DAIHATSU

WORKSHOP MANUAL
S85
(HIJET)
NO. 7933

Daihatsu Motor Co., Ltd.

DAIHATSU

S85

GENERAL INFORMATION

GI

NO. 7933-SE

GENERAL INFORMATION

The manual deals with disassembling procedures including the use of lifts. We recommend using this instrument to improove your operating capacity.
If using a jack or a hydraulic jack, make sure the wheels have been locked and place the vehicle on specific supports.

DISASSEMBLING:

a) Before any disassembling, disconnect the battery negative pole
b) Use specific Daihatsu tools only.
c) Use specific Daihatsu spare parts only.
d) Check carefully if the disassembled parts show signs of wearing or damaging.
e) When disassembling complex parts, help yourself with identification marks and part position schemes.
f) Divide the disassembled parts into two distinct groups: one for parts to be reassembled and the other one for parts to be replaced.
g) Clean carefully every part to be reassembled.

REASSEMBLING

a) Use always new spare parts
b) Check carefully the parts to be reassembled with the recommended specific tools.
c) Respect the recommended tightening torques. Use dinamometric wrenches revised periodically.
d) Use always new gaskets and piston rings.

IMPORTANT SAFETY NOTICE

The vehicle is a machine comprising a great number of parts. Basically speaking, the vehicle is potentially hazard. However, one can handle it safely if he has the required knowledge.

Correct service methods and repair procedures are very vital for assuring not only the safety and reability of a vehicle, but also the safety of service personnel concerned.

The methods and procedures contained in this manual describe in a general way the techniques which the manufacturer has recommended. Thus, they will contribute to ensuring the reability of the products. The contents of the servicing operations comme in a wide variety of ways. Moreover, techniques, tools and parts necessary for each operation are different widely from each other.

THis manual does not cover all details of techniques, procedures, parts, tools and handling instructions which are necessary for these operations, for such coverage is impossible. Hence, any one who obtains this manual is expected first to make his responsible selection as to techniques, tools and parts which are necessary for servicing the vehicle concerned properly. Furthermore, he must assume responsibility for his actions in connection with his own safety.

Therefore, one should not perform any service if he is not capable of making responsible selection and/or if he can not understand the contents here in described, for this manual has been prepared for experienced service personnel.

WARNINGS, CAUTIONS AND NOTES

All these symbols have their specific purposes, respectively.

WARNING:
This symbol means that there is the possibility of personal injury of the operator himself or the nearby workers if the operator fails to follow the operating procedure prescribed in this manual.

CAUTION:
This symbol means that there is the possibility of damage to the component being repaired if the operator fails to follow the operating procedure prescribed in this manual.

NOTE:
To accomplish the operation in an efficient manner, additional instructions concerning the operation are given in this section.

The following list describes general WARNINGS:

- Always wear safety glasses for eye protection.

- Use safety stands whenever a procedure requires you to be under the vehicle.

- Be sure that the ignition switch is always in the OFF position, unless otherwise required by the procedure.

- Set the parking brake when working on the vehicle.

- Operate the engine only in a well-ventilated area to avoid the danger of carbon monoxide.

- Keep yourself and your clothing away from moving parts, when the engine is running, especially from the fan and belts.

- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, catalytic converter and muffler.

- Do not smoke while working on a vehicle.

- To avoid injury, always remove rings, watches, loose hanging jewerly, and loose before beginning to work on a vehicle.

- Keep hands and other objects clear of the radiator fan blades! The electric cooling fan is mounted on the radiator and can start to operate at anytime by a rise in coolant temperature or turning ON of the air conditioner switch in the case of vehicles equipped with an air conditioner. The electric cooling fan is also mounted on the condenser for air conditioner and starts to operate anytime when the air conditioner switch is turned "ON". For this reason, care should be taken to ensure that the electric cooling fan motor is completely disconnected when working under the hood.

HOW TO USE THIS MANUAL

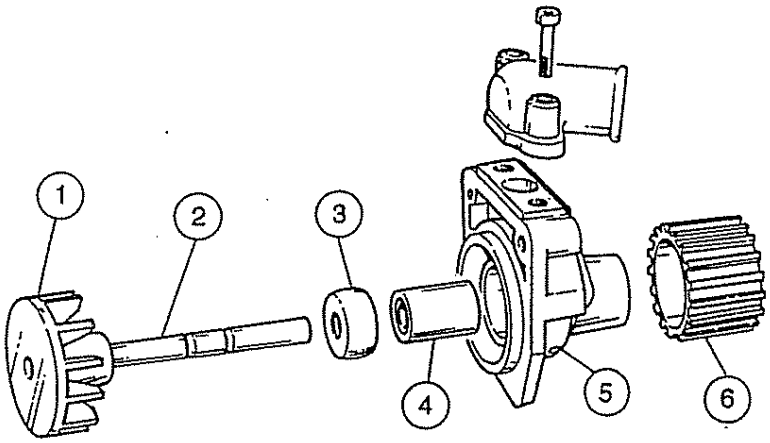
CONTENTS OF EXPLANATION

1. Schematic Diagram of Components

1) The schematic diagram of components that appears at the beginning of each section describes the nomenclature and installed conditions of each component.
2) Those parts whose reuse is not permitted bear a "★" mark for an identification purpose. Be certain to replace these parts with new ones during the assembly.
3) During the assembly, be sure to apply grease to those parts indicated by the ☛ mark in the figure

(Example)

T : Tightening torque
Unit : N.m (kgf-m)
* : Non-reusable parts



① Rotor
② Shaft
③ Face seal gasket
④ Bearing
⑤ Pump body
⑥ Pulley

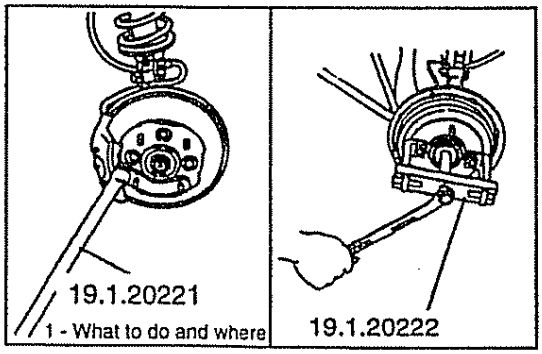
2. Servicing Procedure

1) In principle, the servicing procedure is described in the following sequence given below: Removal -> Inspection -> Installation, and Disassembly -> Inspection -> Assembly.
2) The explanation covers detailed servicing methods, specifications and notes.
3) The main point of each item explains the servicing section and servicing procedure, using illustrations.

(Example)

What to do / How to do it

3. Brake tube installation
1) Tighten the brake tube to the wheel cylinder, using the following SST 19.1.20221



4) The inspection in this manual describes only checking operation. Therefore, if you find any malfunction, replace any defective parts with new ones.

3. SST

For those operations which require the use of any SST, the SST numbers concerned are given in bold letters.

4. Service Specifications

Service specifications are indicated in bold letters or enclosed by heavy lines. Be certain to confirm the specifications concerned.

5. Tightening Torque

For those operations which require the control of tightening torque, the relevant tightening torque is given in bold letters. Be certain to confirm the tightening torque oncerned.

6. Definitions of Terms

Specified Value.....A value which represents the allowable range during the inspection and adjustment.
Limit .....a maximum or a minimum limit which the value should not exceed or fall below.

ABBREVIATION CODES

The abbreviation codes that appear in this workshop manual stand for the following, respectively.

Ay	Assembly
API	American Petroleum Institute
BDC	Bottom Dead Center
BTDC	Before Top Dead Center
BVSV	Bimetal Vacuum Switching Valve
C/W	Choke warning
C/O	Choke opener
ECU	Electronic Control Unit
EFI	Electronic Fuel Injection
EX	Exhaust (Manifold, Valve)
EVAP	Fuel evaporative emission control
FL	Fusible Link
HIC	Hot Idle Compensator
IN	Intake (Manifold, Valve)
ISO	International Organization for Standardization
LH	Left Hand side
LHD, L.H.D	Left Hand Drive
LLC	Long Life Coolant
L/	Less
MP	Multipurpose
M/T, MT	Manual Transmission
O/S	Over Size
PCV	Positive Crankcase Ventilation
RH	Right Hand side
RHD	Right Hand Drive
RVSV	Fuel pressure Regulator Vacuum Switching Valve
SST	Special Service Tool
STD	Standard
SD	Spark delay
S/A	Sub-Assembly
SAE	Society Automotive Engineers
TDC	Top Dead Center
TP	Throttle positioner
TWC	Three-way catalyst
T	Torque
U/S	Under size
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
W/	With
W/O	without

JACKING POINTS AND SUPPORTING POINTS OF SAFETY STANDS

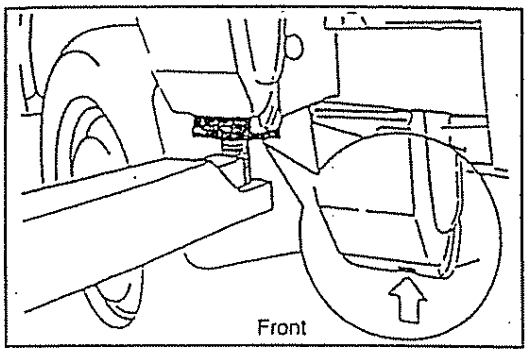
JACKING POINTS AND SUPPORTING POINTS FOR SAFETY STANDS

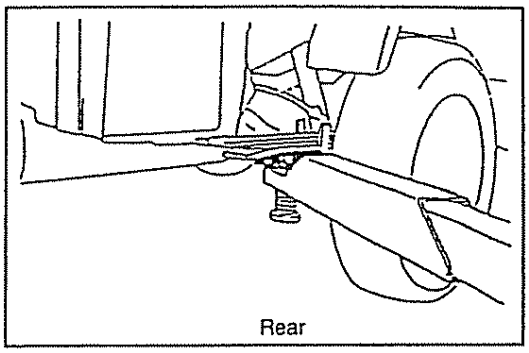
Front side: Support the vehicle at the body under the center pillar.

Rear side: Support the vehicle at the leaf spring.

Caution:

- Never support the vehicle at the body.

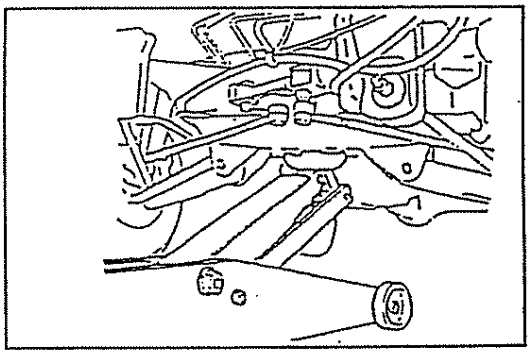


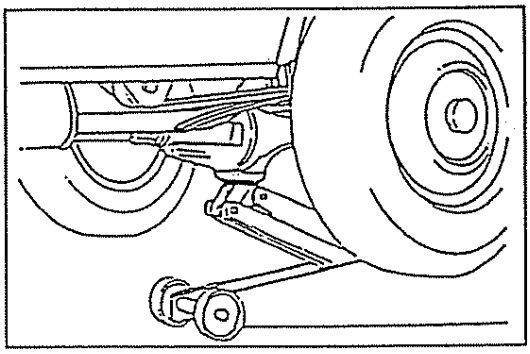


JACKING POINTS FOR GARAGE JACK

Front side: Support the vehicle at the front suspension cross member.

Rear side: Support the vehicle at the differential.

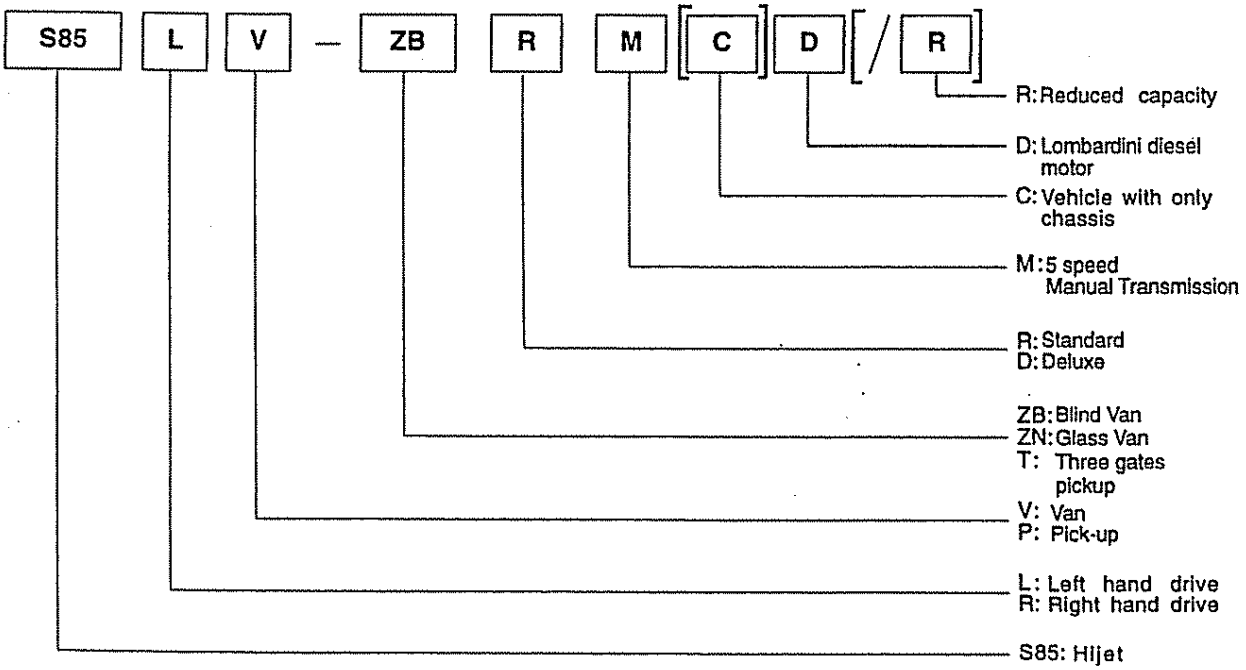




VEHICLE MODELS

Model code	Engine	Driving wheel
S85LP-TRMD S85LP-TRMCD S85LP-TRMD/R S85LV-ZBRMD S85LV-ZNDMD S85LV-ZBRMD/R	LDW 1204/P	Rear, 2-wheel drive

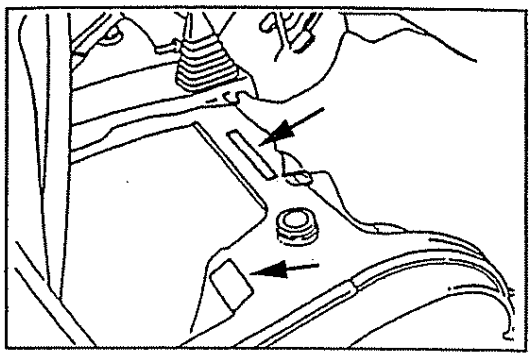
EXPLANATION OF VEHICLE MODEL CODE



NOTE:
[□]: Code no always present

CHASSIS SERIAL NUMBER & MANUFACTURER'S PLATE

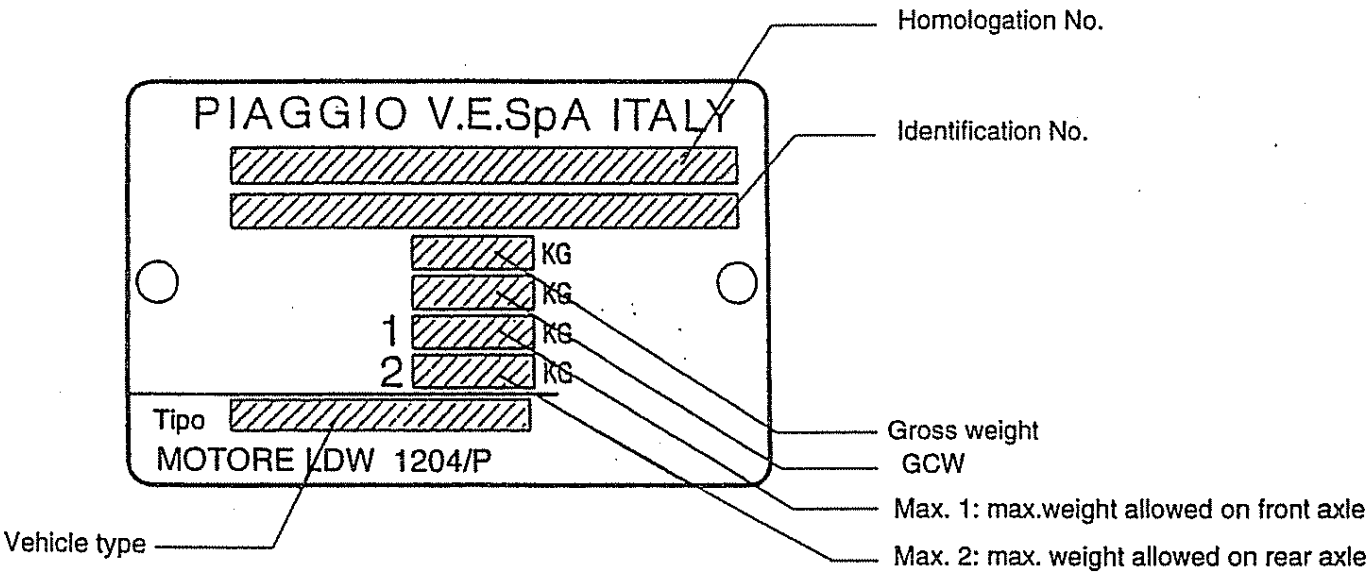
CHASSIS NUMBER & MANUFACTURER'S PLATE



1. Location

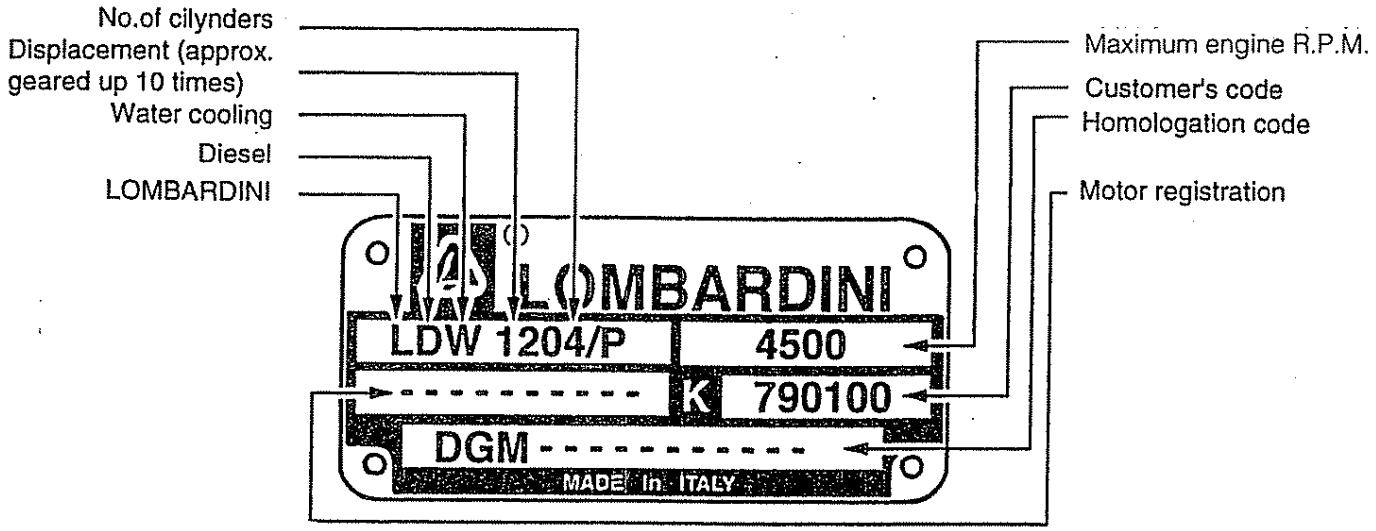
The chassis number is stamped on the front floor panel. The manufacturer's plate is attached on the cowl panel at the right side in the engine compartment.

2. Contents of manufacturer's plate



ENGINE NUMBER AND ENGINE TYPE

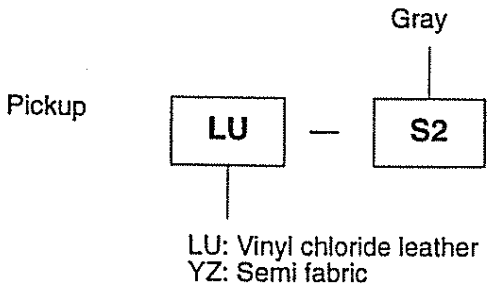
The engine type is embossed on the plate on the rear side of the cylinder block.
The engine serial number is stamped on the same plate.

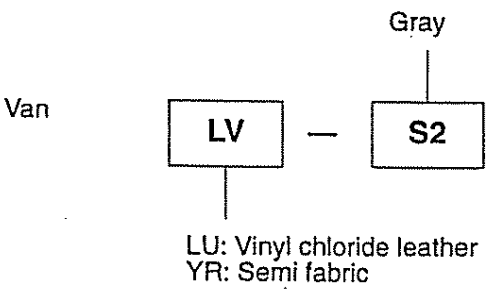


BODY COLOR INFORMATION

Color code	Color	VAN	Pickup
W10	White	●	●
B24	Blue	●	●
R16	Red	●	●
G15	Green Metallic	●	—
S13	Dark grey Metallic	●	—
A01	Dark Blue	●	●

