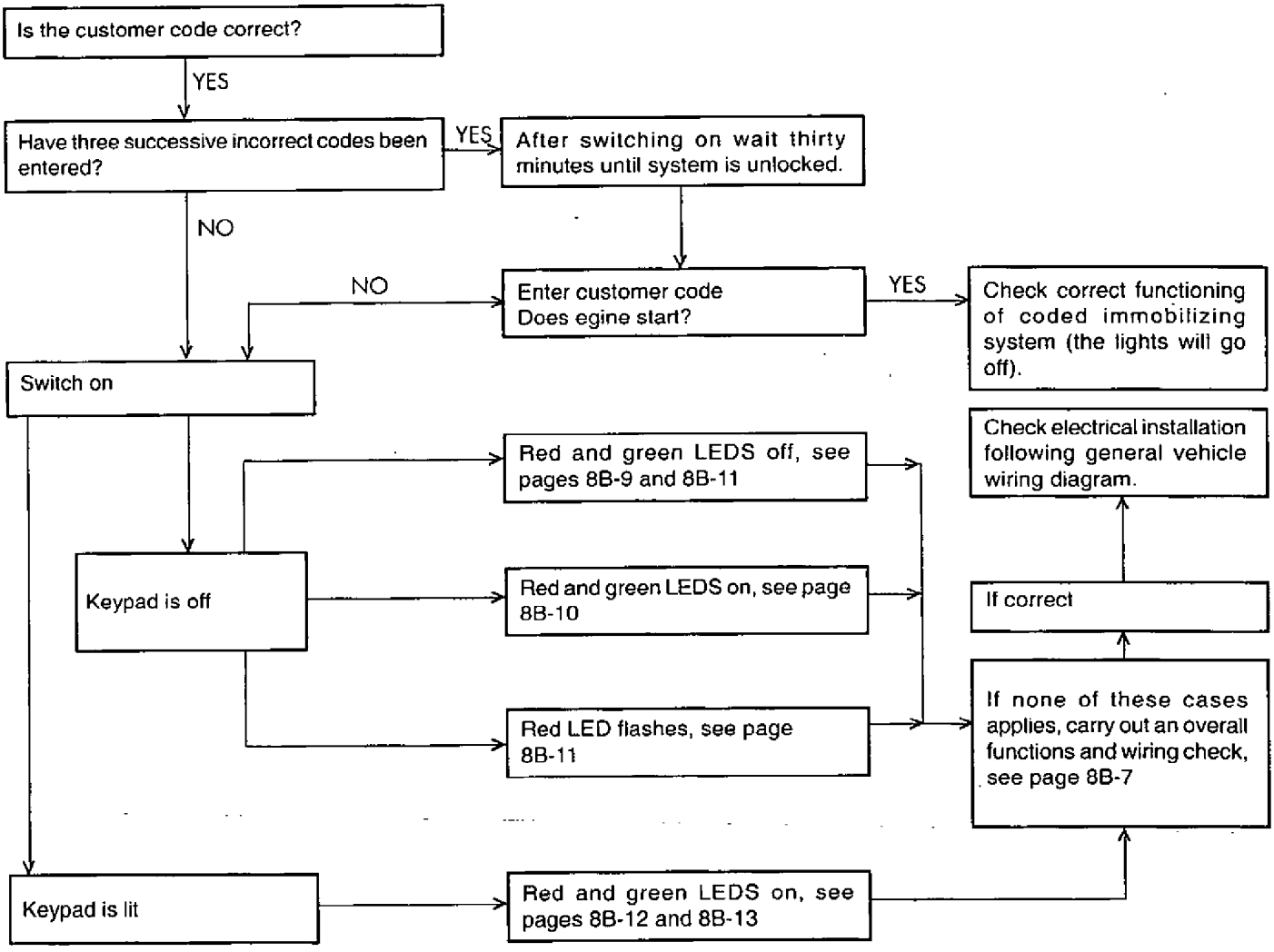
1) Talk to the with customer to know defective functioning symptoms of system and the conditions in which they have occurred.
2) Closely read the "General Outline" chapter in this section to gain thorough knowledge of the system.
3) Please refer to flow charts for each of the defects detected (see defect analysis).
4) Carry out repair to corresponding mechanism.
5) Perform test to confirm correct repair.

PRECAUTIONS ON DIAGNOSING MALFUNCTIONS

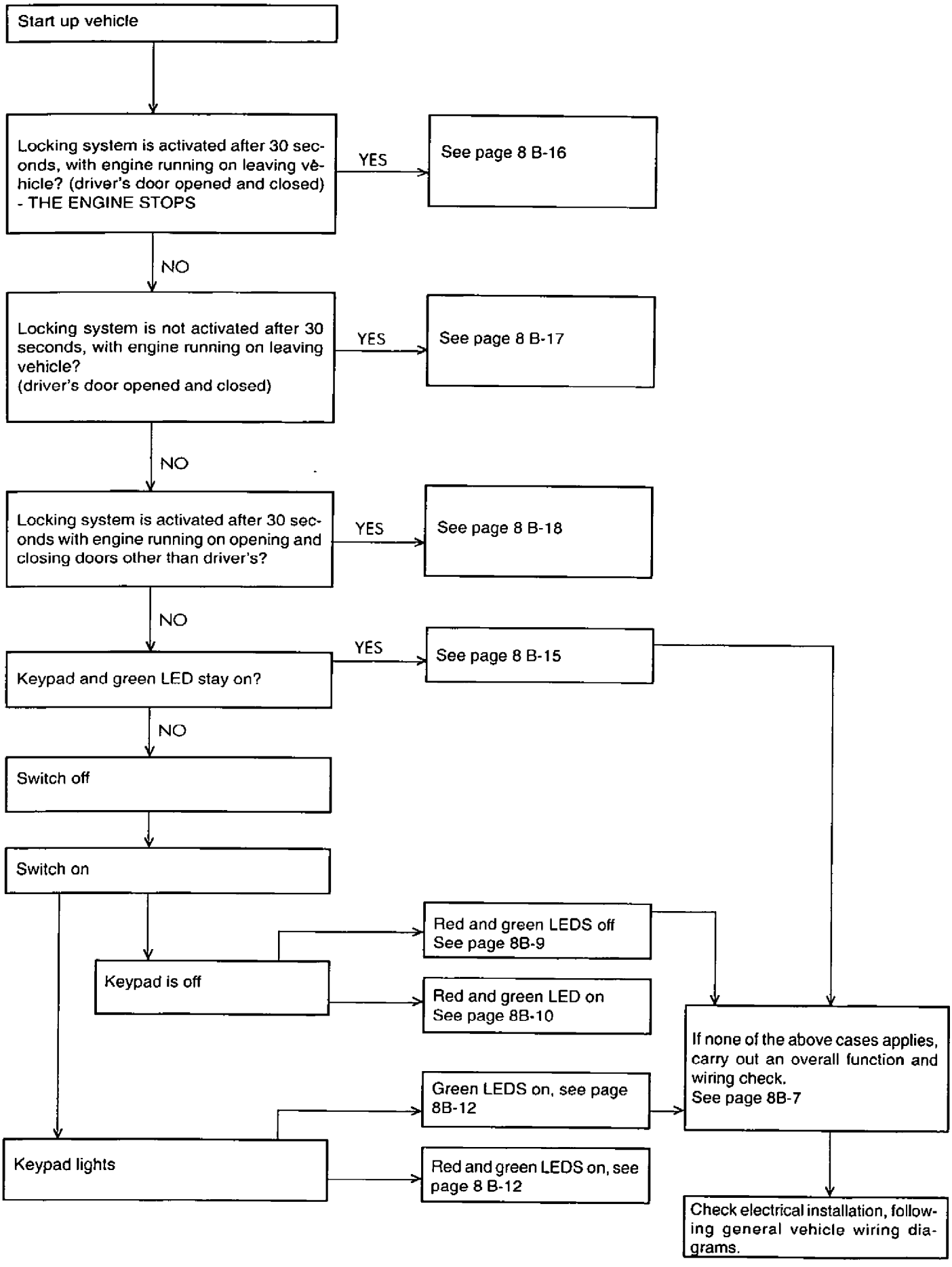
1) Do not disconnect:
   - Battery with the engine running.
   - E.C.M. relay or keypad after switching on.
2) Ensure that the battery is completely charged and that voltage is not lower than 12 v nor higher than 16 v.
3) The majority of intermittent problems are a result of:
   - Bad condition of cables or connections.
   - Incorrect power supply of terminals, or loose connections.
   - Terminals badly conformed or damaged.
   - Oxidized terminals.
   - Faulty connection between terminal and cable.

   Ensure these faults are repaired before continuing with diagnosis.
4) Do not use a pilot lamp or go over an electric arc with a wire to check continuity of a circuit.

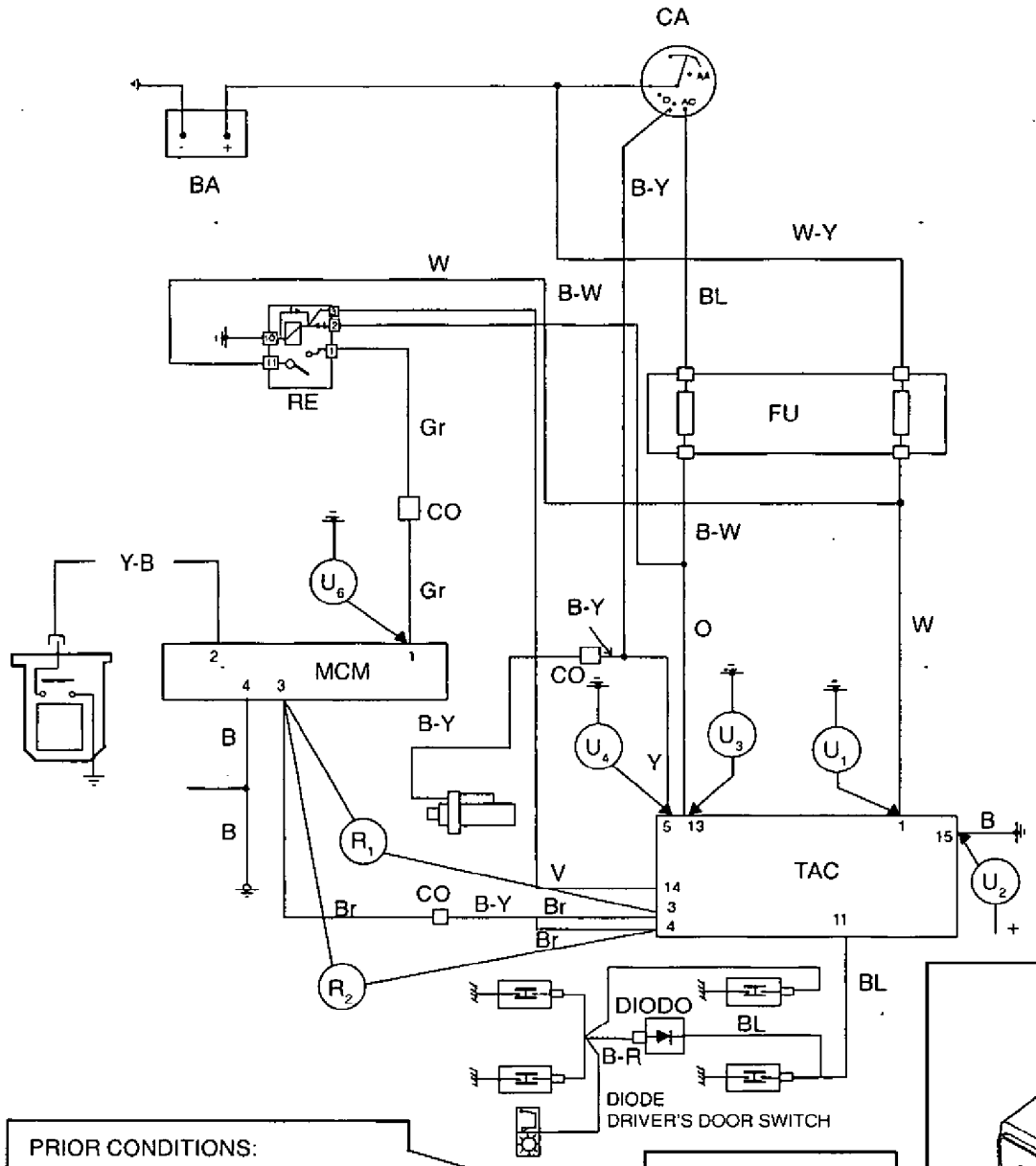
DEFECT ANALYSIS
A-1 ENGINE DOES NOT START

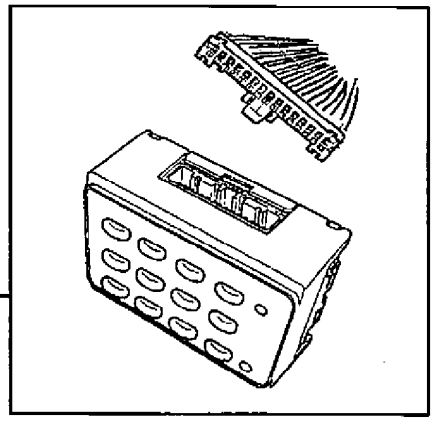


A-2 ENGINE STARTS



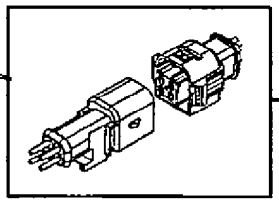
WIRING TEST



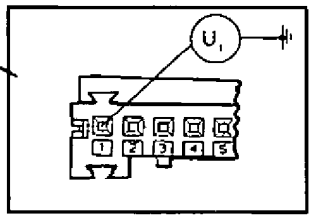


PRIOR CONDITIONS:
- BATTERY VOLTAGE = 12V
- ENGINE CONTROL MODULE DISCONNECTED
- KEYPAD CONNECTOR DISCONNECTED

Check keypad connector as follows:

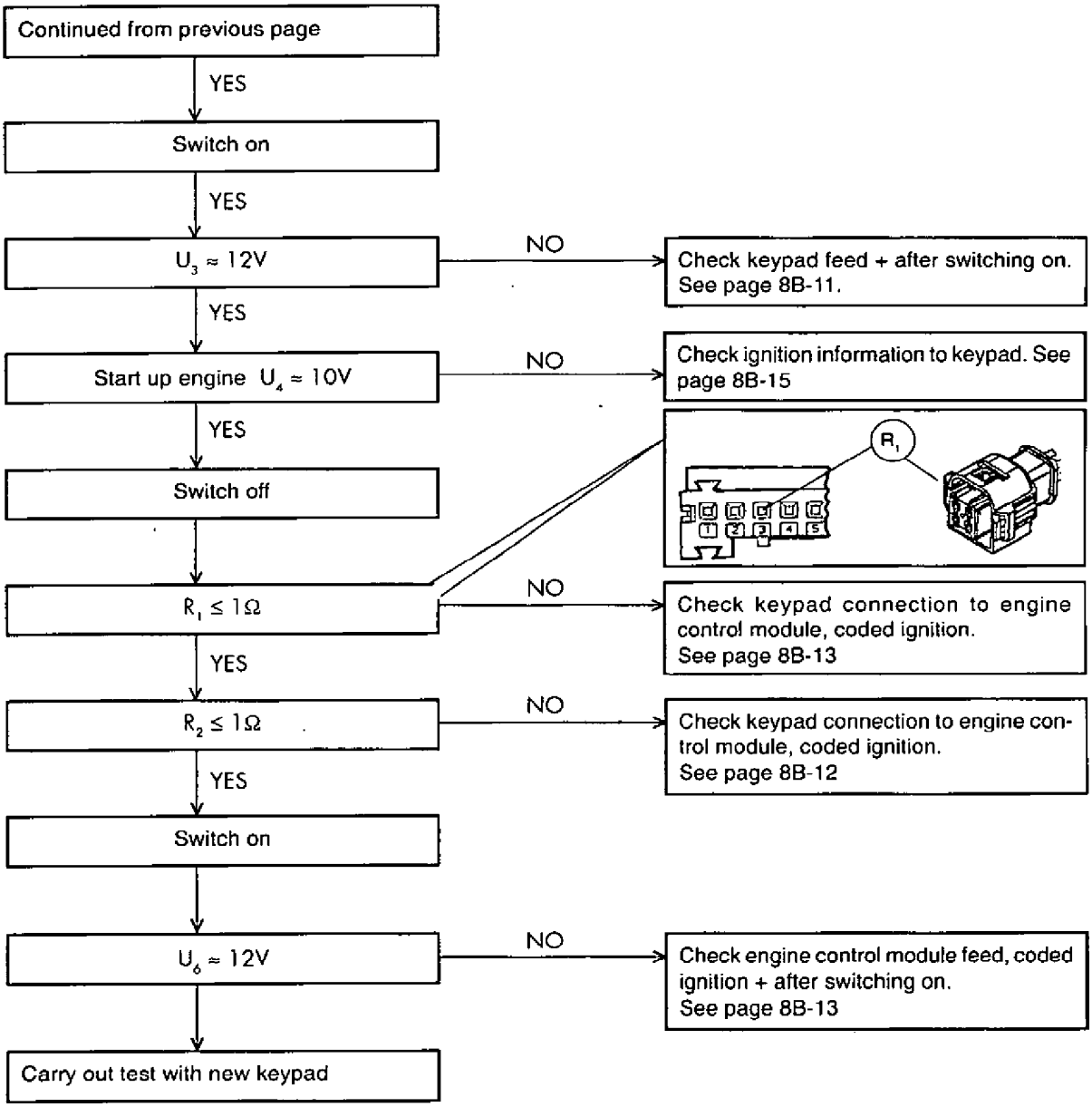


$U_1 \approx 12V$ — NO → Check keypad feed, see page 8B-9

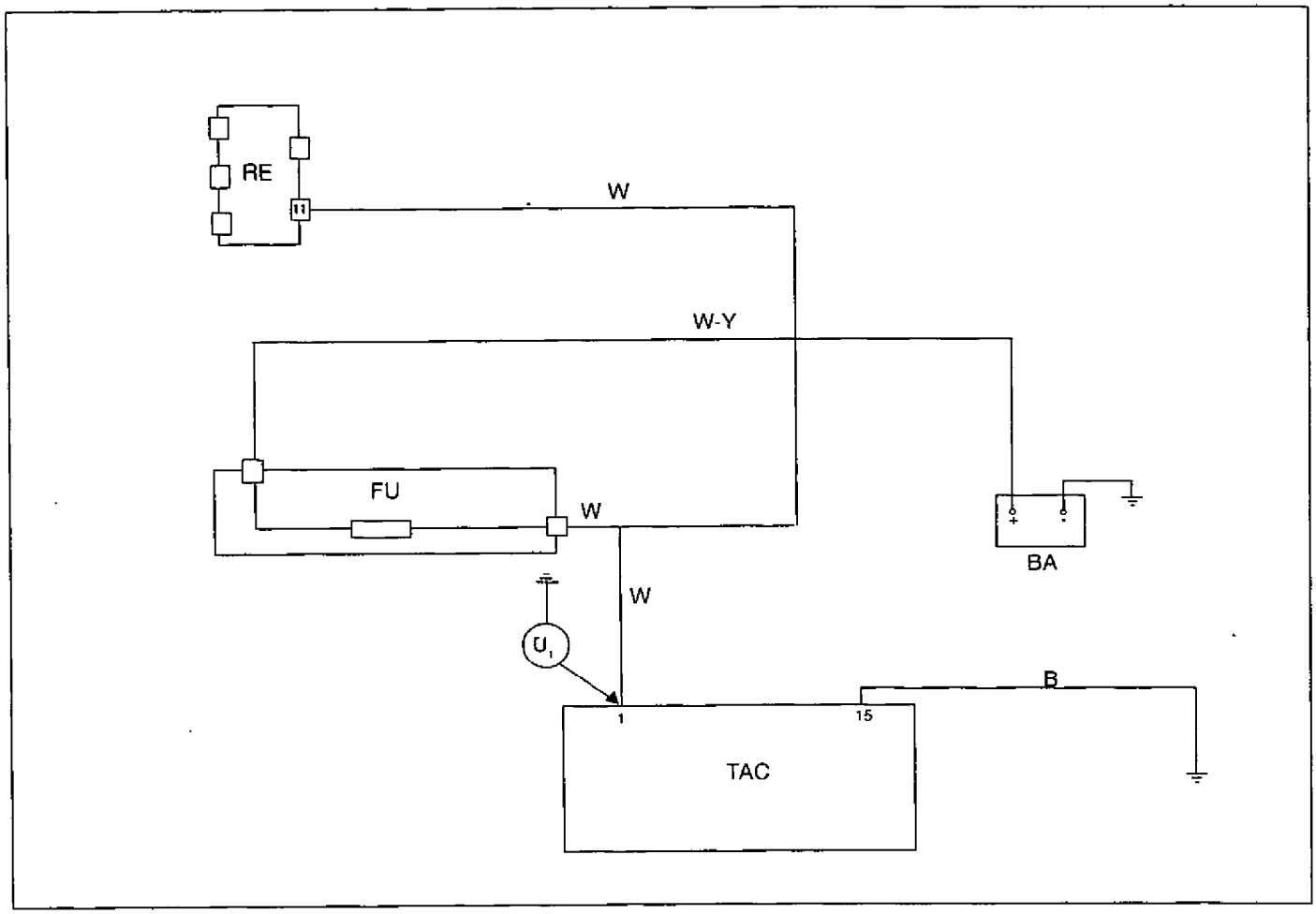


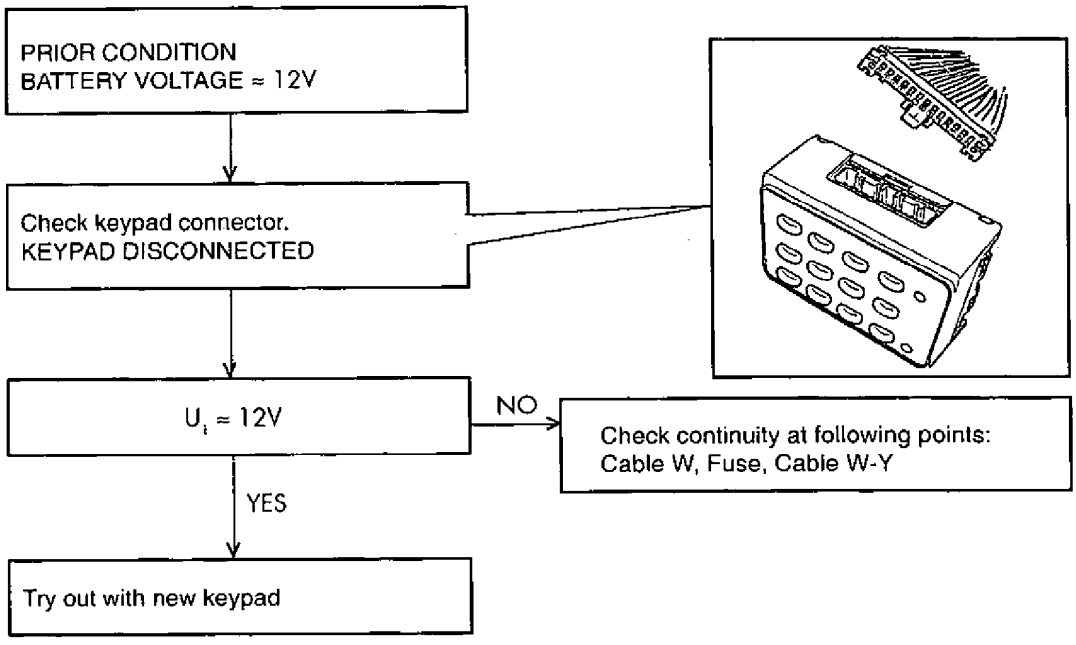
$U_2 \approx 12V$ — NO → Check keypad ground, see page 8B-10

See following page

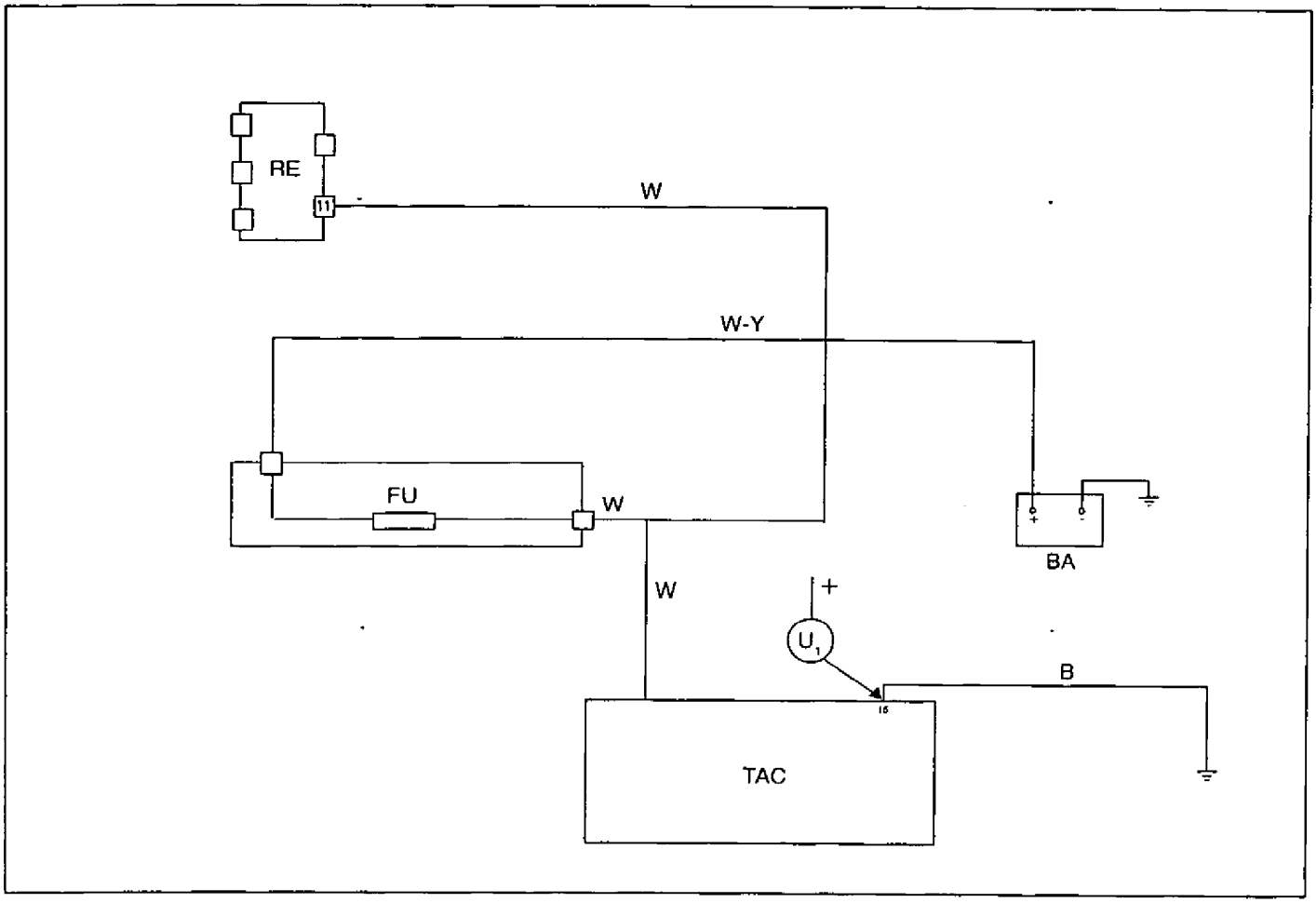

Continued from previous page
YES
Switch on
YES
$U_3 \approx 12V$
NO
Check keypad feed + after switching on. See page 8B-11.
YES
Start up engine $U_4 \approx 10V$
NO
Check ignition information to keypad. See page 8B-15
YES
Switch off
R_1
$R_1 \leq 1\Omega$
NO
Check keypad connection to engine control module, coded ignition. See page 8B-13
YES
$R_2 \leq 1\Omega$
NO
Check keypad connection to engine control module, coded ignition. See page 8B-12
YES
Switch on
$U_6 \approx 12V$
NO
Check engine control module feed, coded ignition + after switching on. See page 8B-13
Carry out test with new keypad

KEYPAD POWER FEED



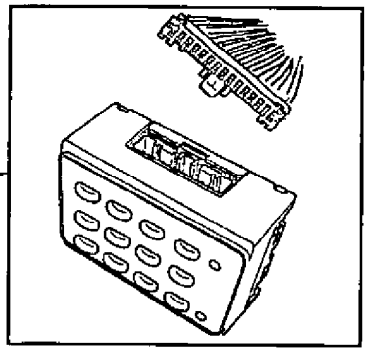


KEYPAD CONTROL EARTH



PRIOR CONDITION
KEYPAD VOLTAGE SUPPLY
(PREVIOUS TEST)
U ≅ 12V

Check on keypad connector
KEYPAD DISCONNECTED



U_1 ≈ 12V

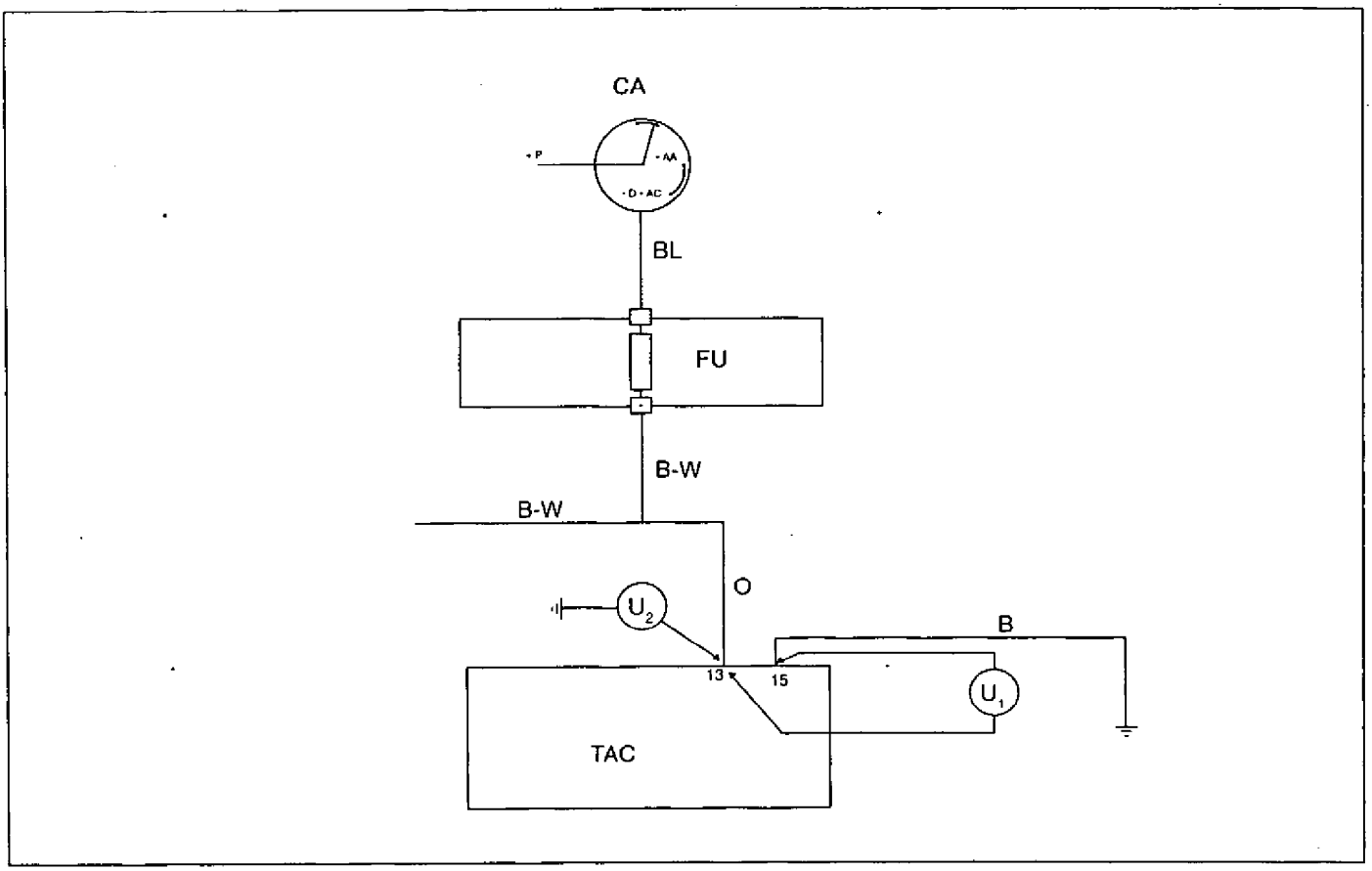
NO

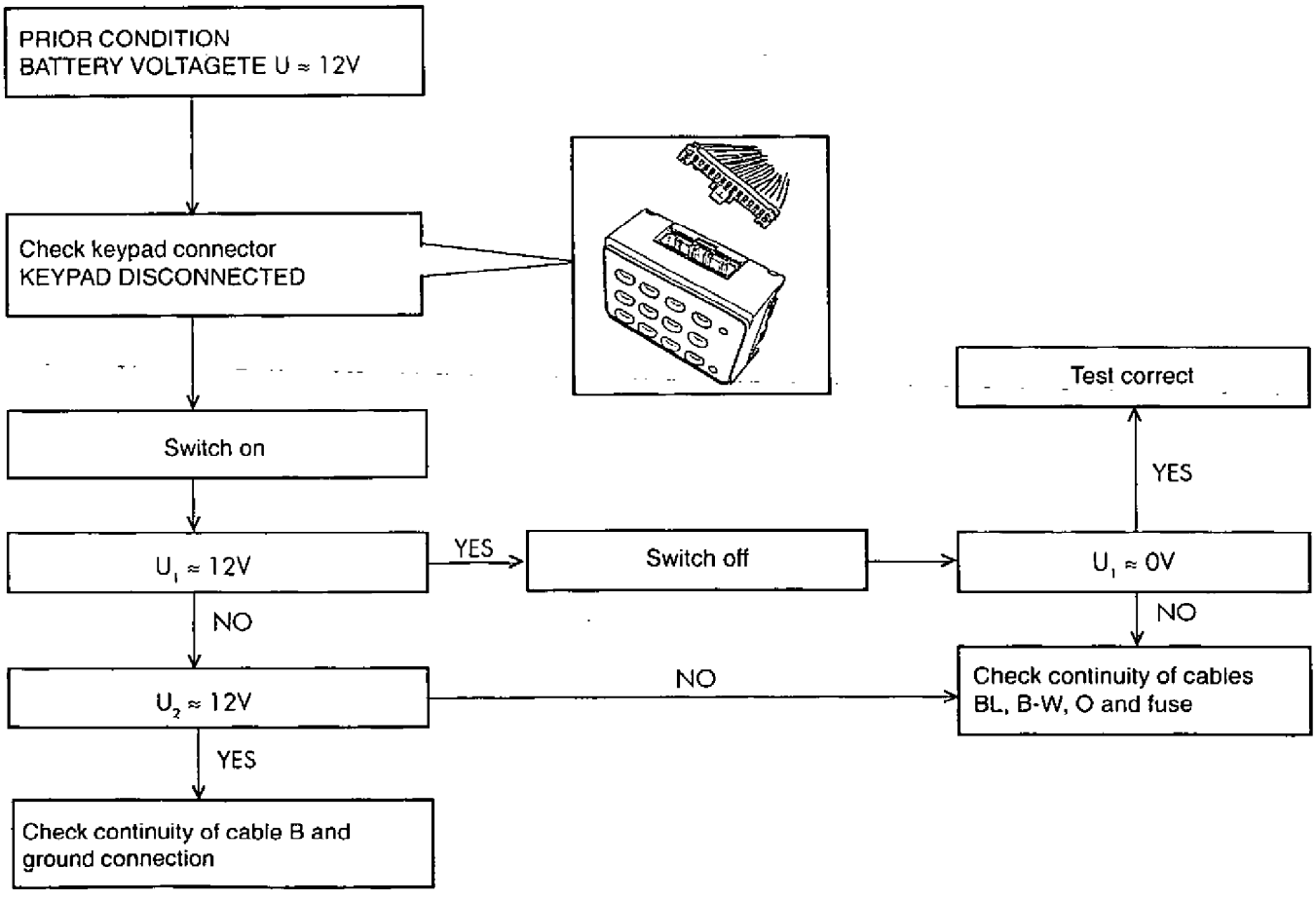
Check cable continuity of ground B and ground connection.

YES

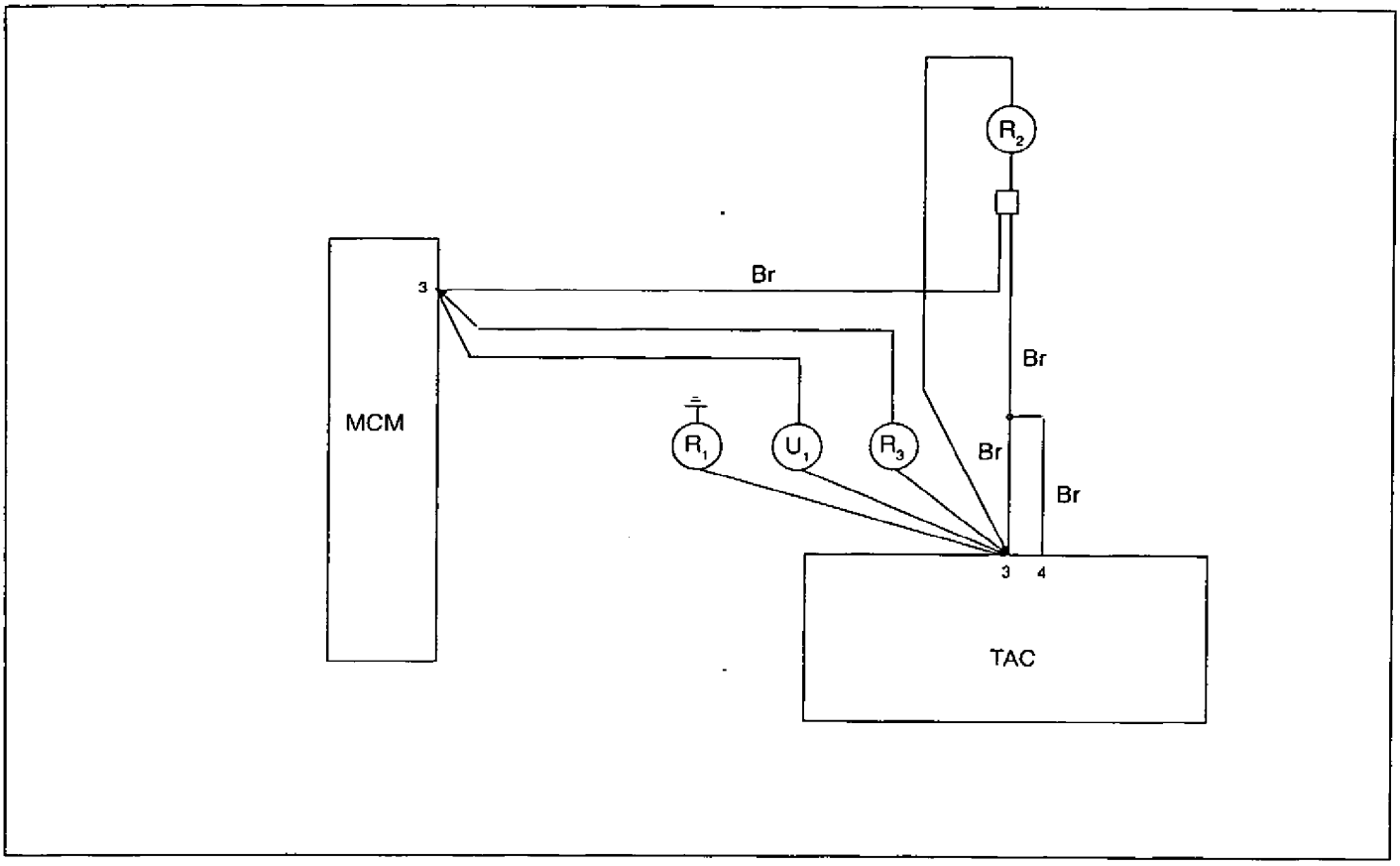
Try out with new keypad.

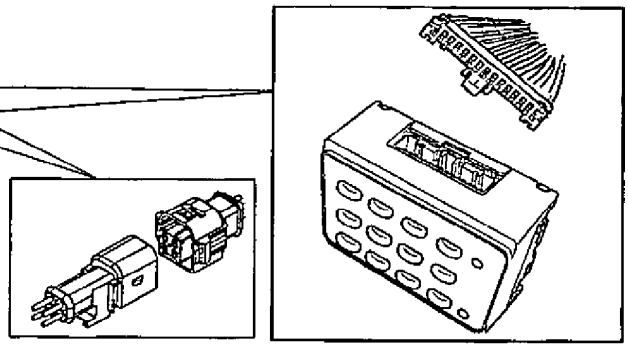
KEYPAD POWER CONTROL: + AFTER CONTACT





TESTING KEYPAD CONNECTION TO CONTROL MODULE





Check keypad and module control connector, coded ignition.
KEYPAD AND ENGINE MODULE CONTROL DISCONNECTED

$U_1 \approx 0$ — NO → Cable Br, in different sections, shorted to battery +

YES

$R_1 > 199'9\ k\Omega$ — NO → Cable Br, in different sections, grounded

YES

$R_2 \leq 1\Omega$ — NO → Cable Br, up to connector, cut off

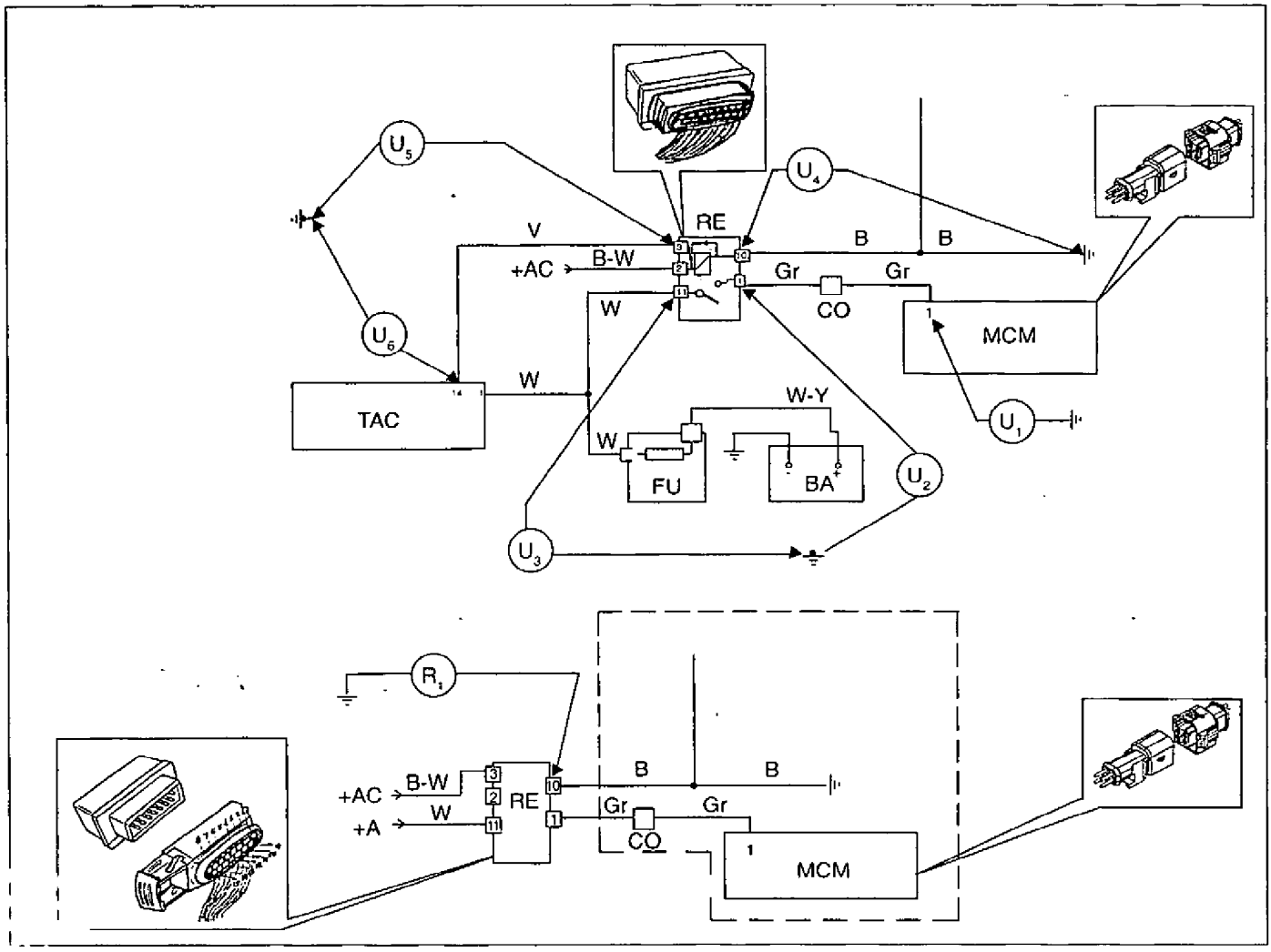
YES

$R_3 \leq 1\Omega$ — NO → Cable Br, in different sections, cut off

YES

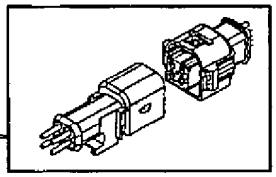
Test correct

TESTING CONTROL MODULE FEED SUPPLY: POSITIVE AFTER SWITCHING ON

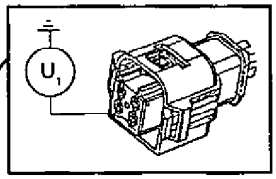


PRIOR CONDITION
KEYPAD FEED CORRECT
(SEE 8B-11)

Check engine control module connector.
ENGINE CONTROL MODULE OFF



Switch on



U_1 = 12V

YES

Switch off

$U_1 \approx 0V$

NO

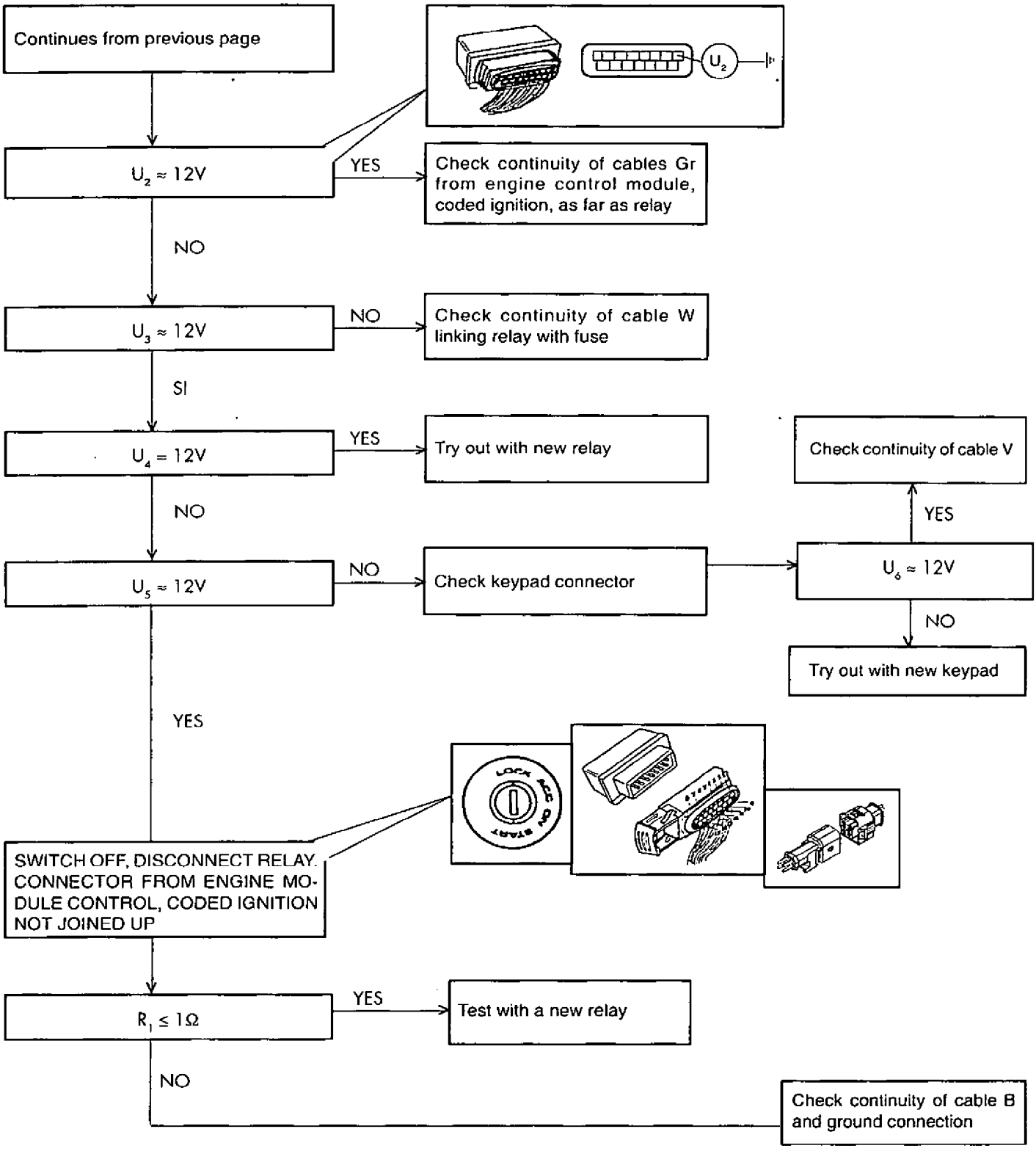
See next page

YES

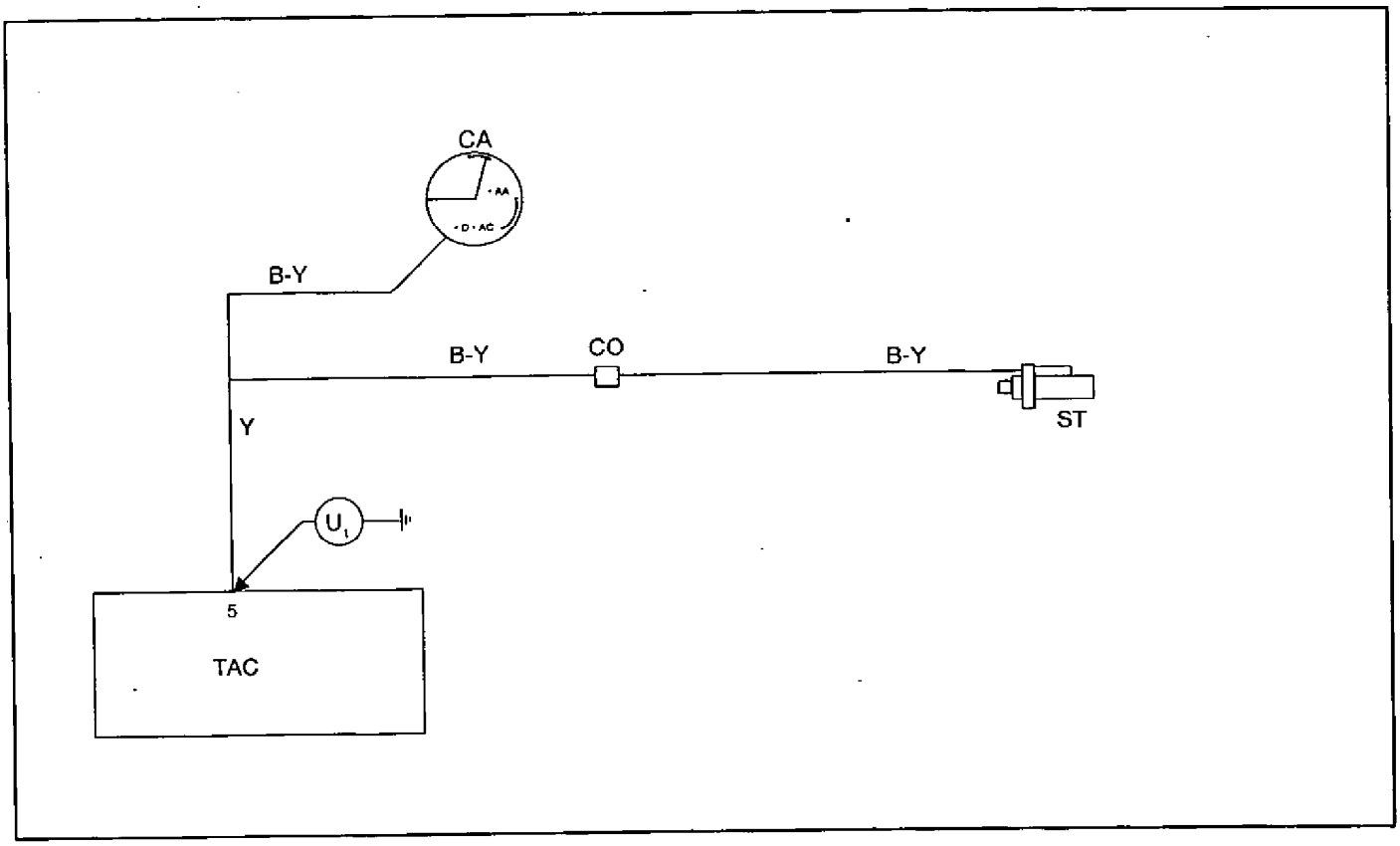
Test correct

NO

Check continuity of cables Gr, before and after connector

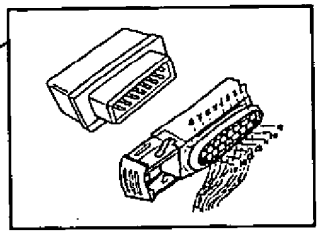

Continues from previous page
U_2
$U_2 \approx 12V$
YES
Check continuity of cables Gr from engine control module, coded ignition, as far as relay
NO
$U_3 \approx 12V$
NO
Check continuity of cable W linking relay with fuse
SI
$U_4 = 12V$
YES
Try out with new relay
NO
$U_5 \approx 12V$
NO
Check keypad connector
Check continuity of cable V
YES
$U_6 \approx 12V$
NO
Try out with new keypad
YES
LOCK
ACC
ON
START
SWITCH OFF, DISCONNECT RELAY. CONNECTOR FROM ENGINE MODULE CONTROL, CODED IGNITION NOT JOINED UP
$R_1 \leq 1\Omega$
YES
Test with a new relay
NO
Check continuity of cable B and ground connection

TESTING IGNITION INFORMATION TO KEYPAD



PRIOR CONDITION
IGNITION SYSTEM CORRECT

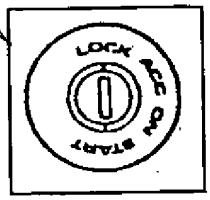
Check keypad connector.
KEYPAD DISCONNECTED



$U_1 \approx 10V$ (at moment of engaging ignition)

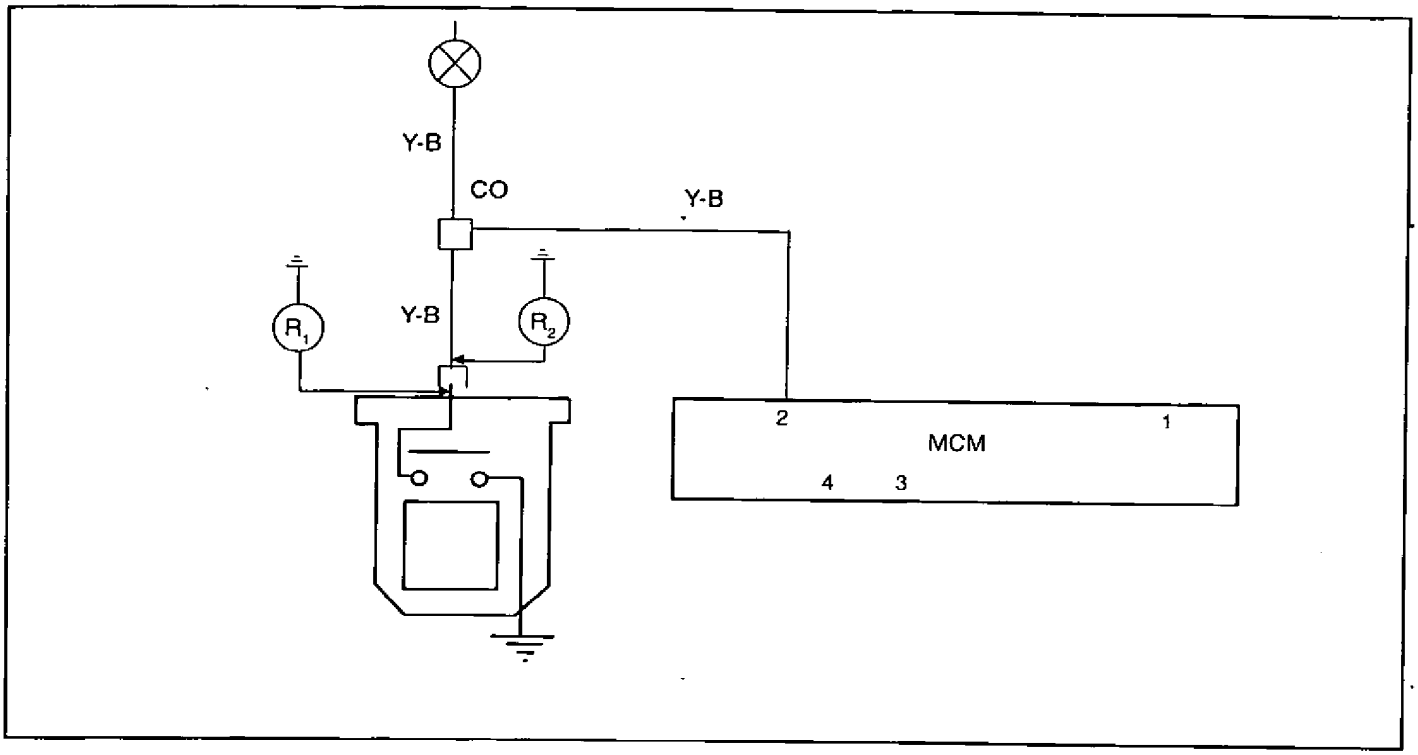
YES → Try out with new keypad

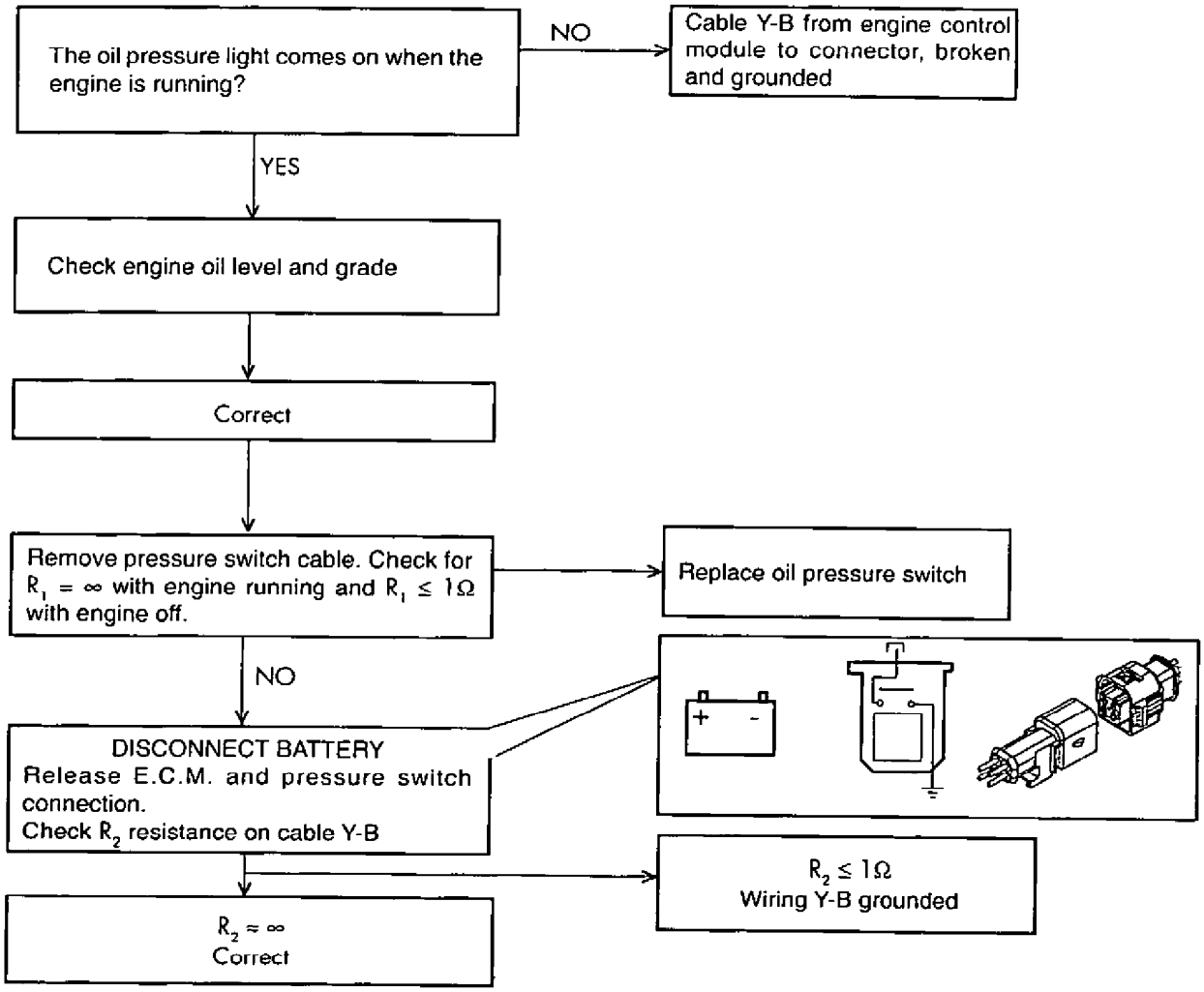
NO



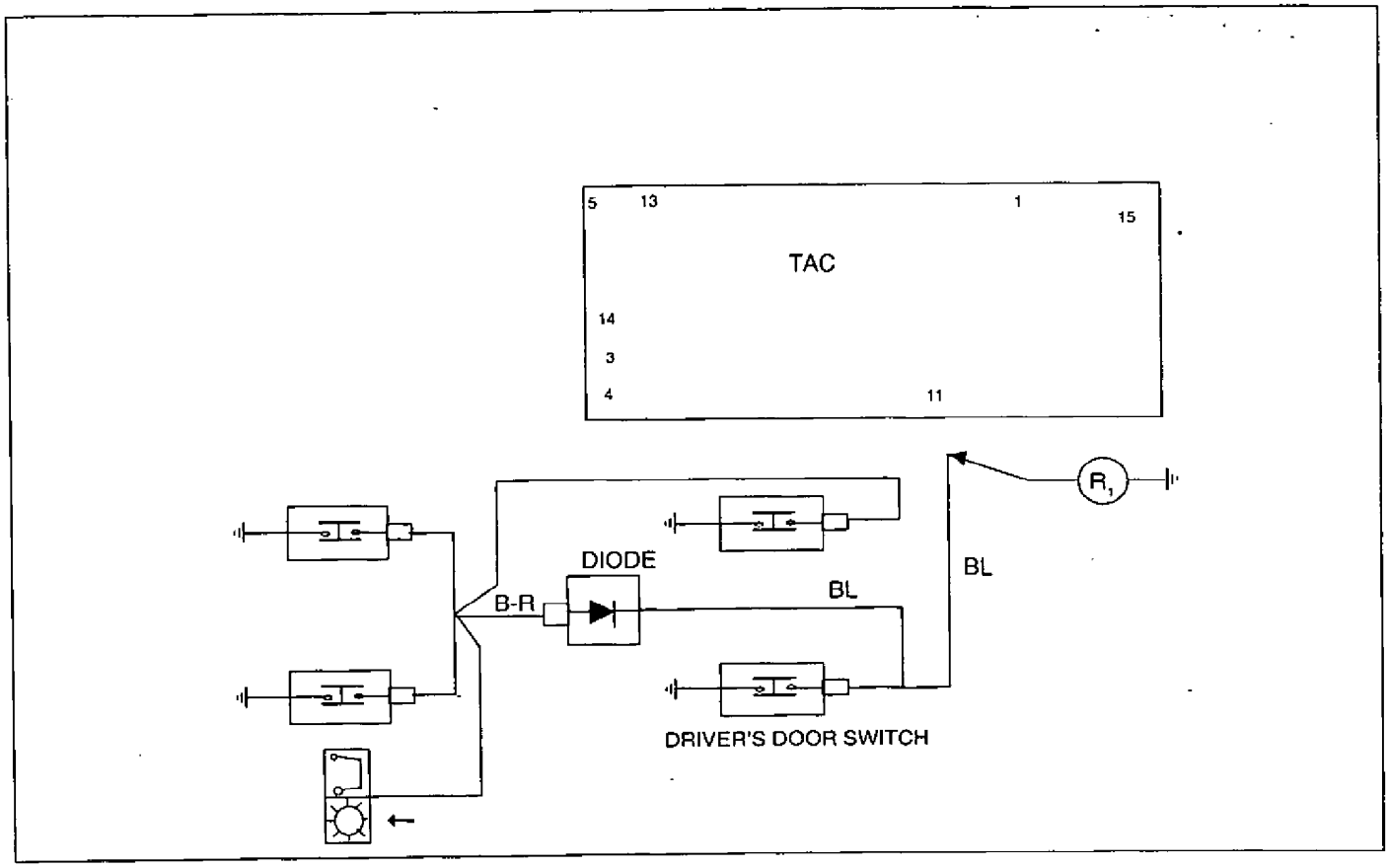
Check continuity of cable Y

ACTIVATING LOCKING WITH ENGINE RUNNING (ON OPENING AND CLOSING DRIVER'S DOOR)

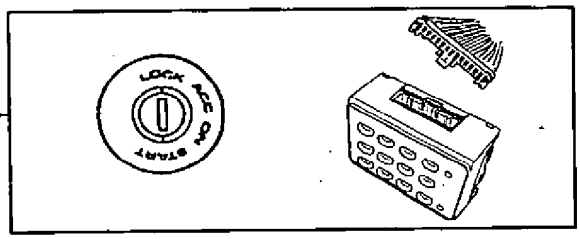




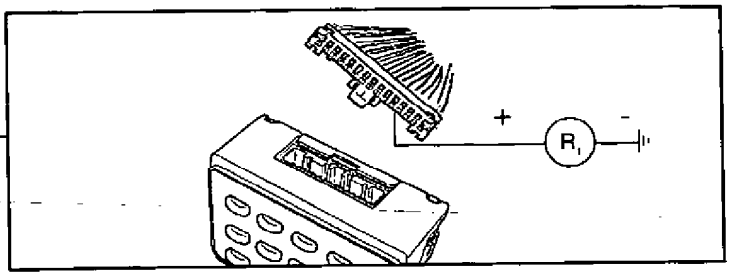
LOCKING NOT ACTIVATED (ON OPENING AND CLOSING DRIVER'S DOOR)



PRIOR CONDITION
IGNITION KEY IN OFF POSITION
KEYPAD CONNECTOR RELEASED



Connect ohmmeter
(positive connection to terminal 11 in wiring and grounding negative)
ALL DOORS CLOSED



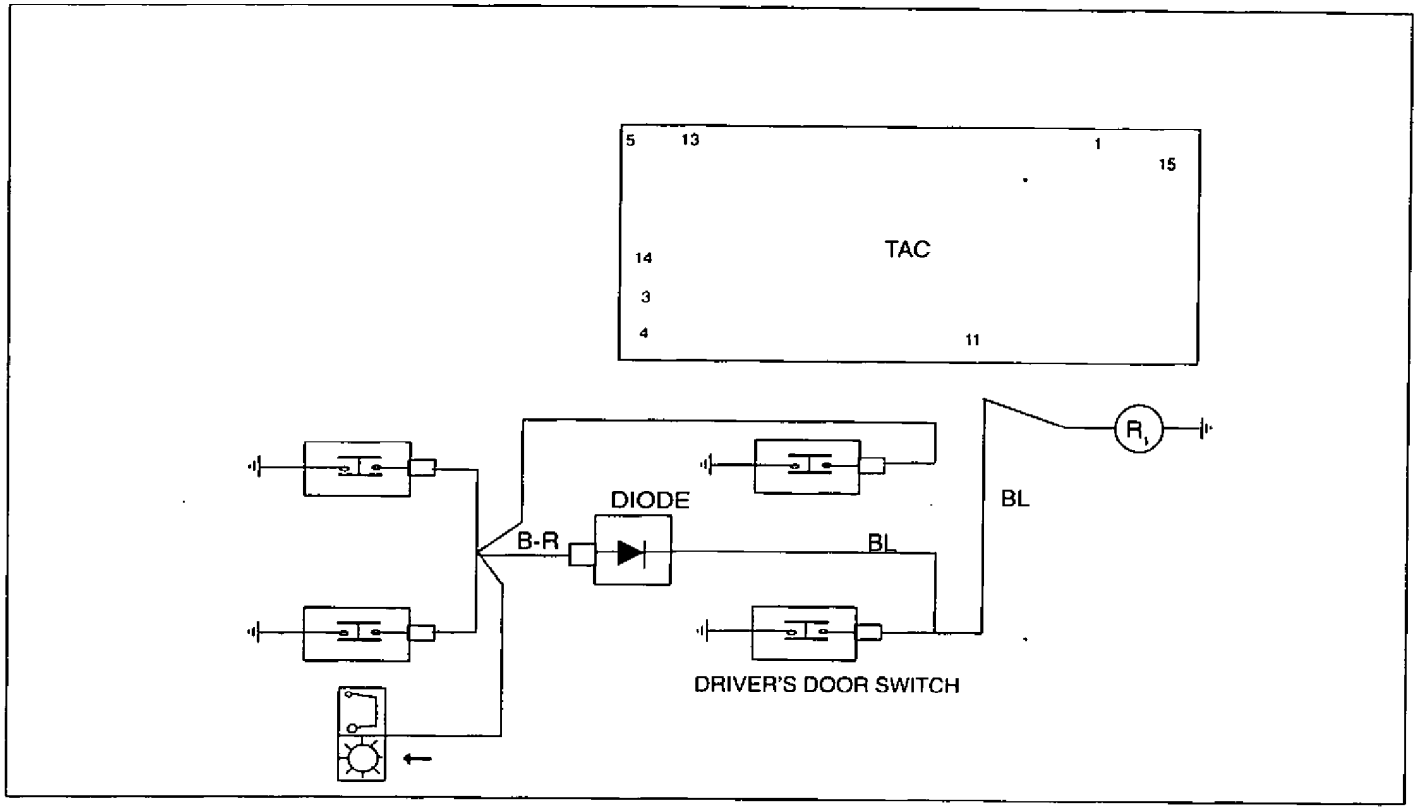
$R_1 \approx \infty$ — NO → Installation of defective doors. Grounded

YES

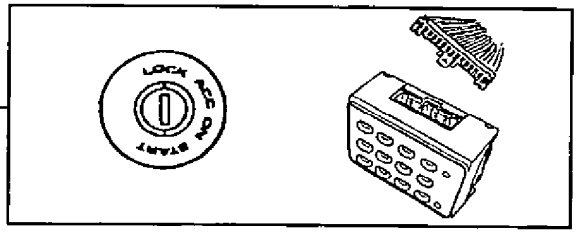
Open driver's door

$R_1 \leq 1\ \Omega$ — NO → Door switch defective — NO → Defective ground in door switch

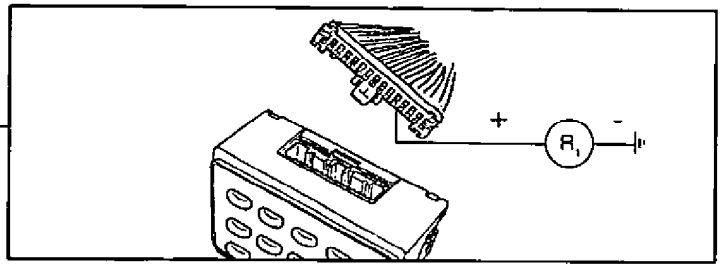
ACTIVATING LOCKING
(ON OPENING AND CLOSING A DIFFERENT DOOR FROM DRIVER'S)



PRIOR CONDITION
IGNITION KEY IN OFF POSITION
KEYPAD CONNECTOR RELEASED



Connect an ohmeter (positive connection to terminal 11 in wiring and grounding negative)
ALL DOORS CLOSED



$R_1 \approx \infty$ — NO → Installation of defective doors. Grounded

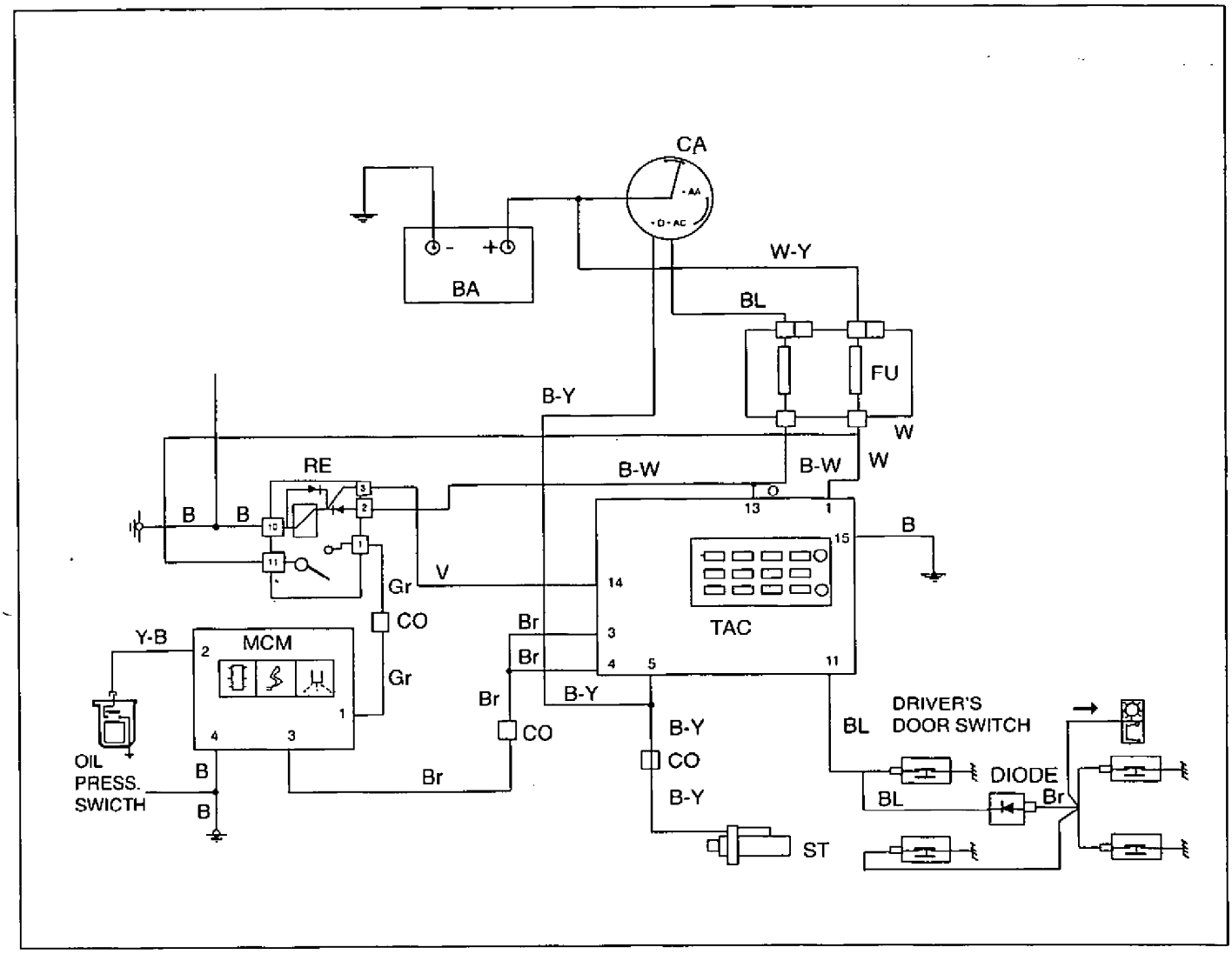
YES

Open every door except driver's

$R_1 = \infty$ — NO → Defective diode in door installation

Correct

WIRING DIAGRAM. IDENTIFICATION OF SYMBOLS



COMPONENTS

BA.- BATTERY
AA.- ANTITHEFT ASSEMBLY (IGNITION KEY)
FU.- FUSES
CO.- WIRING CONNECTOR
RE.- INJECTION FEED RELAY
E.C.M.- ENGINE CONTROL MODULE
A.K.- ANTITHEFT KEYPAD
S.M.- STARTER MOTOR

WIRING COLOURS

B.- BLACK
BW.- BLACK - WHITE
BY.- BLACK - YELLOW
BL.- BLUE
Br.- BROWN
Gr.- GREY
O.- ORANGE
V.- VIOLET
W.- WHITE

SECTION 10

TECHNICAL INFORMATION

LIST OF CONTENTS

ENGINE 10-2
TRANSMISSION AND TRANSFER CASE 10-2
MEASUREMENTS 10-3
WEIGHTS 10-3

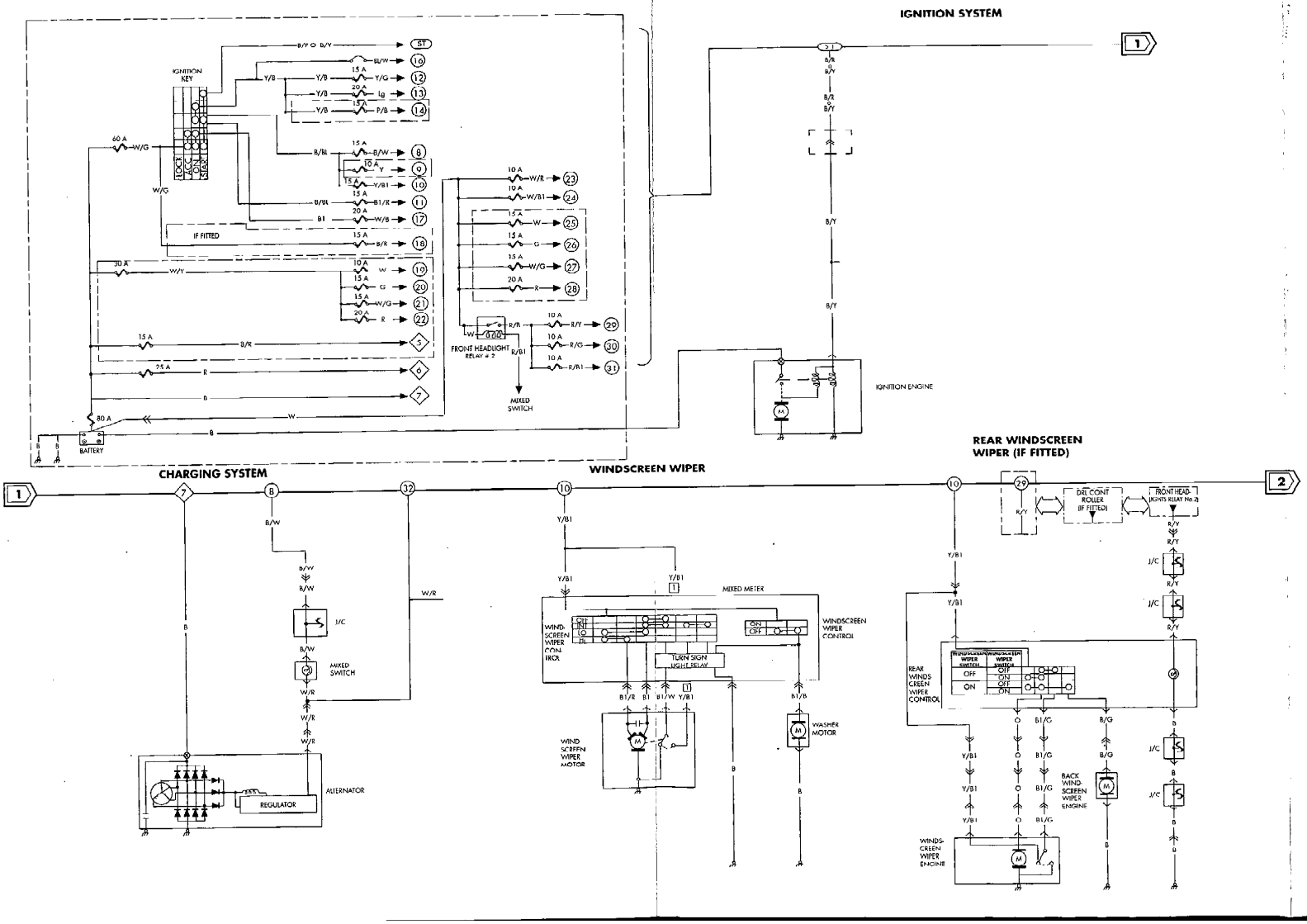
ENGINE		
Number of cylinders and arrangement		4 in line
Fuel firing order (countins rear cylinder as # 1)		1 - 3 - 4 - 2
Timing		OHC Belt actuated
Bore and stroke		83 x 88 mm
Cylinder capacity		1,905 cm^3
Compression ratio		21.5 : 1
Compression Pressure (engine warm)	Maximum	30 Kg/cm^2
	Minimum	25 Kg/cm^2
	Max. Difference	5 Kg/cm^2
Maximum power		55 Kw (4,600 r.p.m.)
Maximum torque		135 Nm. (2,000 r.p.m.)
Maximum crankshaft speed		5,100 r.p.m.
Injection type		Indirect
Injector pressure measurement		130 ± 5 Kg/cm^2
Maximum thermostat aperture		95º C
Oil system pressure	Idling	2 Kg/cm^2
	at 2.000 r.p.m.	3.5 Kg/cm^2
	at 4.000 r.p.m.	4.5 Kg/cm^2
Pressure switch measurement		0.8 Kg/cm^2
TRANSMISSION AND TRANSFER CASE		
Type		Manual Transmission
Transmission Ratios	1st Gear	3.652
	2nd Gear	1.947
	3rd Gear	1.379
	4th Gear	1.000
	5th Gear	0.795
	Rev.	3.670
Transfer case transmission rate	High	1.000
	Low	1.816
Differential groups		4.875

MEASUREMENTS	5 Doors	3 Doors		
	Metal roof	Metal roof	Canvas roof	Plastic roof
Length (mm)	4,030	3,630	3,640	3,640
Width (mm)	1,635	1,630	1,630	1,630
Height (mm)	1,700	1,665	1,665	1,675
Distance between axles (mm)	2,480	2,200	2,200	2,200
Front track width(mm)	1,395	1,395	1,395	1395
Rear track width (mm)	1,400	1,400	1,400	1.400
Headroom (mm)	200	200	200	200
Turning radius (m)	5.4	4.9		
MASSES				
Mass in running order (kg)	1,417	1,304	1,294	1,324
GVW (kg)	1,850	1,650	1,650	

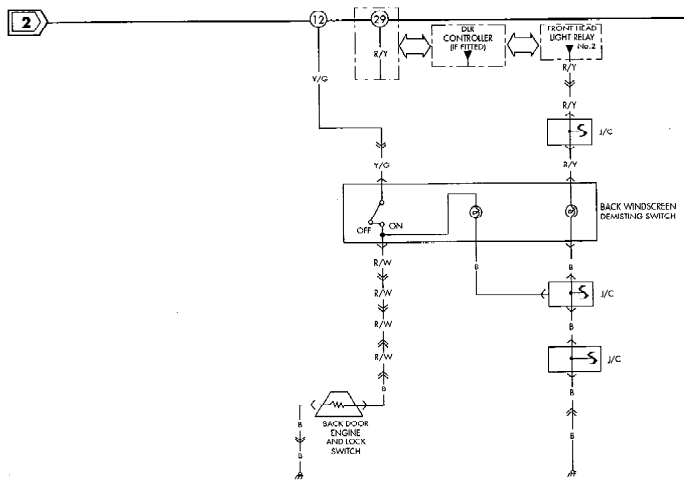
-NOTES-

-NOTES-

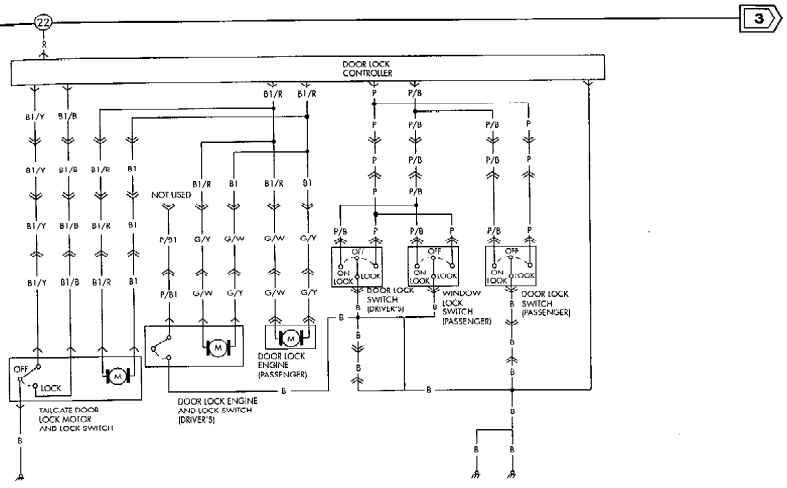
ELECTRICAL DIAGRAMS


IGNITION SYSTEM
IGNITION KEY
LOCK
ACC
ON
START
IF FITTED
BATTERY
FRONT HEADLIGHT RELAY # 2
MIXED SWITCH
IGNITION ENGINE
CHARGING SYSTEM
WINDSCREEN WIPER
REAR WINDSCREEN WIPER (IF FITTED)
MIXED SWITCH
ALTERNATOR
REGULATOR
MIXED METER
WINDSCREEN WIPER CONTROL
TURN SIGN LIGHT RELAY
WIND SCREEN WIPER MOTOR
WASHER MOTOR
DRL CONT ROLLER (IF FITTED)
FRONT HEAD LIGHTS RELAY No.2
REAR WINDS CREEN WIPER CONTROL
BACK WIND SCREEN WIPER ENGINE
WINDS-CREEN WIPER ENGINE

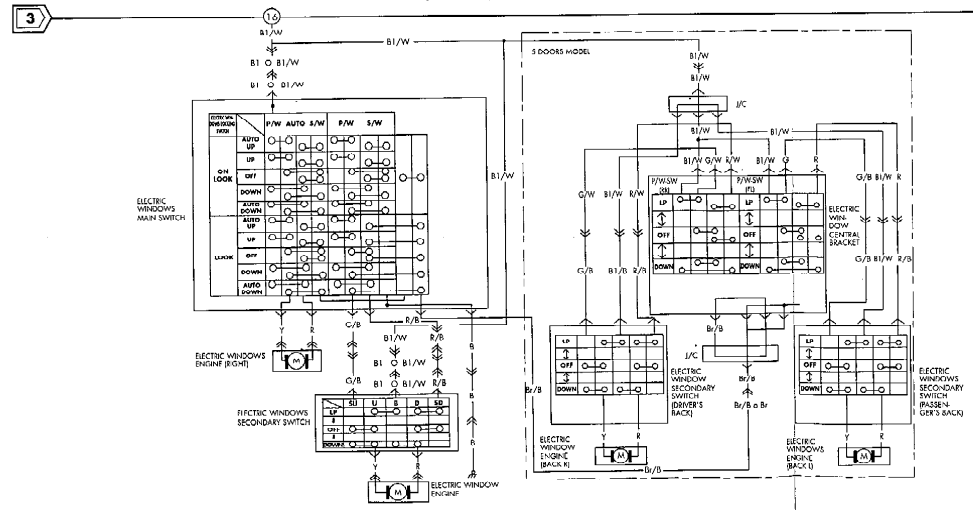
REAR WINDSCREEN DEMISTING



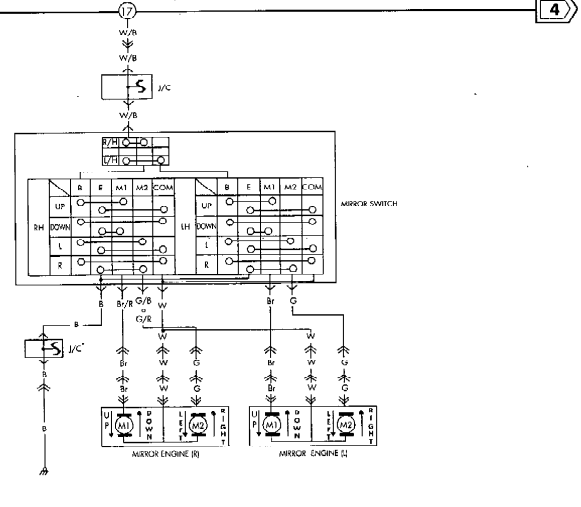
CENTRALIZED LOCKING (IF FITTED)



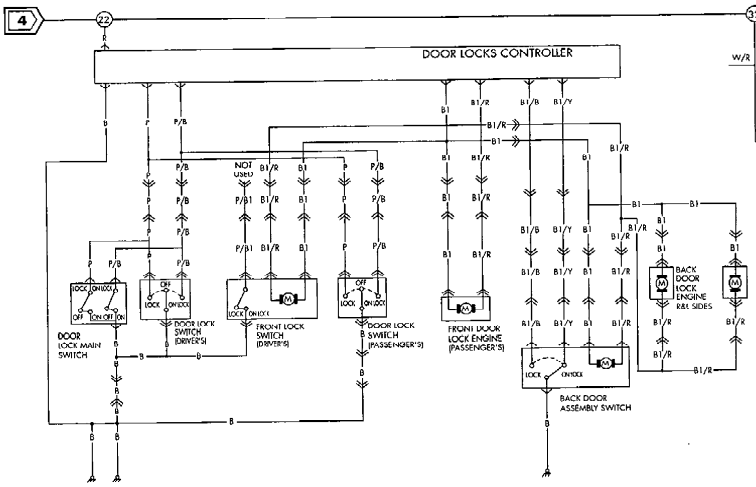
ELECTRIC WINDOWS (IF FITTED)



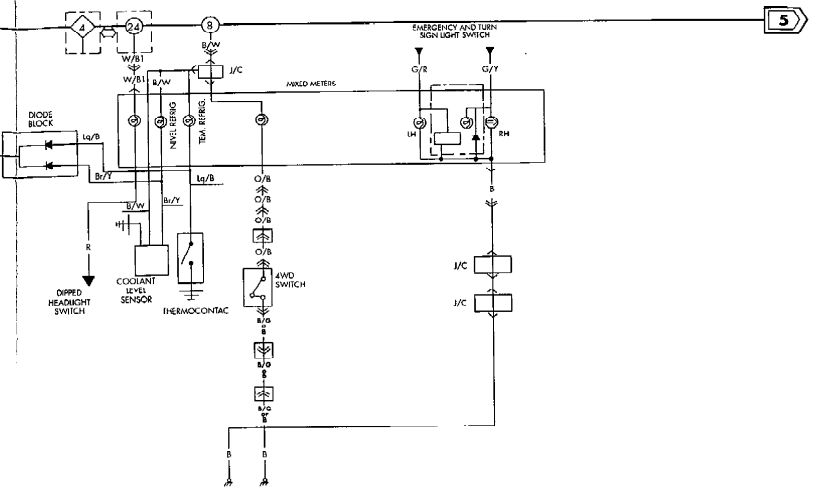
ELECTRIC REAR-VIEW MIRROR (IF FITTED)



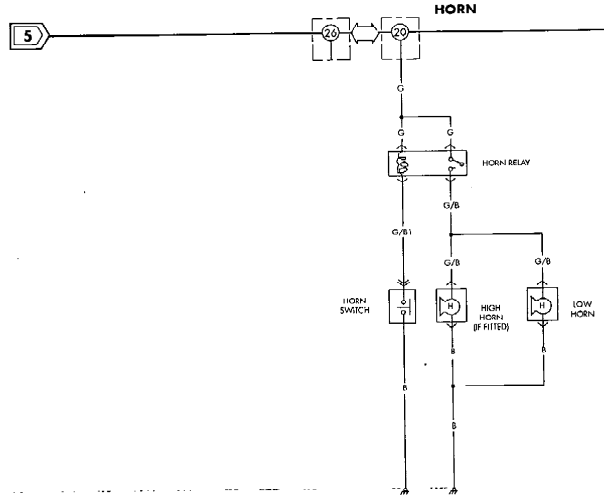
5 DOORS CENTRAL LOCKING (IF FITTED)



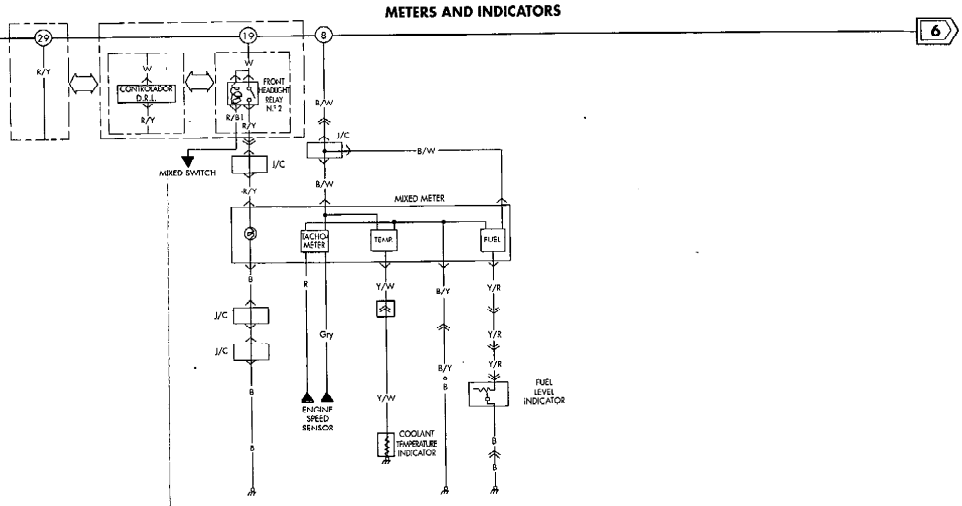
INDICATOR LIGHTS



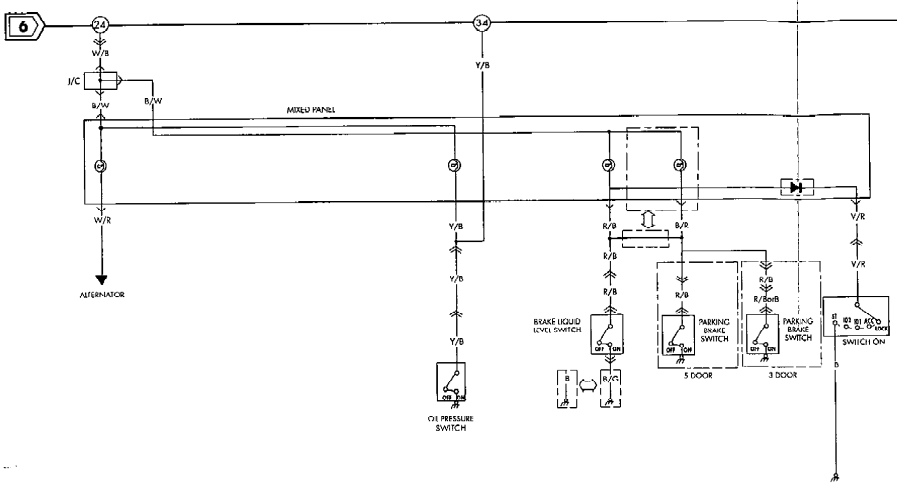
HORN



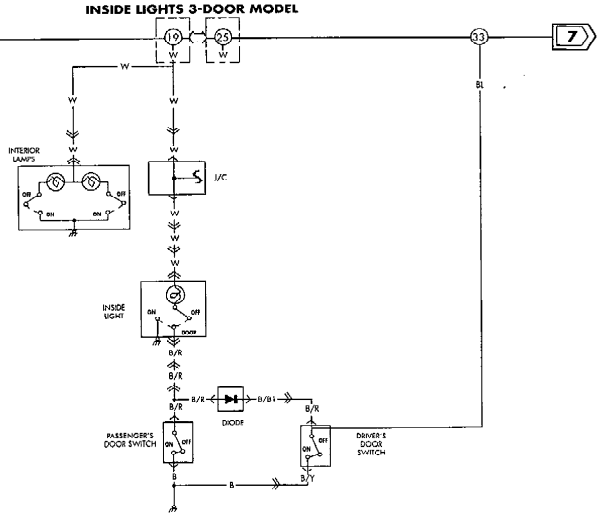
METERS AND INDICATORS



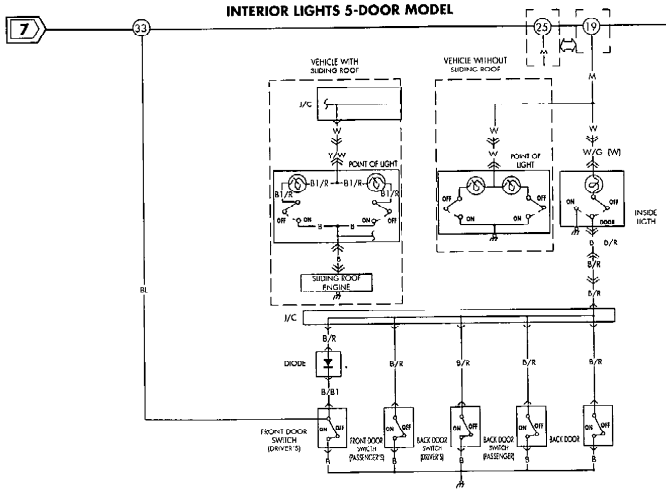
INDICATOR LIGHTS



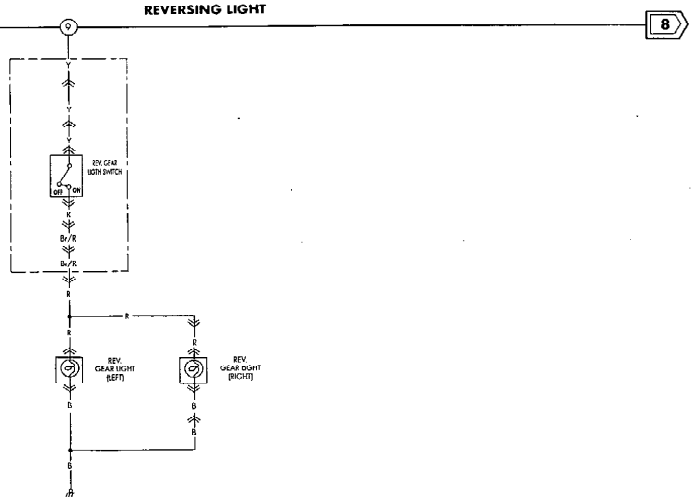
INSIDE LIGHTS 3-DOOR MODEL

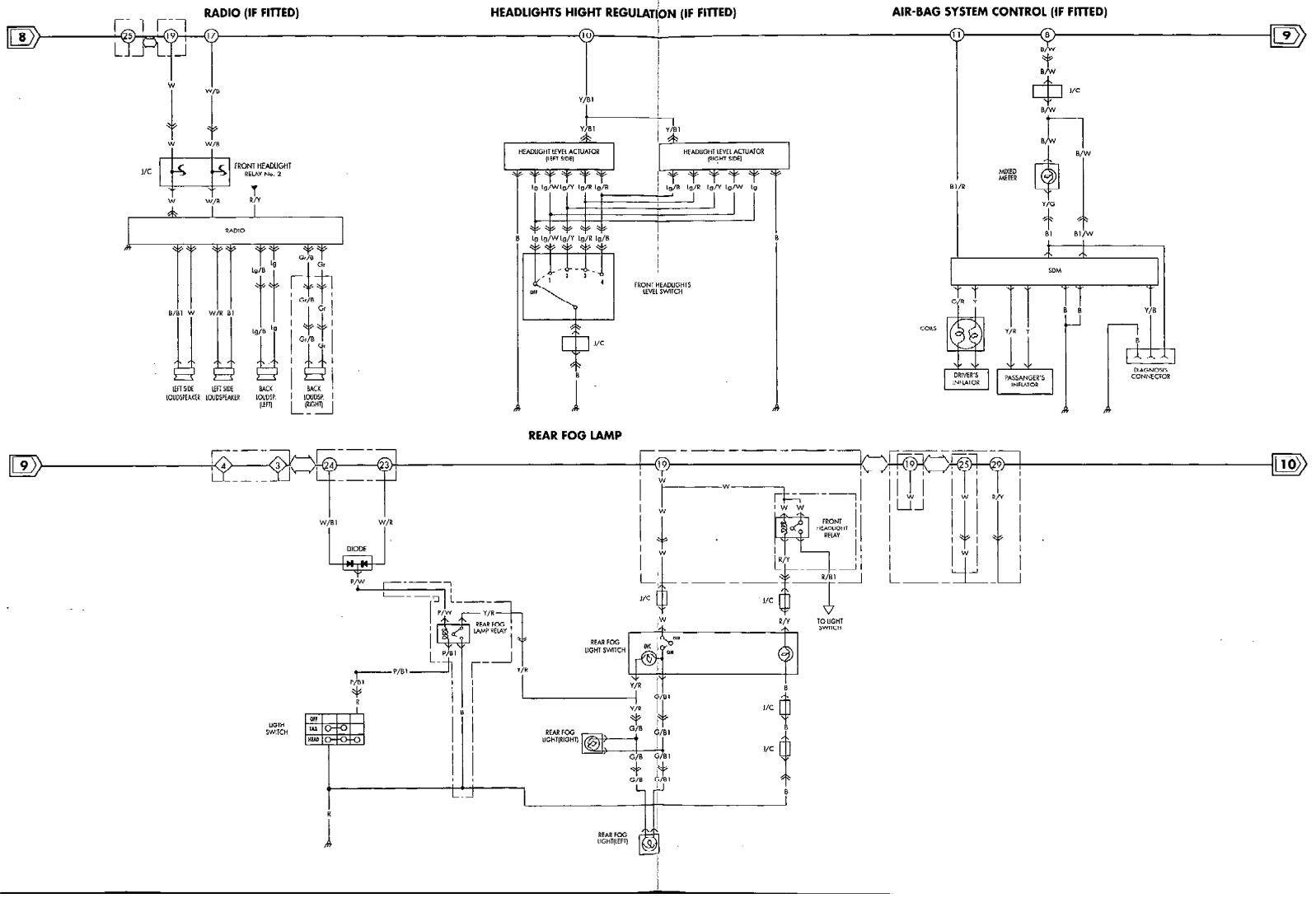


INTERIOR LIGHTS 5-DOOR MODEL

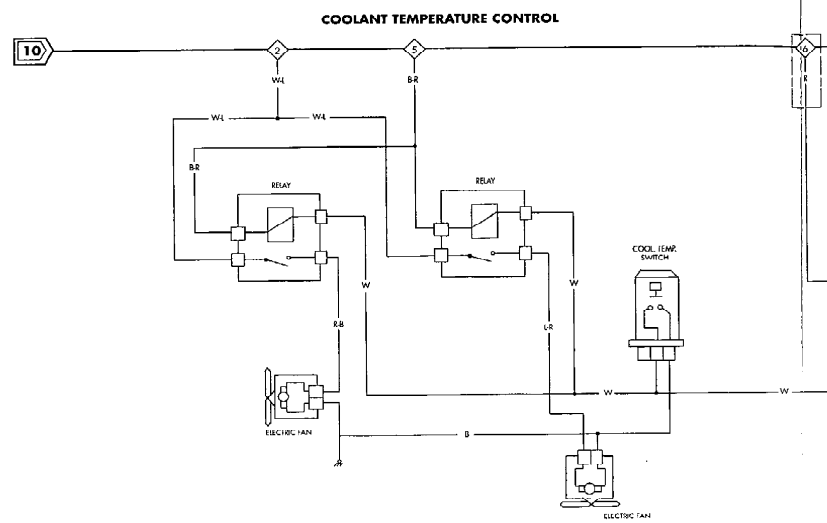


REVERSING LIGHT

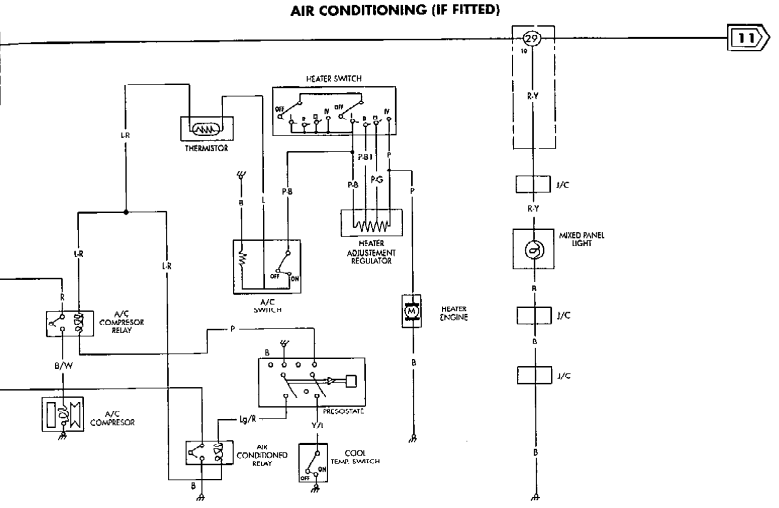



RADIO (IF FITTED)
HEADLIGHTS HIGHT REGULATION (IF FITTED)
AIR-BAG SYSTEM CONTROL (IF FITTED)
REAR FOG LAMP
8
9
10
11
RADIO
FRONT HEADLIGHT RELAY No. 2
HEADLIGHT LEVEL ACTUATOR (LEFT SIDE)
HEADLIGHT LEVEL ACTUATOR (RIGHT SIDE)
FRONT HEADLIGHTS LEVEL SWITCH
SDM
MIXED METER
COILS
DRIVER'S INFLATOR
PASSANGER'S INFLATOR
DIAGNOSIS CONNECTOR
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LEFT SIDE LOUDSPEAKER
BACK LOUDSP. (LEFT)
BACK LOUDSP. (RIGHT)
DIODE
REAR FOG LAMP RELAY
FRONT HEADLIGHT RELAY
TO LIGHT SWITCH
REAR FOG LIGHT SWITCH
REAR FOG LIGHT(RIGHT)
REAR FOG LIGHT(LEFT)
LIGHT SWITCH
OFF
TAIL
HEAD

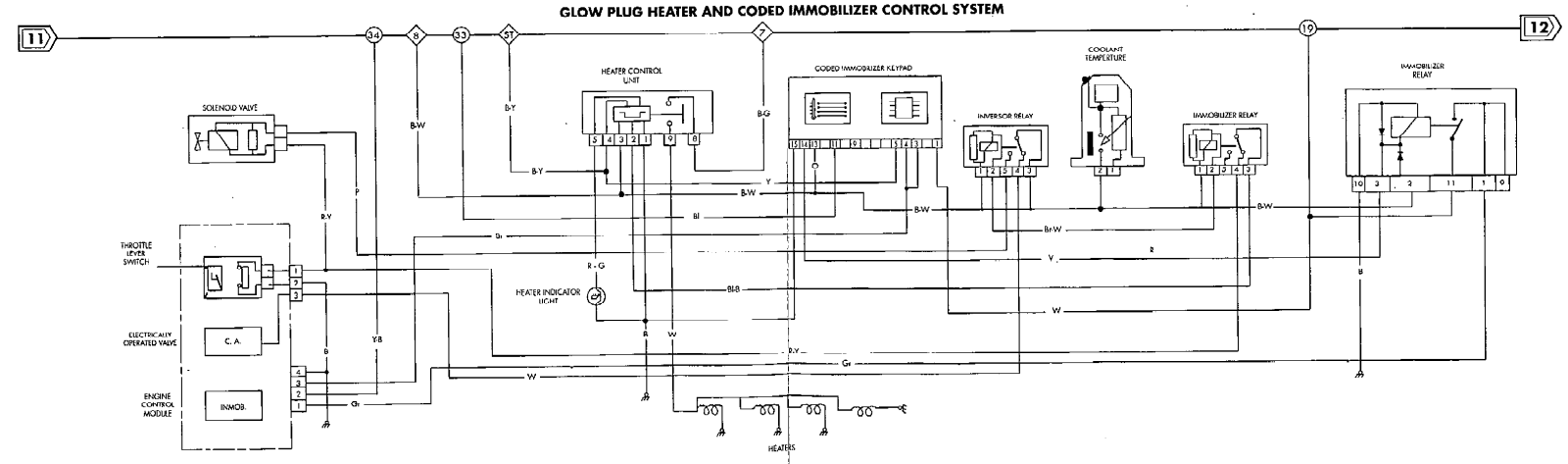
COOLANT TEMPERATURE CONTROL

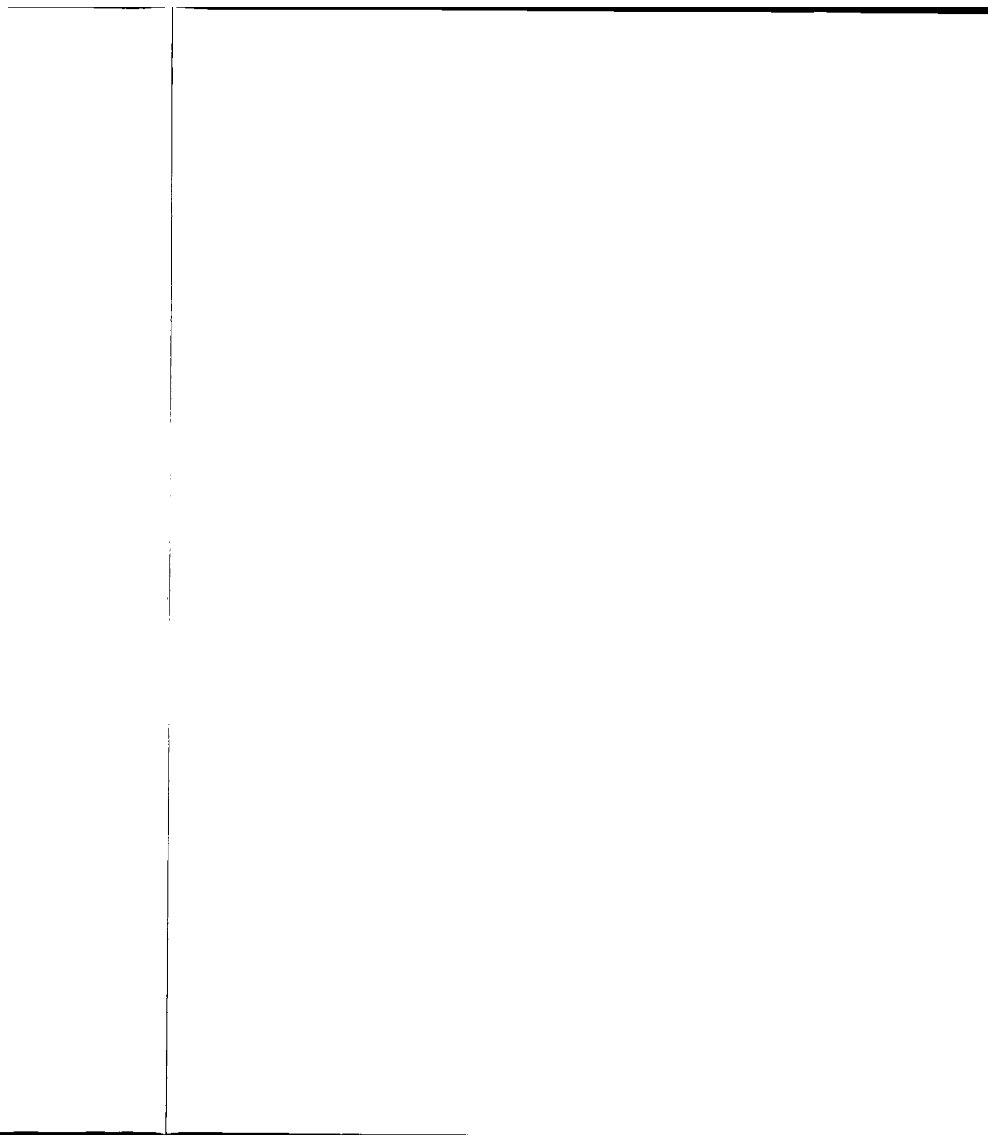


AIR CONDITIONING (IF FITTED)

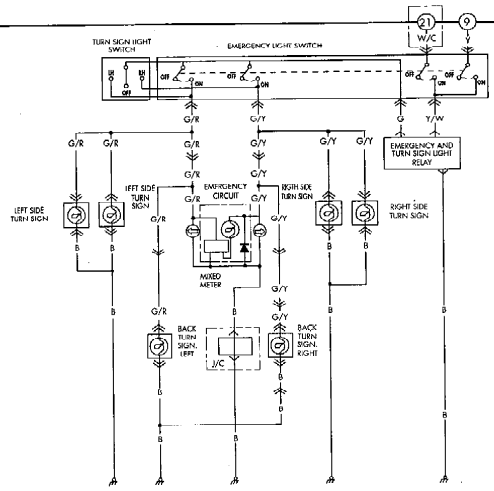


GLOW PLUG HEATER AND CODED IMMOBILIZER CONTROL SYSTEM

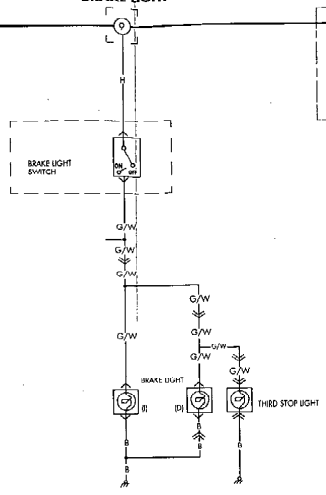




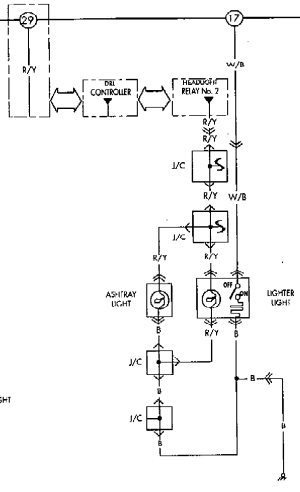
EMERGENCY AND TURNS SIGN LIGHTS



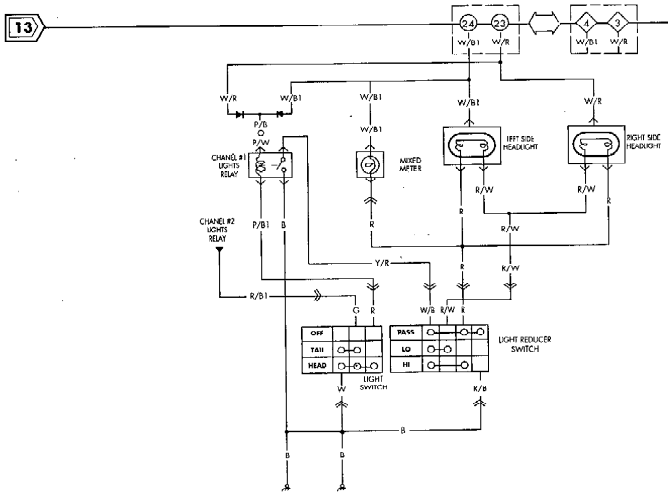
BRAKE LIGHT



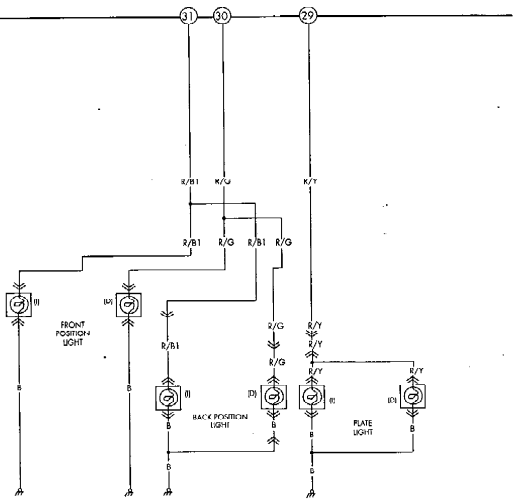
CIGARETTE LIGHTER



SIGNAL LIGHTS



POSITON AND REGISTRATION PLATE LIGHTS



Edited by

SANTANA MOTOR, S.A.

Caring for Customers

November, 2000





Printed in Spain

SUZUKI

VITARA

ADDITIONAL SERVICE MANUAL 1.9 T.D. MODEL AND FREE WHEEL HUBS

USE THIS MANUAL IN ADDITION TO THOSE INDICATED IN THE PREFACE OF THIS PUBLICATION

SUZUKI
Caring for Customers
SANTANA MOTOR, S.A.
00000A01251-01E

IMPORTANT

WARNING/CAUTION/NOTE
Please read this manual and carefully follow the instructions. The words **WARNING, CAUTION** and **NOTE** highlight important information and have very specific significance. Please pay great attention to the messages emphasised by these headings.

WARNING
Indicates a potential danger which could result in personal injuries.

CAUTION:
Indicates potential danger which could damage the vehicle.

NOTE:
Provides special information to facilitate maintenance or clarify instructions.

PREFACE

This Manual is a supplement to the Vitara (SE-416) Service Manual Ref.: 99500-60A10-01S and to Supplementary Service Manuals Ref.: 99501-60A70-01S, 99501-61A10-01S and 00000A01231.

This manual describes the differences between the Vitara 1.9 TD. model and the Vitara (SE-416) 3 and 5 doors.

To look up information, initially consult the Vitara 1.9 TD. manual. If the information cannot be found in this Supplement, consult the Service Manual and Supplements previously mentioned.

When servicing, always use parts, special tools and products recommended by Santana Motor S.A.

There may be some discrepancies between specifications, data, figures etc. that appear in this Manual (available at time of publication) and those incorporated in vehicles currently manufactured.

RELATED SERVICE MANUALS:

- **SERVICE MANUAL (SE-416) (99500-60A10-01S)**
- **SUPPLEMENTARY SERVICE MANUAL FOR 5D (99501-60A70-01S) MODEL**
- **SUPPLEMENTARY SERVICE MANUAL (99501-61A10-01S)**
- **SUPPLEMENTARY SERVICE MANUAL FOR AIR BAG AND 1.9 D. (00000A01231) MODEL.**

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SECTION 0A

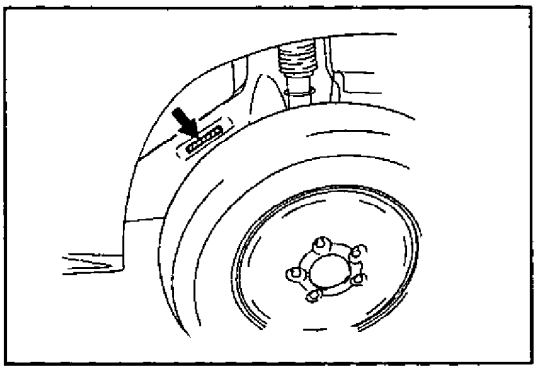
GENERAL INFORMATION

For those sections not contained in this manual, you must consult Service Manual 99500-60A10-01S (VITARA SERVICE MANUAL), 99501-60A70-01S (5P SUPPLEMENTARY SERVICE MANUAL), 99501-61A10-01S (SUPPLEMENTARY SERVICE MANUAL) and 00000A01231 (1.9 D SUPPLEMENTARY SERVICE MANUAL).

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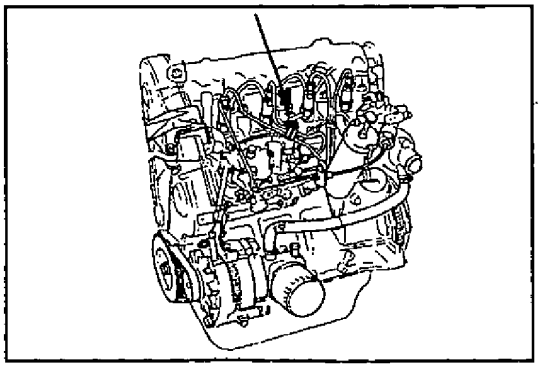
GENERAL INFORMATION
Chassis number identification **0A-1**
Engine number identification **0A-1**

GENERAL INFORMATION



CHASSIS NUMBER IDENTIFICATION

The chassis number is engraved on the front right-hand side, as shown in the figure.



IDENTIFICATION OF ENGINE NUMBER

The engine number is engraved on the plate indicated on the left-hand side, as shown in the figure.

SECTION 0B

MAINTENANCE AND LUBRICATION

NOTE
For topics not covered in this section, please refer to the relevant section of the Vitara Service Manual outlined in the preface.

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MAINTENANCE PROGRAMME

MAINTENANCE IN NORMAL DRIVING CONDITIONS

Interval: This interval must be measured by mileometer readings, or by months, wichever come first.	This table includes programmed servicing up to 90,000 Km. (54,000 miles), subsequently at regular intervals						
	Km. (x1000)	15	30	45	60	75	90
	Miles (x1000)	9	18	27	36	45	54
	Months	12	24	36	48	60	72
1.- ENGINE							
1-1. Drive belt	Vee	I	R	I	R	I	R
	Multi Vee	-	-	I	-	-	R
1-2. Camshaft timing belt		Replace every 80,000 Km. (50,000 miles)					
1-4. Engine oil and filter	CD, CE or CF-4	Replace every 10,000 Km. (6,000 miles) or 8 months					
1-5. Coolant		-	-	R	-	-	R
1-6. Exhaust system (except catalyst)		-	I	-	I	-	I
2.- IGNITION							
2-3. Glow plugs		-	-	-	-	I	-
3.- FUEL SYSTEM							
3-1. Air filter element	Asphalt road	-	R	-	R	-	R
3-2. Fuel types and connections		-	I	-	I	-	I
3-3. Fuel filter	Replace first after 10,000 Km (6,00 miles) and subsequently every 20,000 Km (12,000 miles)						
3-4. Purge lines filter water		Every 10,000 Km (6,000 miles)					
3-5. Fuel Tank		-	-	I	-	-	I
6.- CHASSIS AND BODY							
6-1. Clutch		-	I	-	I	-	I
6-2. Brake discs and pads (front)		I	I	I	I	I	I
Brake drums and shoes (rear)		-	I	-	I	-	I
6-3. Brake hoses and lines		-	I	-	I	-	I
6-4. Brake fluid		-	R	-	R	-	R
6-5. Hand brake lever and cable		I	I	I	I	I	I
6-6. Tyres		I	I	I	I	I	I
6-7. Wheels and free wheeling hubs (it fitted)		I	I	I	I	I	I
6-8. Suspension system		-	I	-	I	-	I
6-9. Propeller shafts		-	-	I	-	-	I
6-10. Transmision oil		I	-	R	I	-	R
6-12. Transfer case oil		I	-	I	-	I	-
6-13. Differential oil (to be changed only after first 15,000 Km)		R or I	-	I	-	I	-
6-14. Steering		-	I	-	I	-	I
6-15. Power assisted steering		I	I	I	I	I	I
6-16. All locks and hinges		-	I	-	I	-	I

NOTES:
"R": Replace or change
"I": Inspect and correct or lubricate if necessary

MAINTENANCE IN SEVERE DRIVING CONDITIONS

If the vehicle is driven in any of the severe conditions outlined below, it is recommended that servicing be performed at the specific intervals indicated in the tables below.

Code of severe conditions.

A – Short frequent journeys
B – Driving on muddy surfaces
C – Driving on dusty surfaces
D – Driving in extremely cold climates.
E – Short frequent journey in extremely cold climates.
G – Use in town/Towing a Trailer/Driving at high speed/At temperatures over 40ºC /Low quality lubricants or fuel.
H – Trailer towing.

Severe conditions code	Maintenance	Maintenance operation	Service interval
- B C D - - -	Drive belts	I	Every 15,000 Km (9,000 miles) or 12 months
		R	Every 45,000 Km (27,000 miles) or 36 months
A - C D E G -	Camshaft drive belts	R	Every 60,000 Km (36,000 miles) or 48 months
A - C D E - H	Engine oil and oil filter	R	Every 5,000 Km (3,000 miles) or 4 months
- B - - - - -	Exhaust pipes and fittings	I	Every 15,000 Km (9,000 miles) or 12 months
- - C - - - -	Air filter element *1	I	Every 2,500 Km (1,500 miles) or 12 months
		R	Every 30,000 Km (18,000 miles) or 24 months
- - C - - G -	Fuel filter	R	Every 10,000 Km (6,000 miles) or 8months
A B - D - - H	Universal joints	I	Every 15,000 Km (9,000 miles) or 12 months
- B - - E - H	Gearbox , transfer and differential oil	I	Every 15,000 Km (9,000 miles) or 12 months
		R	Every 30,000 Km (18,000 miles) or 24 months
- B - - - - -	Suspension nuts and bolts	T	Every 15,000 Km (9,000 miles) or 12 months
- B C D - - H	Wheel bearings	I	Every 15,000 Km (9,000 miles) or 12 months

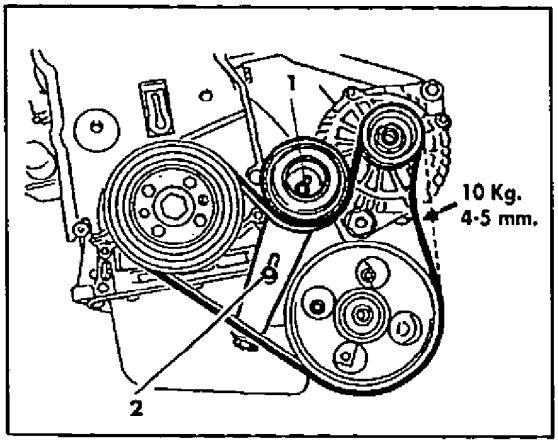
NOTE
"R": Replace or change.
"T": Tighten as specified
"I": Inspect or correct or lubricate if necessary.
***1 : Inspect or replace more frequently if necessary.**

MAINTENANCE SERVICES

ENGINE

ITEM 1-1

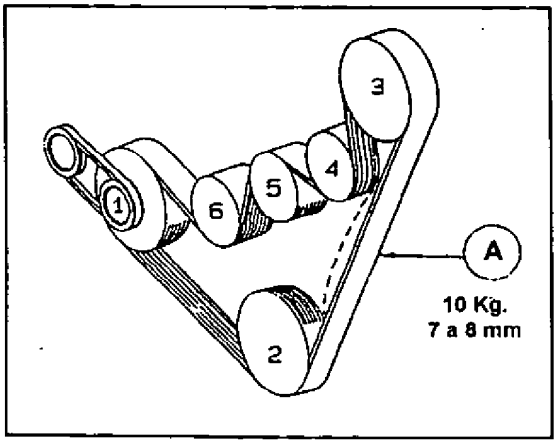
WARNING:
All inspection and replacement work must be carried out with the engine off and the battery disconnected



Drive belt
Inspection:

1) Inspect drive belt to check for splits, distorsion, wear, dirt, etc.
2) In engines without A/C compressor adjust drive belt tension with a deflection of 4 to 5mm.

Belt tension deflection 4 to 5 mm. (0.50 to 0.55 in) with pressure of: 100 N (10 kg, 22 lb).



3) In engines with A/C compressor adjust drivebelt tension with deflection of 7 to 8 mm. in relation to point (A) (belt centre).

Belt tension deflection 7 to 8 mm. with pressure of: 100 N (10 kg, 22 lb).

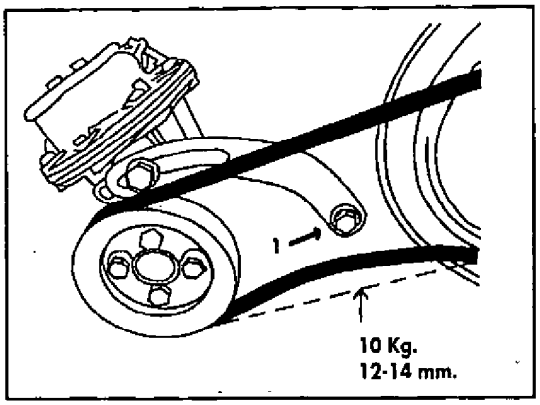
4) If the belt needs to be adjusted, slacken bolts (1) and (2) and tighten adjuster before tightening bolts (1) and (2) once more.

Replacement:

1) Remove lower protective/soundproofing plate.
2) Remove vacuum pump belt
3) Slacken accessory belt with idler belt pulley (4)
4) Remove used belt, fit new one and adjust bolt (3) to tension desired.
5) Tighten bolts (1) and (2). Adjust to final tension with compressor idler pulley.

Idler pulley bolt torque specifications:
18-28 Nm (1.8-2.3 kg.m, 13-20 lb.ft)..

6) Continue assembly reversing disassembly order, assemble and tension vacuum pump belt according to the following instructions.



Vacuum pump belt
Inspect for wear, damage and excess or insufficient tension

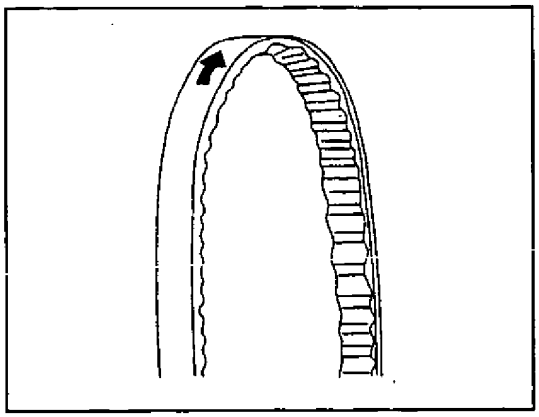
Vacuum pump belt tension: 12 to 14 mm. (0.50 to 0.55 in) with pressure of 100 N (10 kg, 22 lb).

Replacing vacuum pump belt
1) Remove lower protective/soundproof plate.
2) Slacken bolts fixing vacuum pump to bracket and that of idler pulley.
3) Move vacuum pump inwards to remove belt.
4) Fit new belt
5) Move vacuum pump outwards until correct tension is obtained.
6) Tighten bolts attaching vacuum pump to bracket as well as idler pulley bolt.

   Vacuum pump bolts torque specifications: 18-28 Nm (1.8-2.8 kg.m, 13-20 lb.ft).

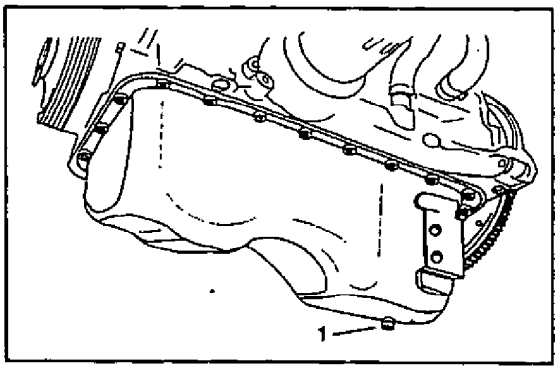
   Idler pulley bolt torque specifications (1): 18-28 Nm (1.8-2.8 kg.m, 13-20 lb.ft).

7) Fit lower protective/soundproofing plate.



ITEM 1-2

Camshaft timing gear.
To replace timing belt, please refer to 6 A1-11.



ITEM 1-4

Engine oil and filter.

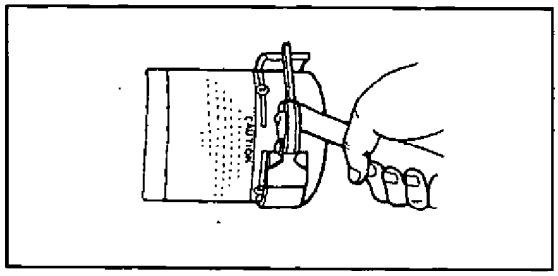
Replacement.

NOTE: This should be undertaken with engine oil hot.

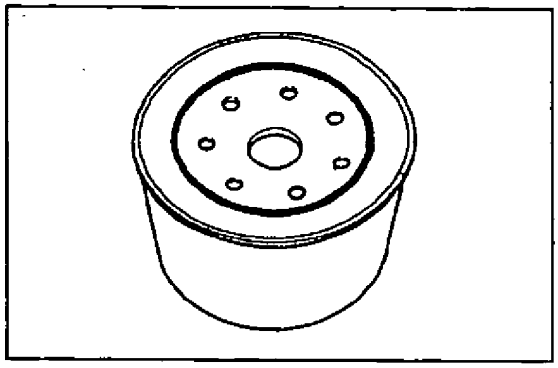
Before draining oil inspect engine to check for leaks. If this is the case, repair defective part before continuing.

1) Remove lower protective/soundproofing plate .
2) Extract motor oil through oil-pan drain plug (1).
3) After draining oil, clean drain plug. Fit once more with new sealing washer and tighten to specified torque.

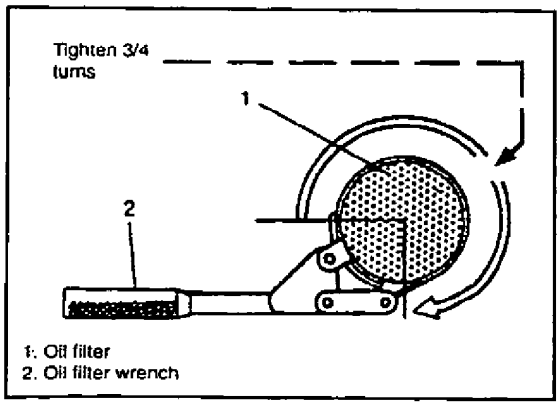
Plug torque specifications:
30-35 Nm (3.0-3.5 kg.m, 22-25 lb.ft).



4) Slacken filter using filter wrench.
5) Apply engine oil to rubber gasket of oil filter.
6) Screw new filter manually onto its support until rubber gasket touches surface of assembly.

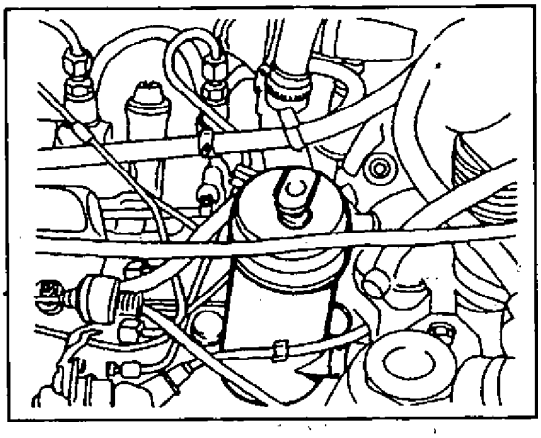


CAUTION:
To tighten oil filter, the point at which the rubber gasket first makes contact with sealing surface must be identified.

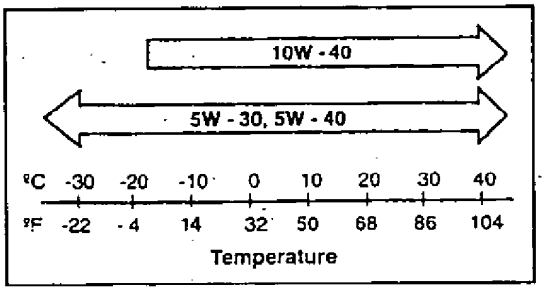


7) Using an oil filter wrench (2), tighten filter (1) finally by specified number of turns or to torque specifications, starting at point where rubber gasket surface and filter support meet.

Tightening: 3/4 turns or 14 Nm (1.4 kg.m, 10 lb.ft).



8) The filler tube and dip stick are located on the left-hand side of engine.

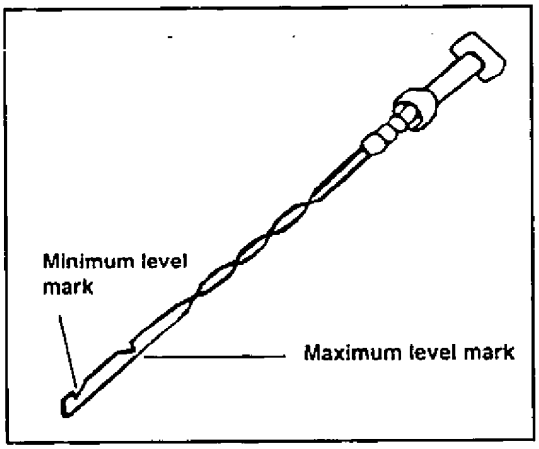


9) Select appropriate CD, CE or CF-4 type oil in accordance with viscosity chart. Use of 20 W-50 oil is only acceptable in those countries where 10 W-40 is not available.

Engine lubricating system oil capacity.

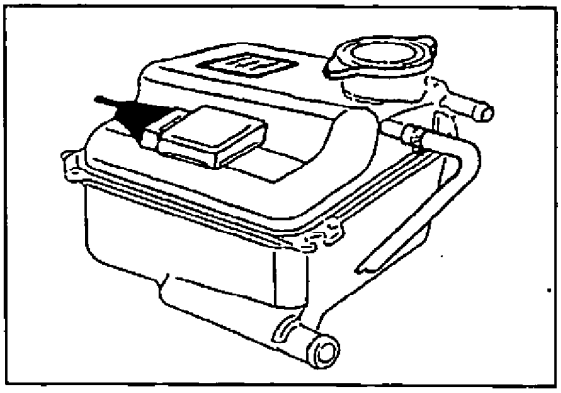
Total system capacity	5.5 litres
Filter capacity	0.5 litres

10) Engine lubricating system capacities are indicated in previous table. When filling, observe the following:
- If filter has not been changed, put in 5 litres.
- If filter has been changed, put in 5.5 litres.



11) Adjust oil level with vehicle horizontal, run engine for 3 mins., switch it off, leave it to settle for 3 mins. and check level with dipstick. Oil level indicated should be at maximum. If it is not, apply small quantities of oil until it reaches maximum.

NOTE:
Point 11 must be carried out in a well-ventilated place or after attaching an exhaust extrator to the exhaust tail pipe.

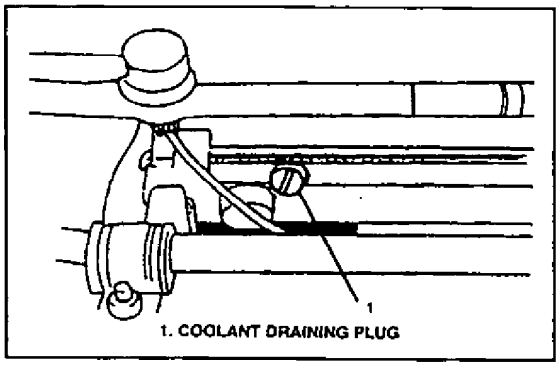


ITEM 1-5

Engine coolant.

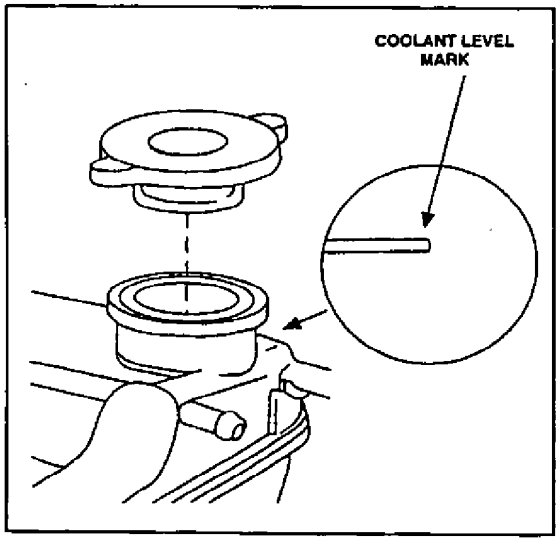
Replacement

WARNING:
To avoid the possibilitis of burns, the expansion reservoir must not be released when engine and radiator are hot. If cap is opened too soon high temperature liquid and vapours could come out.

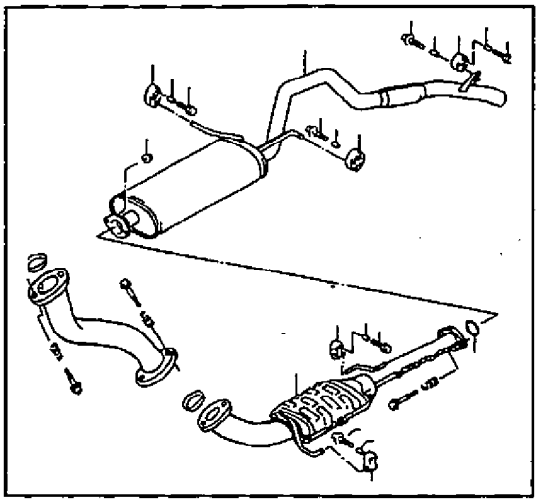


1. COOLANT DRAINING PLUG

1) Open expansion reservoir cap after engine has cooled down.
2) Remove lower protective/ soundproofing plate.
3) Slacken radiator drain plug, let all coolant in system come out and then securely retighten the plug.
4) Remove expansion reservoir, drain and fit once more.
5) Turn on heating controls located inside vehicle.
6) Add fluid to expansion reservoir and start up engine.
7) Add fluid to reservoir as level is reduced.
8) Wait until engine is completely warmed up and continue adding fluid until expansion reservoir level is at maximum. Fit lower protective/soundproofing plate.



CAUTION:
For cooling system use a mix of 50% DINAGEL- 9103 (Dynamic) and 50% distilled or demineralized water. This will provide protection in temperatures of around - 30° C. The coolant mix must be used in both summer and winter, since it provides lubrication and protection against corrosion.



ITEM 1-6

Exhaust system (except catalyst).

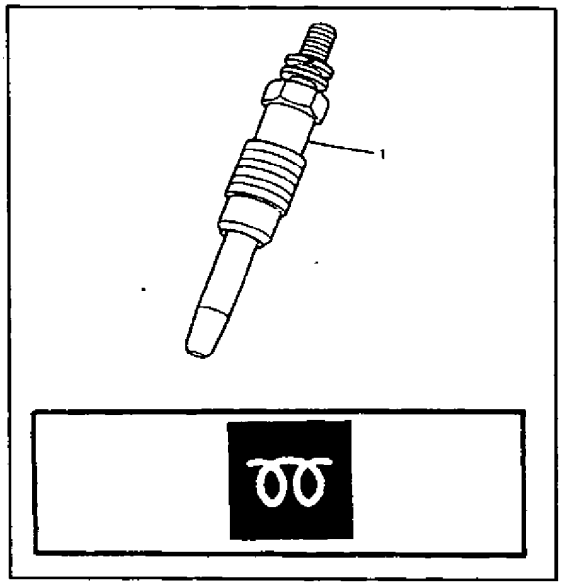
Inspection:

WARNING:
To avoid danger of burns, do not touch exhaust system when hot.

In periodic maintenance work, always inspect exhaust system in following order:

- Inspect rubber mounts for damage, wear or faulty positioning.
- Inspect exhaust system for leaks, weak connections, dents and damage. If nuts and bolts are loose, tighten to specified levels.
- Inspect body exterior for broken or incorrectly situated parts, open seams, holes, loose connections or other defects which may cause exhaust fumes to enter vehicle interior.
- Check that exhaust system components are not touching lower part of vehicle, thereby preventing over heating wel possible damage to floorpan lining and mats.
- All defects must be repaired immediately.

Changing rubber mounts.
Periodically change exhaust pipe rubber mounts.

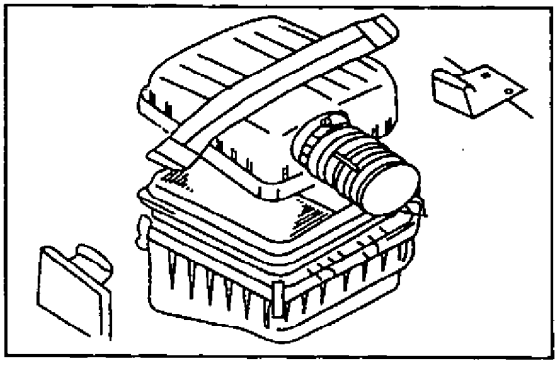


IGNITION SYSTEM

ITEM 2-3

Glow plugs.

Inspection
1) Visually check glow plug function by observing dashboard panel controls.
2) Observe engine running from a cold start. Any difficulty in starting from cold could be a result of problems with glow plug heating system.

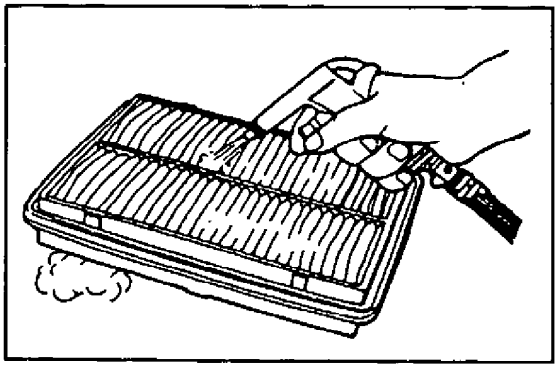


FUEL SYSTEM

ITEM 3-1

Air filter Element.

Inspection
1) Release air filter anchoring strap.
2) Release four clips securing upper housing and extract filter.
3) Remove dust by blowing compressed air onto outlet side of element.



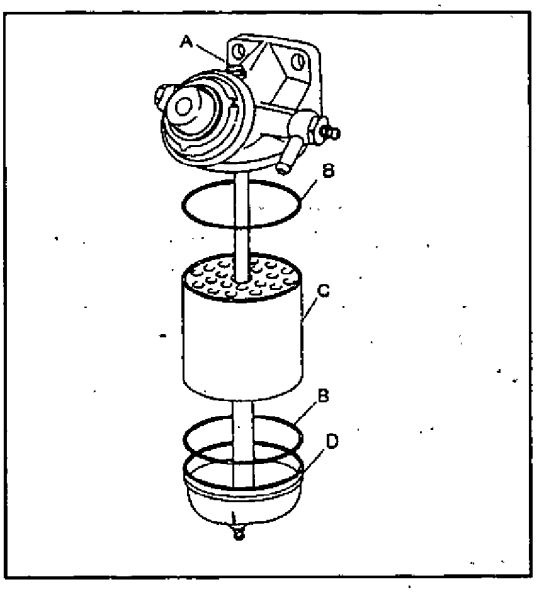
Replacement
1) Release air filter anchoring strap.
2) Release four anchoring clips on upper housing and extract filter.
3) Install new filter in air filter housing.

NOTE:
Replace more frequently in dusty working conditions. Consult OB-3 for maintenance and correct replacement interval in severe driving conditions.

ITEM 3-2

Types of fuel and connections

Inspection
1) Visually inspect fuel inlet and fuel return lines to ensure is there no distortion or friction liable to cause cracks.
2) Check that connections are not damaged and that hose clamps are securely fastened.



ITEM 3-3

Fuel filter.

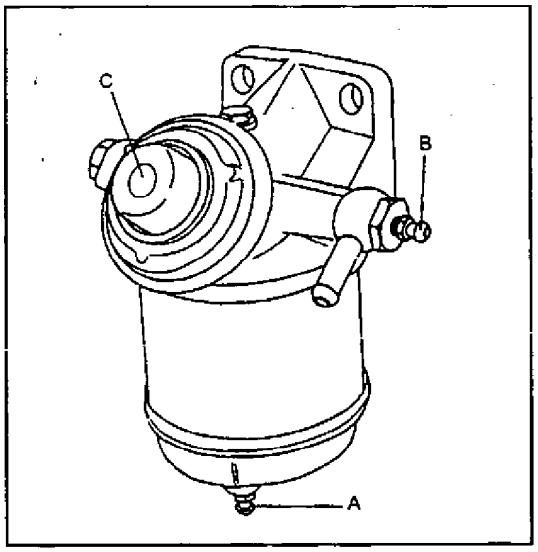
Replacement

WARNING:
This work must be carried out in a well ventilated place away from naked flames or heat.

1) Loosen the filter bolt (A), remove case (D), element (C) and gaskets (B)
2) Clean case with diesel oil and fit new filter and new seals. Tighten (A) as specified.

Filter bolt torque specifications: 15 Nm (1.5 kg.m, 11lb.ft)

NOTE:
The fuel filter is located on the left-hand side of the engine compartment, attached to the bulkhead.



ITEM 3-4

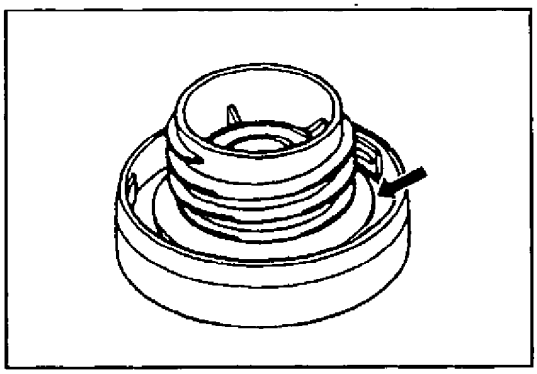
Fuel filter bleed.

Air bleed

NOTE:
This operation should be performed as frequently as indicated in the maintenance chart OB-2 and when the situation demands following an intake of air due to lack of diesel oil with the subsequent difficulties in starting.

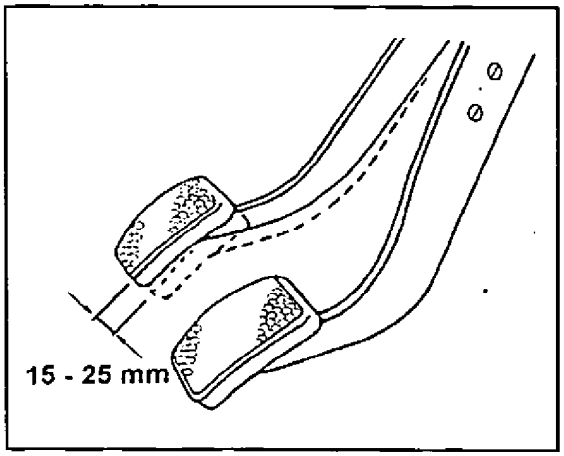
1) Make sure there is sufficient fuel in tank.
2) Slacken bleeder (B). Pump several times pressing button (C) until air ceases to come out of the bleeder. Tighten bleeder (B) when fuel with no air content comes out and when the button stiffens on pumping.

Water and residue bleed.
1) Slacken bleeder (A) and tighten it when water and residue cease to come out.



ITEM 3-5

Fuel tank.
1) Visually inspect fuel tank filler cap seal for damage, distortion or excessive stiffness. If damaged, change it for a new one.
2) Check fuel lines and hoses, making sure they are securely fastened and there are no leaks. Change hoses or pipes damaged in any way.



CHASSIS AND BODY

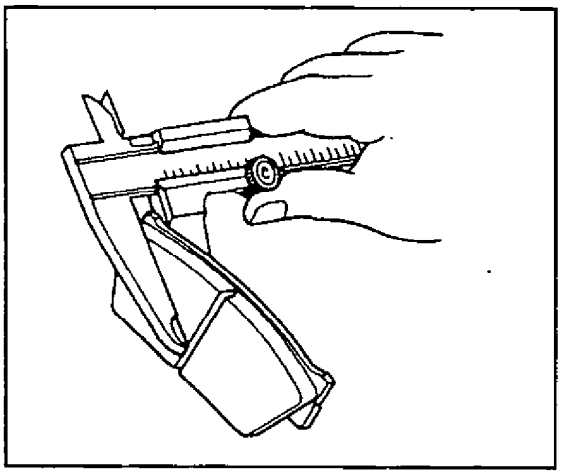
ITEM 6-1

Clutch.

1) Inspect freeplay of clutch pedal.
2) In left-hand drive vehicles the clutch pedal should be 5 mm (0.2 ins.) higher than the brake pedal. On right-hand drive vehicles, the clutch pedal should be set level with the brake pedal.

Clutch pedal freeplay	**15 - 25 mm (0.6-1.0 in)**

For more information, please refer to section 7C.

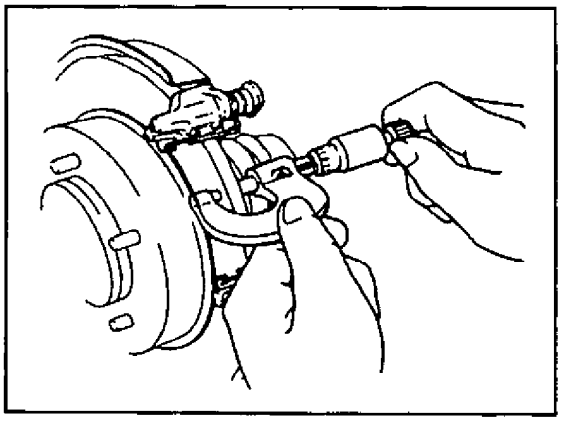


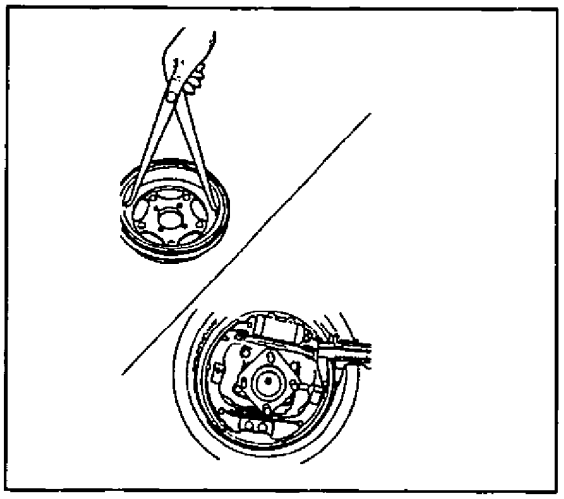
ITEM 6-2

Brake discs and pads (front).
Brake drums and shoes (rear).