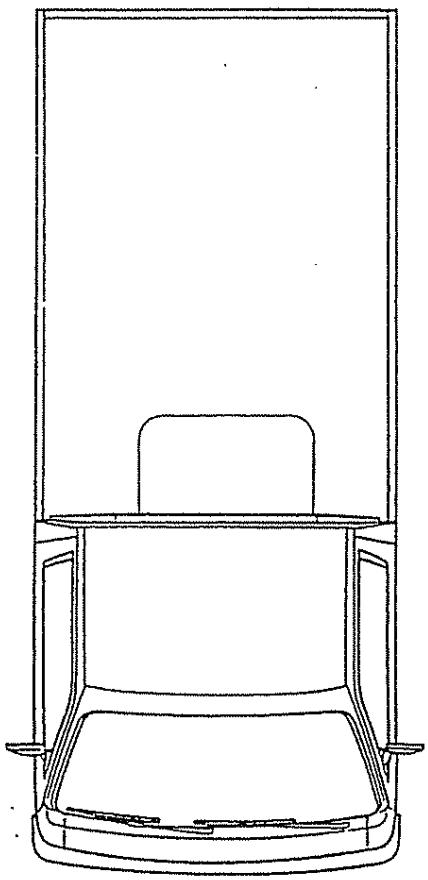
TRIM CODE

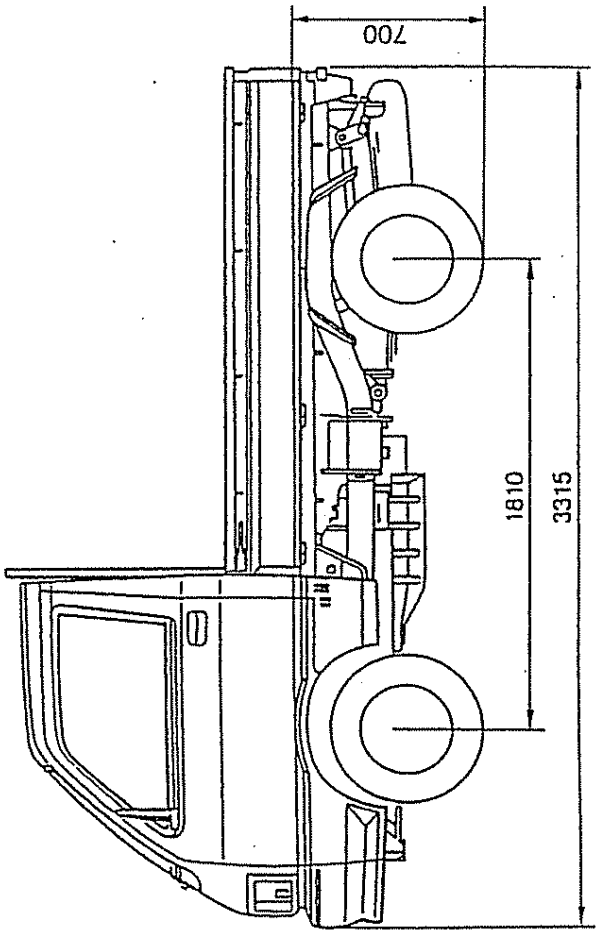


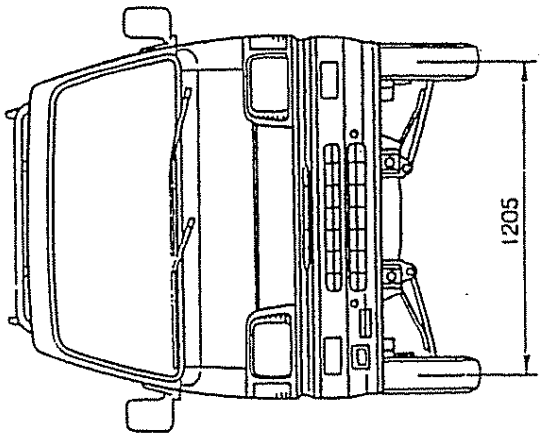


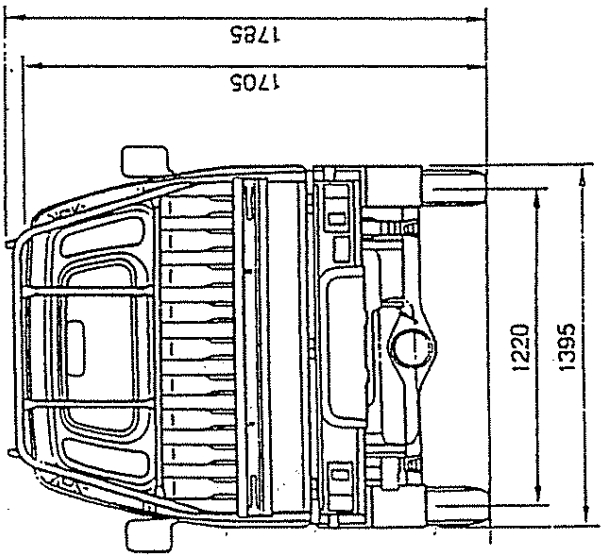
VEHICLE 4-PLANE DIAGRAMS

Pickup

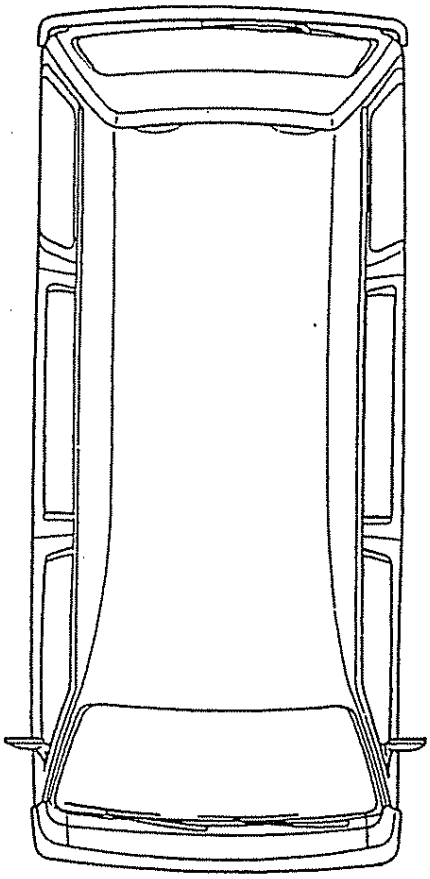


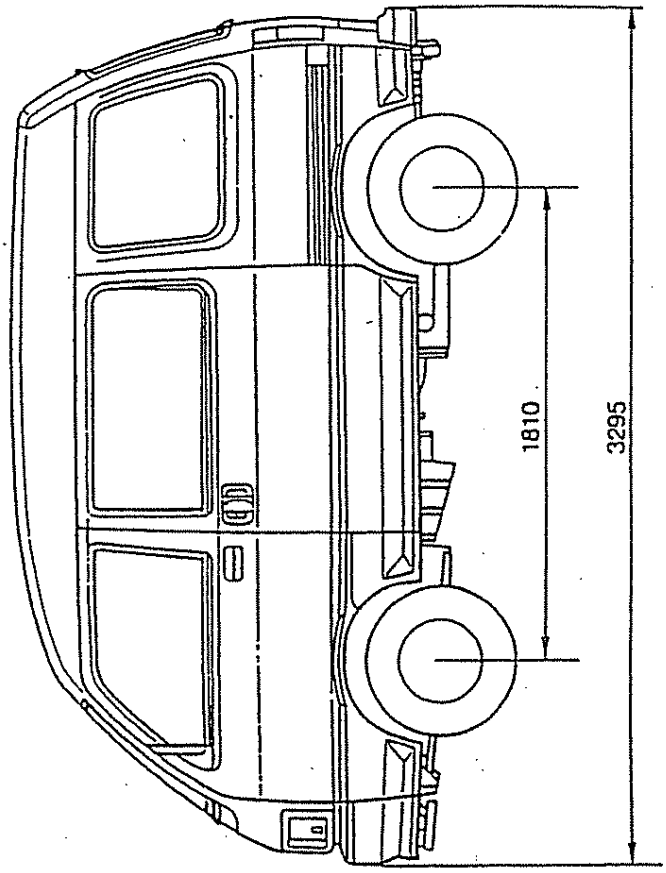


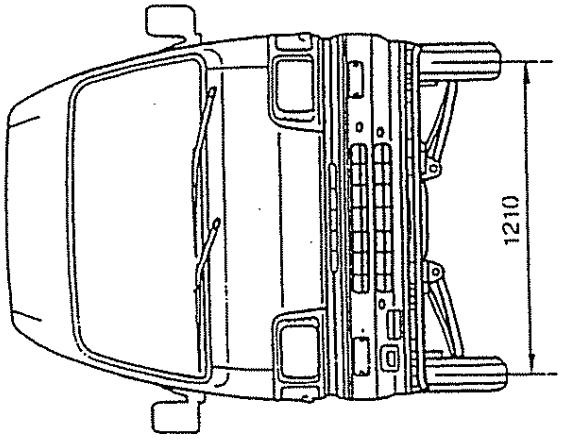


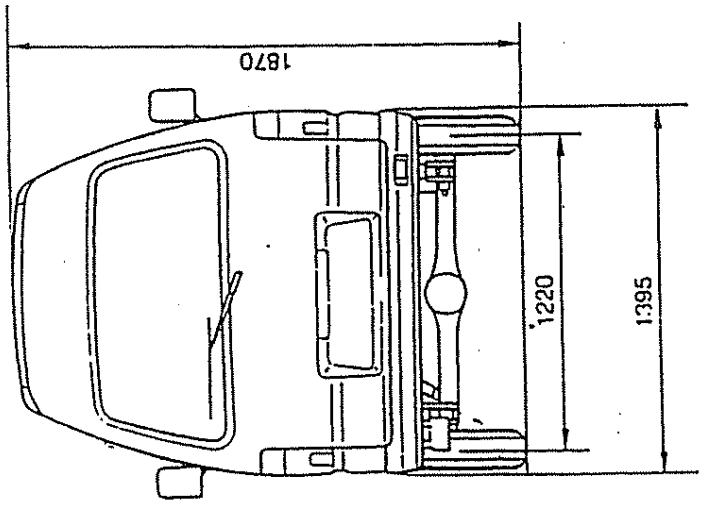


Van





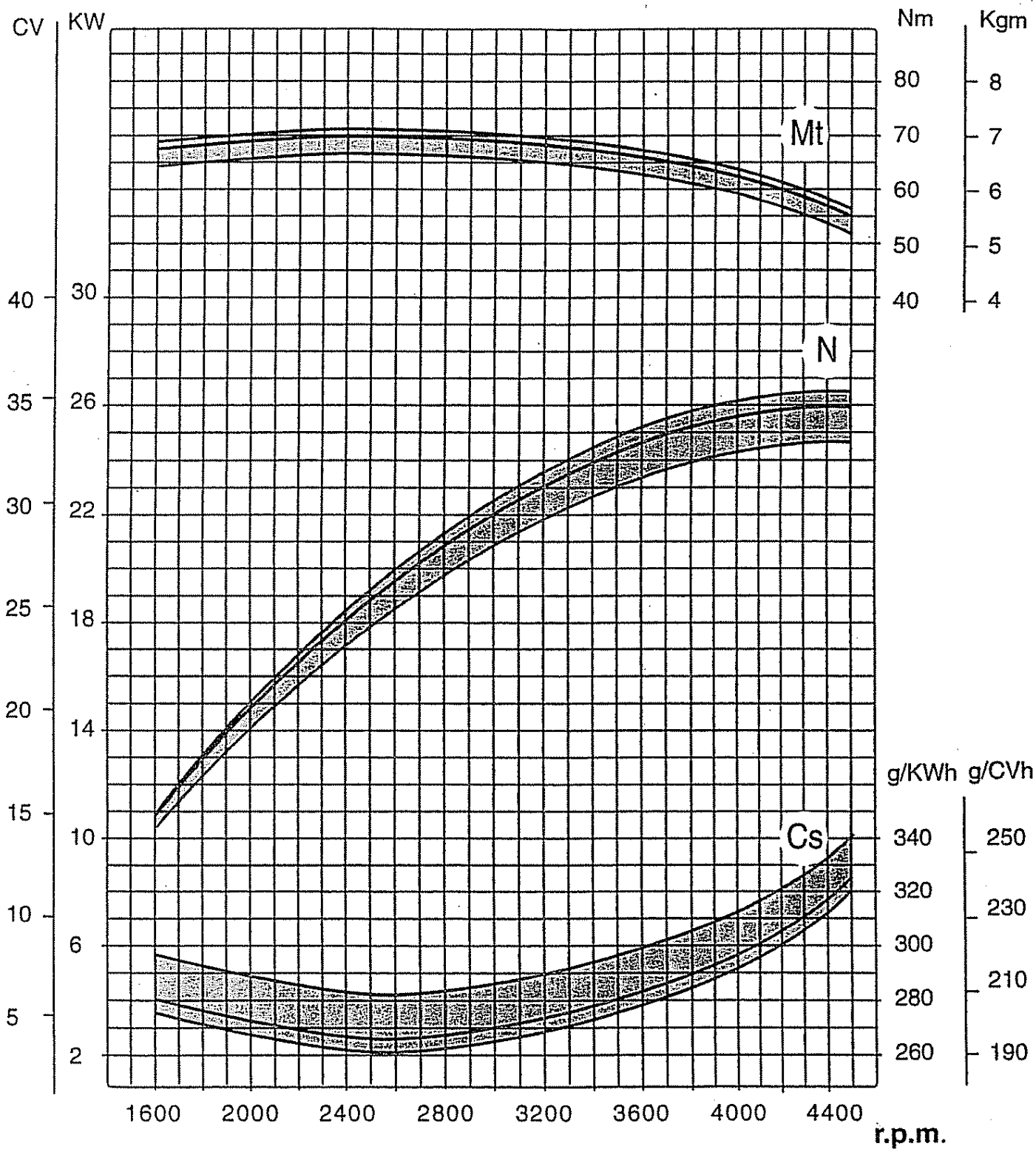




PERFORMANCE DIAGRAMS

CHARACTERISTIC POWER, TORQUE AND SPECIFIC CONSUMPTION CURVES

Engine LDW 1204/P



N = Right power curve (80/1269/CEE) - Max power = 26 kW - 4500 rpm
Mt = Right torque curve - Max torque = 71 Nm - 2700 rpm
Cs = Specific fuel consumption curve

ENGINE SPECIFICATIONS

Item \ Engine type					LDW 1204/P
Engine proper	Tipe				Diesel, water cooled, 4-cycle
	Cylinder No. and arrangement				4-cylinder-in-line, mounted longitudinally
	Combusion chamber type				Low turbulence
	Valve mechanism				Belt-driven
	Bore x Stroke mm.				72 x 75
	Compression ratio				23
	Compression pressure kPa (kg/cm²) rpm				2800 (28) - 250/300
	Maximum output (DIN) KW/rpm				26/4500
	Maximum torque (DIN) Nm/rpm			Pickup	71/2700
				Van	71/2700
	Engine dimensions (Lenght x Width x height) mm.				544 x 621 x 453
	Service engine weight kg				107
	Number of piston ring		Compression ring		2
			Oil ring		1
	Valve timing	Intake	Open		18° BTDC
			Close		46° ABDC
		Exhaust	Open		54° BBDC
			Close		18° ATDC
	Valve clearance (Cold) mm.		Intake/Exhaust (Regulator/valve)		0.20
			Intake/Exhaust (Roll/came)		0,15
	Idling speed rpm				900 ± 50
	Blow-by gas recirculating system				Closed type
Lubricating system	Lubricating method				Fully-forced feed method
	Oil pump				Trochoid type
	Lubricant capacity l				4.15
Cooling system	Cooling method				Water cooled, electromotor type
	Radiator type				Corrugation type forced circulation
	Coolant capacity (including the heater and reserve tank) l			Pickup	5,5
				Van	5,5
	Water pump type				Centrifugal type, "V" belt-driven type
	Thermostat type				Wax type
Air cleaner	Type				Filter paper type
	Number				1

Item				Engine type LDW 1204/P
Fuel system	Fuel tank	Capacity	l.	35
		Location	Pickup	Under cargo platform at rear side of rear axle
			Van	Under cargo platform at right side, midpoint between front and rear axles
	Fuel pipe material			Rubber and steel tube
	Fuel pump type			Mechanical type
	Fuel filter type			Filter paper type
	Feeding pump characteristic at 1500 rpm	Capacity		75 l/h
		Automatic control pressure		0.55 ÷ 0.65 bar
Engine electrical system	Glow-plugs	Tension		12.5 V
		Electrical imput		13.5 - 16.5 A after 5"
		Temperature of sheath		720°/820° C after 5"
	Battery	Type		TUDOR 12V 60 Ah 380 A
		Capacity Ah		60 Ah (20h) 52 Ah (5h)
	Alternator	Type		3-phase alternating current commutating type
		Output	V/A	14 - 65
		Regulator type		Electronic
	Starter	Type		With reduction unit
		Output	V-kW	12 - 1.4

POWER TRAIN SPECIFICATIONS

Clutch	Mechanism from engine to transmission			Engine-clutch-transmission
	Type			Dry-single disc diaphragm
	Facing	Dimensions [Outer dia. x inner dia.] mm.		181.5 × 127
		Facing area cm^2		132
		Material		Non-asbestos
Transmission	Type	Forward		Contact-mesh type
		Reverse		Selective sliding type
	Gear ratio (tooth No.)	1st gear		4.059 (43/13 × 27/22)
		2nd gear		2.045 (35/21 × 27/22)
		3rd gear		1.457 (38/32 × 27/22)
		4th gear		1.000
		5th gear		0.838 (28/41 × 27/22)
		Reverse		4.128 (37/26 × 26/11 × 27/22)
Differential gear	Type			Conventional type
	Gear ratio (tooth No.)			4.875 (39/8)
Running system	Front axle	Toe-in mm.		2.0 : $^{1.5}_{1.0}$
		Camber angle		1 : $^{0°}_{30'}$
		Caster angle		3°02' ± 1°
		Kingpin angle		11°25' ± 1°
	Rear axle type			Semi-floating type
Steering	Wheel	Outer diameter mm.		370
		Maximum lock to lock turns		4.1
	Gear	Type		Rack and pinion
		Gear ratio		∞
	Turning angle	Inner angle		36°
		Outer angle		34.8°
Brake	Type	Front		Disc
		Rear		Drum
	Master cylinder inner diameter mm.			19.05
	Wheel cylinder inner diameter		Front	51.10
			Rear	17.46
	Parking brake system			Mechanical hand operation which applies to rear wheels

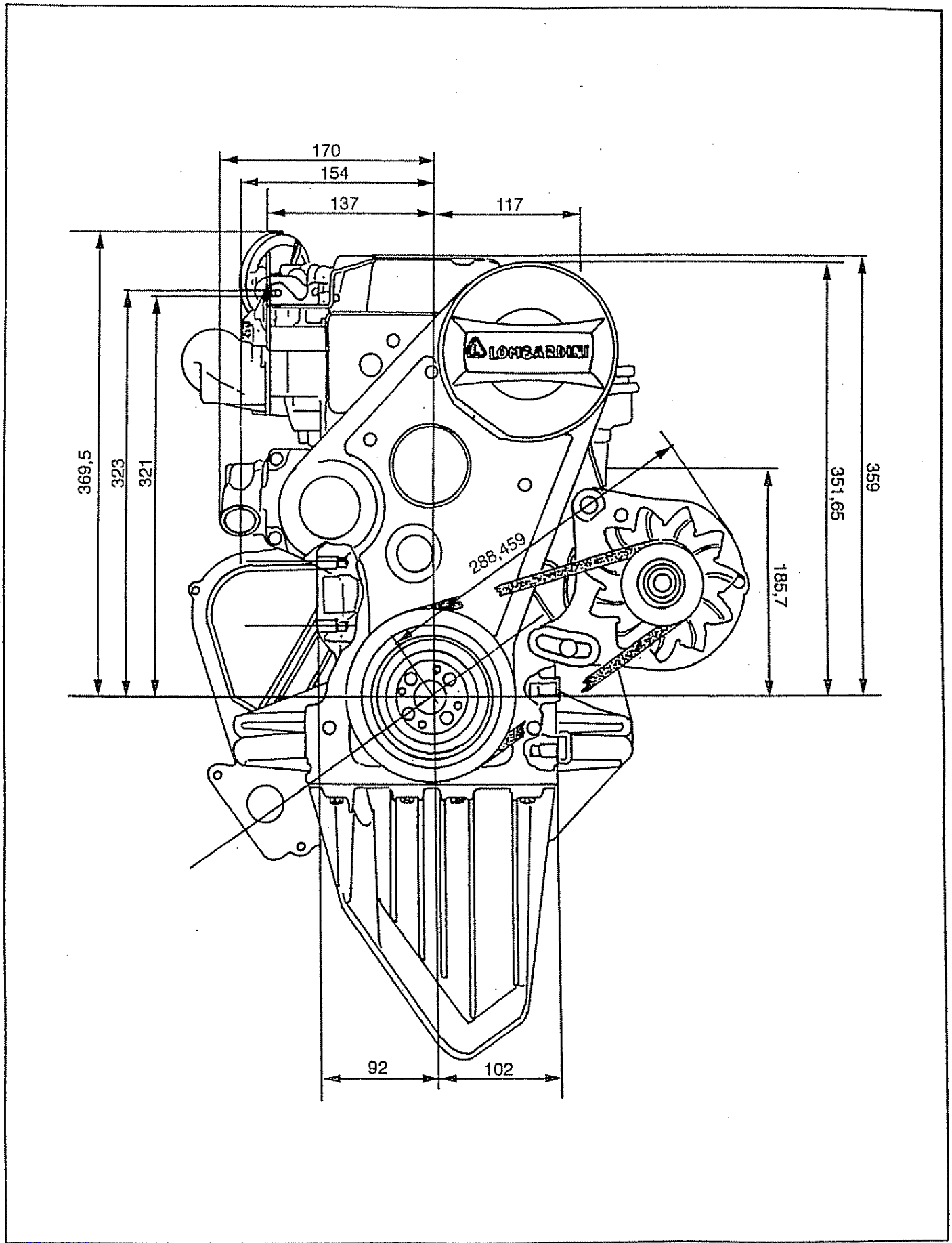
Suspension	Suspension type		Front		Independent, Macpherson strut
			Rear		Rigid axle
	Spring type		Front		Coil spring
			Rear		Semi-elliptical leaf spring
	Main spring dimensions	Front (Wire diameter x spring diameter x free lenght-effective turns) mm.		Pickup	(10.5 - 10.0) × 85.0 × 263 - 7.54
				Van	(10.9 - 10.0) × 85.0 × 262 - 7.37
		Rear (Lenght x width x thickness-number of leaves) mm.		Pickup	1000 × 50 × 7 - 1 / 870 × 50 × 7 - 1
				Van	1000 × 50 × 7.5 - 1 / 850 × 50 × 7.5 - 1
	Auxiliary spring dimensions	Rear (Lenght x width x thickness-number of leaves) mm.		Pickup	740 × 50 × 11 - 1 / 460 × 50 × 11 - 1
				Van	690 × 50 × 11 - 1 / 460 × 50 × 11 - 1
	Shock absorber type				Double-acting telescopic type
Occupant protective device	Front seat belt				3 point ELR
Glass	Front windshield glass		Type		Laminated
			Thickness mm.		5.3
			Type		Membrane

LAMP SPECIFICATIONS

Light		Wattage
Headlights	White	45/40
	Halogen	60/55
Clearance lights		5
Side turns signal lights		5
Front turn signal lights		21
Rear turn signal lights		21
Back-up light		21
Licence plate lights		5
Rear fog light		21
Interior light		5
Rear room light		5

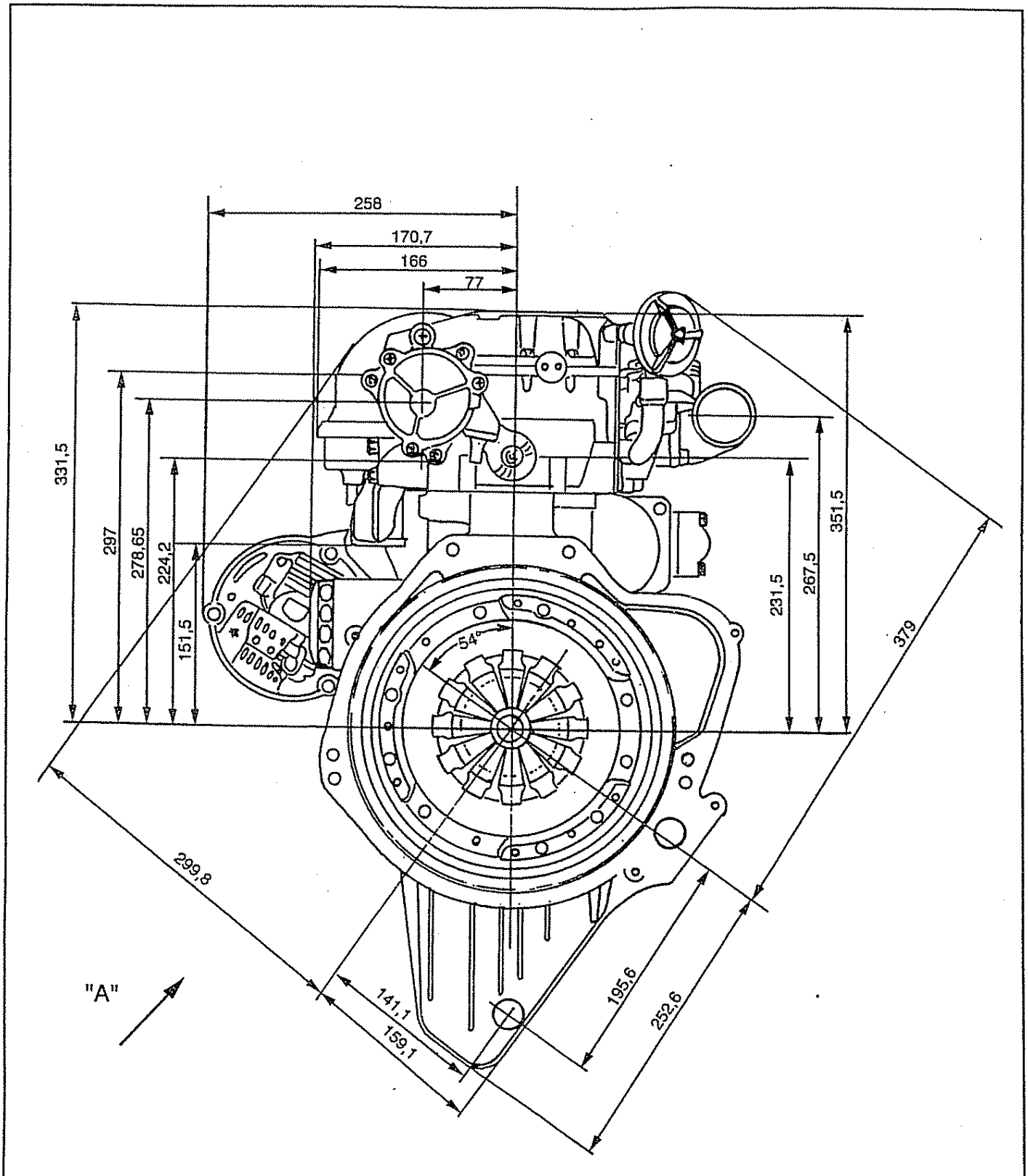
ENGINE

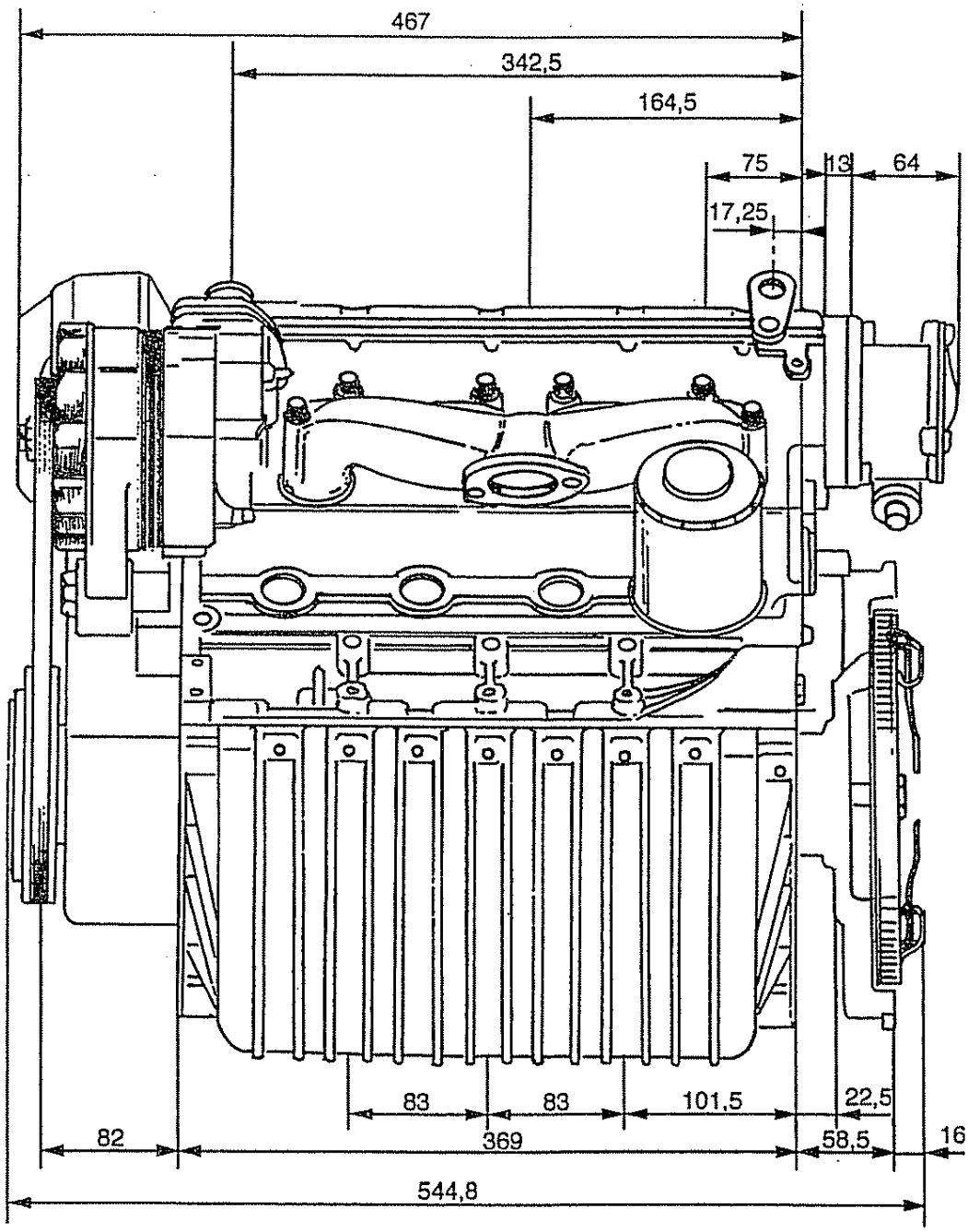
SECTIONAL VIEW



CLUTCH

SECTIONAL VIEW





DAIHATSU

S85

MA

MAINTENANCE

NO. 7933-SE

MAINTENANCE SCHEDULE

Follow the distance and the period the vehicle has been driven whichever come first.

Continue periodic maintenance service after 150.000 km, restarting at 7.500 km (4687 miles).

○ Check ● Change or replacement

Section	Inspection			x 1000 km.	1	7,5	15	22,5	30	37,5	45	52,5	60	67,5	75	82,5	90	97,5	105	112,5	120	127,5	135	142,5	150
				x 1000 miles	0.6	4.5	9	13.5	18	22.5	27	31.5	36	40.5	45	49.5	54	58.5	63	67.5	72	76.5	81	85.5	90
				(Months) Years	-	(6)	1	(6)	2	(6)	3	(9)	4	(6)	5	(6)	6	(6)	7	(6)	8	(6)	9	(6)	10
Engine	• Air cleaner	• Cleaning				○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
		• Change							●				●				●				●				
	• Valve clearance and rocker arm	• Clearance						○		○			○			○		○			○			○	
	• Engine oil	• Check * • Change	API CD or higher grade		Every 7.500 Km (4518 miles)																				
	• Oil filter	• Change					●		●		●		●		●		●		●		●		●		●
	• Fuel filter	• Change °							●				●				●				●				
	° Solenoid valve	• Operation						○		○			○			○		○			○			○	
	• Recovery pipe of oil steams	• Connection • Damage						○		○			○			○		○			○			○	

° Check the fuel filter for the eventual water sediments every 15.000 Km (9375 miles)

* Every 3500 Km. (2187 miles)

○ Check ● Change or replacement

Section	Inspection			x 1000 km.	1	7,5	15	22,5	30	37,5	45	52,5	60	67,5	75	82,5	90	97,5	105	112,5	120	127,5	135	142,5	150
				x 1000 miles	0.6	4.5	9	13.5	18	22.5	27	31.5	36	40.5	45	49.5	54	58.5	63	67.5	72	76.5	81	85.5	90
				(Months) Years	-	(6)	1	(6)	2	(6)	3	(9)	4	(6)	5	(6)	6	(6)	7	(6)	8	(6)	9	(6)	10
Engine	° Fuel line & connection	• Damage • Crak • Tightness • Leakage			○			○		○			○			○		○			○			○	
		° Fuel hose change			Every 4 years																				
	° Injectors	• Setting • Cleaning								○						○					○				●
	° Coolant	• Quantity • Leakage • Change			○		○	○	○	●		○	○	○		●	○	○		○	○	○		○	○
	° Drive belt	• Tension • Crack • Unit inspection			○		○	○	○	○		○	○	○		○	○	○		○	○	○		○	○
	• Timing belt	° Check			Every 50.000 Km (31250 miles)																				
		• Change			Every 100.000 Km (62500 miles)																				
	• Radiator fin	° Cleaning						○		○			○			○		○			○			○	
	• Alternator	• Check						○		○			○			○		○			○			○	
Power trasmetting system	• Clutch pedal	• Free play • Reserved working travel			○		○	○	○	○		○	○	○		○	○	○		○	○	○		○	○
	• Transmission & differential	• Oil level • Oil leakage			○		○	○	●	○		○	●	○		○	●	○		○	●	○		○	●

○ Check ● Change or replacement

Section	Inspection		x 1000 km.	1	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120	127.5	135	142.5	150
			x 1000 miles	0.6	4.5	9	13.5	18	22.5	27	31.5	36	40.5	45	49.5	54	58.5	63	67.5	72	76.5	81	85.5	90
			(Months) Years	-	(6)	1	(6)	2	(6)	3	(9)	4	(6)	5	(6)	6	(6)	7	(6)	8	(6)	9	(6)	10
Power transmitting system	• Propeller shasft	• Rattle • Unit inspection		○			○		○			○			○		○			○			○	
Suspension system	• Suspension arm • Control arm • Dust cover	• Tightness • Unit inspection					○		○			○			○		○			○			○	
	• Shock absorber	• Function • Oil leakage					○		○			○			○		○			○			○	
Running system	• Tire	• Pressure • Damage • Wear		○		○	○	○	○		○	○	○		○	○	○		○	○	○		○	○
	• Front & rear wheel bearing	• Rattle					○		○			○			○		○			○			○	
	• Front wheel bearing grease	• Grease change							●						●					●				
Steering system	• Steering wheel	• Tightness • Free play		○			○		○			○			○		○			○			○	
	• Linkage • Dust cover	• Tightness • Rattle • Unit inspection		○			○		○			○			○		○			○			○	