Brake discs and pads

1) Remove wheel and brake caliper without disconnecting brake hose
2) Inspect brake pads and discs for excessive wear, damage or distortion.
   Replace any parts necessary.
   Tighten fastening elements as specified. For more information, please refer to section 5 of Service Manual 99500-60A10-01E.





Brake drums and shoes.

1) Remove wheel and brake drum.
2) Check brake drums and brake shoe linings for excessive wear and damage.
3) Check wheel cylinders for leaks, condition of dust covers, etc. Replace parts in bad condition.

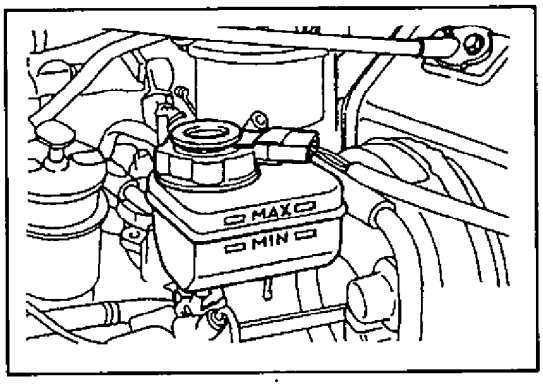
For more information, please refer to section 5 of Service Manual 99500-60A10-01E.

ITEM 6-3

Brake lines and hoses

1) Check brake pipes and hoses for installation problems, leaks, cracks, splits and other damage.

CAUTION:
After changing any pipe or hose, bleed areas in question.



ITEM 6-4

Brake fluid

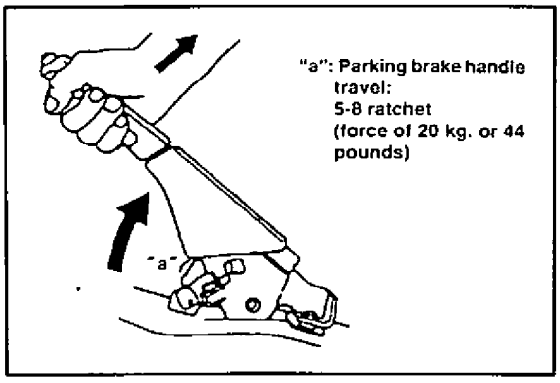
Inspection

1) Inspect master cylinder and reservoir area for fluid leaks. Repair or replace the parts causing any leak.
2) Inspect fluid level. If fluid level is below reservoir minimum, fill to correct level using specified brake fluid.

CAUTION:
Use only glycol-based brake fluid matching the factory fill brake fluid. You could damage braking system if you use or add other types of fluid. Do not use old or used brake fluid, or fluid from an unsealed container.

Changing

Replace brake fluid by draining all braking system fluid and fill system with a recommended fluid before bleeding. For more information please refer to section 5 of Service Manual 99500-60A10-01E .



ITEM 6-5

Handbrake lever and cable.

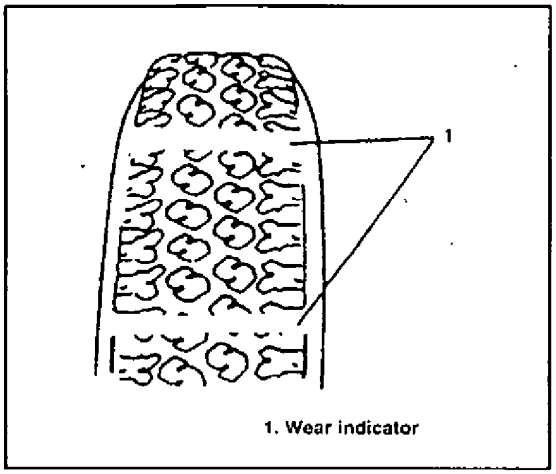
Handbrake lever

1) Inspect points of ratchet teeth for any damage or wear. If damaged or worn, replace lever assembly.
2) Check that brake lever functions correctly and rises to correct height. Adjust if necessary.

Handbrake cable

Carefully inspect brake cable for damage.
Replace if damaged.

For more information, please refer to section 5 of Service Manual 99500-60A1-01 E.



1. Wear indicator

ITEM 6-6

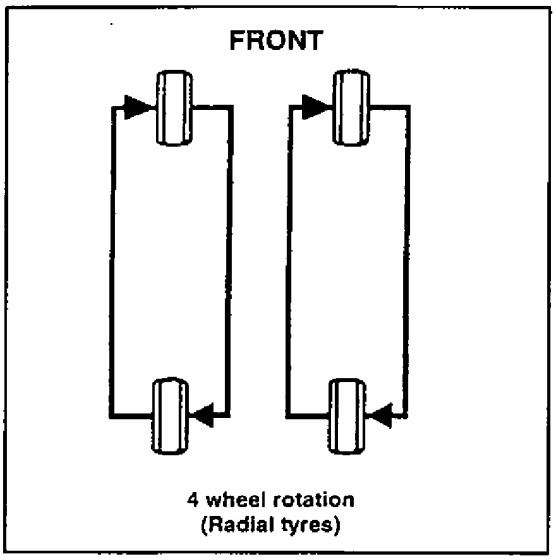
Tyres

1) Inspect tyres for any uneven, excessive wear or damage. Replace if defective.
2) Inspect air pressure in each tyre and adjust to specified pressure if necessary.
3) Rotate wheels in the manner shown.

NOTE:

- **Inspect tyre pressure when cold.**
- **Specific air pressure is indicated in Owner's manual.**
- **Change tyres at recommended intervals.**

For more information, please refer to section 3F of Service Manual 99500-60A10-01E.

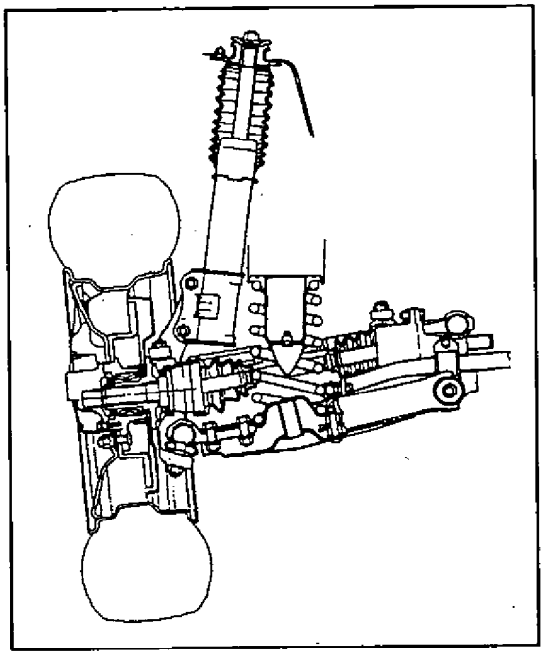


4 wheel rotation
(Radial tyres)

ITEM 6-7

Wheels and free wheeling hubs (if fitted).

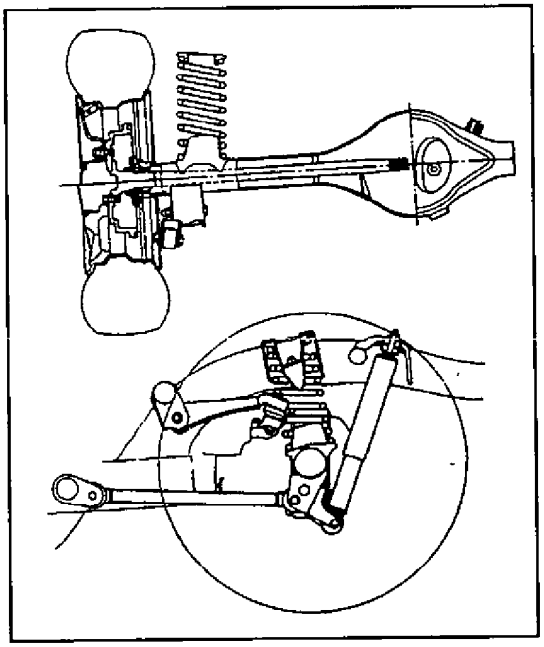
Inspect each rim for dents, distortions or cracks. A rim with any of the above defects should be replaced.



ITEM 6-8

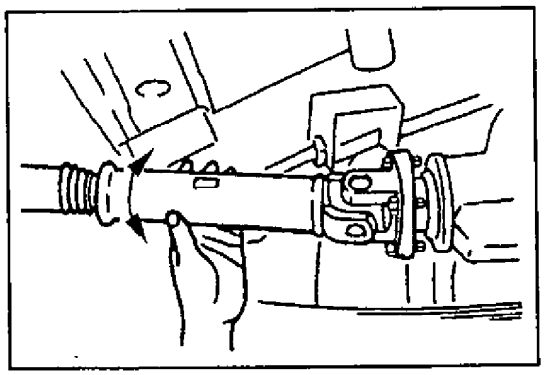
Suspension system.

- Inspect shock absorbers for oil leaks, dents or other damage and inspects their mountings for wear.
  Change shock absorbers if necessary.
- Inspect front rods for leaks, dents or other damage.
- Inspect front control arms, balljoint dust covers for oil loss, loose or broken parts.
  Replace damaged or malfunctioning parts.



- Inspect half-shaft boot dust covers (wheel end and differential end) for cracks or other damage.
  Change boots if necessary.
- Inspect supension system for damaged, loose or missing parts.
  Repair or change defective parts or those that show signs of wear or lack of lubrication.
- Check torque of suspension nuts and bolts and tighten if necessary.
  Repair or change any defective parts.

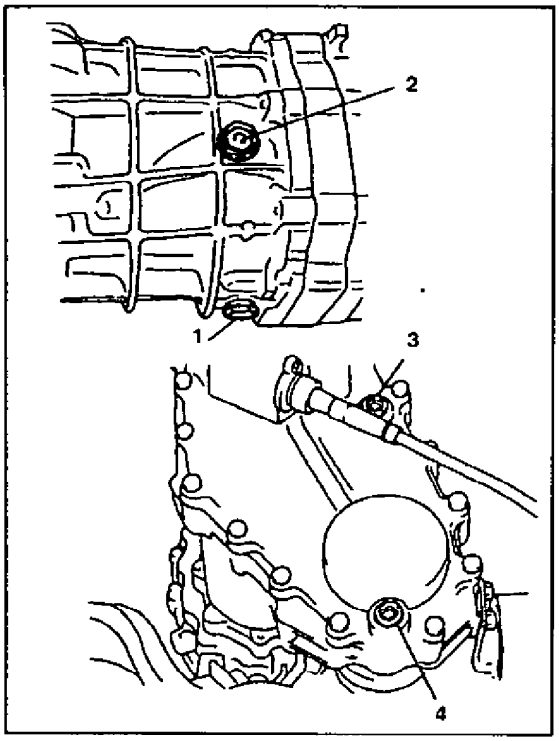
NOTE:
For more informaticn on points to check, please refer to SPECIFICATIONS chart in Service Manual SECTIONS 3D and 3E 99500-60A10-01E .



ITEM 6-9
Propeller shafts.

1) Inspect universal joint and axle shaft knurling for any looseness or knocking when functioning.
   If any of the above anomalies are detected, change the defective part.
2) Check tightness of propeller shaft nuts and bolts and retighten if necessary.

Propeller shaft nut torque specifications:
55 Nm (5.5 kg.m, 40 lb.ft)



ITEM 6-10

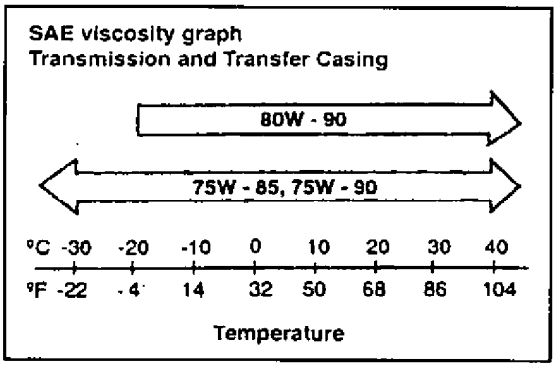
Transmission oil

Inspection
1) Inspect transmission for possible oil leaks.
2) Park vehicle on horizontal ground before checking level.
3) Remove plug (2) to check oil level. The level is correct if a small amount of oil seeps over the of edge of the hole on removing plug. If no oil comes out, add a suitable quantity.

Oil change
1) With vehicle horizontal, drain oil from transmission by removing drain plug (1).
2) Clean oil on plug and housing and apply sealer 99000-31110 to thread. Replace plug and tighten as specified.
3) Add oil to the level of filler plug (2) before replacing the plug and tightening to the specified torque.

Torque specifications:

Plug (1)	**23 Nm (2.3 kg.m, 17 lb.ft).**
Plug (2)	**23 Nm (2.3 kg.m, 17 lb.ft).**
Plug (3 and 4)	**23 Nm (2.3 kg.m, 17 lb.ft).**



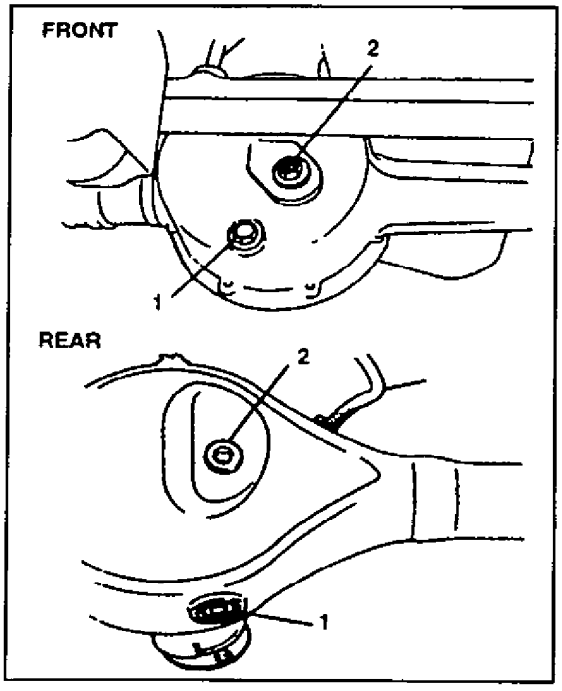
Use of gear oil 75 W - 90, type API GL 4 is strongly recommended

Oil capacity

Transmission: 1,5 litres (2.6 Imp. pints).
Transfer case: 1.7 litres (3.0 Imp. pints).

ITEM 6-12
Transfer case oil.

NOTE:
Proceed as for transmission (previous point), removing oil level (3) and drain, (4) plugs.



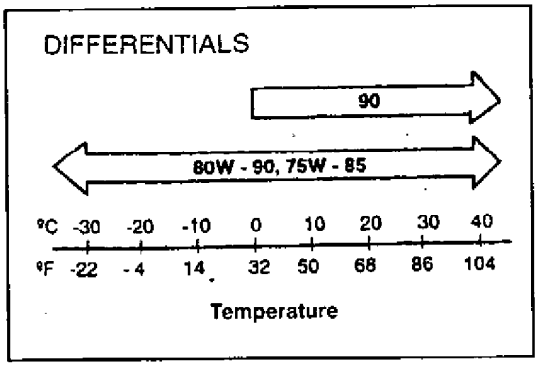
ITEM 6-13

Differential oil.

Inspection
1) Make sure vehicle is situated on horizontal ground.
2) Remove oil level and filler plug (2).

If level is correct, a small amount of oil should seep out of the hole.
If no oil comes out, add a suitable quantity.

Oil change
1) With the vehicle situated horizontally, drain oil by removing plug (1).
2) Clean oil from plug (1) and housing, apply sealer 99000-31110 to thread, fit plug to specified torque. Pour in suitable quantity of oil to reach level and replace filler plug (2), applying sealer indicated as specified.



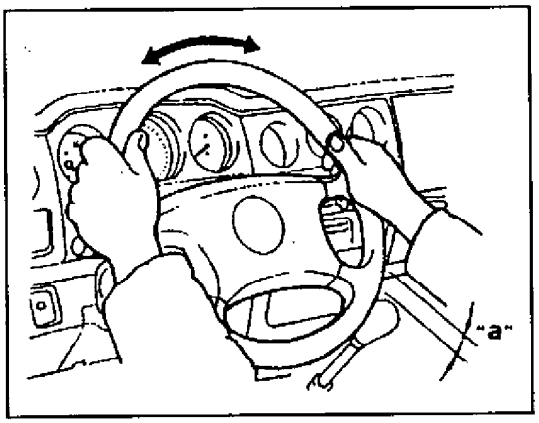
Torque specifications:

Front plug (1)	**23 Nm (2.3 kg.m, 17 lb.ft).**
Rear plug (1)	**22 Nm (2.2 kg.m, 16 lb.ft).**
Front plug (2)	**40 Nm (4.0 kg.m, 29 lb.ft).**
Rear plug (2)	**43 Nm (4.3 kg.m, 31lb.ft).**

Use of hypoid gear oil 80 W - 90, type API GL 5 is strongly recommended.

Oil capacity:

Front axle: 1.0 litres (1.8 Imp. pints).
Rear axle: 2.2 litres (3.9 Imp. pints).



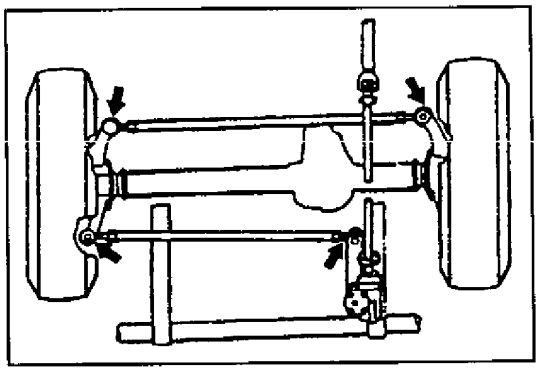
ITEM 6-14

Steering system.

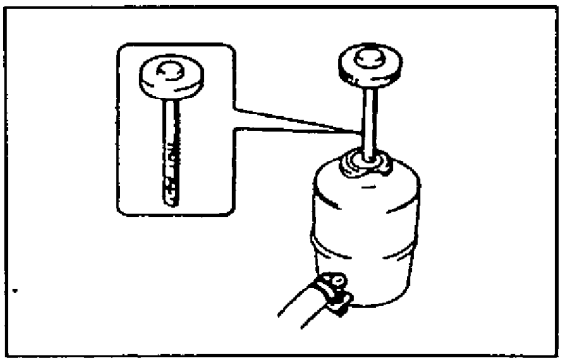
1) Inspect steering wheel for play, noise or looseness while vehicle is maintained on the ground with wheels pointing forward.

   Steering wheel free play: 10 - 30 mm (0.4 -1.1 ins.) at rim.

2) Inspect universal joints on steering axis for noise, looseness or damage. If any problem exists, replace defective part for new one.



3) Check nuts and bolts are correctly tightened and re-tighten if necessary.
4) Inspect steering gear mechanism for any oil leaks. If there are, inspect oil level in gear mechanism.
5) Inspect steering linkage dust covers for damage (leaks, loose elements, breaks, etc). Replace any damaged dust covers.
6) Inspect wheel alignment.



ITEM 6-15

Power assisted steering.

1) Visually check power steering system for liquid leaks and damaged hoses. Replace or change any defective parts.
2) Unscrew filler cap and check level marked by dipstick, which should be between MAX and MIN levels. If it is below MIN level, fill up to MAX level.

NOTE:

- **Ensure P/S, DEXRON-II or equivalent fluid is used.**
- **Fluid level should be checked when cold.**

3) Visually inspect power steering pump belt for cracks or wear.
4) Check belt tension. For further information on this subject, please refer to section 3B3 of Power Steering System Service Manual 99500-60A10-01 S. Adjust or replace belt if necessary.

ITEM 6-16

All locks and hinges.

Lubricate door hinges and inspect locks for correct functioning lubricate as appropriate.

FINAL INSPECTION

Carry out a road test in a safe place.

WARNING:
When carrying out road tests, make sure they are in a safe place with no passing pedestrians or vehicles. This will reduce the possibility of accidents.

1) **Starting engine.**
   Check that engine starts and runs without problem.

2) **Clutch and clutch cable.**
   Check the following points with engine running.
   - Test all six gears and ensure they all change without difficulty or scraping.
   - In 4th gear, engage the hand brake, accelerate a little and try to slowly release the clutch pedal. The engine should stall and the vehicle remain stationary. This means the clutch does not slip. If on releasing the clutch the engine tries to keep running, then the clutch is slipping.

3) **Brakes.**
   Check the following points when driving.
   - There are no abnormal noises when braking.
   - The same brake power is applied to all the wheels.
   - The vehicle does not tend to veer one way when brakes are applied firmly.
   - Wheels do not lock.
   - No one wheel locks up independently of the other wheels on the vehicle.

4) **Hand brake**
   Check hand brake functioning by stopping vehicle on pronounced slope and fully engaging the handbrake. If vehicle moves, adjust the hanbrake.

5) **Engine.**
   - Check that it responds quickly in all gears.
   - Check that engine does not produce abnormal noise or vibration.

6) **Body, wheels and transmission system.**
   Check body, wheels and transmission system for abnormal noise or vibration.

7) **Meters and indicators**
   Check speedometer, mileometer, fuel gauge, temperature gauge, etc. for correct functioning.

8) **Oil pressure and charge lights.**
   Check these lights go off when engine starts. If any come on, with the engine running, there is some problem with the engine lubrication system or the charging system.

9) **Safety belt.**
   Inspect safety belt system, including belts, buckles, latch plates, retractors, anchoring, etc.

10) **Body.**
    Check the following points with the vehicle stationary:
    - Bonnet catch.
    - Door closure.
    - Seat sliding and reclining.
    - Battery electrolyte level.
    - Windscreen wipers.

RECOMMENDED FLUIDS

ENGINE OIL	Multigrade 10W/40 API CD or CE or CF-04
ENGINE COOLANT	DINAMIC - DINAGEL - 9103
BRAKE FLUID	DOT-3 or SAE J-1703
TRANSMISSION	API GL4 SAE 75W-90
TRANSFER CASE	API GL4 SAE 75W-90
DIFFERENTIALS	API GL5 SAE 80W-90
POWER ASSISTED STEERING	Equivalent to DEXRON-II

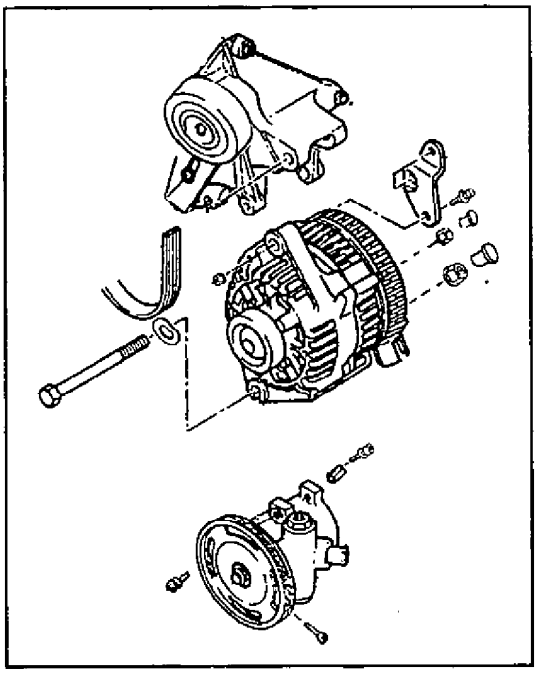
SECTION 3B2

POWER ASSISTED STEERING PUMP

NOTE
For topics not covered in this section, please refer to the relevant section of the Vitara Service Manual outlined in the preface.

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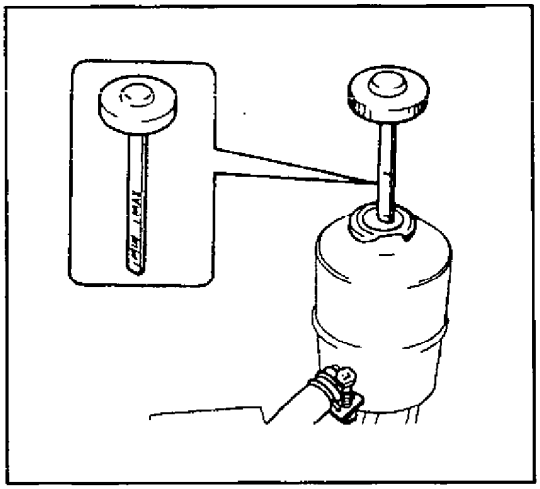
PUMP REPLACEMENT 3B2-2



PUMP REPLACEMENT

Disassembly

1) Disconnect negative cable from battery.
2) Remove inner soundproof plate.
3) Slacken two bolts on the side and lower part of the alternator tensioner and remove belt.
4) Remove attaching bolts and positive and alternator drive cables.
5) Remove lower and upper attaching bolt of the alternator to support.
6) Release inlet and outlet pump lines and collect liquid in a tray.
7) Turn power assisted steering pump pulley and slacken through hole one of the bolts on the side. Remove the other two attaching bolts.
8) Detach power assisted steering pump.



Assembly

1) Reverse order of the disassembly process.
2) Tighten attaching elements to their torque specification.

Torque specification for pump attaching bolts to support: 20 Nm (2.0 kg.m, 15 lb.ft).

Torque specification for power assisted steering pump pressure lines: 50-70 Nm (5.0-7.0 kg.m, 36-51lb.ft).

3) Tighten belt as indicated on page 0B-4.
4) Add power assisted steering fluid in the reservoir. Start engine and turn the steering wheel several times in both directions, adding fluid to the reservoir until the level is maximum.

Power assisted steering fluid DEXRON-II

SECTION 3D

FRONT SUSPENSION

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Replacement of "B" type manual free wheel **3D-14**
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FREE WHEEL HUB

GENERAL DESCRIPTION

A free wheel hub disconnects the front wheel from its drive-shaft when two wheel drive is required yet allows reconnection when four wheel drive is used..
This device is located at the end of each front drive shaft where it replaces the normal drive flange.
Using a free wheel hub reduces front tyre wear, and prevents the front wheels fron driving the drive-shafts, differential and front drive. This reduces noise and wear and aids fuel economy.
There are two types of free wheel device. A manual type is operated by hand whilst the automatic types connect and disconnect the drive wihout driver intervention whenever 4H or 4L are selected.

MANUAL FREE WHEEL PERFORMANCE

The manual device is located at both ends of the front drive shafts and has a knob located at the center that can be rotated to either the FREE or LOCK positions.
When the knob is set to its FREE position, the drive shafts and the wheel are disengaged and the front wheel rotation is free. When it is set to its LOCK position the axle and the wheel are engaged. Refer to the Owner's Manual, provided with the vehicle for further information.

AUTOMATIC FREE WHEEL PERFORMANCE

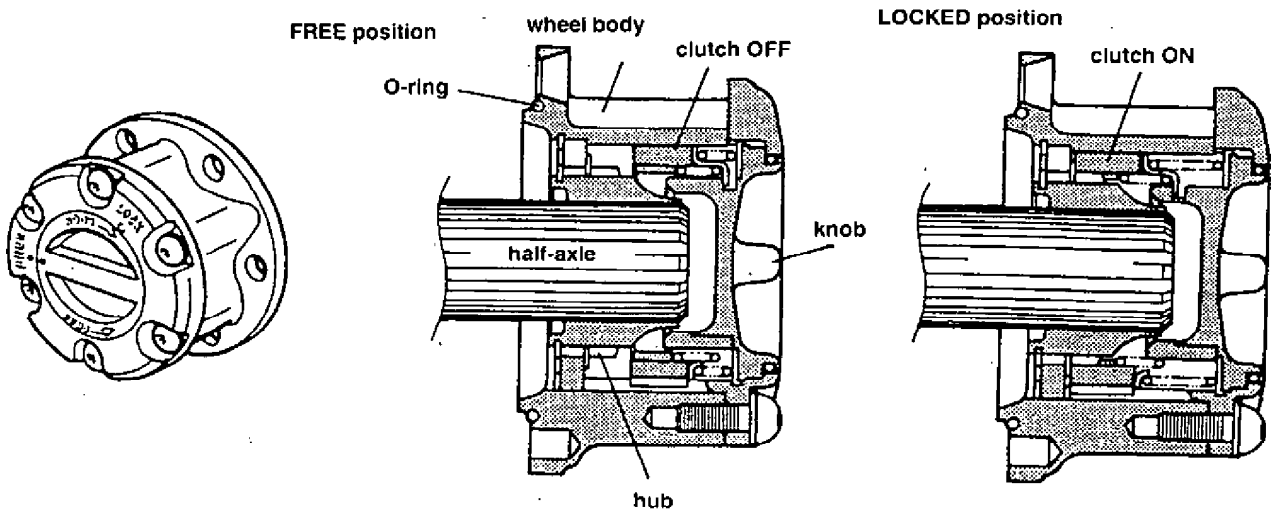
This device is also located at the end of each front drive shaft. Whenever driving torque is trasmitted to the front drive shafts (when 4H or 4L is selected and the vehicle is driven) the internal mechanism automatically connects the drive-shafts with their respective driving wheels.
The initial change from two to four wheel drive must be made with the vehicle stationary although sibsequart changes between 4H and 2H may be made on the move. The initial change takes place within 2 metres of vehicle movement fron stationary.
To disengage the free wheel device set the transfer lever in 2H and the gear lever in reverse position. Approx. 2 metres later the locking device is disconected. To engage the free wheel in reverse, set the transfer lever in 4H or 4L and move backward a short distance. Now the unlocking will be produced by selecting 1st gear, the transfer lever in 2H and moving forward some metres.

FREE WHEEL HUB TYPES DESCRIPTION

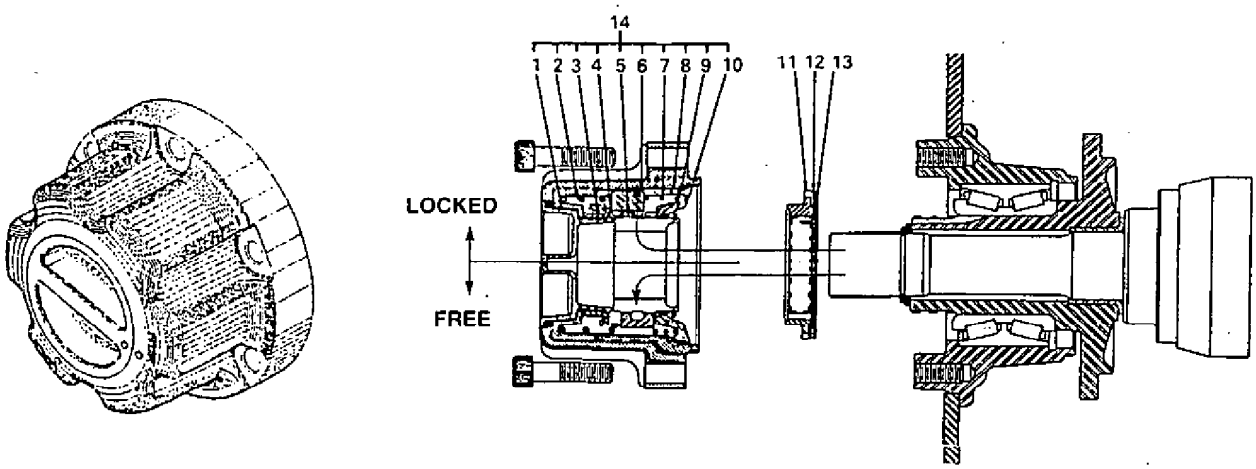
There are two types of free wheel hub, a manual driven one and an automatic one, and for each type there are two versions, so that, in total there are four kinds of free wheels hub.
The installation of one or other type depends on the vehicle specification. The installation and maintenance method changes from one to another; make certain you are using the correct method by consulting the relevant section.

CAUTION:
- **Make certain that the same type of free wheel hub is fitted to each side of the front axle.**
- **If free wheel hubs are fitted, be sure that both are in the "LOCK" or "FREE" position.**
- **Never dismantle a free wheel hub as this may adversely affect its performance. This does not include the removal of the cover to lubricate the hubs splines.**

"A" Type manual free wheel

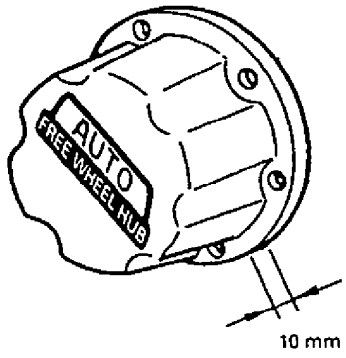


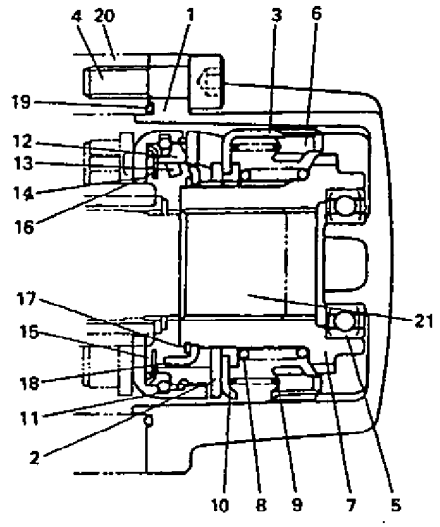
"B" Type manual free wheel



1. Knob
2. Main spring
3. Knob screw
4. Knob nut
5. Internal driving gear
6. Clutch ring
7. Return spring
8. Bearing
9. Retainer ring
10. O-ring
11. Slotted nut
12. Antirotation spring
13. Rear spring plate
14. Free wheel assy

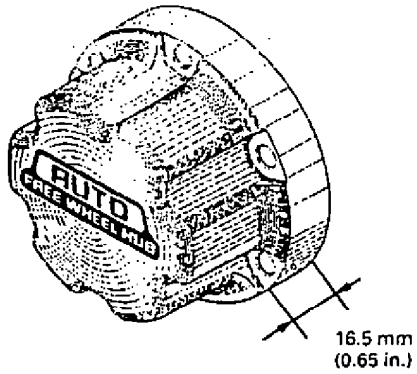
"A" Type automatic free wheel.

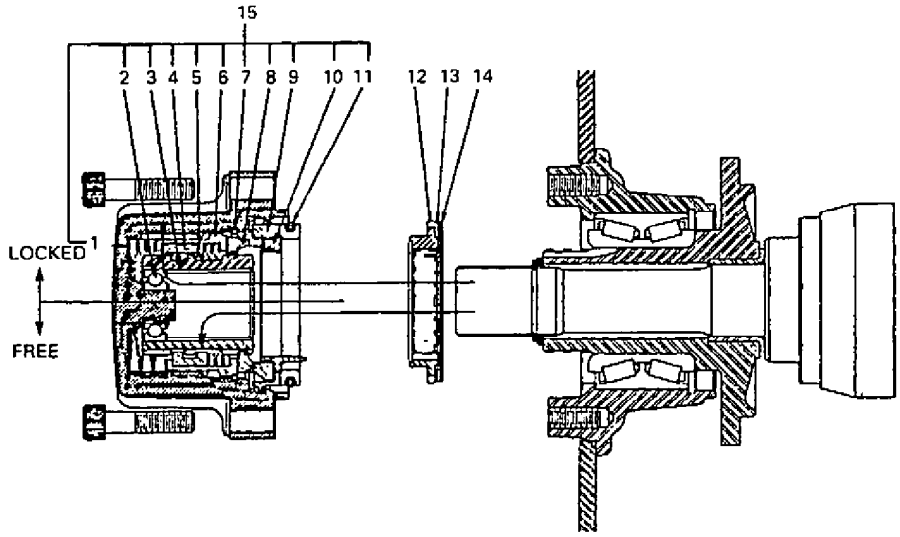




1. Cover
2. Cam
3. Retainer
4. Screw
5. Bearing
6. Sliding gear
7. Driving gear
8. Return spring
9. Change spring
10. Sustaining spring
11. O-ring
12. Internal brake
13. Retaining ring
14. External brake
15. Neddle bearing
16. Driving washer
17. Elastic ring
18. Retaining plate
19. O-ring
20. Wheel hub

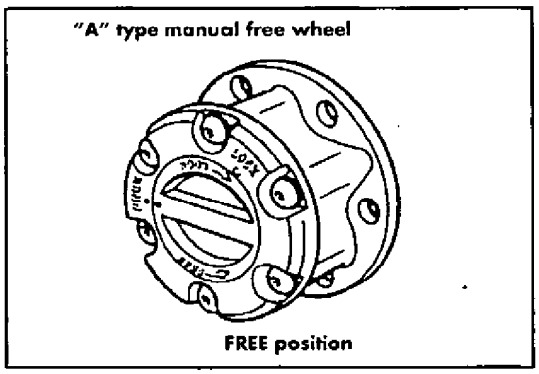
"B" Type automatic free wheel





1. Wavy return spring
2. Bearing
3. Internal driving gear
4. Clutch ring
5. Wavy spring box
6. Clutch box ring
7. Retaining ring
8. Follower cam
9. Mobile cam
10. Fix cam
11. O-ring
12. Slotted nut
13. Check spring
14. Plate
15. Assy

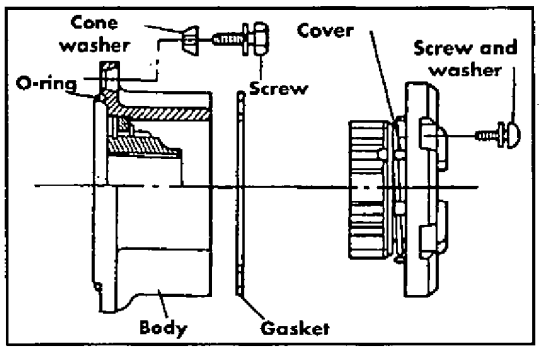
NOTE: Some vehicles may incorporate the hub bearing retaining system consisting of nut (not slotted) and safety washer. This mechanism is compatible with "A" and "B" manual driven free wheels and with "A" type automatic ones. For "B" type automatic free wheel it is essential that a locking system consisting of slotted nut, check spring and plate is used as shown above.



INSTALLATION OF "A" TYPE MANUAL FREE WHEEL HUB

Disassembly

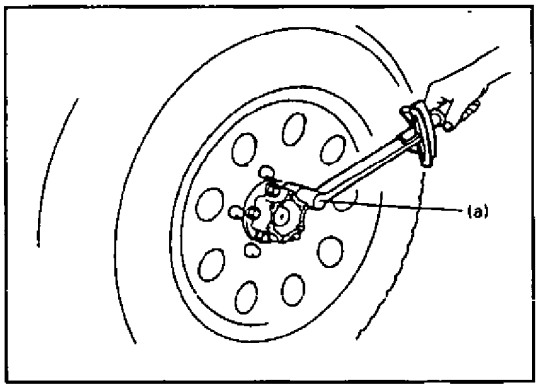
1) Jack the vehicle and remove the wheel, if necessary.
2) Remove the drive-shaft and hub attaching flange.



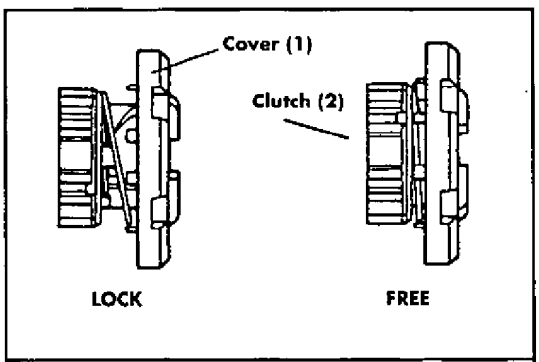
Assembly

1) Align the "O" mark on the free wheel hub knob with **FREE** position. Detach from the hub body the free wheel hub cover assy.
2) Install the free wheel body assy on the wheel hub.

Torque of attaching screws: 25 Nm (2.5 kg.m, 18 lb.ft)

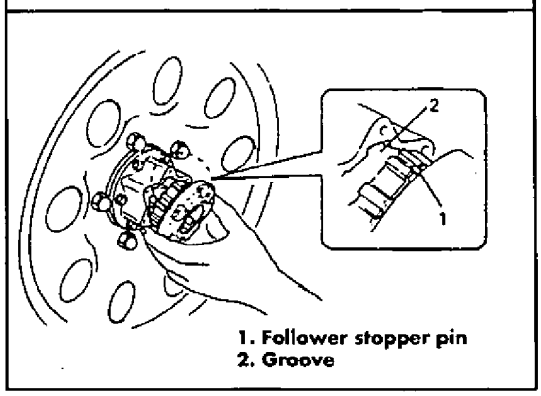


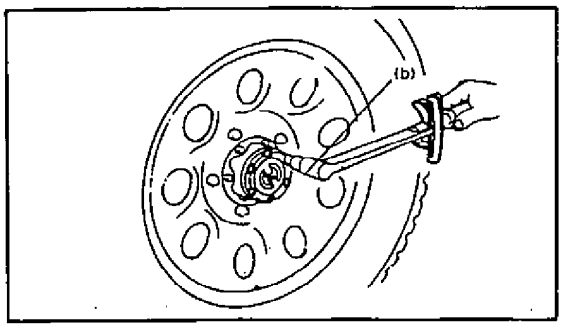
3) Chech that the gasket is aligned correctly and install the cover assy on the body assy, so that follower stopper pins of the driving roller are located in the grooves of the body assy.



NOTE:
Before installing the cover assy check the following points:

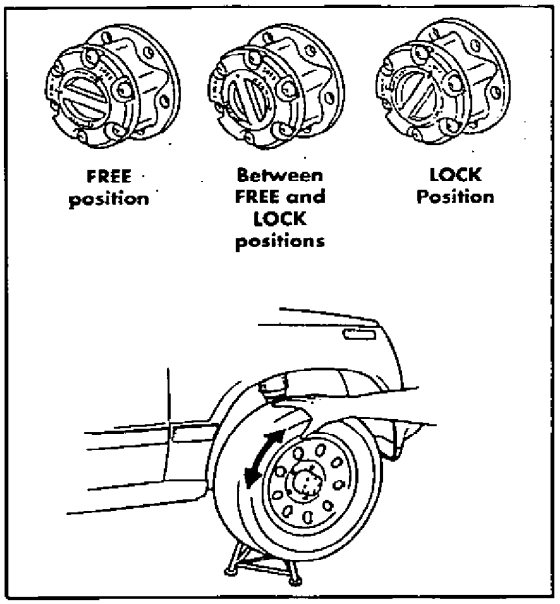
- **The "O" mark of the knob is in FREE position.**
- **The clutch (2) is located toward the cover side (1).**
- **There are only two grooves to accomodate the follower stopper pins.**





4) Attach the cover assy on the body assy by means of cover screws.

Torque of the cover attaching screws:
10 Nm (1.0 kg.m, 7 lb.ft)

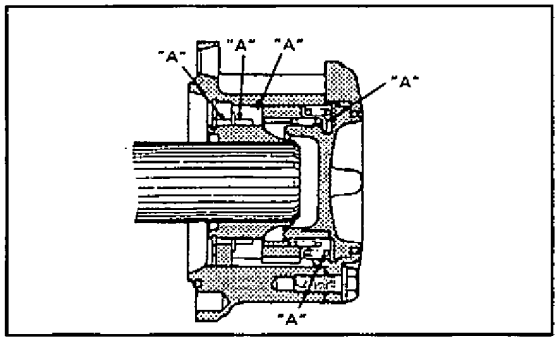


5) To check the performance of the free wheel, jack the front end of the vehicle and move the knob between **FREE** and **LOCK** positions, checking its free movement. Also check, by hand turning, that the wheels remain attached to the half-axle in the **LOCK** position and release in **FREE** position.

MAINTENANCE SERVICE

The vehicles provided with free wheel are subject to the following periodic checks.

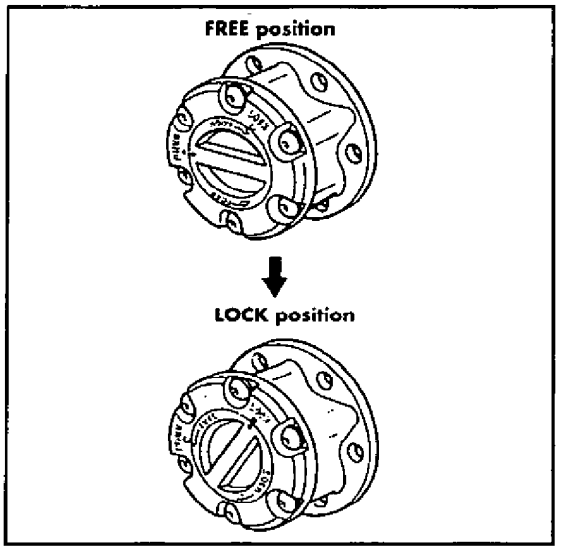
In order to check the performance of the free wheel hub, jack the front end of the vehicle, move the knob between **FREE** and **LOCK** positions, and check its free movement. Also check if the wheel operates correctly with the knob in **FREE** and **LOCK** positions by turning the wheel by hand.



If necessary, remove the free wheel cover and grease each sliding surface using lithium grease or grease after cleaning each sliding part.

LITHIUM GREASE
SUZUKI SUPER GREASE A (99000-25010)

If the performance does not improve after greasing, rework or replace the damaged part.

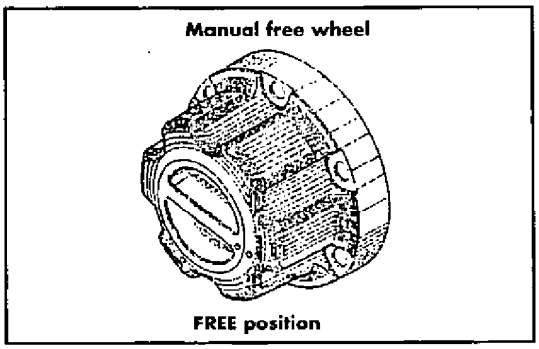


CAUTION
The hubs must not be packed with grease.

INSTALLATION OF "B" TYPE MANUAL FREE WHEEL

Disassembly

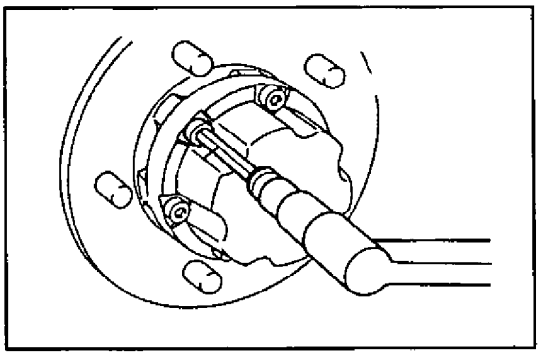
1) Jack the vehicle and remove the front wheels.
2) Undo the six bolts each side and remove the front axle drive flanges.

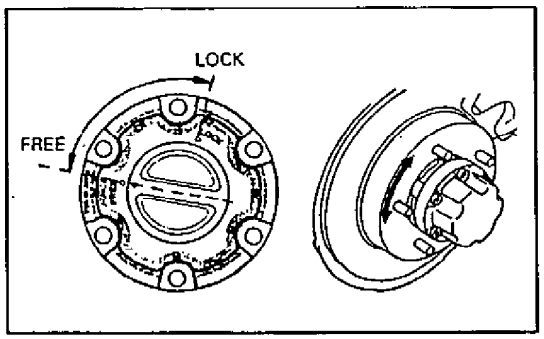


Assembly

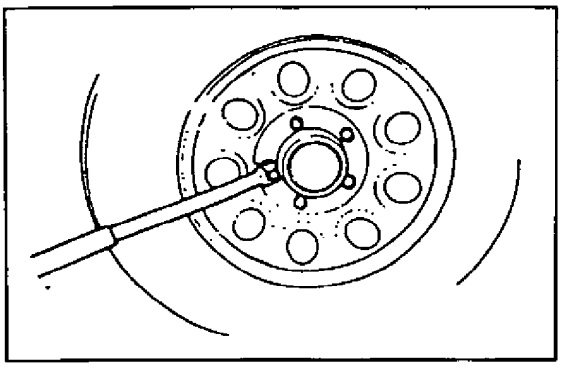
1) Check that O-ring of the free wheel hub is not damaged and is correctly located.
2) Place the free wheel in **FREE** position by rotating the knob.
3) Clean the contact surfaces of the hub and the free wheel hub.
4) Intall the free wheel hub using the screws supplied witch must be tightered to the specified torque.

Torque of the free wheel hub bolts: 33 Nm (3.3 kg.m, 24 lb.ft)





5) Check the following:
   - The knob actuates correctly and changes freely from **FREE** to **LOCK** position and vice-versa.
   - The wheel turns freely and it is not linked to the half-axle when the knob is in its **FREE** position.
   - The free wheel assy is linked to the half-axle when the knob is in its **LOCK** position.



4) Replace the road wheels and torque the nuts to the specified value.

Torque of wheel nuts: 95 Nm (9.5 kg.m, 69 lb.ft)

MAINTENANCE

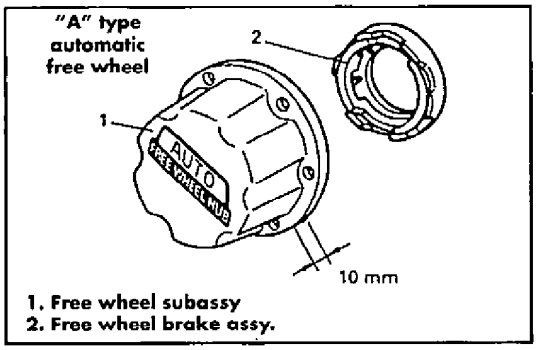
Jack the vehicle and check that the free wheel operates in **FREE** and **LOCK** positions, by turning the wheel. If defective replace the free wheel assy.

CAUTION
Hubs must not be grease packed.

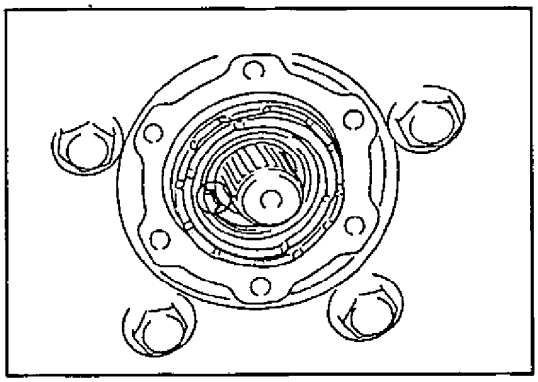
INSTALLATION OF "A" TYPE AUTOMATIC FREE WHEEL

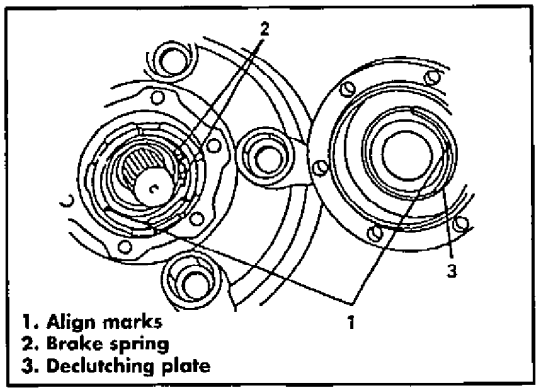
Disassembly

1) Jack the vehicle and remove front wheels.
2) Remove drive-shaft and hub mounted drive flanges.

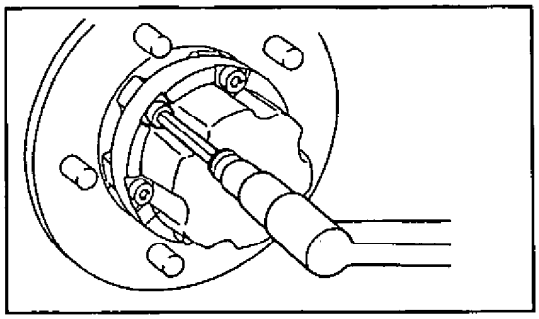


1. Free wheel subassy
2. Free wheel brake assy.





1. Align marks
2. Brake spring
3. Declutching plate



Assembly

1) Check the O-ring of the free wheel hub for damage and correct location.
2) Install the free wheel hub aligning it with free wheel brake assy cotter and with sleeve cotter.
3) Install the free wheel subassy matching the marks of the brake assy and subassy.

CAUTION
Make certain the marks mentioned above are aligned, if not, they may interfere with each other and cause damage.

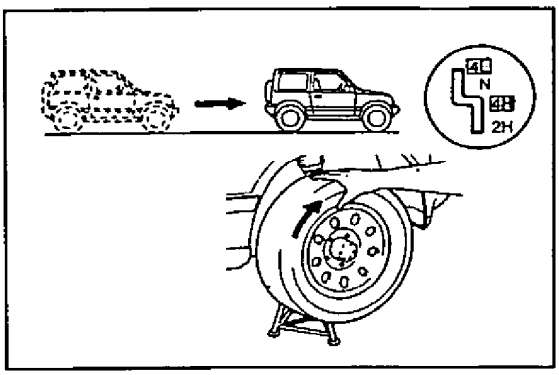
4) Torque the free wheel hub bolts to the specified value.

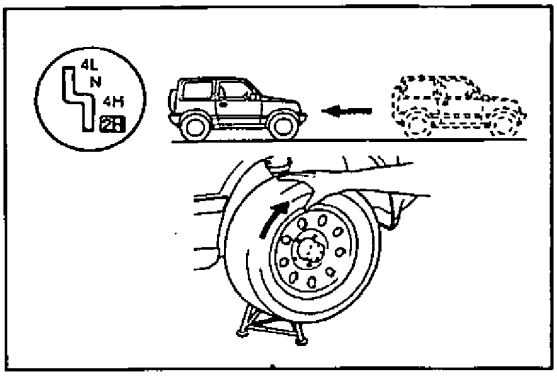
Torque of the bolls: 33 Nm (3.3 kg.m, 24 lb.ft).

5) Install front road wheels, (if removed) and torque the attaching nuts to the specified value.

Torque of wheel nuts: 95 Nm (9.5 kg.m, 69 lb.ft).

6) Lower the vehicle and perform the checks mentioned in the following paragraph.





Performance checking

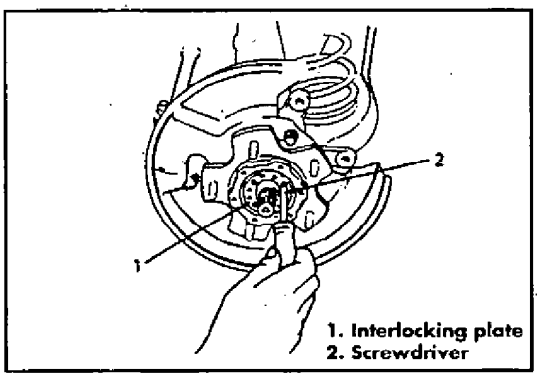
Confirm the performance of the free wheel hub by means of the following tests:

1) Set the transfer box lever in 4H or 4L and slowly move the vehicle 2 metres or more forward.
2) Jack the vehicle front and check that the drive-shaft moves with the wheel when it is turned by hand in a clockwise direction (counterclockwise for the left wheel).
3) Lower the vehicle.
4) Set the transfer lever in 2H and slowly move the vehicle 2 metres or more backwards.
5) Jack the vehicle front and check that the drive-shafts do not move with the wheels when one are turned by hand in a clockwise (counterclockwise for the left wheel) direction.
6) Repeat the steps 1) to 4) when revase gear in selceted in 4H or 4L. In this condition the hub should lock in the reverse direction and unlock when moving forward.

If defective, replace the free wheel hub assy.

MAINTENANCE

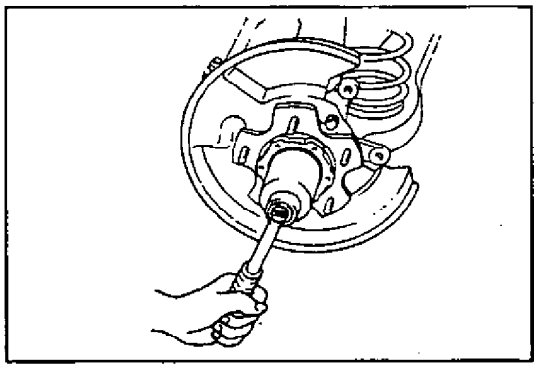
Periodically check the performance of the free wheel hub following the steps above and replace them if required.



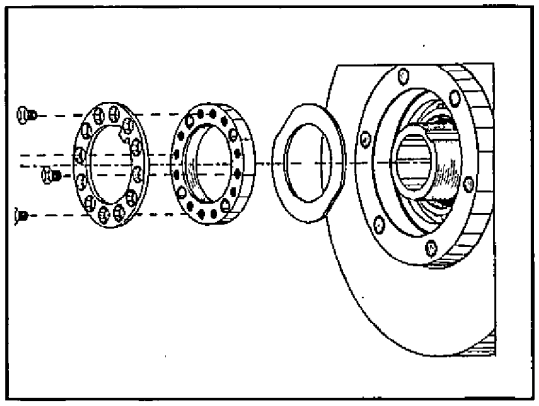
INSTALLATION OF "B" TYPE AUTOMATIC FREE WHEEL

Disassembly

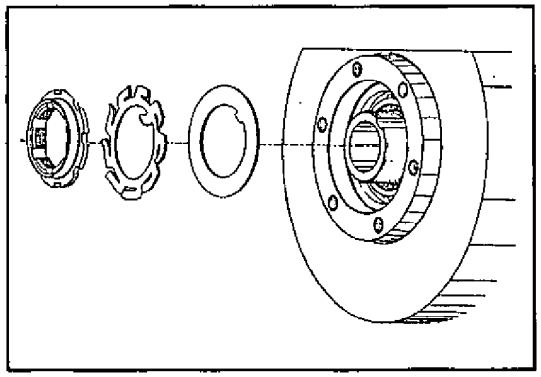
1) Jack the vehicle and remove the wheel.
2) Remove the axle and hub attaching flange.
3) Remove the hub bearing interlocking plate by loosening the four screws.



4) Withdraw the hub bearing nut using a suitable tool.

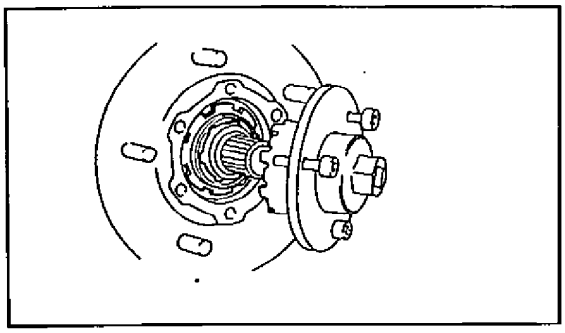


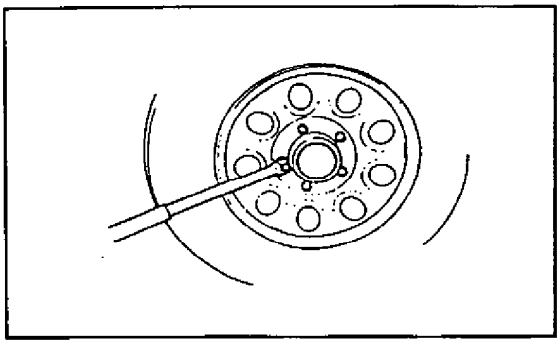
5) Withdraw the hub bearing safety washer



Assembly

1) Install the spring washer (supplied with the free wheel hub assy), on the sleeve; aligning the tab in the groove. This washer may be installed in any position.
2) Install the antirotation spring washer, (supplied with the free wheel hub assy), on the sleeve. The tab of the washer must be located in the groove and point outwards.
3) Install the slotted nut, supplied with the free wheel hub assy, on the sleeve and tighten it by hand.





4) Install the special tool (09943-0610) consisting of two parts attaching it to the hub by means of three bolts and matching the edges of the wrench with the slotted nut grooves.
5) Torque by hand the three tool attaching screws in the previous position.
6) While turning the wheel hub by hand, torque the slotted nut using the special tool to the specified value.

Torque specification for nut: 210 Nm (21.0 kg.m, 152 lb.ft)

7) Check that the O-ring of the free wheel hub is not damaged and is correctly located.
8) Check that the contact surfaces of the free wheel hub and the hub are clean.
9) Install the free wheel hub matching its edges with the groove in of the slotted nut, already installed on the hub.
10) Torque the screws supplied with the free wheel hub to the specified value, using a cross pattern.

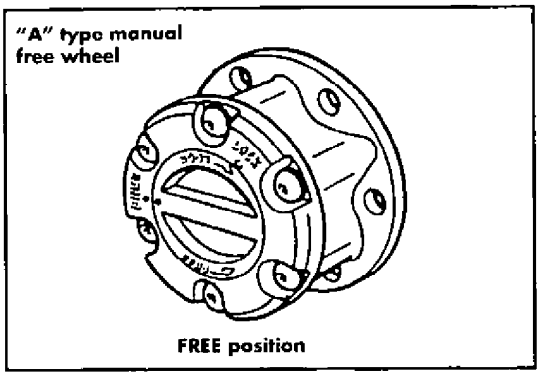
Torque specification for the free wheel attaching screws: 33 Nm (33.0 kg.m, 24.lb.ft)

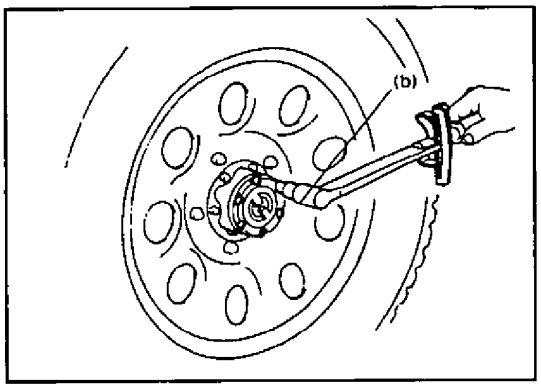
11) Install the wheels and torque the nuts to the specified value.

Torque specification for wheel attaching nuts: 95 Nm (9.5 kg.m, 69 lb.ft)

Performance Checking

Use the same method as previously described for the "A" type automatic free wheel.





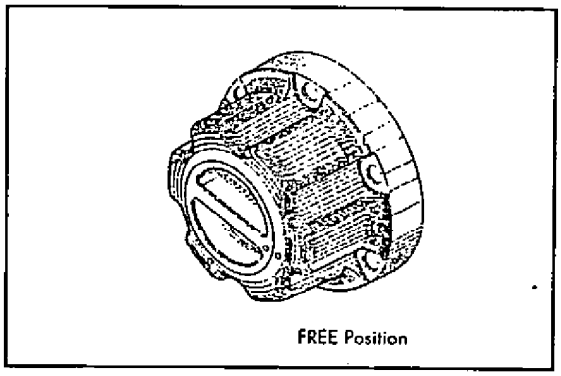
REPLACEMENT OF "A" TYPE MANUAL FREE WHEEL HUB

Disassembly

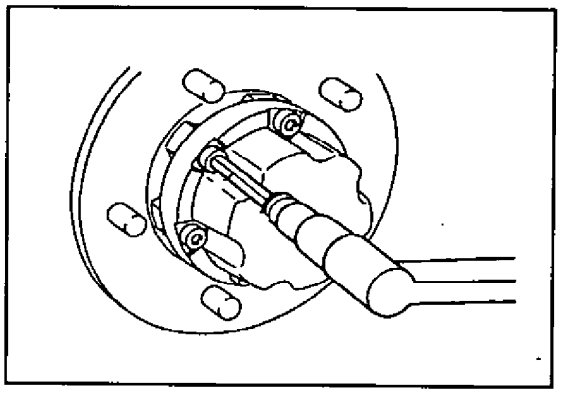
1) Jack the vehicle and remove the wheels if required.
2) Set the actuating knob of the free wheel hub to its **FREE** position.
3) Remove the 6 screws attaching the wheel to the hub.

Assembly

1) Refer to steps 1) to 5) provided for the Installation of "A" type manual free wheel hub, (Section 3D-5)



FREE Position



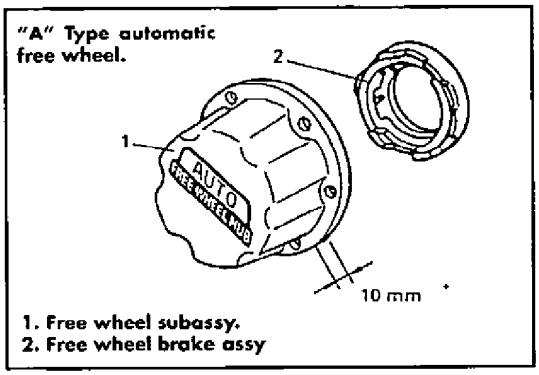
REPLACEMENT OF "B" TYPE MANUAL FREE WHEEL HUB

Disassembly

1) Jack the vehicle and remove the wheels.
2) Set free wheel hub actuating knob to "**FREE**" position.
3) Remove the 6 screws attaching the free wheel to the hub.

Assembly

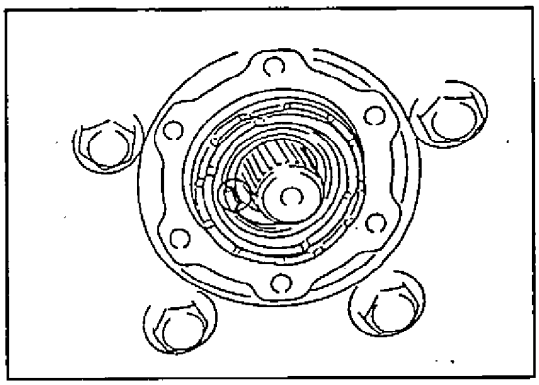
1) Perform the operations 1) to 5) provided for the installation of the "B" type manual free wheel (Section 3D-7).

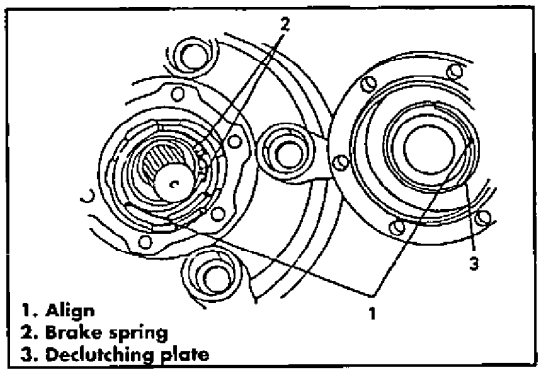


REPLACEMENT OF "A" TYPE AUTOMATIC FREE WHEEL

Disassembly

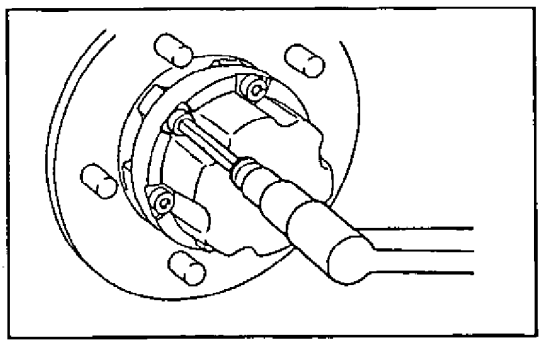
1) Set free wheels in **free** position (transfer lever to 2H position and move the vehicle backwards 2 metres or more).
2) Jack the vehicle and, if necessary, remove the wheel.
3) Remove the free wheel subassy and free wheel assy.





Assembly

1) Refer to steps 1) to 6) of the installation of "A" type automatic free wheel and performance checking. (Pages 3D-9 and 3D-10).

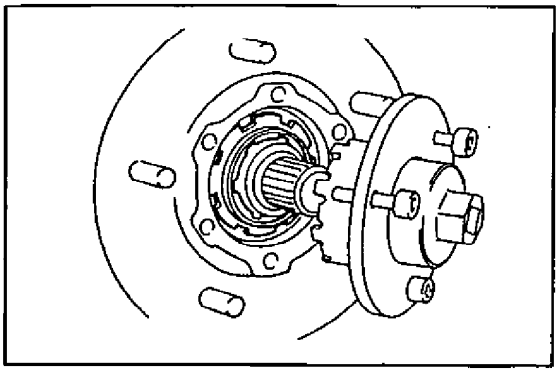


REPLACEMENT OF "B" TYPE AUTOMATIC FREE WHEEL

Disassembly

Free wheel assy

1) Jack the vehicle and remove the wheel.
2) Remove the six screws attaching the free wheel to the hub and withdraw the free wheel.

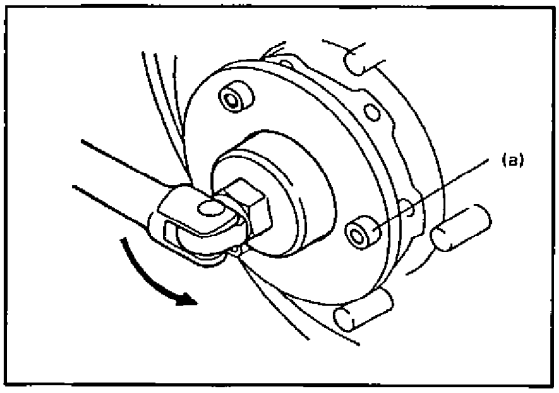


Bearing retaining system

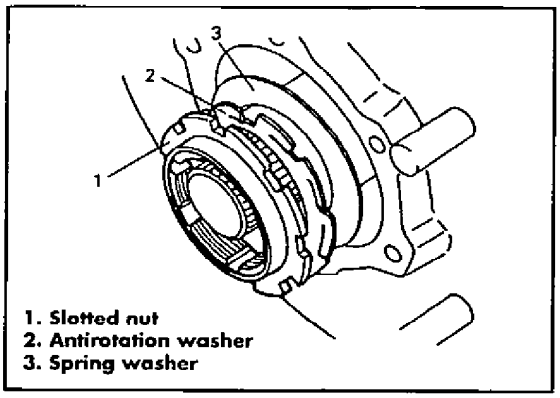
If necessary remove the slotted nut, the antirotation spring washer and the spring washer following the steps below:

1) Install the plate and slotted wrench assy (tool **ref. 09943-06010**) on the wheel hub, aligning the edges of the wrench with the grooves in the slotted nut.
2) Torque the three plate attaching screws.

Torque specification for plate attaching bolts: 2.5 Nm (0.25 kg.m, 2 lb.ft)



3) Turn the slotted nut counterclockwise 2 complete turns in order to loosen it from the antirotation spring washer.
4) Remove the special tool attached to the wheel hub.



1. Slotted nut
2. Antirotation washer
3. Spring washer

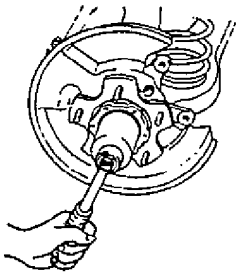
5) Remove the slotted nut, the antirotation spring washer and the spring washer.

Assembly

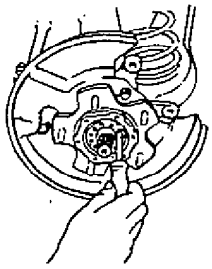
1) Perform the operations 1) to 6) indicated for the installation of the "B" type automatic free wheel (Page 3D-11) (Only if the spring washer, retaining spring washer and slotted nut assy has been replaced).
2) Install the free wheel assy as described in steps 7) to 11) of the installation of "B" type automatic free wheel (page 3D-12).
3) Undertake performance checks described on Page 3D-10.

SPECIFIED TORQUES

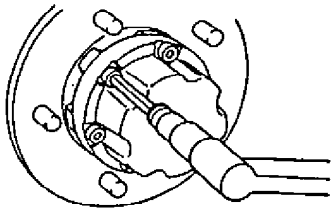
ELEMENT	TORQUE		
	kg.m	Nm.	lb.ft
Hub attaching nut/slotted nut	21	210	152
Fixing plate screws	0.25	2.5	2
Attaching bolts of the free wheel ("B" type manual and "A" and "B" types automatic)	3.3	33	24
Attaching bolts of the flange and "A" type manual free wheel	2.5	25	18



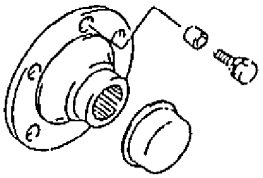
HUB ATTACHING NUT



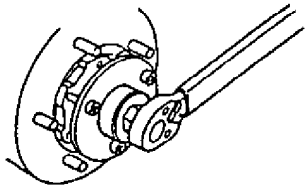
FIXING PLATE SCREWS



FREE WHEEL ATTACHING BOLTS

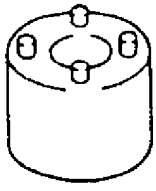


FLANGE ATTACHING BOLTS

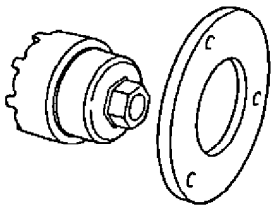


SLOTTED NUT

SPECIAL TOOLS



09951-16050
HUB NUT TORQUE TOOL



09943-0610
SLOTTED NUT TORQUE TOOL

SECTION 5

BRAKES

NOTE:
For topics not covered in this section, please refer to the relevant section of the Vitara Service Manual sections outlined in the preface.

LIST OF CONTENTS

GENERAL OUTLINE 5-2

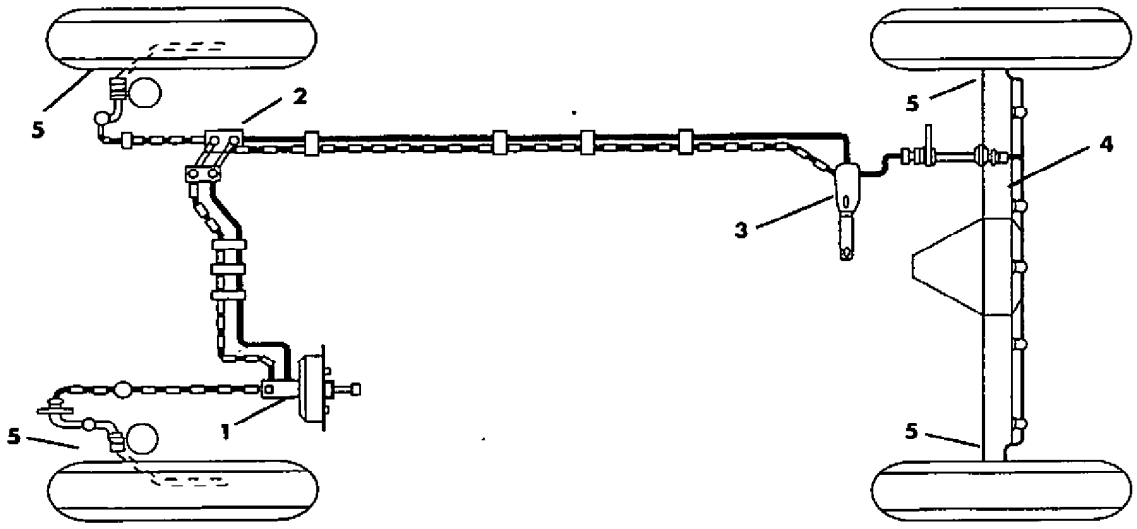
VACUUM CIRCUIT 5-3

CHECKING VACUUM PUMP 5-4

REPLACING VACUUM PUMP 5-4

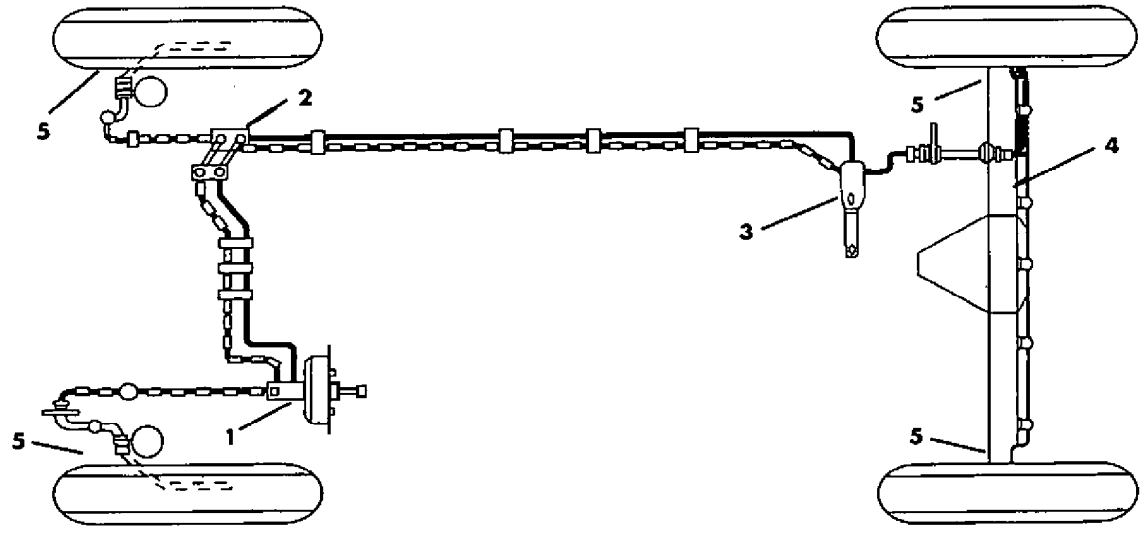
GENERAL OUTLINE

3D VEHICLE

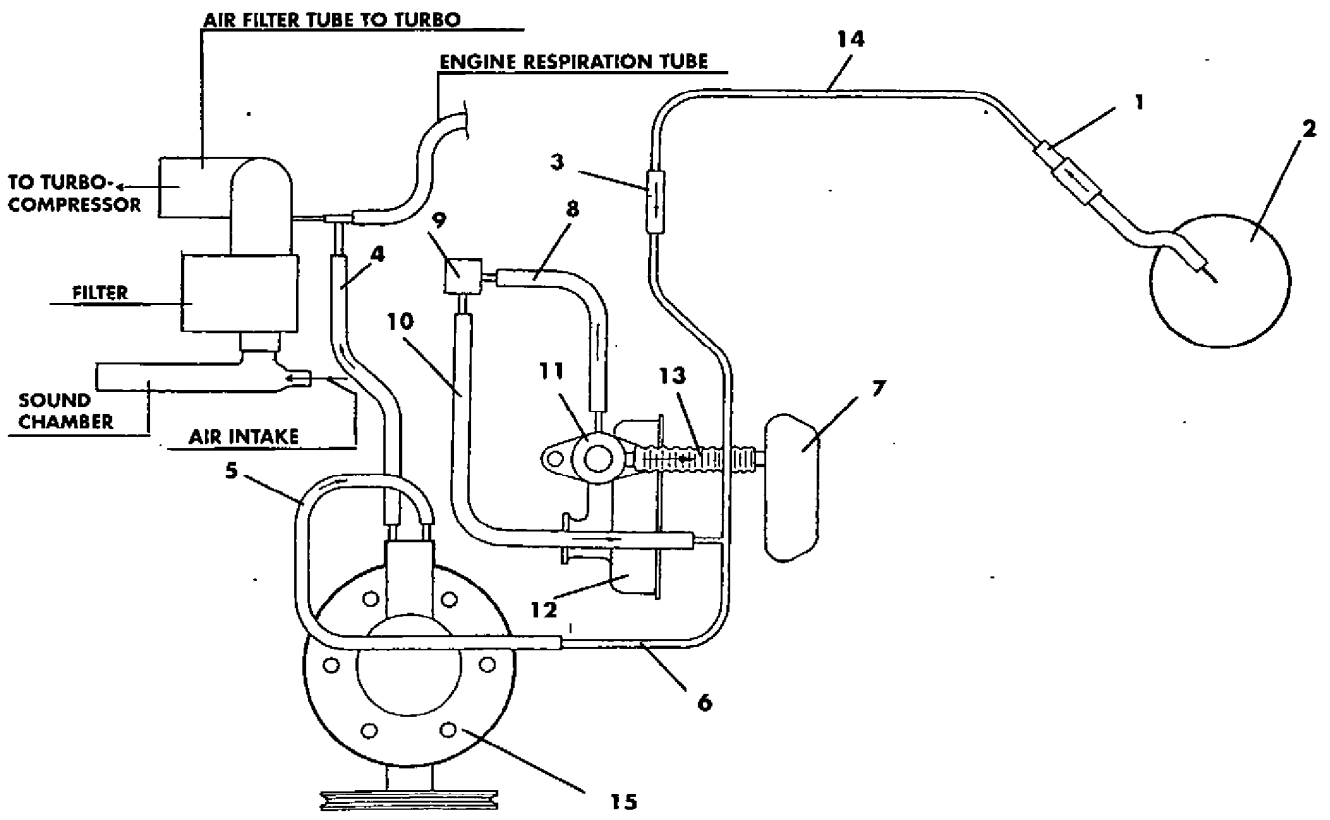


1. Servo brake
2. 5 way valve.
3. L.S.P.V. valve.
4. Rear axle
5. Brake disc and drums.

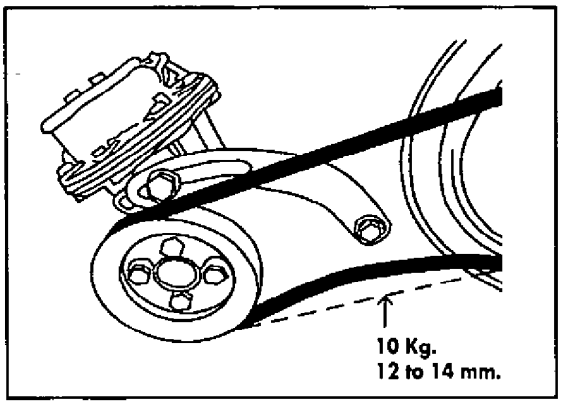
5D VEHICLE



VACUUM PUMP CIRCUIT



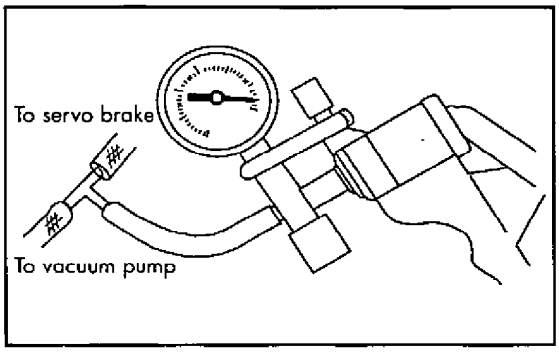
1. SERVO BRAKE VACUUM LINE
2. SERVO BRAKE
3. INTERCONNECTION LINE
4. VACUUM PUMP EXHAUST LINE
5. VACUUM PUMP INTAKE LINE
6. VACUUM LINE No1
7. AIR ADMISSION DIVIDER
8. ELECTRIC EGR VALVE LINE
9. SOLENOID ELECTRIC VALVE
10. ELECTRIC VALVE VACUUM TUBE LINE
11. EGR VALVE
12. EXHAUST MANIFOLD
13. EGR VALVE TO DIVIDER LINE
14. VACUUM LINE Nº2
15. VACUUM PUMP

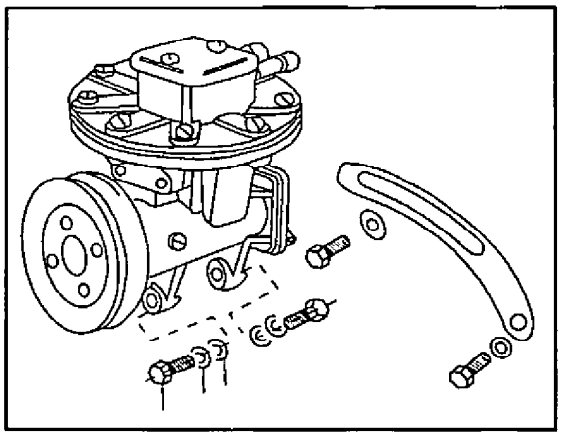


CHECKING VACUUM PUMP

1) Remove lower soundproofing plate of engine.
2) Make sure that belt is correctly tensioned.
3) Run the engine and check, that braking is sufficient.

4) If braking is unsatisfactory, remove suction lines connecting brake servo with vacuum pump and install a bypass vacuum gauge.
5) Rev engine to 1000 rpm and check that vacuum level is close to 570 mm Hg.
6) If it is not, check for:
   - Possible leaks from suction lines.
   - Possible obstruction of pump outlet hose.





REPLACING THE VACUUM PUMP

Removal

1) Remove lower soundproofing plate of engine.
2) Remove suction and outlet lines.
3) Slacken vacuum pump tension and mounting bolts.
4) Rock vacuum pump towards engine and remove belt.
5) Remove bolts and dismount vacuum pump.

Installation

1) Install by reversing order of above operations.
2) Tension vacuum pump belt and tighten attaching bolts.
   - **Belt tension:**
     12-14 mm (0.5-0.55 in), with pressure of 100 N (10 kg, 22 lb)
   - **Idler pulley-depressor torque specifications:**
     18-23 Nm (1.8-2.3 kg.m, 13-17 lb.ft).
   - **Idler pulley-engine attachment bolt torque specifications:**
     18-23 Nm (1.8-2.3 kg.m, 13-17 lb.ft).

SECTION 6

ENGINE

LIST OF CONTENTS

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ENGINE DIAGNOSIS 6-3
REPAIRING ENGINE 6A4
COOLING SYSTEM 6B
EMISSION CONTROL 6C
STARTER SYSTEM 6G
CHARGING SYSTEM 6H

GENERAL INFORMATION

CLEANING INSTRUCTIONS AND POINTS OF CAUTION

When repairing the engine please pay attention to the following points:

- Order of injection in cylinders is 1,3,4,2.
  Cylinder no. 1 is situated at rear of engine and no. 4 at the front next to the radiator.
- Before carrying out any general repair work, diagnose the engine (compression pressure measurement, leak check, tune up timing, pump setting and fitting, turbocompressor functioning, etc.), to help you isolate the problem.
- Always disconnect negative battery cable, to prevent short circuits.
- All operations related to fuel system must be carried out in well ventilated areas and adopting the appropriate safety measures.
- During disassembly/assembly or when storing parts, protect cylinder heads, cylinder block, fuel distribution pump, turbocompressor, etc to prevent accidental entry of impurities and foreign material.
- On removing engine components, please keep in order so that they are placed in original position during stet reassembly.
- Components like the turbocompressor are non-serviceable and the whole unit must be replaced. The injection pump must be serviced at an Official Lucas Service Centre.
- During installation, use engine oil to lubricate surfaces exposed to friction. This will protect engine during initial functioning.
- When removing electrical connectors do not pull on cables. Remove locking clamps first and pull at both ends.

NOTE:

- **Unless otherwise stated, measurements are expressed in mm. and inches and degrees centigrade.**
- **Unless otherwise stated measurements are expressed in Nm, kg.m and lb.ft.**

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Engine does not start (engine turns over correctly)	**Defective fuel system**	
	• Lack of fuel in tank	Add fuel
	• Dirty fuel filter	Remove
	• Water or air in fuel	Clean
	• Dirty or blocked tank and fuel lines.	Repair
	Fuel distribution pump	
	• Defective fuel cutoff solenoid.	Replace
	• Defective fuel distribution pump adjustment.	Adjust
	• Air intake	Repair
	• Defective fuel distribution pump.	Replace
	• Defective idle adjustment.	Adjust
	• Malfunciton in cold start mechanism.	Adjust
	• Manual stop control locked.	Repair
	Low compression	
	• Incorrect valve clerance	Adjust
	• Loss of compression through valve seat	Grind valve seat
	• Valve stuck	Correct or replace
	• Valve springs damaged or worn	Replace
	• Loss of compression through cylinder head gasket	Repair or replace
	• Piston ring stuck or damaged	Replace
	• Piston, ring or cylinder worn	Replace piston ring or piston or rectify cylinder
	Other	
	• Blocked exhaust pipe	Clean
	• Broken timing belt.	Replace and repair valves
Engine idles erratically	**Defective fuel system**	
	• Lack of fuel in tank	Add fuel
	• Dirty fuel filter	Clean or Remove
	• Water or air in fuel.	Clean
	Fuel distribution pump	
	• Defective fuel cutoff solenoid.	Replace
	• Defective fuel distribution pump adjustment	Adjust
	• Air intake	Repair
	• Defective fuel distribution pump	Replace
	• Idle speed badly adjusted	Adjust
	• Defective throttle cable adjustment	Adjust
	• Loose fuel distribution pump clamps	Tighten
	• Residual flow (antistop) not properly adjusted.	Adjust
	• Defective manual stop control.	Repair
	Injection lines	
	• Cracked fuel lines	Replace
	• Fuel leaks at connections.	Repair
	Injectors	
	• Pressure measurement incorrect	Adjust
	• Needle stuck in one or more nozzles	Replace
	• Incorrect positioning of one or more nozzles in nozzle-holder	Repair
	• Needle nozzle leaks.	Replace nozzle
	• Injector lock washers incorrectly fitted.	Repair
	Engine overheating	See Overheating section
	Other	
	• Valve clearance incorrect	Adjust
	• Low compression	See previous point

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Excessive engine movement (especialtes at idle)	**Defective fuel system**	
	• Air filter elements blocked.	Clean or replace
	• Blocked nozzles, lines or connections.	Clean or replace
	Engine overheating	See Overheating section
	Fuel filter	
	• Water or air in filter.	Repair
	• Blocked filter.	Replace
	Fuel distribution lines	
	• Cracks	Replace
	• Leaks through connections	Repair
	Injectors	
	• Incorrect pressure measurement.	Adjust
	• Needle stuck in nozzle.	Replace nozzle
	• Injector dripping	Replace
	• Lock washers incorrectly fitted.	Repair
	Fuel distribution pump	
	• Loose pump clamps.	Tighten
	• Defective fuel cutoff solenoid.	Replace
	• Defective pump adjustment	Adjust
	• Air intake.	Repair
	• Defective fuel distribution pump.	Replace
	• Idling speed incorrectly adjusted.	Adjust
	• Throttle cable incorrectly adjusted.	Adjust
	• Anti-stall incorrectly adjusted.	Adjust
	• Defective manual stop mechanism.	Repair
	Low compression	Previously described
	Others	
	• Incorrect valve clearance.	Adjust
	• EGR incorrect performance.	Repair
	• Loose engine mounts.	Tighten
	• Timing belt not tensed correctly.	Adjust
Engine accelerates by itself from idle	**Lubrication**	
	• Oil level too high.	Correct
	Fuel distribution pump	
	• Defective fuel distribution pump.	Replace
Engine stalls when decelerating	**Fuel distribution pump**	
	• Idle speed incorrectly adjusted.	Adjust
	• Anti-stall incorrectly adjusted.	Adjust
	• Cold idle incorrectly adjusted.	Adjust
	• Cold idle thermostatic element malfunctioning.	Replace and adjust
	• Defective fuel distribution pump.	Replace

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Engine crawls. Erratic running	**Defective fuel system**	Previously described
	Fuel distribution pump	
	• Incorrect adjustment of idle speed.	Adjust
	• Defective adjustment.	Adjust
	• Defective fuel distribution pump.	Replace
	Injectors	
	• Injection lines leaks.	Correct
	• Defective injectors.	Replace
	• Incorrectly fitted lock washers.	Correct
	Low compression	Previously described
	Others	
	• Valve clearance incorrect.	Adjust
Excessive oil consumption	**Intake system**	
	• Air filter element blocked.	Replace
	• Air intake line blocked.	Repair
	Lubricating system	
	• Excessive oil level.	Adjust
	• Crankcase ventilation blocked.	Repair
	Turbocompressor	
	• Oil drain lines blocked.	Repair
	• Defective turbocompressor.	Replace
	Others	
	• Plungers or guides worn.	Replace
	• Valve guide retainers worn.	Replace
	• Piston, piston ring or cylinders worn.	Replace
Excessive fuel consumption	**Defective fuel system**	
	• Fuel leaks in tank or lines.	Correct
	• Fuel filter blocked.	Replace
	Fuel distribution pump	
	• Defective adjustment.	Adjust
	• Idle speed too high.	Adjust
	Injectors	
	• Incorrect pressure measurement.	Adjust
	• Nozzle stuck.	Replace
	• Incorrect installation of nozzles in holder.	Repair
	• Fuel leak from nozzle needle.	Replace
	Air intake	
	• Air filter blocked.	Replace
	Low compression	Previously described
	Others	
	• Incorrect valve seating.	Grind valves
	• Brakes binding.	Repair
	• Low tyre pressure.	Adjust
	• Clutch slips.	Replace
	• Defective performance of EGR system.	Repair
Blue fumes when hot, idling or decelerating	**Lubrication**	
	• Excessive level of engine oil.	Adjust
	• Crankcase ventilation system blocked.	Repair
	Turbocompressor	
	• Oil drain lines blocked.	Repair
	• Defective turbocompressor.	Replace

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Blue fumes when hot, idling or decelerating	**Intake system**	
	• Air filter element blocked.	Replace
	• Air intake line blocked.	Repair
	Fuel distribution pump	
	• Incorrect fuel distribution pump adjustment.	Adjust
	• Defective fuel distribution pump.	Replace
	Injectors	
	• Defective or incorrectly fitted injector gaskets.	Correct
	• Defective injectors.	Replace
	Fuel circuit	
	• Filter blocked.	Replace
	Low compression	Previously described
	Others	
	• Incorrect distribution adjustment.	Adjust
	• Incorrect valve clearance.	Adjust
Lack of power (Black fume)	**Air intake system**	
	• Air filter blocked.	Replace
	• Intake flexible line chocked.	Replace
	Fuel system	
	• Dirty filter	Replace
	• Air in circuit.	Repair
	Fuel distribution pump	
	• Defective fuel distribution pump adjustment.	Adjust
	• Defective fuel distribution pump.	Replace
	Injectors	
	• Defective injectors.	Replace
	• Crushed lines (connections over tighted).	Replace
	Turbocompressor	
	• Turbo to divider line blocked.	Repair or replace
	• Air leak from turbo divider manifold.	Repair or replace
	• Leaks from intake manifold gasket.	Repair or replace
	• Gas leaks between exhaust manifold and turbo.	Repair
	• Gas leaks from exhaust manifold.	Replace
	• Gas leaks from turbocompressor.	Replace
	• Malfunctioning of relief waste gate.	Replace oil and filter.
	• Dirty turbocompressor turbine.	Replace turbocompressor.
	• Defective turbocompressor.	Replace
	Low compression	Previously described
	Others	
	• Incorrect valve clarance.	Adjust
	• Distribution incorrect adjustment.	Adjust
	• EGR electric valve hoses inverted.	Repair
	• Exhaust pipe blocked.	Repair or replace
Lack of power (no black fume)	**Fued distribution pump**	
	• Lack of travel in throttle cable.	Adjust
	• Maximum revolutions stop bolt incorrectly adjusted.	Adjust
	• Defective fuel distribution pump.	Replace
	Fuel system	
	• Dirty filter.	Replace
	• Air in circuit.	Repair
	Turbocompressor	See lack of power (black fume) Turbocompressor

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Low oil pressure	**Lubrication**	
	• Inadequate oil viscosity.	Change viscosity
	• Defective pressure switch.	Replace
	• Insufficient oil.	Refit
	• Oil pan pickup tubes blocked.	Clean
	• Defective oil pump.	Replace
	• Pressure relief valve stuck.	Repair
	• Excessive wear in engine parts.	Replace defective parts
Noises in engine **Before checking noises in engine, ensure that:** • Injection pump is correctly fitted • Injector pressure measurement is correct. • Correct fuel is used • Correct oil is used	**Valve noises**	
	• Inadequate valve clearance.	Adjust
	• Valve plungers and guides worn.	Repair
	• Valve spring weak or deteriorated.	Replace
	• Valve warped or bent.	Refit
	Piston, piston ring and cylinder noises	
	• Excessive wear in piston, piston ring and cylinders.	Replace affected parts
	Connecting rods noises	
	• Connecting rod bearings worn.	Repair
	• Connecting rod pins worn.	Repair
	• Connecting rod nuts loose.	Repair
	• Low oil pressure.	Previously described
	Crankshaft noises	
	• Low oil pressure.	Previously described
	• Engine main bearings worn.	Repair
	• Crankshaft pins worn.	Repair
	• Engine bedplate bolts loose.	Repair
	• Excessive crankshaft end play.	Repair
Noises in turbocompressor	**Air intake system**	
	• Air intake blocked or leaking.	Repair
	• Turbocompressor divider hoses blocked or leaking.	Repair
	• Intake manifold blocked or leaking.	Repair
	Exhaust system	
	• Exhaust system blocked.	Repair
	• Gas leak from exhaust manifold.	Repair
	Turbocompressor	
	• Gas leak from exhaust and turbo manifold.	Repair
	• Gas leak from exhaust manifold to turbocompressor connection.	Repair
	• Defective turbocompressor.	Replace

ENGINE DIAGNOSIS

Symptom	Probable reason	Correction
Overheating	**Cooling system**	
	• Front grill blocked.	Eliminate obstacles
	• Defective radiator thermo sensor.	Replace
	• Insufficient coolant.	Refit
	• Thermostat not working or working incorrectly.	Replace
	• Water pump defective.	Relace
	• Radiator blocked or leaking.	Clean, repair or replace
	Electrical system	
	• Electric fan relays defective.	Replace
	• Electric fan defective.	Replace
	Lubrication	
	• Insufficient engine oil.	Refit
	• Inadequate engine oil grade.	Replace
	• Oil filter blocked.	Replace
	• Oil pump defective.	Replace
	Others	
	• Brake drag.	Repair or replace
	• Defective cylinder head gasket.	Replace
	• Air filter blocked.	Clean or replace

SECTION 6A4

ENGINE REPAIR

LIST OF CONTENTS

6A4

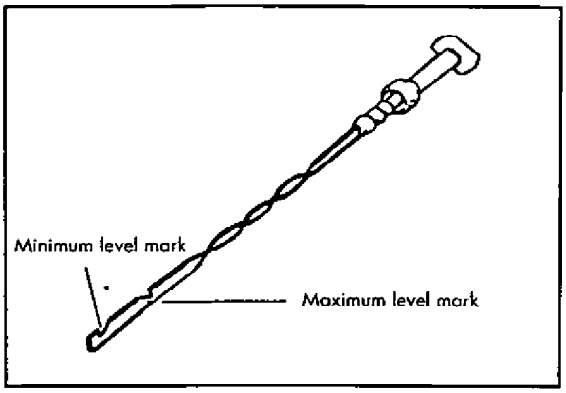
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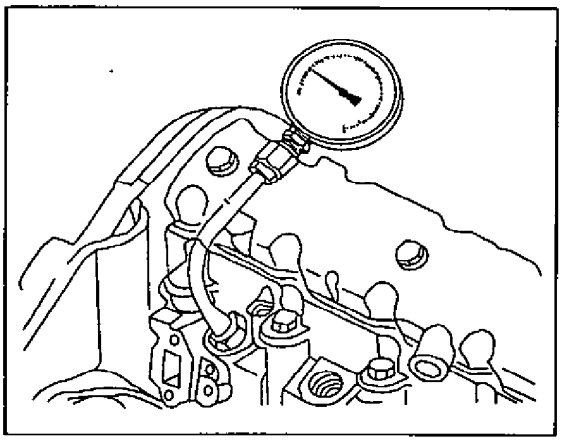


ON VEHICLE CHECKS

OIL LEVEL

1) Ensure that vehicle is on a horizontal surface.
2) Start up engine and wait until it reaches a normal functioning temperature. Stop vehicle and wait 3 minutes.
3) Take out dipstick and check that oil is between maximum and minimum levels.
4) Add any oil if necessary.

NOTE:
The difference between maximum and minimum level is 1.5 litres (2.6 Imp. pints) (approximately).



COMPRESSION PRESSURE CHECK

1) Ensure that battery is fully charged.
2) Start up engine and wait until it reaches a normal functioning temperature and then switch it off.

NOTE:
The compression check can be carried out from injector housing or heater housing, by using a compression gauge adaptor.
The compressor gauge must have a scale of at least 0-3923 K Pa (0-40 kg/cm², 0-570 psi)

3) Disconnect all heaters, remove all injectors and attach compression gauge to first cylinder.
4) Disconnect the cut off solenoid from the jet pump. In vehicles with immobilizer, do not enter the code.
5) Activate ignition directly, without going through heater position and observe compression levels on gauge
6) Repeat this operation in every cylinder.
   The correct level should be between the maximum and minimum indicated.

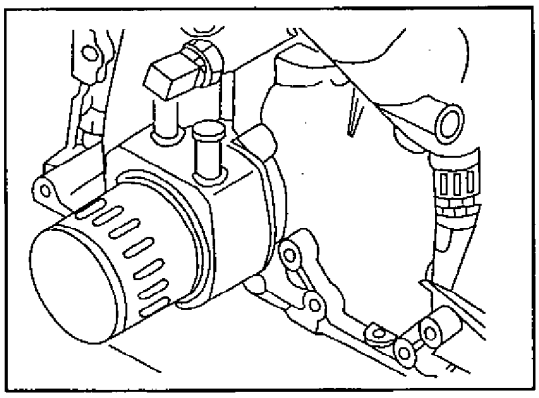
   Maximum compression 2941 K Pa (30 kg/cm², 427 psi)
   Minimum compression 2452 K Pa (25 kg/cm², 356 psi)
   Maximum difference between cylinders
   490 K Pa (5 kg/cm², 71 psi)

7) If compression in one or more cylinders is low, add a small quantity of engine oil to the cylinder and repeat the test.
   1) If the compression level rises when repeating the test, the piston, piston rings or the cylinders are defective.
   2) If the compression level does not alter, the valve seats or valve clearances are defective.
   3) If the compression is low in adjoining cylinders, the cylinder head gasket might be defective, or the cylinder head distorted.

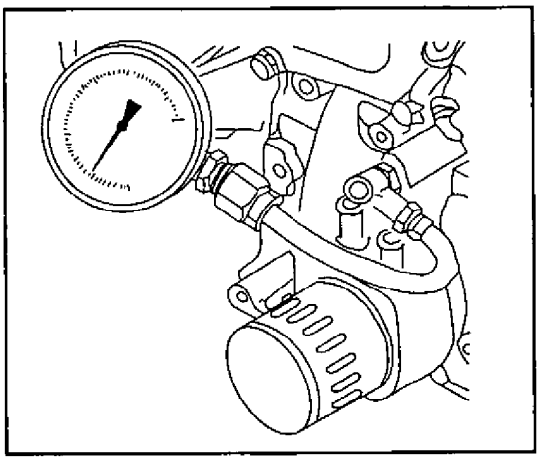
OIL PRESSURE CHECK

NOTE:
Before checking oil pressure, examine the following:

- **Level of oil in oil pan, which should be between maximum and minimum marks.**
- **Oil quality.**
- **Renew oil if discoloured or in deteriorated condition.**
- **Repair if oil leaks observed.**



1) Remove oil pressure switch from cylinder block.
2) Fit pressure gauge with a scale of at least 0-980 K Pa (0-10 kg/cm², 142 psi)
3) Start up engine and heat up to normal functioning temperature.
4) Observe oil pressure level.

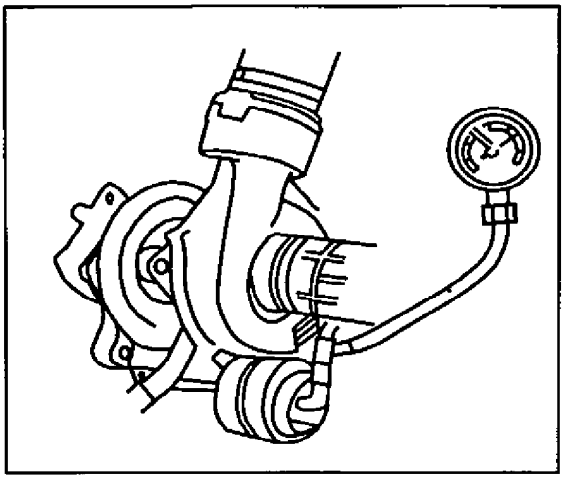


Oil pressure specification	**At 750 rpm 196 K Pa (2.0 kg/cm², 28 psi)**
	At 2.000 rpm 343 K Pa (3.5 kg/cm², 50 psi)
	At 4.000 rpm 441 K Pa (4.5 kg/cm², 64 psi)

5) After checking oil pressure, remove pressure gauge and fit pressure switch with new gasket tightened as specified.

Pressure switch torque specifications:
30 Nm (3.0 kg.m, 22 lb.ft)

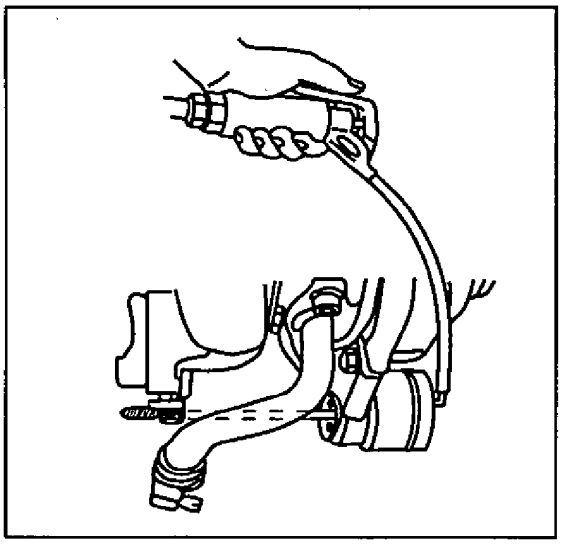
WARNING:
Be careful working when engine is hot, high temperatures can cause burns.



TURBOCOMPRESSOR CHECK

Turbocompressor

1) Remove upper air filter cap and union between filter and turbocompressor.
2) Connect "T" bypass to pipes joining intercooler with relief valve, as shown in figure, and attach pressure gauge
3) Fit air filter and suction hose assembly
4) Set transmission in neutral and warm engine up to normal functioning temperature
5) Road test the vehicle and whilst ascending a slope check that pressure on gauge corresponds to specifield levels.
   At 1,000 r.p.m. 7 K Pa (0.07 kg/cm^2, 1.0 psi)
   At 1,250 r.p.m. 11.5 K Pa (0.12 kg/cm^2, 1.7 psi)
   At 2,250 r.p.m. 30 K Pa (0.31 kg/cm^2, 4.35 psi)
   At 4,600 r.p.m. 40 K Pa (0.41 kg/cm^2, 5.80 psi)
6) If pressure is below specified levels, check the following:
   - Leaks from connection between turbocompressor and exhaust manifold.
   - Air leaks from union between admission turbine and intercooler.



RELIEF VALVE CHECK

1) Carry out operation (1) for checking turbocompressor.
2) Disconnect lines joining intercooler with relief valve and attach a tool to supply pressure as shown in figure.
3) Apply pressure up to maximum of 40 K Pa (0.41 kg/cm^2, 5.80 psi). Observe that relief valve rod terminates travel when pressure is approximately 40 K Pa (0.41 kg/cm^2, 5.80 psi).

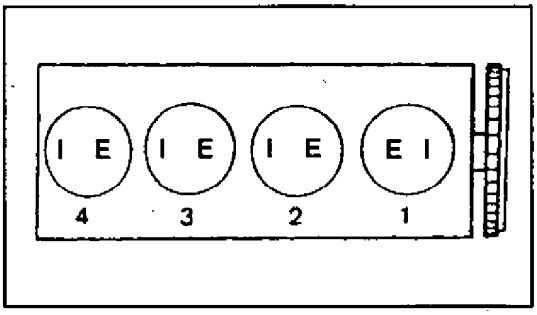
NOTE:
Never exceed 40 K Pa (0.41 kg/cm^2, 5.80 psi) of pressure

4) Replace the turbocooler if the pressure is insufficient or if the relief valve functioning is incorrect.

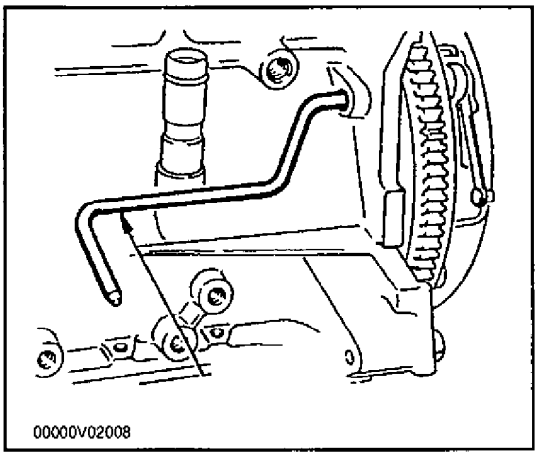
VALVE CLEARANCE (CHECKING)

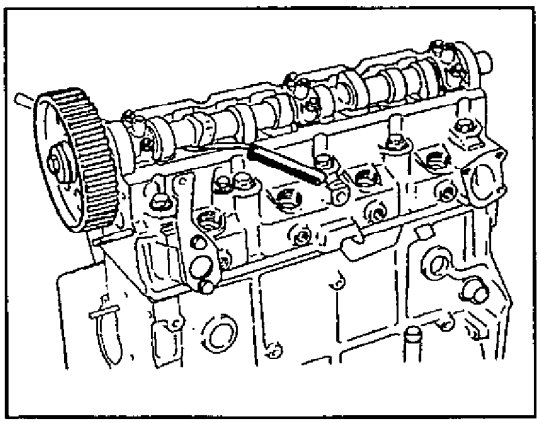
1) Disassemble the following components
   - Negative battery cable.
   - Turbocompressor and intercooler union.
   - Turbocompresor outlet line.
   - Vacuum pump flexible line.
   - Fuel flexible lines.
   - EGR electric valve lines.
   - Rocker arm cover.

NOTE:
Valve clearances should be checked with engine cold.
Cylinder no. 1 is situated in the rear part of engine.



2) Turn engine in normal direction until valves of cylinder no. 4 are both open (cylinder no. 1 compressed).
3) Lock engine flywheel with tool (A) **Ref. 00000V02008**. In this position, check intake valve clearances on cylinders no.1 and 2 and exhaust valves for cylinders no. 1 and 3.
4) Rotate crankshaft 360º (one complete turn) and lock engine flywheel with a tool. **Ref. 00000V02008** At this moment cylinder no. 1 is crossed and no. 4 compressed.
   Check intake valve clearances in cylinders no. 3 and 4, and exhaust valves for cylinders no. 2 and 4.

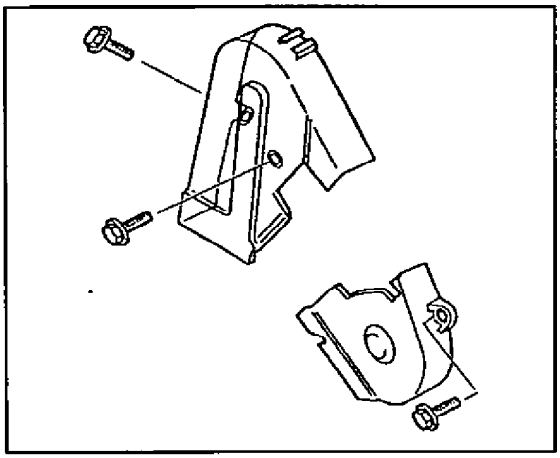


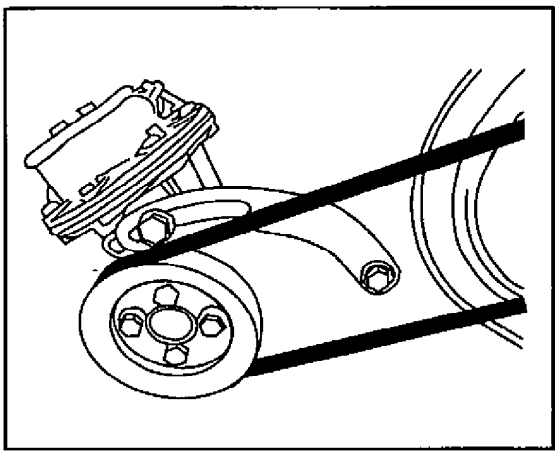


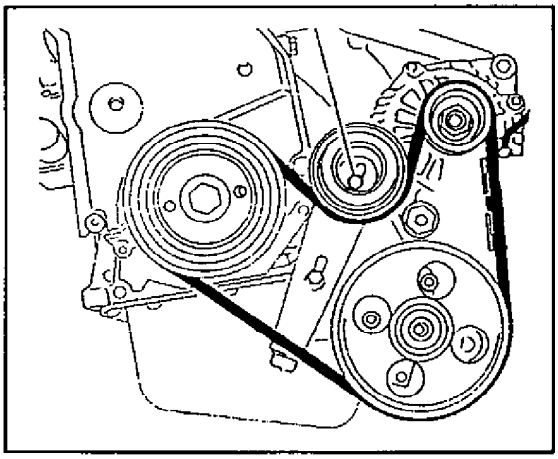
CROSSED	**I4 E4**	**I1 E1**
CONTROL	**I1 E1** **I2 E3**	**I4 E4** **I3 E2**

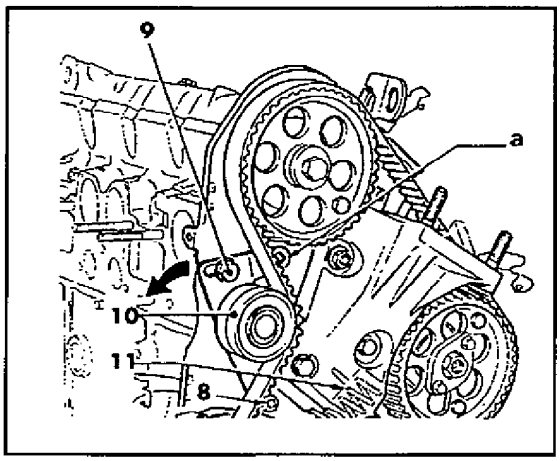
Valve clearance:

Intake	**I**	**0,15 mm (0.006 in)**
Exhaust	**E**	**0,30 mm (0.011 in)**
Tolerance	**T**	**0,08 mm (0.003 in)**









VALVE CLEARANCE ADJUSTMENT

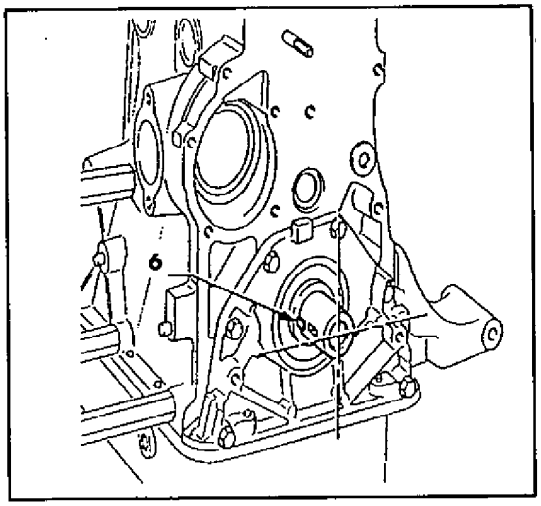
NOTE:
Check valve clearances as indicated in 6ª4-5.

Disassembly

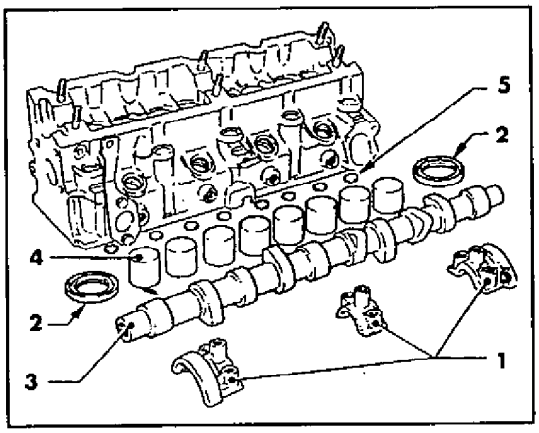
1) Remove negative cable from battery.
2) Remove electric fan connection next to engine
3) Remove the thermocontact connection.
4) Remove the dummy front engine mount.
5) Slacken the two upper fixing bolts of the radiator and move it backwards.
6) Slacken the four bolts of the electric fan and take this out on the upper part.
7) Remove the left and right timing covers.
8) Rotate crankshaft until camshaft pulley and fuel distribution pump pulley with the timing bolt holes are aligned, fix stet with bolt M8 x 125 x 30.
9) Lock fuel distribution pump pulley using bolts TYPE M8 x 125 x 35.
10) Lock engine flywheel with tool **Ref. 00000V02008**.
11) Remove lower soundproof plate.
12) Slacken tensioner and remove the vacuum pump belt.
13) Slacken the tensioner and remove the alternator belt and power steering pump.
14) Slacken the bolt and remove the crankshaft pulley and the lower timing cover.
15) Slacken nut (8) and bolt (9) from the tensioner pulley mounting (10).

NOTE:
Before adjusting valve clearances, the actual clearances should be measured and recorded.

16) Insert a 3/8" driver at point "a" and compress the belt tensioner spring to relax the belt tension. Lock it off with the bolt (9)



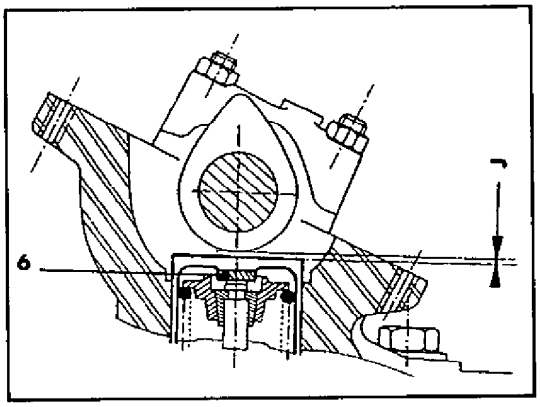
17) Remove timing belt and detach camshaft pinion.
18) Remove engine flywheel locking tool **Ref. 00000V02008** and turn engine flywheel round until crankshaft keyway is at 9 o'clock position.



19) Remove of the following components and place them in the same order for assembly:
- Camshaft bearing caps (1)
- Oil seals (2)
- Camshaft (3)
- Tappets (4)
- Shims (5)

Checking

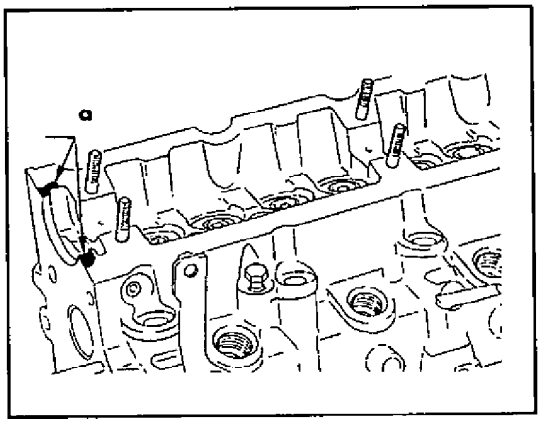
1) Taking account of the clearances obtained and after checking clearance and measuring thickness of each shim removed, determine the correct shim thickness by using the following example:



EXAMPLE

INTAKE VALVE	
Clearance allowed	**0,15**
Clearance measured	**0,25**
Difference	**0,10**
Existing shim	**2,425***
Shim to be fitted	**2,500**
Play obtained	**0,175**

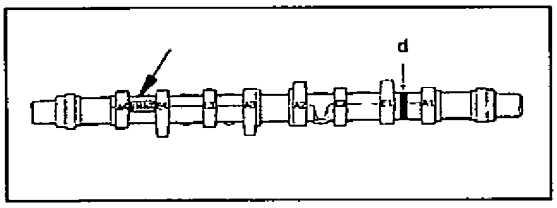
(*) Base shim. (Value in mm)



NOTE:
66 sizes of shim exist. The range of thickness varies from 1.650-4.000 mm (0.065-0.0158 in)

2) Fit shim and tappets previously selected.

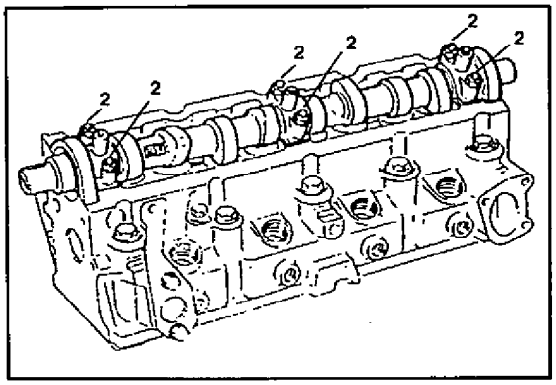
NOTA:
Apply MOLIKOTE G. PLUS RAPID to camshaft covers and recommended products for sealing the front and rear areas (a).

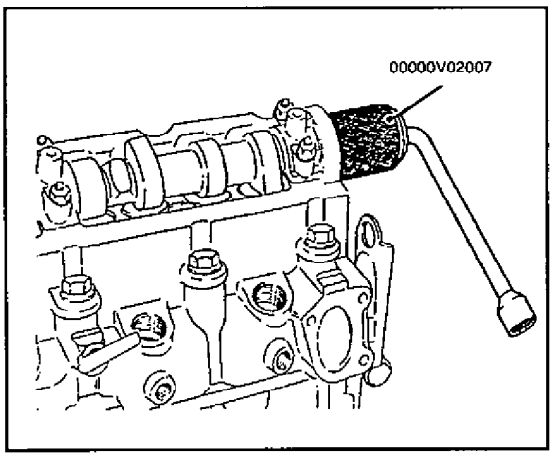


Assembly

1) Fit camshaft (3) with DIST label facing towards timing, and progressively tighten camshaft bearing cap nuts (2) to torque specification.

Torque specification for camshaft cap nuts:
18 Nm (1.8 kg.m, 13 lb.ft)





2) Fit a new oilseal on the tool **Ref. 00000V02007** locating it in the deeper reccess. Instal the rear and front oilseals using the camshaft pulley bolt to press them into place.
3) Replace the woodruff key on the camshaft and fit the drive pulley with an M8 x 125 x 40 bolt, instal the pulley retaining bolt and tighten to the specified torque. Remove the locking bolt.

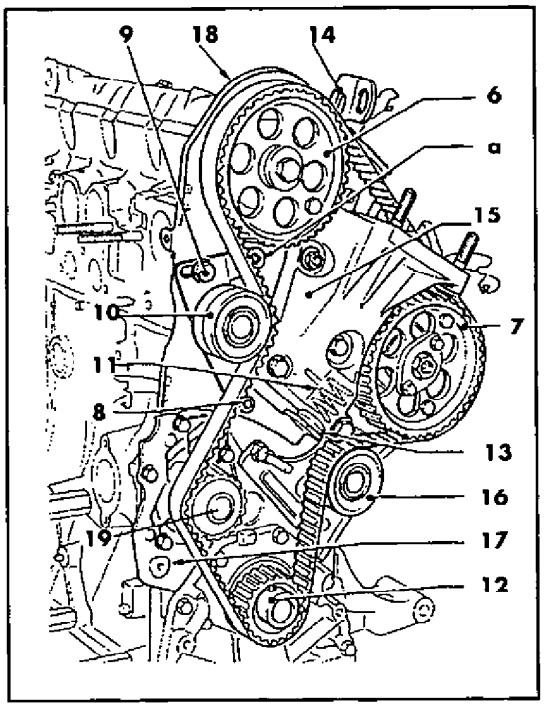
Torque specification for camshaft pully bolt:
40 Nm (4.0 kg.m, 29 lb.ft)

4) Install belt and set timing (see timing Belt (Replacement) (6A4-9)).
5) Assemble the parts in the reverse order.

TIMING BELT (REPLACEMENT)

Disassembly

1) Perform the operations:
   - Op. 1 — Corresponding to valve clearance checking 6A4-5.
   - Op. 1 to 16 — Corresponding to valve clearance adjustment 6A4-6.
2) Remove timing belt.



Inspection

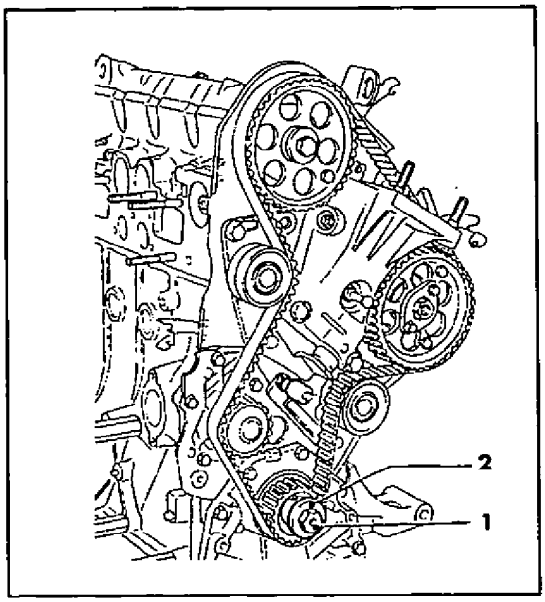
1) Ensure that tensioner pulley, fixed pulley and water pump pulley function correctly. (They should turn freely and without looseness).

Assembly

1) Ensure the engine flywheel, camshaft pulley and fuel distribution pump are locked in their position.
2) Assemble new timing belt, (14) in the following order:
   - Crankshaft (12).
   - Fixed pulley (16).
   - Fuel distribution pump pulley (7).
   - Camshaft pulley (6).
   - Tensioner pulley (10).
   - Water pump pulley (19).
3) Slacken bolt (9) and nut (8) of the tensioner pulley until it works freely and places pressure on the belt.
4) Pinch-tighten tensioner pulley bolt (9) and nut (8).

Timing adjustment

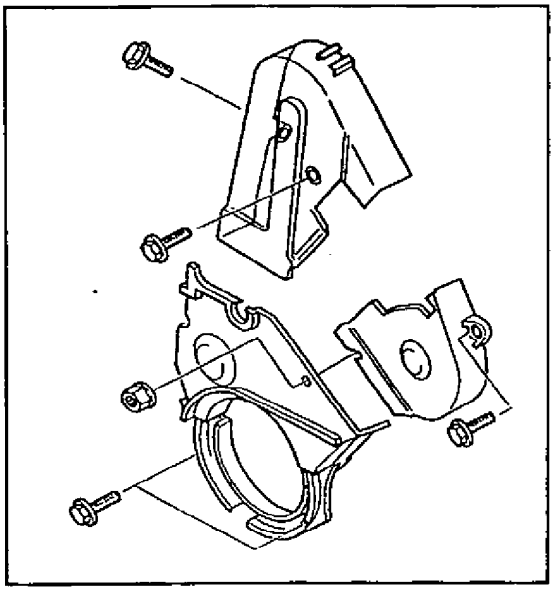
1) Remove fuel distribution pump and camshaft centering bolts, and flywheel locking tool.
2) Assemble bolt (1) and washer (2) at the end of crankshaft and rotate engine two complete turns (in normal engine rotation direction). Upon completion of the second rotation, re-align the fluwheel mark and check the alignment of the camshaft and fuel holen distribution pump pulleys with their locking bolt.
3) Place locking bolts in timing pinion, pump pinion and tool **Ref. 00000V02008** of engine flywheel lock.

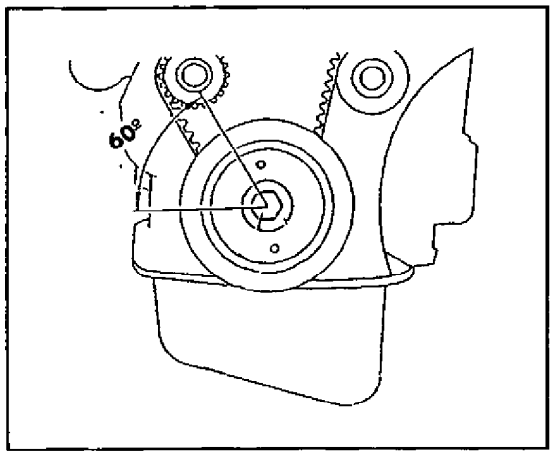


NOTE:
Engine must always be rotated in normal direction. If attaching points do not coincide (camshaft, fuel distribution pump and flywheel), repeat operation.

4) Release timing tensioner attaching bolt and nut and re-torque to their specification.

Tensioner pulley nut and bolt torque specifications:
18 Nm (1.8 kg.m, 13 lb.ft)

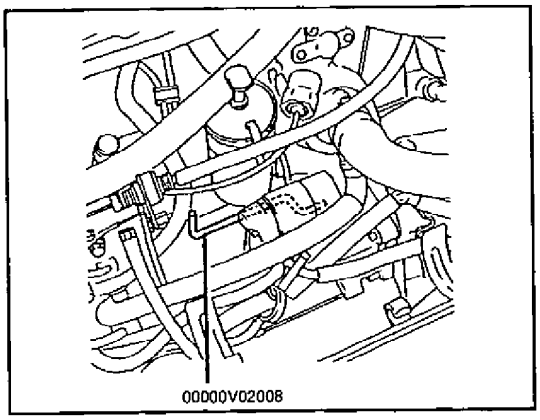




5) Remove camshaft and fuel distribution pump pulley locking bolts. Remove bolt and washer from the crankshaft pulley.
6) Assemble the three timing covers.
7) Clean and degrease the crankshaft pulley lock bolt and washer.
8) Apply **LOCTITE FRENETACH** to thread and friction area on the washer. Instal the pulley and reolace the pulley bolt and washer. Tighten to the specified torque.

Crankshaft pulley bolt torque:
40 Nm (4.0 kg.m, 29 lb.ft) PLUS 60º rotation.

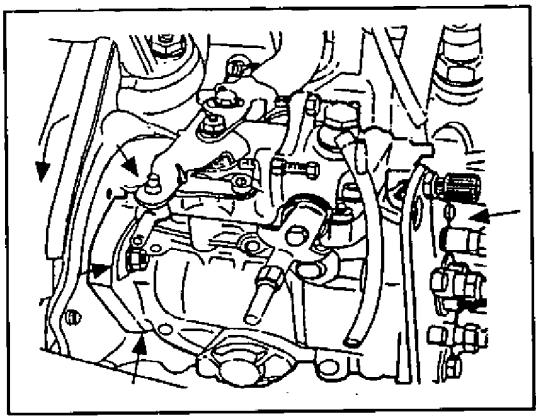
19) Remove engine flywheel retaining tool
Continue assembly operations in reverse order to disassembly.



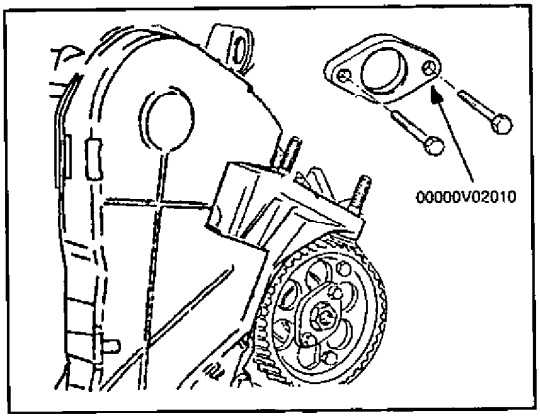
FUEL DISTRIBUTION PUMP REPLACEMENT

Disassembly

1) Remove the following components:
   - Negative battery cable
   - Throttle and fast idle cable.
   - Fuel feed and overflow lines.
   - Torque electric valve connection.
   - Timing cover of (fuel distribution pump side).
2) Remove injection lines.
3) Rotate crankshaft until position is fixed with tool **00000V02008** and it is possible to lock fuel distribution pump pulley with two bolts type M8x125x35.



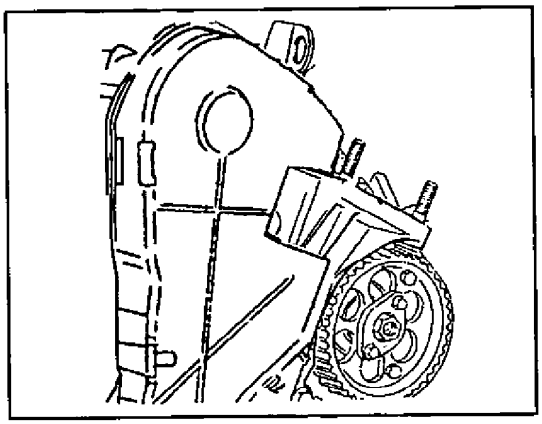
4) Remove the bolts holding the pump to the support, including back bolt, and move the pump to maximum rear position (away from the engine).



5) Slacken lock bolt from the pump to the pinion.
6) Place tool **Ref. 00000V02010** and fit it to the pump pinion with two bolts, slackening the bolt until it is completely moved.

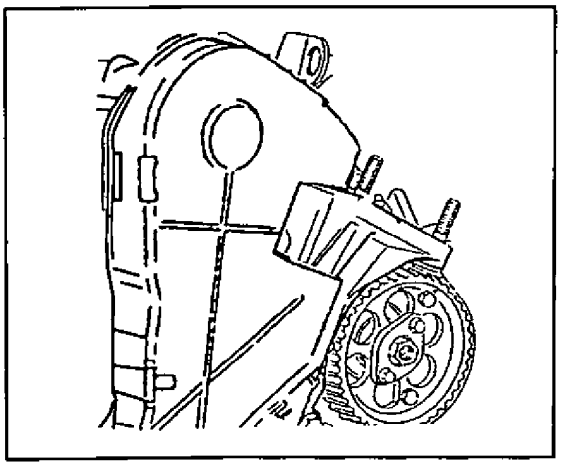
NOTE:

For pump removal and replacement it is not necessary to time the engine.



Assembly

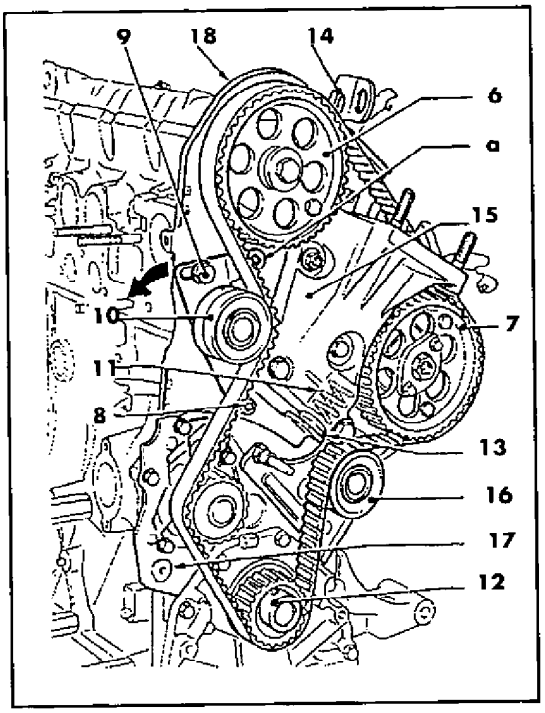
1) Disassemble tool **Ref. 00000V02010**
2) Fit pump on the support and enter the drive shaft through the pulley placing the key in the keyway.

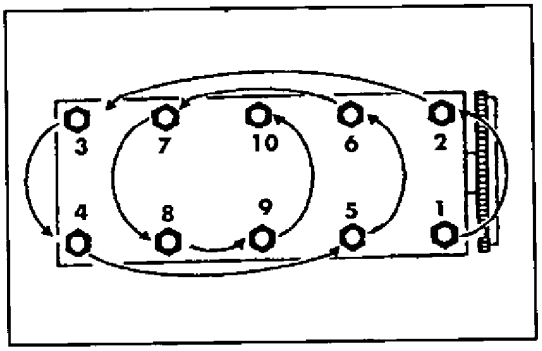


3) Fit nut to fix pinion to pump.

   Pinion to fuel distribution pump lock nut torque:
   50 Nm (5.0 kg.m, 36 lb.ft)

4) Fit the three pump lock nuts to the pinion and the back bolt using tool **Ref. 00000V02017.**
5) Remove the two pinion lock nuts from the pump.
6) Perform pump tuning up, as indicated by points 1) to 10) of fuel distribution pump overhaul and 1) to 3) checking. Adjustment revision (pages 6E3-2 and 6E3-3).
7) Carry out assembly in reverse order to disassembly.
8) Bleed system and start engine.





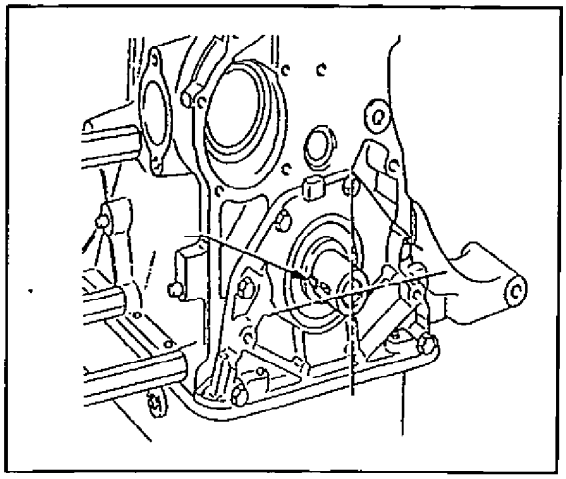
CYLINDER HEAD GASKET REPLACEMENT

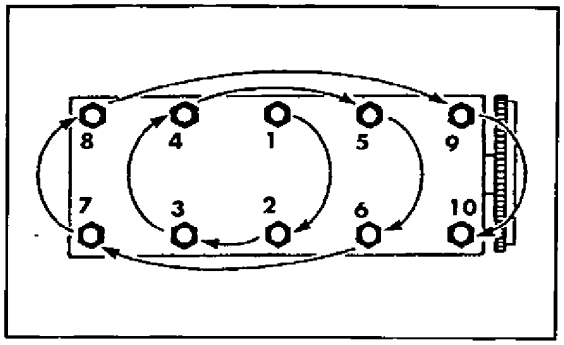
Disassembly

1) Carry out operations 1) to 9), indicated for Air Intake System, 6A4-18.
2) Carry out operations 2) to 14), indicated for Valve clearance adjustment, 6A4-6.
3) Disconnect, unclip and separate hoses and pipes connected to cylinder head.
4) Remove the collection bowl outlet of the first part of exhaust.
5) Remove the injection lines.
6) Slacken tensioner pulley (10) backplate bolt (8) and nut (9).
7) Insert a 3/8″ drive into the recess in the tension pulley backing plate (10) at the point "a". Lever the plate against the tensioning spring (11) to relax the belt tension.
8) Re-fit the bolt (9) to lock off the tension.
9) Remove the following elements:
   - Timing belt.
   - Camshaft pulley fastening bolt
   - Tensioner pulley (10), recovering the follower (13) and spring (11).
10) Remove the tensioner spring lock upper bolt.
11) Slacken the cylinder head bolts, progressively, following the order shown opposite.
12) Remove the cylinder head and remove the gasket, using tools **Ref. 00000V2015** and **00000V02016**.

Inspection

1) Please refer to engine assembly repair 6A4-25 and next section.



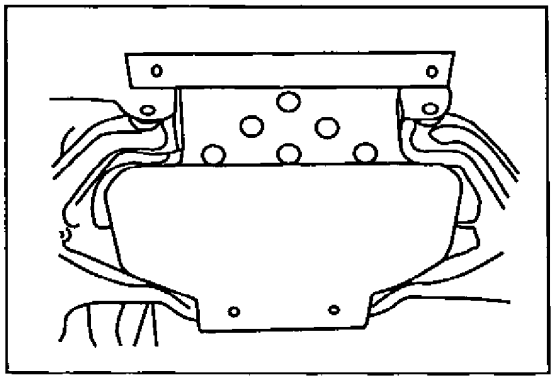


Assembly

1) Turn crankshaft until the pistons are midway up the cylinder bores and the crankshaft pinion key is at 9 o'clock position.
2) Once the inspection and repair is completed, fit new gasket and the cylinder head on the block.
3) Check the lengths of each cylinder head bolts (as indicated in engine general repair section) and apply **MOLICOTE G PLUS RAPID** on threads and washers (washers must always be replaced with new parts) Fit the bolts.
4) Tighten head bolts using tools **Ref. 00000V02015 and 00000V02016.** Apply as specified in sequence indicated.

   - **Initial torque: 20 Nm (2.0 kg.m, 14.5 lb.ft)**
   - **Subsequent torque: 60 Nm (6.0 kg.m, 13.5 lb.ft)**
   - **Angular: 180º**

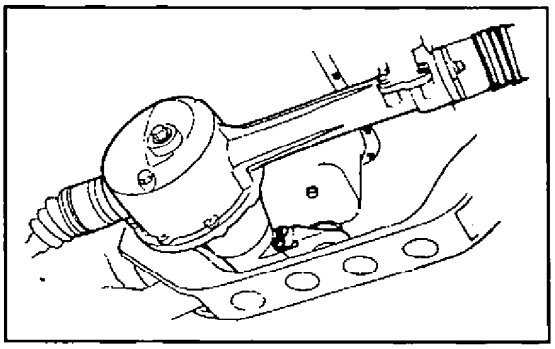
5) Continue assembly in reverse order to disassembly.
6) Time the engine (pages 6A4-9)



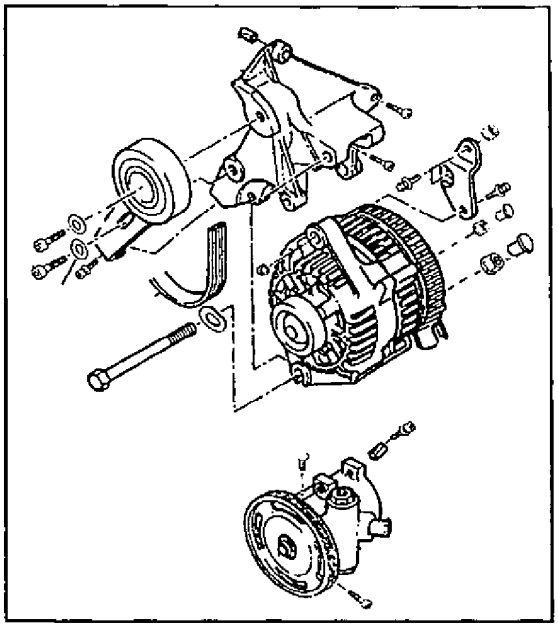
OIL SUMP AND OIL PUMP

Disassembly

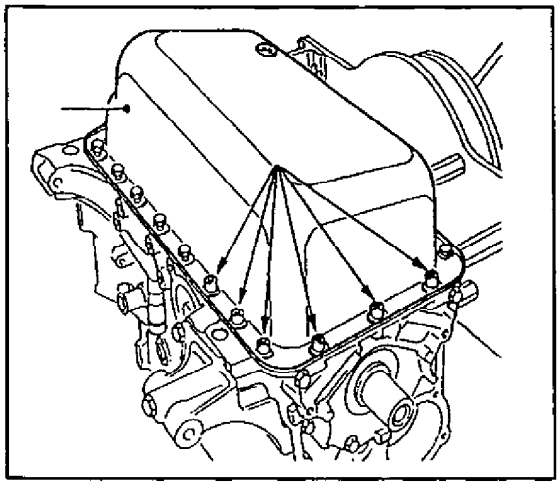
1) Disconnect negative battery cable.
2) Lift the vehicle.
3) Remove lower engine soundproof cover.



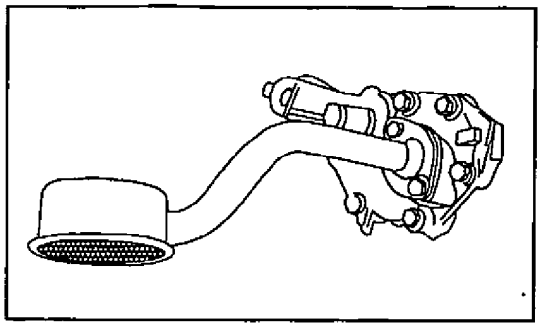
4) Drain the front differential oil.
5) Disconnect front axle assembly, and remove.



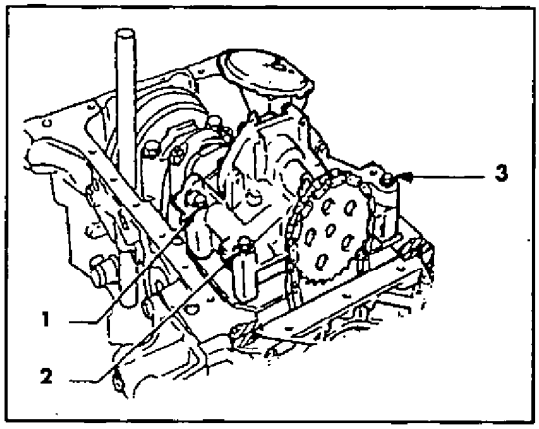
6) Loosen alternator tensioner and disassemble:
   - Belt.
   - Alternator.
   - Power steering pump.
   - Alternator mount and pump.



7) Remove plug and drain oil sump.
8) Loose bolts attaching sump to block and remove sump.



9) Loosen two attaching bolts and remove the oil pick up.



10) Take out two oil pump attaching bolts (1), (2) and (3), noting that bolt No.1 is different and serves to align the pump.
11) Remove oil pump.
12) Disassemble oil baffle attaching bolts and extract if necessary.

Assembly

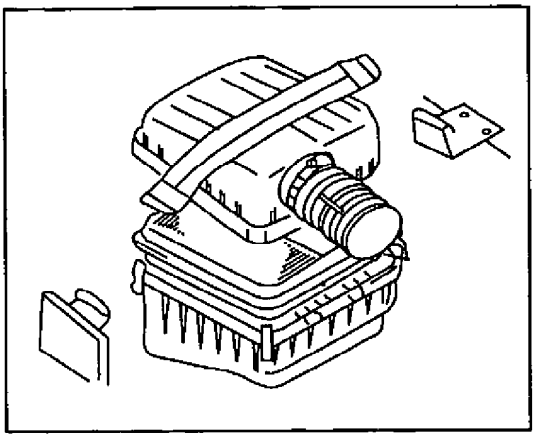
1) Replace pump and chain.
2) Attach pump with bolts.

NOTE:
Bolt No.1 is different and aligns the pump.

Torque specifications for oil pump attaching bolts:
20 Nm (2.0 kg.m, 15.5 lb.ft).

3) Continue assembly in reverse order to disassembly, applying sealing to oil sump and providing all elements with the corresponding torque specification.

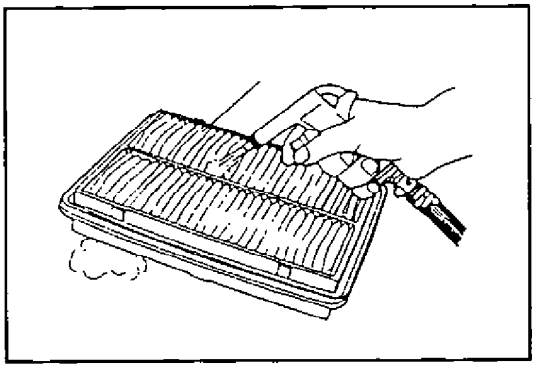
Torque specifications for oil sump attaching bolts:
20 Nm (2.0 kg.m, 15.5 lb.ft).



AIR FILTER

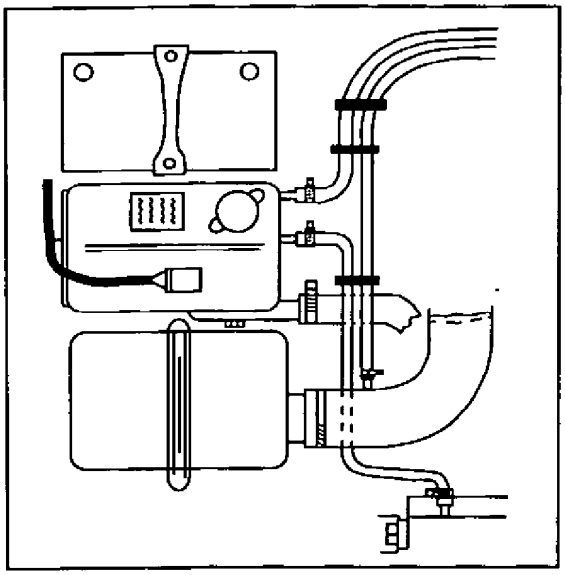
Cleaning

1) Release air filter attaching strap.
2) Disconnect four clips attaching upper body and extract filter.
3) Remove dust by blowing compressed air onto outlet side of element.



Replacement

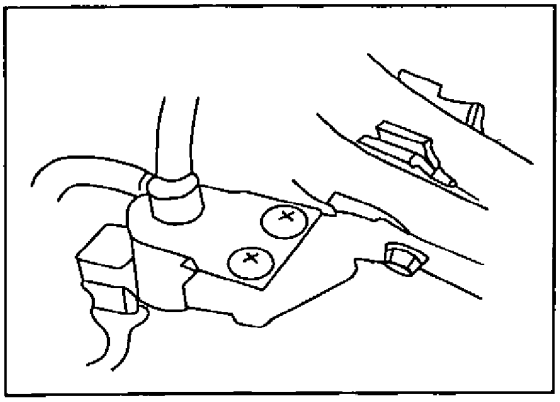
1) Release air filter attaching strap.
2) Disconnect four clips securing upper body and extract filter element.
3) Install a new element in the air filter box.



OF AIR INTAKE SYSTEM

Inspection

1) Disconnect battery.
2) Remove air filter assembly and turbocompressor hose.
3) Remove the expanding cylinder, joining bolt and cooler gauge connector hoses.
4) Remove coolant expander reservoir.
5) Disassemble turbocompressor and exhaust manifold.
6) Disassemble EGR electric valve and its hoses.
7) Slacken flexible hose clamps at the EGR side and the timing frame.
8) Disconnect turbocompressor oil drain line from its union with the block, and then remove the turbocompressor.
9) Slacken the 7 attaching bolts to intake manifold and remove this.

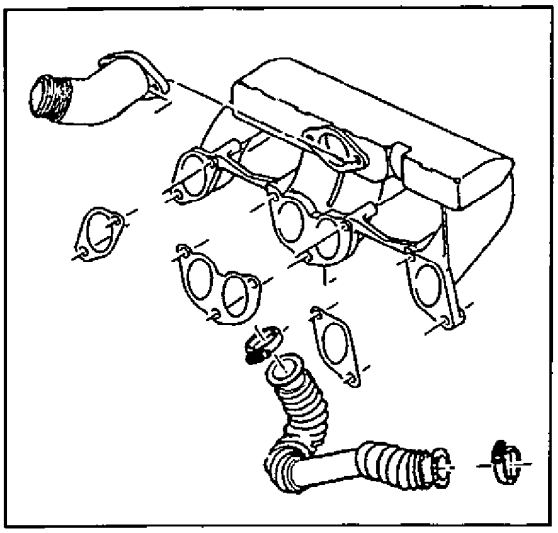


Inspection

1) Check cylinder head intake manifold mating surfaces for flatness and evenness, replacing if necessary.
2) If the inlet manifold is not being replaced, clean surfaces and apply sealant before assembling to cylinder head.
3) Renew inlet manifold gaskets with new ones.

Assembly

1) Assemble in reverse order to disassembly, following specified torque specifications and following recommendations given.

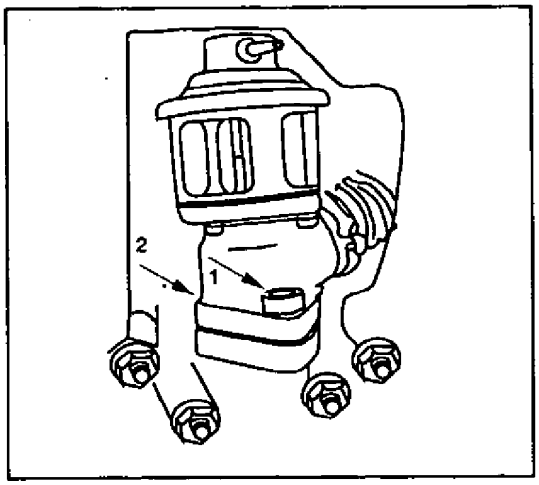


NOTE:
Use jubillee clips for fixing EGR valve flexible hose.

Torque specifications for intake manifold bolts:
25 Nm (2.5 kg.m, 18 lb.ft).

Torque specifications for exhaust manifold nuts:
15 Nm (1.5 kg.m, 11 lb.ft).

Torque specifications intake manifold flange nuts:
15 Nm (1.5 kg.m, 11 lb.ft).

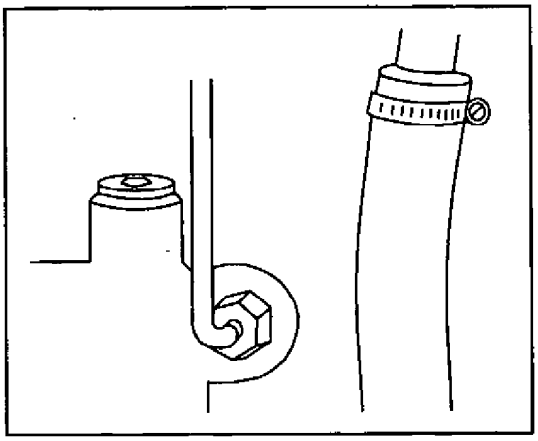


TURBOCOMPRESSOR REPLACEMENT

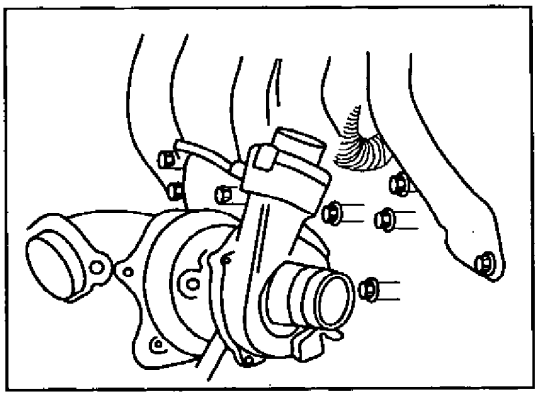
Disassembly

Perform the following operations:

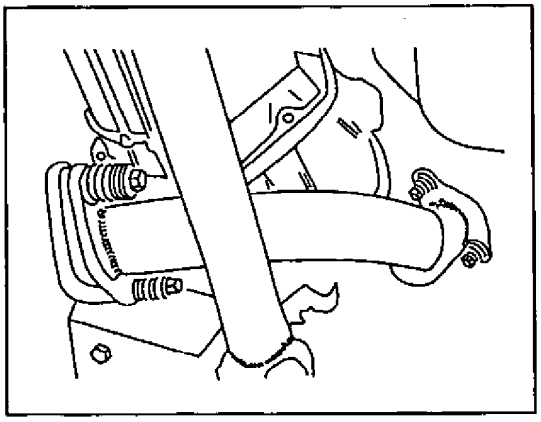
1) Remove battery, coolant expander reservoir and air filter assembly and inlet line.
2) Disconnect bolts (1) connecting EGR (2) to exhaust manifold.