○ Check ● Change or replacement

Section	Inspection		x 1000 km.	1	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120	127.5	135	142.5	150
			x 1000 miles	0.6	4.5	9	13.5	18	22.5	27	31.5	36	40.5	45	49.5	54	58.5	63	67.5	72	76.5	81	85.5	90
			(Months) Years	-	(6)	1	(6)	2	(6)	3	(9)	4	(6)	5	(6)	6	(6)	7	(6)	8	(6)	9	(6)	10
Steering system	• Wheel alignment	• Toe test					○		○			○			○		○			○			○	
Braking system	• Brake pedal & parking brake	• Free play • Reserved working travel		○		○	○	○	○		○	○	○		○	○	○		○	○	○		○	○
	• Parking brake cable	• Unit inspection				○		○			○			○		○			○			○		
	• Brake hose • Brake tube	• Leakage • Unit inspection • Loose clamps		○		○	○	○	○		○	○	○		○	○	○		○	○	○		○	○
		• Hose change		Every 4 years																				
	•Brake fluid	• Level		○		○	○	○	○		○	○	○		○	○	○		○	○	○		○	○
		• Change		Every 1 years																				
	• Brake drum • Brake lining	• Wear • Unit inspection					○		○			○			○		○			○			○	

○ Check ● Change or replacement

Section	Inspection		x 1000 km.	1	7,5	15	22,5	30	37,5	45	52,5	60	67,5	75	82,5	90	97,5	105	112,5	120	127,5	135	142,5	150
			x 1000 miles	0.6	4.5	9	13.5	18	22.5	27	31.5	36	40.5	45	49.5	54	58.5	63	67.5	72	76.5	81	85.5	90
			(Months) Years	-	(6)	1	(6)	2	(6)	3	(9)	4	(6)	5	(6)	6	(6)	7	(6)	8	(6)	9	(6)	10
Braking system	• Brake booster	• Function					○		○			○			○		○			○			○	
	• Disc & linigs (Disc brake)	• Clearance • Wear • Damage				○	○	○	○		○	○	○		○	○	○		○	○	○		○	○
	• Rubber parts and vacuum hose of brake booster	• Change		Every 4 years																				
	• Bracking calibrator	• Unit inspection					○		○			○			○		○			○			○	
		• Function							○						○					○				
Chassis & body	• Muffler • Exhaust pipe	• Tightness • Unit inspection					○		○			○			○		○			○			○	

○ Check ● Change or replacement

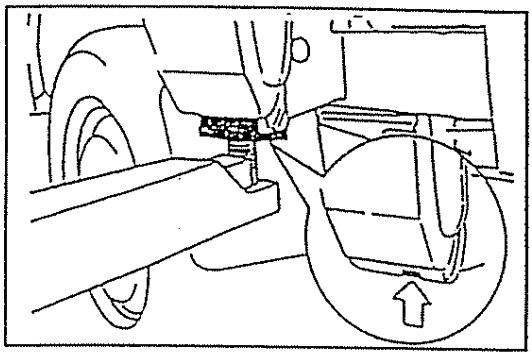
Section	Inspection		x 1000 km.	1	7,5	15	22,5	30	37,5	45	52,5	60	67,5	75	82,5	90	97,5	105	112,5	120	127,5	135	142,5	150
			x 1000 miles	0.6	4.5	9	13.5	18	22.5	27	31.5	36	40.5	45	49.5	54	58.5	63	67.5	72	76.5	81	85.5	90
			(Months) Years	-	(6)	1	(6)	2	(6)	3	(9)	4	(6)	5	(6)	6	(6)	7	(6)	8	(6)	9	(6)	10
Chassis & body	• All doors • Hood	• Lock operation • Tightness					○		○			○			○		○			○			○	
	• Seat belt	• Operation • Tightness					○		○			○			○		○			○			○	
	• Chassis grease	• Condition • Apply	○		○	○	○	○		○	○	○		○	○	○		○	○	○		○	○
	• Other nuts & bolts	• Tightness	○		○	○	○	○		○	○	○		○	○	○		○	○	○		○	○
Electrical system	• Wiring harness	• Tightness • Damage	○		○	○	○	○		○	○	○		○	○	○		○	○	○		○	○
	• Lighting system • Meter & gauges	• Function	○		○	○	○	○		○	○	○		○	○	○		○	○	○		○	○

JACKING POINT

SUPPORTING POINTS FOR SAFETY STANDS AND TWINPOST LIFT

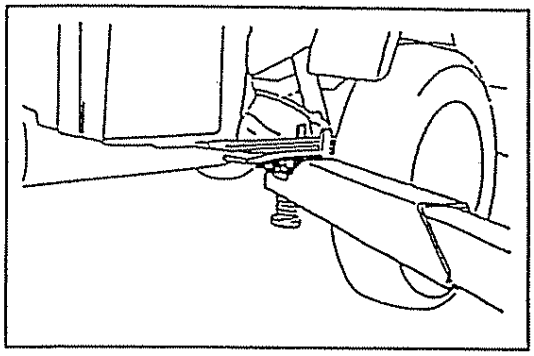
Front side

Support the vehicle at the body under the center pillar.



Rear side

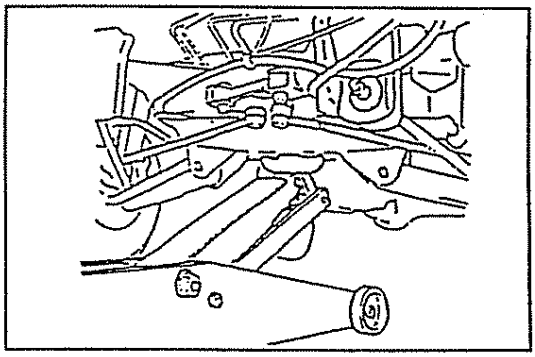
Support the vehicle at the leaft spring.



SUPPORTING POINTS FOR GARAGE JACK

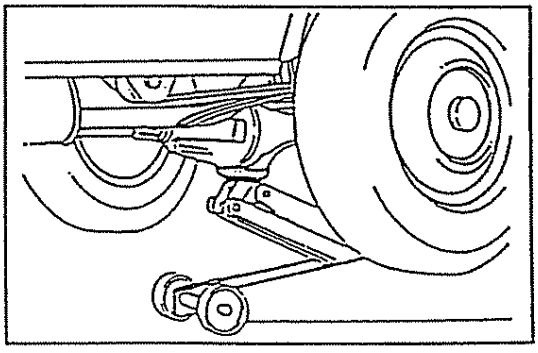
Front side

Apply the jack to the front suspension cross member.



Rear side

Apply the jack to the lower section of the differential.



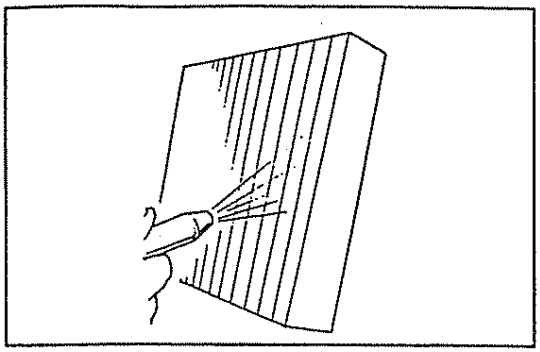
MAINTENANCE OPERATIONS

ENGINE

AIR CLEANER ELEMENT

Remove the air filter element.

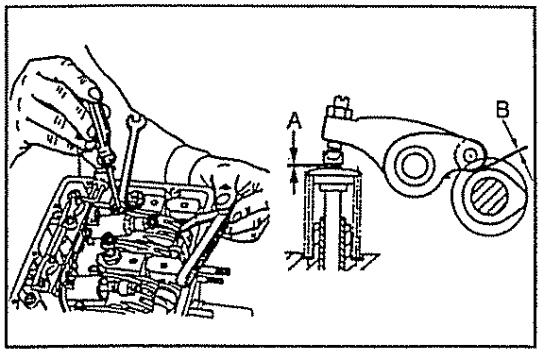
1) Visually inspect the air filter element for being excessively dirty, damage or oil.
2) Clean the element with compress air.
   Replace the element at the specified intervals.



VALVE CLEARANCE

Check and adjust the valve clearance.
Measure between camshaft and valve rocker arm.
(See the Engine Mechanicals Section).

Specified Value:(cold engine)
A: 0.20 mm
B: 0.15 mm



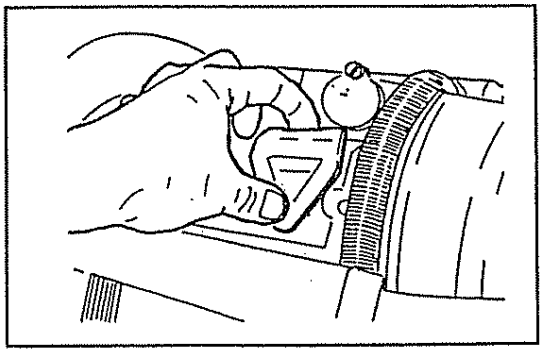
ENGINE OIL & OIL FILTER

Leakage

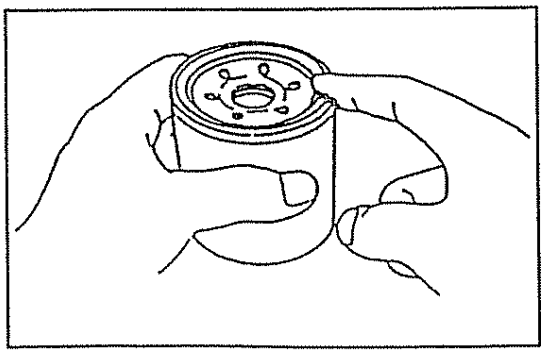
Check each gasket section and so forth for oil leakage.

Oil and filter change

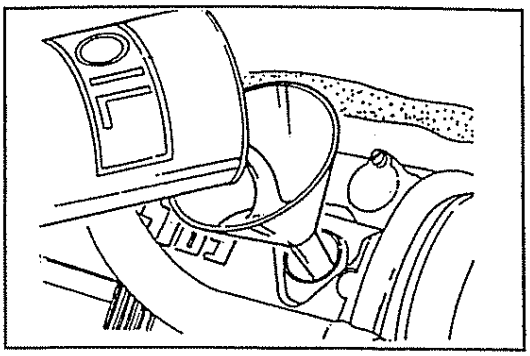
1) Stop the engine after warming it up.
   Then remove the oil filler cap.
2) Drain the engine oil by removing the oil drain plug.
3) Remove the oil filter element with an oil filter wrench.
4) Inspect and clean the oil filter installation surface.
5) Apply engine oil to the O-ring of a new oil filter.



6) Screw and tighten the oil filter.
7) Clean the oil drain plug. Install it with a new gasket interposed.
   NOTE:
   - Be sure to remove the remaining gasket material from the oil pan, using a gasket scraper.



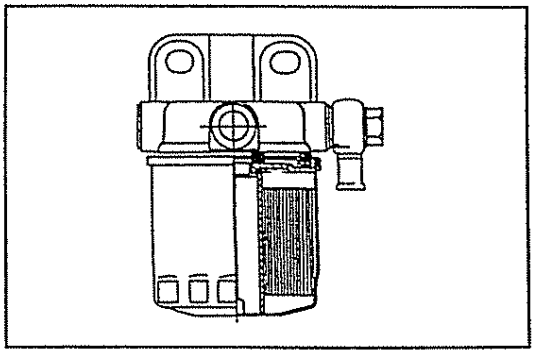
9) Pour engine oil to the engine until it comes to the upper level of the oil level gauge.
(Recommended grade API CD or higher).



10) Start the engine and check it for leakage.
11) Stop the engine.
12) Check the oil level again and replenish engine oil if necessary.

FUEL FILTER

1) Change the fuel filter.
2) After changing, inspect the fuel leakage from around the fuel filter.



FUEL LINE & CONNECTION

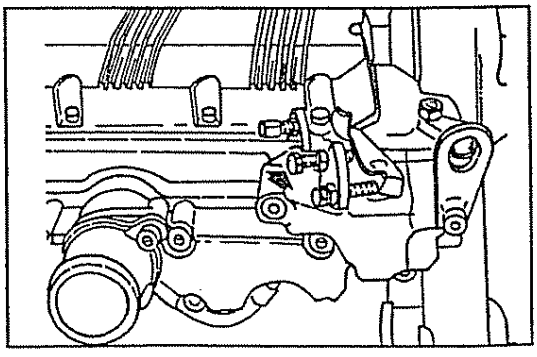
Check the fuel line and connections for cracks, leakage, loose connection or deformation.

REGULATOR

Adjustment of idle speed

NOTE:

- Do not perform the idle speed adjustment while the fan motor is functioning.



1) Connect a tachometer warm up the engine thoroughly.
2) With the engine running, turn the idle speed adjust screw to adjust engine speed to the specified RPM.(900±50)
3) Raise the engine speed quickly to 2000 RPM two or three times to confirm engine RPM is correct.

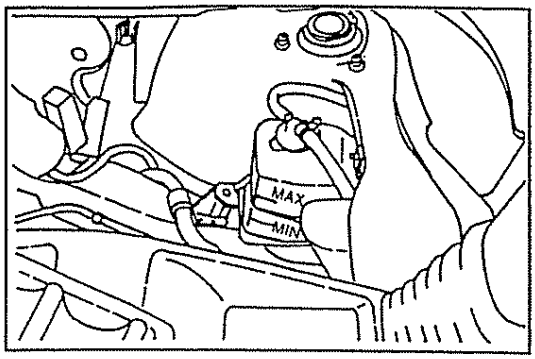
COOLANT

Level

Check the coolant level at the reserve tank.
If the coolant level is below the low line, and coolant, as required.

Leakage

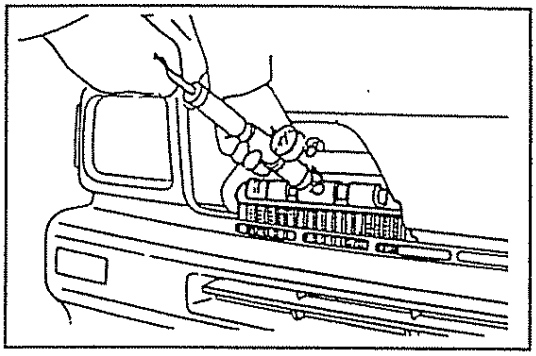
1) Fill the radiator with coolant. Attach a radiator cap tester.
2) Warm up the engine.
3) Apply a pressure of 117.2 kPa (1.2 kgf/cm²) to the cooling system by means of the radiator cap tester.
4) Ensure that no leakage is present.



Coolant change

CAUTION:
- Never open the radiator cap and/or drain plug when the engine is still hot.

1) To carry out this operation see CO section.

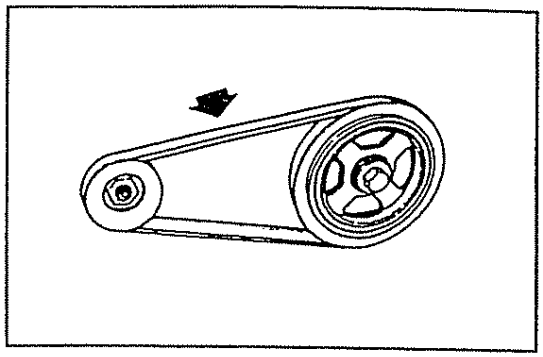


ALTERNATOR BELT

Tension

Depress the "V" belt with a force of 100 N (10 kgf) and measure the deflection.

Specified Deflection: New belt 10 - 15 mm

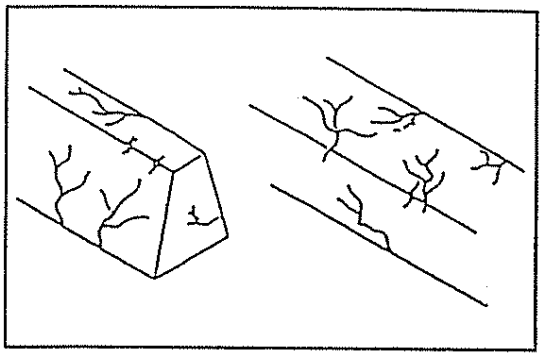


NOTE:

- The new belt refers to a belt which has been used less than five minutes on a running engine.

Crack and damage

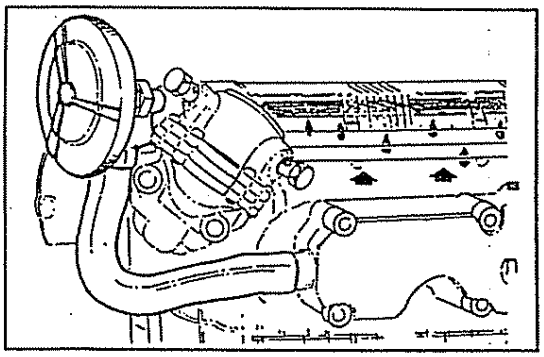
Check the drive belt if it is free from crack or damage.
If necessary, adjust the drive belt tension.



EXHAUST EMISSION CONTROL SYSTEM

BLOW-BY GAS VENTILATION HOSE

Check of hose for damage, restriction and connection.



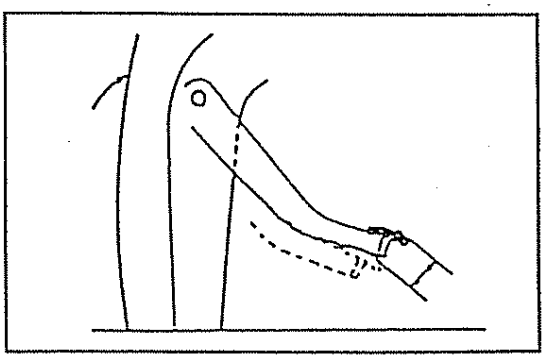
TRANSMISSION SYSTEM

CLUTCH PEDAL

Free play

Lightly depress the clutch pedal by hand, until you feel resistance. Then measure the free play.

Specified Value: 25 - 35 mm (1.0 - 1.4 inches).

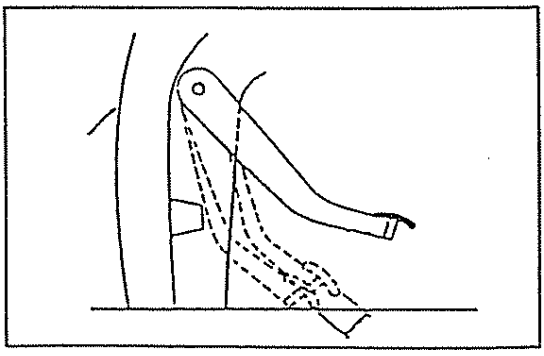


If the free play does not conform to the specification, see the CL Section).

Reserve travel

1) Run the engine at the idle speed and fully apply the parking brake.
2) Fully depress the clutch pedal and shift the transmission to the 1st gear.
3) Slowly release the pedal and measure the distance shown in the illustration at the point when the clutch is engaged.

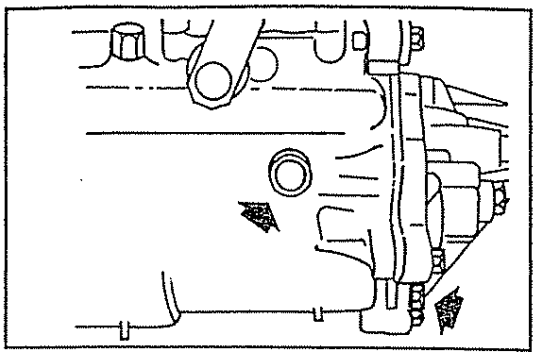
Specified Value: Not less than 20 mm (0.8 inch).



Operation

Check the operation of the clutch pedal.

MANUAL TRANSMISSION



Oil leakage

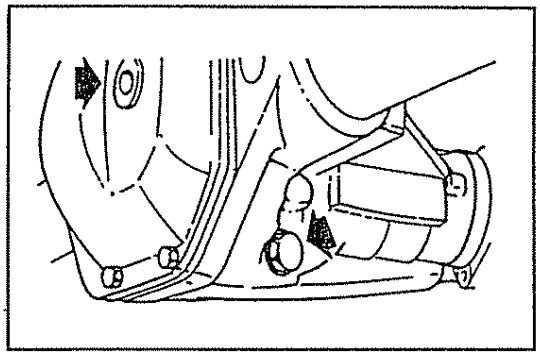
Check the transmission for oil leakage.
Check the transmission oil level.

1) Remove the filler plug.
2) Oil level in the transmission should be at level check hole or under 5 mm.

Change of transmission oil

1) Remove the drain plug and filler plug.
   Drain the transmission oil.
2) Reinstall the drain plug with a new gasket interposed.
   Tightening Torque: 29.4 - 49.0 N·m
   (3.0 - 5.0 kgf-m, 21.7 - 36.2 ft-lb).
3) Replenish the specified transmission oil, until it begins to overflow from the filler hole.
   Specified Transmission Oil:
   API GL - 3 oil
   SAE 75W - 90, 80W - 90 or 80W
4) Reinstall the filler plug with a new gasket interposed.
   Tightening Torque: 29.4 - 49.0 N·m
   (3.0 - 5.0 kgf-m, 21.7 - 36.2 ft-lb).

DIFFERENTIAL



Oil leakage

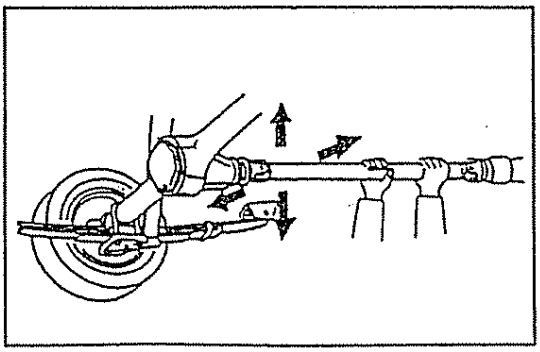
Check at the differential for oil leakage.

Change of differential oil

1) Remove the drain plug and filler plug.
   Drain the differential oil.
2) Reinstall the drain plug with a new gasket interposed.
   Tightening Torque: 39.2 - 58.8 N·m
   (4.0 - 6.0 kgf-m, 28.9 - 43.4 ft-lb).
3) Replenish the specified differential oil, until it begins to overflow from the filler hole.
   Specified Transmission Oil:
   API GL - 5 oil
   SAE 90
4) Reinstall the filler plug with a new gasket interposed.
   Tightening Torque: 53.9 - 68.6 N·m
   (5.5 - 7.0 kgf-m, 39.8 - 50.6 ft-lb).

PROPELLER SHAFT

Check propeller shaft for rattle and damage.



SUSPENSION SYSTEM

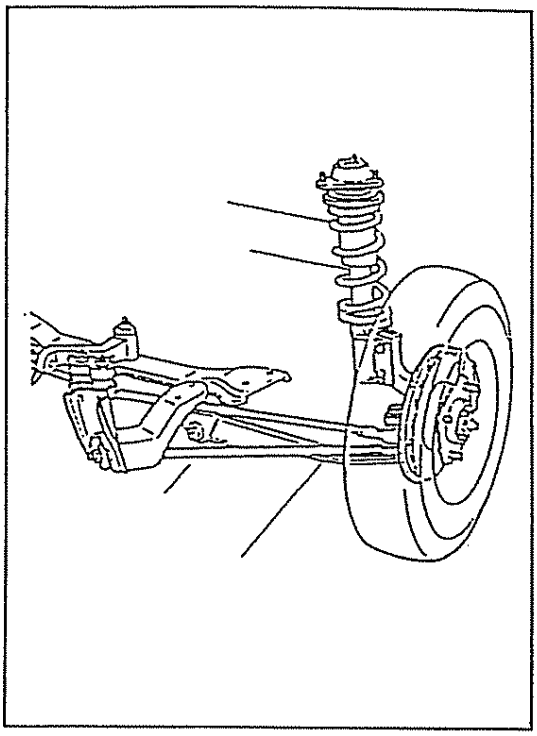
SPRING

Inspection of damage

Visually inspect each spring for breakage and cracks.

Attaching sections and connecting sections

1) Inspect the attaching sections for tightness and damage.
2) Inspect the connecting sections for rattle.



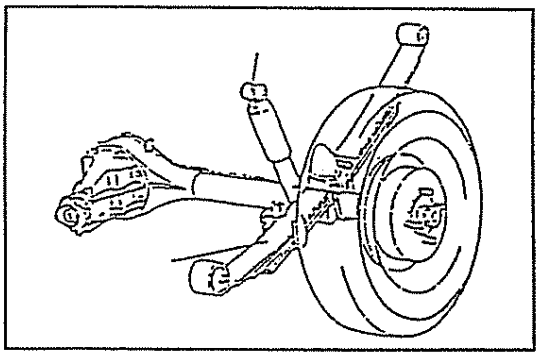
SUSPENSION

Inspection of damage

Visually inspect the suspension for damage and deterioration.

Inspection of rattle

Check the connecting section for rattle by rocking it by hand.



SHOCK ABSORBERS

Inspection of damage

Visually inspect each shock absorber for damage and leakage.

Checking of performance

Bounce the end of the vehicle and check that the bound and rebound action should be quickly damped.

RUNNING SYSTEM

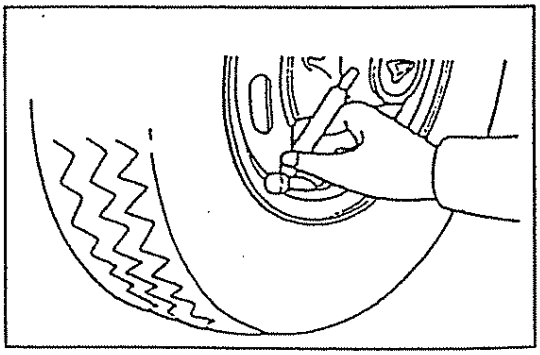
TIRES

Air pressure

- Check to see if the tire air pressure conforms to the specification, using a tire gauge.
- Ensure that no air leaks from the tire valve and that the valve cap is attached.

NOTE:

- For the specified air inflation pressure, see the caution plate attached to the vehicle. Be very careful not to overinflate the tite excessively.

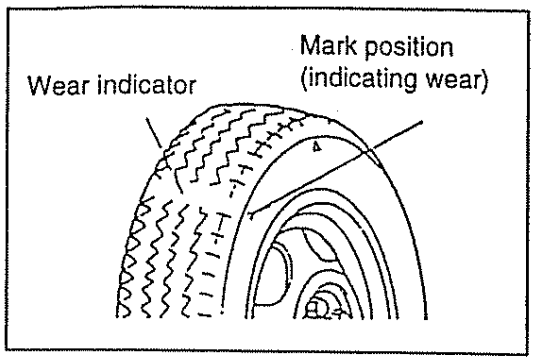


Wear

- Inspect the tread section for wear. Ensure that the groove depth is at least 1.6 mm (0.0063 inch).

NOTE:

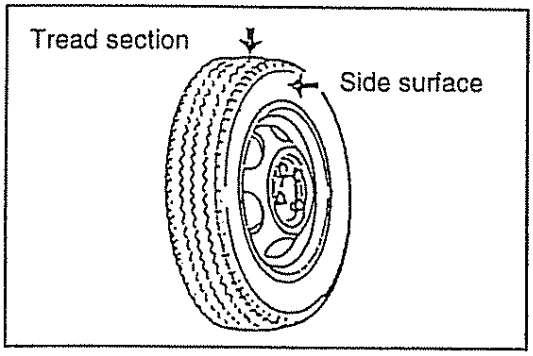
- Care must be exercised as to the wear indicator mark. (When the remaining groove depth is reduced to less than 1.6 mm (0.063 inch), the wear indicator mark will become visible).



- Inspect the tire for uneven wear, ridge and other abnormal wear.

NOTE:

- If the tires exhibit an uneven wear pattern, check the wheel balancing and front wheel alignment.

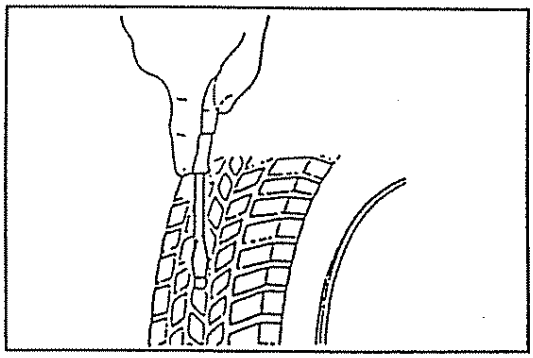


Crack and damage

Check that the tread section and side wall section are free from cracks and damage.

Objects caught in tire pattern

Ensure that no nail, metal chip, gravel or other foreign matters lodge at the grooves of each tire, or none of them sticks into the tire.