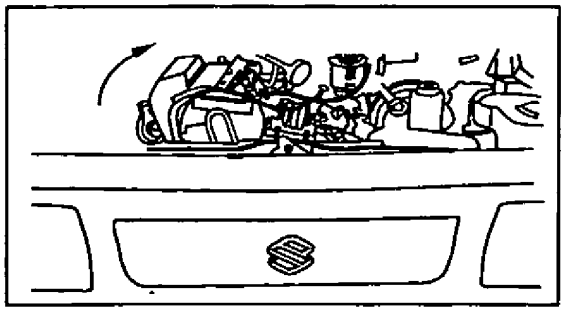
3) Disconnect turbocompressor oil drain pipe at its union with engine block.
4) Disconnect turbocompressor flexible oil drain pipe.



5) Disconnect turbocompressor gas outlet elbow and plug its inlet and exhaust nozzles.
6) Slacken the six nuts attaching exhaust manifold to cylinder head.



7) Remove the fist exhaust section.



8) Disconnect the three bolts from the right side and the left side engine mount silentblock.
9) Lift the engine with a crane towards the left, until the exhaust manifold assembly and turbocompressor can be removed from the right side.

Inspection and replacement

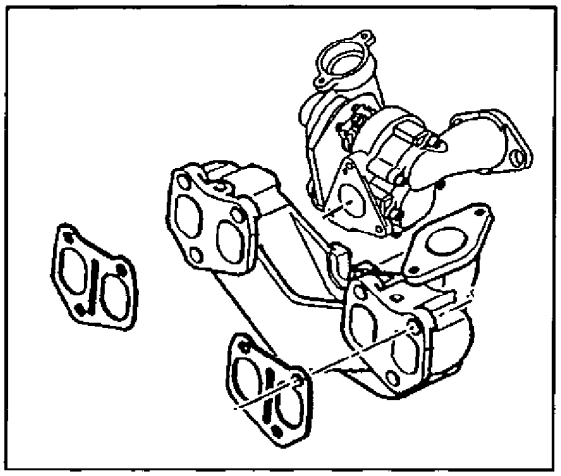
1) Separate turbocompressor from the exhaust manifold by disconnecting the three joining bolts.
2) Check the evenness of exhaust manifold.
3) Replace turbocompressor if it is defective.

NOTE

Turbocompressor attaching nuts must always be replaced with new ones.

Assembly

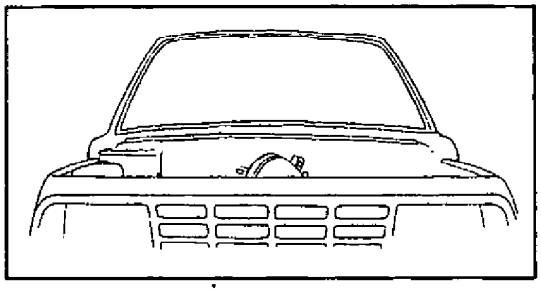
1) Carry out assembly in reverse order to disassembly, applying the torque specifications stated in the table at the end of this section.

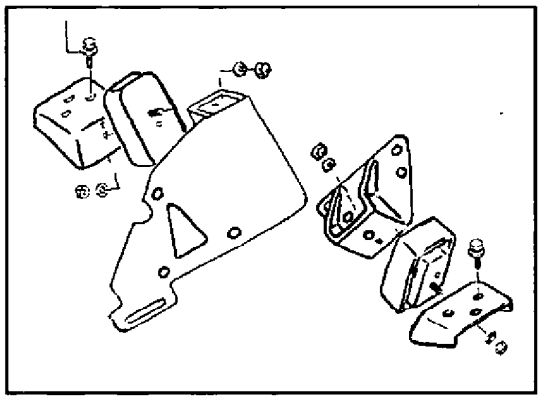


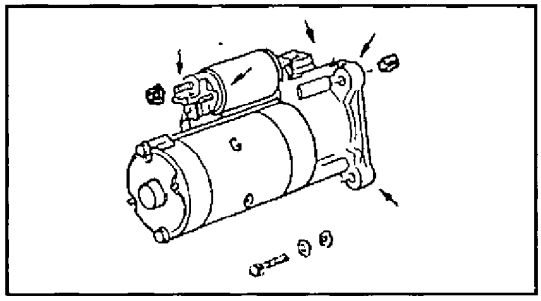
NOTE:

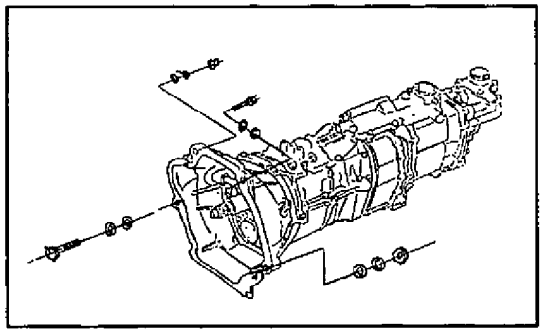
When starting up engine, the following procedure is essential:

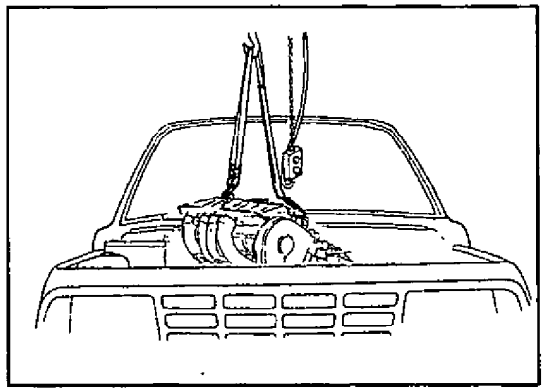
- **Disconnect the torque electric valve fuel at-off valve connection an the fuel distribution pump connection.**
- **Switch on until engine oil pressure light goes off.**
- **Connect again the torque electric valve fuel at-off valve connection an the fuel distribution pump connection.**
- **Start the engine and let it turn at idle speed for 30 seconds, approximately.**
- **Check the tightness of the different connectors.**











REMOVAL OF ENGINE ASSEMBLY

Disassembly

Perform the following operations:

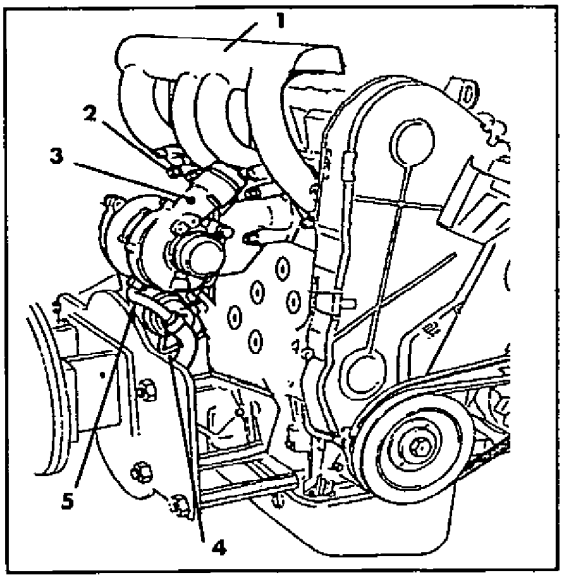
1) Remove battery.
2) Drain out cooling system.
3) Remove engine bonnet.
4) Remove section No.1 of the exhaust manifold.
5) Remove flexible air pipe between filter and turbocompressor.
6) Remove fuel filter.
7) Remove cooling pipes, fuel, power steering lines and electrical connections of the engine room.
8) Remove coolant header tank and air filter.
9) Remove throttle and clutch cables.
10) Slacken right side engine mount three attaching bolts to chassis and rubber silentblock attaching bolt.
11) Slacken left side engine mount three attaching bolts to chassis and rubber silentblock attaching bolt.
12) Remove starter motor.
13) Remove the fasteners between the bell housing and the engine.
14) Take out engine with a crane.

Assembly

1) Carry out assembly in reverse order to disassembly, applying the corresponding torque specifications.

Torque specification engine mount to chassis:
40-50 Nm (4.0-5.0 kg.m, 29-36 lb.ft).

Torque specification silentblock to mount:
50-60 Nm (5.0-6.0 kg.m, 36-43 lb.ft).



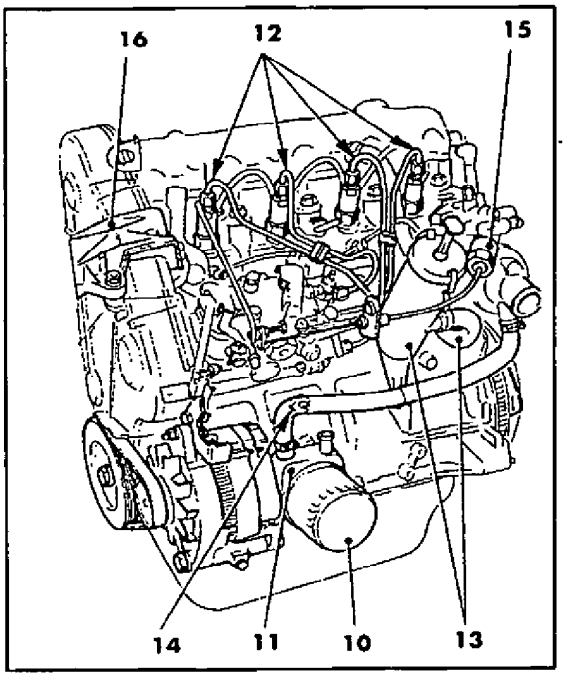
ENGINE BLOCK REPAIR

ENGINE DISASSEMBLY

Exterior components

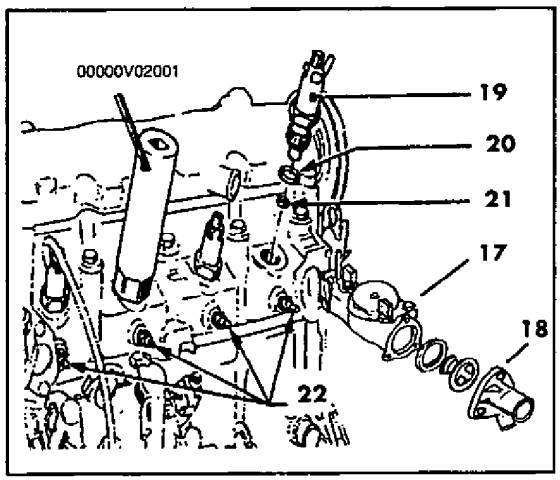
Remove the following components:

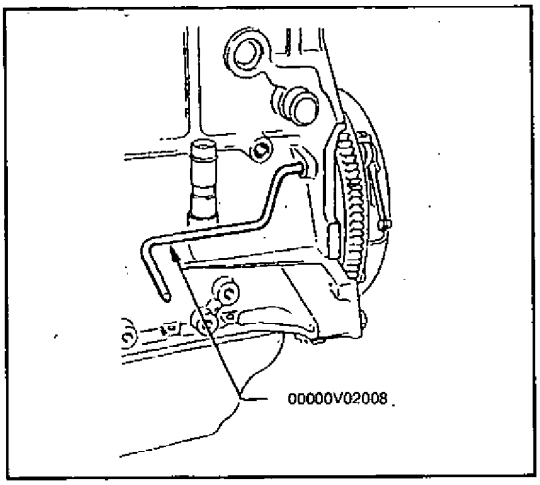
1) TDC pickup.
2) Vacuum pump belt.
3) Vacuum pump and pump mount.
4) Alternator.
5) Power steering pump.
6) Alternator and power steering pump brachets.
7) Turbocompressor oil feed and return lines (4) and (5).
8) Inlet and exhaust manifolds together with the turbocompressor (1), (2) and (3).

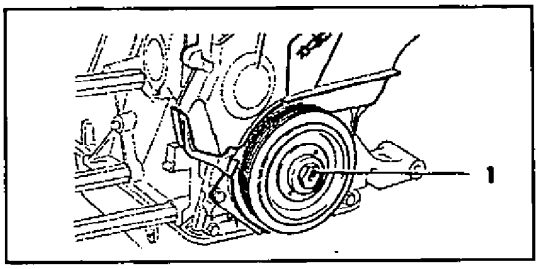


Continue removing the following components:

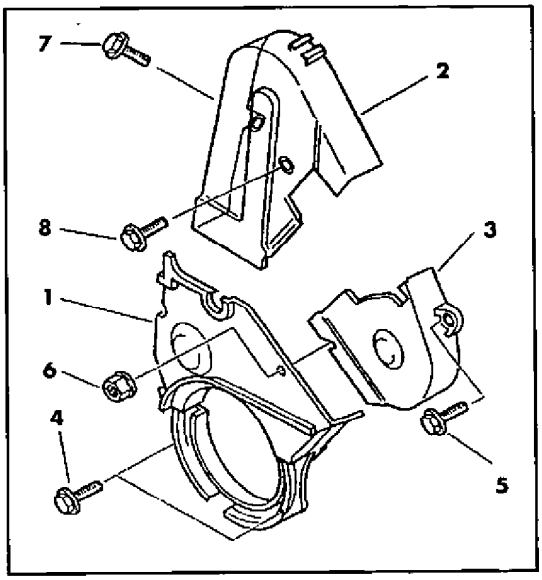
1) Oil filter (10).
2) Oil cooler (11).
3) Fast idle control (15).
4) Injectors lines (12).
5) Pre-heating plug lines.
6) Oil filler neck and blowby gas separator assy (13).
7) Oil pressure switch (14).
8) Dummy engine mount (16).
9) Thermostat housing (17) and (18).
10) Injectors using tool **Ref 00000V02001**, (and recovering the fire cutoff and sealing washers (20) and (21)).
11) Glow plugs (22).

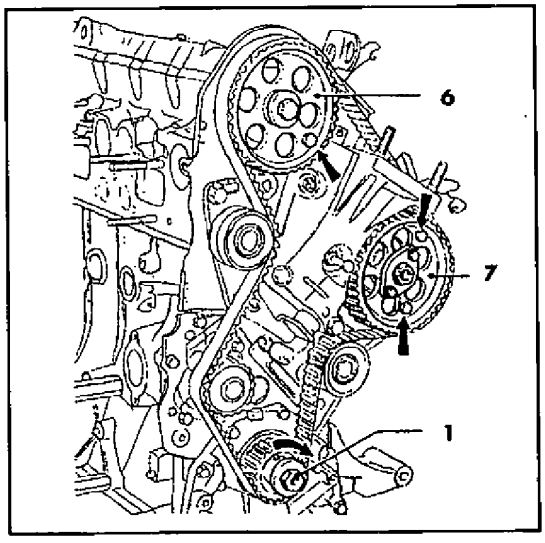






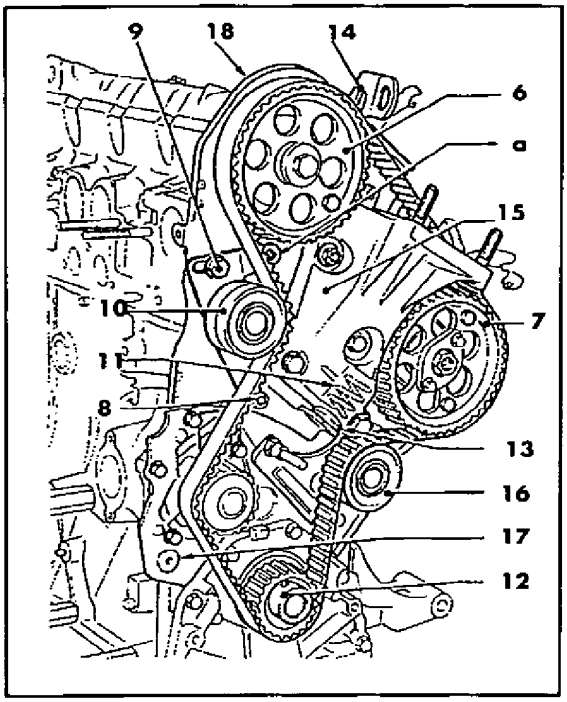
Lock the flywheel using tool **Ref. 00000V02008.**
Remove the following components:
1) Pulley attaching bolt (1).
2) Clutch mechanism.
3) Cranhshaft pulley.
4) Flywheel locking tool **Ref. 00000V02008.**
5) Right cam belt cover bolt (5) and nut (6).
6) Left cam belt cover (2) bolts (7) and (8).
7) Lower cam belt cover (1) bolts (4).



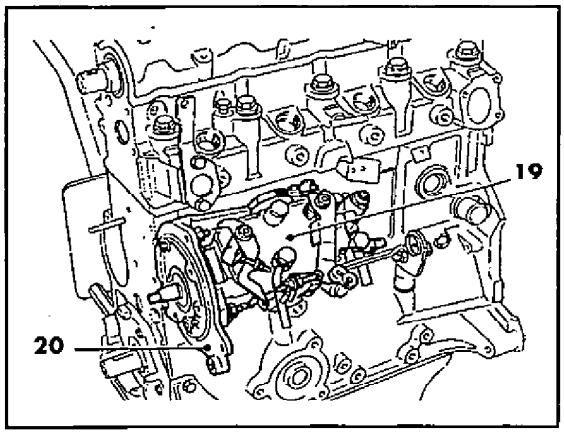


Timing belt disassembly.
1) Fit bolt (1) and washer at crankshaft pinion.
2) Rotate engine until camshaft (6) and fuel distribution pump (7) pulleys align with the lock bolt tapping.
3) Lock camshaft using bolt M8 x 125 x 40 and the fuel distribution pump with two bolts M8 x 125 x 35.

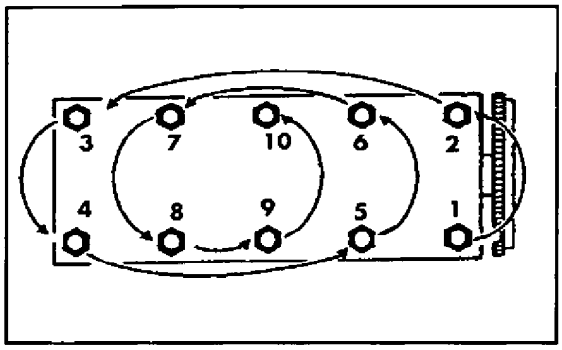
NOTE:
Bolts should be tightened by hand.



4) Slacken nut (8) and bolt (9) of tensioner pulley mount (10).
5) Insert a 3/8" drive into the recess in the tensioner pulley backing plate (10) at the point "a". Lever the tensioner against the spring (11) to relax the belt tension.
6) Tighten the bolt (9) again.
7) Remove timing belt.
8) Take out the camshaft (6), fuel distribution pump (7) and crankshaft (12) pulleys and recover the keys.
9) Take out the tensioner pulley (10) and recover the thruster (13) and spring (11).
10) Remove the dummy engine mount (15) and the fixed pulley (16).
11) Remove water pump (17).

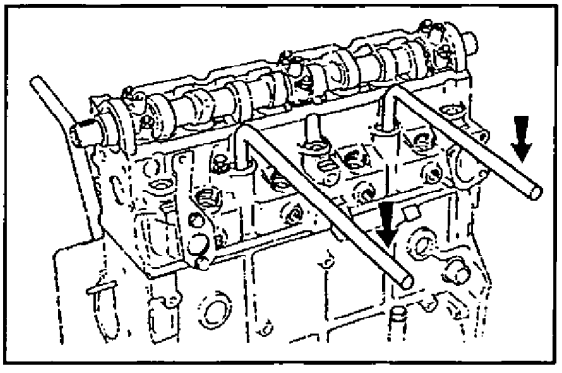


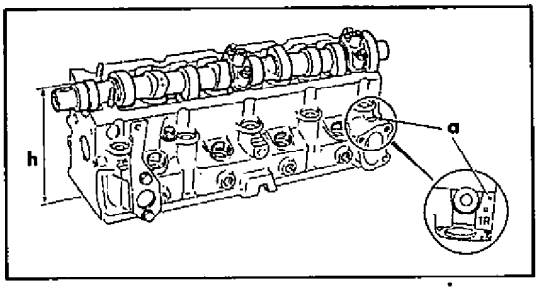
12) Remove fuel distribution pump (19) and housing (20).



Cylinder head disassembly

1) Remove rocker arm cover.
2) Slacken the cylinder head bolts progressively, following the order shown opposite.
3) Dismount cylinder head and remove gasket.



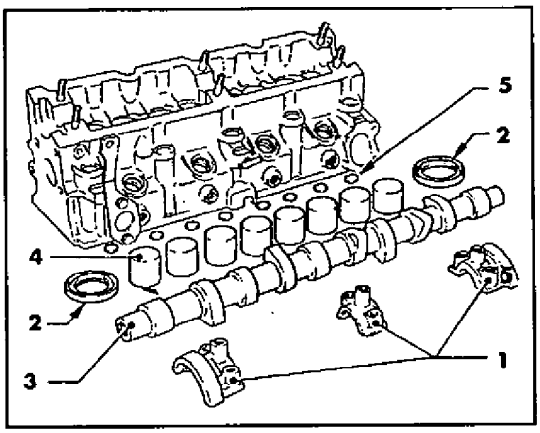


CYLINDER HEAD INSPECTION

1) Measurement of cylinder head height should be carried out with camshaft in position and secured by two caps (h) measurement being taken of the oilseal diameter (the larger diameter).

(h). Nominal: from 157.40 to 157.75mm (6.197 to 6.211 ins).

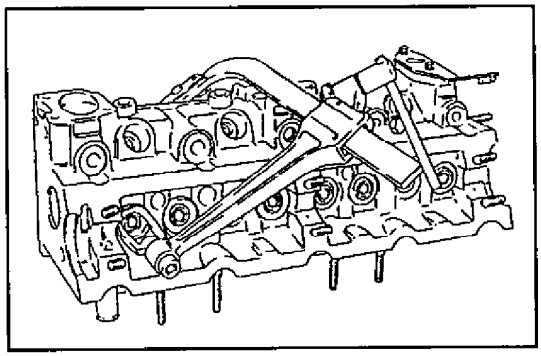
2) The maximum distortion permitted for the camshaft is **0.07 mm (0.003 in),** (the camshaft should turn freely on cylinder head).
3) Maximum admitted rectification of cylinder head gasket face is **0.40 mm (0.016 in)** with respect to nominal height measure (h).
4) Rectified cylinder heads should be marked by stamping an **R** in the area (a).

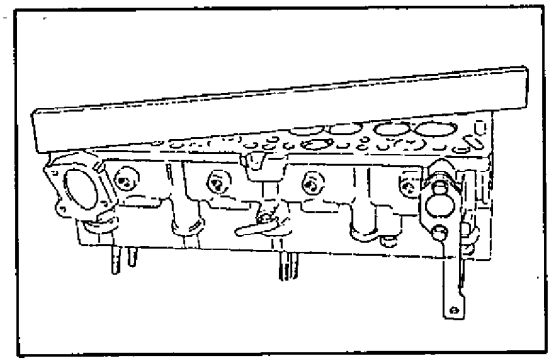


5) When the head gasket face of the cylinder head is rectified the following operations should be carried out:
   - **Rectify valve seats to ensure they are correctly levelled.**
   - **Replace turbulence chambers (pre-chambers) with oversize chambers and level up correctly.**
   - **Fit compensating washers of 0.4 mm (0.016 in) below valve springs**

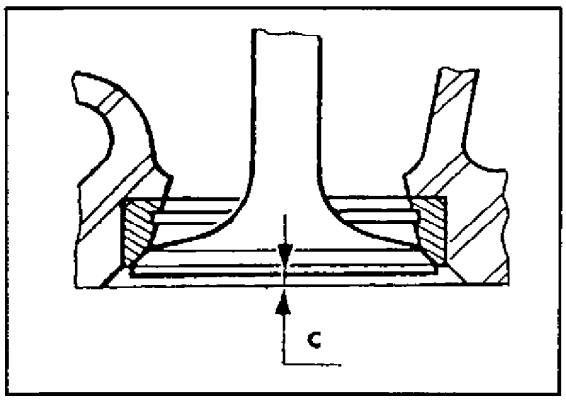
6) Cylinder heads with under-size camshaft bearings **(+0.5 mm)** are marked with a (1) in the area indicated (a).
7) Remove the following components from cylinder head and place them in same order as that for assembly.
   - Camshaft covers (1).
   - Oilseals (2).
   - Camshaft (3).
   - Tappets (4).
   - Shims (5).
8) With the aid of a valve extractor, remove the following components from cylinder head:
   - The 8 valves.
   - Turbulence chambers.
9) Clean cylinder head using **DECAPLOC 88.**
10) Check cylinder head distortion.

Maximum distortion = 0.07 mm (0.003 in).





11) Check condition as indicated in section on cylinder head repair:
   - Valve seats and guides.
   - Valves.
   - Valve springs.
   - Turbulence canisters.
   - Camshaft.
   - Camshaft supports.
   - Threads

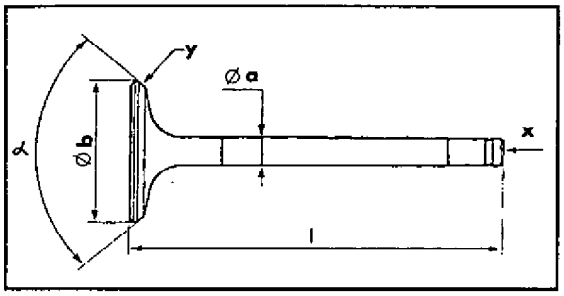


CYLINDER HEAD REPAIR

1) If after checking the cylinder head gasket face level, rectifications have to be made, it is necessary to check valve depth after rectification and rectify seats to establish correct depth (c).

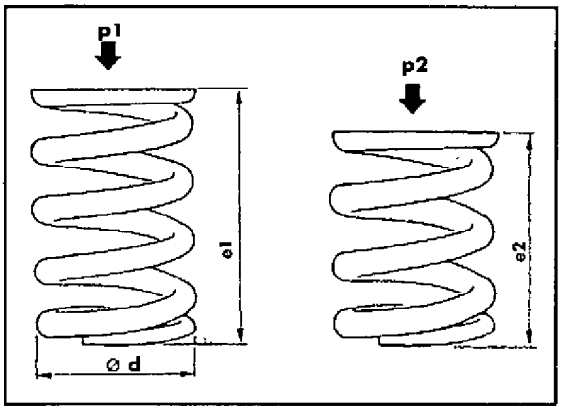
Valve depth (dimension c)
Intake 0.5 a 1.05 mm (0.020-0.041 in).
Exhaust 0.9 a 1.45 mm (0.020-0.041 in).

2) Checking valves.



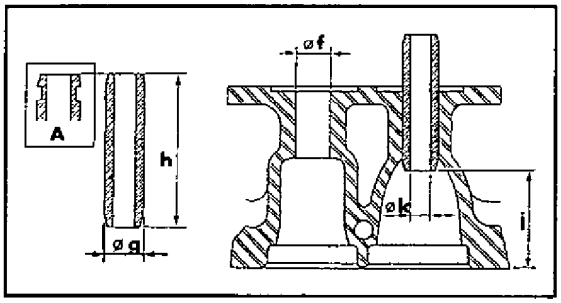
	Intake	Exhaust
L min.	112.5	
Øa + 0 - 0.015	8.005	7.985
Øb. + /-0'1	38.5	33
Angle	90º	90º

3) Checking valve springs.



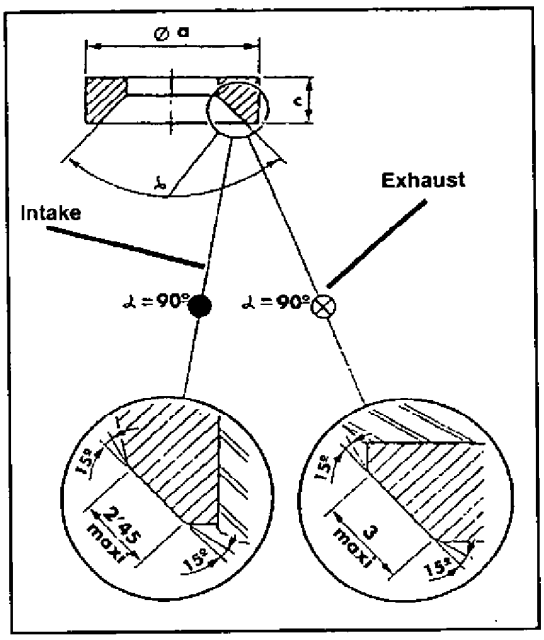
DIAMETER d : 29	
P1: kg/N	18/180
e1	42.4
P2: kg/N	45/450
e2	33.3

4) Valve guides.
When valve guides are removed, and oversize guides are to be inserted, the valve guide bores in the cylinder head must be machined to suit the oversize the guides according to the dimensions shown.



	Ø: g	Ø: f	h	j	Ø: k
Tolerance	0	0.032	0.25	0.5	0
	-0.011	0	-0.25	-0.5	+0.2
Original value	14.02	13.981	52.00	36.5	8.02
	14.13	14.051			
1st Repair	14.29	14.211			
2nd Repair	14.59	14.511			

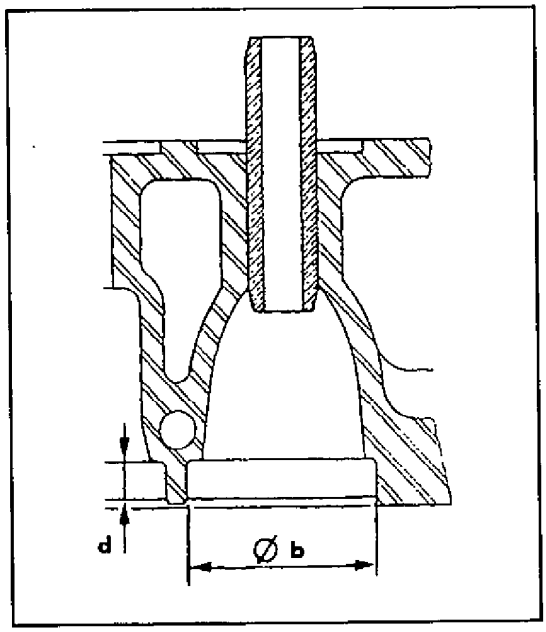
NOTE:
Value K is achieved once guides have been fitted in cylinder head.



5) **Valve seats.**
When valve seats are removed, the housing must be machined to accept a new oversize seat.

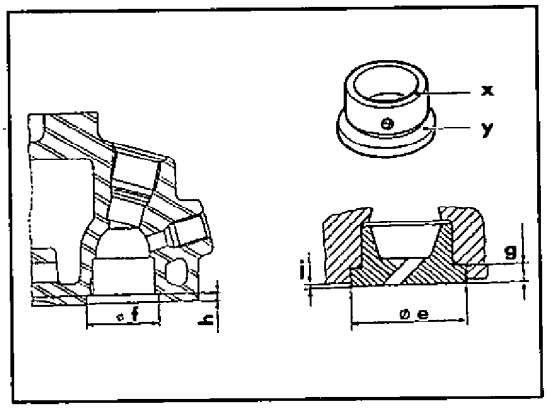
The required measurements are shown in the tables below.

	INTAKE			
	Ø: a	Ø: b	c	d
Tolerance	0 - 0.025	+/- 0.025	0 - 0.01	+/- 0.15
Value original	40.161 40.361	40 40.2	6.25 6.45	8.267 8.467
1st Repair	40.461	40.3	6.45	8.467
2nd Repair	40.661	40.5	6.45	8.467



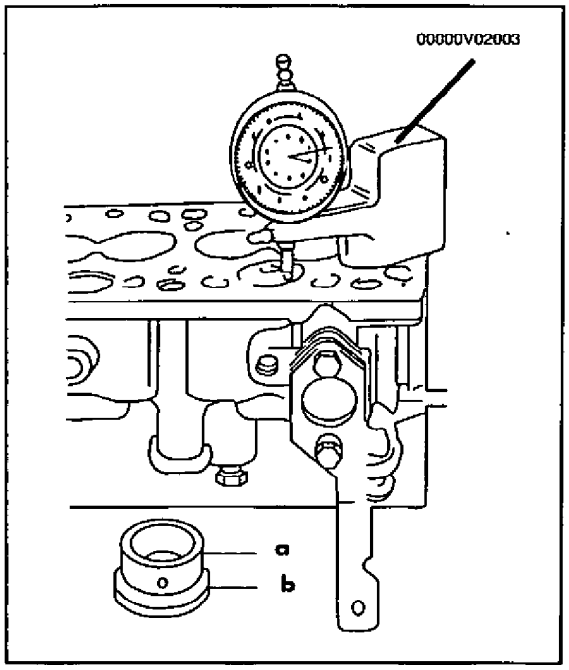
	EXHAUST			
	Ø: a	Ø: b	c	d
Tolerance	0 - 0.025	+/- 0.025	0 - 0.01	+/- 0.15
Value original	34.137 34.337	34 34.2	6.05 6.25	8.15 8.35
1st Repair	34.437	34.3	6.25	8.35
2nd Repair	34.637	34.5	6.25	8.35

6) Turbulence canisters.
When it is necessary to machine the cylinder head surface, it is important to remove the pre-chambers first. To fit new ones, it necessary to machine the housing and then machine new canisters in areas (x) and (y) so that they remain level with the cylinder head surface.



Machining of turbulence canister housing.

	Ø: e	Ø: f	g	h
Tolerance	0.099 - 0.06	0.039 0	0.02 - 0.025	0.02 -0.04
Value original	32.05 32.25	32 32.2	4.00 4.1	3.90 4.0
1st Repair	32.45	32.4	4.2	4.1
2nd Repair	32.65	32.6	4.3	4.2

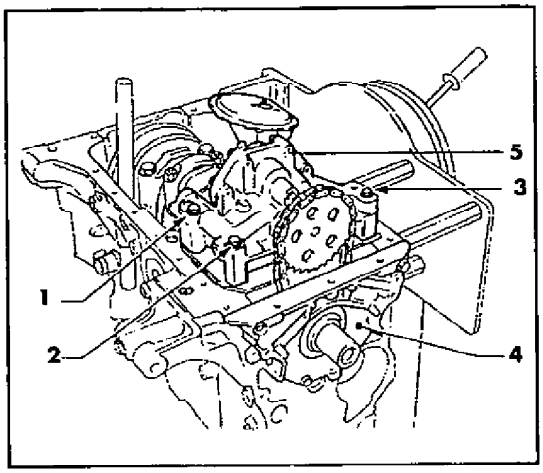


Use dial gauge special tool 00000V2003 to check the level of the canisters to me tolerance below:

Pre-chamber leve tolerance:
from 0.00-0.03 mm (0.000-0.001 in)

NOTE:
When major fissures (over 2 mm.) are noted in pre-chamber window, this should be replaced.

7) Assembling cylinder head.
Fit the valves, springs, new valve guide retainers (using tool **Ref.00000V02009**), tappets, adjustment plates and camshaft to the cylinder head.
Adjust the valve clearances as described in sections 6A4-5 and 6A4-6 "Valve clearance checking and adjustment".



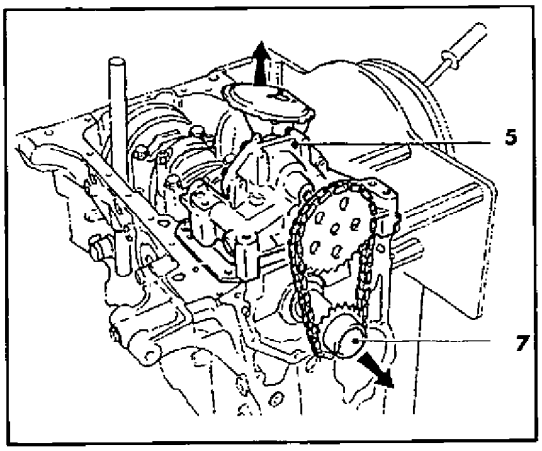
ENGINE BLOCK DISASSEMBLY

From the underside of engine remove the following components:

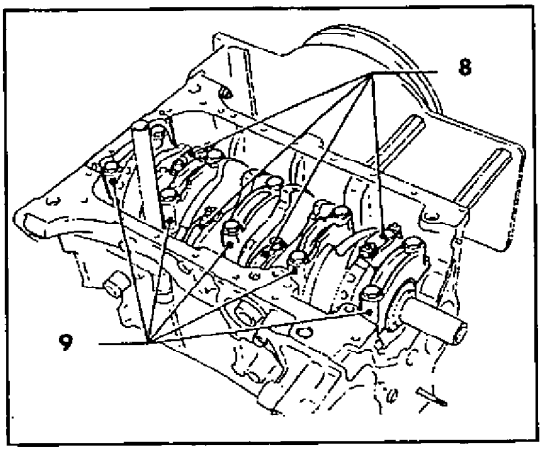
1) Oil pan.
2) Two oil pump pickup bolts, removing the pick-up.
3) Oil pump (5) bolts (1), (2) and (3) and retainer holder (4).

NOTE:
Bolt no. 1 is special since it serves to align the pump.

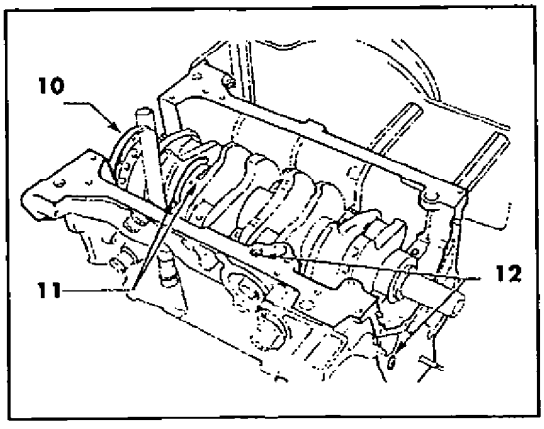
4) Remove the four baffle attaching bolts, removing the baffle.

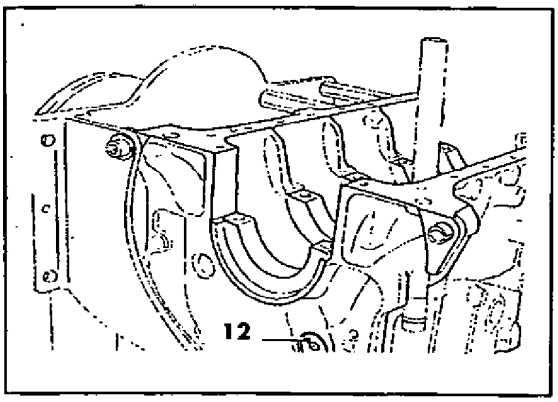


5) Prise the pump (5) and remove with chain and crankshaft pinion (7), recovering the key.

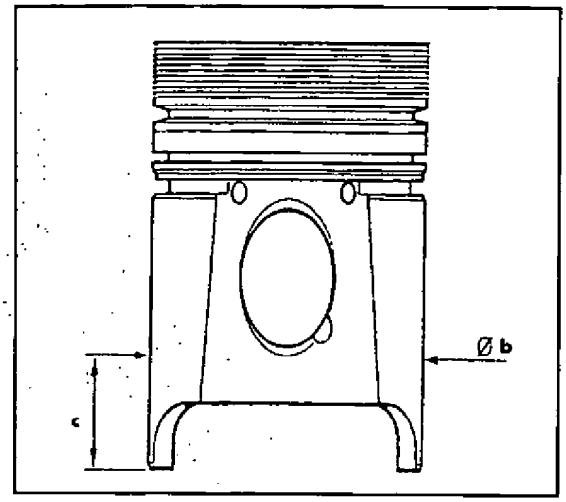


6) Remove the following components:
   - Connecting rod caps (8), marking them with a marker pen.
   - Main bearing caps (9), (welding mark).
   - Crankshaft shims installed in crankshaft support no. 2.
   - Oilseal (10) and shims adjusting axial play (11).
   - Crankshaft, main bearing shells and connecting rod assemblies.





7) Unfasten connecting rods by releasing circlips.
8) Remove oil gallery caps. (12).

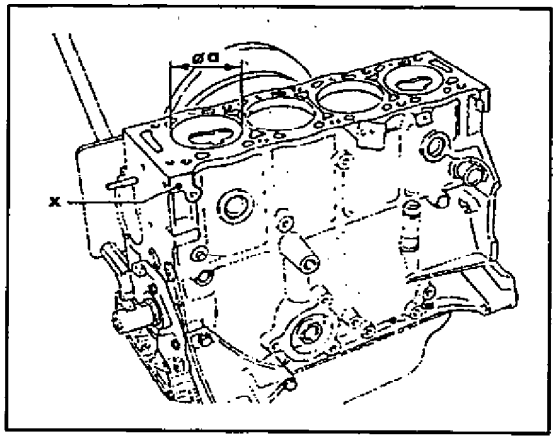


CYLINDER BLOCK REPAIR

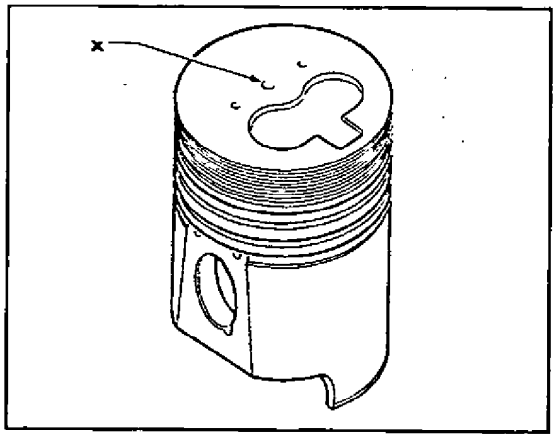
1) Matching up cylinder and piston.
Measure internal diameter of cylinders and external diameter of the pistons and determine the rectification that is necessary according to the following table. The piston diameter "b" must be measured at a distance "c" from the base.

Distance (c) = 25.00 mm (1.00 in).

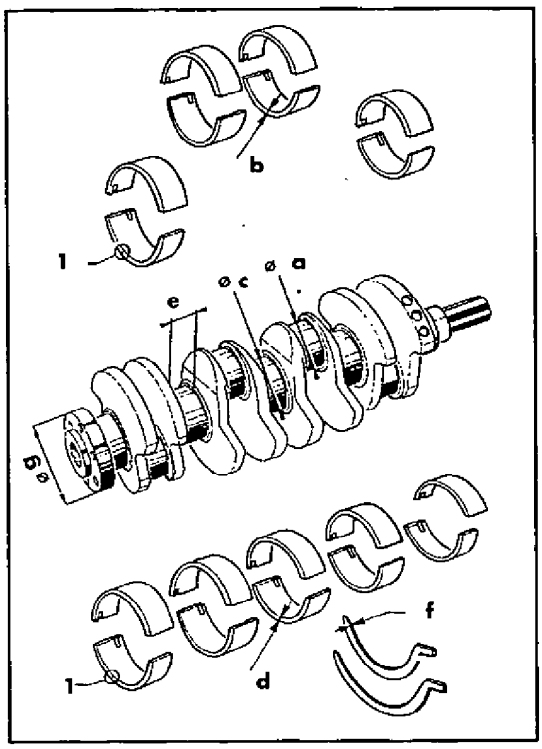
Scribe the relevant rectification mark (R1, R2 or R3) on the block in position (x).



		CYLINDER		PISTON	
	Mark (x)	Diameter (a)	Tolerance	Diameter (b)	Tolerance
Value original	NONE	83		82.93	
	A1	83.03	+ 0.018	82.96	+ 0.009
1st Repair	R1	83.2	- 0	83.13	- 0.009
2nd Repair.	R2	83.5		83.43	
3rd Repair.	R3	83.8		83.73	



Diameter of piston pin: 28 mm.



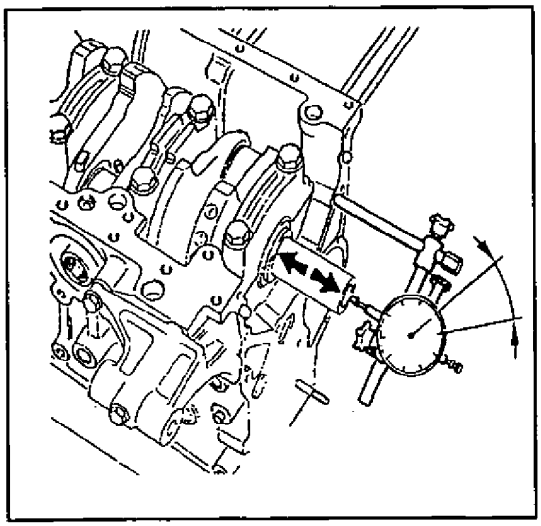
2) Cranhshaft repairs
Measure the main bearing and big-end journals. Machine to undersize if necessary. If machining is necessary (see the table below) use oversize shell bearings. These are marked with white paint on the side.

The following dimension are in mm:

	Ø: a	b	Ø: c	d
Tolerance	0	0.003	0	0.003
	- 0.016	- 0.003	- 0.019	- 0.003
Original	50	1.827	60	1.842
1st Repair	49.7	1.997	59.7	1.992

NOTE:
Connecting rod and main bearing shells in first repair should be identified with a white paint marking on the edges.

3) Crankshaft thrust clearance adjustment.
Crankshaft thrust play should be between **0.07-0.32 mm (0.003-0.012 in)** It is secured by four crescent shims, two located on the block and two on the main bearing cap no.2. They should be fitted with their copper side facing towards crankshaft.



The following dimension are in mm:

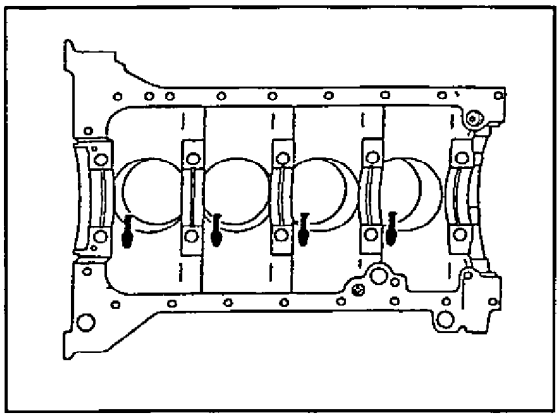
	Main bearing No. 2		Axial shim thickness	
	e	Tolerance	f	Tolerance
Value original	26.6	+ 0.05 - 0	2.305	+ 0.025 - 0.025
1st Repair	26.8		2.405	
2nd Repair.	26.9		2.455	
3rd Repair.	27		2.505	

4) Rear retainer seat.
Check diameter of crankshaft wrist pin and rectify if necessary.

The following dimension are in mm:

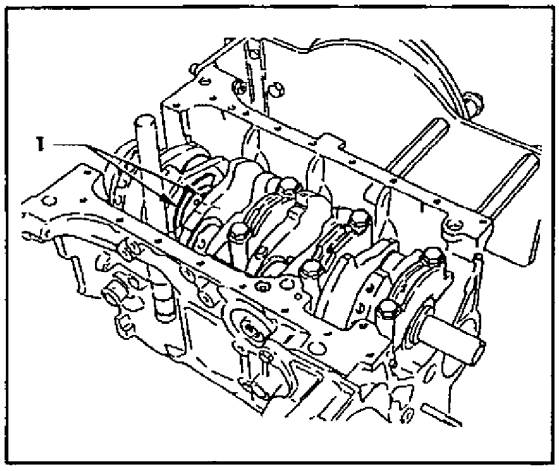
Dimension	Ø = g	Tolerance
Value original	90	+ 0 - 0.087
1st Repair	89.80	

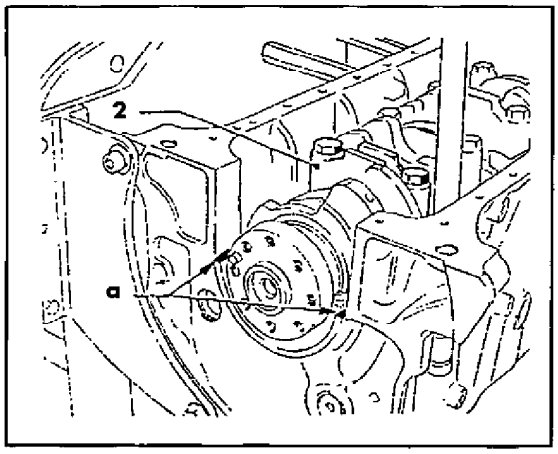
5) Cleaning block and crankshaft.
Clean with degreasing product, inserting a suitable brush in internal holes of cylinder block and crankshaft.



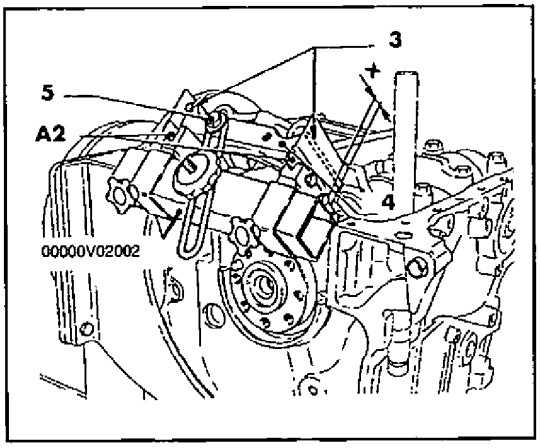
CYLINDER BLOCK ASSEMBLY

1) Crankshaft assembly.
   - Replace oil gallery plugs using thread lock an their threads.
   - Replace the oil nozzles in the cylinder block.
   - Instal the shell bearings in the block main bearings and their caps, having applied lubricant to the shell face.
   - Instal the crankshaft and loosly install the main bearing caps on journals no. 3. 4. 5.
   - Fit two thrust bearing into no. 2 journal, applying lubricant to the thrust faces.



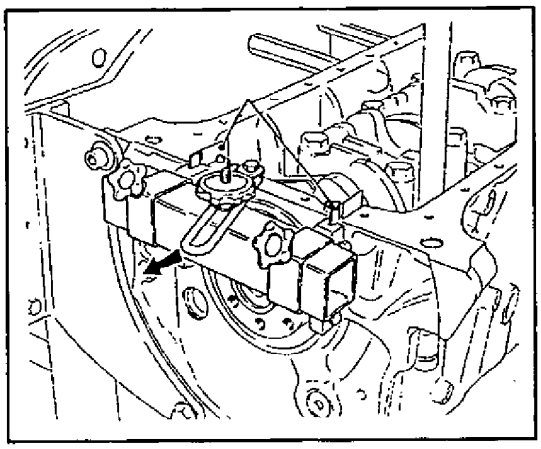


- Instal the main bearing cap no. 2 journal, ensuring that the thrust faces an lubricated.



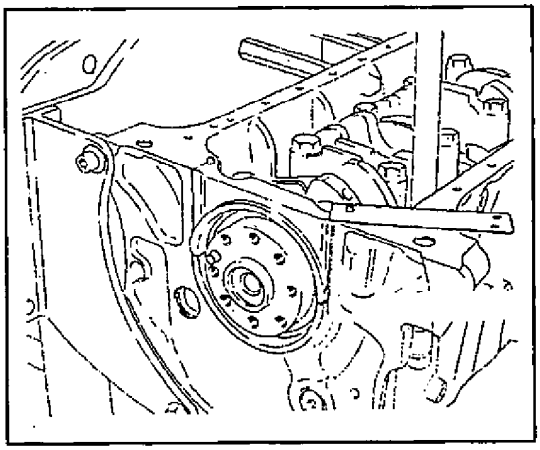
- Fit two new lateral seals (3) to main bearing cap no.1.
- Fix tool **Ref. 00000V02002** equipped with metal centering plates **A2 Ref. 00000V02005**, to main bearing cap no. 1 (4), by means of a bolt and washer (5).
- Adjust height (x) of metal centering plates.
- Grease metal plates and housing.

NOTE:
So as not to elongate lateral seals, fit main bearing cap no. 1 as indicated below.

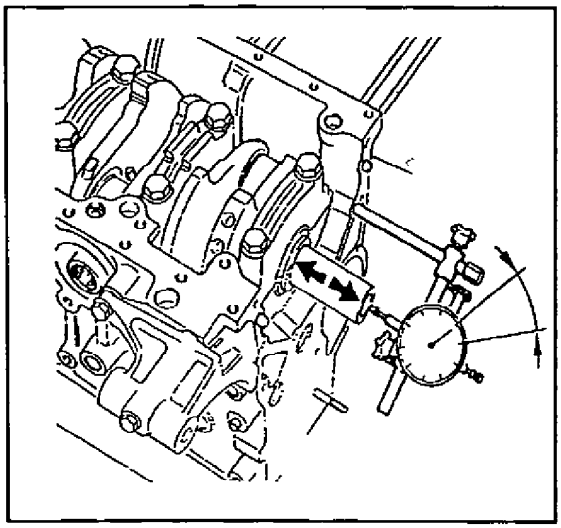


- Insert in housing at an inclination of 45º.
- Straighten up once inserted.
- Slowly lower.
- Tighten main bearing cap bolts as specified.

Main bearing bolt torque specifications:
70 Nm (7.0 Kg-m. 50.5 lb.ft).



- Remove tool horizontally.
- Cut lateral seals so they project out 2 mm.

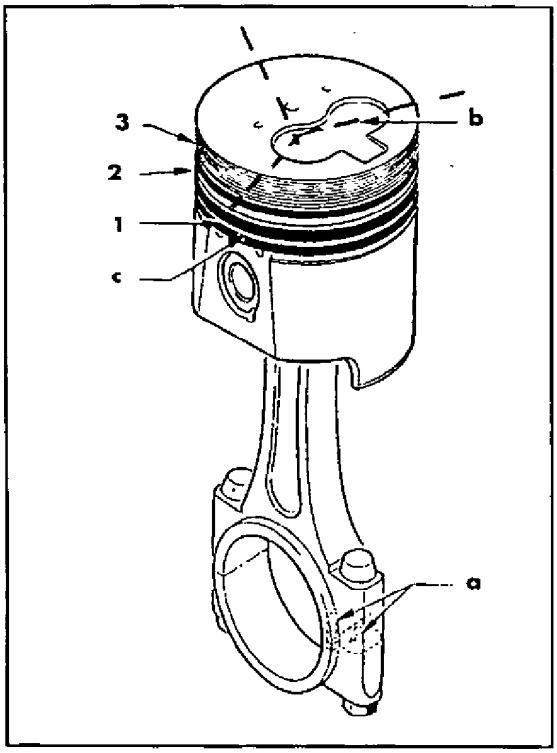


2) Check crankshaft thrust clearance.

Crankshaft thrust clearance:
0.07 to 0.32 mm. (0.003-0.012 in)

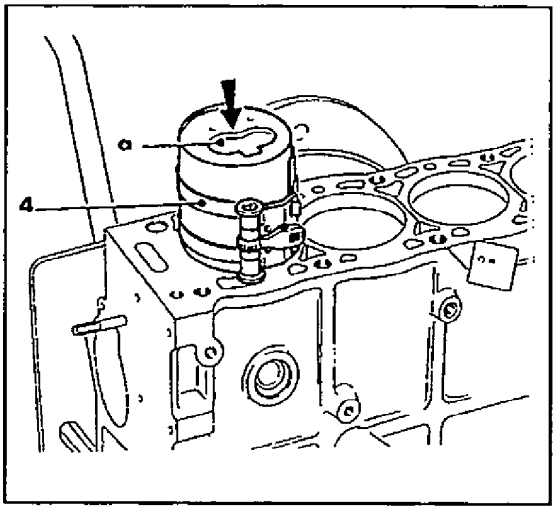
If the clearance is out of specification adjust by reference to the section in 6A4-31.

3) Installation of connecting rods and pistons.
- Assemble connecting rods and pistons aligning the connecting rod notches (a) towards the recesses (b) of the pistons.
- Fit piston ring using expander, in the following order:
  (1) Oil control ring.
  (2) Tapered section compression ring.
  (3) Chrome/convex section compression ring.



NOTE:
The side marked (TOP) of the tapered ring should face the combustion chamber.

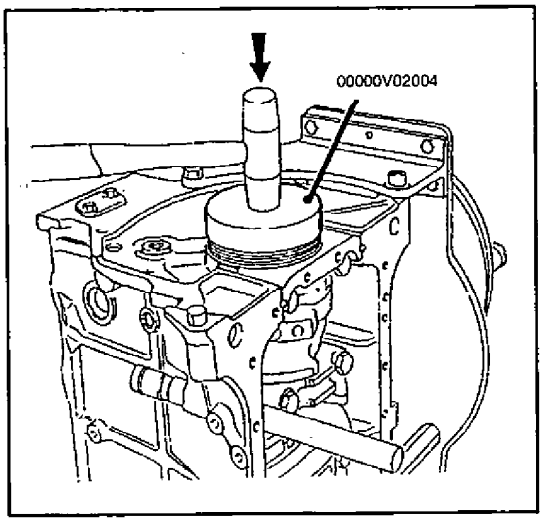
- Align piston ring gaps at 120º, taking the clearance (c) of oil control ring for reference.
- Lubricate piston and compress the piston rings with a compressor (4).



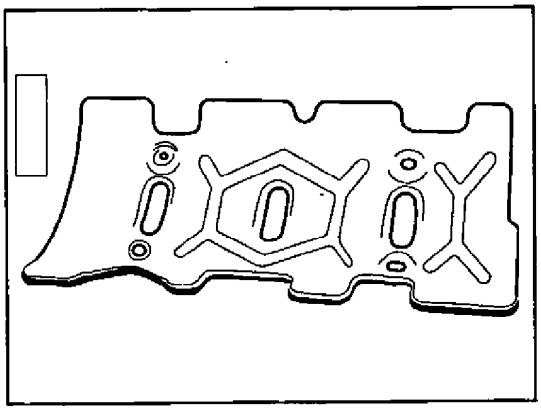
- Remove connecting rod caps, install pistons in block, respecting the marks made during disassembly and pointing the recess (a) of the piston towards the oil filter. Fit caps with their shell bearings and tighten to specified torque.

Connecting rod caps torque specifications:
20 Nm (2.0 kg.m, 14.5 lb.ft) PLUS 70º ± 5º rotation

NOTE:
For selection of connecting rod shell bearing please refer to "ENGINE REPAIR".

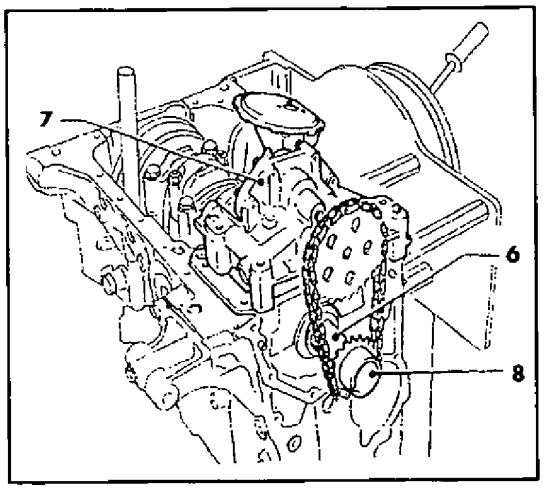


- Fit new oil seal on tool **Ref.00000V02004.**
- Insert oil seal by hitting with a mallet until it fits snug.
- Rotate tool to remove
- Check that oil seal lip is correctly positioned.

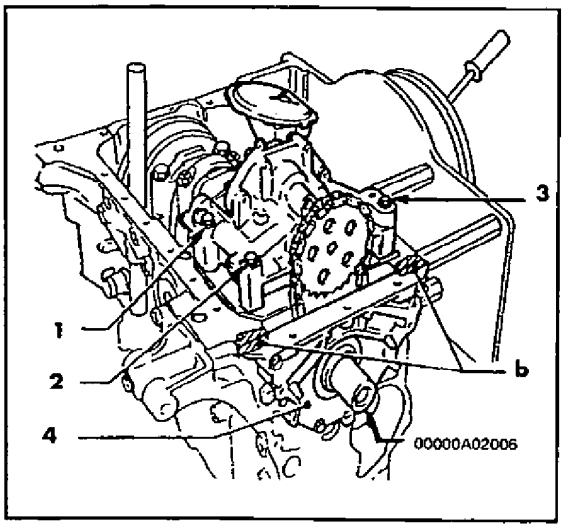


- Fit sump baffle with 4 attaching bolts.
- Tighten the bolts to the specified torque

Sump baffle bolt torque specification:



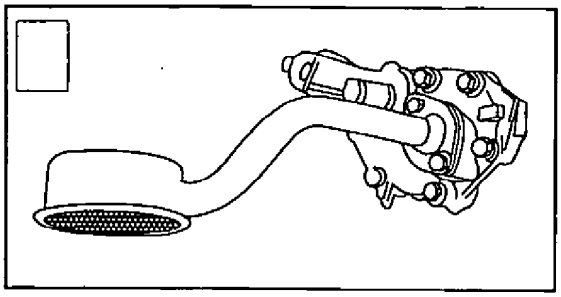
4) Assembly of oil pump and pan.
   Install components in following order:
   - Woodruff key (6).
   - Pump assembly (7), chain and drive gear (8).



NOTE:
Bolt no. 1 is special and serves to align pump.

- Tighten to specified torque pump bolts numbers (1), (2) and (3).

Torque specifications for bolts: 20 Nm (2.0 kg.m, 14.5 lb.ft)

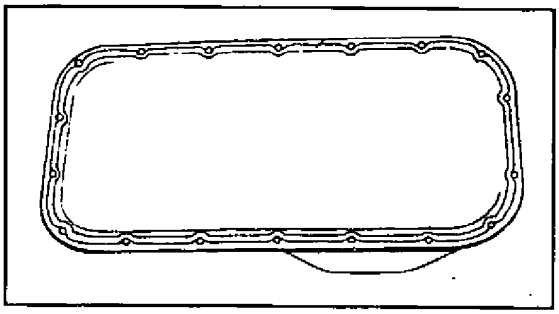


- Fit a new front oilseal on tool **Ref.00000A02006** and insert in housing by knocking with a mallet until it is snug.
- Tighten attaching cover bolts as specified

Torque specifications for cover bolts:
15 Nm (1.5 kg.m, 11 lb.ft)

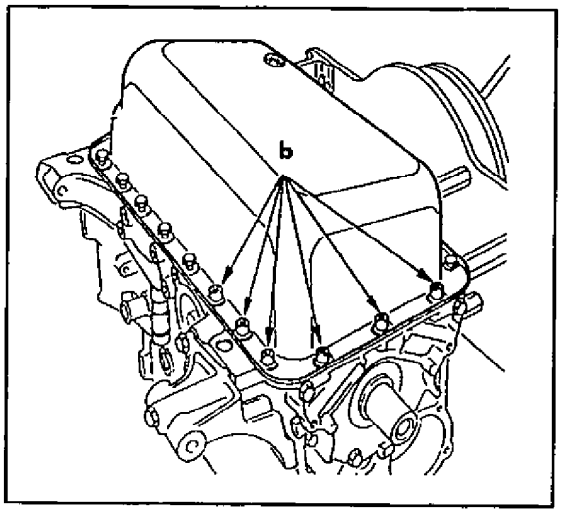
- Install oil pickup tube and attach with two bolts to specified torque.

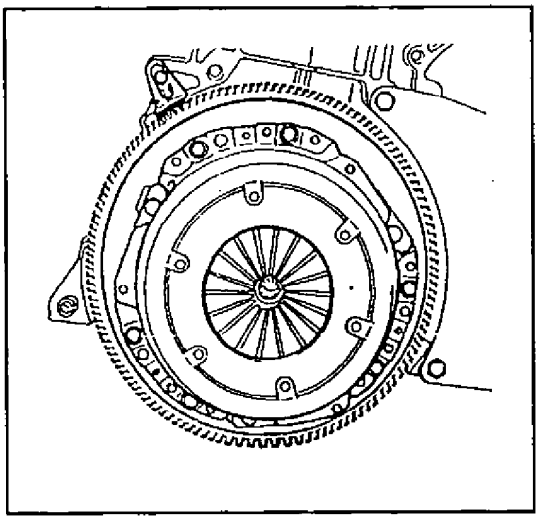
Pickup tube bolts torque specifications:
20 Nm (2.0 kg.m, 14.5 lb.ft)



- Apply line of **AUTO JOINT BLEU** sealant to edges of bolt housing in oil pan.
- Fit oil pan on engine and tighten bolts to specified torque.

Torque specifications for oil pan attaching bolts:
20 Nm (2.0 kg.m, 14.5 lb.ft)





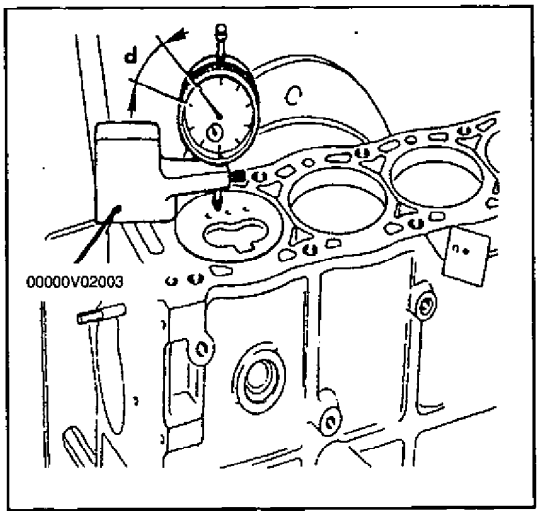
5) Clutch assembly installation.
   - Fit engine flywheel and insert bolts smeared with **LOCTITE FRENETANCH.**
   - Fit locking tool **Ref. 00000V02008** on the engine flywheel and tighten attaching bolts.

Engine flywheel attaching bolts torque specifications:
50 Nm (5.0 kg.m, 36 lb.ft)

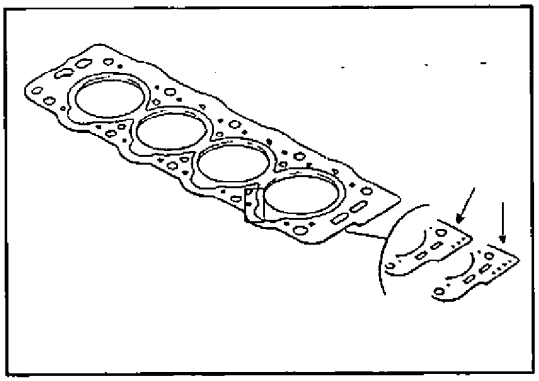
   - Fit pressure disc and plate and tighten attaching bolts.

Torque specifications for pressure plate bolts:
25 Nm (2.5 kg.m, 18 lb.ft)

   - Remove locking tool from engine flywheel.

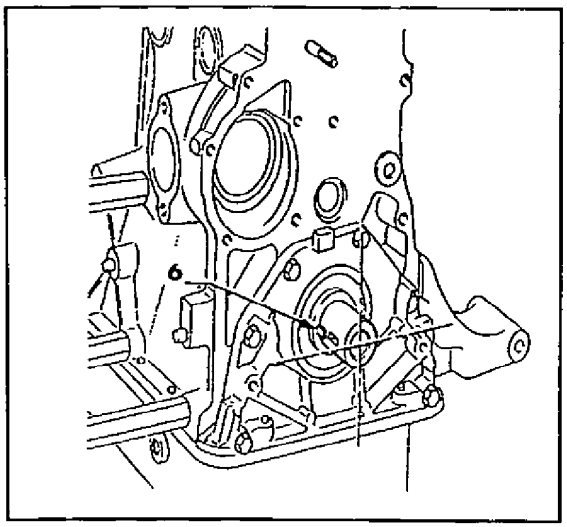


6) Cylinder head gasket assembly.
   Fit dial indicator on support **Ref. 00000V02003** and set to zero on flat surface
   - Turn crankshaft until pistons no. 1 and 4 are at T.D.C. using detent tool **Ref.00000V02008.**
   - Measure maximum projection of piston.
   - Repeat operation with pistons No.2 and 3.
   - With measurements obtained choose gasket thickness as in the table below.

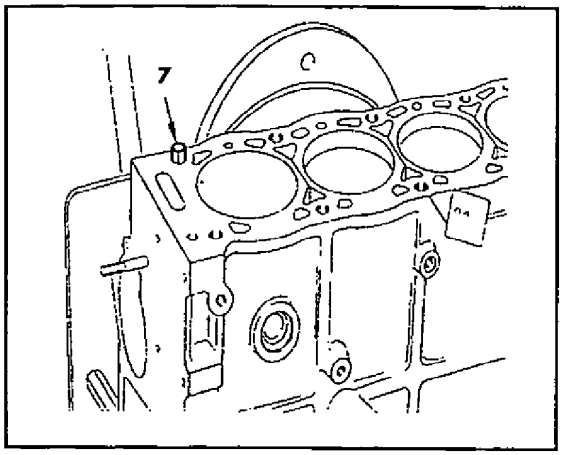


All dimension shun are in mm:

PISTON PROTRUSION	THICKNESS	I. D. MARKS ON GASKET
0.56 - 0.71	1.46	2
0.72 - 0.75	1.50	3
0.76 - 0.79	1.54	4
0.80 - 0.83	1.58	5



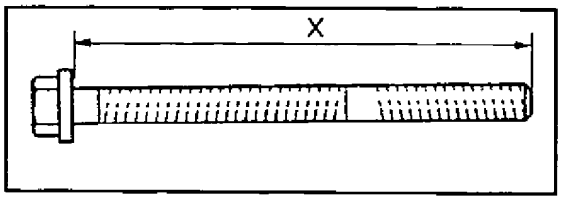
7) Installing cylinder head.
   - Turn crankshaft until pistons are midway in their cylinder bores and the crankshaft woodruff key (6) is at 9 o'clock position.



- Clean cylinder head fixing holes with M - 12 x 150 tap.
- Fit dowel (7) on engine block.
- Assemble cylinder head gasket (dry).
- Place cylinder head on block.
- Measure length (x) of cylinder head bolts from the underside of the bolt head flange to the tip of the threaded post.

- **Bolt maximum length without tip 121.25 mm.**
- **Bolt maximum length with tip 124.5 mm.**

NOTE:
Screws longer than indicated measurement must not be used.

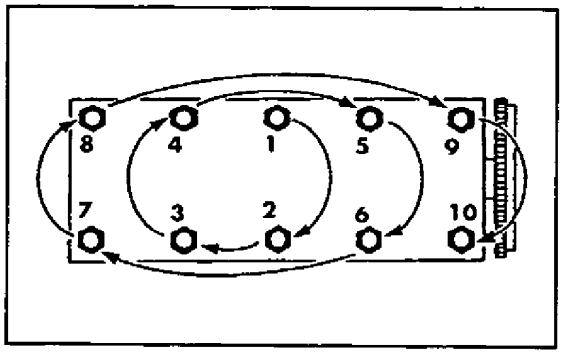


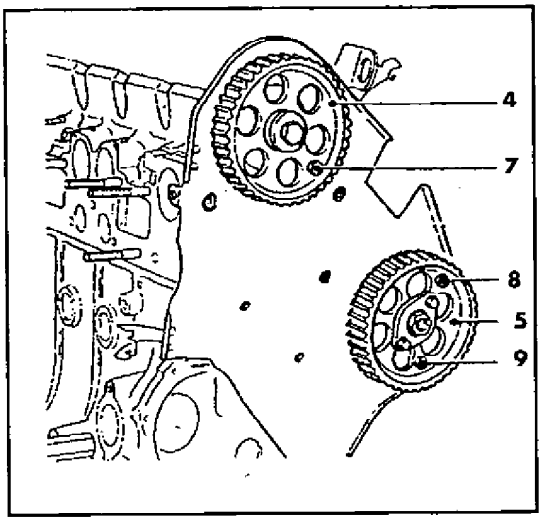
- Clean screw threads and replace washers with new ones.
- Apply **MOLIKOTE G RAPID PLUS** to screw threads and washer contact surfaces.
- Tighten cylinder head bolts in order indicated following the steps below:

Initial tightening: 20 Nm (2.0 kg.m, 14.5 lb.ft)

Subsequent tightening: 60 Nm (6.0 kg.m, 43 lb.ft)

Final angular tightening: PLUS 180º rotation.



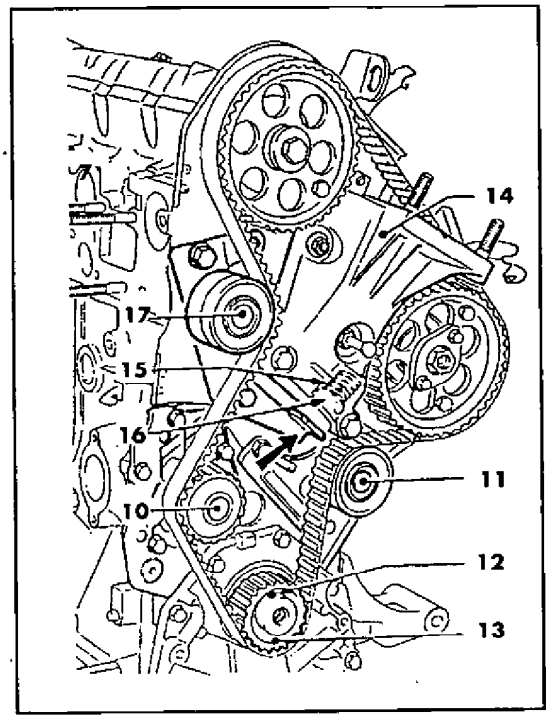


8) Timing belt assembly.
   - Fit fuel distribution pump bracket and pump.
   - Fit fuel distribution pump pulley (5).
   - Instal pulley timing bolts (7), (8) and (9), tightening by hand.
   - Tighten nut attaching pulley to fuel distribution pump to its torque specification.

Torque specifications for nut attaching pulley to fuel distribution pump: 50 Nm (5.0 kg.m, 36 lb.ft)

- Rotate crankshaft in its normal rotation and lock flywheel at Nº 1 TDC with tool **Ref. 00000V02008.**
- Assemble the following components in the order indicated:
  - Water pump (10) with a new gasket.

Torque specifications for nut sealing to fuel distribution pump: 15 Nm (1.5 kg.m, 11 lb.ft)



- Lower pulley (11).

Torque specification for lower pulley attaching bolts: 18 Nm (1.8 kg.m, 13 lb.ft)

- Woodruff key (12) and crankshaft pulley (13).
- Dummy engine mount (14) with screws with **LOCTITE FRENETANCH** and tightened to its torque specification.

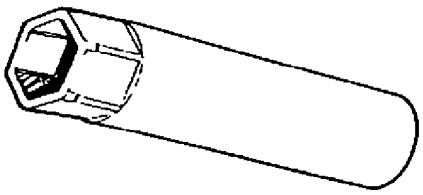
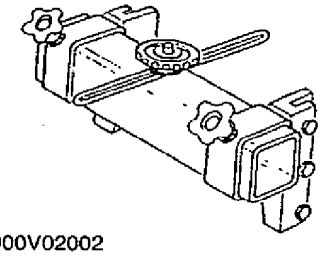
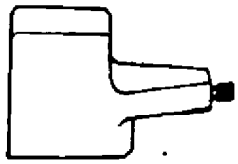
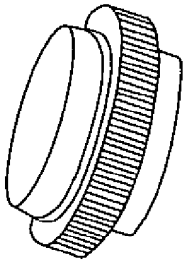
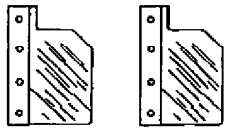
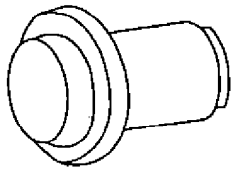
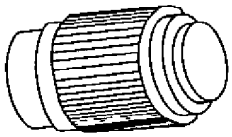
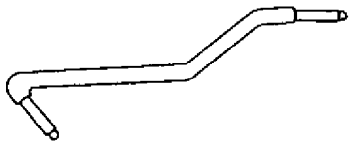
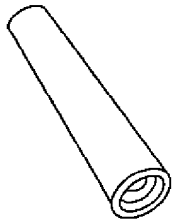
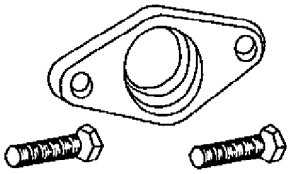
Torque specification for crankshaft pulley bolt: 40 Nm (4.0 kg.m, 29 lb.ft)

- Spring (15), retainer (16) and tensioner pulley (17).

- Immobilise pulley (17) at tappet compressed position.
- Continue with operations (1) to (4) (assembly) (1) to (10) (timing adjustment) from "section 6A4-9 Timing Belt" (Replacement).

Torque specification for tensioner bolts: 20 Nm (2.0 kg.m, 14.5 lb.ft)

SPECIAL TOOLING

 00000V02001 INJECTOR EXTRACTOR WRENCH	 00000V02002 MAIN BEARING CAP MOUNT	 00000V02003 DIAL INDICATOR SUPPORTS
 00000V02004 RETAINER MOUNT	 00000V02005 CENTERING PLATES	 00000V02006 FRONT RETAINER MOUNT
 00000V02007 CAMSHAFT RETAINER MOUNT	 00000V02008 T.D.C. ATTACHING ELEMENT	 00000V02009 VALVE RETAINER INSTALLATION TUBE
 00000V02010 INJECTION PUMP FLANGE	 00000V02015 SOCKET	 00000V02016 HEXAGONAL SOCKET
 00000V02017 SEMI CIRCLE WRENCH		

TORQUE SPECIFICATION

SYSTEM	ELEMENT	VALUES		
		Nm.	kg.m	lb.ft
ENGINE	Camshaft cover locknuts	18	1.8	13.0
	Main bearing bolts	70	7.0	50.5
	Connectjng rod nuts	20 +.70º	2.0 + 70º	14.5 + 70º
	Oil sump attaching bolts	20	2.0	14.5
	Front retainer mount plate	15	1.5	11.0
	Oil pump attaching bolt	20	2.0	14.5
	Engine flywheel case attaching bolts	25	2.5	18.0
	Clutch disc pressure plate bolts	50	5.0	36.0
	Engine flywheel bolts	40	4.0	29.0
	Camshaft pulley attaching bolts	50	5.0	36.0
	Fuel distribution pump/pulley locknut	20	2.0	14.5
	Spring tensioner support/cylinder head attaching bolts	45	4.5	32.5
	Timing tensioner attaching nut and bolt	18	1.8	13.0
	Lower timing cover support fittings	15	1.5	11.0
	Left timing cover attaching fittings	15	1.5	11.0
	Right timing cover attaching bolt	10	1.0	7.0
	Right timing cover locknut	5	0.5	3.5
	Crankshaft pulley attaching bolt	40 + 60º	4 + 60º	29.0 + 60º
	Injectors	90	9.0	65.0
	Glow plugs	22	2.2	16.0
	Thermostat housing attaching bolt	15	1.5	11.0
	Fuel filter fitting	15	1.5	11.0
	Rocker arm cover fitting	15	1.5	11.0
	Oil pressure switch	30	3.0	21.5
	Alternator tensioner attaching bolts	22	2.2	16.0
	Engine mounts attaching bolts	40 - 50	4.0 - 5.0	29.0-36.0
	Engine silentblock/support union	40 - 60	4.0 - 6.0	29.0-43.0
	Oil pan drain plug bolt	30 - 35	3.0 - 3.5	21.5-25.0
	Fuel lines/filter fitting	30 - 40	3.0 - 4.0	21.5-29.0
	Power steering pressure pump lines	50 - 70	5.0 - 7.0	36.0-50.5
	Engine/transmission union	40 - 60	4.0 - 6.0	29.0-43.0
	Power assisted steering pump and alternator to engine block	18 - 28	1.8 - 2.8	13.0-20.0
	Vacuum pump mount fitting/engine block	30 - 40	3.0 - 4.0	21.5-29.0
	Vacuum pump/mount attaching bolts	18 - 28	1.8 - 2.8	13.0-20.0
	Vacuum pump tensioner	18 - 28	1.8 - 2.8	13.0-20.0
	Vacuum pump tensioner (engine block side)	18 - 23	1.8 - 2.3	13.0-17.0
	Oil pickup tube bolts	15	1.5	11.0
	E.G.R. valve attaching bolts	20	2.0	14.5
	Exhaust collector tap bolts	18 - 28	1.8 - 2.8	13.0-20.0
	Intake manifold connections - first section	18 - 28	1.8 - 2.8	13.0-20.0
	Starter motor fitting	20 - 30	2.0 - 3.0	14.5-21.5
	Intake manifold locknuts	25	2.5	18.0
	Intake manifold attaching bolts	25	2.5	18.0
	Turbocompressor attaching bolts	30	3.0	21.5
	Turbocompressor drain pipe attaching bolts	15	1.5	11.0

SECTION 6B

COOLING SYSTEM

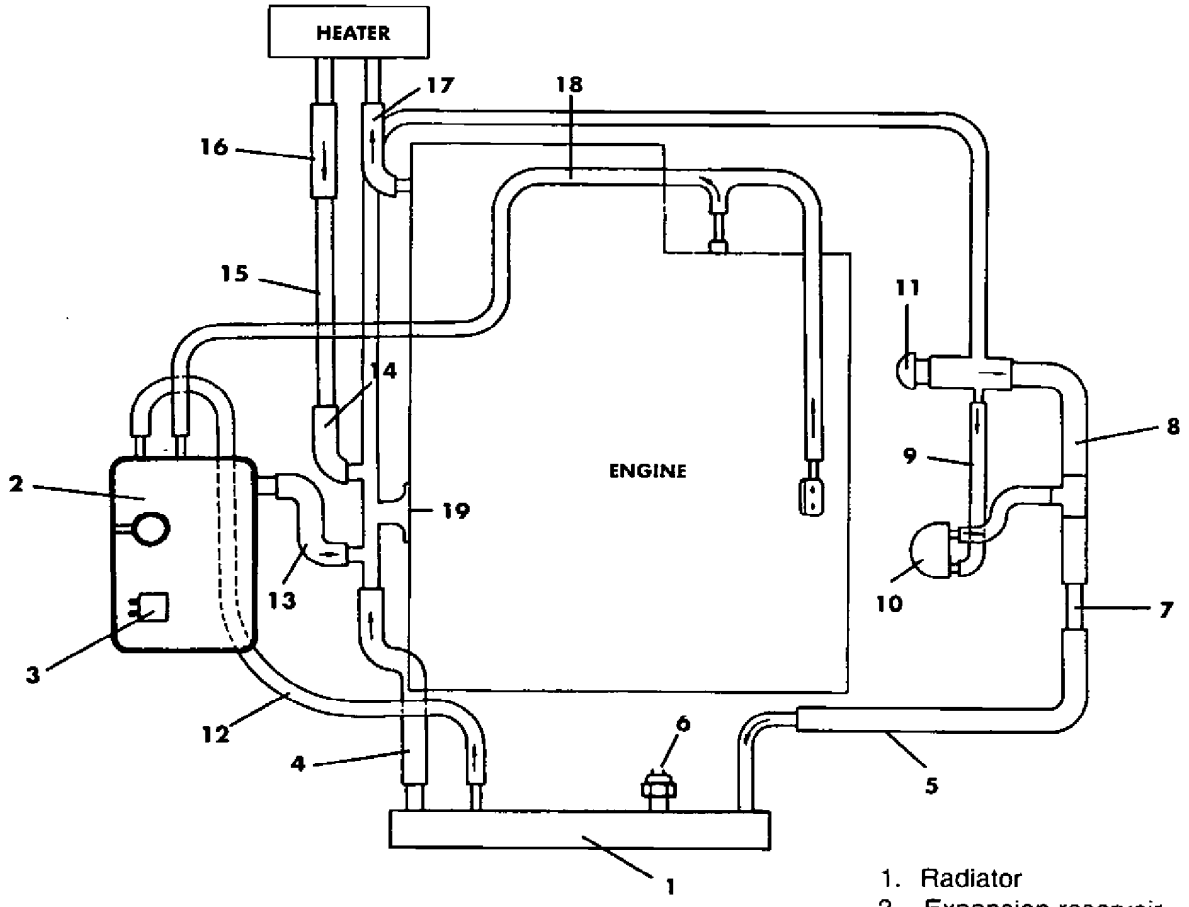
NOTE:
For topics not covered in this section, please refer to the relevant section of the Vitara Service Manual outlined in the PREFACE.

CONTENS

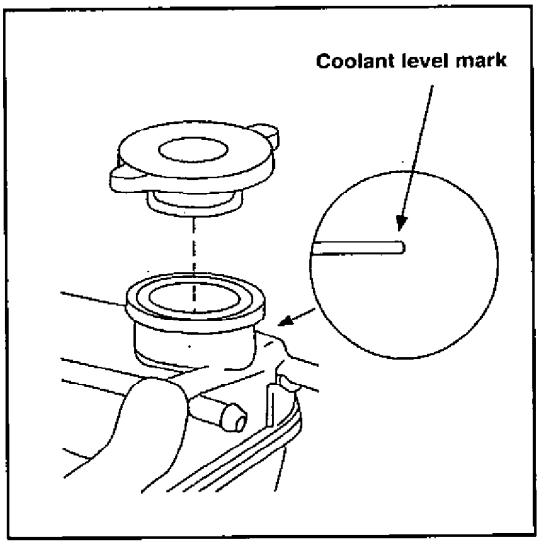
GENERAL OUTLINE **6B-2**
Cooling circuit **6B-2**
MAINTENANCE **6B-3**
Coolant level **6B-3**
Replacing coolant **6B-3**
Inspection and cleaning **6B-4**
IN THE VEHICLE **6B-5**
Checking and components **6B-5**

GENERAL OUTLINE

The cooling system comprises up of the following components: radiator, degassing reservoir, coolant sensor, oil cooling, thermostat, heater, heat relay thermocontact and electric fan.



1. Radiator
2. Expansion reservoir
3. Coolant level sensor
4. Outlet hose-radiator
5. Intake hose-radiator (no. 1)
6. Thermo sensor
7. Interconnecting hose
8. Intake hose-radiator (no. 2)
9. Intake hose-oil cooler
10. Oil cooler
11. Thermostat
12. Radiator expansion hose
13. Filler hose
14. Heater outlet hose (no. 2)
15. Heater outlet lines
16. Heater outlet hose (no. 1)
17. Heater intake hose
18. Engine expansion hose
19. Bypass hose



MAINTENANCE

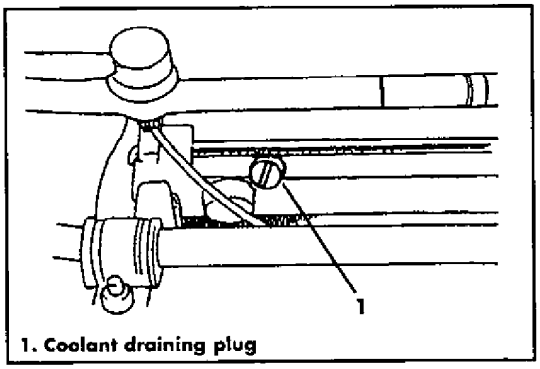
COOLANT LEVEL

Remove coolant expansion reservoir cap and check coolant is reaching upper part.

WARNING:
To avoid the possible risk of burns do not remove cap while engine and radiator are hot, pressurised vapour and boiling water could come out.

If coolant level is low, fill with coolant to maximum level.

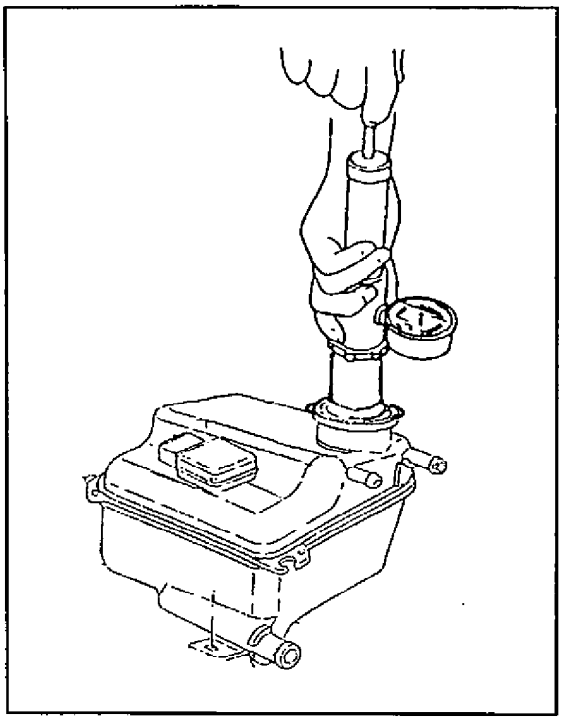
NOTE:
Ensure that filler cap is totally closed.

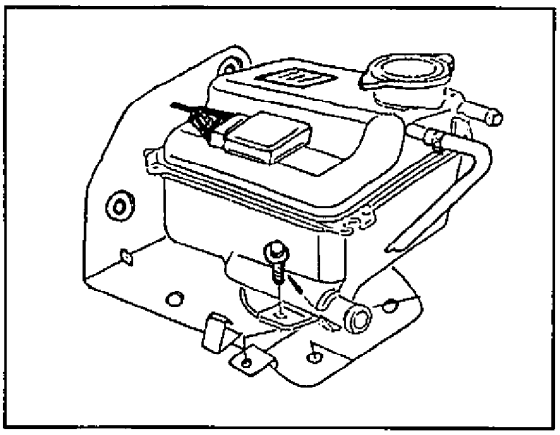


1. Coolant draining plug

COOLANT REPLACEMENT

1) Remove lower engine soundproofing plate.
2) With engine cold, unscrew expansion reservoir filler cap.
3) Open draining plug in lower part of radiator until all fluid has flown out.
4) Close draining plug.
5) Add coolant to expansion reservoir, until it reaches upper part.
6) Turn on heater controls and start up engine.
7) Continue adding coolant as reservoir level reduces, until the engine is completely warmed up.





7) Ensure that coolant stabilises at maximum level in expansion reservoir.
8) Fit cap on coolant expansion reservoir.
9) Fit lower engine soundproofing plate.

NOTE:
Cooling system capacity is 8 litres.
Use a mix of 50% DYNAMIC DYNAGEL 9103 antifreeze and 50% distilled or demineralized water.

INSPECTION AND CLEANING

Inspection.
1) Remove upper cover of coolant expansion reservoir.
2) Fit pressure gauge and create pressure of 137 K Pa (1.4 kg/cm^2, 20 psi).
3) Check that pressure does not fall from above level. If it does, check for existence of leaks and correct if necessary.

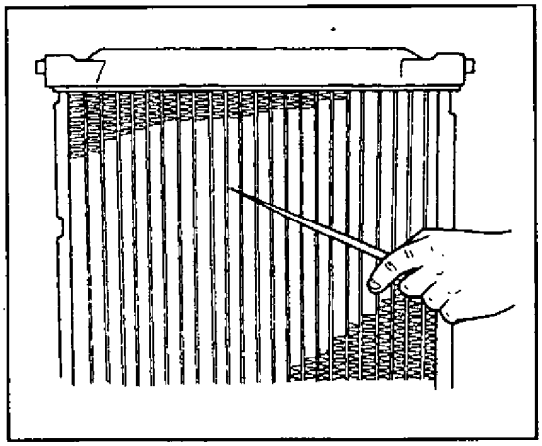
Cleaning.
1) Remove lower engine soundproofing plate.
2) Remove coolant expansion reservoir cap.
3) Start up engine and run until thermostat outlet hose is warm.
4) Turn off engine and remove radiator draining plug, thereby evacuating coolant.
5) Fit filler cap and wait for engine to cool down.
6) Add water to coolant expansion reservoir and wait again for engine to warm up until proceeding to drain..
7) Repeat this operation 3 or 4 times until water coming out of drain hole is almost transparent.
8) Remove and eliminate interior dirt.
9) Fit once more and securely tighten radiator draining plug.
10) Fill system with mixture of water and antifreeze, as specied above.

IN THE VEHICLE

COMPONENT REPLACEMENT

Radiator removal

1) Remove lower soundproof plate.
2) Drain radiator by removing coolant expansion reservoir and radiator draining plug.
3) After draining, be sure to replace and tighten radiator draining plug.
4) Disconnect radiator hoses and the electric connections to the electric fan adjacent to the engine (rear).
5) Remove radiator support fittings to engine.
6) Remove rear electric fan from the radiator.

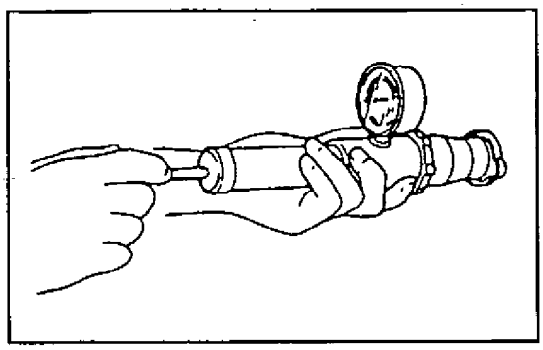


NOTE:
Be careful not to damage radiator fins.

Radiator inspection

Perform the following revisions, and repair or replace if necessary:

1) Cracks or breaks.
2) Cooling fins (straighten them with a screwdriver).
3) Inlet and outlet radiator hoses (for distortion).

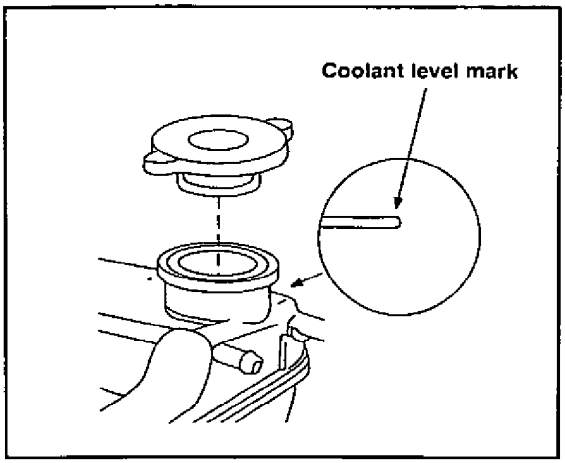


Inspection of expansion reservoir cap

1) Clean expansion reservoir cap.
2) Install pressure testing tool and apply pressure of approximately 137 K Pa (1.4 kg/cm^2, 20psi). This pressure should be maintained for at least 10 s. If not the cap should be replaced.

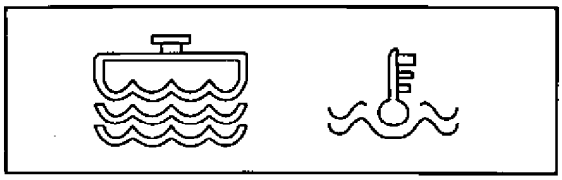
Radiator assembly

1) Carry out disassembly operations in reverse order.
2) Fill and bleed system as outlined above.
3) Fit lower engine soundproofing plate.

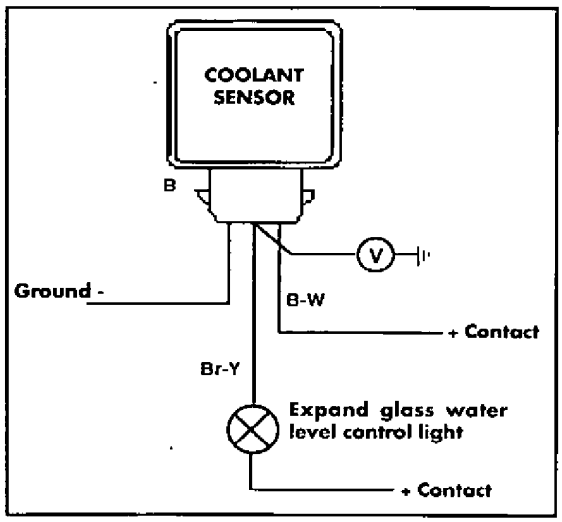


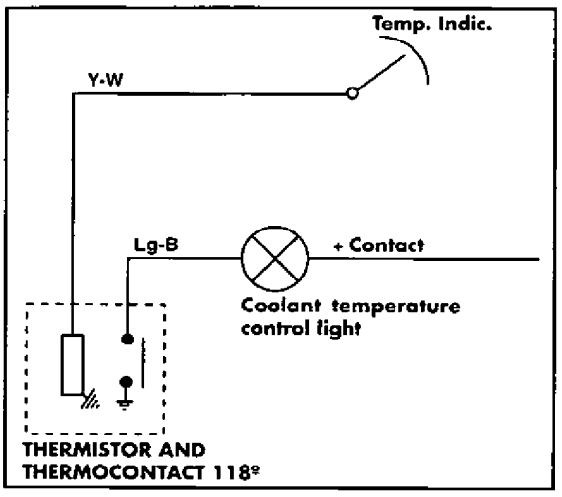
Coolant temperature sensor

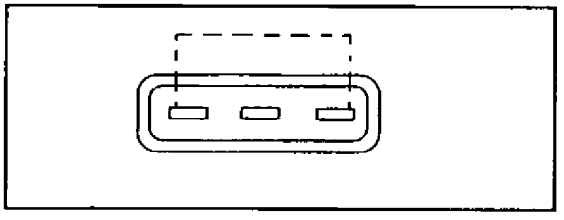
1) Ensure that coolant reaches upper part of coolant expansion reservoir.



2) Check that the coolant level and temperature warning lamps light up when the starter motor is engaged. This should happen before the engine starts. Once the engine has fired the lights should go out.
3) If lights remain on after starting up, check:
   - Condition of diodes on instrument panel, replacing if defective.
   - Connect voltmeter between coolant sensor terminal Br-Y and ground. When engine is running the reading should be similar to battery voltage. If not, check for possible grounding fault in the above circuit. If no defect is found, replace sensor.
   - Connect voltmeter between coolant sensor cable B-W and ground. When engaging starter motor the reading should be similar to battery voltage. If not, check possible grounding fault of above cable.
4) If lights do not come on when engaging starter motor, check:
   - Condition of bulbs.
   - Condition of diodes.
5) Perform the following final inspections:
   - Disconnect the thermo probe sensor, start the engine and short-circuit the Br-Y cable to carth. The coolant level indicator must light up. If the contrary, check cable continuity.
   - Disconnect Lg-B cable from the termperature indicator thermo sensor and short-circuit it to earth. The indicator must light up, if the contrary, check the cable continuity.

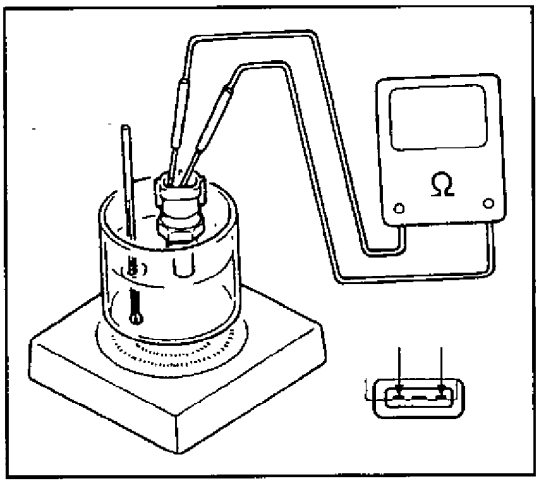






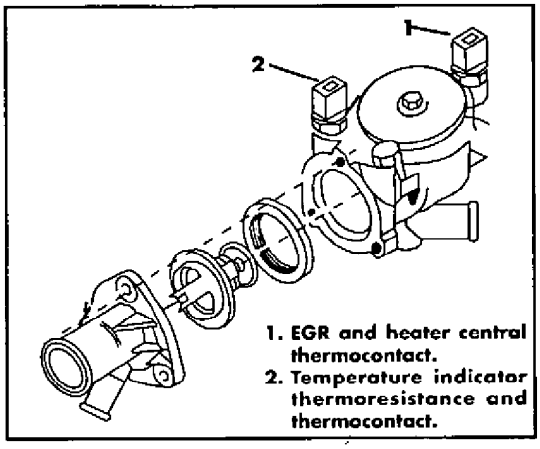
Inspection of electric fans.

1) Turn ignition key in ON position.
2) Disconnect thermo sensor connector and link connector ends with a wire as shown in diagram (left). Check that both fans work.
3) If they do not, check electrical fitting, fuses, relays and electric fans.



Inspection of electric fans thermo sensor

1) Remove radiator thermo sensor.
2) Insert it in a container with water and a thermometer.
3) Apply heat to the water.
4) Check that on reaching a temperature of approximately 95º C there is continuity between the terminals at the ends. Check that when temperature drops to 86º C (approx.) no continuity exists.
   Replace thermo sensor if necessary.



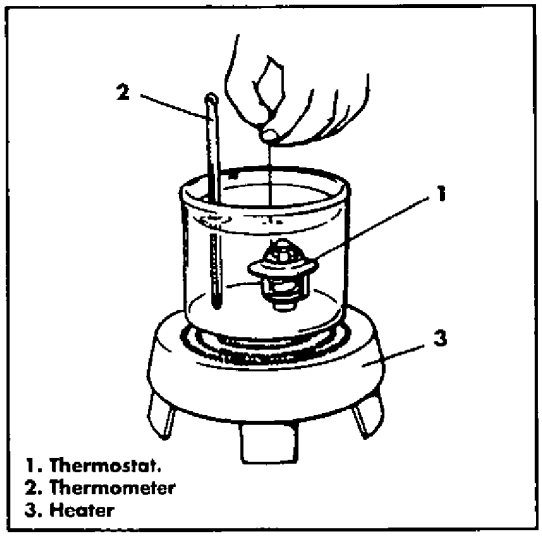
1. EGR and heater control thermocontact.
2. Temperature indicator thermoresistance and thermocontact.

Inspection of thermostat

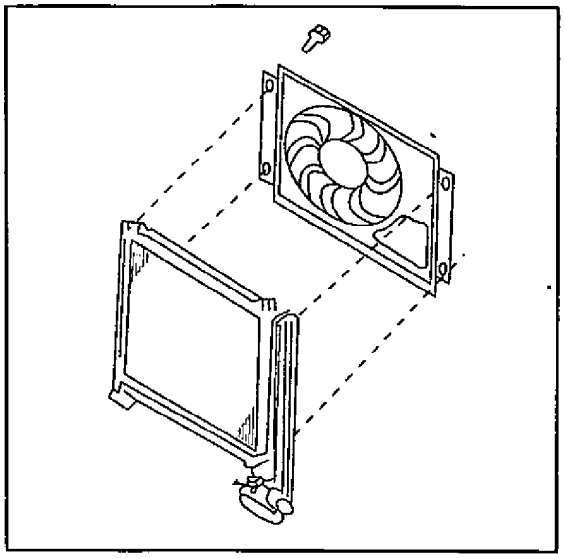
1) Release hose attaching radiator to thermostat housing.
2) Remove rear thermostat cover and extract thermostat.
3) Place thermostat in a container with water and heat up, check that at beginning and end of aperture the following values show:

Starting open: 86º C
Fully open: 95º C
Movement: 7.5 mm (0.30 in)

Replace thermostat if it does not perform to these values.

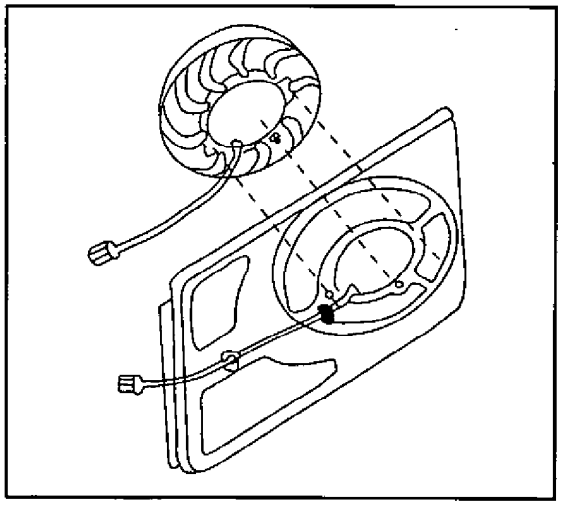


1. Thermostat.
2. Thermometer
3. Heater

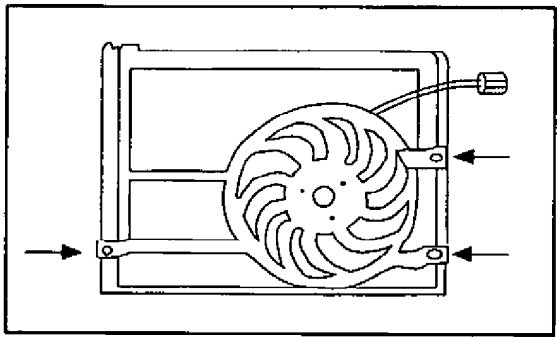


Replacement of rear electric fan

1) Remove electric fan electric connection.
2) Remove the four bolts attaching the fan hood to radiator.

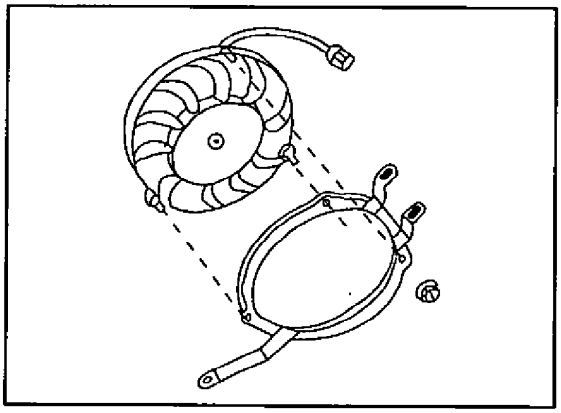


3) Detach electric fan cable from the circlips.
4) Remove nuts and separate electric fan from hood.
5) For assembly perform, reverse order of disassembly.



Replacement of front electric fan

1) Remove front grill.
2) Remove electric fan connector.
3) Remove three bolts attaching hood to radiator support.



4) Remove three bolts attaching electric fan to hood and separate them.
5) For assembly, reverse order of disassembly.

SECTION 6E3

ENGINE AND EMISSIONS CONTROL SYSTEM

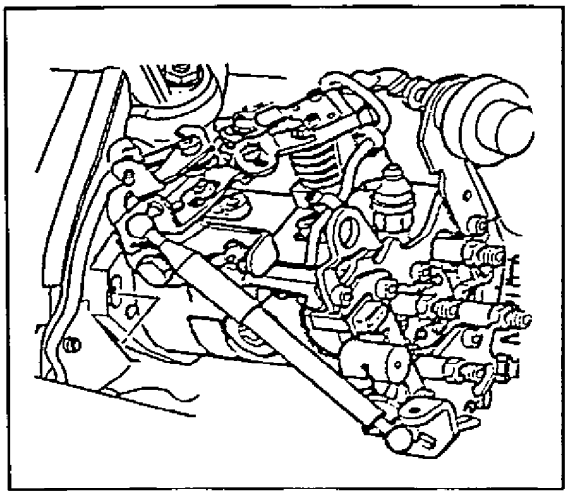
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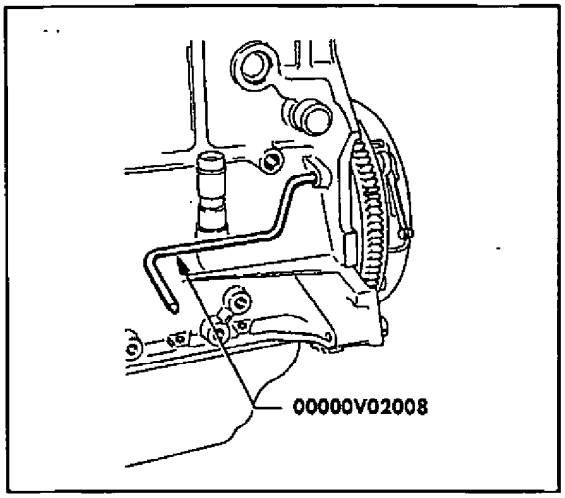
ON THE VEHICLE

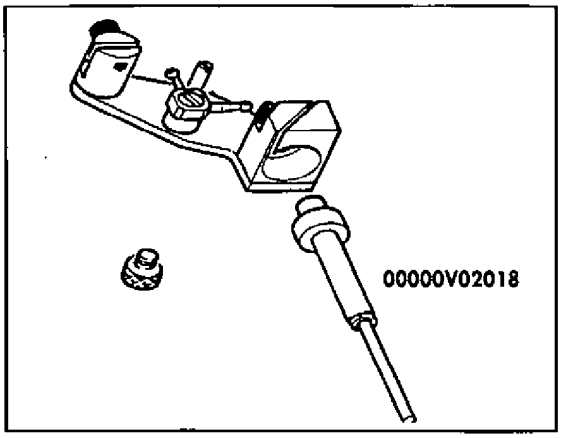
NOTE:
Internal adjustments and repairs to fuel distribution pump must be carried out at an official Lucas Service Centre.

FUEL DISTRIBUTION PUMP OVERHAUL (LUCAS)

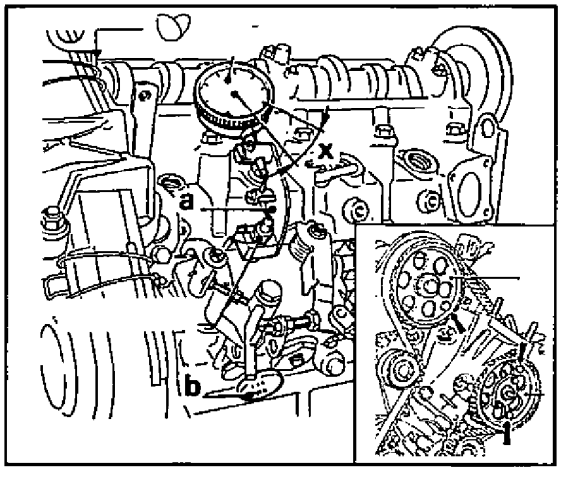
Adjustment

1) Remove the tap from the pump port hole.
2) To ease engine rotation remove glow plugs.
3) Remove injection lines, loosen pump attachings and swing this to the maximum retrieve position (away from the engine).
4) Set crankshaft to TDC of cylinder No.1, setting engine flywheel with tool **Ref. 00000V02008.**

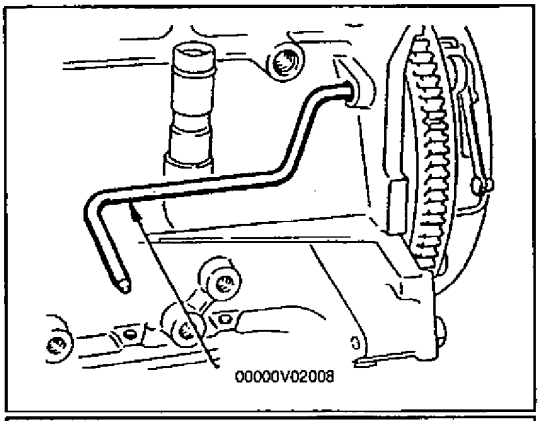




5) Install centering rod of tool **Ref. 00000V02018** in its housing.

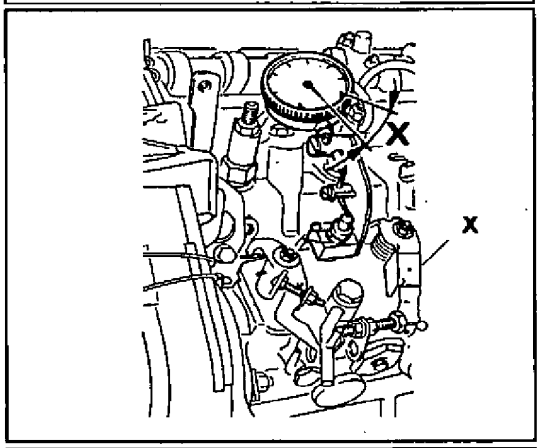


6) If the engine is in injection position in cylinder No.1 rotate engine a complete turn and set flywheel with tool **Ref. 00000V02008**, in this position cylinder No.4 will be in injection.
   This position can be confirmed because the cylinder No.4 cams are not in contact with tappets, or because the camshaft pulleys and injection pump align with those of the cylinder block.
7) Set the dial indicator support **Ref. 00000V02018** on the pump and to this attach a universal dial indicator provided with plain point (b).
8) From the TDC centering position turn the crankshaft in reverse movement to rotation until the dial indicator needle stops. In this position adjust the dial indicator to zero (0º).



9) Slowly turn crankshaft in normal rotating direction, until flywheel is locked by tool **Ref. 00000V02008**.
   Observe the dial indicator reading.
10) Slowly turn fuel distribution pump in advance direction (towards engine), until dial indicator shows the **(X)** travel indicated on the plate on the throttle lever **0.04 mm (0.0016 in).**

NOTE:
If the dimension is exceeded, turn the pump back until a reading less man (X) is obtained and adjust again.



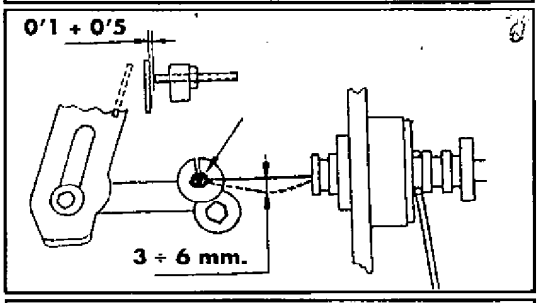
CHECKING ADJUSTMENT

1) Turn engine, from the previous position, a quarter turn in the opposite direction.
2) Turn engine in rotating direction and center engine flywheel with tool **Ref. 00000V028008.**

   At this position, dial indicator must show **X 0.04 mm (0.0016 in).**

3) Tighten pump attachings and remove dial indicator.

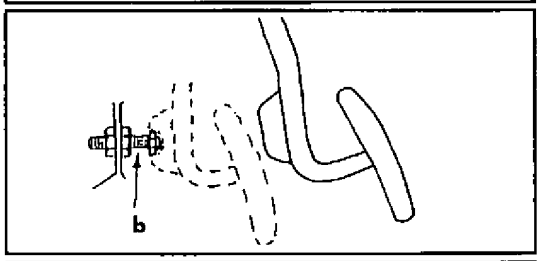
Torque specifications for jet pump attaching bolts: 20 Nm (2.0 kg.m, 14.5 lb.ft).



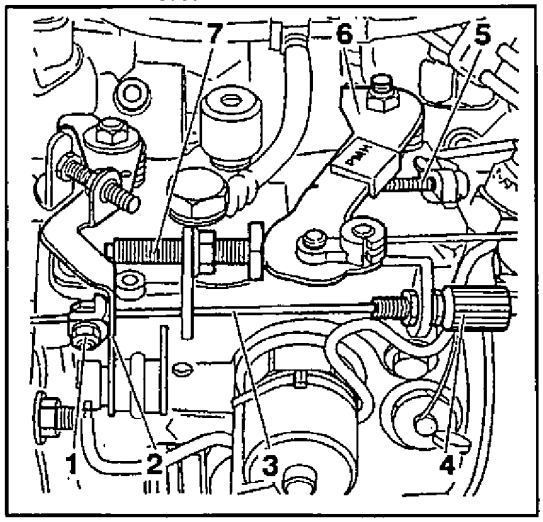
ADJUSTING JET PUMP

Throttle cable adjustment

1) Attach throttle cable to the lever.
2) Fit cable cover to mount with the retention clip, leaving **3-6 mm (0.12-0.24 in)** of slack.

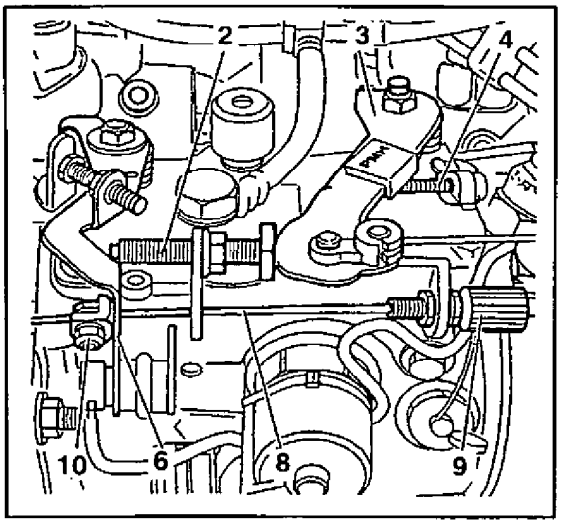


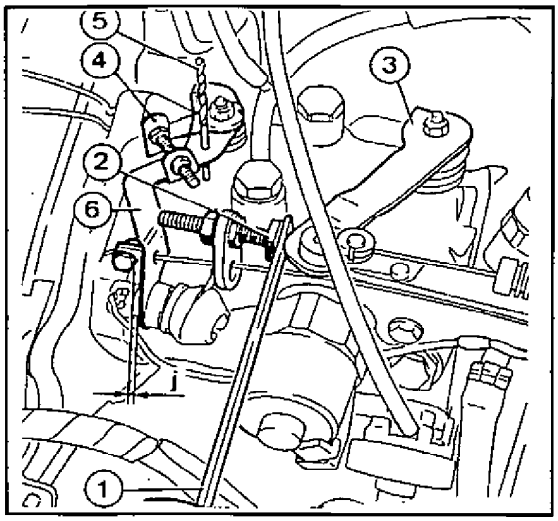
3) Adjust throttle pedal height using stop bolt (b), in such a way that when pushing the pedal and stopping the bolt on the pedal there is **0.1-0.5 mm (0.004-0.020 in)** between the throttle lever (6) and the revolutions stop bolt (5).

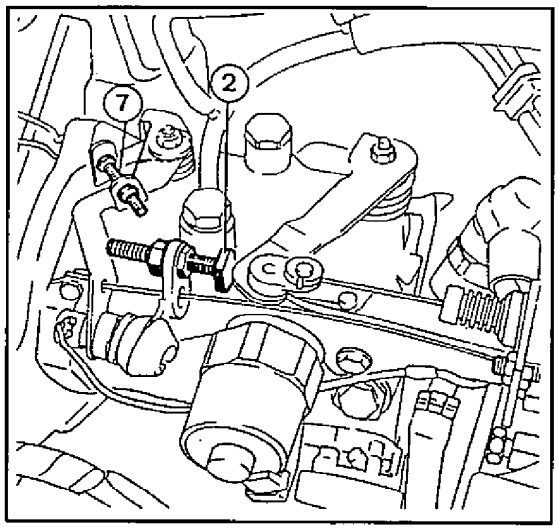


4) Ensure that in idle position, throttle lever upper end (6) contacts the stop bolt (7).

NOTE:
Do not change maximum r.p.m. of the engine via the stop bolt.







Adjusting fast idle cable

Cold engine

1) Verify that when the lever (6) is pressed right, cable (8) is completely tightened. If not, tighten the cable using on the clamp (10).
2) Adjust cable tension with tensioner (9).

NOTE
Idle r.p.m. must be 950±50.

Hot engine (thermostat open)
1) Verify cable (8) is not tight.
2) Place the thermostatic probe on the thermostat housing and check engine temperature.

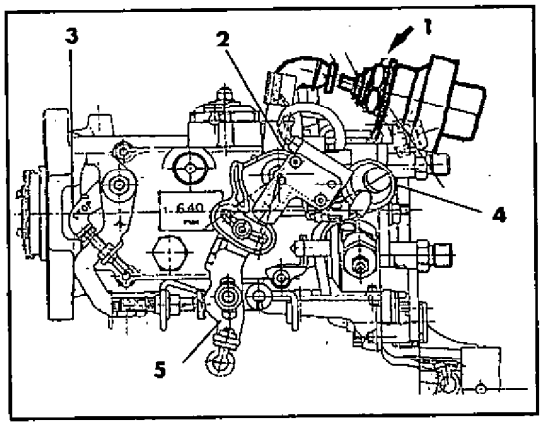
NOTE
Between cold engine and hot engine there must be a maximum cable movement of 6 mm (0.24 in) and the play (J) must be between 0.5-1.0 mm (0.020-0.040 in).

Adjusting throttle lever
1) Ensure throttle lever idle is on the adjustment stop bolt (2).

Adjusting rigging
1) Place a **3 mm (0.012 in)** gauge (1) between throttle lever (3) and adjustable bolt (2).
2) Move the manual stop lever (4) to the left.
3) Place a **3 mm (0.012 in)** drill (5) in the fast idle lever (6).
4) Adjust engine to **900±50** r.p.m. by adjusting the screw (2).
5) Remove gauge (1) and drill (5).

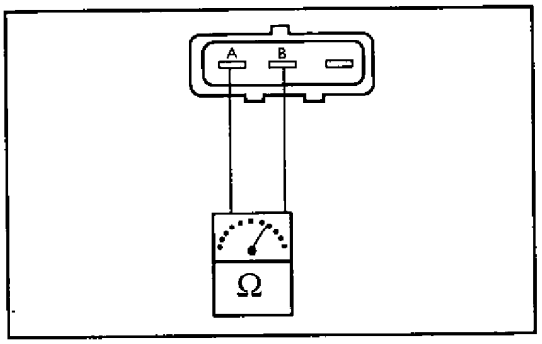
Idle adjustment
1) Adjust idle by adjusting the idle screw (7).

Fast idle r.p.m. (800^{+0}_{-50}).



Engine deceleration control

1) Move throttle lever (5) until **3.000 r.p.m.** is obtained. Deceleration time must be about 3 to 4 sec. after throttle lever is released.
2) Adjust deceleration time by adjusting the dashpot bolt (1).

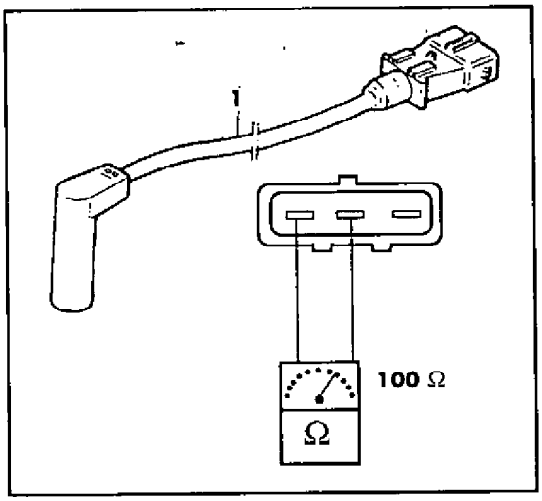


E.G.R. system driving microswitch.

1) To check its performance use an ohmmeter and measure resistance between pump connector terminals A and B. From idle position, up to about, **30 mm (1.2 in)** of throttle cable movement the ohmmeter must show continuity. Beyond that position, resistance must be infinite.

NOTE

Valve adjustment or replacement must be accomplished by a Lucas Service Centre.



Manual stop control

1) With engine at idle, pull the lever (3) backwards. Engine must stop.

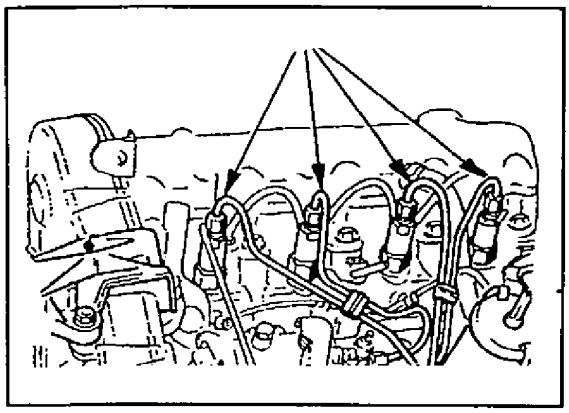
Electric stop control

1) Measure resistance (between earth and output terminal) of the fuel shutoff electric valve (4). This must be about **8Ω** .

r.p.m. sensor

1) Check resistance on the connector as shown at left.

Pickup coil resistance: 100 Ω (approx.)



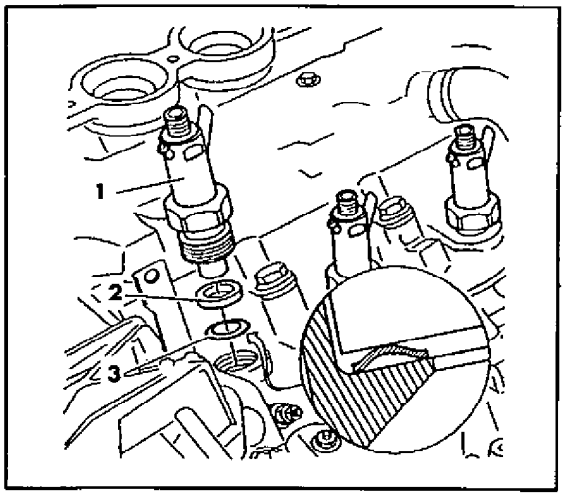
REPLACEMENT OF INJECTORS

Disassembly

1) Disconnect injector and return lines.
2) Remove injectors using tool **Ref.00000V02001.**
3) Extract washers (2) and (3).

NOTE:

Injector checks and repairs should be performed by a Lucas Service Centre.



Assembly

1) Insert new fire cutoff washer in housing (3) with convex area facing outwards.
2) Fit a new sealing washer (2).
3) Fit injectors and tighten to specified torque with tool **Ref.00000V02001.**

Torque specifications for injector:
90 Nm (9.0 kg.m, 65 lb.ft).

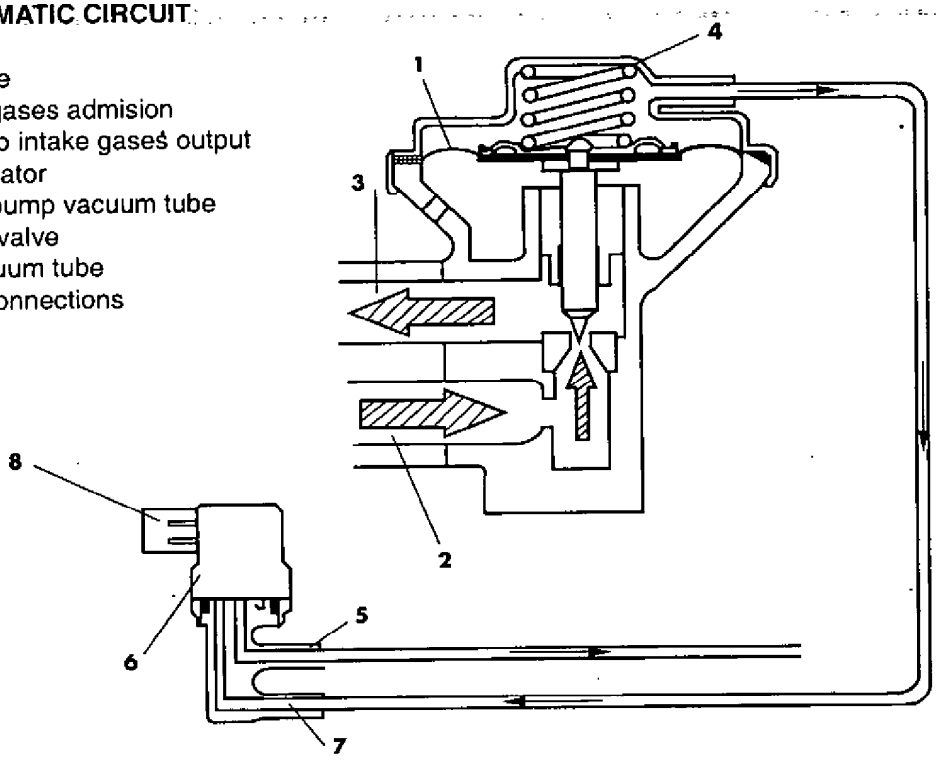
4) Fit injection lines.
5) Check they are not blocked and fit injector return lines.

ENGINE AND EMISSIONS CONTROL

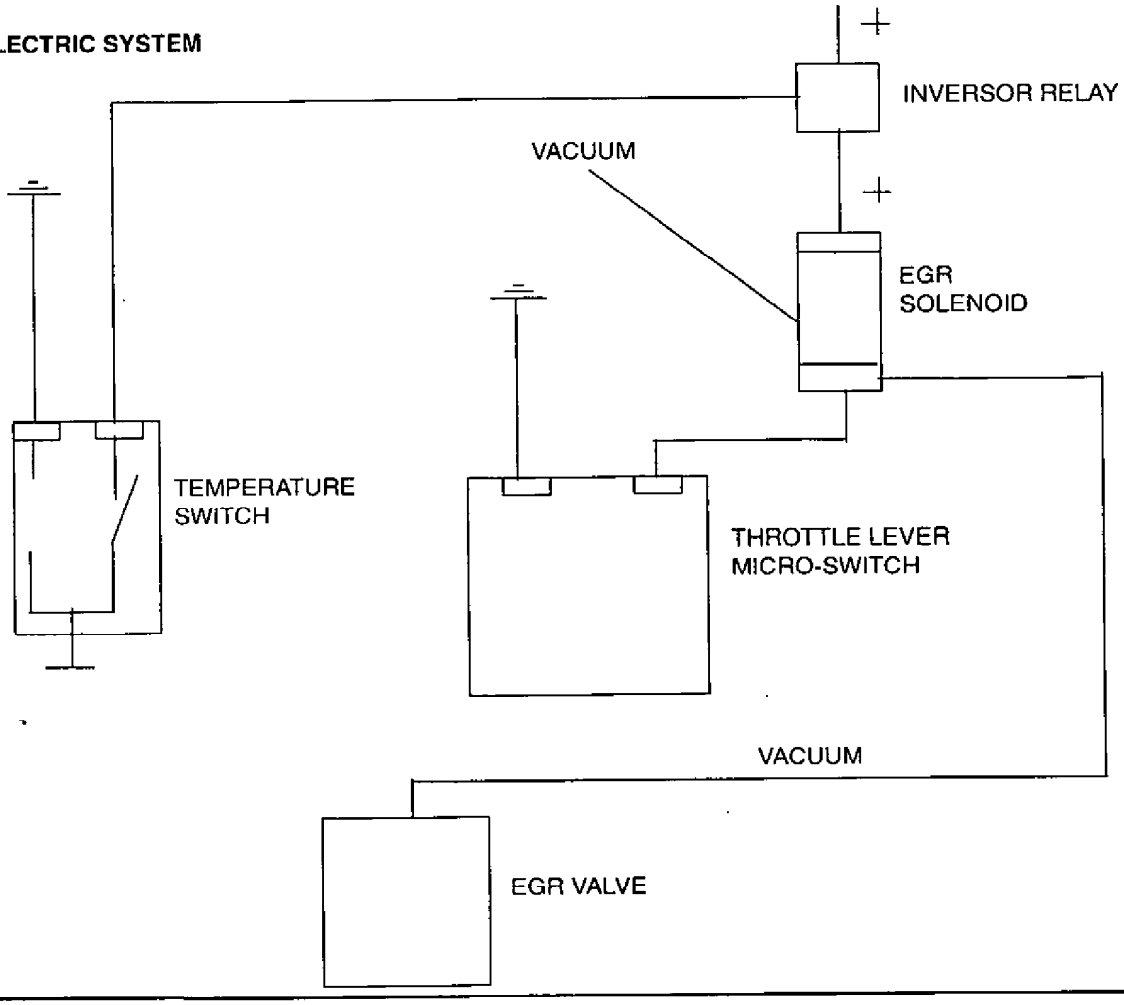
EGR SYSTEM DIAGRAM

EGR PNEUMATIC CIRCUIT

1. EGR valve
2. Exhaust gases admision
3. Exhaust to intake gases output
4. EGR actuator
5. Vacuum pump vacuum tube
6. Solenoid valve
7. EGR vacuum tube
8. Electric connections



EGR ELECTRIC SYSTEM



E.G.R. SYSTEM (COMPONENTS)

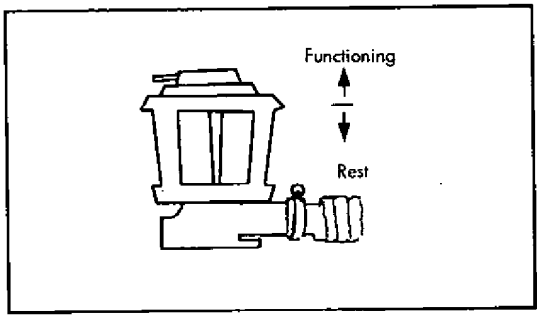
The E.G.R. system is designed to reduce pollution levels. This is why it allows a certain amount of exhaust gases to enter the engine under certain operating conditions. It's made up of the following components.

- **Temperature switch**
  This has two funcitons, one is to make EGR operative when coolant temperature is over 60º C and the other is to control the performance time of glow plugs. Its contact, is normally closed and it earths the circuit when temperature exceeds 60º C.
- **Throttle lever switch**
  This control the system when the throttle lever is moved from rest position to a position between **25-30 mm (1.00-1.20 in)**. From that position the electrical circuit is interrupted and EGR system stops.
- **EGR electric valve**
  When it receives current, it allows a vacuum to pass from vacuum pump to EGR valve.
- **EGR valve**
  This allows exhaust gases to pass into the inlet manifold when the valve is separated from its seat. This happens when vacuum is transmitted through EGR solenoid.
- **Relay**
  This cuts current to electro valve when starting, even when coolant temperature exceeds 60º C and throttle lever movement is under **25-30 mm (1.00-1.20 in)**.
- **Inversor relay**
  This supplies current to electric valve when the temperature switch is closed at 60º C.

EGR SYSTEM FUNCTIONING

When coolant temperature is under **60º C**, temperature switch is open, not earthing the inversor relay and preventing EGR electric valve from functioning. When temperature is over **60º C**, temperature switch is closed activating inversor relay, which will supply current to EGR electric valve, allowing vacuum to pass to EGR valve, this will be lifred from its seat allowing exhaust gases to flow into the intake manifold.

When throttle lever is moved from idle position to a driving of **25-30 mm (1.00-1.20 in)**, EGR system functions as previously described, but at that point **25-30 mm (1.00-1.20 in)** micro-switch placed on fuel distribution pump is opened and interupts the earth that activated the electric valve. In this way, vacuum to EGR valve is not present and exhaust gases are prevented from entering the engine's intace system.



EGR SYSTEM (INSPECTIONS)

If the E.G.R. system does not work, the driver will not notice a fault, but pollution levels will increase and could damage the exhaust catalyst.

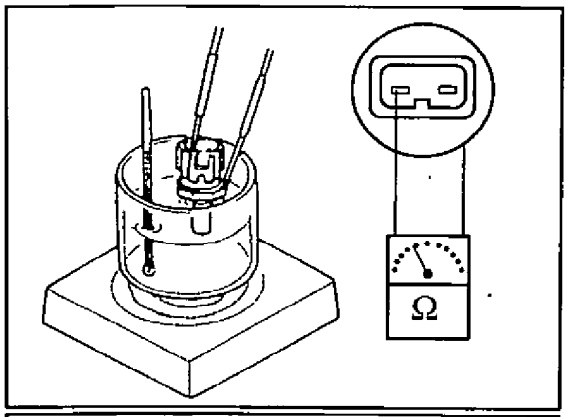
If the E.G.R. system functions incorrectly or permanently. the level of fumes will increase and engine performance will be affected. This is why the EGR system should be checked regularly in the following way:

General inspection

1) With cold engine (temperature under **60º C**) check that EGR membrane does not move independently of the throttle lever position.
2) Ensure the engine temperature is over **60º** C. Slowly move throttle lever and observe membrane which should return to rest position when throttle lever has moved between **25-30 mm (1.00-1.2 in)**.

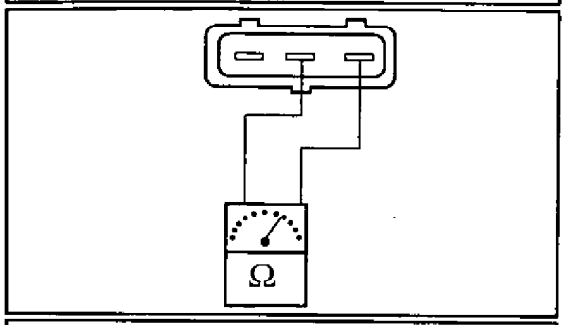
Electric cables

1) With engine running and hot, check one of the electric valve terminals for (+) and (-) earth in the other.
2) Check that when the thermocontact terminal is released, (+) disappears from the electric valve.
3) Check that when moving throttle over the first **25-30 mm (1.00-1.2 in)** earth (-) is disconnected on the other side of the electric valve.



Electric switch

1) Insert switch in a container of cold water and connect an ohmmeter as shown. In this condition, ohmmeter must indicate open circuit.
2) Raise temperature of the water and check at **60º C** that ohmmeter shows continuity.

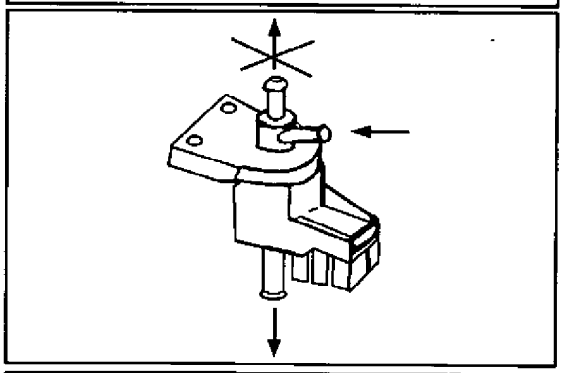


Throttle lever switch

1) Fit ohmmeter probes as indicated on the micro-switch connector.
2) Move throttle lever. In the first part from idle to **25-30 mm (1.00-1.2 in)**. the ohmmeter must indicated continuity. Beyond that point, resistance must be infinite.

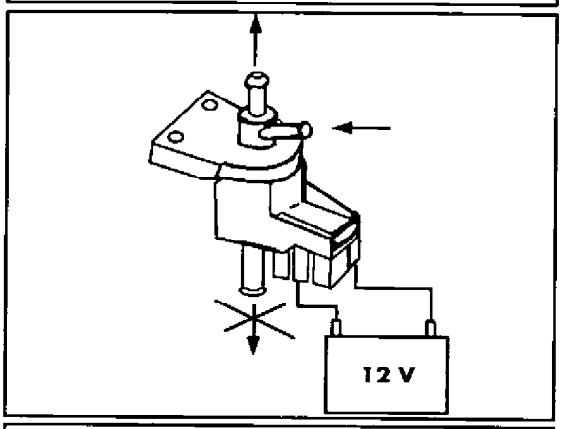
NOTE

Throttle lever switch can only be adjusted by a Lucas Service Centre.



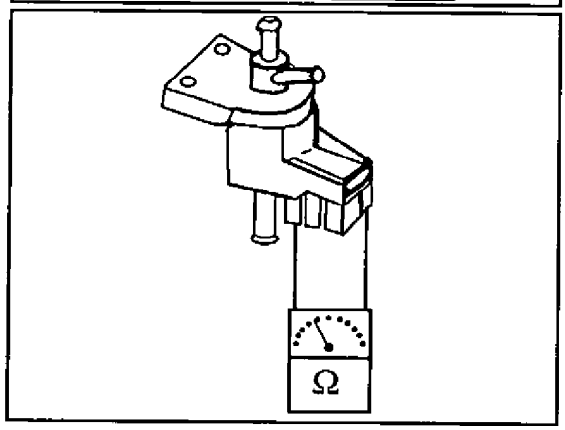
Electric valve

1) Blow through electric valve as shown and check that air comes out of the lower pipe.
2) Block lower exit and check no air comes out from the upper pipe.



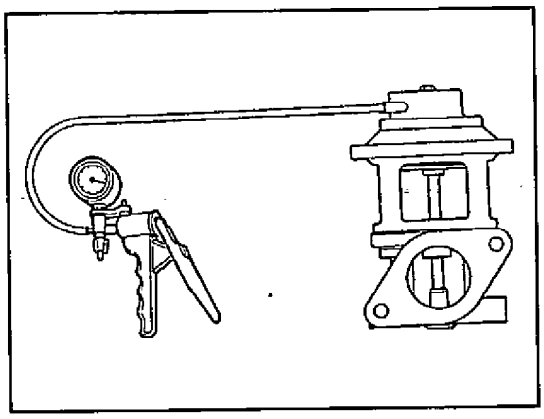
3) Connect the electric valve to a 12v power surce and check no air comes pipe from the lower pipe and it only comes out from the upper.
4) Check electric valve lower resistance at 20º C.

Electric valve resistance at 20º: 30 Ω approx.



NOTE

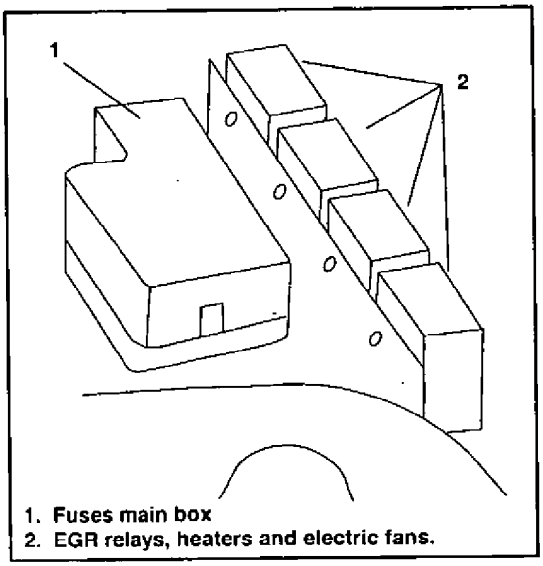
The electric valve upper tube must be connected to the vacuum pump and the EGR valve to its horizontal pipe. Reversing these connections will cause engine and braking malfunctions.



EGR valve

Asuming EGR system works correctly, if the valve upper tube is removed when the engine is at idle, the sound of the engine will slightly change. If this does not occur, check its functioning, by applying the following procedure:

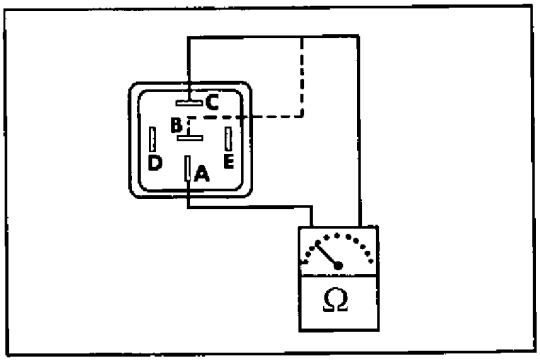
1) Check the valve is closed.
2) Apply vacuum as shown at left, and check that the valve opens.
3) Maintain vacuum for **10 sec.** with vacuum pump and ensure the reading does not drop.

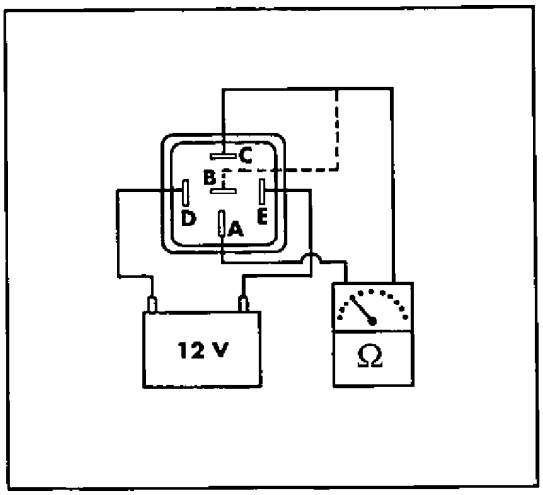


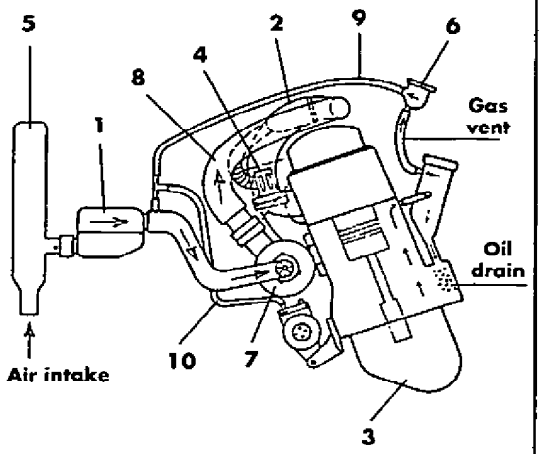
1. **Fuses main box**
2. **EGR relays, heaters and electric fans.**

Relays

1) Remove the four relays placed next to the fuse main box.
2) Identify the EGR system relays and central heaters according to the line colours and the electrical diagram.
3) Separate relay from its connector and perform the following tests:
   - Use an ohmmeter to confirm an open circuit between A and C.
   - Check, for a closed circuit between A and B.
   - Feed points D and E with a 12v supply.
   - Check for continuity in this situation between A and C and open circuit between A and B.
   - Replace those relays not performing as above.







1. Air filter
2. Intake collector
3. Oil sump
4. EGR valve
5. Air-resonator intake
6. Regulator
7. Turbocompressor
8. Turbo line – intake collector
9. Engine ventilation line
10. Vacuum pump outflow lines

TURBO-DIESEL INTAKE SYSTEM

POSITIVE CRANKCASE VENTILATION SYSTEM (PVC)

Functioning

1) Gases generated in the oil sump rise through ventilation pipes, through the valve, and into the turbocompressor where they are sucked into the engine by the cylinders.

Maintenance

1) Check and replace valve whenever the following are observed:
   - Bluish exhaust fumes.
   - Excess pressure in the crankcase which can cause oil loss through front and rear crankshaft retainer.

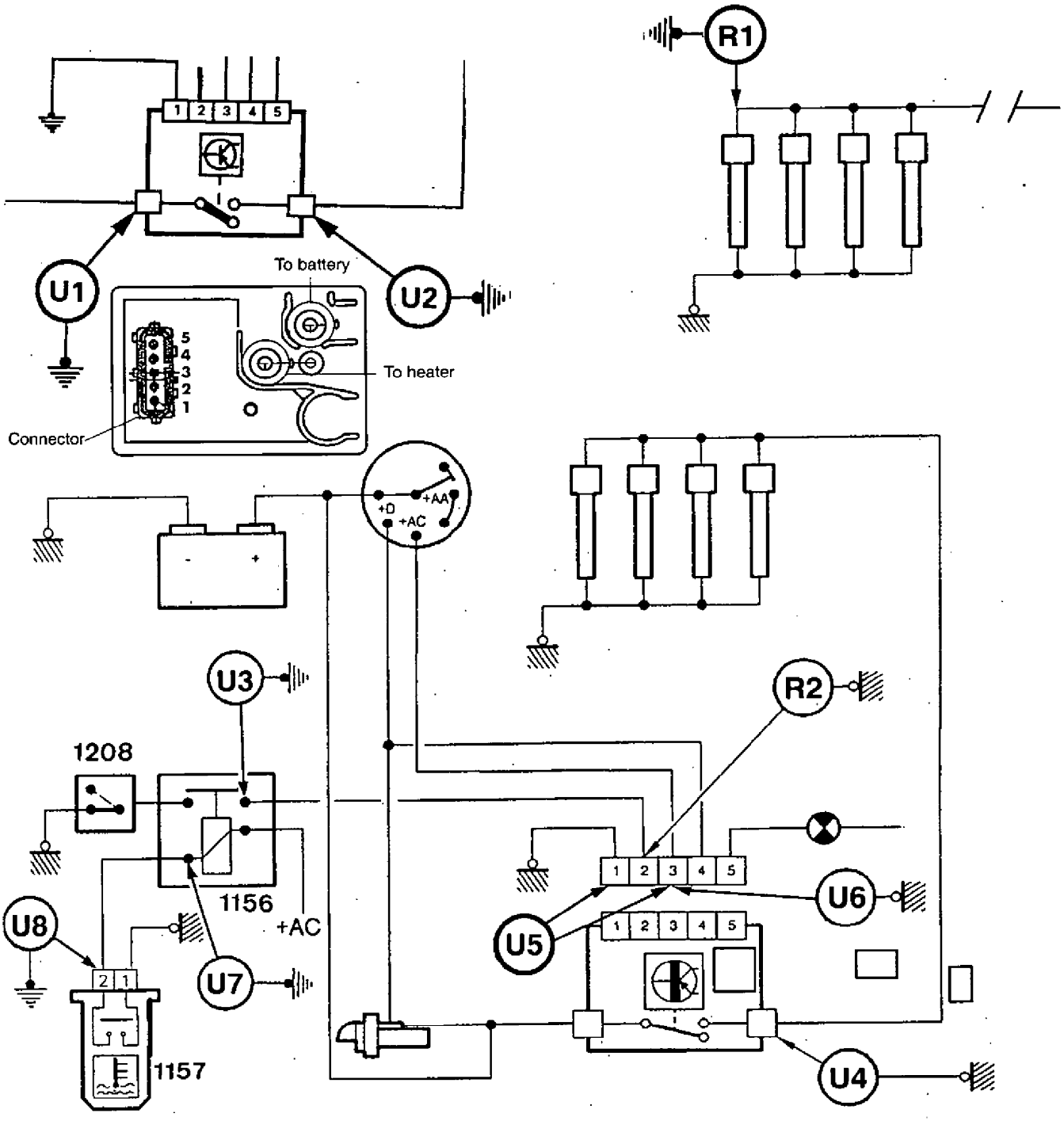
GLOW PLUG CIRCUIT

FUNCTIONING

Pre-heating system supplies the necessary temperature to combustion pre-chamber which facilitates cold start. It consists of:

- Four glow plugs, connected in parallel, which provides the proper temperature to combustion pre-chambers.
- Pre-heating control which controls current feeding time to heaters for 9 seconds from initial start-up, when engine is cold.
- Thermocontact (the same as for EGR). Under **60º C** it is kept open and its relay remains deactivated. Over **60º C** thermocontact closes and relay activates earthing the heater control, considerably reducing heaters feeding time.

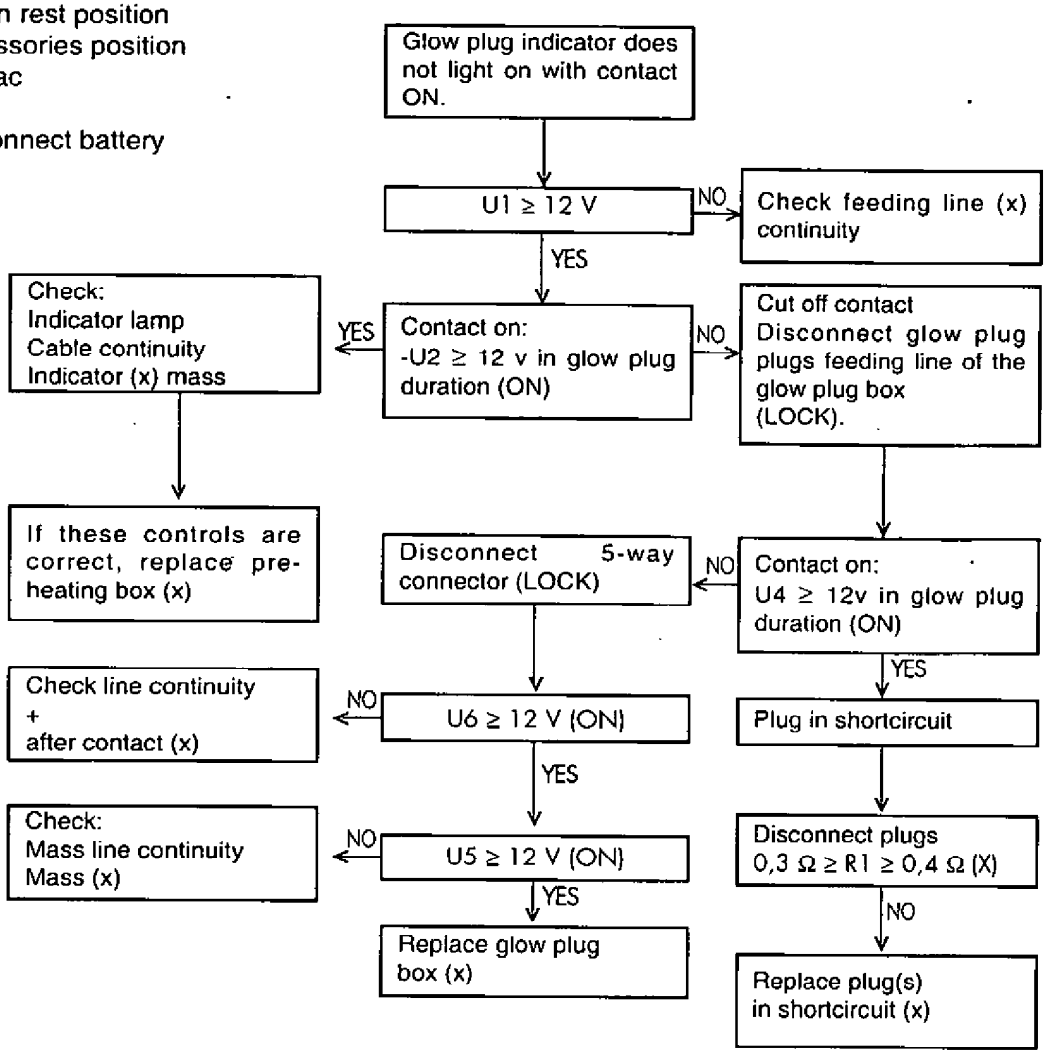
INSPECTIONS



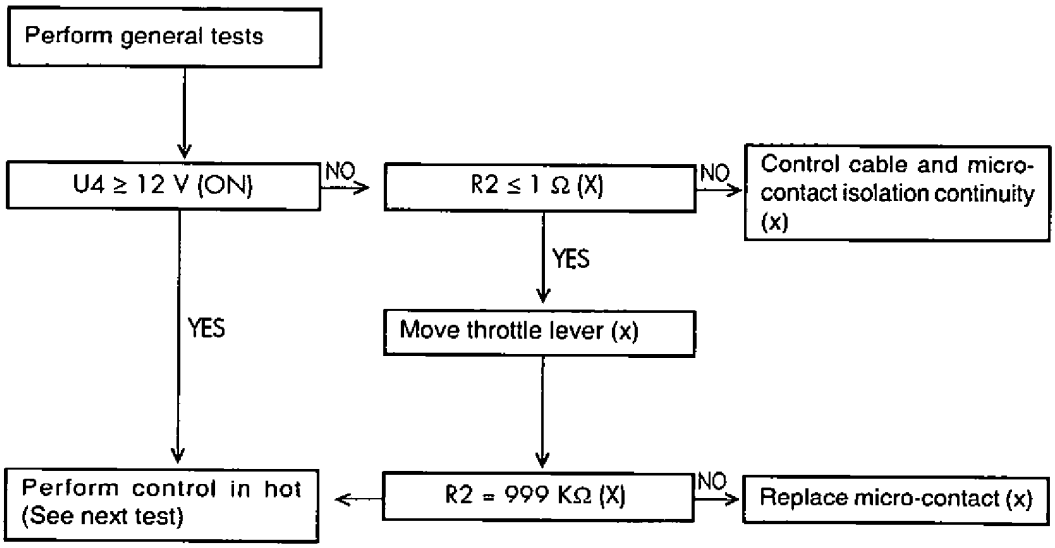
GENERAL TESTS

NOTE: When using multimeter as ohmmeter, ensure there is no voltage in the circuit. Fit ignition key in the indicated position.