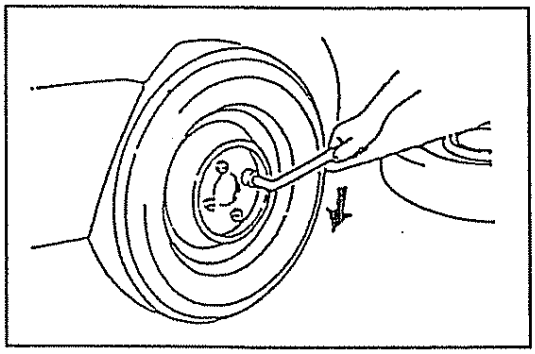


WHEELS

Looseness of hub nuts and bolts

Check the wheel hub nuts and bolts for looseness, using a wheel nut wrench.

Tightening Torque: 88.3 - 117.7 N·m (9.0 - 12.0 kgf-m)



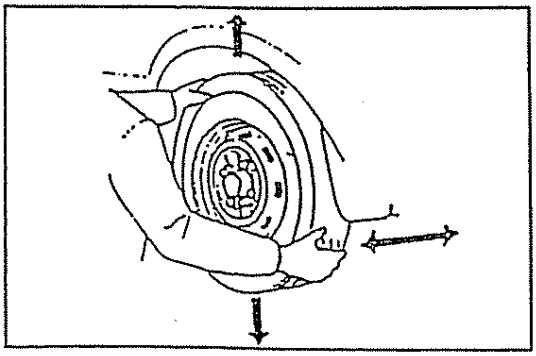
WHEEL BEARING

Rattle

Move the tire up and down while holding it at the top and bottom sections by your hands.

Ensure that the wheel bearing exhibits no excessive play.

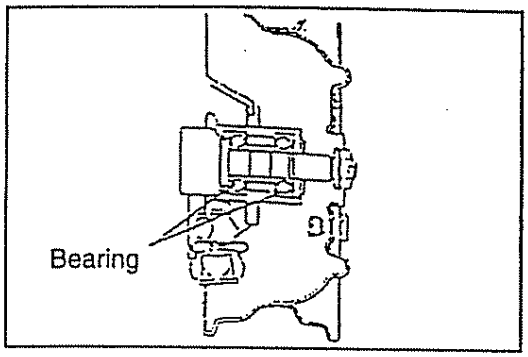
Ensure that no abnormal sound is emitted when the wheel is rotated.



BEARING GREASE

Grease change (Front wheel)

Apply the MP grease.



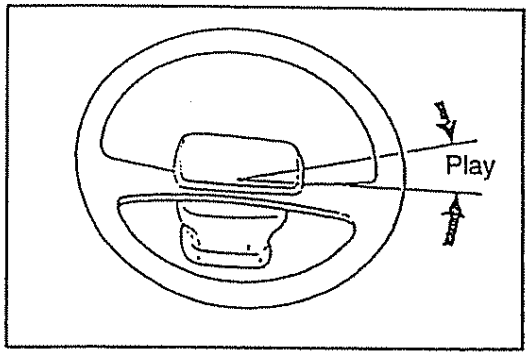
STEERING SYSTEM

STEERING WHEEL

Steering wheel free play

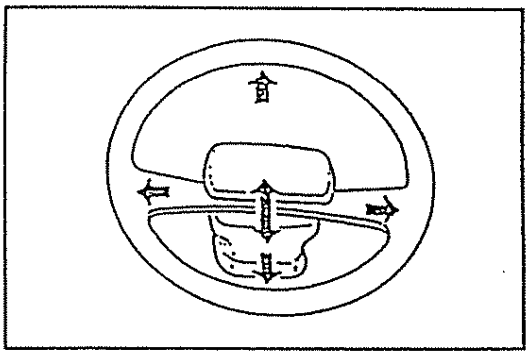
Set the vehicle in a straight-ahead condition. Inspect the steering wheel play by turning it lightly with your fingers.

Specified Value: Less than 30 mm (0.39 inch).



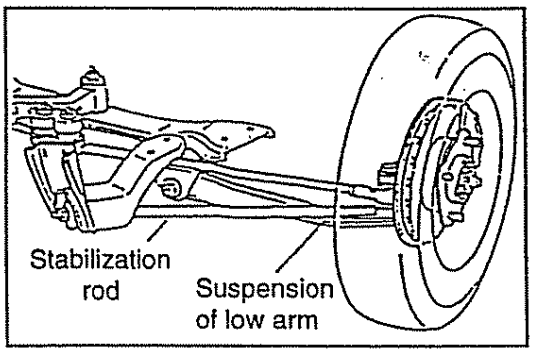
Steering wheel for tightness

Check steering wheel for looseness in axial direction as well as in normal direction to the steering wheel shaft.



LINKAGE & DUST COVER

Check of steering linkage and dust cover.



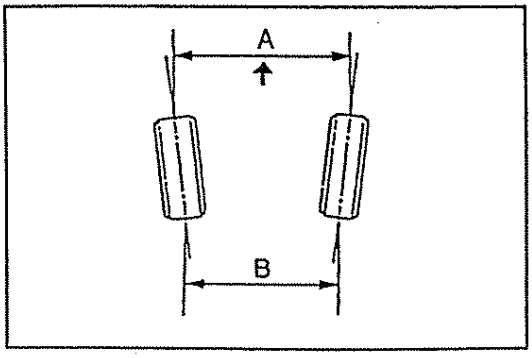
WHEEL ALIGNMENT

Toe-in measurement

Measure the distance between the marks at the front side of each front wheel. Determine the toe-in amount by calculating the difference.

Specified Value:

2.0^{+1}_{0} mm ($0.079^{+0.039}_{0}$ inch)



BRAKE SYSTEM

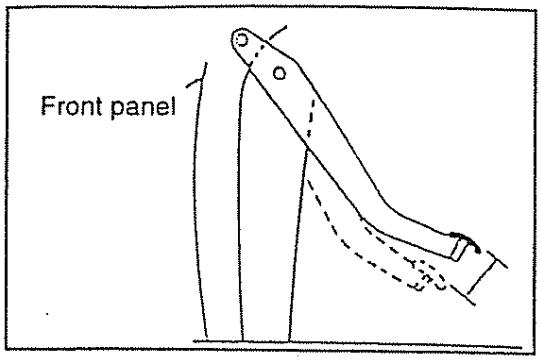
BRAKE PEDAL

Free play

Turn the engine "OFF" and depress the brake pedal ten times or more.

Measure the brake pedal free play from the pedal resting point to a point where resistance is felt.

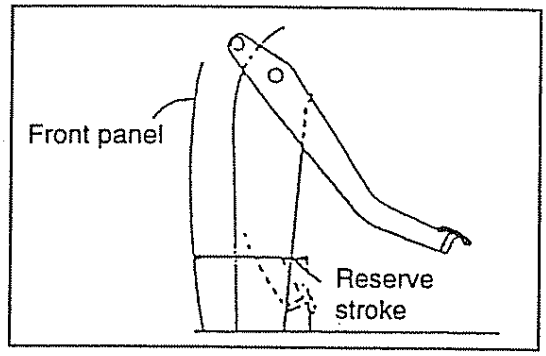
Specified Value: 2 - 7 mm (0.08 - 0.28 inch).



Reserve travel

Place chocks at the wheels. Place the transmission in the neutral state. With the engine running at the idle speed and with the parking brake lever released, depress the brake pedal with a pedal applying force of 490 N (50 kgf). Measure the distance between the position where the depressed pedal stops and the floor panel.

Specified Value: More than 85 mm (3.35 inch).

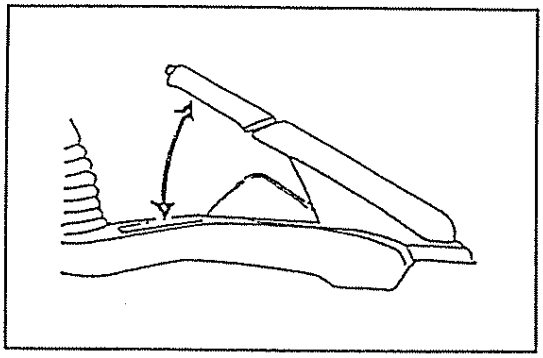


PARKING BRAKE

Reserve travel

With a force of 196 N (20 kgf), pull up the parking brake lever slowly and count the notches.

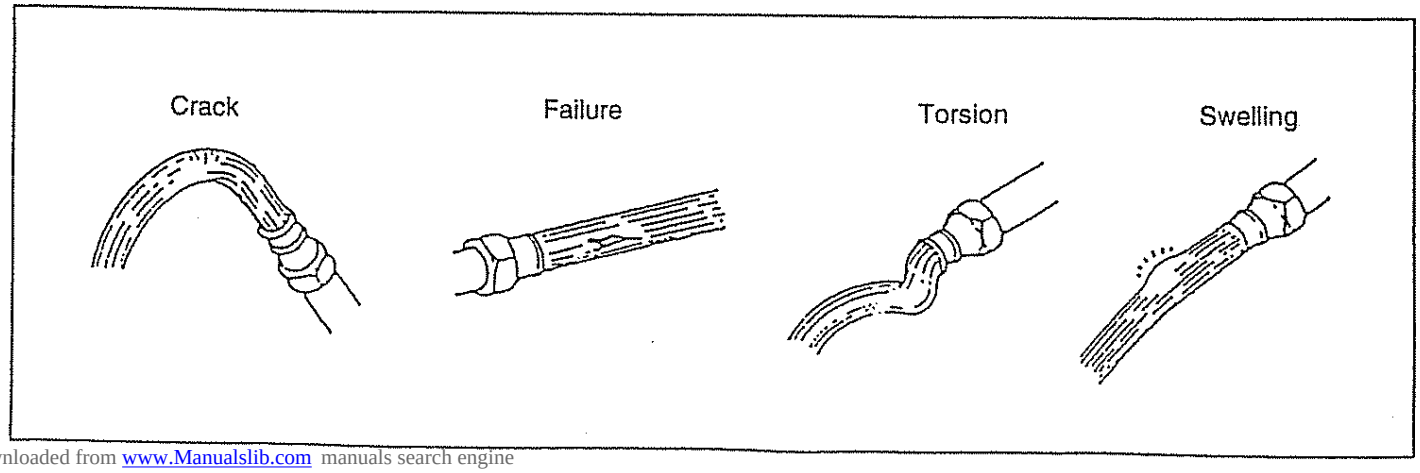
Specified Value: 6 - 10 notches



BRAKE HOSE AND TUBE

Inspect the following items.

① Hoses and tubes for damage, cracks.
② Hoses for deformation or swelling.
③ Tubes for corrosion or swelling.
④ Connection for fluid leakage.
⑤ Tube clamps for tightness.
⑥ Hoses for extreme bending, twisting or pulling.

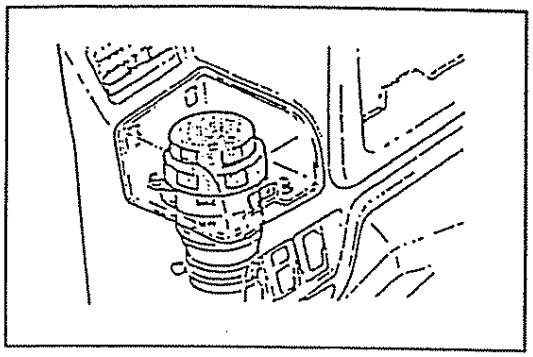


BRAKE FLUID

Check the brake fluid level and replenish the brake fluid to the "MAX" line of the reserve tank, as required.

NOTE:

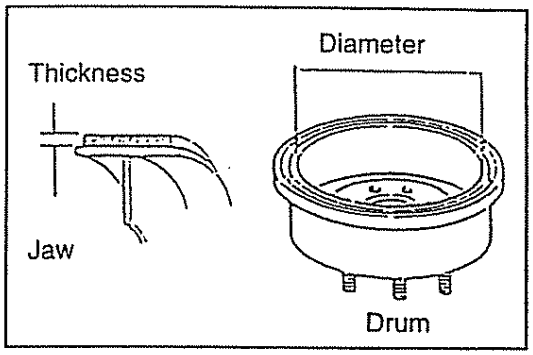
- As for fluid change, see the BR Section.



BRAKE DRUMS & BRAKE LININGS

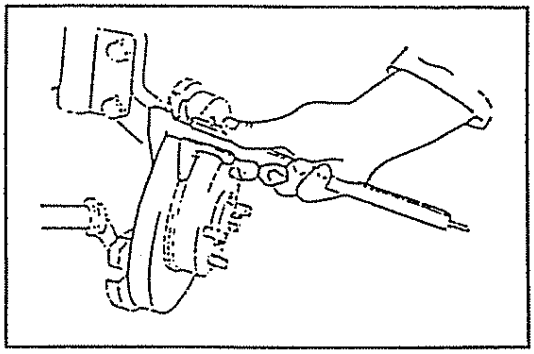
Inspect the brake drum for damage, inner surface wear, scores, or uneven wear.

Specified Diameter: 200 mm (7.87 inch).
Allowable thickness limit:
Drum diameter limit: 201.5 mm (7.93 inch)
Lining thickness limit: 1 mm (0.039 inch).

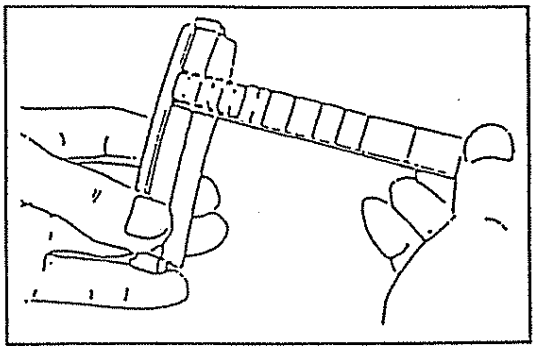


BRAKE DISC & DISC PAD

1) Inspect the brake disc for damage, wear, scores and uneven wear.
   Specified Diameter: 16.0 mm (0.63 inch).
   Allowable Limit: 15.0 mm (0.59 inch).



2) Inspect the brake disc pad for damage or wear.
   Specified Diameter: 9 mm (0.35 inch).
   Allowable Limit: 1 mm (0.04 inch).



BRAKE BOOSTER

Brake booster check

1) With the engine stopped, depress the brake pedal several times: the travel distance should not change.
2) With the brake fully depressed, start the engine: the pedal should move down a little when the engine starts.
3) Depress the brake, stop the engine and hold the pedal for about 30 seconds: the pedal should neither sink nor rise.
4) Restart the engine, run it for about a minutes and turn it off. Then firmly depress the brake several times: the pedal travel should decrease with each application.

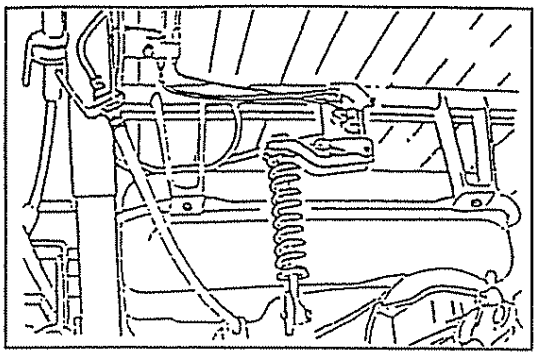
LOAD SENSING PROPORTIONING VALVE

Damage

Check the LSPV for damage.

Function

Refer to see BR section.



CHASSIX & BODY

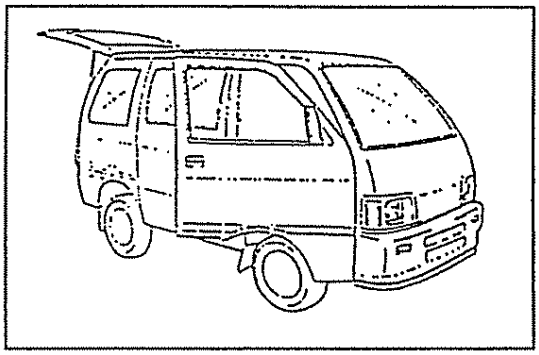
EXHAUST PIPE AND MUFFLER

Check muffler, exhaust pipe, mountings.

1) Checking of exhaust pipe for tightness.
2) Checking of muffler, exhaust pipe, mountings for damage.

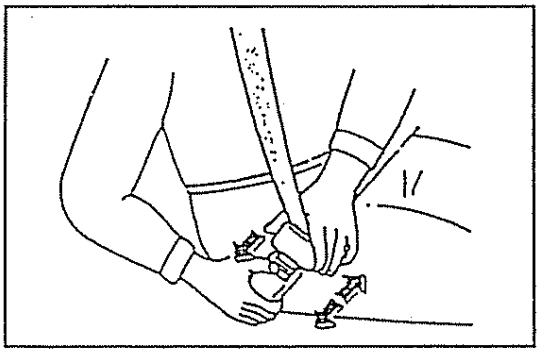
DOORS

Check that the doors locks operate properly.
Check that the doors locks do no hit striker.



SEAT BELT

Operation and tightness.
Check the seat belt for damage.
Check that the torque plate will be locked securely.



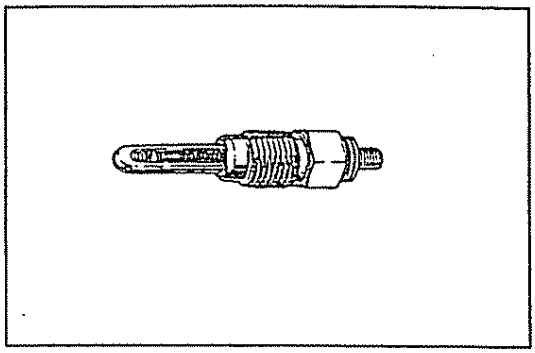
CHASSIX GREASE

Check that the condition of oil and grease is adequate on the following parts:

- Steering wheel-related parts
- Suspension-related parts
- Door-related parts.

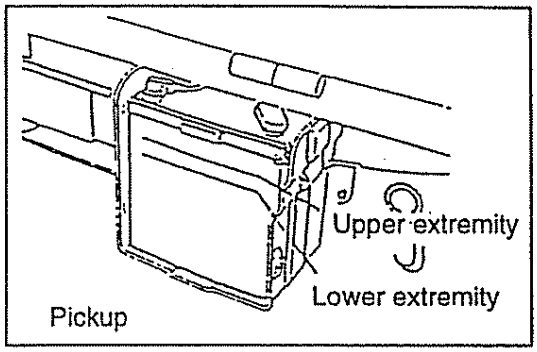
GLOW PLUGS

Ensure the efficiency of glow plugs, otherwise replace them.



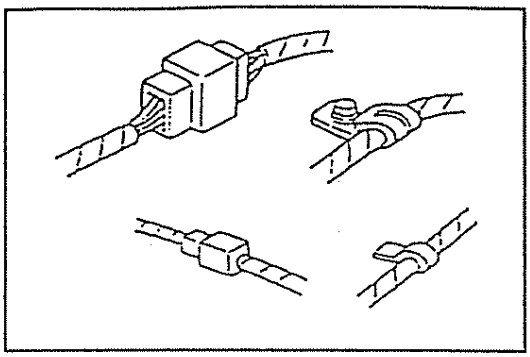
BATTERY

The battery doesn't need either checks or maintenance.



WIRE HARNESS

1) Check the wiring for damage or looseness.
2) Check each clamp and connection for looseness.



LIGHTING SYSTEM METER & GAUGE

Check of lighting system, meter & gauges.
Check of lighting system, meter & gauges for function.

1) Check headlamps, turn signal lamps, stop lamps, back-up lamps, tail lamps, licence plate lamps, hazard warning lamps and meter illumination lamps for function.
2) Check fuel gauge, water temperature gauge, charge warning lamp, oil pressure warning lamp, parking brake warning lamp, stop lamp warning lamp, brake fluid warning lamp and speedometer for function.

DAIHATSU

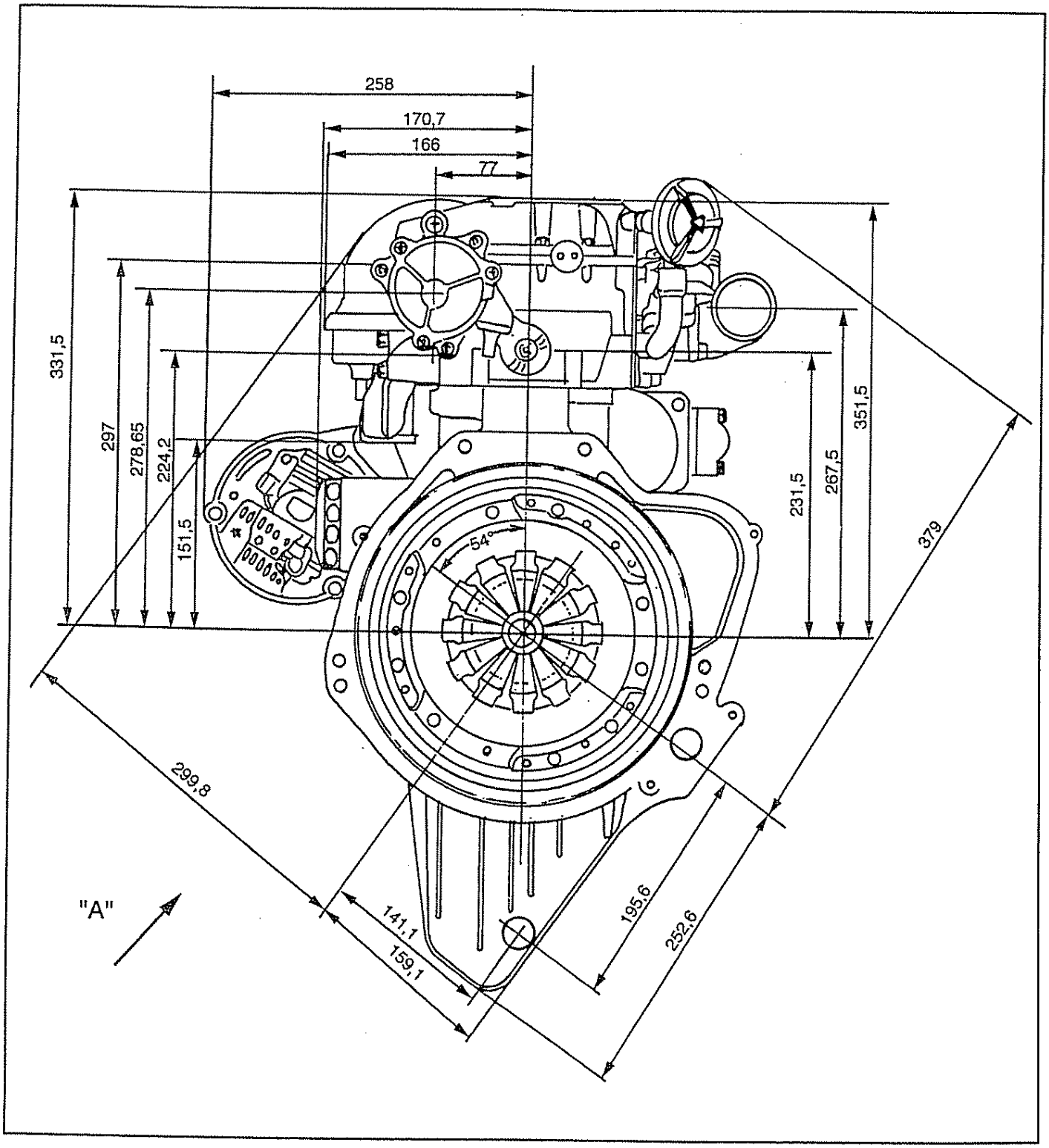
S85

EM

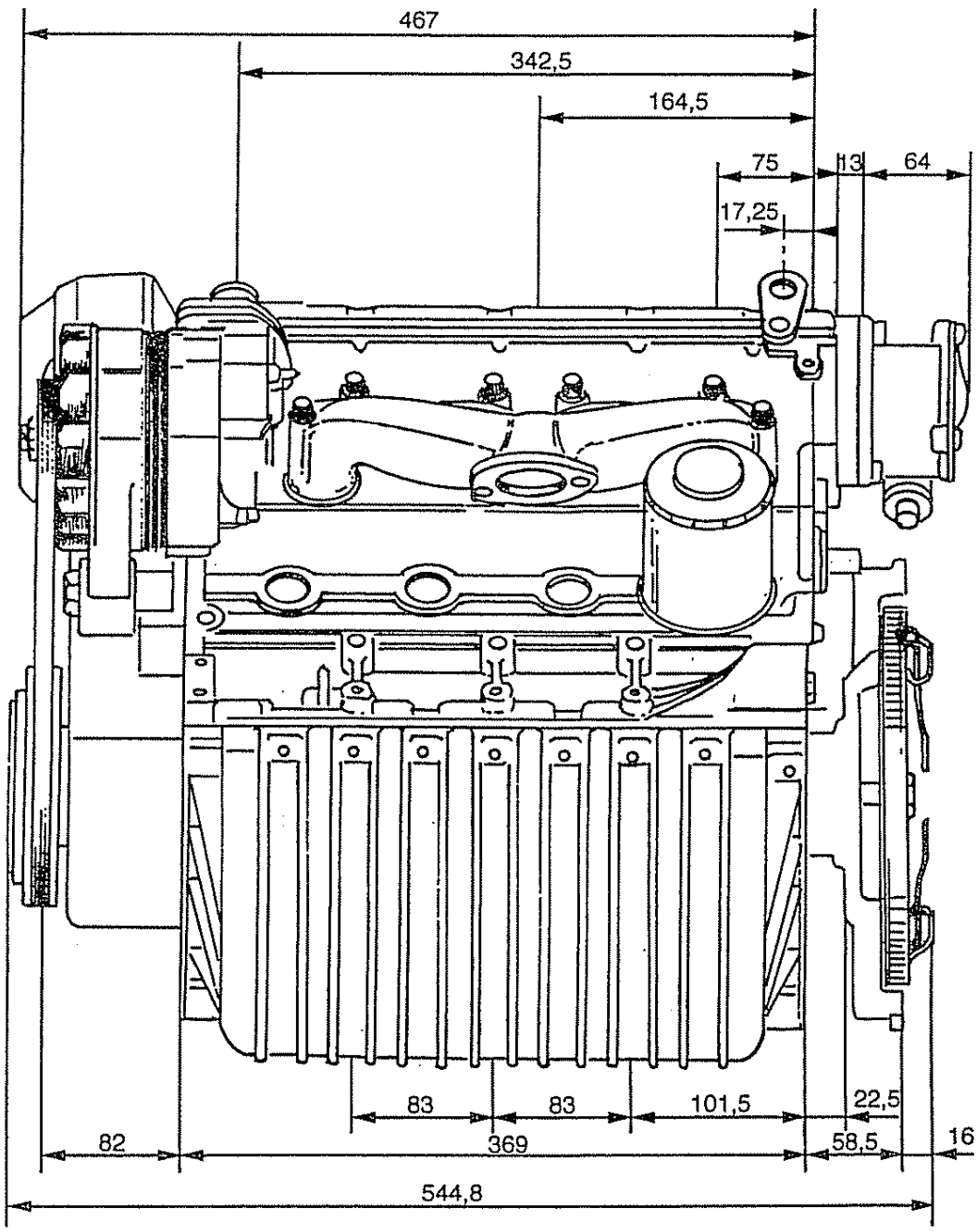
ENGINE MECHANICAL

NO. 7933-SE

ENGINE OVERALL DIMENSIONS

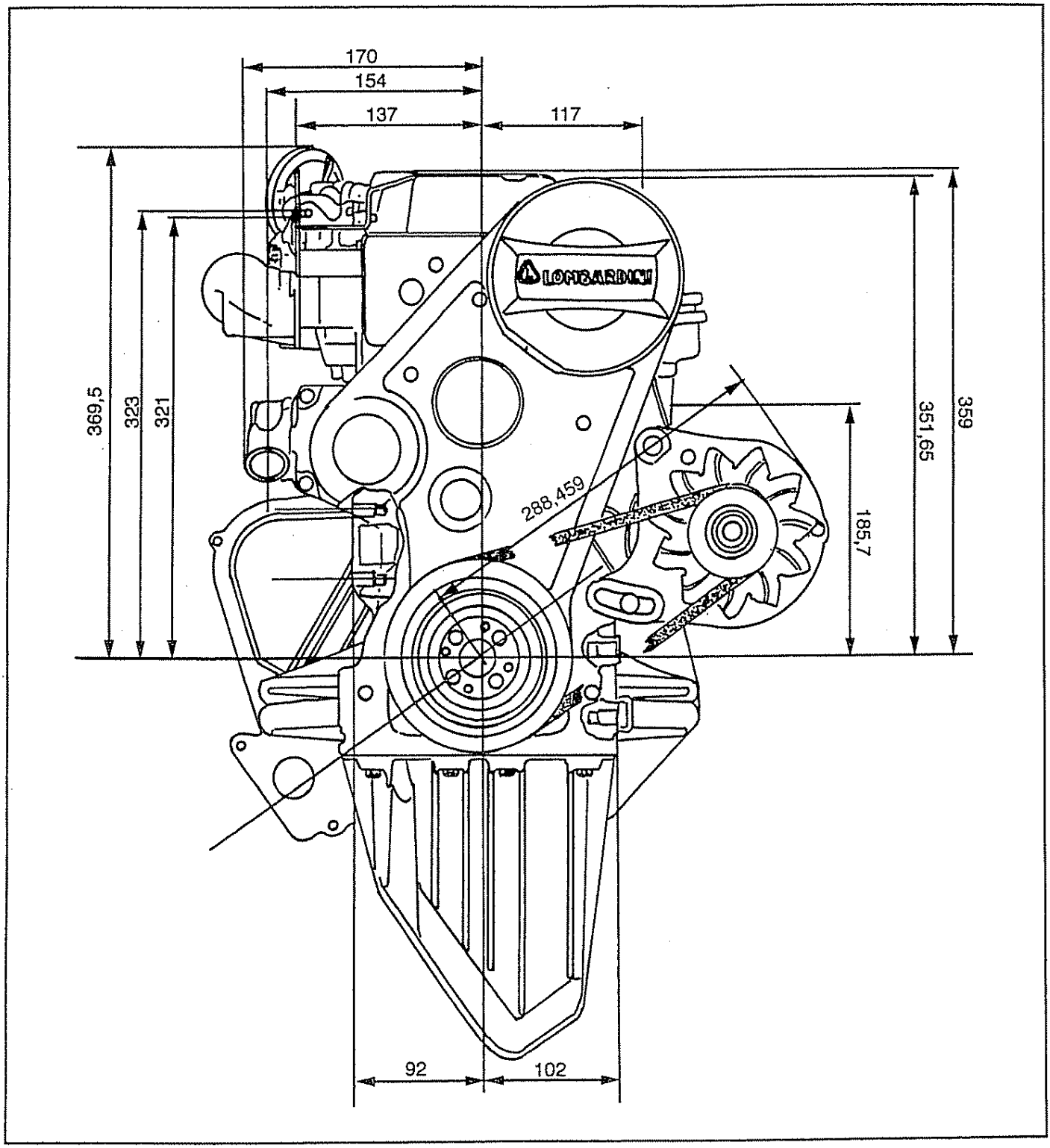


ENGINE OVERALL DIMENSIONS



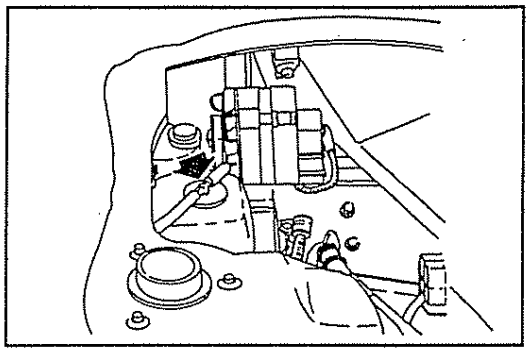
VIEW "A"

ENGINE OVERALL DIMENSIONS



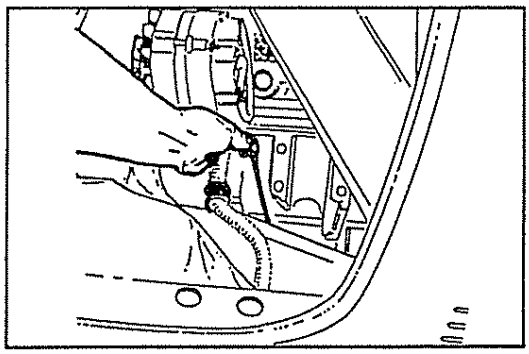
1. ENGINE TUNE-UP

1) Check the coolant level in the expansion chamber as shown in the figure.