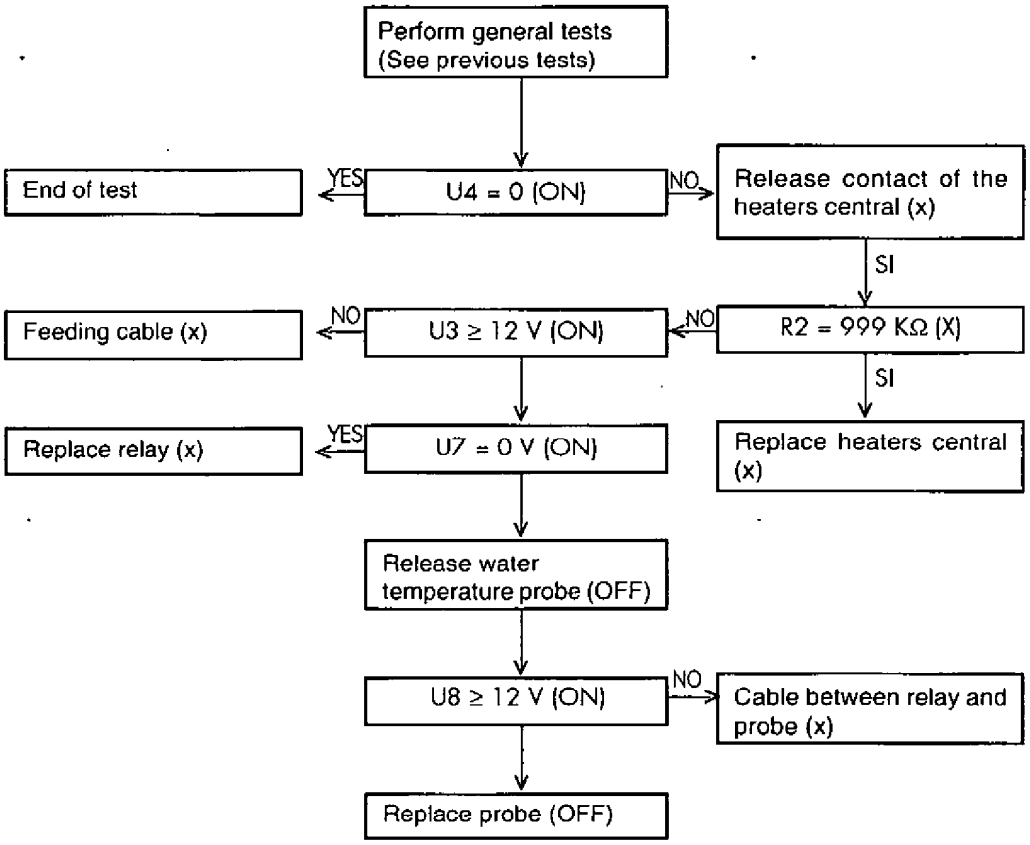
Abbreviations:
LOCK = Key in rest position
ACC = Accessories position
ON = Contac
START = Start
X = Disconnect battery



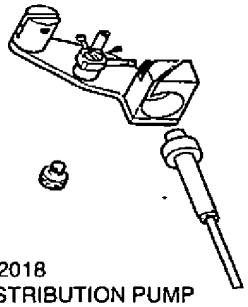
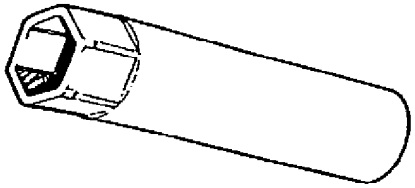
CONTROLS WITH HOT ENGINE (TEMPERATURE OVER 60º)



CONTROLS WITH COLD ENGINE (TEMPERATURE UNDER 60º)



SPECIAL TOOLING

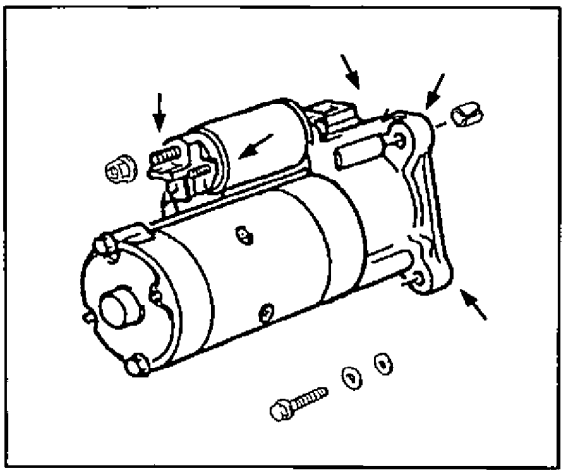
 00000V02008 T.D.C. FIXER	 00000V02018 FUEL DISTRIBUTION PUMP COMPARATOR SUPPORT	 00000V02013 INJECTORS EXTRACTION WRENCH
 00000V02017 SEMI-CIRCLE WRENCH	 00000V02001 INJECTORS EXTRACTION WRENCH	

SECTION 6G

STARTER SYSTEM

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STARTER MOTOR REPLACEMENT 6G-1



STARTER MOTOR REPLACEMENT

Characteristics

Brand: **BOSCH**
Voltage: **12 v**
Power: **1.7 Kw**
No. of teeth in pinion: **11**

Disassembly

1) Disconnect the battery negative cable
2) Release positive cable and relay cable from the starter motor.
3) Slacken and remove the starter motor three attaching bolts.

Assembly

1) Perform assembly in reverse order as disassembly.
2) Tighten starter motor bolts according to its to specifications.

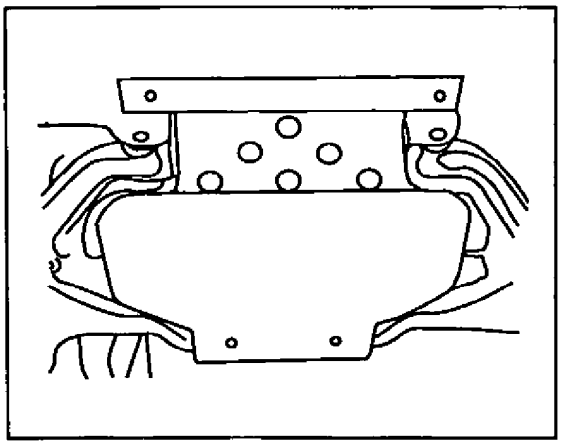
Torque specification for starter motor attaching bolts: 20-30 Nm (2.0-3.0 kg.m, 14.5-21.0 lb.ft).

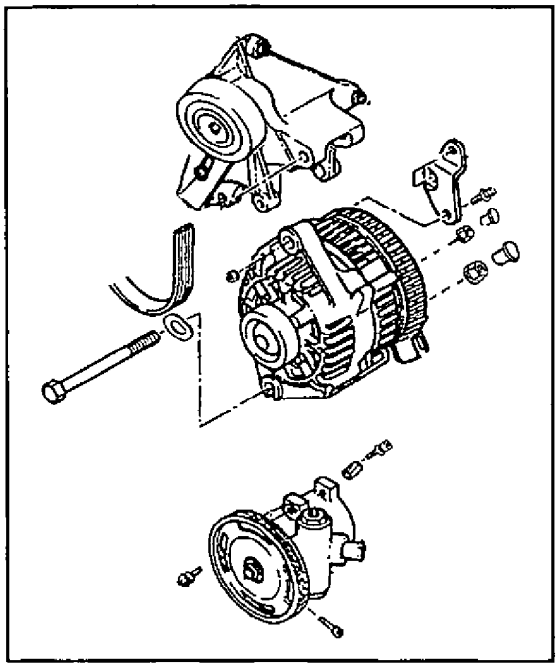
SECTION 6H

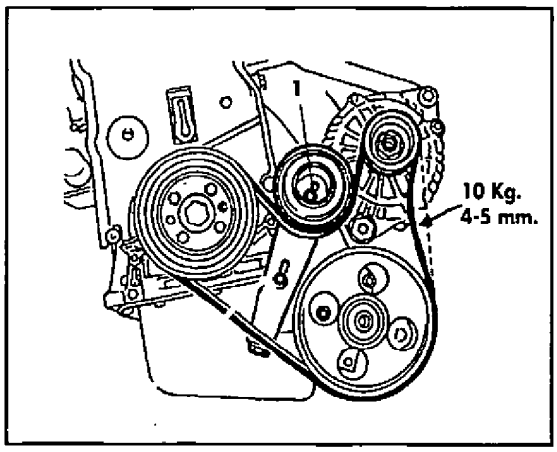
CHARGING SYSTEM

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ALTERNATOR REPLACEMENT 6H-1







ALTERNATOR REPLACEMENT

Characteristics

Brand: **BOSCH**
Nominal voltage: **14 v**
Maximum outflow: **70A**
Polarity: **Ground negative**
Vacuum speed: **r.p.m. 1,200**
Regulated voltage: **14.5 ± 0.3 v**
Maximum speed allowed: **r.p.m.18,000**

Disassembly

1) Remove lower soundproof plate.
2) Remove negative cable from battery.
3) Slacken vacuum pump tensioner and extract vacuum pump belt.
4) Slacken two bolts at the sides and at the lower part of the alternator tensioner and remove belt.
5) Remove attaching nuts and remove alternator positive and drive cables.
6) Remove lower and upper alternator support bolts.

Assembly

1) Reverse the order of disassembly, tightening bolts to their torque specification.

Torque specification for alternator tensioner bolts:
11-22 Nm (1.1-2.2 kg.m, 8.0-16.0 lb.ft).

Alternator belt tension:
10 mm (0.40 in) with 100 N (10 kg, 22 lb).

Vacuum pump belt tension:
10 mm (0.40 in) with 100 N (10 kg, 22 lb).

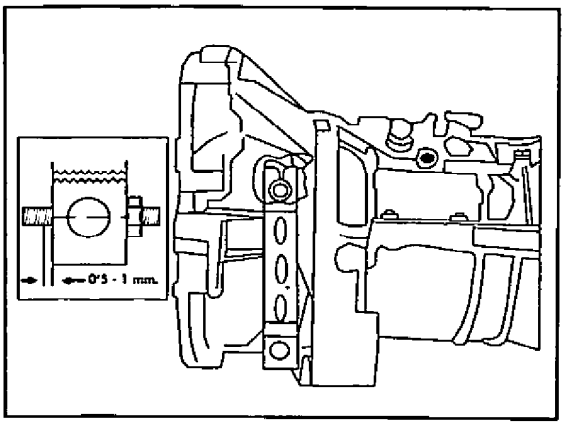
SECTION 7C

CLUTCH

NOTE
For topics not covered in this section, please refer to the corresponding section of the Vitara Service Manual outlined in the PREFACE.

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Clutch system. 7C-3
Operation Shaft Disassembly. 7C-3



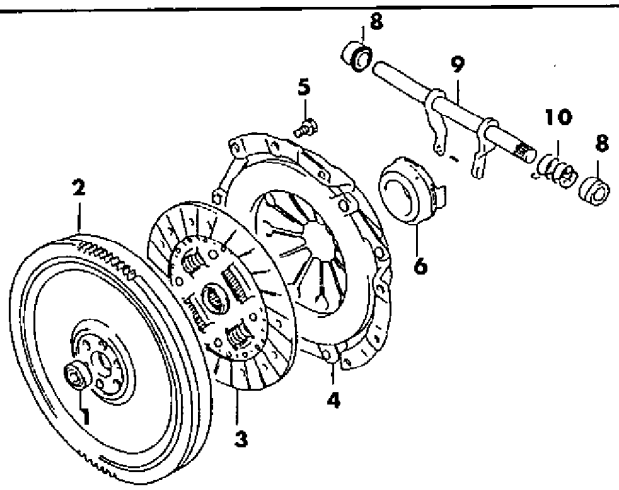
IN THE VEHICLE

ADJUSTMENT OF CLUTCH CABLE

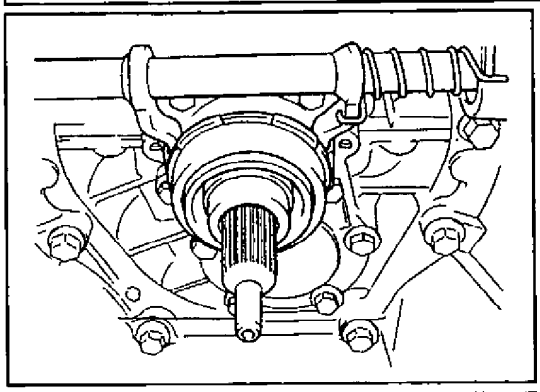
1) Lightly depress the clutch lever to remove the free play.
2) This required a force of **10 Nm (1.0 kg.m, 7.5 lb.ft).**
3) Adjust cable free-play to **0.5-0.10 mm (0.020-0.040 in)** using the adjusting nut.

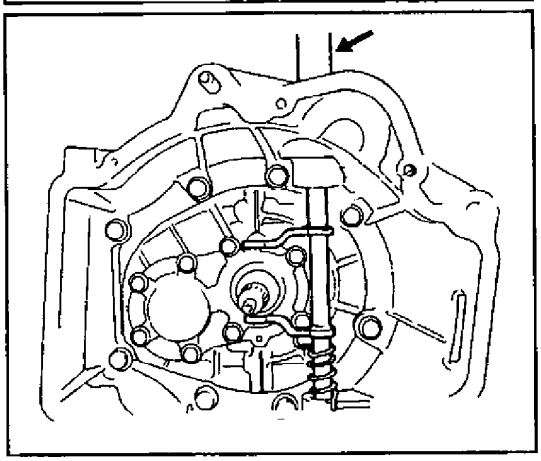
GENERAL REPAIR OF ASSEMBLY

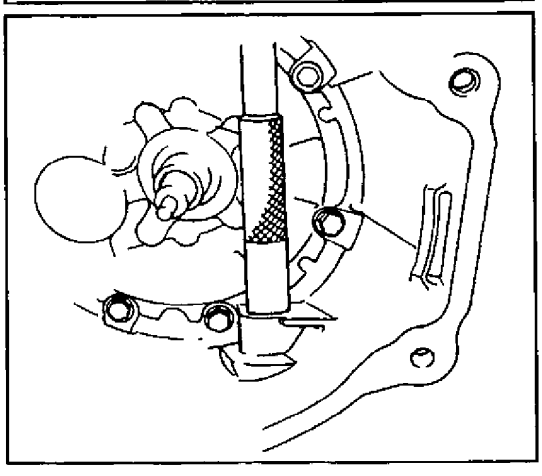
CLUTCH SYSTEM



1. Input shaft bearing.
2. Flywheel
3. Clutch disc
4. Clutch cover
5. Bolt
6. Thrust bearing
7. Shaft sealing
8. Bushing
9. Clutch shaft
10. Return spring







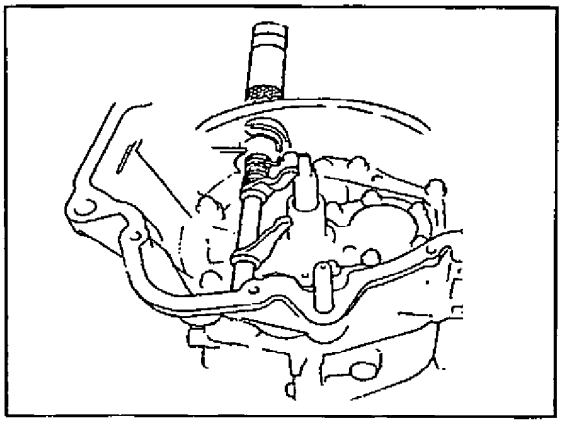
OPERATION SHAFT DISASSEMBLY

Disassembly

1) Remove transmission and transfer case from vehicle.
2) Remove thrust bearing.
3) Disconnect return spring, sliding clutch shaft outwards.
4) Push downwards the bushing on the right side with special tool until the shaft and bushing are out of their housing.
5) Extract bushing on the right side and move clutch shaft upwards, until the lower end is disconnected from the bushing, and then extract shaft of the clutch case.
6) Knock from outside, to remove bushing on the left side.

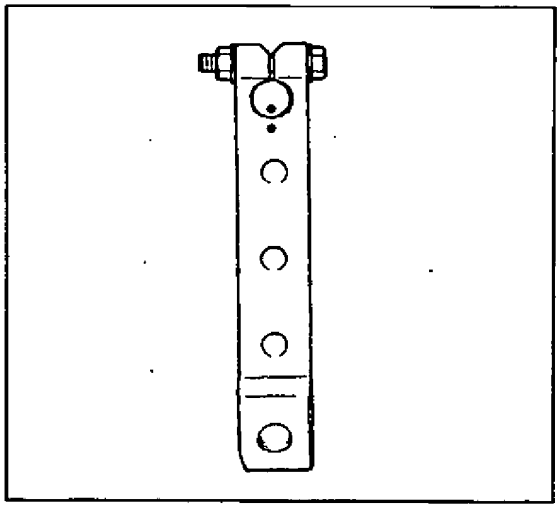
Inspection

1) Check clutch bearing turns smoothly.



Assembly

1) Press the right-hand bush into the housing until it stops. Apply grease to the inner surface.
2) Insert the clutch actuating shaft complete with spring into the housing having greased the right hand end.
3) Grease the inside of the left hand bush and its complementary surface on the shaft.
4) Press the left hand bush into position ensuring that the chamfered end is out board until the chamfer ridge is level with the casing.
5) Position the spring ends, one on the casing and the other on the fork.

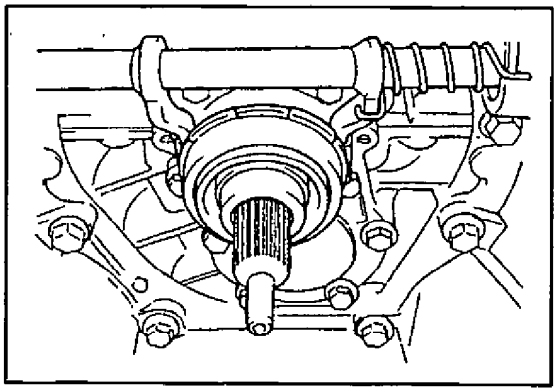


CAUTION
Do not wash thrust bearing, this could cause grease to leak and consequently damage the bearing.

Assembly

1) Fit clutch lever so that it aligns with center punch marks and tighten bolt and nut.

Torque specification: from 10-16 Nm (1.0-1.6 kg.m, 7.0-11.5 lb.ft).



2) Apply graphite grease inside the sliding surface of the thrust bearing, assembly it and check it is properly fitted in the fork.
3) Assemble transmission and transfer case on the vehicle.
4) Assemble clutch cable and perform adjustment as previously described.

SECTION 8

ELECTRICAL SYSTEM

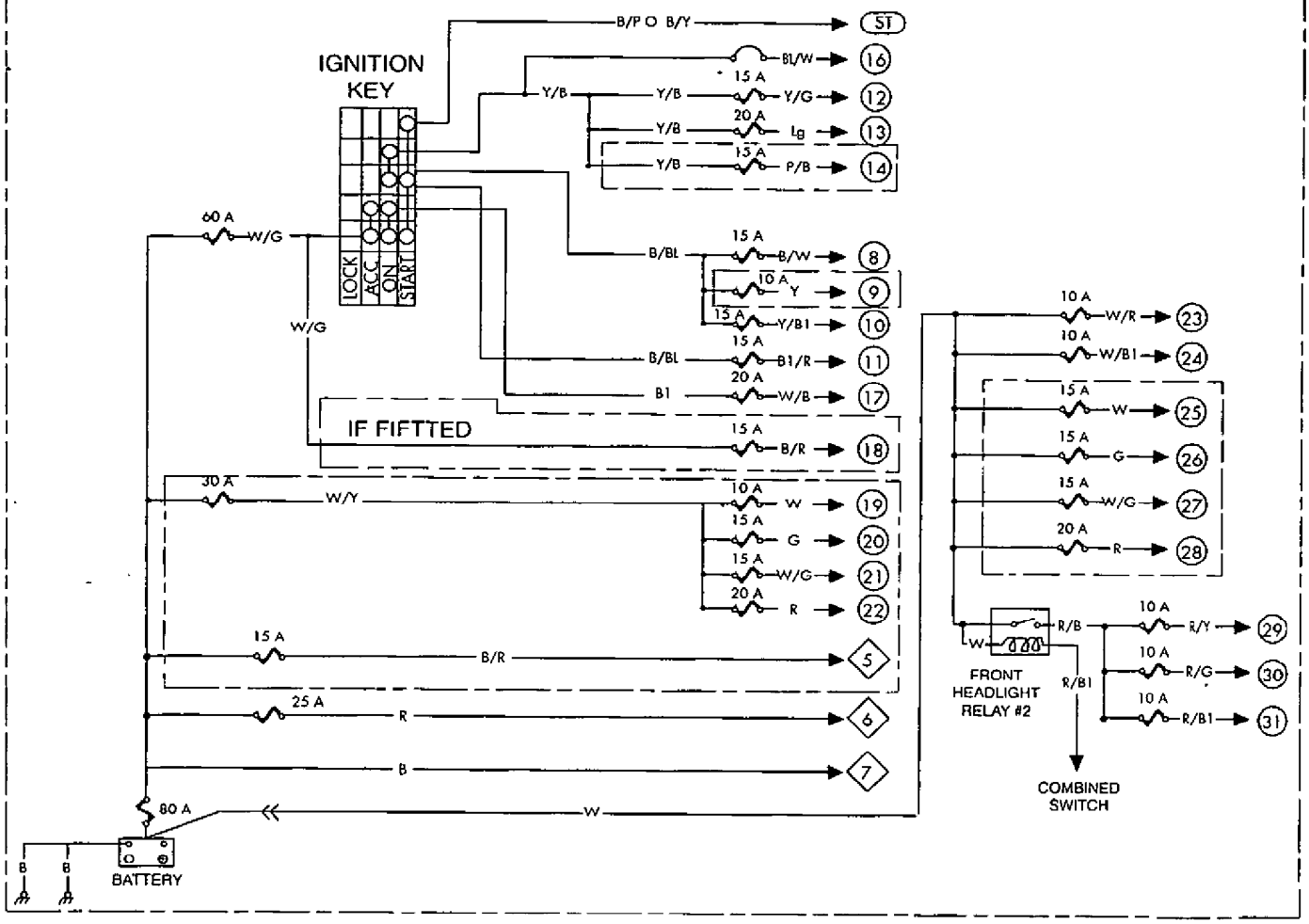
NOTE
For topics not covered in this section please refer to the corresponding section of the Vitara Service Manual in the PREFACE.

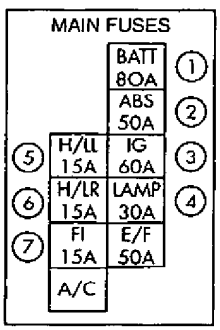
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CHASSIS ELECTRICAL SYSTEM

FUSES

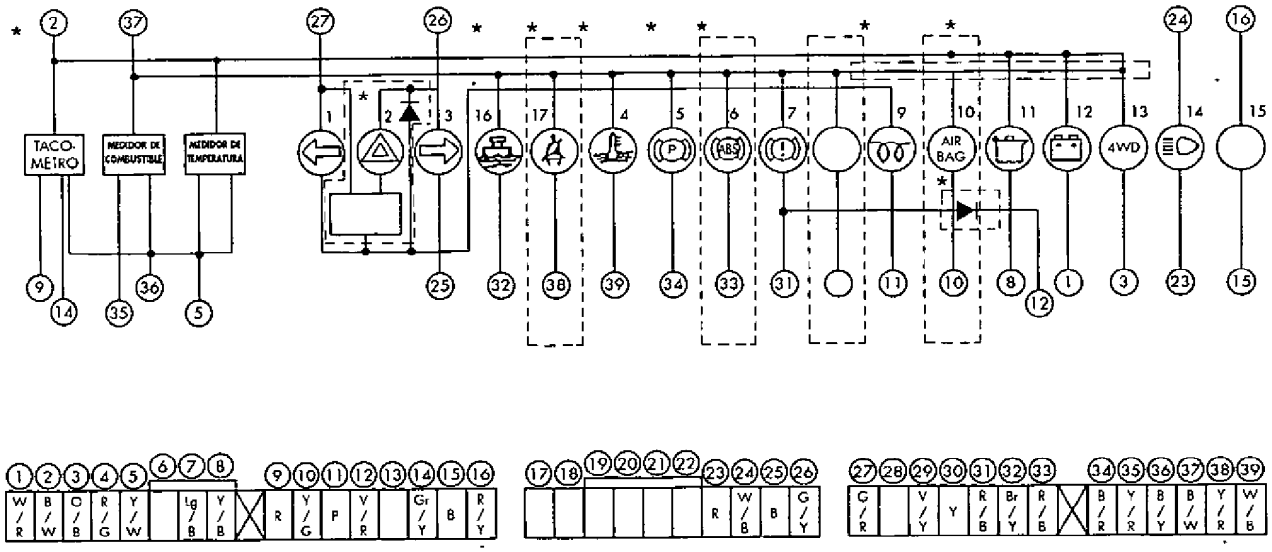




ONLY USE INDICATED FUSES						
10A	10A	10A	15A	15A	15A	20A
RIGHT AND LEFT HEADLIGHTS		INTERIOR LIGHTS	BRAKE AND HORN LIGHTS	HAZARD LIGHTS	WINDSCREEN DEMISTING AND DEFROSTING	ENGINE HEATER
10A	10A	10A	20A	15A	10A	15A
NUMBER PLATE LIGHT	POSITION LIGHTS (RIGHT)	POSITION LIGHTS (LEFT)	CIGARETTE LIGHTER AND RADIO	RPM METER	REVERSE AND INDICATOR LIGHT	WINDSCREEN WIPERS
SUZUKI						

INSTRUMENTS AND DIALS

INSTRUMENT PANEL



1. Turn signal dial (left side)
2. Hazard light
3. Turn signal (right side)
4. Temperature gauge
5. Parking light
6. ABS light (if fitted)
7. Brake wear warning light
9. Heater light
10. "AIR BAG" light
11. Oil pressure gauge
12. Alternator charge gauge
13. 2WD light
14. Road lamp
15. Instrument panel light
16. Coolant temperature warning
17. Seat belt warning lamp (if fitted)

①	To alternator	White/Red
②	To ignition	Black/White
③	To 4WD switch	Orange/Black
⑤	To water temperature sensor	Yellow/White
⑧	To pressure switch	Yellow/Black
⑨	To r.p.m. sensor	Brown/White
⑩	To AIR BAG unit	Yellow/Green
⑪	Heaters relay	Pink
⑫	To ignition	Violet/Red
⑮	To light key	Black
⑯	To light relay	Red/Yellow
㉓	To headlamps	Red
㉔	To fuse box	White/Blue
㉕	To ground	Black
㉖	To indicator light (left side)	Green/Yellow
㉗	to indicator light (right side)	Green/Red
㉛	To Brake fluid level switch	Red/Black
㉜	To cooling level switch	Light Green/Red
㉝	To ABS control unit	Red/Blue
㉞	To parking brake switch	Black/Red
㉟	To fuel gauge	Yellow/Red
㊱	To ground	Black/Yellow
㊲	To ignition	Black/White
㊳	To seat belt switch	Yellow/Red
㊴	To temperature switch	White/Black

SECTION 8B

CODED VEHICLE IMMOBILIZER

NOTE
For topics not covered in this section, please refer to the corresponding section of the Vitara Service Manual outlined in the PREFACE.

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Activating lock (on opening and closing driver's door) **8B-18**
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GENERAL OUTLINE

The coded vehicle immobilizing system is a mechanism designed to lock the fuel injection system, as long as the access code established by the owner is not entered. It consists of the following components.:

- **Engine control module (ECM)**
- **Injection relay (IR)**
- **Coded immobilizing keypad (CIK)**

It functions in the following way:

STARTING THE ENGINE

When the ignition key is entered and turned to ON position:

- If the green light on keypad comes on, the engine can be started directly.
- If the red light on keypad comes on, the immobilizing system is activated and it is necessary to enter the personal access code.

To start up the engine with the red light on, it is necessary to key in your personal four-digit number. The green light will come on and the red light will go off.

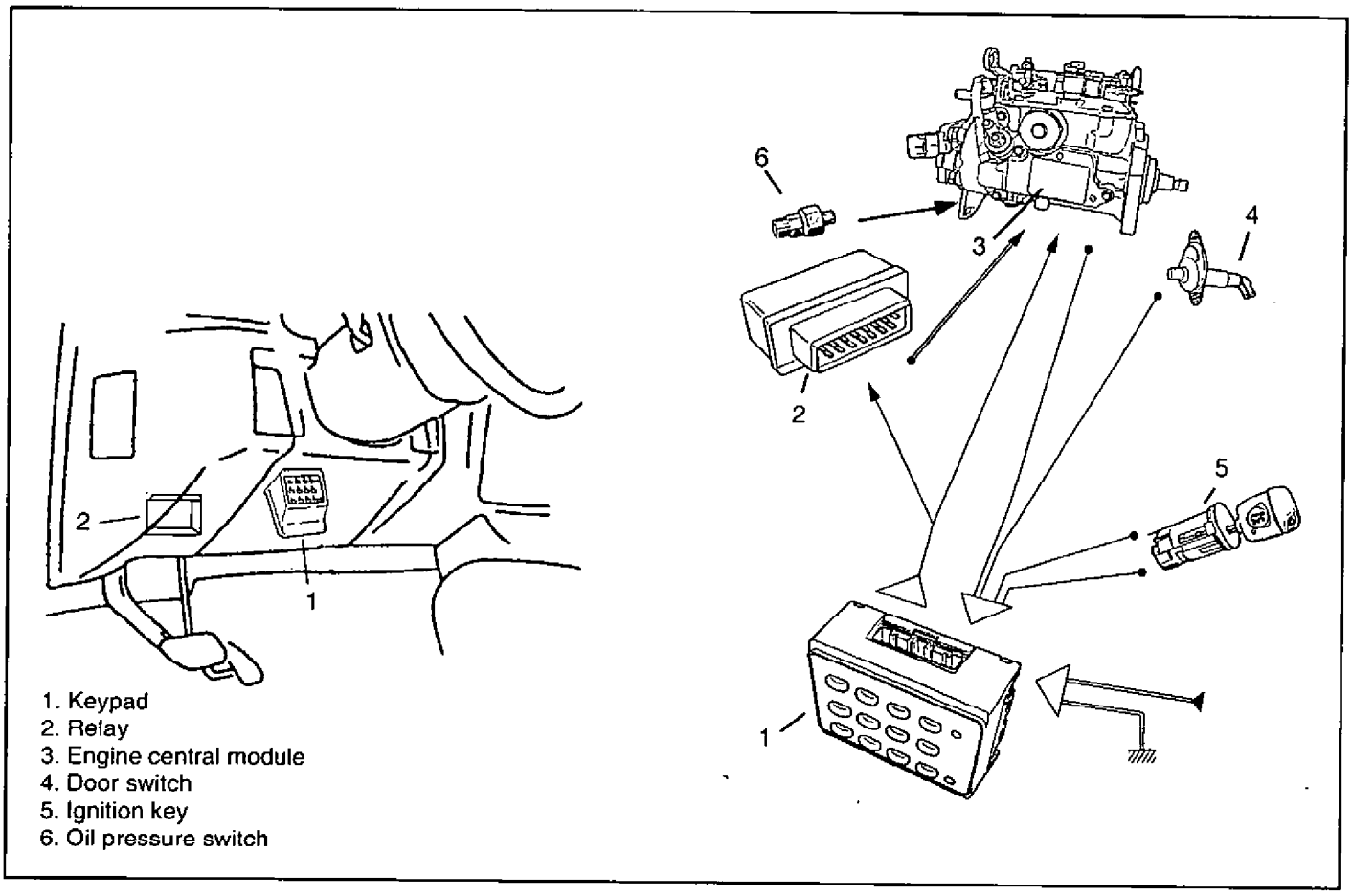
On leaving the Factory all vehicles have the code 1111 entered, which the customer may use if they do not wish to change it.

If you key in the wrong number, key in the correct four-digit code again. Each time a key is pressed a "beep" is heard. If an error is made on entering a code or in the process for changing a code, this is signalled by a two second warning sound.

With the ignition on, a "beep" sound is made if an attempt is made to start the engine up with the immobilizing system activated. This becomes permanent if the attempt to start continues.

NOTE

If the incorrect code is entered three times in succession, the keypad is rendered immobilized for thirty minutes.



1. Keypad
2. Relay
3. Engine central module
4. Door switch
5. Ignition key
6. Oil pressure switch

ENTERING PERSONAL CODE FOR FIRST TIME

This should be effected in the following way:

1). Turn ignition key to ON position.
2). Enter code 1111.
3). Press key C.
4). Enter a personal four-digit code.
5). Press key C to validate operation. This operation is confirmed by four green flashes and four "beep" sounds.

MODIFYING PERSONAL CODE

This operation should be effected in the following way:

1). Turn the ignition key to ON position.
2). Enter memorized code.
3). Press key C.
4). Enter new four-digit code.
5). Press key C to validate operation. This operation is confirmed by four green flashes and four "beep" sounds.

SECURITY MEASURES

The two codes (the old one preserved or new one validated) remain present until one of them is used, automatically anulling the other.
If the code is not confirmed, take out the key, enter once more and repeat the operation.
Simultaneous flashing of red and green lights indicates an incorrect operation or a malfunction. If this occurs, wait for approximately a minute, switch off and then on again. If the problem persists, a diagnosis of the fault should be effected as indicated below.

SETTING IN SERVICE MODE

This process allows the customer to let a garage or another person use the vehicle without knowing their personal code.
This mode allows the use of inmobilizer function with a variable code, regardless your own code (four digits).
This operation should be effected in the following way:

1. Enter personal code and press S.
2. Enter service code (the code 1111 is recommended) and press S.

Six green flashes accompanied by six "beep" sounds confirm the operation.
The service code is automatically anulled when the personal code is entered again, it being unnecessary to go through the code modification process again.

LOCKING SYSTEM

Locking is effected automatically on switching off in the following cases.

1.Thirty seconds after opening and closing of driver's door.
2.Ten minutes after switching off.

NOTE:

The oil pressure gauge switch is responsible for informing the engine control module, if the engine is off or running.
If the driver leaves the vehicle without turning off the engine, on opening the door the latter's switch sends a locking signal via the engine control module keypad. At the same time, the oil pressure gauge sends another signal to the running engine. This signal reaches the coded immobilizing module control so that the order received from door switch to lock doors is not effected.

IDENTIFICATION OF SYSTEM

System locking can be checked after thirty seconds by observing the red keypad light. This light comes on for ten seconds after system locking and then flashes until the starter motor is engaged again.

NOTE

In the event of a malfunction or the battery current being cut off, the personal code remains in the memory. In the event of the personal code being lost, it is necessary to replace the coded ignition engine control module.

DIAGNOSIS

INTRODUCTION

To effect a correct diagnosis and repair of the coded immobilizing mechanism the following steps should be taken:

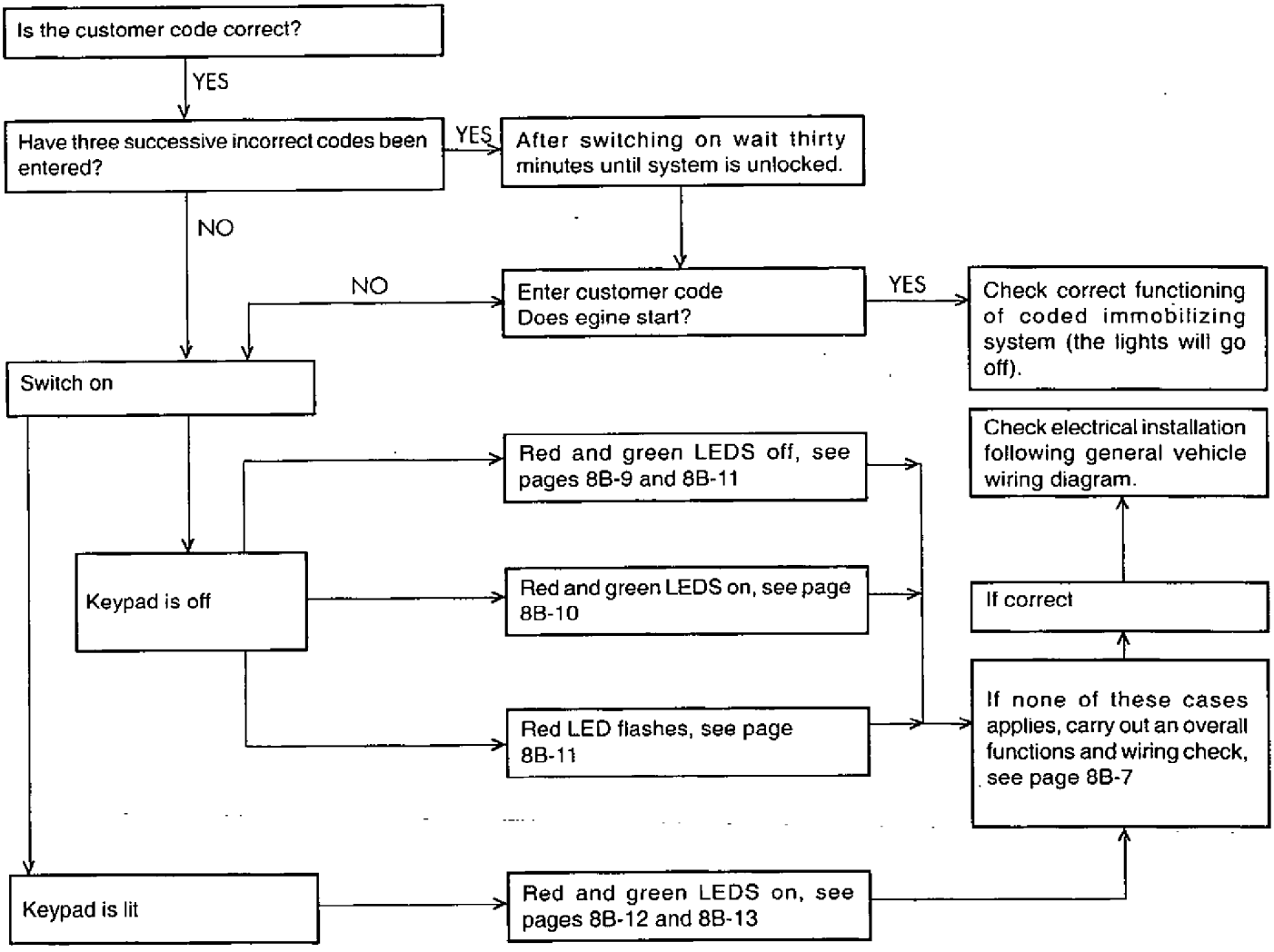
1) Talk to the with customer to know defective functioning symptoms of system and the conditions in which they have occurred.
2) Closely read the "General Outline" chapter in this section to gain thorough knowledge of the system.
3) Please refer to flow charts for each of the defects detected (see defect analysis).
4) Carry out repair to corresponding mechanism.
5) Perform test to confirm correct repair.

PRECAUTIONS ON DIAGNOSING MALFUNCTIONS

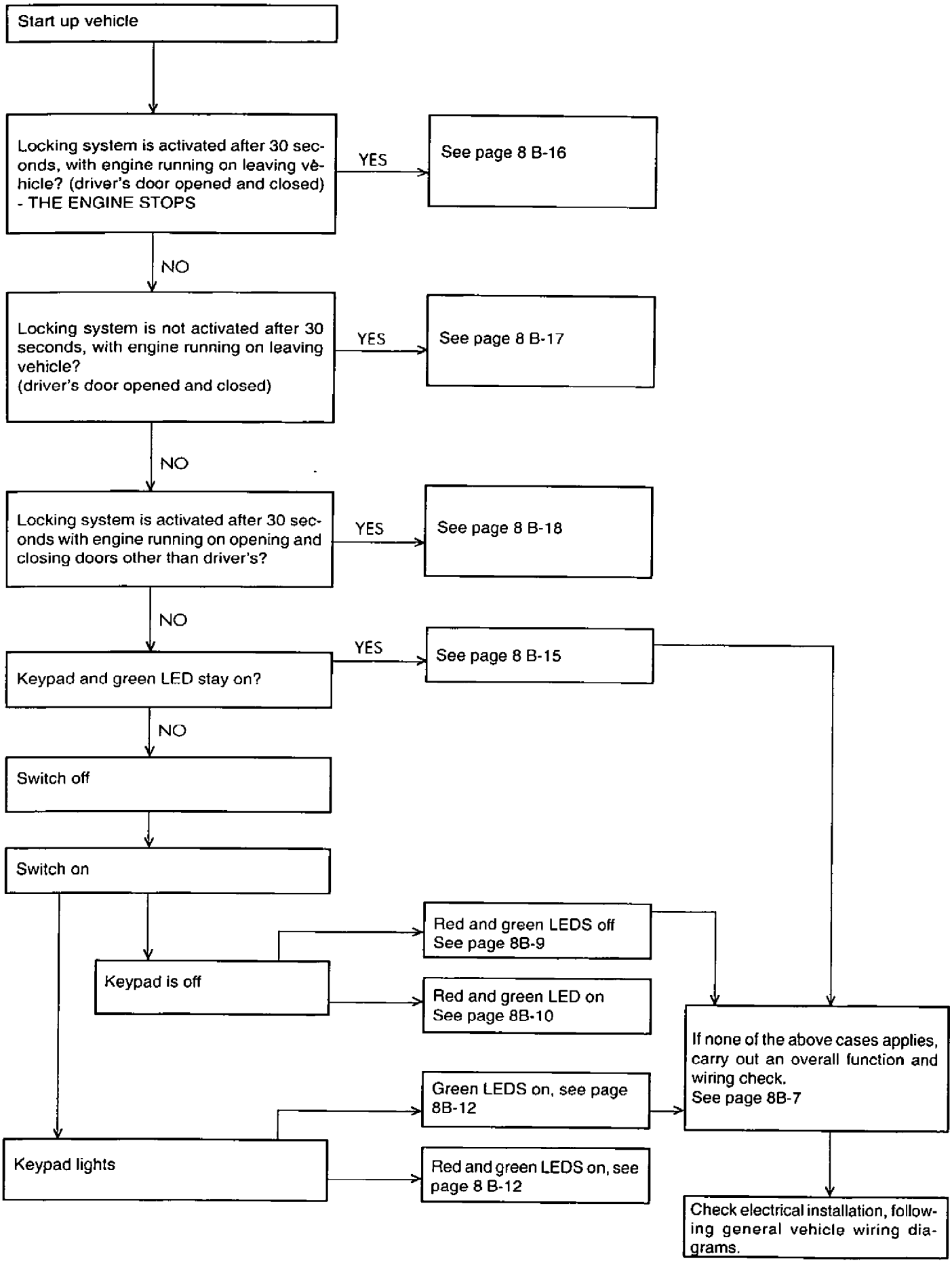
1) Do not disconnect:
   - Battery with the engine running.
   - E.C.M. relay or keypad after switching on.
2) Ensure that the battery is completely charged and that voltage is not lower than 12 v nor higher than 16 v.
3) The majority of intermittent problems are a result of:
   - Bad condition of cables or connections.
   - Incorrect power supply of terminals, or loose connections.
   - Terminals badly conformed or damaged.
   - Oxidized terminals.
   - Faulty connection between terminal and cable.

   Ensure these faults are repaired before continuing with diagnosis.
4) Do not use a pilot lamp or go over an electric arc with a wire to check continuity of a circuit.

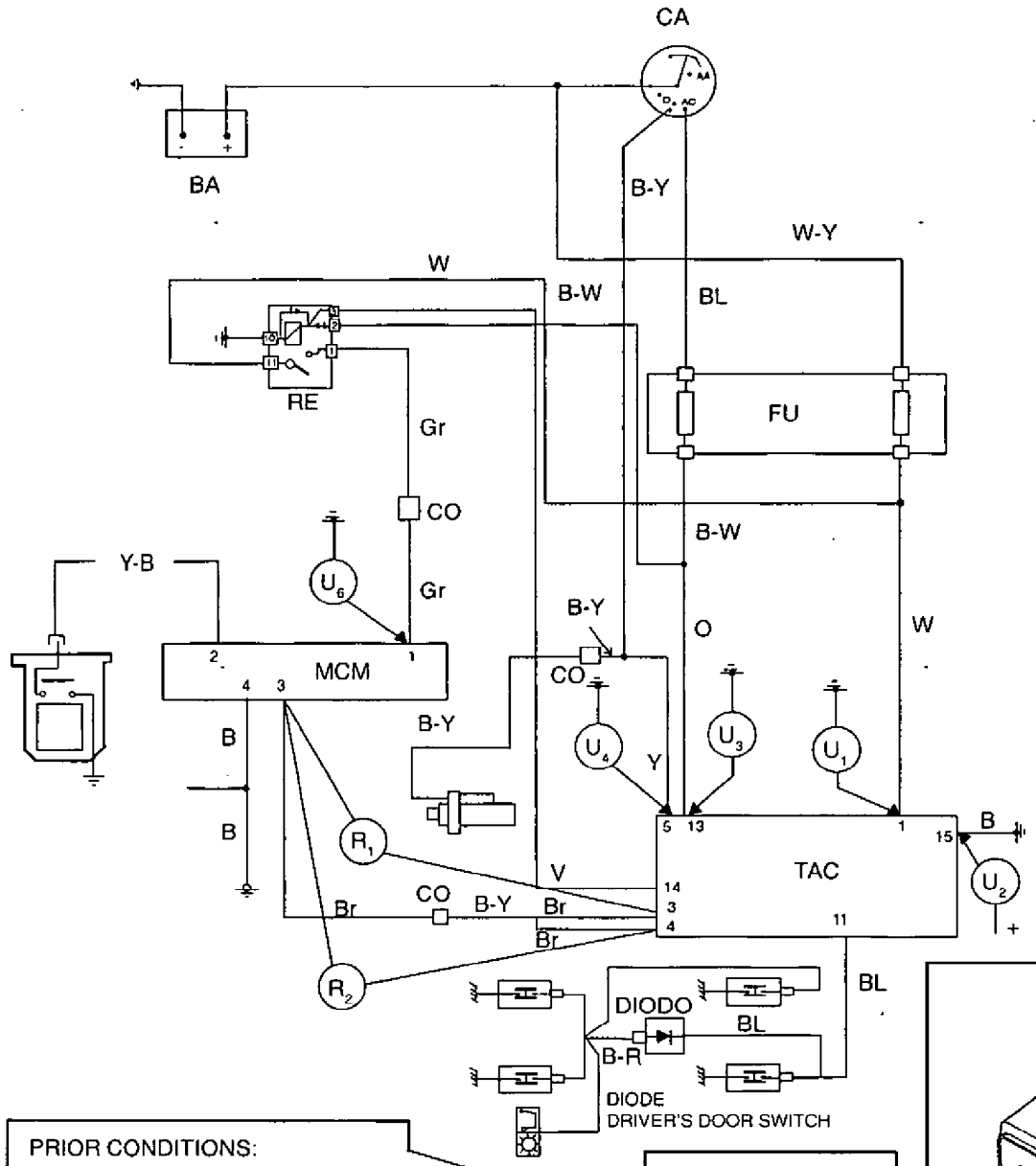
DEFECT ANALYSIS
A-1 ENGINE DOES NOT START

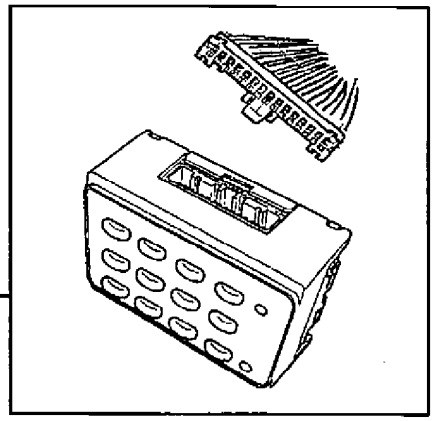


A-2 ENGINE STARTS



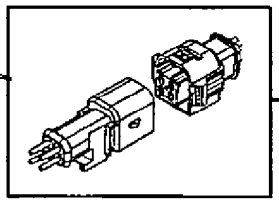
WIRING TEST



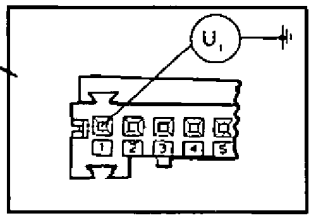


PRIOR CONDITIONS:
- BATTERY VOLTAGE = 12V
- ENGINE CONTROL MODULE DISCONNECTED
- KEYPAD CONNECTOR DISCONNECTED

Check keypad connector as follows:

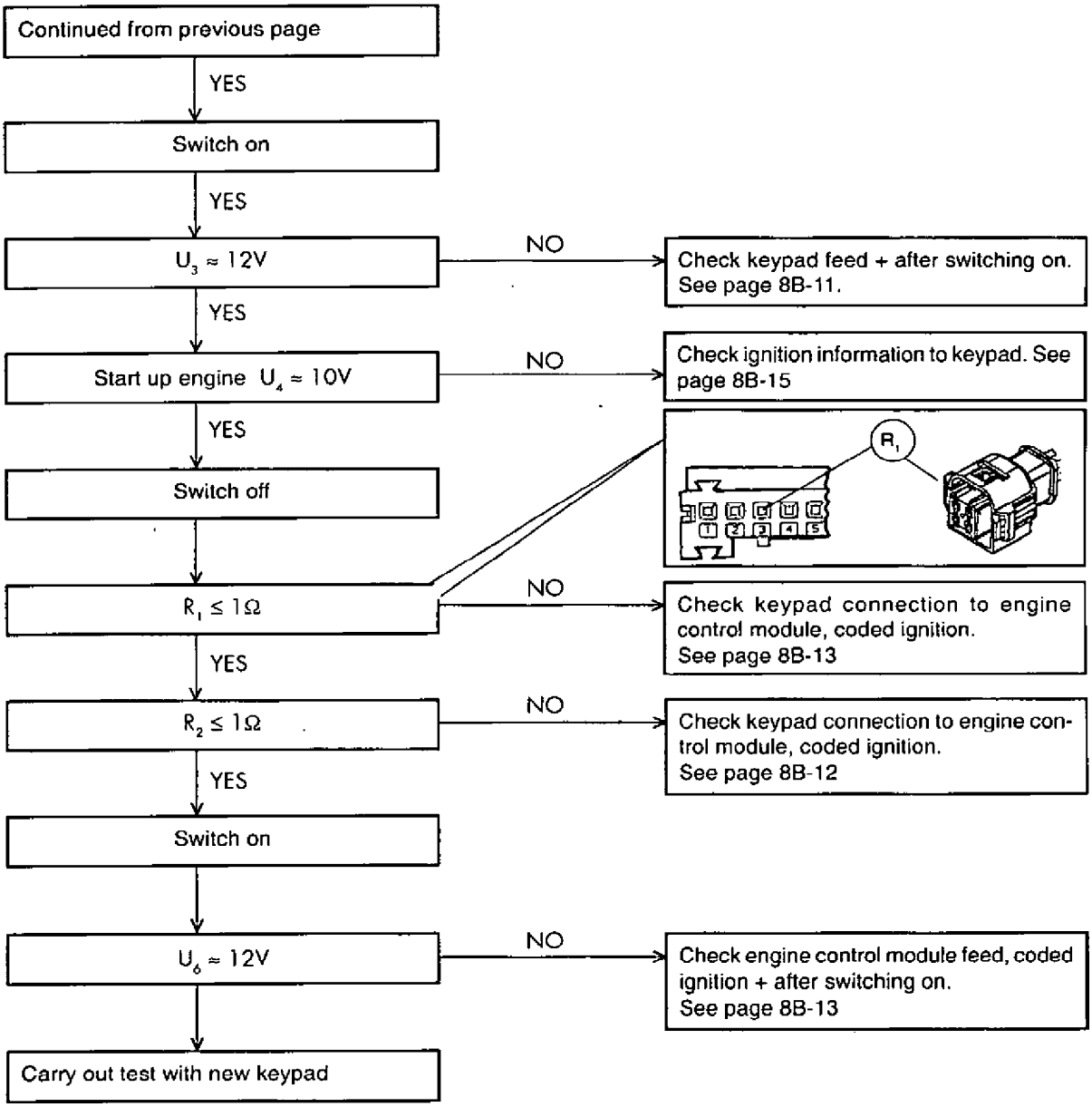


$U_1 \approx 12V$ — NO → Check keypad feed, see page 8B-9

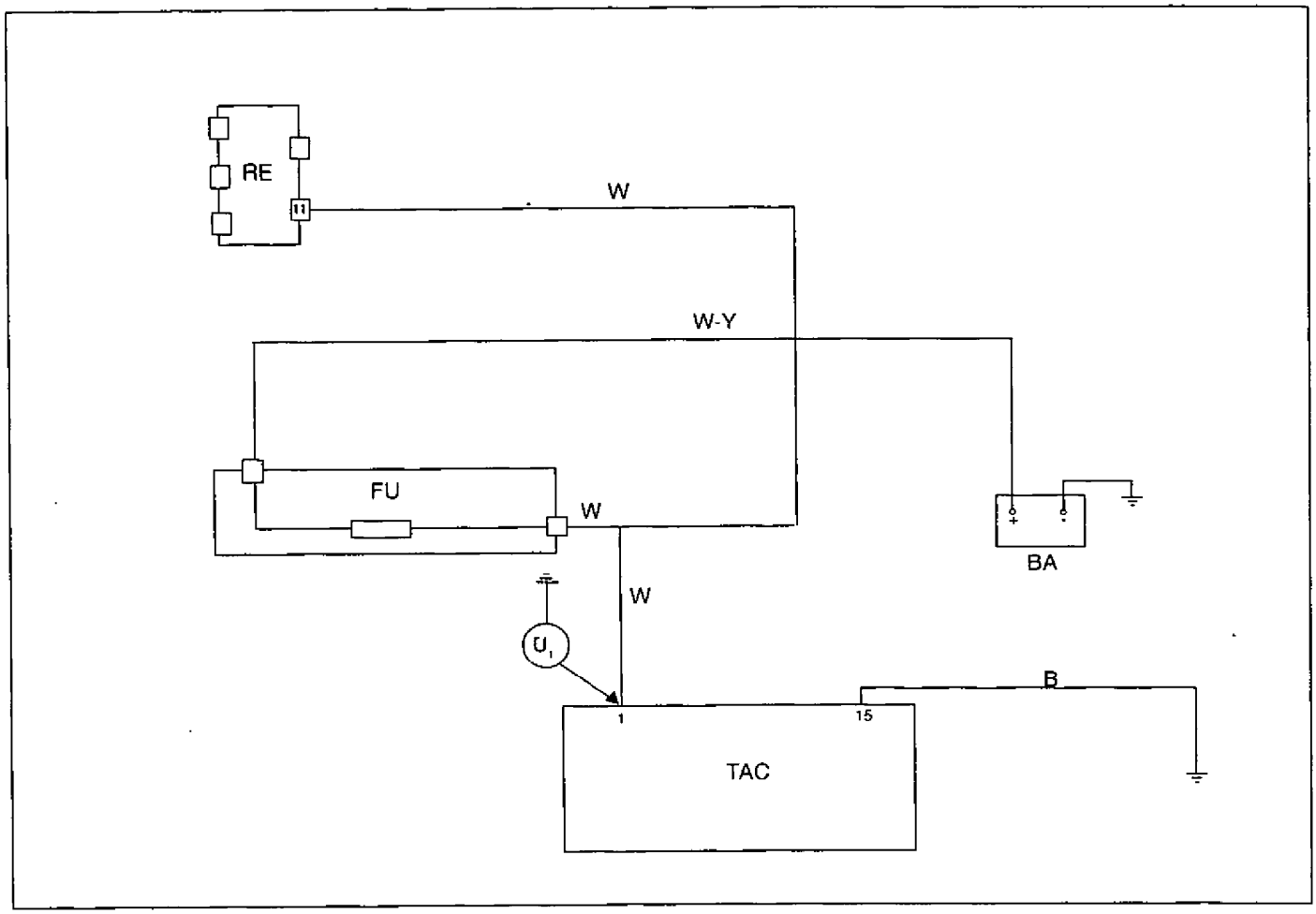


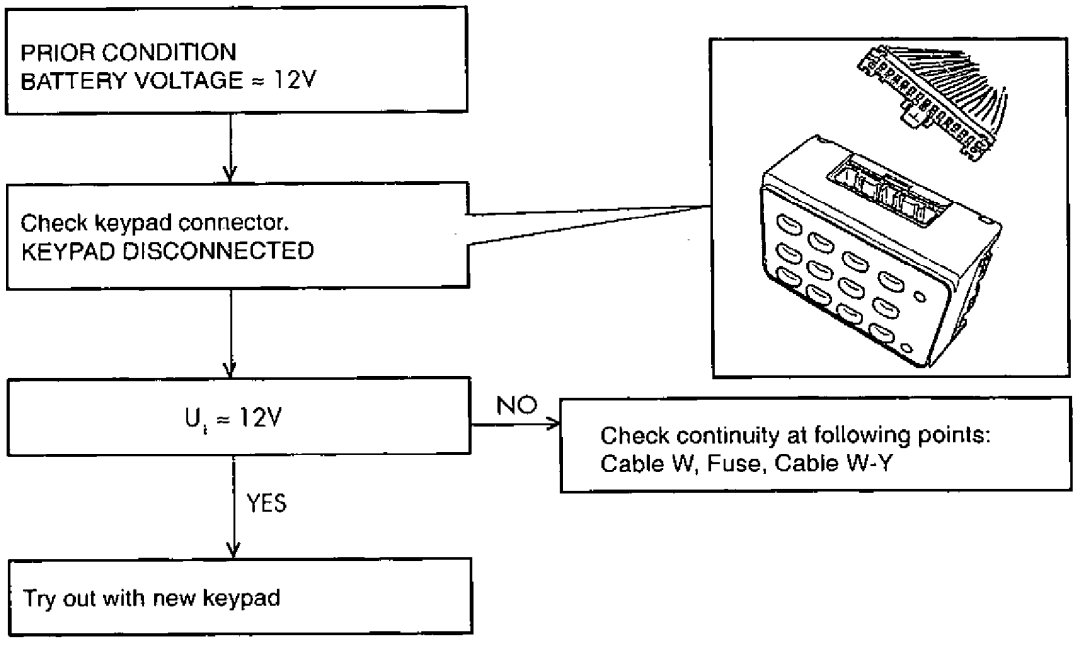
$U_2 \approx 12V$ — NO → Check keypad ground, see page 8B-10

See following page

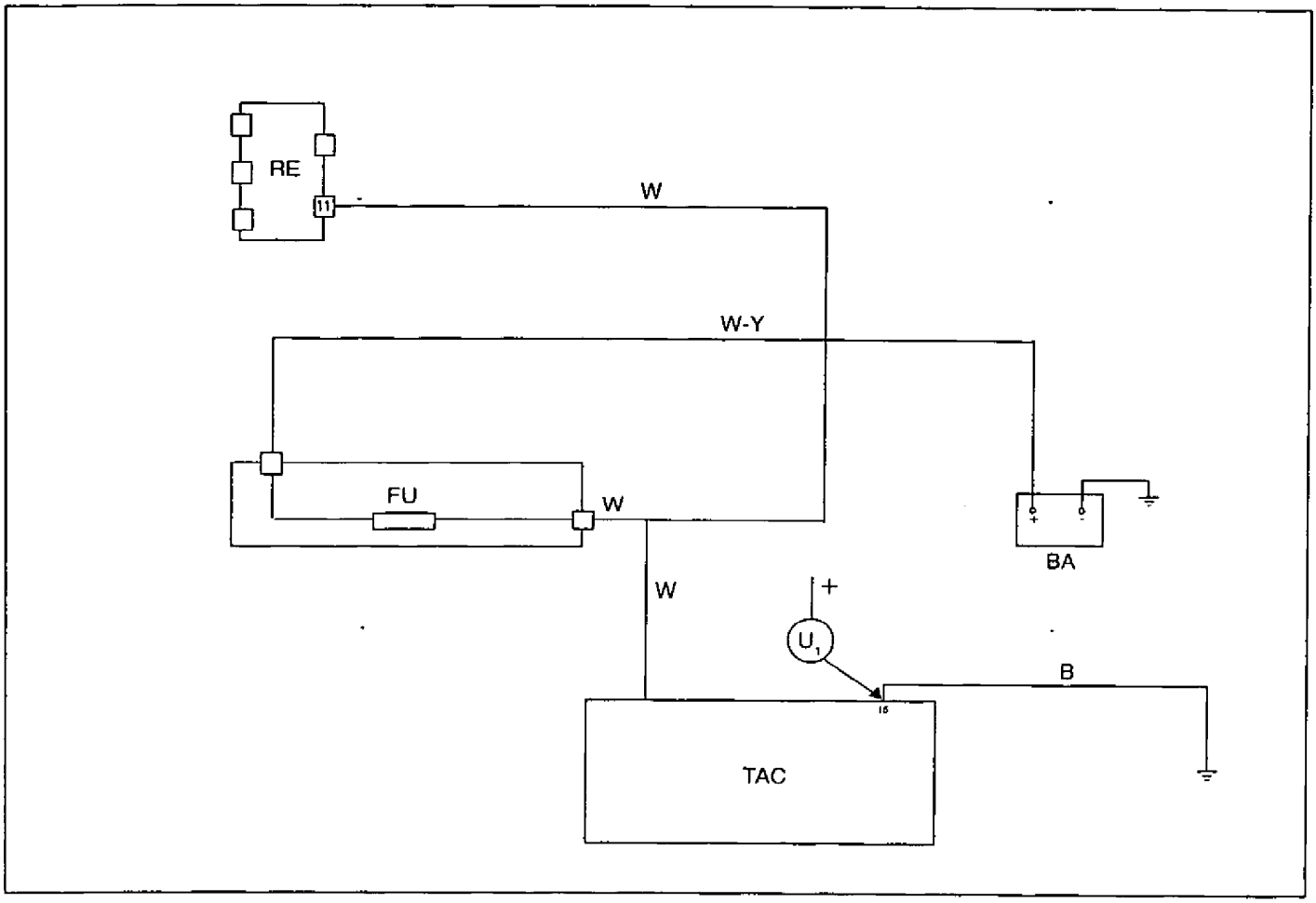

Continued from previous page
YES
Switch on
YES
$U_3 \approx 12V$
NO
Check keypad feed + after switching on. See page 8B-11.
YES
Start up engine $U_4 \approx 10V$
NO
Check ignition information to keypad. See page 8B-15
YES
Switch off
R_1
$R_1 \leq 1\Omega$
NO
Check keypad connection to engine control module, coded ignition. See page 8B-13
YES
$R_2 \leq 1\Omega$
NO
Check keypad connection to engine control module, coded ignition. See page 8B-12
YES
Switch on
$U_6 \approx 12V$
NO
Check engine control module feed, coded ignition + after switching on. See page 8B-13
Carry out test with new keypad

KEYPAD POWER FEED



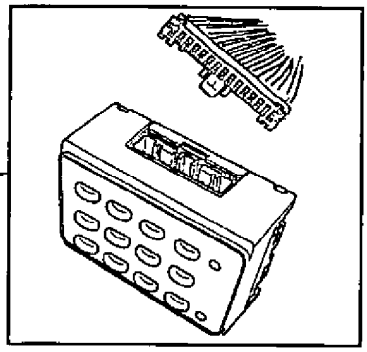


KEYPAD CONTROL EARTH



PRIOR CONDITION
KEYPAD VOLTAGE SUPPLY
(PREVIOUS TEST)
U ≅ 12V

Check on keypad connector
KEYPAD DISCONNECTED



U_1 ≈ 12V

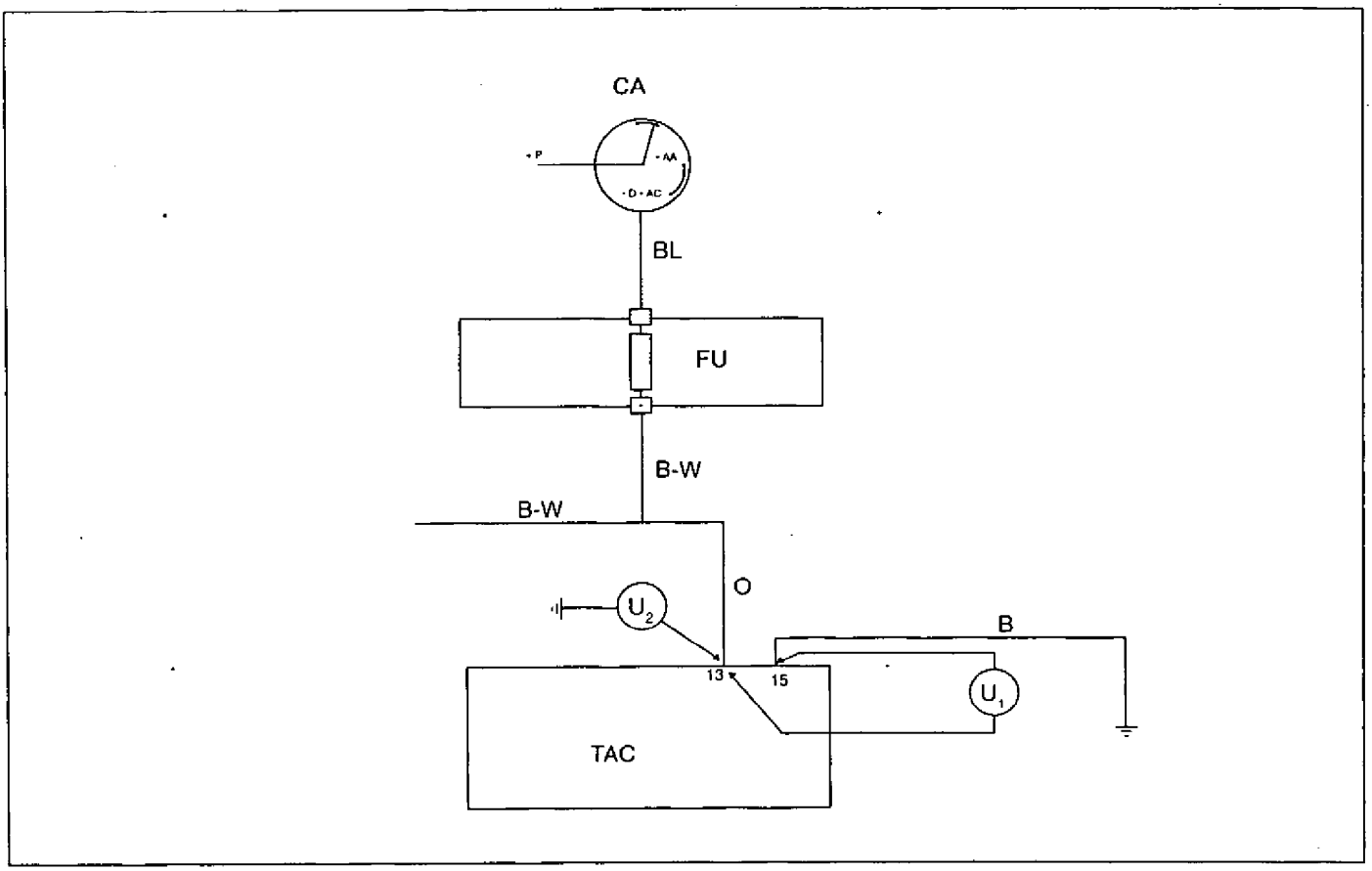
NO

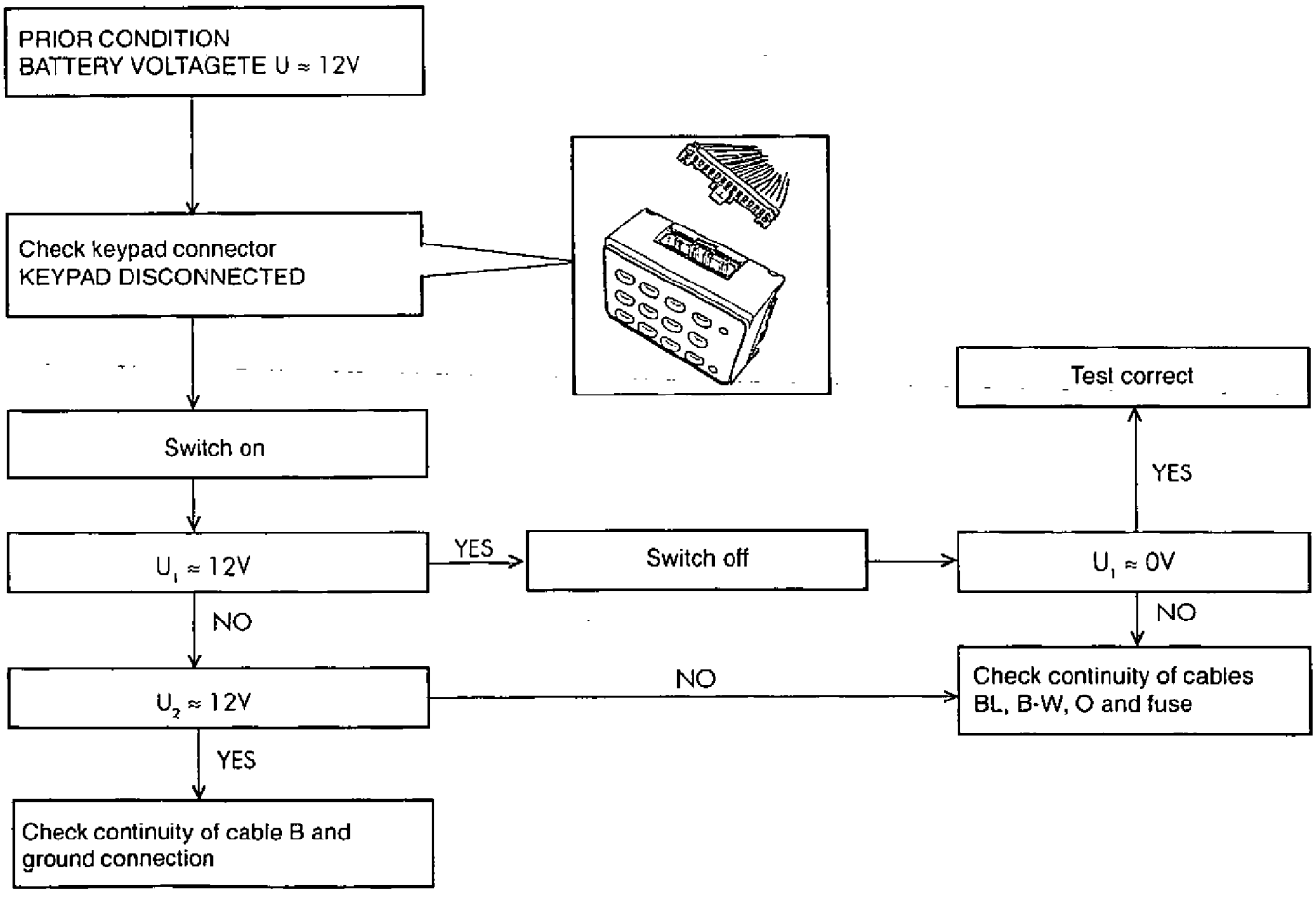
Check cable continuity of ground B and ground connection.

YES

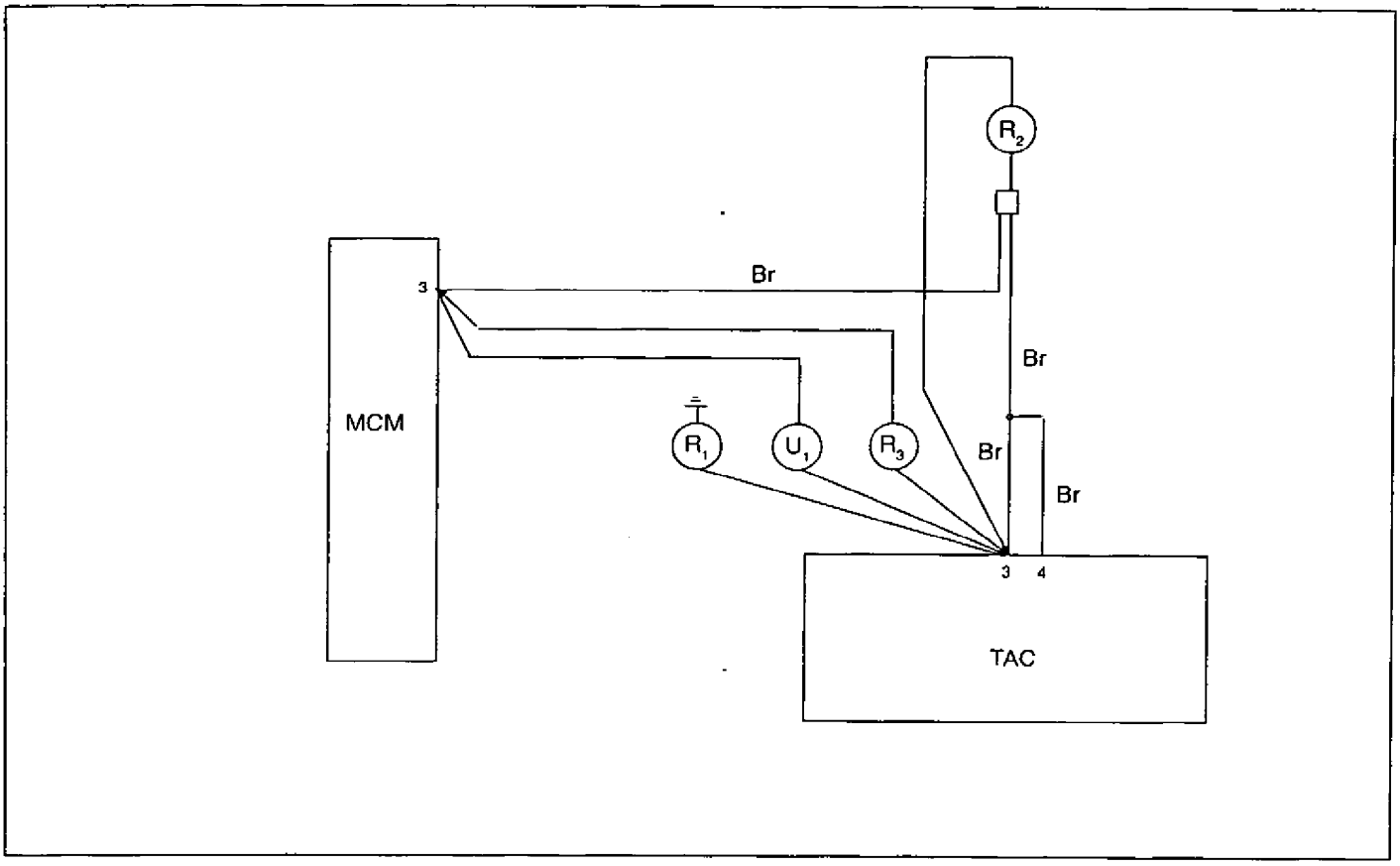
Try out with new keypad.