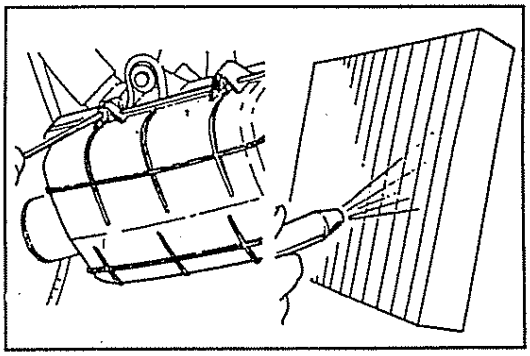
Cooling system capacity 5.5 l.
(including the heating circuit and the expansion chamber).

2) Check the oil level by using the dip-stick as shown in the figure.



	Specifications	Api CD or higher
capacity (ℓ)	with filter	3.65
	without filter	3.25

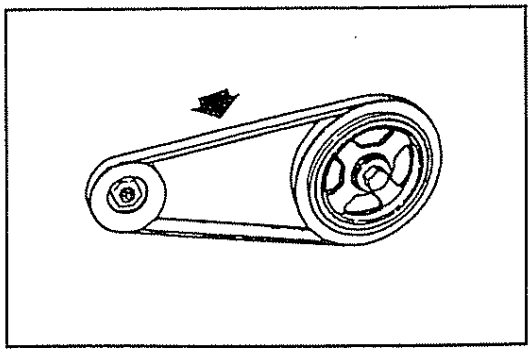
3) Remove the filter cartridge.



① Visually check if the air filter cartridge is excessively dirty, damaged or oily.
② Clean the cartridge with compressed air.
Replace the cartridge at the prescribed intervals.

4) Checking the glow plugs

5) Checking the belt deflection
Specified Valve:
Deflection: 10 - 15 mm at 100N (new belt)



6) Checking the valve clearance

① Remove the cylinder head cover.

② Revolve the crankshaft until cylinder No. 1 (the one on the flywheel side) reaches the top dead centre.

③ This position is reached when the marks on the front pulley are aligned as shown in the figure. Another sign that the position has been reached is when both rocker arms of cylinder No. 4 lose their play (crossing phase).
In this position it is possible to adjust the play of the valves of cylinder No. 1.
For the other cylinders proceed as shown in the table.

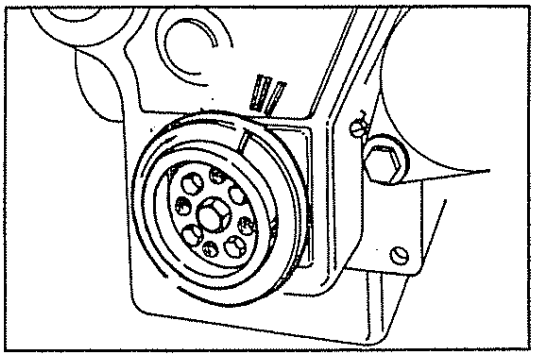
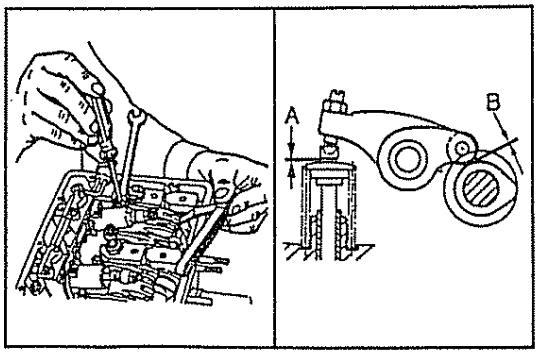


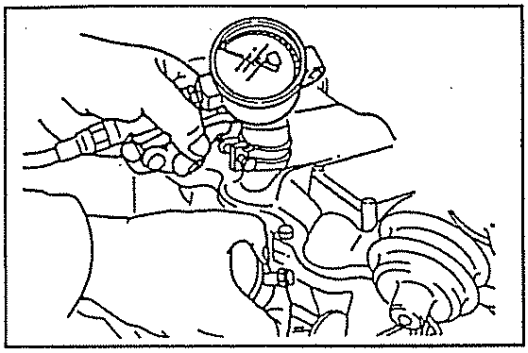
Table of valve play adjustment in ignition sequence				
Cylinder to be adjusted	1	3	4	2
Reference cylinder (crossing)	4	2	1	3

Carry out the adjustment when the engine is cold.

④ The valve clearance can be measured in two positions:
Valve clearance A = 0.20 both valves (inlet and exhaust)
Valve clearance B = 0.15 both valves (inlet and exhaust)



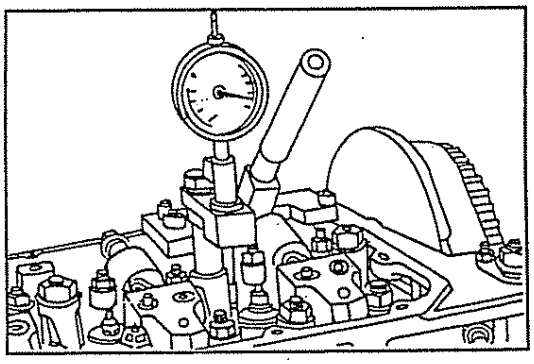
7) Checking the cylinder compression.
   ① Warm up the engine.
   ② Remove the glow plugs.
   ③ Screw the dummy plug on cylinder No. 1. This plug is part of the compression testing tool.
   ④ Connect the compression testing pressure gauge.
   ⑤ Disconnect the connector from the solenoid valve.
   ⑥ Run the engine by means of the starter motor until the pressure read on the pressure gauge becomes stable. Repeat the test for each cylinder.



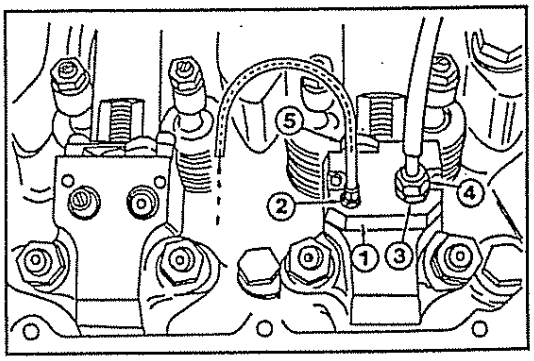
   Limit pressure: 28 bar (At 250 - 300 rpm)

   NOTE:
   - While checking, the motor keep constant the required number of revolutions. Pressure values over 28 bar are permissible.

8) Checking the injection timing
   ① Checking the piston top dead center by using the SST No. 19. 1. 20302, before the injection timing checking.
      a. Remove the cylinder head cover.
      b. Position the SST No. 19. 1. 20302 on the cylinder head above cylinder No. 4.
      c. Fit the comparator on the same valve.
      d. Open the valve until it comes into contact with the piston using lever No. 2 of the SST.
      e. Revolve the crankshaft until the piston top dead center while reading the comparator and set the comparator pointer to zero at top dead center.



   ② Connect the SST No. 19. 1. 20301 to the injector No. 1 shown in right figure, by removing the feed pipes.



   NOTE:
   - The SST automatically positions the delivery control lever on maximum delivery.
   - The tank of the SST equipment is placed at least 30 cm upper than the plane of the injector.

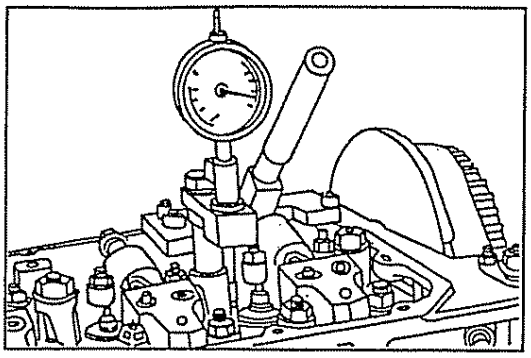
   ③ Slowly revolve the crankshaft in its direction of rotation towards the TDC No. 1 until fuel stops following out form plastic tube as SST No. 2 shown in right figure.
   ④ Check the position to bring back the valve into contact with the piston using lever No. 2 of SST and read the comparator.
   This position must become 11 ± 1° before the TDC. If not, adjust the injection timing.

REFERENCE:

- Converts the piston stroke into degrees of rotation using the following table.

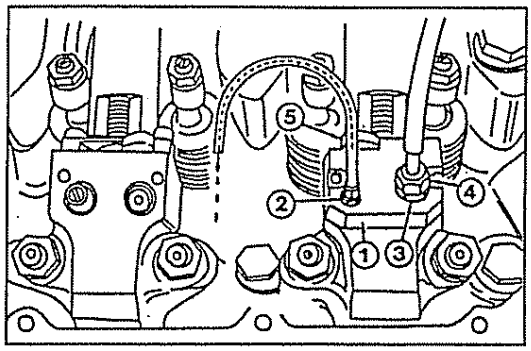
Rotation degrees	13°	12°	11°	10°	9°
Piston stroke	1.242	1.059	0.891	0.737	0.597

⑤ Repeat above operation ① - ④ for each cylinder.
⑥ Remove the SST.



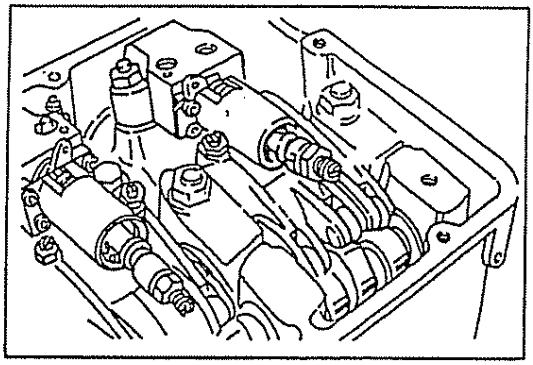
9) Adjusting the injection timing
① Position the SST No. 19. 1. 20301 and No. 19. 1. 20302 to the engine.

② Check the injection timing.



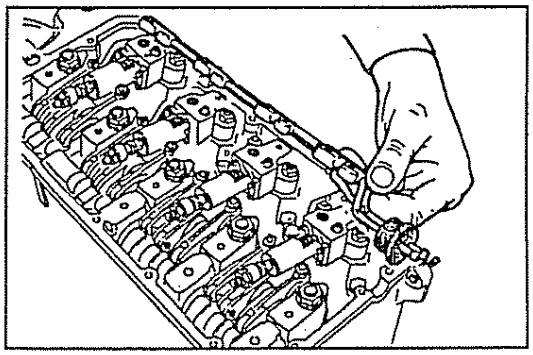
③ Adjust the injection timing to operate the rod control threaded adjuster as shown in figure.
- Turn the adjuster clockwise;
  The injection timing is advanced.
- Turn the adjuster counterclockwise;
  The injection timing is delay.
- A half-turn corresponds to approximately 5°.

④ Repeat the injection timing checking procedure to adjust the injection timing correctly.
⑤ Repeat above operation ① - ④ for each cylinder.

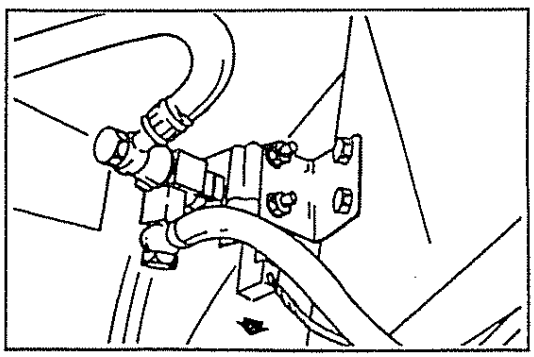


⑥ Remove the SST.
⑦ Reinstall the fuel feed pipe and cylinder head cover.

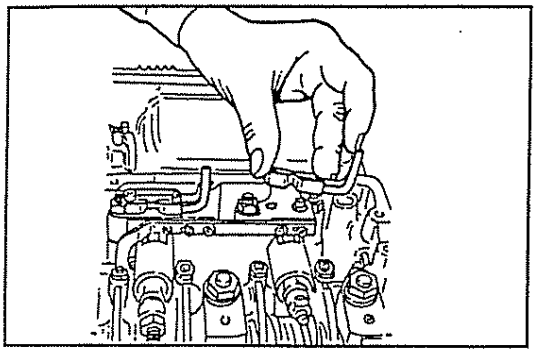
10) Leveling deliveries.
① Remove the head cover.
② Remove the feed pipe from the pump injectors.



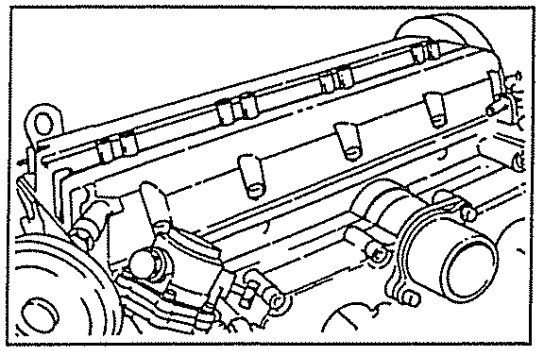
③ Disconnect the connector from the solenoid valve.



④ Fit the pump-injector with the heads that are part of specific tool 19.1.20314/2



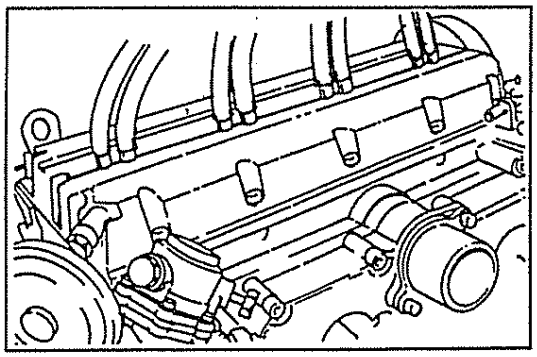
⑤ Position specific tool 19.1.20314/4, which substitutes for the head cover.



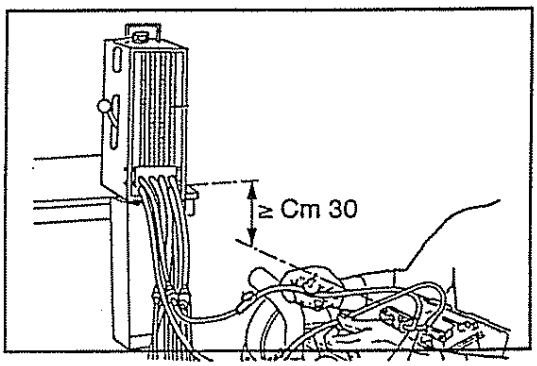
⑥ Connect the tubings of specific tool 19.1.20314/1 to the heads.

NOTE:

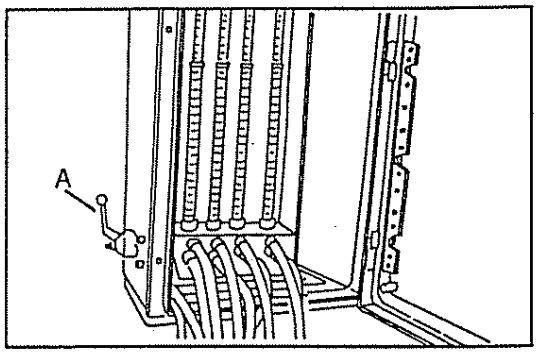
- The feed pipes have no filters and must be connected to the inlets of the pump-injectors. The return tubes have filters and must be connected to the outlets



⑦ Supply the tool with filtered diesel fuel. Position the equipment at least 30 cm higher than the pumps, so as to ensure sufficient feeding pressure.

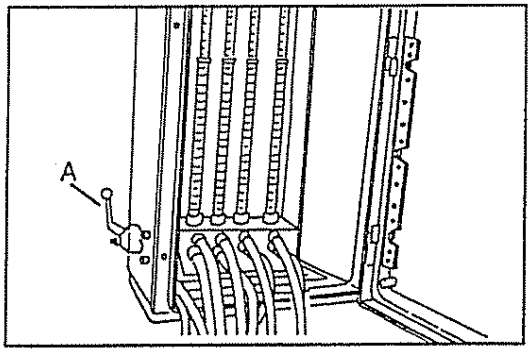


⑧ Open the cock by placing lever (A) in the "tank connected" position.



⑨ Start and warm up the engine and bleed the system at ~ 2000 r.p.m.

⑩ With the engine having the temperature and speed mentioned at the previous point, place lever (A) in the "tank disconnected" position.

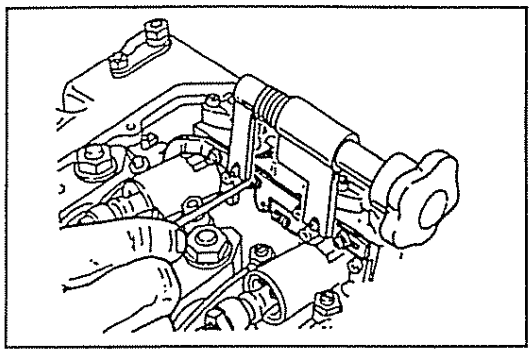


⑪ One minute after actuating the above-mentioned lever, stop the engine by cutting the diesel fuel feed by means of lever (A).

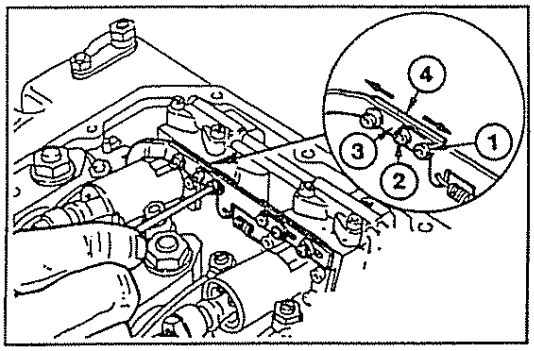
⑫ Observe the levels of the burettes to make sure that they are the same. A difference of < 2 cm^3 between the upper and the lower level is allowed.

⑬ For a thoroughgoing check, it is advisable to repeat the test both at a higher speed (~ 3000 r.p.m.) and at idling speed.
Based on the outcome of these test, proceed to correct the levelling of deliveries.

⑭ To this purpose, use specific tool 19.1.20314/ 3, which must be adjusted so as to be inserted on the level fixing screw (5) of the pump to be corrected and the adjoining one.



⑮ Loosen screws (1) and (2), which fasten plate (4) to rod (3). Using the specific tool (screwing and unscrewing) shift plate (4), thus changing the pump delivery. When the plate is shifted to the right in relation to rod (3), delivery is increased. Conversely, delivery is decreased when the plate is moved to the left.

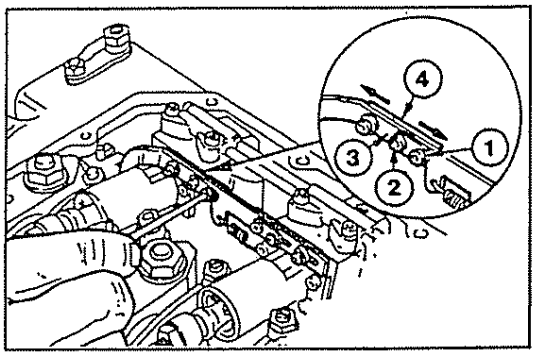


NOTE:
- Shift the plate slightly. To facilitate further adjustments, make sure to note down the radial changes of the tool.

⑯ Repeat the delivery measurements and adjust the pumps until deliveries come within the prescribed limits.

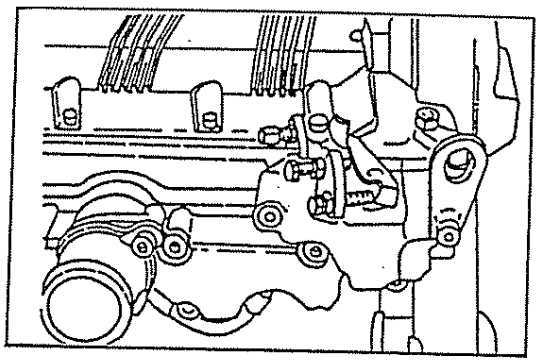
⑰ After completing the adjustment, tighten screws (1) and (2) of the leverages to the prescribed torque: 1.1÷1.3 N.m.

⑱ Remove the specific tool and close the engine following the same steps in reverse order.



11) Idle speed tune-up
① Warm up the engine until 2 interventions of the electric fan are obtained.
② Measure the idling r.p.m. while the electric fan is not moving.
Specification:
Idle speed 900 ± 50 rpm

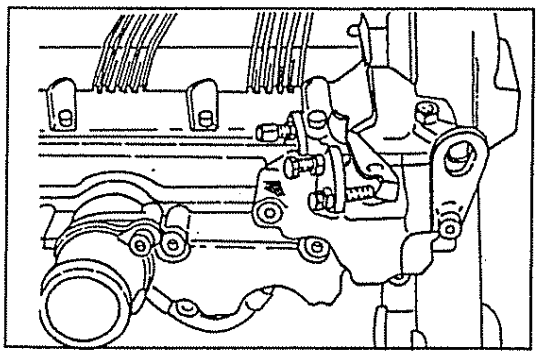
If the measured value is different, adjust the engine speed by turning the screw shown in the figure.



NOTE:
- To measure the engine speed, it is possible to use a mechanical counter to be attached to the crankshaft or an electric counter to be connected to the alternator connection.

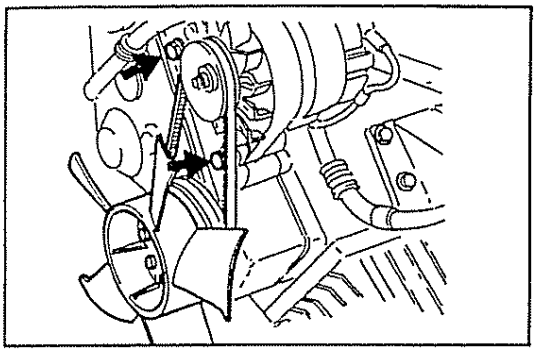
12) Full load speed tune-up
① Warm up the engine until 2 interventions of the electric fan are obtained.
② Measure the engine speed while keeping the accelerator pedal fully depressed for a few seconds.
Full load speed: 4900 r.p.m.

③ If the measured value is different, adjust the engine speed by turning the screw shown in the figure.

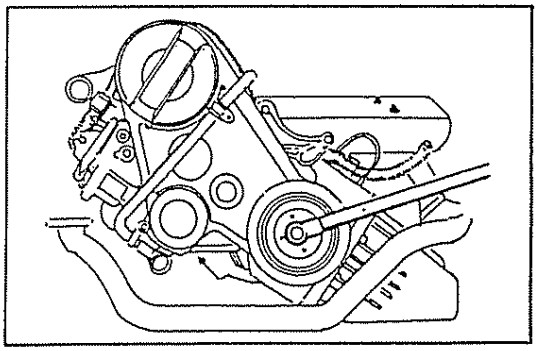


NOTE:
- The full load speed adjuster has an inviolability seal. This seal must be restored every time the full load speed has to be adjusted.

2. REMOVING THE TIMING BELT



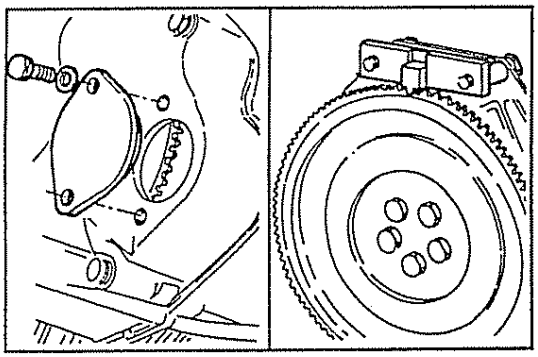
1) Remove the fan which is coaxial with the crankshaft, with the related pulley support.
2) Remove the alternator and its drive belt.



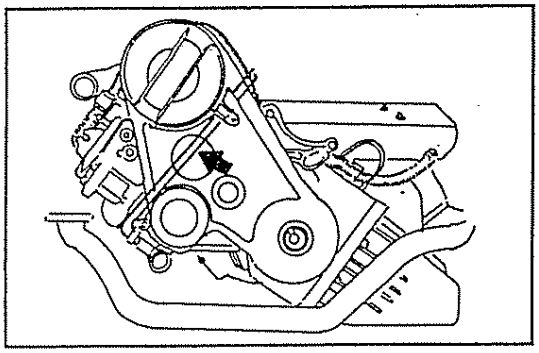
3) Removing the front pulley.
Remove the crankshaft front pulley after loosen the 4 screws and central screw.

NOTE:
- Bear in mind that the central screw is used the left-handed letter screw.
- Prevent the pulley from turning with SST;

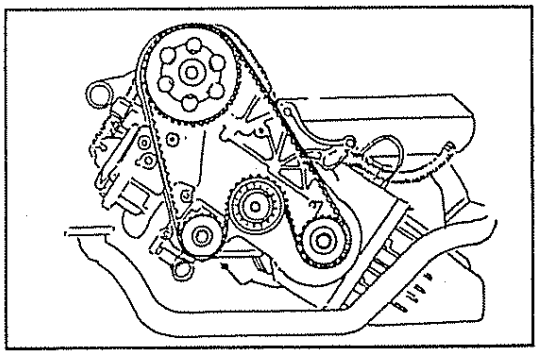
No. 19. 1. 20313: On the bench
No. 19. 1. 20299: On the vehicle.



NOTE
- After removing the central screw, remove the specific flywheel locking tool.

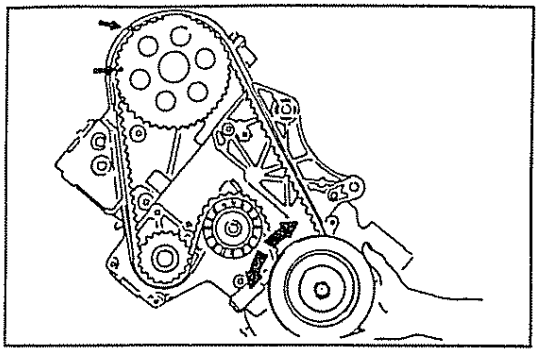


4) Remove the sleeve connecting the pump and the base of the thermostat.

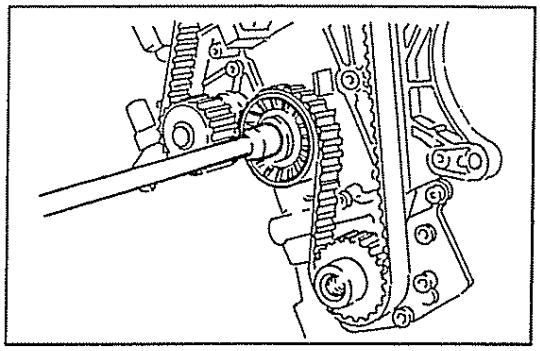


5) Removing the belt cover.
Remove the timing belt cover.
NOTE
- If the operation is performed on the vehicle, it is necessary to shift the metal tubes of the cooling system after removing the bodywork fasteners.

6) Removing the timing belt.
Rotate the crankshaft until the marks on the pinion and on the camshaft pulley are aligned, then loosen the belt stretcher and remove the timing belt.
NOTE
- To facilitate the rotation of the crankshaft, temporarily reinsert the front pulley.
The belt is to be replaced according to the prescriptions on the maintainance table and also every time it is disassembled.

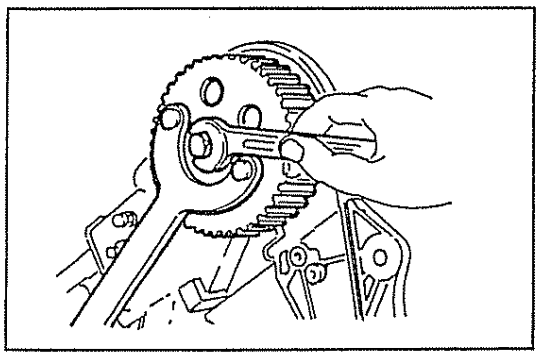


7) Removing and checking the belt stretcher.
Remove the belt stretcher. Check that the bearing rotates smoothly, with no anomalous play. Make sure that the outside surface of the stretcher is not damaged. Replace the stretcher if necessary.



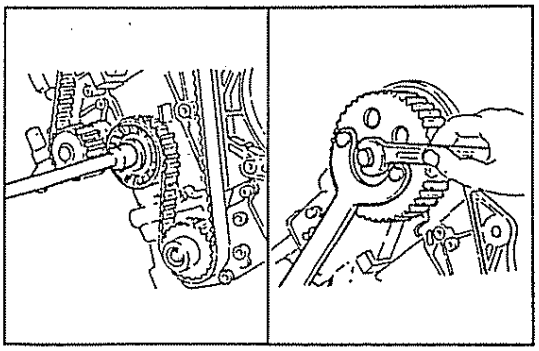
NOTE
- To remove the stretcher, unscrew the nut fastened on the stud. Unscrewing of the stud would cause the coolant to flow out. To avoid this, LOCTITE 601 is to be applied between the stud bolt and the cylinder block.

8) Removing the camshaft pulley.
Loosen the central screw while holding the pulley with tool No. 19.1.20172
NOTE
- Check for possible wear caused by the sealing ring lip on the pulley hub.



3. FITTING THE TIMING BELT

1) Fitting the belt stretcher.
Provisionally insert the stretcher into its housing in the position it has when the belt is completely slack.
Fit the pulley on the camshaft and tighten with an 80 N.m. torque by means of specific tool No. 19.1.20172
Position the camshaft pulley on the reference mark.

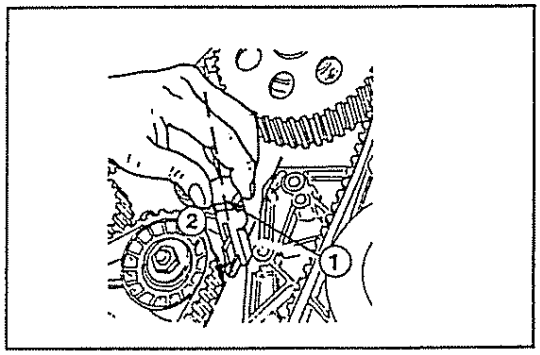


WARNING
- The pulley bears two timing reference marks:the one on the left is identified by the code 502; the one on the right has no caption. Align the right-hand mark (without a caption) with the track in the head.
  Make sure that the crankshaft pulley is still timed.

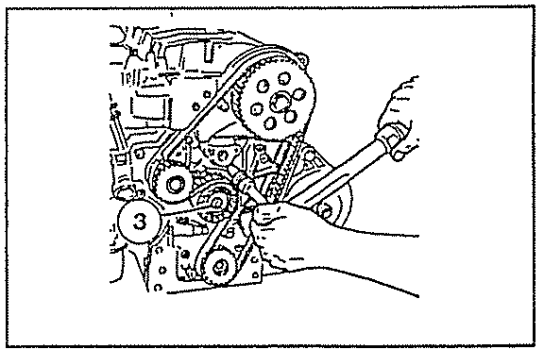
NOTE
- When the pulley is in the timing position, pistons Nos. 1-4 are at the TDC.
  Fit the belt on the pulleys, taking care to observe the direction of rotation shown by the arrows.

NOTE
- Always fit a new belt.
- Provisionally bring the stretcher into contact with the belt.
- Align the belt by manually causing the crankshaft to make a few revolutions, then check the timing again.

2) Belt tensioning.
   ① Insert tool No. 19.1.20295 into the stretcher lever (see figure), then use a dynamometric key, taking care that key axis "A" is at an angle of approximately 90° to lever axis "B".



   ② Loosen stretcher nut "3" and turn the tool clockwise, applying a 30 N.m. torque. Keep the torque constant and lock nut "3" with 40 N.m.

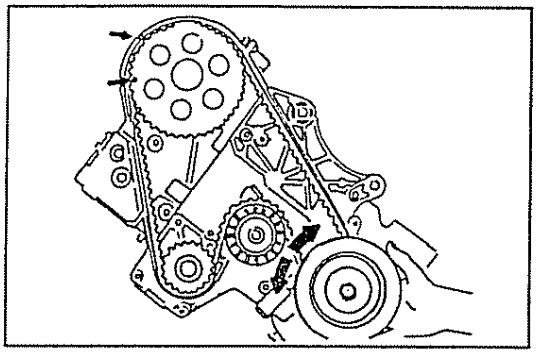


③ Fit the timing cover, checking the condition of the gasket.
Replace if necessary.

④ Fit the rubber sleeve.

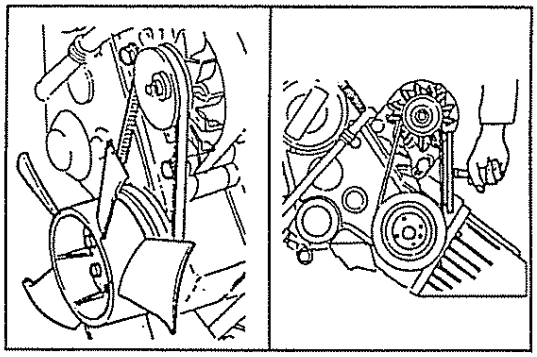
⑤ If the operation is carried out with the engine fitted on the vehicle, fasten the cooling system metal tubes to the bodywork.

⑥ Fit the front pulley, tightening the central screw with a 360 N.m. torque.
Use one of the specific tools already employed for the removal 19.1.20313/ 19.1.20299.
After completing the operation, remove the specific tool and, if the operation was carried out with the engine fitted on the vehicle, install the starter motor.



⑦ Fit the fan on the crankshaft by means of the related support.

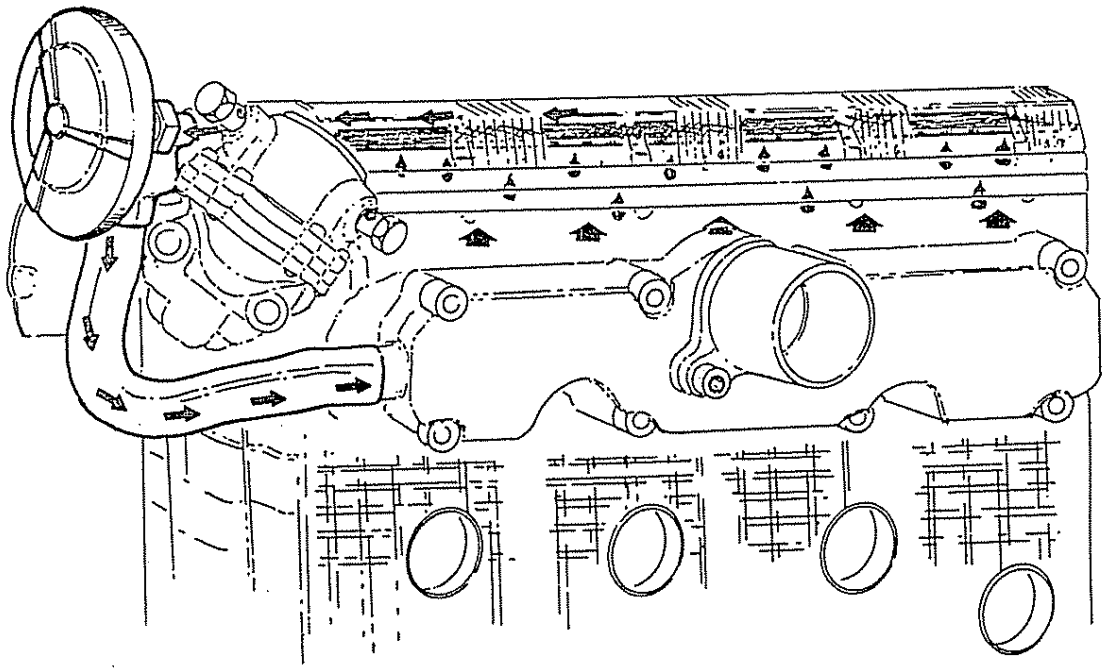
⑧ Fit the V-belt; tension the belt so that when a 100 N.m. torque is applied between the two pulleys, a 10-15 mm sag will be obtained (see figure).



⑨ If the operation has been carried out with the engine fitted on the vehicle, fill up and bleed the cooling system (see chapter CO-4).

OIL VAPOURS RECIRCULATION DIAGRAM

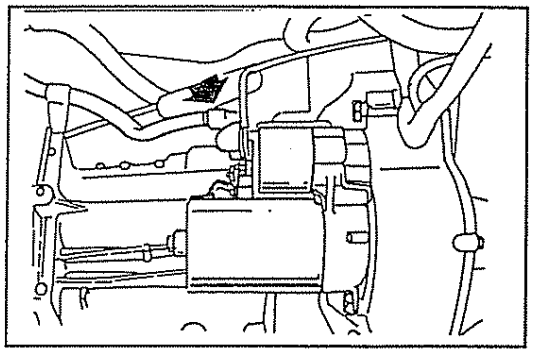
The engine is equipped with a crankcase vapours recirculation system. The system is designed to guarantee sufficient protection against supercharging. The gases leak through the rings and rise to the head cover carrying the oil vapours. After going through a filter, a valve and a condensation chamber, the oil becomes liquid again and trickles back to the sump, while the gases are recovered by the inlet manifold through a valve equipped with a control membrane which stops the flow when vacuum becomes excessive (e.g. when the air filter is clogged).



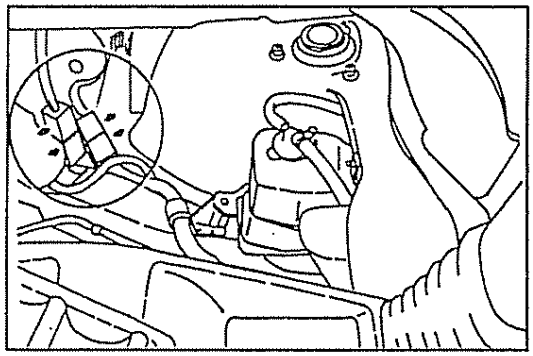
REMOVING THE ENGINE FROM THE VEHICLE

1) Position the vehicle on the lift using the 4 points of support designed for this purpose.
2) Disconnect the negative cable of the battery.
3) Empty the cooling system.
4) Drain the engine oil.

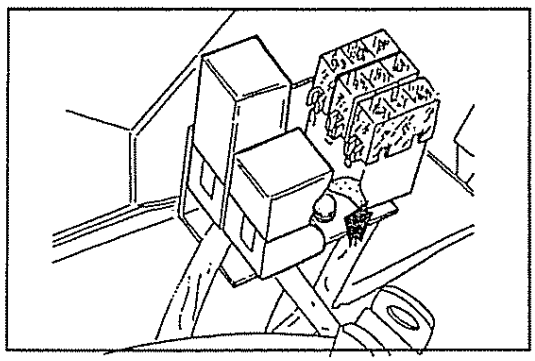
5) Disconnect the positive cable of the starter motor.



6) Disconnect the two multiple terminals of the engine wiring (positioned at the front, right-hand side).

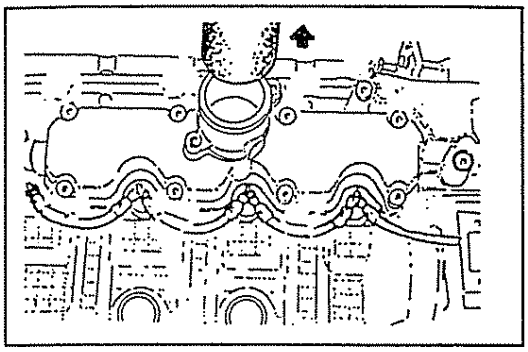


7) Disconnect the preheating control unit support from the chassis.

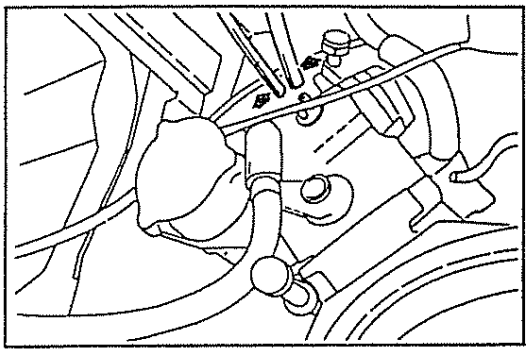


8) Disconnect the engine supplementary earth from the chassis.
9) Disconnect the transmissions (throttle, clutch, gearbox, speedometer).
10) Disconnect the water pump sleeves from the heater and thermostat outlets.

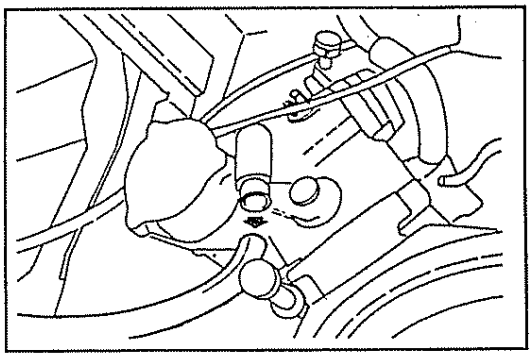
11) Disconnect the engine intake sleeve.



12) Disconnect the diesel fuel feed pipes (from the head and from the fuel feed pump).

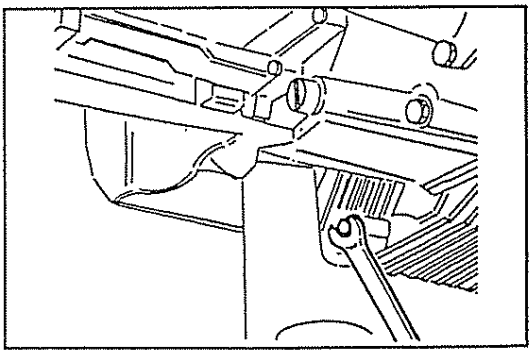


13) Disconnect the pneumatic pump tube.

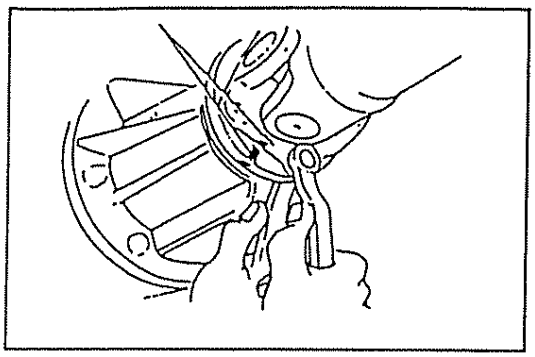


14) Disconnect the silencer from the exhaust pipe.

15) Drain the gearbox oil.



16) Remove the transmission shaft after loosening the 4 screws (mark their positions) which fix it to the differential gear.



17) Place a steady, strong and adequately-dimensioned support under the engine.

18) Lower the vehicle until the engine rests gently on the support.

19) Remove the engine support framework from the chassis.

20) Lift the vehicle.

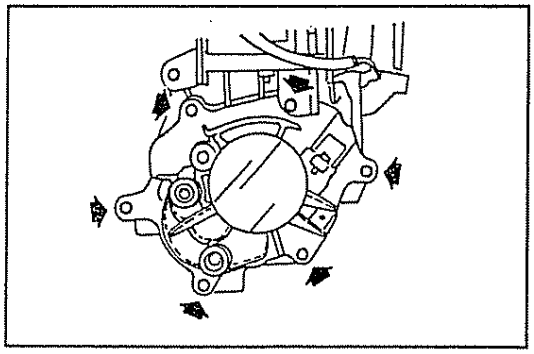
FITTING

Carry out the removal operations in reverse order. Remember to fill up and bleed the cooling system, to supply the engine and the gearbox with oil and to bleed the fuel feed system (refer to the relative chapters).

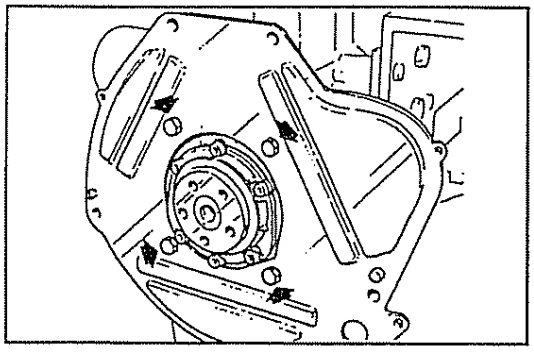
PREPARING FOR THE BENCH OVERHAUL

1) Disconnect the electrical equipment from the engine and from the gearbox.

2) Loosen the screws fastening the gearbox to the engine.



3) Loosen the screws fastening the metal sheet casing.

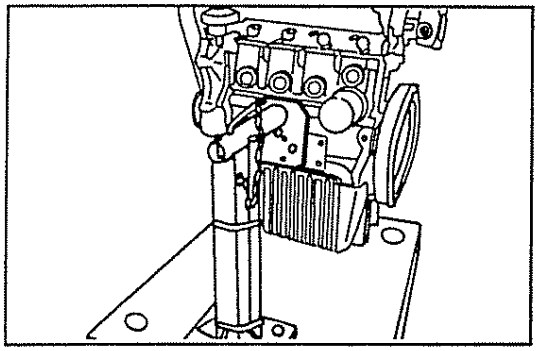


4) Separate the gearbox from the engine.

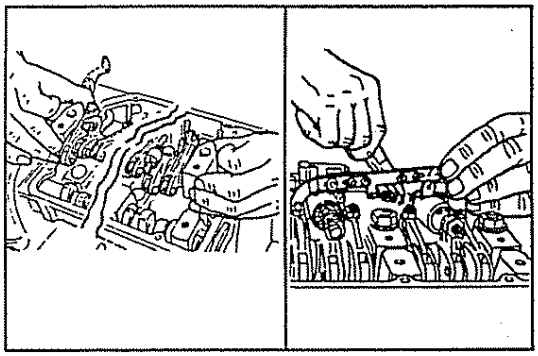
5) Remove the framework with the elastic supports from the engine.

6) Remove the exhaust manifold with the tube.

7) Position the engine on specific support 19.1.20180 by means of link 19.1.20181 and adapter 19.1.20308



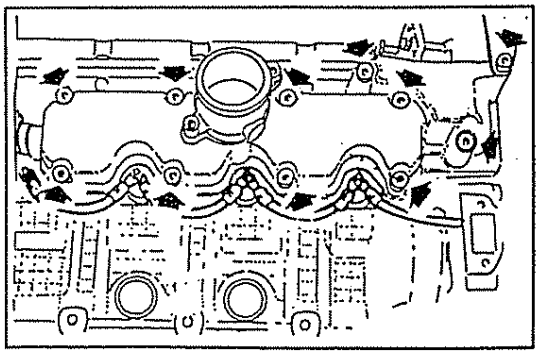
REMOVING THE CYLINDER HEAD



1) Remove the head cover. .
2) Remove the fuel feed connection.
3) Remove the pump-injectors control rod.
4) Remove the pump-injectors.
5) Remove the rocker arms pivot after loosening the nuts which fasten it to the cylinder head.

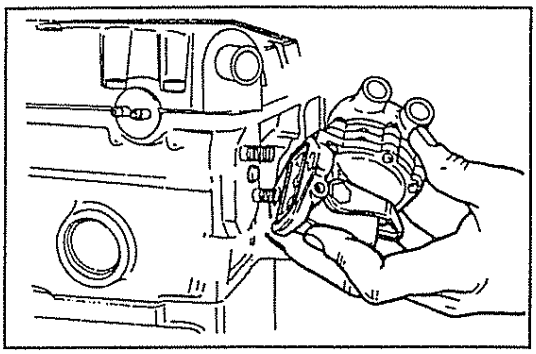
6) Removing the inlet manifold.
   ① Detach the tube of the pressure relief valve and the accelerator control cable. Loosen the 2 screws of the manifold connection.

   ② Turn the 11 screws of the manifold as shown in the figure.
   ③ Slightly raise the metal protection.
   ④ Remove the spring retainer.

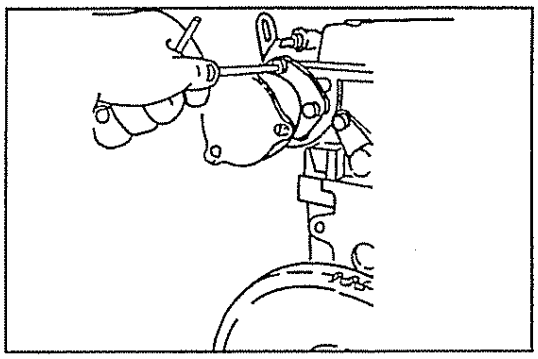


⑤ Rotate the manifold so as to disengage the throttle control and the spring case from the accelerator lever.

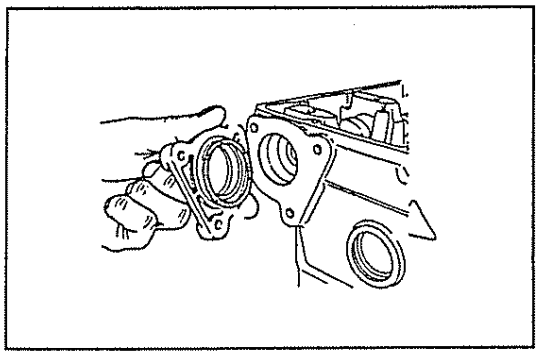
7) Remove the fuel feed pump.



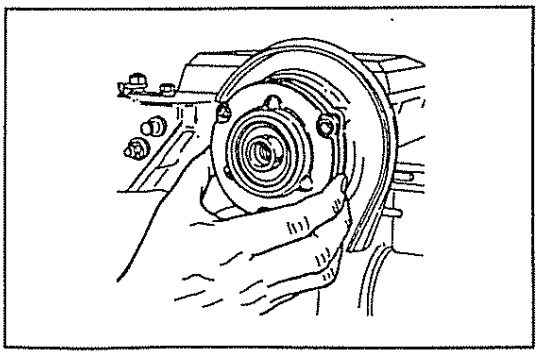
8) Removing the pneumatic pump.
① Remove the pneumatic pump after loosening the three screws as shown in the figure.



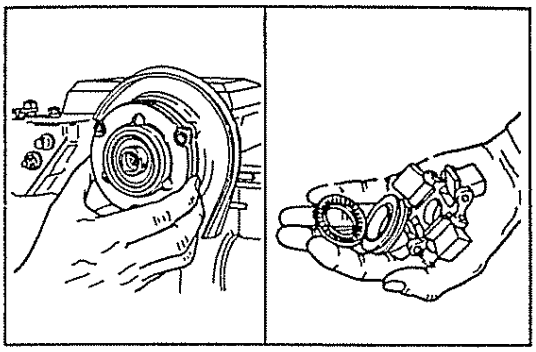
② Remove the flange with an O-ring seal after loosening the screws as shown in the figure.



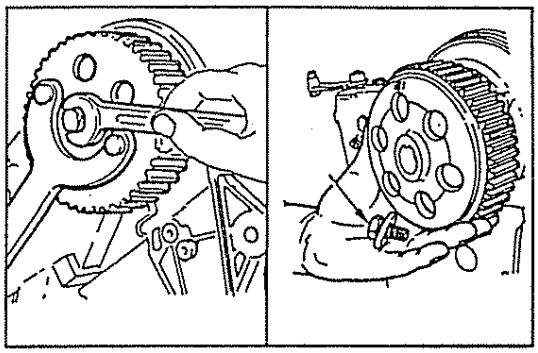
9) Removing the revolution governor.
① Loosen the 3 screws and remove the revolution governor flange.



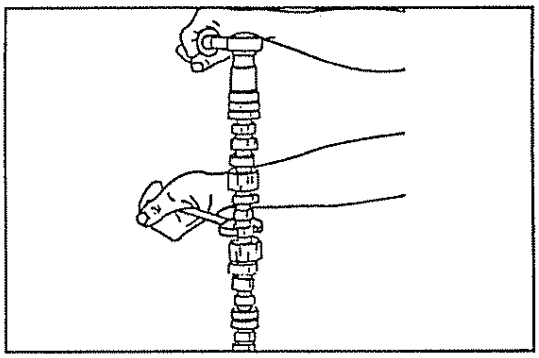
② Remove the 3 screws, the plate, the bearing and the oil seal.
③ Remove the support with the camshaft weights



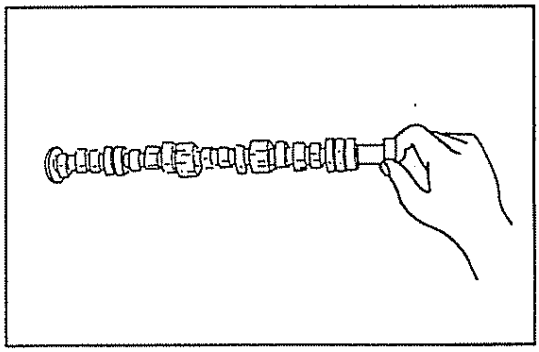
10) Remove the camshaft pulley (see EM-14).
11) Remove the camshaft, flywheel side.



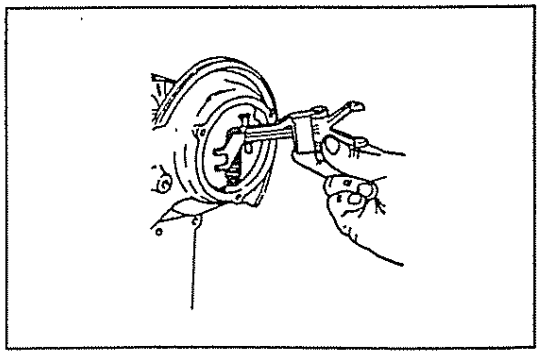
12) Removing the cam on the camshaft.
① Clamp the camshaft in a vice, using aluminium linings. Remove the special feed cam locking screw while keeping the contrast with a fork spanner inserted in a cam (see figure at right).