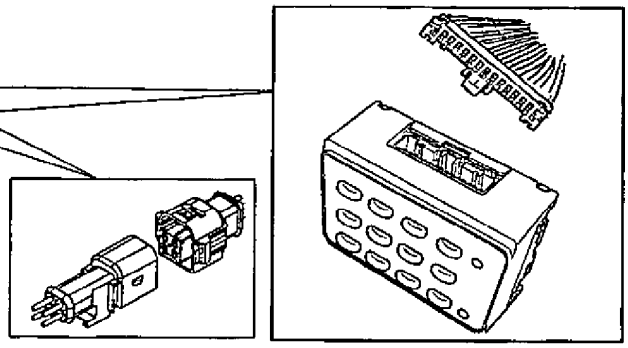
KEYPAD POWER CONTROL: + AFTER CONTACT





TESTING KEYPAD CONNECTION TO CONTROL MODULE





Check keypad and module control connector, coded ignition.
KEYPAD AND ENGINE MODULE CONTROL DISCONNECTED

$U_1 \approx 0$ — NO → Cable Br, in different sections, shorted to battery +

YES

$R_1 > 199'9\ k\Omega$ — NO → Cable Br, in different sections, grounded

YES

$R_2 \leq 1\Omega$ — NO → Cable Br, up to connector, cut off

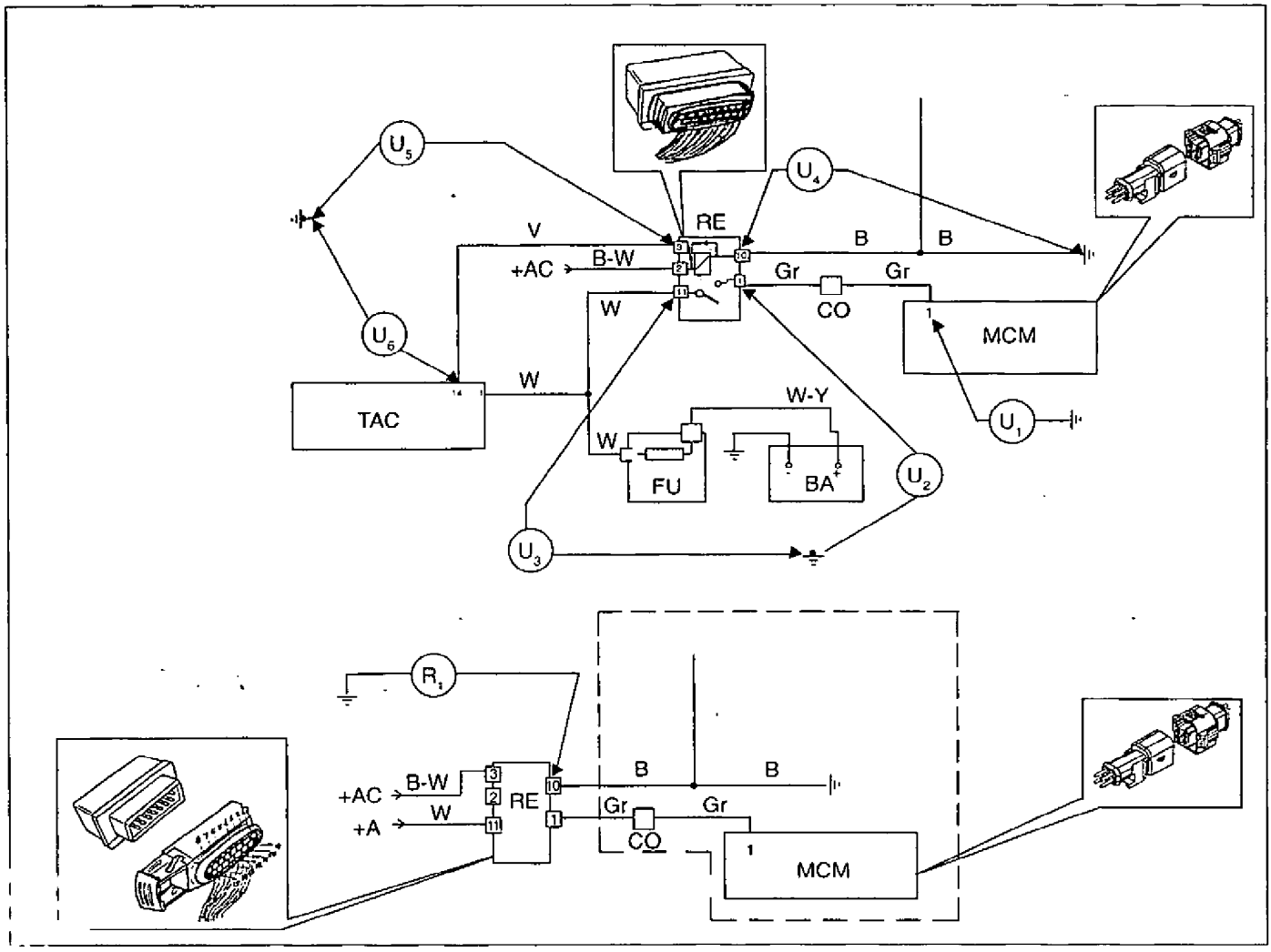
YES

$R_3 \leq 1\Omega$ — NO → Cable Br, in different sections, cut off

YES

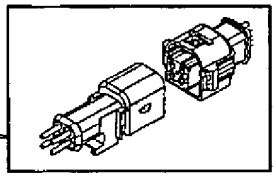
Test correct

TESTING CONTROL MODULE FEED SUPPLY: POSITIVE AFTER SWITCHING ON

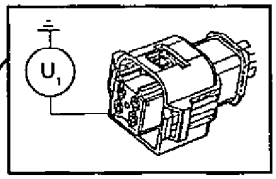


PRIOR CONDITION
KEYPAD FEED CORRECT
(SEE 8B-11)

Check engine control module connector.
ENGINE CONTROL MODULE OFF



Switch on



U_1 = 12V

YES

Switch off

$U_1 \approx 0V$

NO

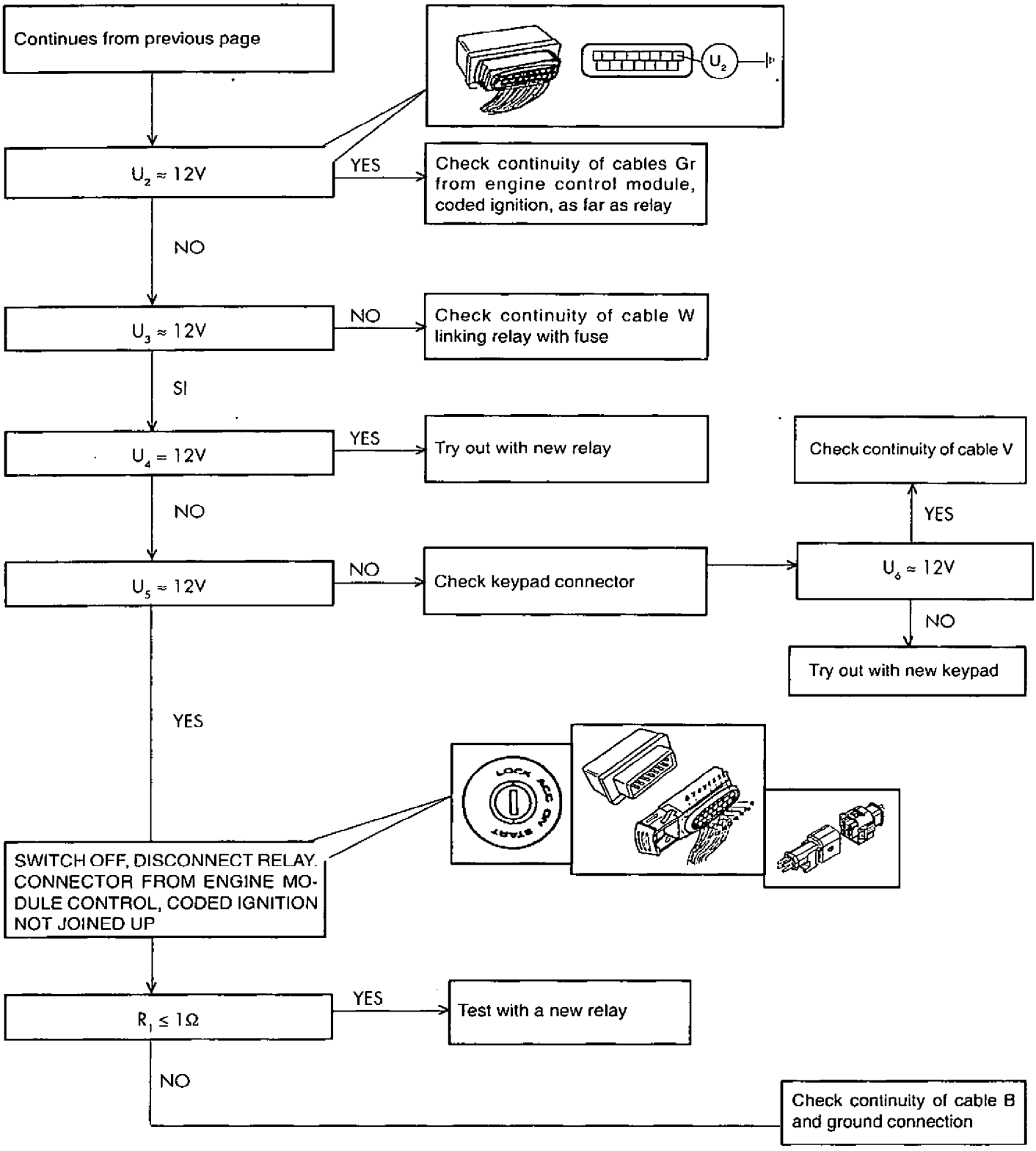
See next page

YES

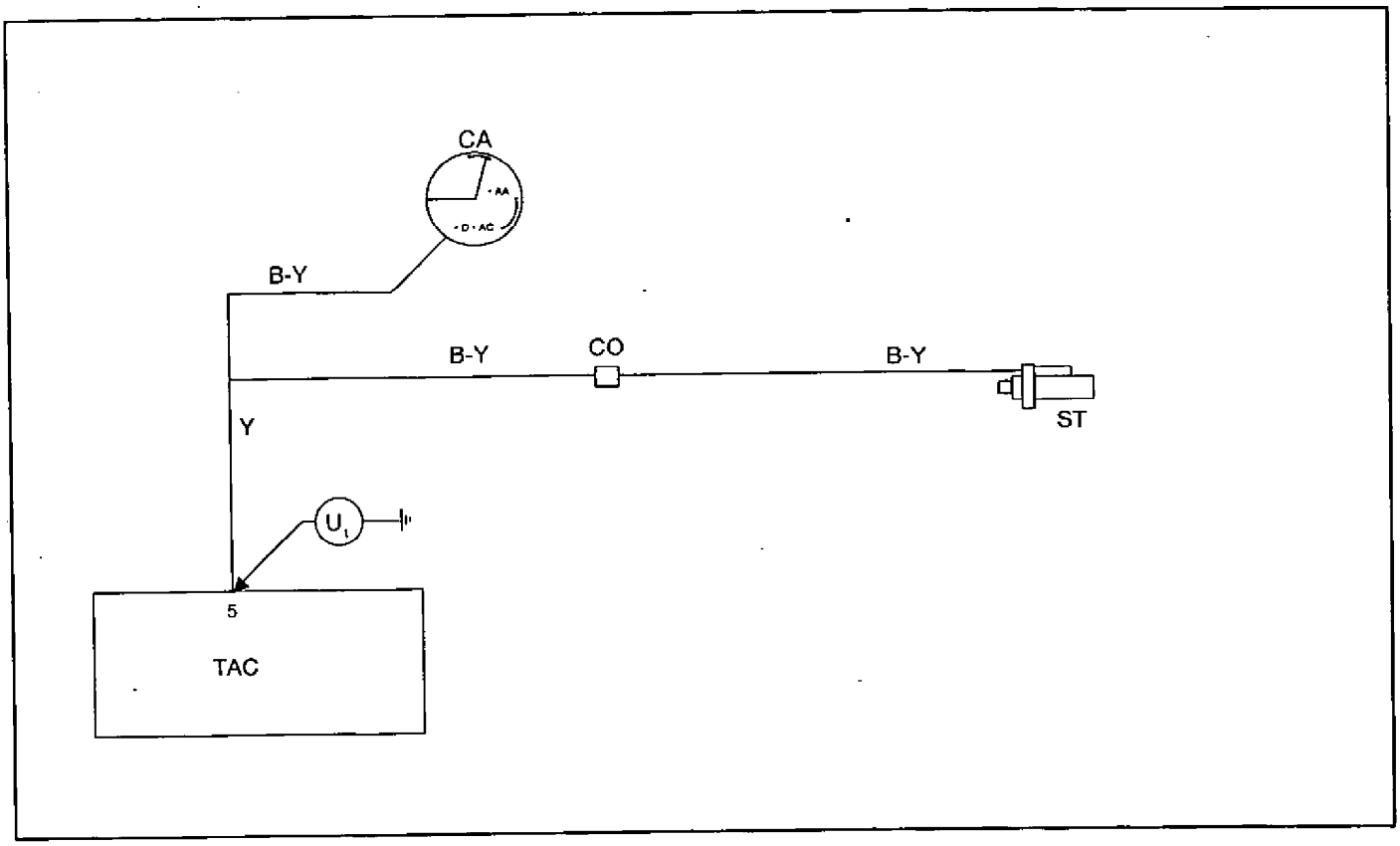
Test correct

NO

Check continuity of cables Gr, before and after connector

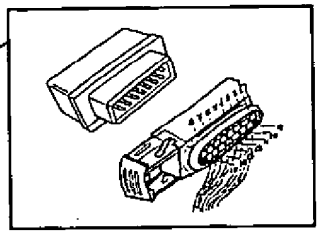

Continues from previous page
U_2
$U_2 \approx 12V$
YES
Check continuity of cables Gr from engine control module, coded ignition, as far as relay
NO
$U_3 \approx 12V$
NO
Check continuity of cable W linking relay with fuse
SI
$U_4 = 12V$
YES
Try out with new relay
NO
$U_5 \approx 12V$
NO
Check keypad connector
Check continuity of cable V
YES
$U_6 \approx 12V$
NO
Try out with new keypad
YES
LOCK
ACC
ON
START
SWITCH OFF, DISCONNECT RELAY. CONNECTOR FROM ENGINE MODULE CONTROL, CODED IGNITION NOT JOINED UP
$R_1 \leq 1\Omega$
YES
Test with a new relay
NO
Check continuity of cable B and ground connection

TESTING IGNITION INFORMATION TO KEYPAD



PRIOR CONDITION
IGNITION SYSTEM CORRECT

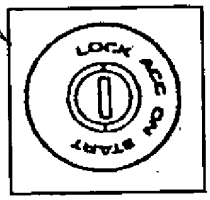
Check keypad connector.
KEYPAD DISCONNECTED



$U_1 \approx 10V$ (at moment of engaging ignition)

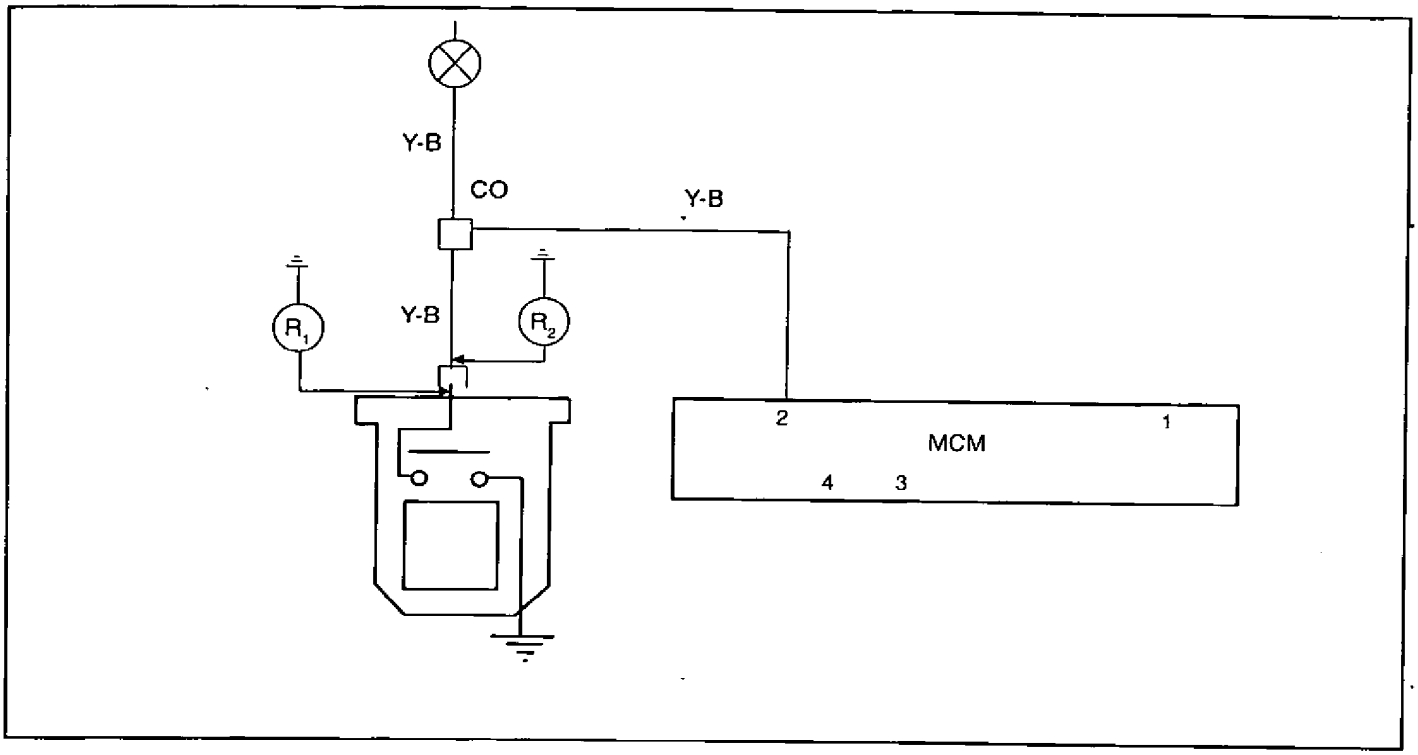
YES → Try out with new keypad

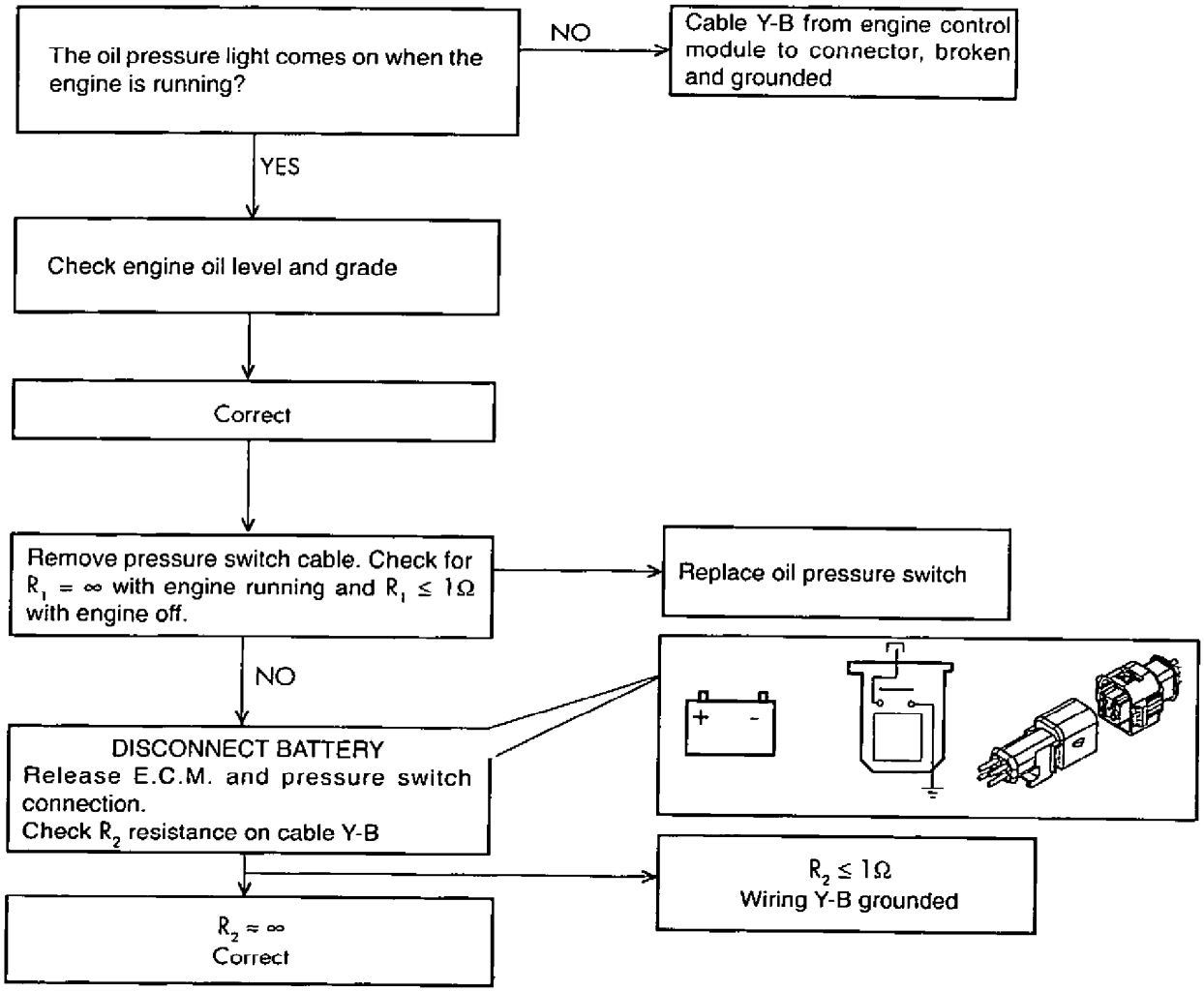
NO



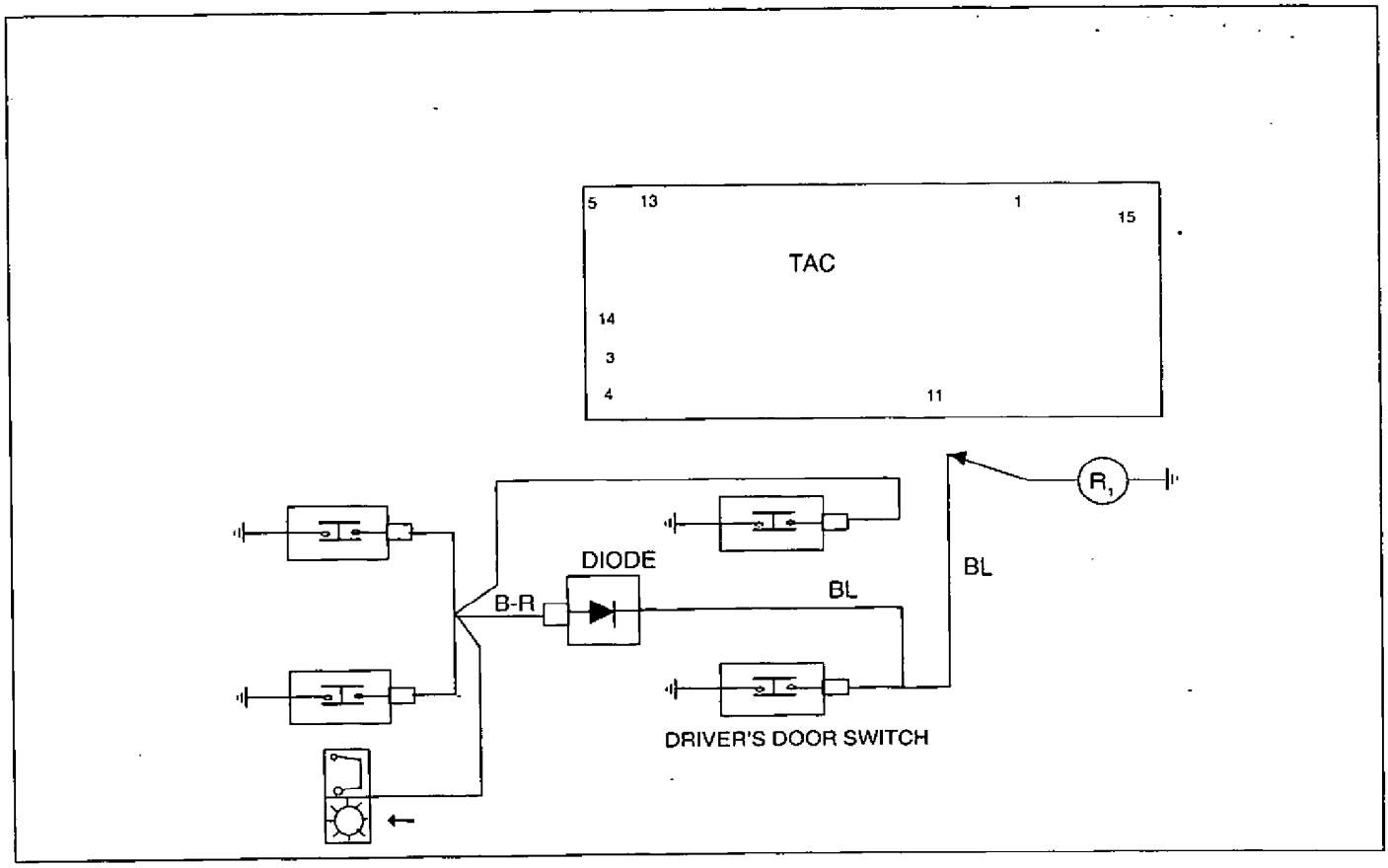
Check continuity of cable Y

ACTIVATING LOCKING WITH ENGINE RUNNING (ON OPENING AND CLOSING DRIVER'S DOOR)

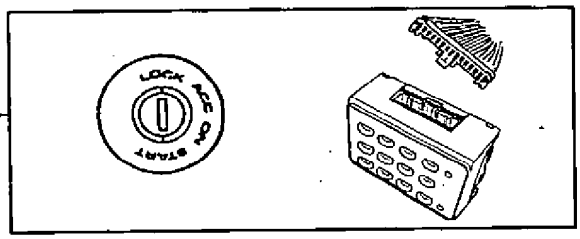




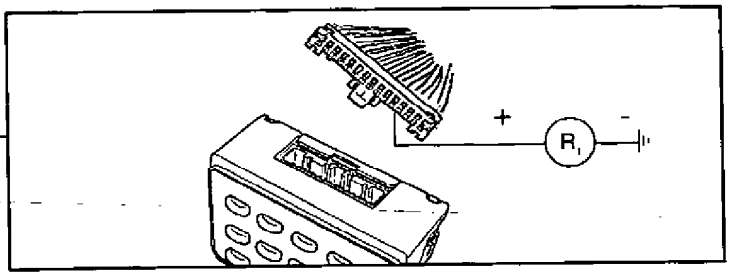
LOCKING NOT ACTIVATED (ON OPENING AND CLOSING DRIVER'S DOOR)



PRIOR CONDITION
IGNITION KEY IN OFF POSITION
KEYPAD CONNECTOR RELEASED



Connect ohmmeter
(positive connection to terminal 11 in wiring and grounding negative)
ALL DOORS CLOSED



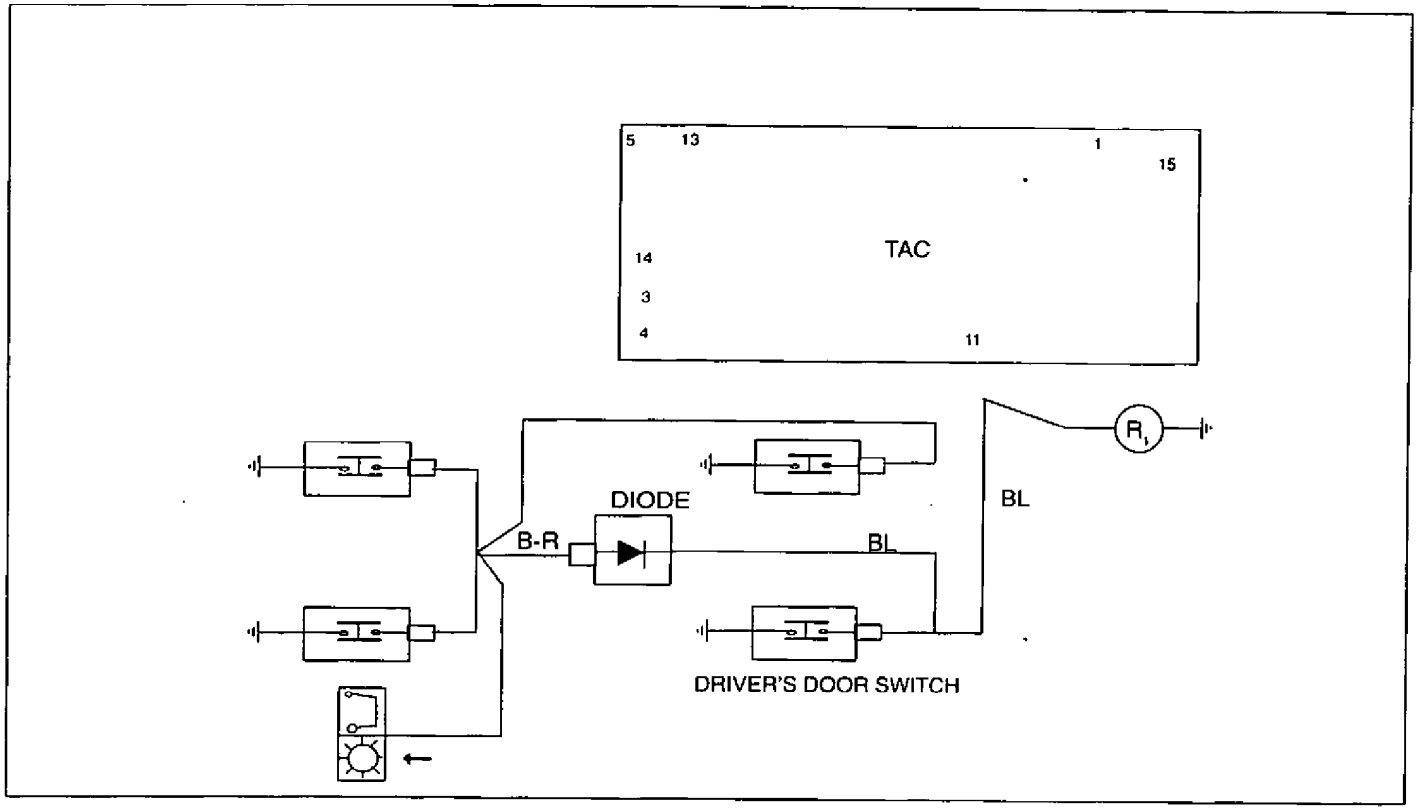
$R_1 \approx \infty$ — NO → Installation of defective doors. Grounded

YES

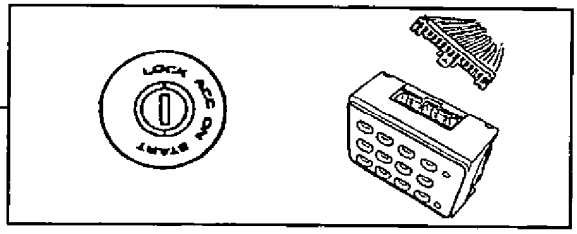
Open driver's door

$R_1 \leq 1\ \Omega$ — NO → Door switch defective — NO → Defective ground in door switch

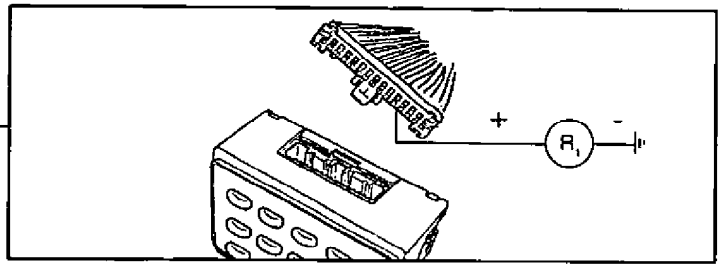
ACTIVATING LOCKING
(ON OPENING AND CLOSING A DIFFERENT DOOR FROM DRIVER'S)



PRIOR CONDITION
IGNITION KEY IN OFF POSITION
KEYPAD CONNECTOR RELEASED



Connect an ohmeter (positive connection to terminal 11 in wiring and grounding negative)
ALL DOORS CLOSED



$R_1 \approx \infty$ — NO → Installation of defective doors. Grounded

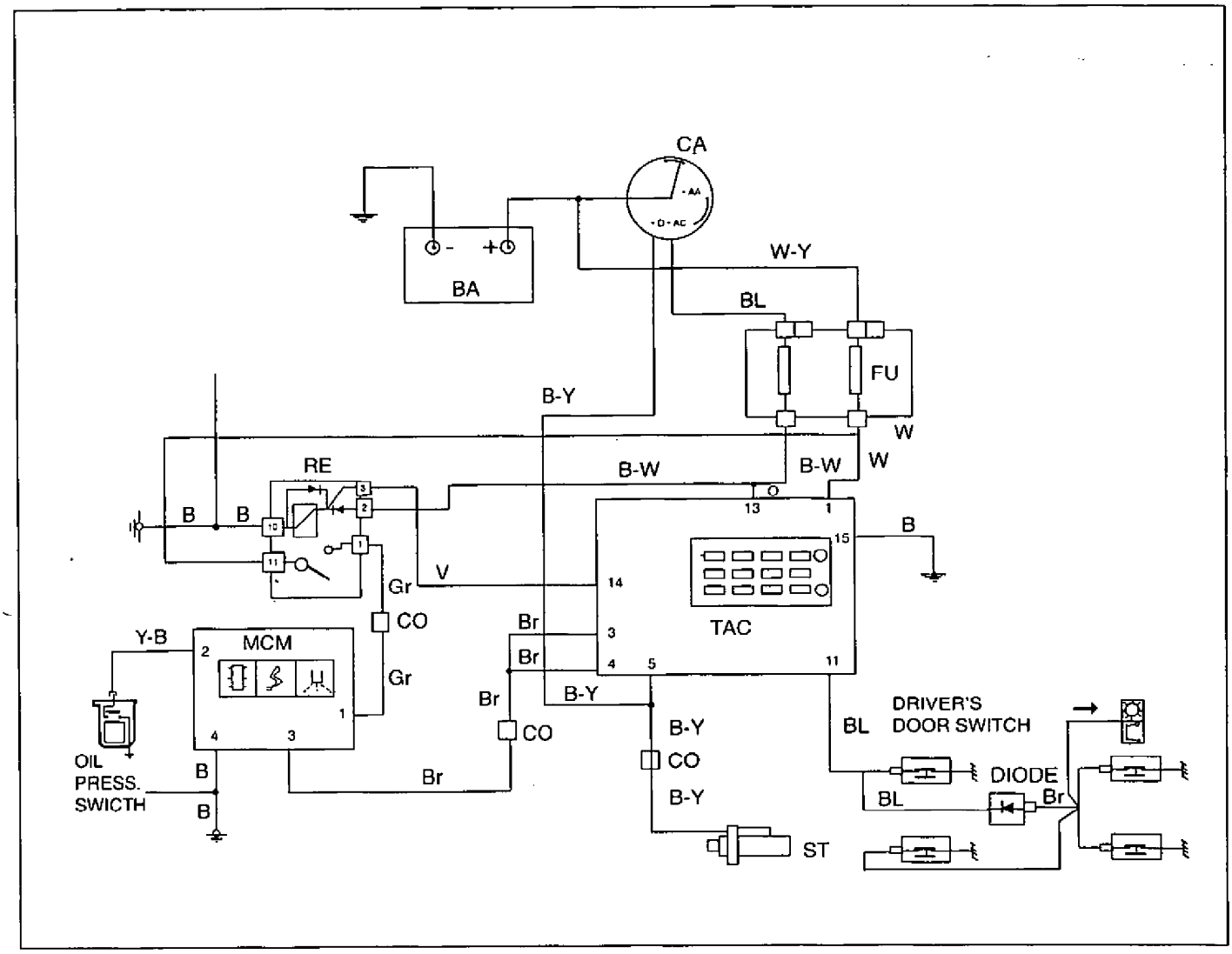
YES

Open every door except driver's

$R_1 = \infty$ — NO → Defective diode in door installation

Correct

WIRING DIAGRAM. IDENTIFICATION OF SYMBOLS



COMPONENTS

BA.- BATTERY
AA.- ANTITHEFT ASSEMBLY (IGNITION KEY)
FU.- FUSES
CO.- WIRING CONNECTOR
RE.- INJECTION FEED RELAY
E.C.M.- ENGINE CONTROL MODULE
A.K.- ANTITHEFT KEYPAD
S.M.- STARTER MOTOR

WIRING COLOURS

B.- BLACK
BW.- BLACK - WHITE
BY.- BLACK - YELLOW
BL.- BLUE
Br.- BROWN
Gr.- GREY
O.- ORANGE
V.- VIOLET
W.- WHITE

SECTION 10

TECHNICAL INFORMATION

LIST OF CONTENTS

ENGINE 10-2
TRANSMISSION AND TRANSFER CASE 10-2
MEASUREMENTS 10-3
WEIGHTS 10-3

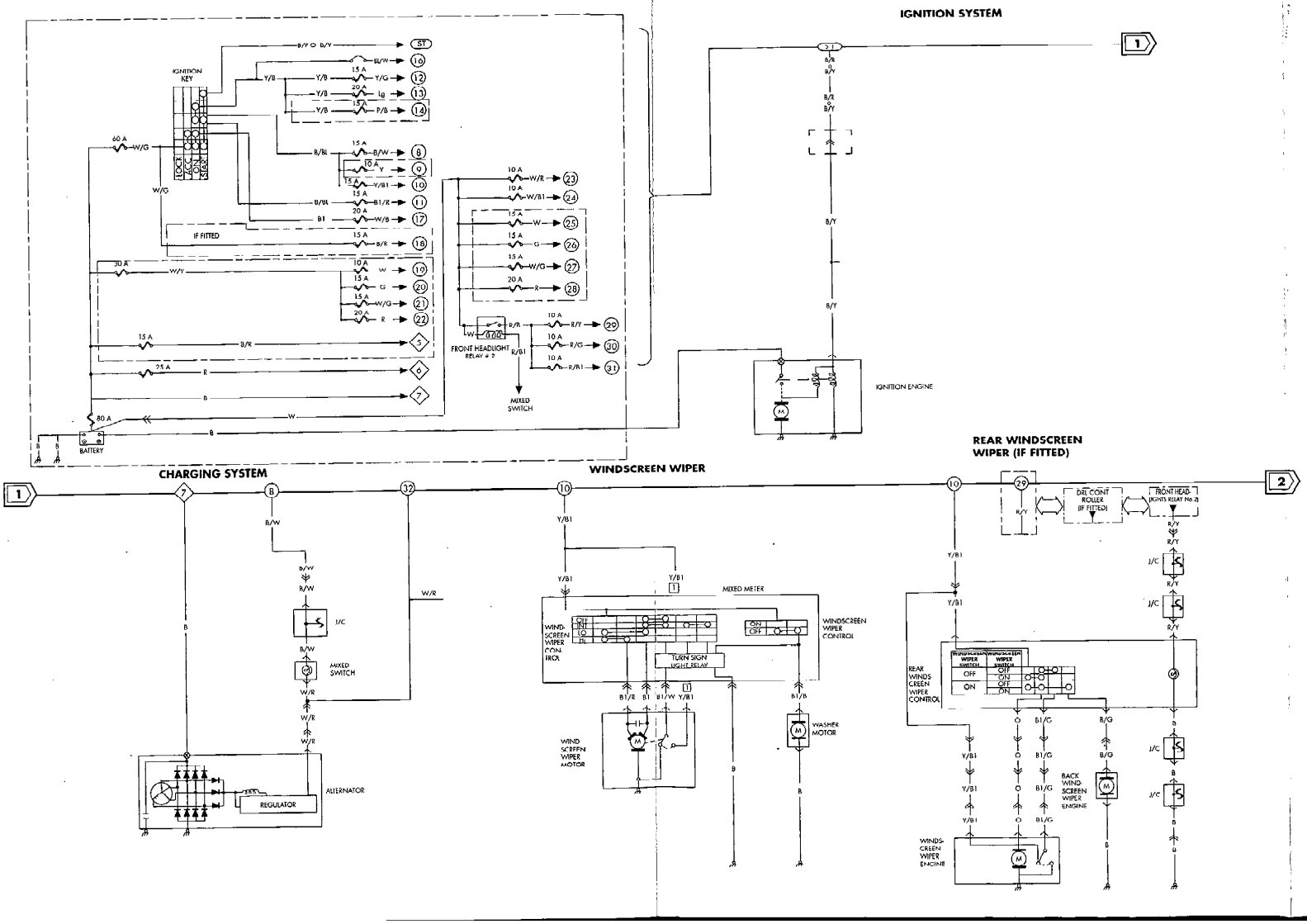
ENGINE		
Number of cylinders and arrangement		4 in line
Fuel firing order (countins rear cylinder as # 1)		1 - 3 - 4 - 2
Timing		OHC Belt actuated
Bore and stroke		83 x 88 mm
Cylinder capacity		1,905 cm^3
Compression ratio		21.5 : 1
Compression Pressure (engine warm)	Maximum	30 Kg/cm^2
	Minimum	25 Kg/cm^2
	Max. Difference	5 Kg/cm^2
Maximum power		55 Kw (4,600 r.p.m.)
Maximum torque		135 Nm. (2,000 r.p.m.)
Maximum crankshaft speed		5,100 r.p.m.
Injection type		Indirect
Injector pressure measurement		130 ± 5 Kg/cm^2
Maximum thermostat aperture		95º C
Oil system pressure	Idling	2 Kg/cm^2
	at 2.000 r.p.m.	3.5 Kg/cm^2
	at 4.000 r.p.m.	4.5 Kg/cm^2
Pressure switch measurement		0.8 Kg/cm^2
TRANSMISSION AND TRANSFER CASE		
Type		Manual Transmission
Transmission Ratios	1st Gear	3.652
	2nd Gear	1.947
	3rd Gear	1.379
	4th Gear	1.000
	5th Gear	0.795
	Rev.	3.670
Transfer case transmission rate	High	1.000
	Low	1.816
Differential groups		4.875

MEASUREMENTS	5 Doors	3 Doors		
	Metal roof	Metal roof	Canvas roof	Plastic roof
Length (mm)	4,030	3,630	3,640	3,640
Width (mm)	1,635	1,630	1,630	1,630
Height (mm)	1,700	1,665	1,665	1,675
Distance between axles (mm)	2,480	2,200	2,200	2,200
Front track width(mm)	1,395	1,395	1,395	1395
Rear track width (mm)	1,400	1,400	1,400	1.400
Headroom (mm)	200	200	200	200
Turning radius (m)	5.4	4.9		
MASSES				
Mass in running order (kg)	1,417	1,304	1,294	1,324
GVW (kg)	1,850	1,650	1,650	

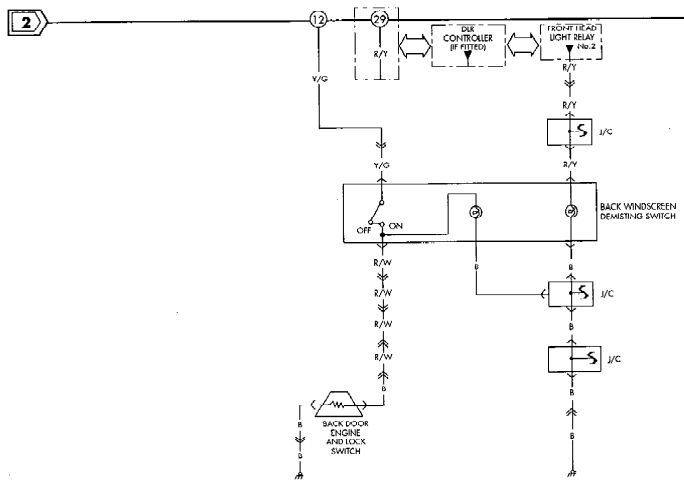
-NOTES-

-NOTES-

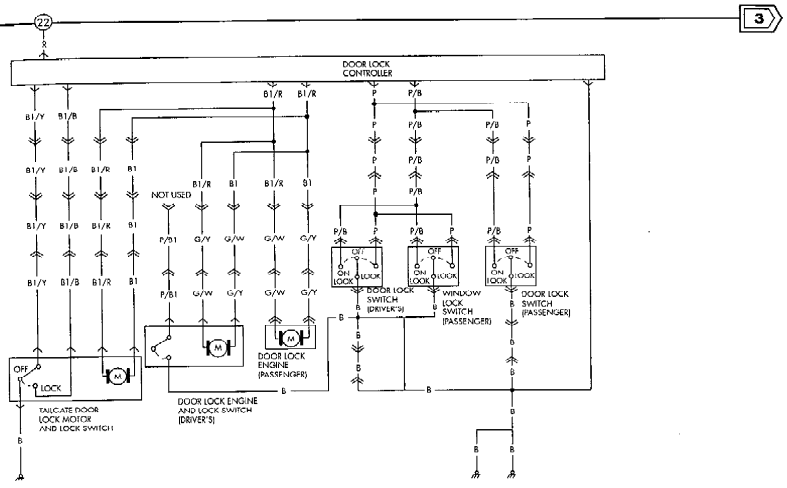
ELECTRICAL DIAGRAMS


IGNITION SYSTEM
IGNITION KEY
LOCK
ACC
ON
START
IF FITTED
BATTERY
FRONT HEADLIGHT RELAY # 2
MIXED SWITCH
IGNITION ENGINE
CHARGING SYSTEM
WINDSCREEN WIPER
REAR WINDSCREEN WIPER (IF FITTED)
MIXED SWITCH
ALTERNATOR
REGULATOR
MIXED METER
WINDSCREEN WIPER CONTROL
TURN SIGN LIGHT RELAY
WIND SCREEN WIPER MOTOR
WASHER MOTOR
DRL CONT ROLLER (IF FITTED)
FRONT HEAD LIGHTS RELAY No.2
REAR WINDS CREEN WIPER CONTROL
BACK WIND SCREEN WIPER ENGINE
WINDS-CREEN WIPER ENGINE

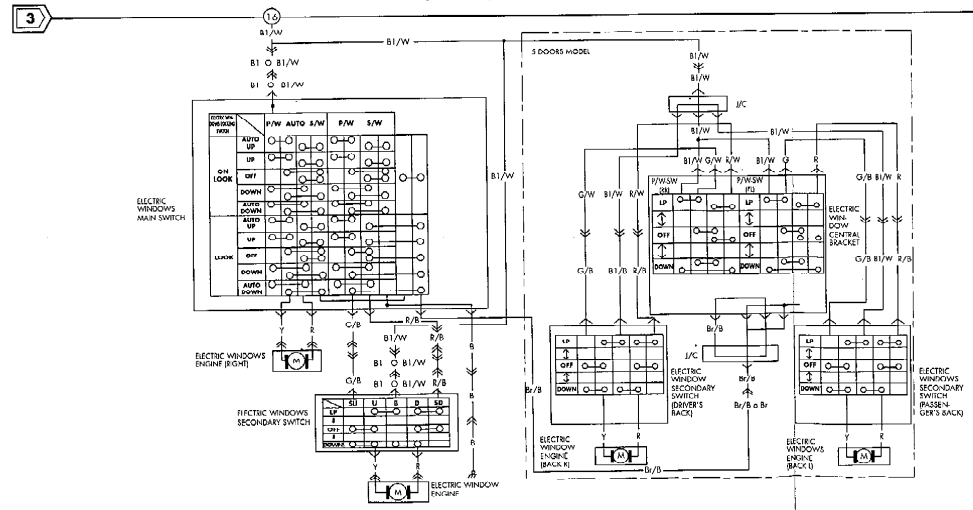
REAR WINDSCREEN DEMISTING



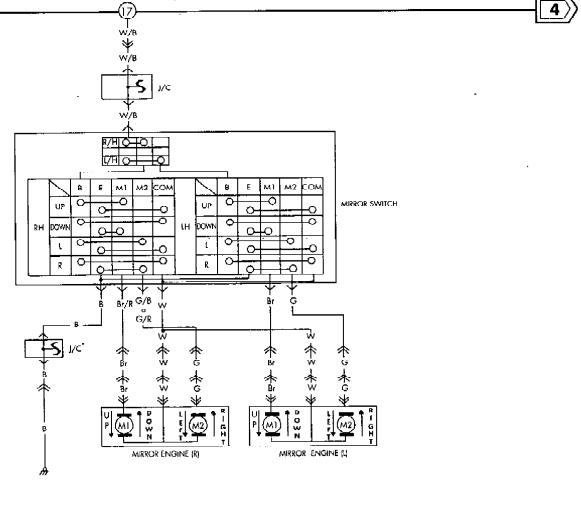
CENTRALIZED LOCKING (IF FITTED)



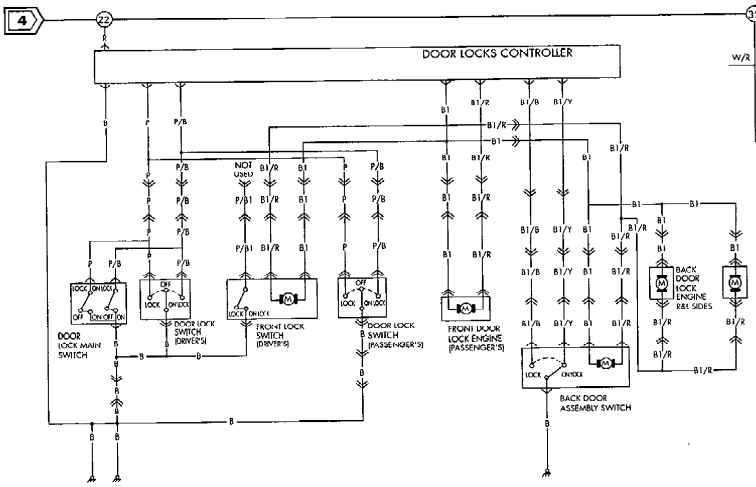
ELECTRIC WINDOWS (IF FITTED)



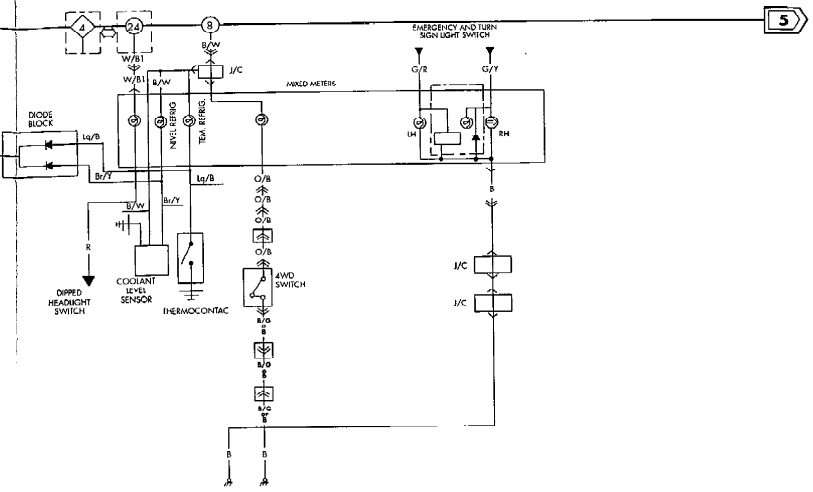
ELECTRIC REAR-VIEW MIRROR (IF FITTED)



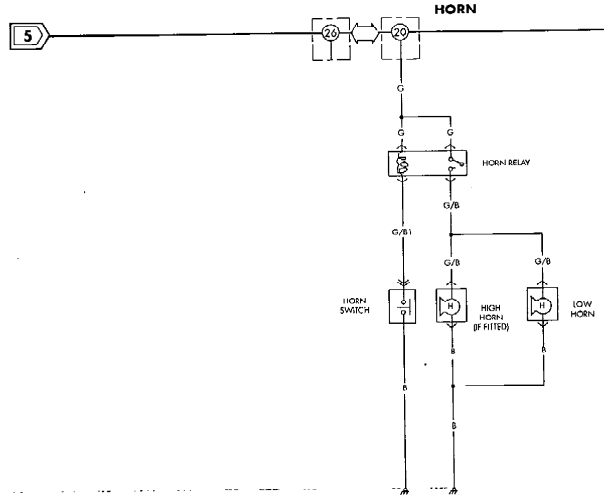
5 DOORS CENTRAL LOCKING (IF FITTED)



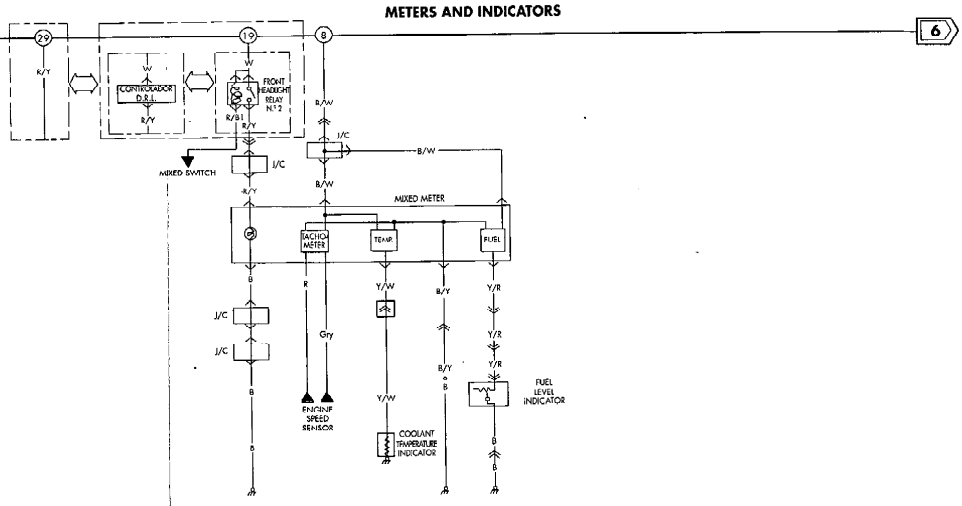
INDICATOR LIGHTS



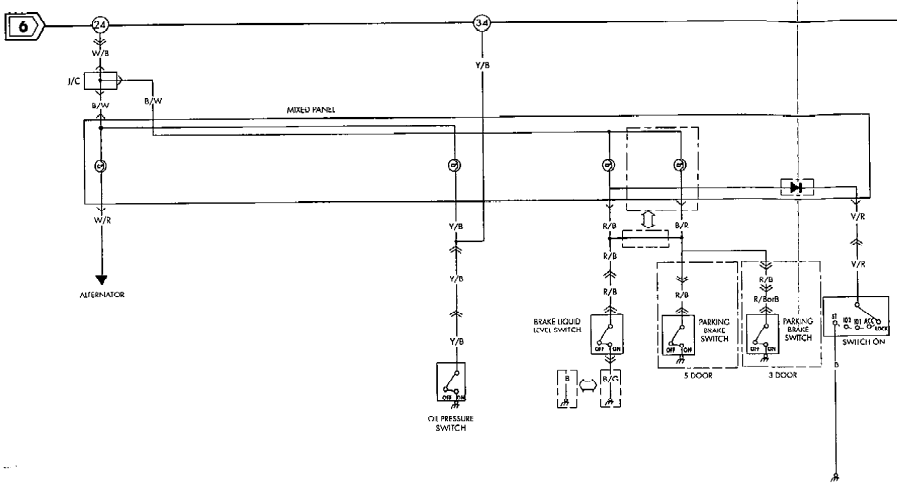
HORN



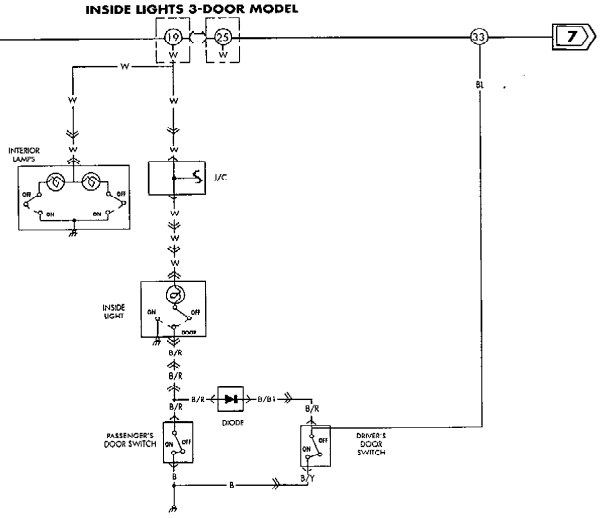
METERS AND INDICATORS



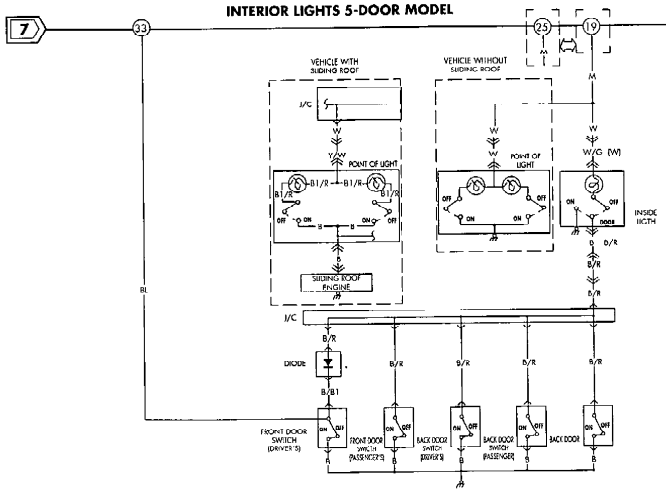
INDICATOR LIGHTS



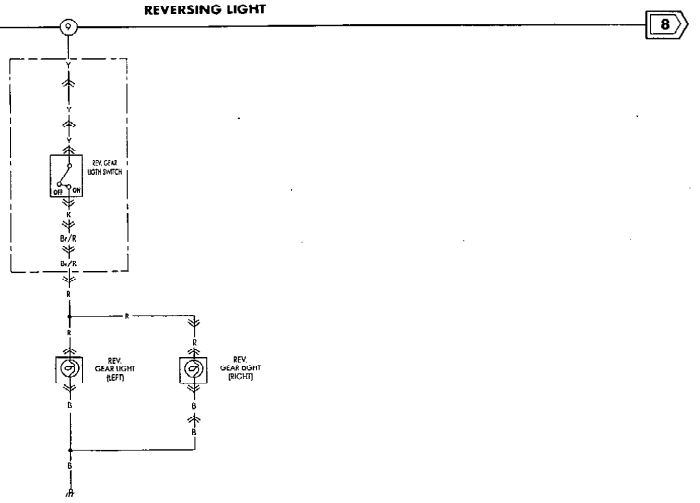
INSIDE LIGHTS 3-DOOR MODEL

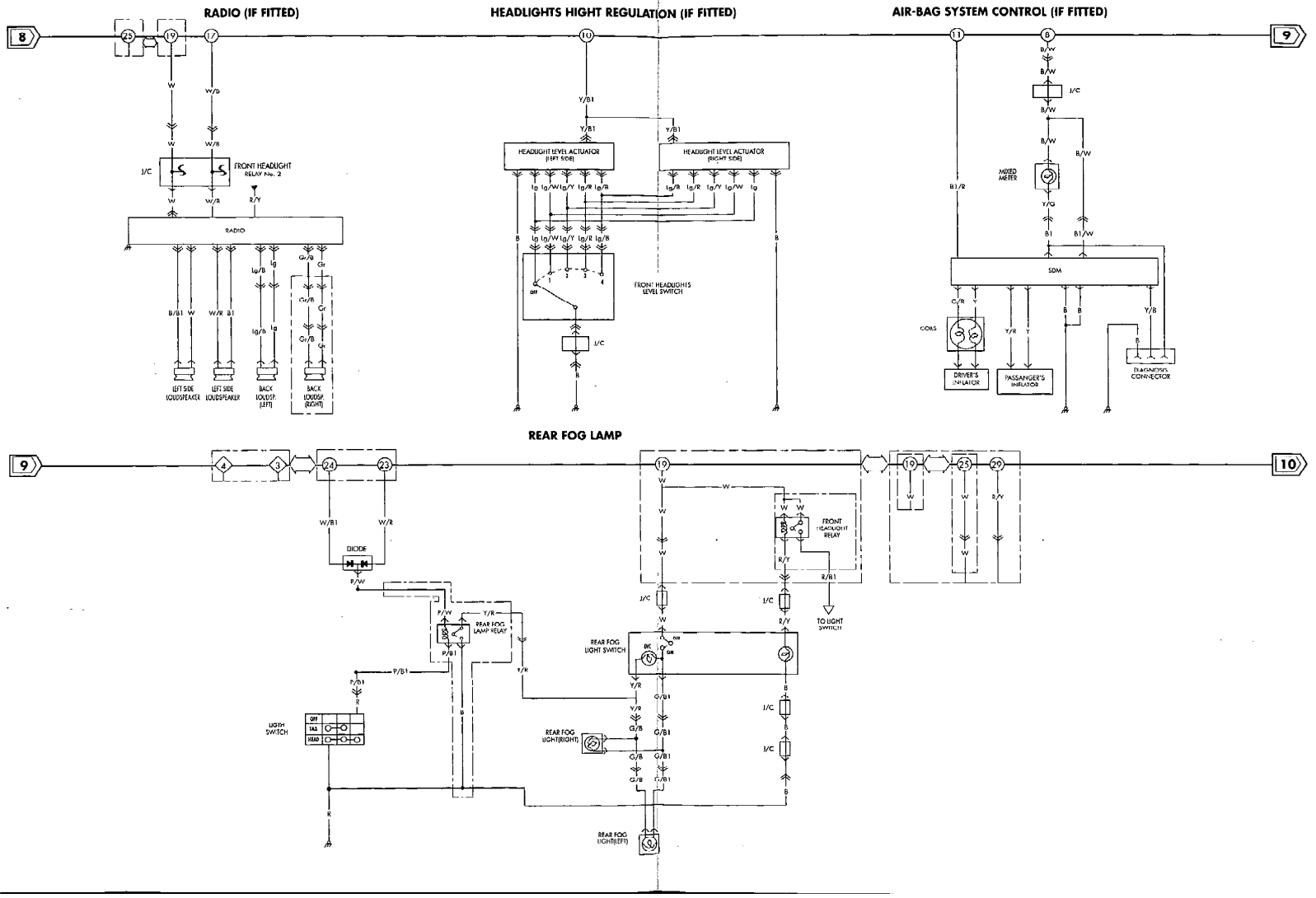


INTERIOR LIGHTS 5-DOOR MODEL

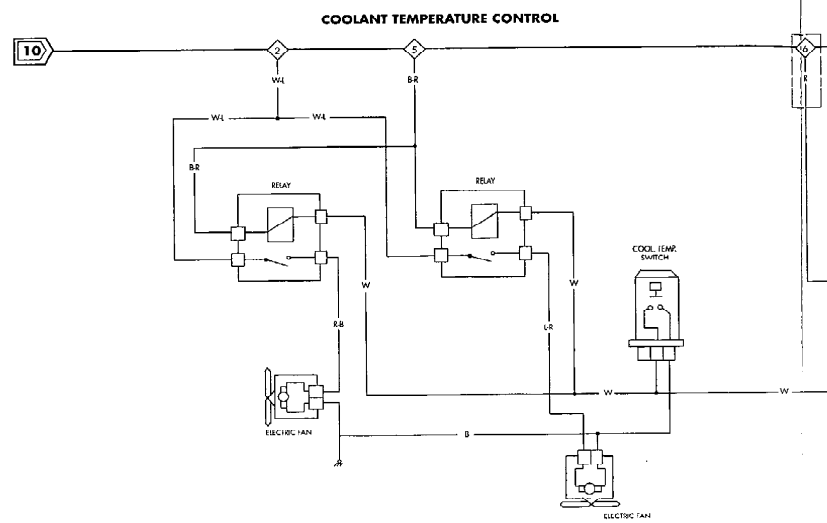


REVERSING LIGHT

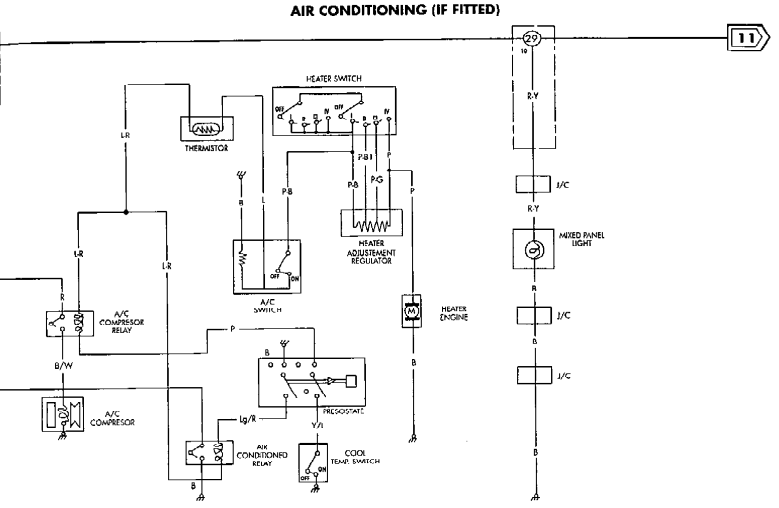



RADIO (IF FITTED)
HEADLIGHTS HIGHT REGULATION (IF FITTED)
AIR-BAG SYSTEM CONTROL (IF FITTED)
REAR FOG LAMP
8
9
10
11
RADIO
FRONT HEADLIGHT RELAY No. 2
HEADLIGHT LEVEL ACTUATOR (LEFT SIDE)
HEADLIGHT LEVEL ACTUATOR (RIGHT SIDE)
FRONT HEADLIGHTS LEVEL SWITCH
SDM
MIXED METER
COILS
DRIVER'S INFLATOR
PASSANGER'S INFLATOR
DIAGNOSIS CONNECTOR
LEFT SIDE LOUDSPEAKER
LEFT SIDE LOUDSPEAKER
BACK LOUDSP. (LEFT)
BACK LOUDSP. (RIGHT)
DIODE
REAR FOG LAMP RELAY
FRONT HEADLIGHT RELAY
TO LIGHT SWITCH
REAR FOG LIGHT SWITCH
REAR FOG LIGHT(RIGHT)
REAR FOG LIGHT(LEFT)
LIGHT SWITCH
OFF
TAIL
HEAD

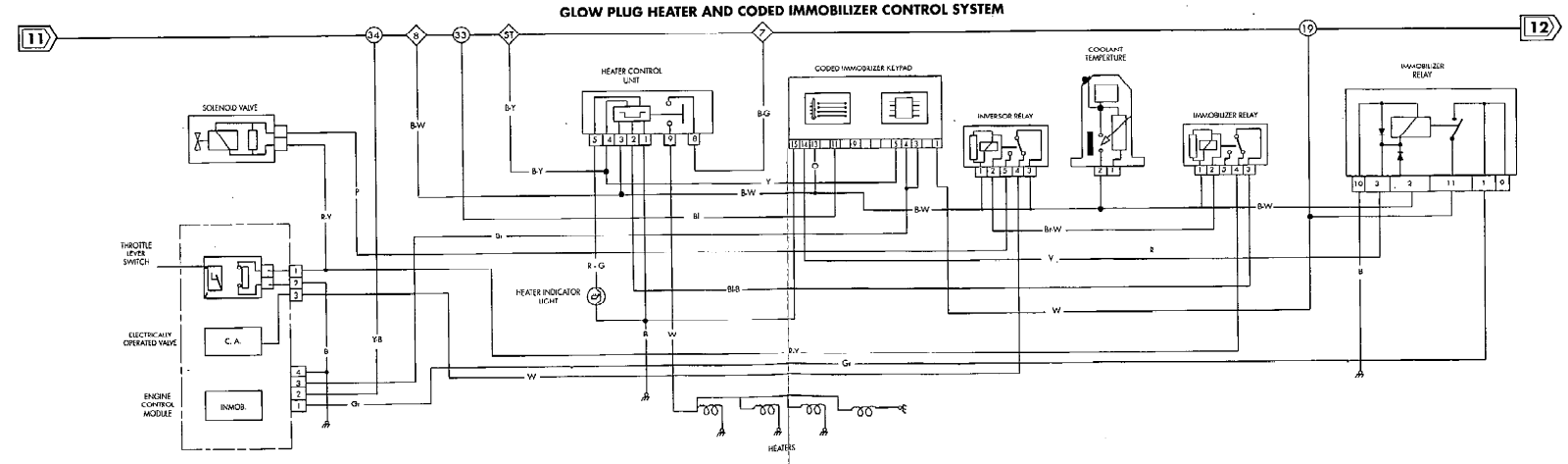
COOLANT TEMPERATURE CONTROL

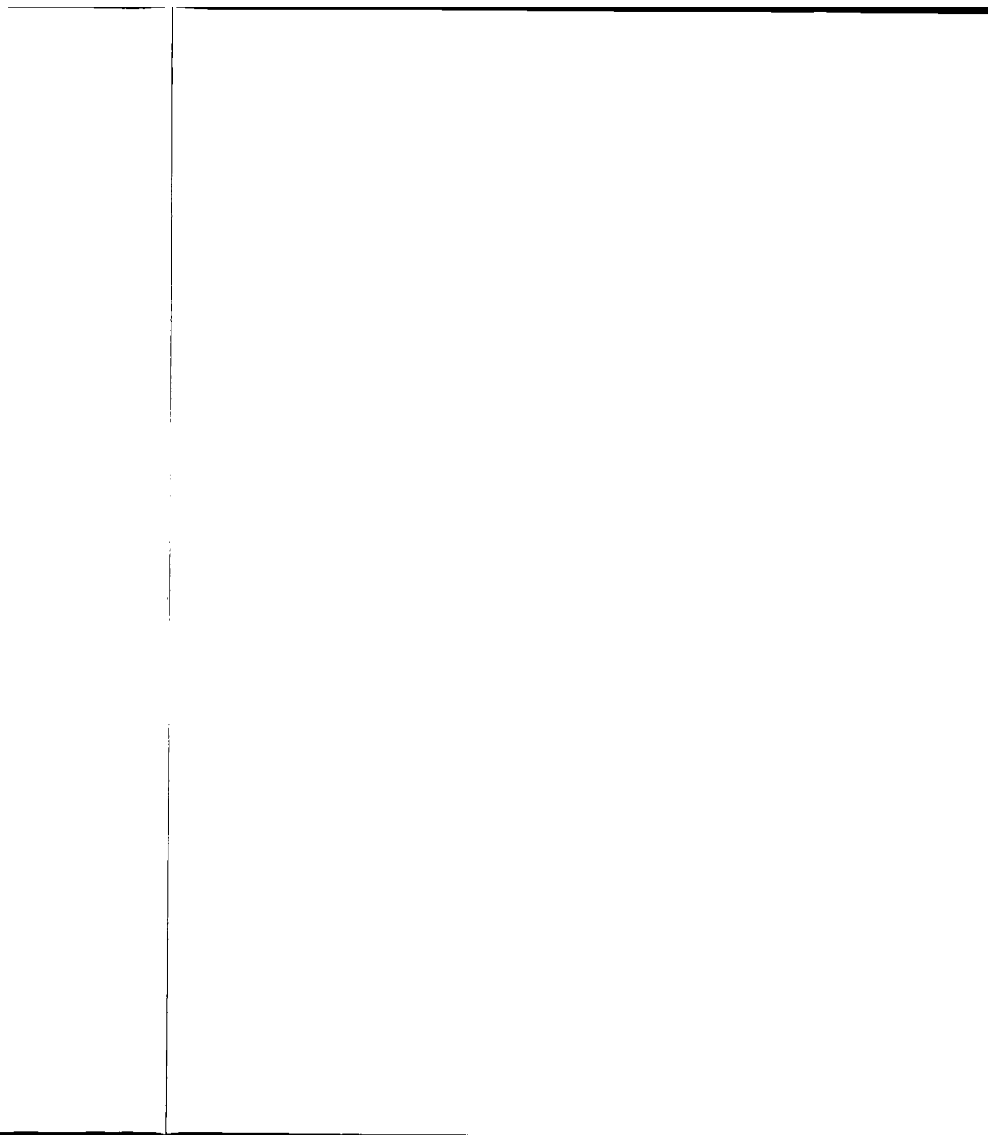


AIR CONDITIONING (IF FITTED)

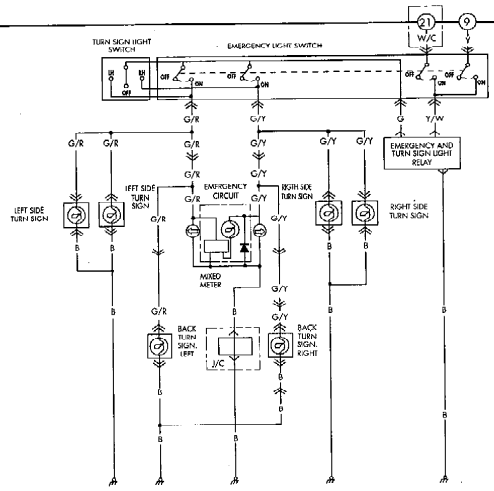


GLOW PLUG HEATER AND CODED IMMOBILIZER CONTROL SYSTEM

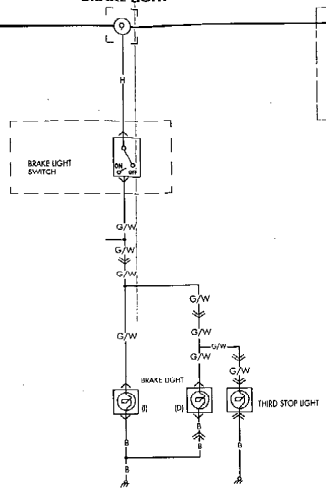




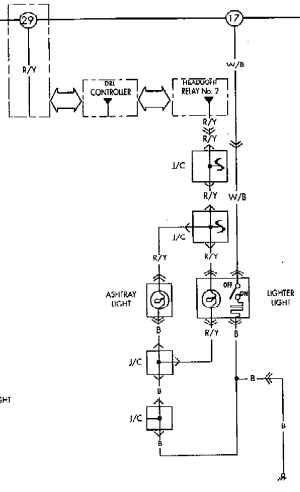
EMERGENCY AND TURNS SIGN LIGHTS



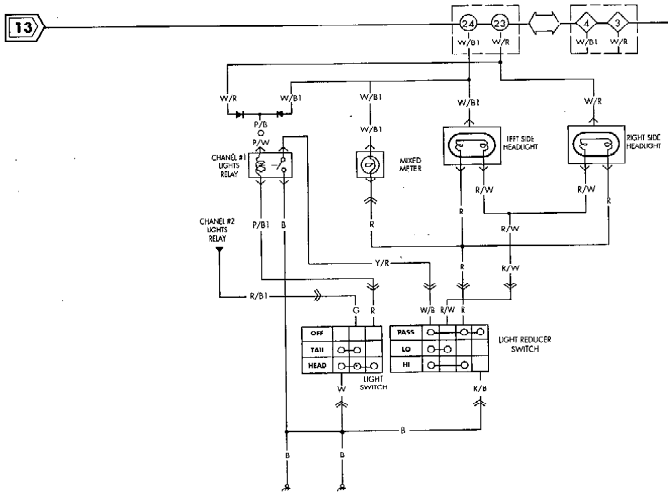
BRAKE LIGHT



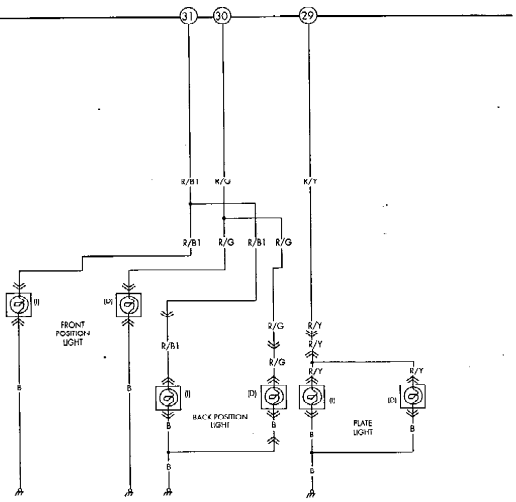
CIGARETTE LIGHTER



SIGNAL LIGHTS



POSITON AND REGISTRATION PLATE LIGHTS



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November, 2000





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