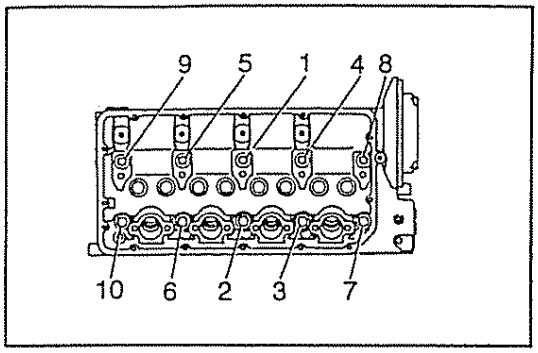
② Remove the cam and the outer ring.



13) Unscrew the pivot and extract the governor leverage.

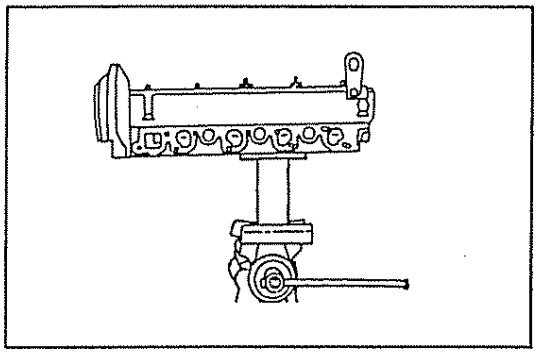


14) Unscrew the 10 screws in the order indicated, acting progressively and in successive stages.



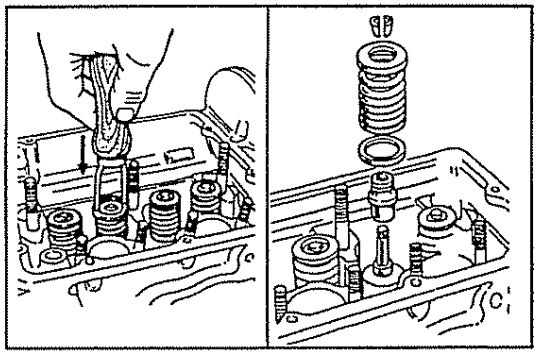
WARNING:
- The head may become distorted if the screws are not removed according to the correct sequence. To facilitate the removal, gently tap with a plastic mallet.

15) Install the head on specific support 19.1.20312.



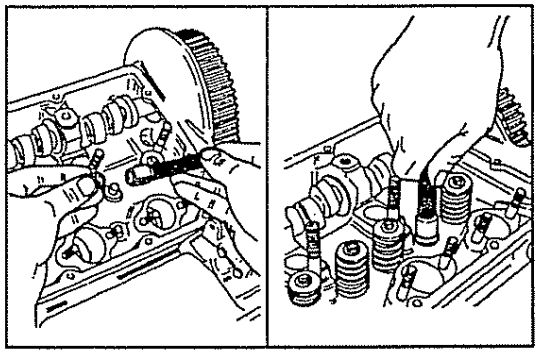
WARNING:
- When fitting the head on the support, act carefully so as to avoid damaging the sealing surfaces.

16) Removing the valves.
① Remove the valve by means of a curved-nose clamp.



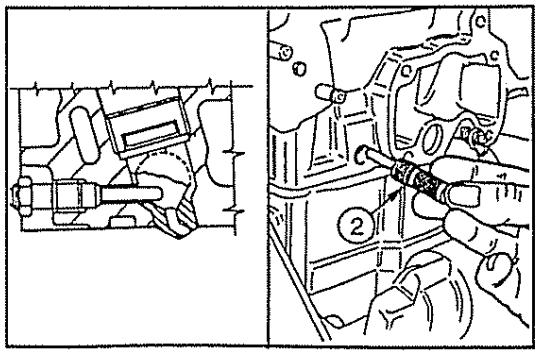
NOTE:
- Should the valves be reused, they will have to be repositioned in their respective seats. To ensure this, mark the valves or place them in different containers.

② Remove the valve oil seals by means of specific tool 19.1.20303.

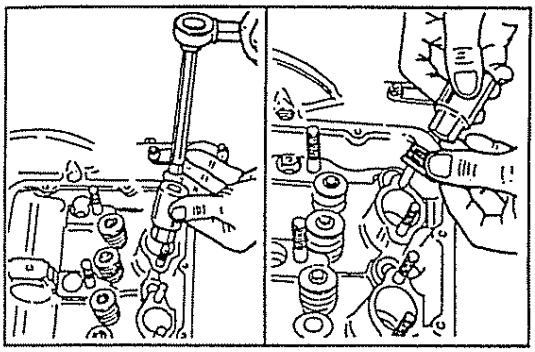


NOTE:
- Remember to remove the lower thrust rings of the springs.

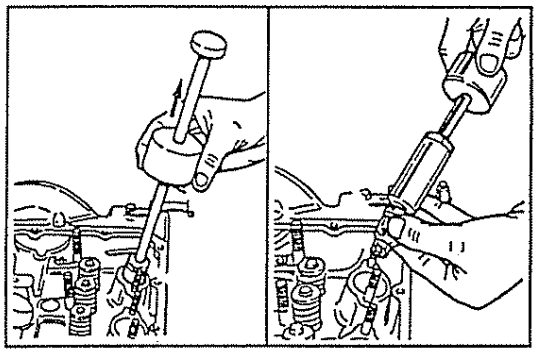
17) Removing the precombustion chambers.
① Remove glow plugs "2".



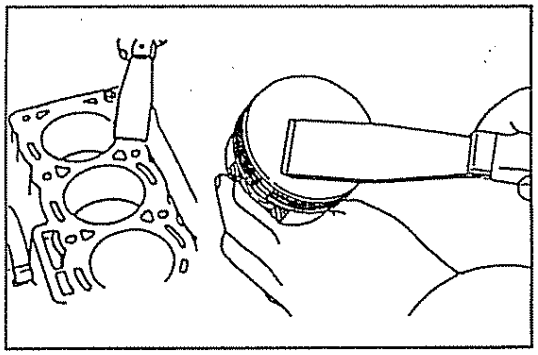
② Remove the collar by means of specific tool 19.1.20296



③ Screw tool 19.1.20304 on the precombustion chambers and, acting on the hammering weight, extract them from the head. Mark the chambers so as to be able to fit them again on the same cylinder.



4. CHECKING, CLEANING AND REPAIRING CYLINDER HEAD COMPONENTS

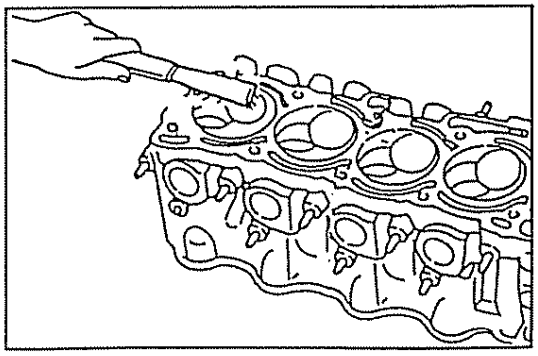


1) Cleaning the piston crowns and the cylinder block ceiling.
Revolve the crankshaft until the pistons reach the TDC.
Using a gasket scraper remove any carbon formations from the piston crowns.
Using a gasket scraper, remove any gasket residues from the cylinder block upper part.
Blow off the carbon residues from the screw holes with an air jet.

CAUTION:
- Always protect the eyes when using compressed air.

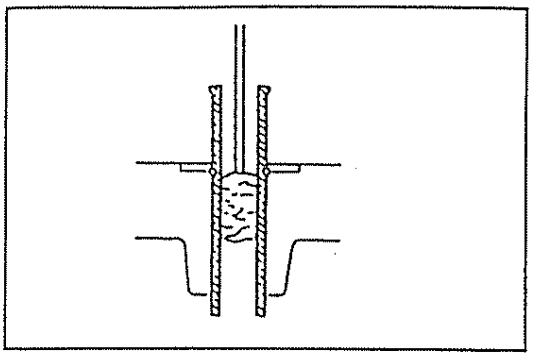
WARNING:
- When using the scraper, take care not to scratch the cylinder block surfaces.

2) Removing any gasket residues.
Using a gasket scraper, remove any gasket residues from the cylinder head and from the manifold surfaces.



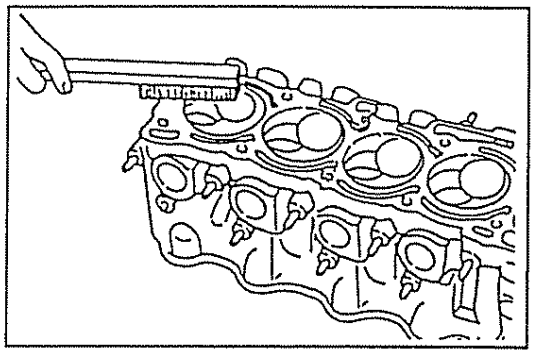
WARNING:
- Take care not to scratch the cylinder head gasket contact surfaces.

3) Cleaning the valve guides.
Using solvent and a suitable brush, clean the valve guide bushes.



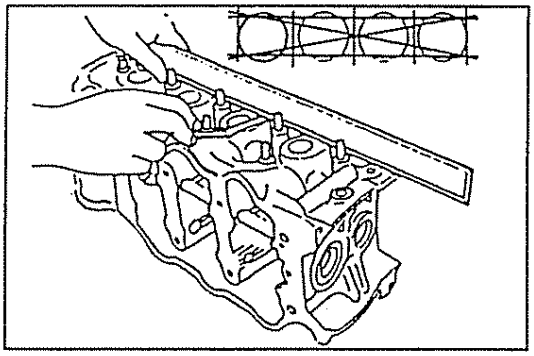
4) Cleaning the head.
Thoroughly clean the head using solvent and a soft brush.

WARNING:
- Take care not to scratch the cylinder head gasket contact surfaces.

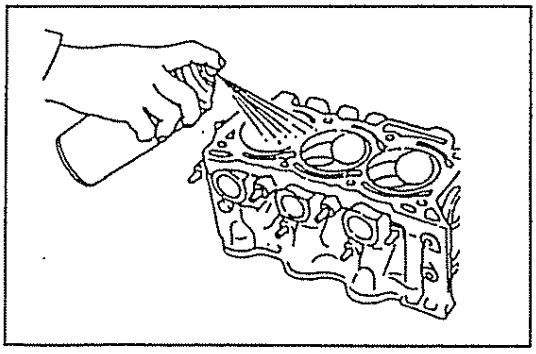


5) Checking the head surfaces.
Using the precision bar and a thickness gauge, check that the various surfaces are not distorted.
Maximum surface distortions:
Cylinder block side (*): 0.10 mm
Inlet manifold side: 0.10 mm
Exhaust manifold side: 0.10 mm

(*) If the surface distortion exceeds the prescribed limit, reface the surface, taking care to remove as little material as possible. In any case, do not exceed 0.2 mm.

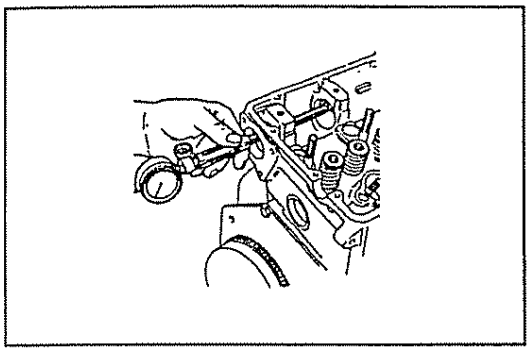


6) Checking for any cylinder head cracks.
Using a penetrating liquid, make sure there are no cracks in the combustion chamber, on the inlet and exhaust ports and on the cylinder head upper part.
Replace the head if any cracks are found.

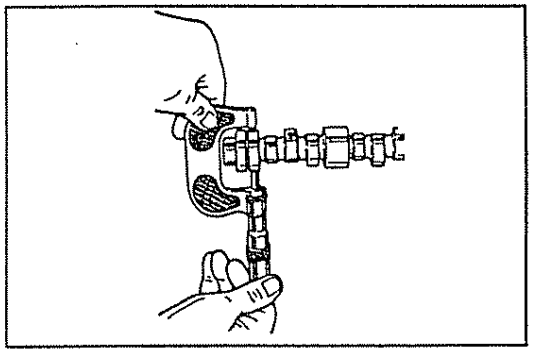


7) Checking the camshaft play.

① Measure the diameter of the 4 camshaft sockets with an interior micrometer.
Measurements should be taken at an angle of 90° to each other.
Note down the measured values.



② Measure the diameters of the camshaft in connection with the deliveries. Two measurements should be taken, at an angle of 90° to each other.
Note down the measured values.



③ Calculating the coupling play.
Calculate the coupling play basing on the measurements obtained according to points Ⓐ and Ⓒ .

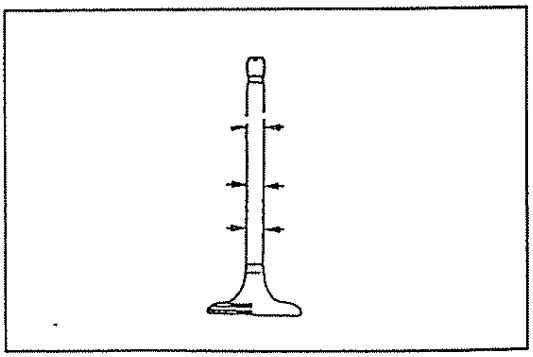
Camshaft coupling play:

A	37.035 ÷ 37.060 mm
B	36.975 ÷ 37.000 mm
(A-B)	0.035 ÷ 0.085 mm
(A-B) wear limit	0.170

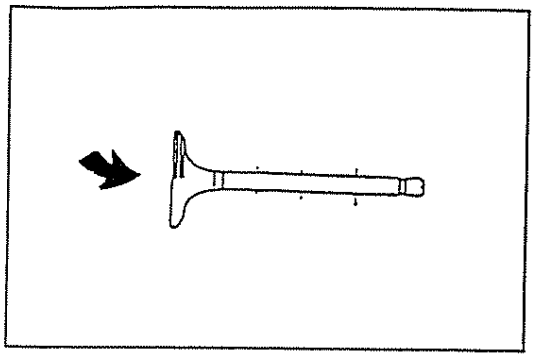
④ If the coupling play exceeds the prescribed value, replace the parts so that the prescribed play may be obtained.

8) Checking and grinding the valves.

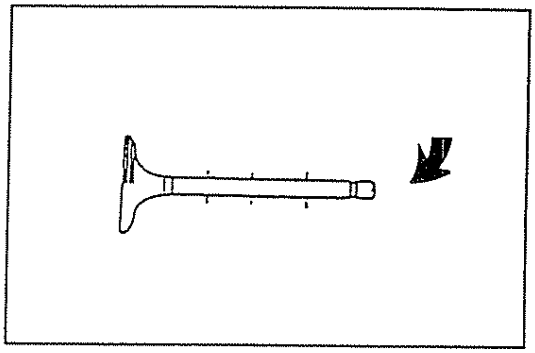
① Visually check if the valve stem shows signs of seizure or damage.



② Visually check if the valve head shows signs of overheating or damage. If so, replace the valve.

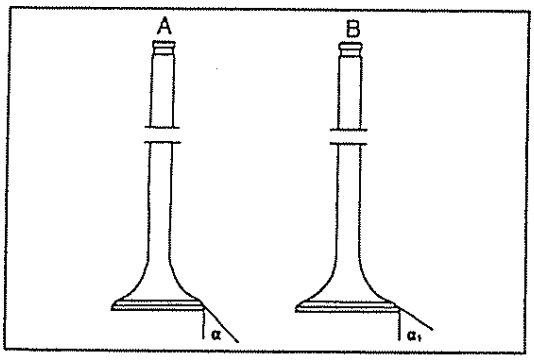


③ Visually check if the stem end shows signs of anomalous wear.

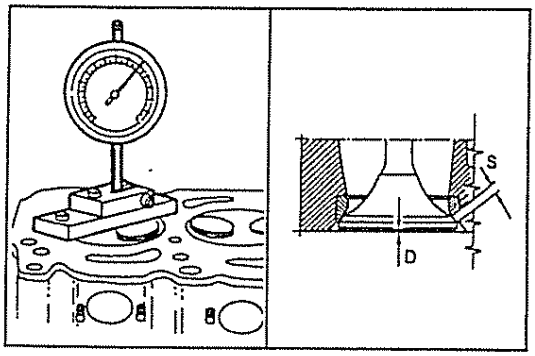


④ Grind the valves so that the related seals have an angle of 45° 30' ÷ 45° 45' (exhaust valve) and 60° 30' ÷ 60°45' (inlet valve).

NOTE:
- After the grinding, make sure that the angles obtained correspond to the above values.



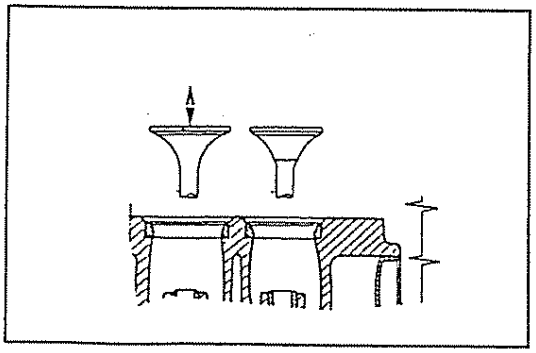
⑤ Checking the embedding of the valves.
Grind the valves on their seats with fine emery paste.
Using specific tool 19.1.20310, check the embedding of the valves D.
If the embedding exceeds the prescribed value, replace the valve.
D = 0.5 ÷ 0.8 mm
Wear limit = 1.1 mm



9) Checking and cleaning the valve seats.

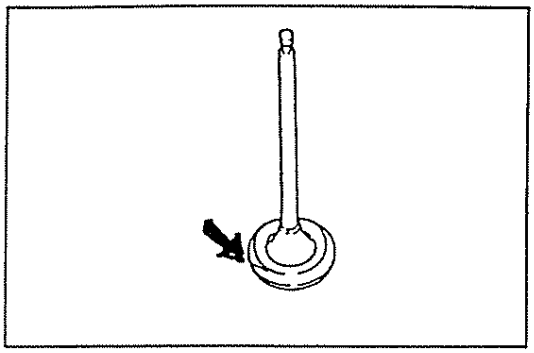
① Apply a thin film of red (or white) lead to the valve seat.

② Allow the valve to go down under its weight into its seat two or three times.



③ Remove the valve.
④ Check the tightness of the valve and the relevant seat by following these steps:

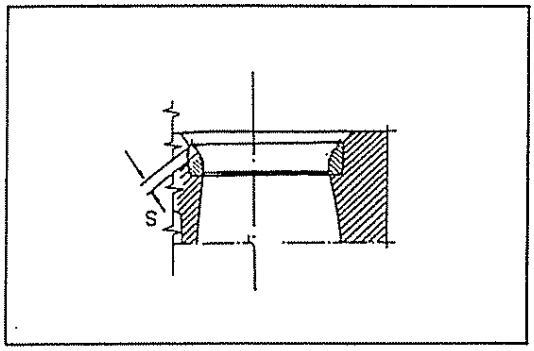
a. Make sure that the area of contact of the valve is continuous on all valve circumference. If it is not, replace the valve.



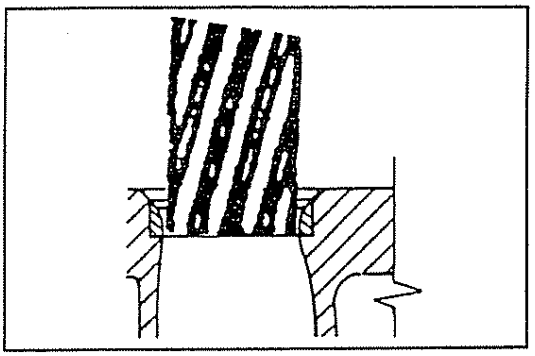
b. Make sure that the area of contact of the valve seat is continuous on all seat circumference. If it is not, replace the valve seat.
c. Measure the width of the area of contact of the valve seat.

Width of area of contact: 1.6 ÷ 1.7 mm
Wear limit: 2.0 mm

If the measurement is greater, replace the valve seat.

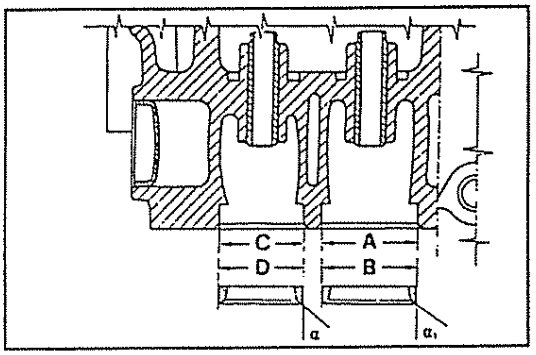


10) Replacing the valve seats.
① Using a miller of suitable diameter, remove material from the seat until it becomes thin enough to be easily removed.



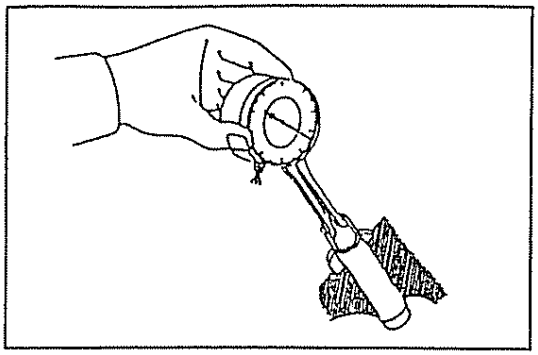
11) Check that the housings of the valve seats have the following dimensions:

Dimensions:	
A	34.020 ÷ 34.045
B	34.106 ÷ 34.115
C	30.020 ÷ 30.041
D	30.108 ÷ 30.116
α	44°53' ÷ 45°
α'	59°53' ÷ 60°

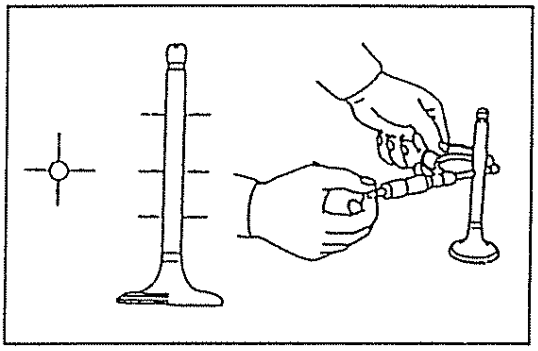


Fit the new seats on the head, heating the head to 120° or cooling the seats in liquid nitrogen.
NOTE:
- Seats are predefined. After being driven, they require no additional treatment.

12) Checking the valve stem - valve guide coupling play.



① Using a plug gauge, measure the inside diameter of the valve guide at 6 different points.
Note down the measurements.



② Using a micrometer, measure the diameter of the valve stem at 6 different points.
Note down the measurements.

③ Calculating the coupling play.
The coupling play is obtained by subtracting the outside diameter of the valve stem from the inside diameter of the valve guide.

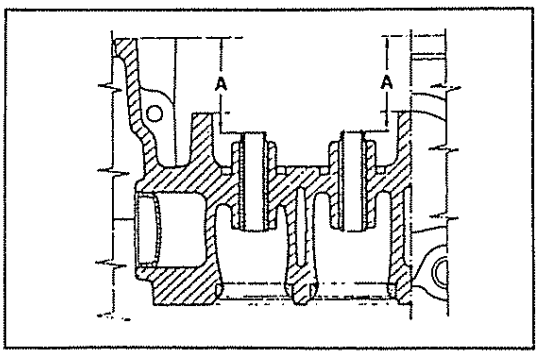
Prescribed coupling play: 0.015 ÷ 0.050 mm

Wear limit: 0.10 mm

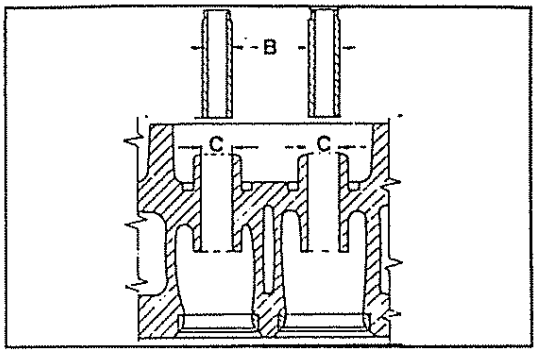
NOTE:
- If the calculated coupling play exceeds the prescribed play, replace the valve and the valve guide.
- If this operation has already been performed, it is necessary to replace the head.

④ If needed, the driving depth of the valve guides can be verified as shown in the figure.

A = 39.4 ÷ 39.6



Check the valve guides - head couplings as indicated in the table below.

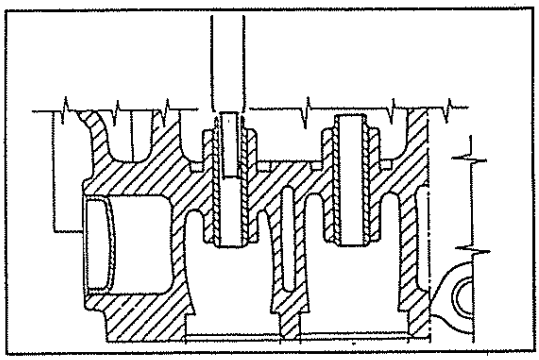


Head seat	C	11.000 ÷ 11.018
Outside diameter of valve guide	B	11.045 ÷ 11.054
Name	Dim. ref	Dimension

Some guides have a diameter increased by 0.5 mm. For these guides, the C dimension must be increased to 11.500 ÷ 11.518.

13) Replacing the valve guides.

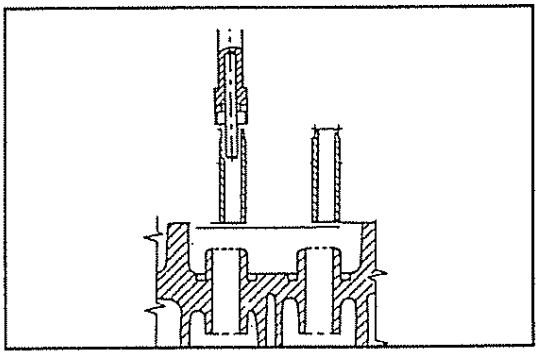
① Undrive the valve guide by means of specific tool 19.1.20174



WARNING:
- Do not damage the head.

② Drive out the valve guide towards the combustion chamber by means of specific tool 19.1.20174.

③ By means of tool 19.1.20311 push the new valve guide in until the tool comes to the abutting end.



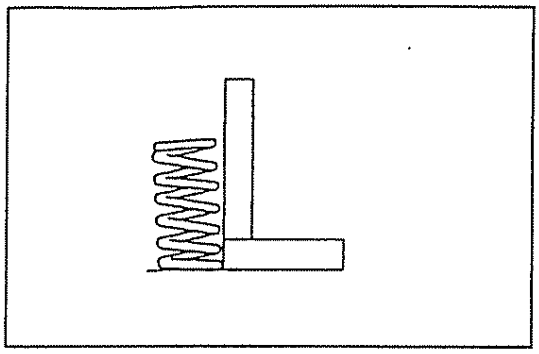
NOTE:
- To be able to carry out this operation, it is necessary to heat the head to 120°C. If a larger guide has to be fitted, its housing will have to be bored as described above.
  Valve guides are predefined and, consequently, require no additional treatment.

14) Manual valve grinding.

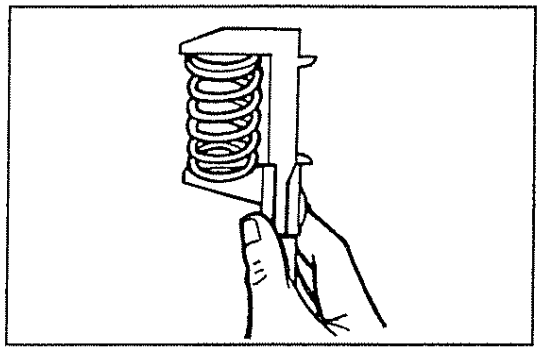
① Carry out the valve grinding with emery paste.

② After the operation, thoroughly clean the valves and the head.

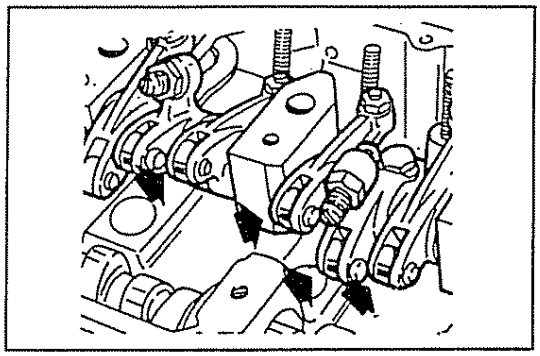
15) Checking the valves.
① Check the orthogonality of the valve spring by means of a steel square.
Maximum allowed deviation: 1.5 mm
If the deviation exceeds the above limit, replace the valve spring.



② Measure the length of the valve spring by means of a gauge.
Minimum free length: 39.8 mm
Allowable limit: 38.5 mm

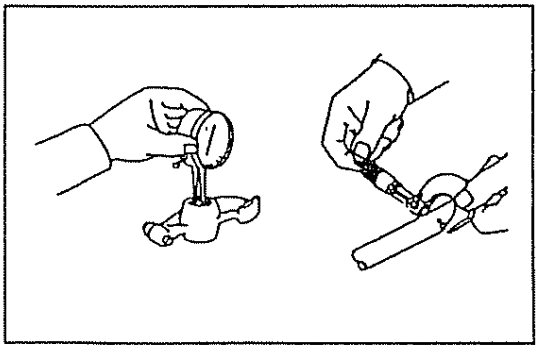


16) Checking the rocker arms and the rocker arms pivot.
① Visually check that the rocker arm roller shows no cracks, streaks or wear.
If necessary, replace the rocker arm.



② Visually check if the rocker arms pivot shows any signs of cracking, seizure or wear.
If necessary, replace the rocker arms pivot.

③ Rocker arms pivot - rocker arms.
- Using a comparator, measure the inside diameter of the rocker arm at two different points, 90° to each other.
- Using a micrometer, measure the outside diameter of the pivot at two different points, 90° to each other.
- The coupling play is obtained by subtracting the diameter of the rocker arms pivot from the inside diameter of the rocker arm.

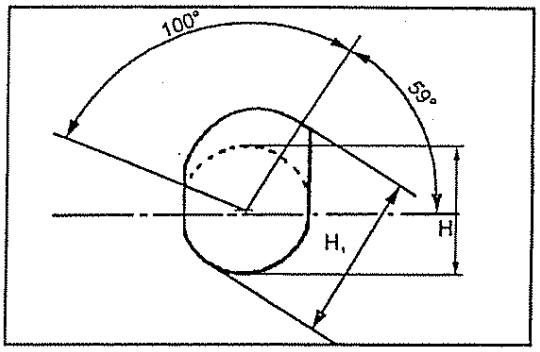


Coupling play: 0.016 ÷ 0.09

If the coupling play is not as specified above, replace the uncomplying parts with new ones.

Inside diameter of rocker arm	18.015 ÷ 18.030 mm
Outside diameter of rocker arm pivot	17.989 ÷ 18.000 mm

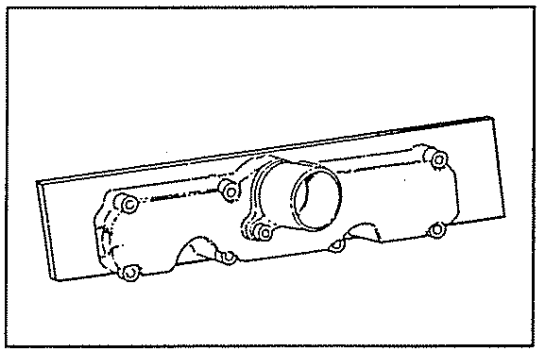
17) Measuring the height of the cam hump.
Using a micrometer, measure the height of the cam hump.



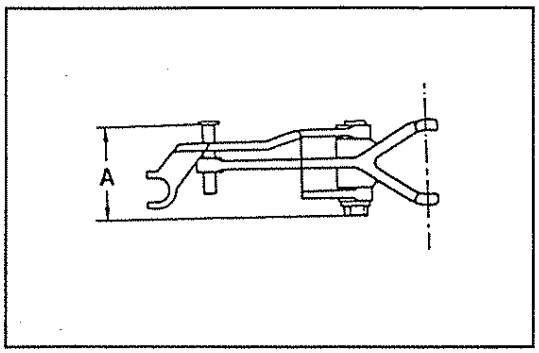
Cam dimensions:
H = 29.598 ÷ 29.650 (inlet and exhaust cams)
H_1 = 28.948 ÷ 29.000 (injection cam)
Limit measurement for H: 28.498
Limit measurement for H_1: 28.848

If cam wear exceeds the above limits, replace the camshaft.

20) Checking the inlet manifold.
Using a ground bar and a thickness gauge, check for any distortion of the exhaust manifold plane.
Maximum allowable distortion: 0.1 mm
If distortion exceeds the above limit, replace the exhaust manifold.

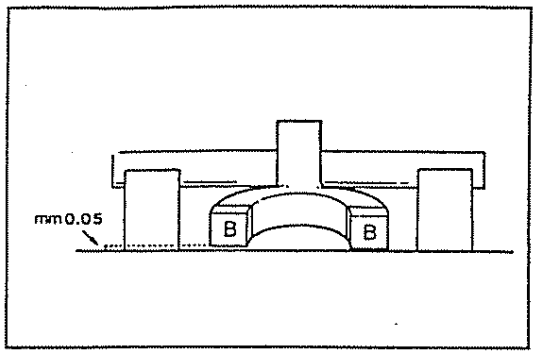


21) Checking the governor leverages.
① With the levers fitted on the guide pin, check that height "A" falls within the 45 ÷ 47 range.



② Using block squares and a surface plate, check the parallelism of pads "B".

A deviation of 0.05 mm is allowed.



5. FITTING THE CYLINDER HEAD

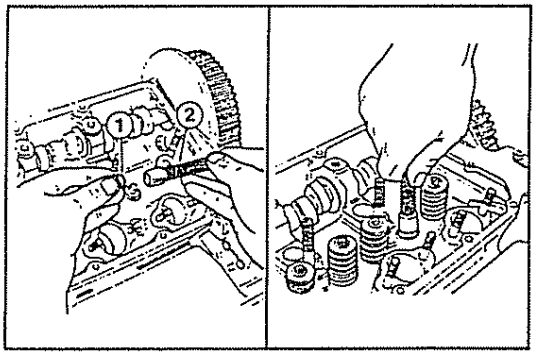
NOTE:
- Thoroughly clean all parts to be fitted.
  Before proceeding to the fitting, lubricate all sliding and rolling surfaces with motor oil.
  Replace all gaskets and sealing rings.

1) Fit the support washers for the valve springs.

2) Fit the valve stem sealing ring.

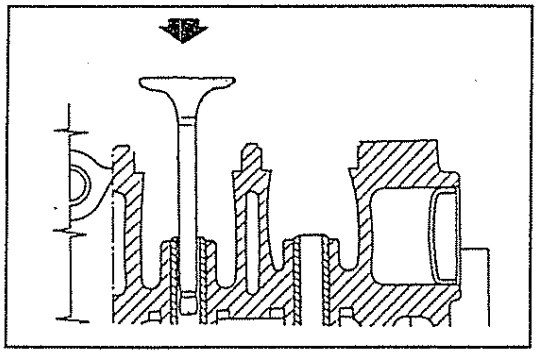
① Oil the sealing ring.

② Fit the sealing ring by means of tool 19.1.20311



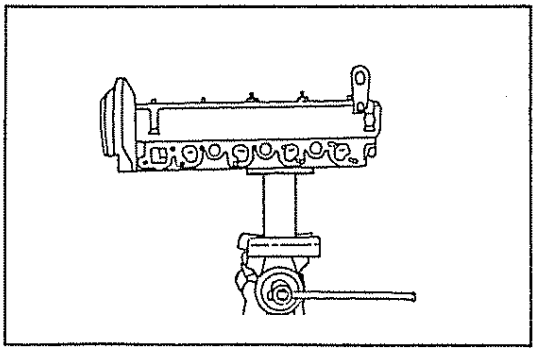
NOTE:
- Take care not to damage the valve guide bush.

3) Fitting the valves.
① Oil the valve stem.
② Insert the valve from the combustion chamber, taking the utmost care not to damage the sealing ring.

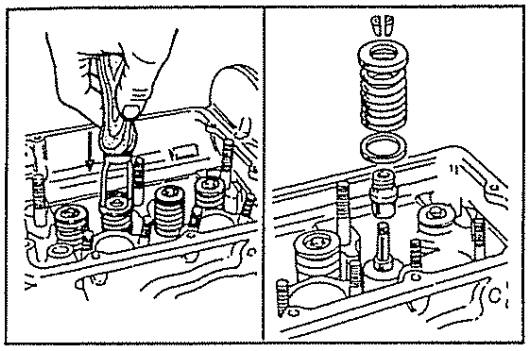


NOTE:
- Do not extract the valve after it has been inserted.
- Whenever the valve has to be extracted, replace the valve stem sealing ring with a new one.

4) Fitting the cylinder head
① Fit the cylinder head on tool 19.1.20312.
② Block firmly the tool into the vice.



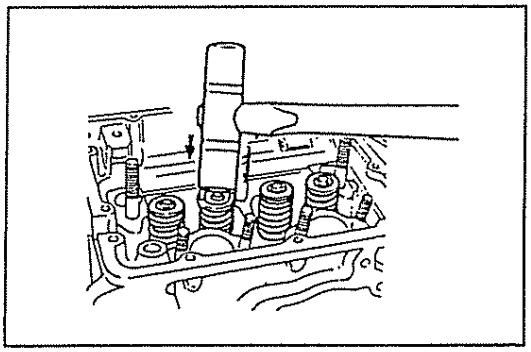
5) Fit the valve springs.
6) Fit the lock cones, using a curved-nose valve-lifting clamp.



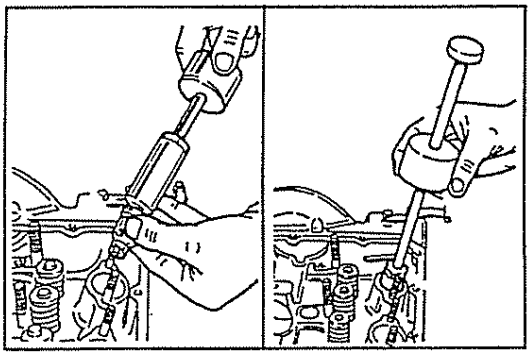
① To bed the cones in their housings, gently tap them with a plastic mallet.

WARNING:

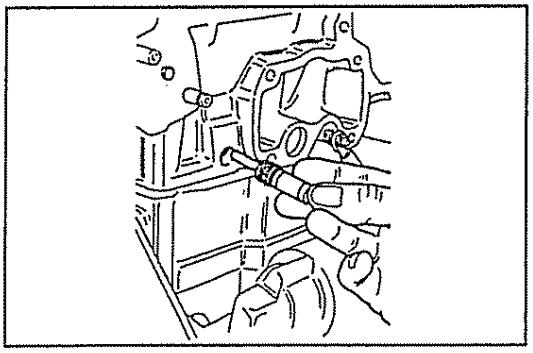
- Be careful when performing this operation, as the cones may spring off.
- Always protect the eyes when carrying out this operation.



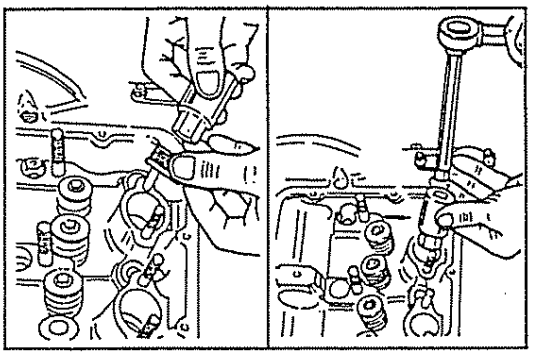
7) Fitting the precombustion chambers and the glow plugs.
   ① Fit the precombustion chamber on specific tool 19.1.20304 and position it on the head, taking care to align the glow plug socket with the hole on the head.



② Carefully screw specific tool 19.1.20300 on the head to the abutting end.



③ Remove tool 19.1.20304 and insert the ring nut, locking it in two stages by means of specific tool 19.1.20296.
1st fastening: 100 N.m.
2nd fastening: 180 N.m.

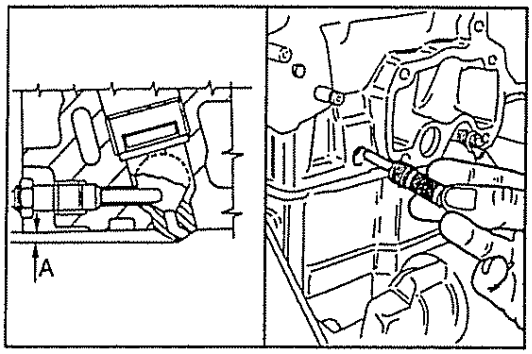


④ Remove tool 19.1.20300.

NOTE:

- During this operation some resistance may be felt owing to the friction of the tool against the precombustion chamber. This is to be regarded as normal.

⑤ Fit the glow plug.



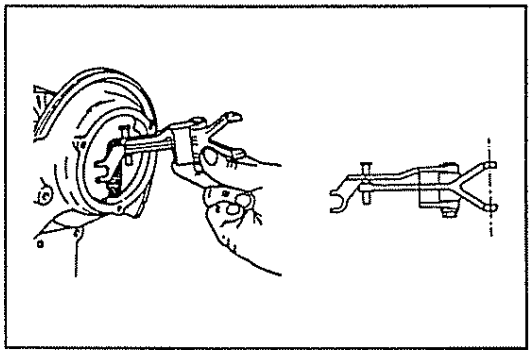
⑥ Repeat the above operations for the other precombustion chambers.

After installing the precombustion chambers, make sure that projection "A" measures 3.68 ÷ 4.10 mm.

7) Fitting the governor leverages on the head.

① Assemble the lever group, the guide pin and the spring framework (for Idle speed and full load speed springs).

② Insert the head lever group from the camshaft housing side.
Fit the specific pin-locking screw.



NOTE:

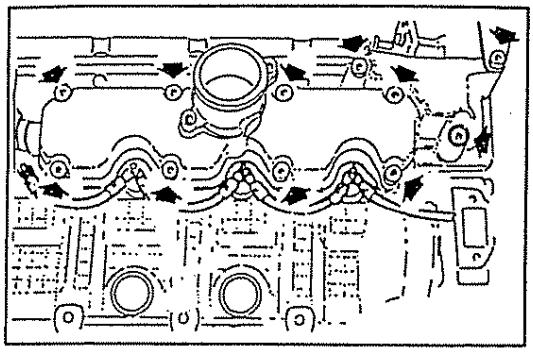
- Replace the O-ring seal.

8) Fitting the inlet manifold.

① Position the manifold gasket on the head after smearing the surfaces of contact with bearing grease.

② Hook the tie-rod of the regulator springs to the accelerator lever.

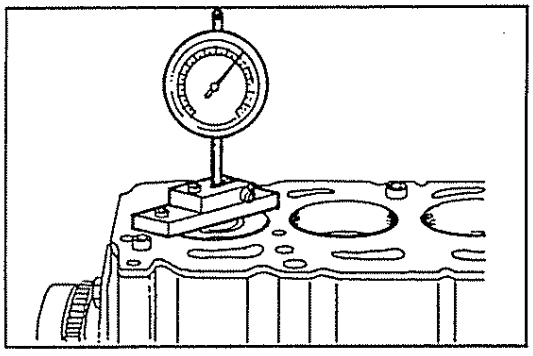
③ Fasten the manifold to the head by means of the 11 relevant screws.



④ Externally, fit the accelerator control with the spring retainer and fasten the latten.

⑤ Fasten the manifold connection with the 2 screws.

9) Checking the piston projections

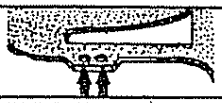
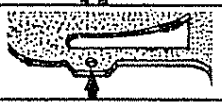


Using specific tool 19.1.20310 and a comparator, measure the projection of each piston from the cylinder block plane.

Take measurements at 4 diagonally-opposed points for each piston.

Projections affect the compression ratio. Therefore, to ensure an adequate ratio, determine the projection of the head gasket based on the table below.

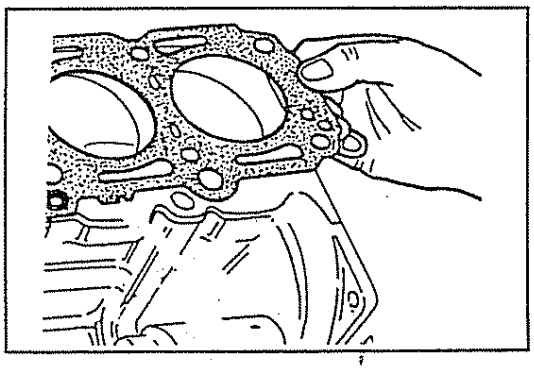
NOTE:
- Only take account of the maximum values obtained.

Measured piston projection	Thickness of gasket	Graphical representation	Dead space
1.25 ÷ 1.17	1.65 2 notches		0.40 mm 0.48 mm
1.16 ÷ 1.07	1.55 1 notches		0.39 mm 0.48 mm
1.06 ÷ 0.97	1.45 0 notches		0.39 mm 0.48 mm

NOTE:
- The dead space is the distance between the piston (TDC) and the head.

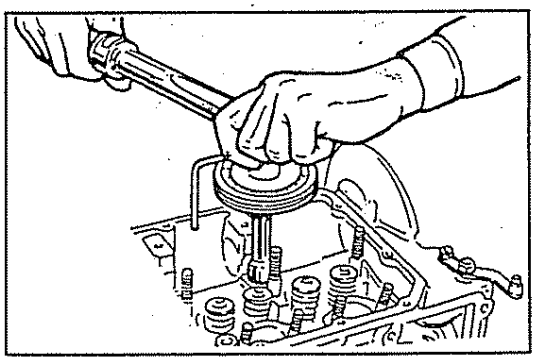
10) Installing the head.
① Fit a new head gasket having the previously determined thickness.
② Install the head.

NOTE:
- Make sure the dowel bolts and the sealing rings are correctly fitted on the gasket.



③ Fit the head-fastening screws and washers after lubricating the screw threads.

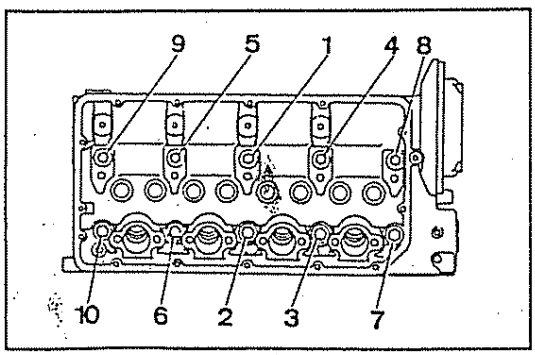
NOTE:
- When overhauling, it is advisable to replace the screws with new ones. After intermediate-mileage interventions, check the lenght (*) of each screw.



(*) Standard length: 89.5 ÷ 90.5 mm
Maximum allowable length: 92 mm

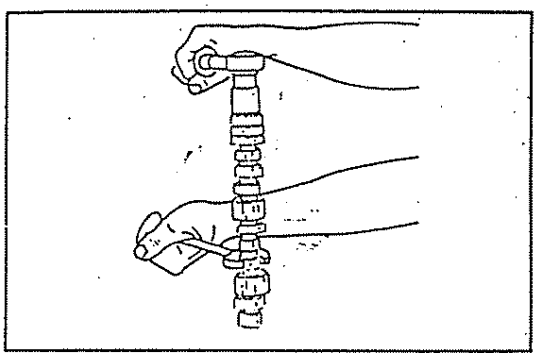
If even one screw exceeds the maximum allowable length, replace the whole set of screws.

④ Fasten the head by gradually tightening the screws in the numerical order shown in the picture to 50 N·m.
1st step : turn the key for 90° clockwise.
2nd step : turn the key for 120° clockwise.



NOTE:
- There is no need to check the tightening after running the engine.

11) Fitting the camshaft



① Clamp the camshaft in a vice, using aluminium linings. Position the feed pump control (ring and cam) on the camshaft and lock it with the special screw at 80 N.m. while counteracting with a fork spanner inserted in a cam.

② Insert the camshaft into the head on the flywheel side.

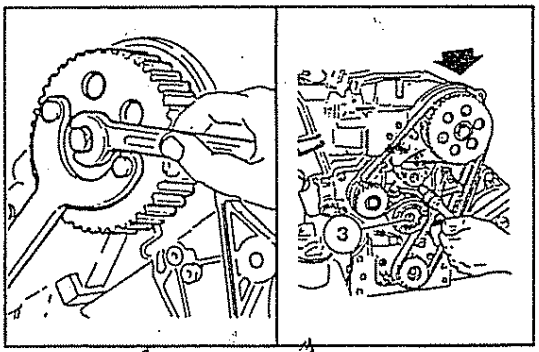
③ Assemble the bearing on the camshaft.
④ Assemble the support with weights and the pipe. Place the group into the camshaft.

NOTE
- Be sure to place the weights and their holder in the right place to let uncovered the lubrication hole.

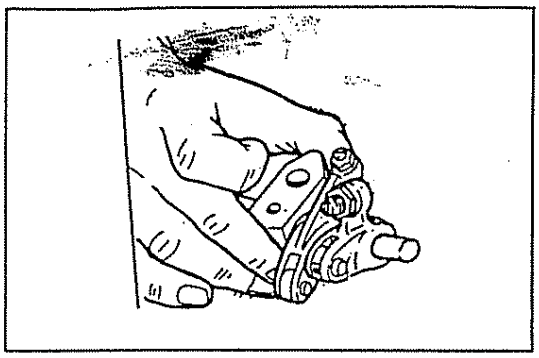
⑤ Assemble the bearing with the retainer and the new oil retainer on the flange of the pulley side; fix the bearing with retainer plate and fasten the screws with Loctite 270 to the specified tightening torque.
Tightening torque 10 N·m.

⑥ Assemble the flange on the head with a new O-ring. Fix the three screws to the specified tightening torque.
Tightening torque 12 N·m.

⑦ Assemble the pulley of the camshaft and the timing belt (See EM-14).



12) Fitting the rocker arm pivot.

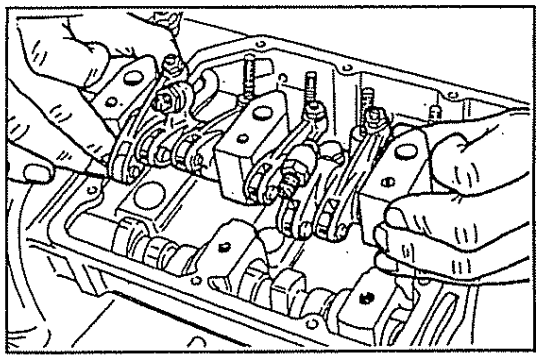


① Fit the rocker arm pivot on the 1st flywheel-side support. Insert a new pin, pushing it about 0 ÷ 1 mm under the surface of the support.

NOTE:

- If the pivot has been opened to be cleaned, reinsert the plugs at the pivot ends.

② Fit the rocker arm and the support, keeping the reverse order to the removal.



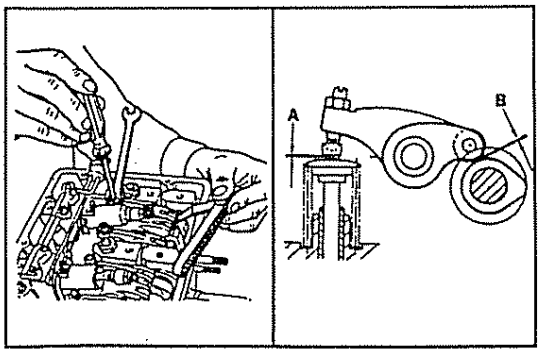
③ Install the pivot with the rocker arms on the head.

NOTE:

- To facilitate the fitting, it is advisable to keep the rocker arms aligned with rubber bands.

④ Tighten the nuts of the supports.
Tightening Torque: 40 N·m

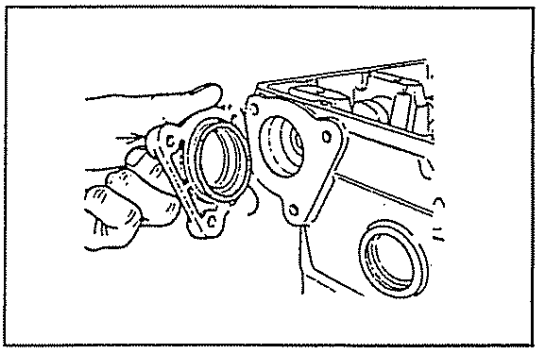
13) Adjusting the play of the valves.



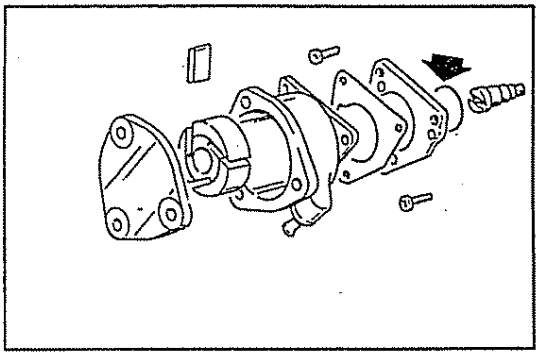
① Adjust the play of the valves. For this operation refer to EM-6.

14) Install the fuel feed pump. For this operation refer to FU section.

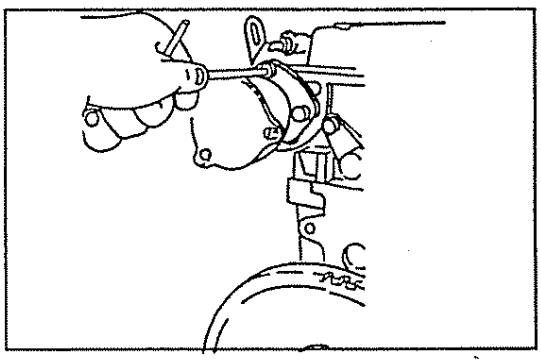
15) Fit the pneumatic pump support flange without using a new O-ring seal. Tighten the screws with the prescribed torque.
Prescribed torque: 12 N.m.



16) Fit a new O-ring seal on the pump shaft.



17) Fit the pneumatic pump with a new gasket and a new O-ring seal on the coupling surface. Tighten the screws with the prescribed torque.
Prescribed torque: 30 N.m.



18) Fitting the pump-injectors on the head.

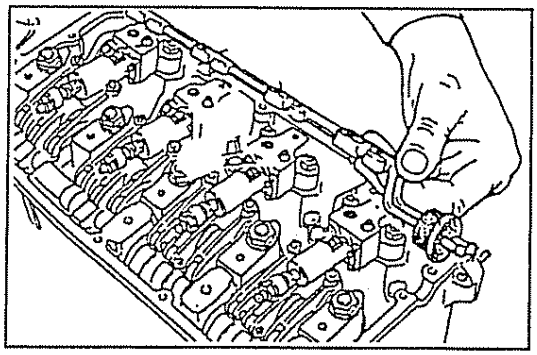
① For this operation refer to FU section.

② Carry out the injection advance and the levelling of deliveries. See EM-7.

NOTE:

- The injection advance can be carried out with the engine on the bench or fitted on the vehicle; for the levelling of deliveries the engine must be installed on the vehicle.

③ Fit the pump feed pipes, replacing the O-ring seals and applying silicone sealant to the rubber gaskets on the head-cover coupling.
Prescribed torque: 3.5 ÷ 4 N.m.

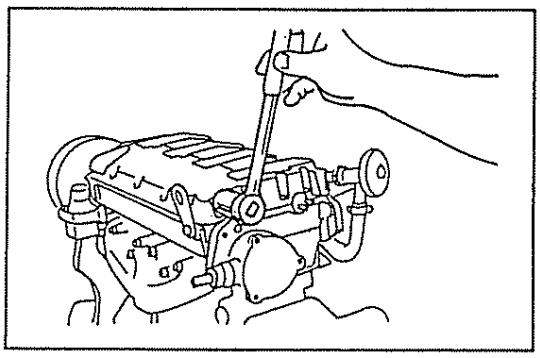


④ Fit the head cover with a new gasket. Tighten with the prescribed torque.
Prescribed torque: 9 N.m.

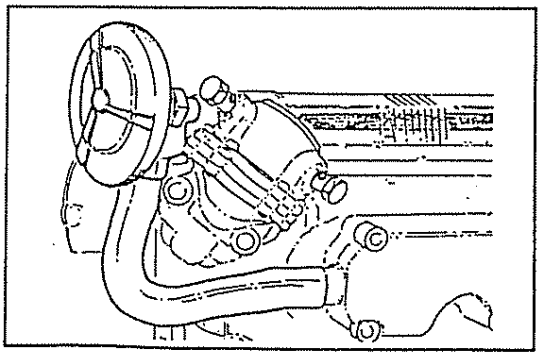
CAUTION:

- Rubber pipe must not come out of its housing (head cover).

19) Fit the minimum oil pressure switch.
Prescribed torque: 25 N.m.
Connect the relevant electric terminal.

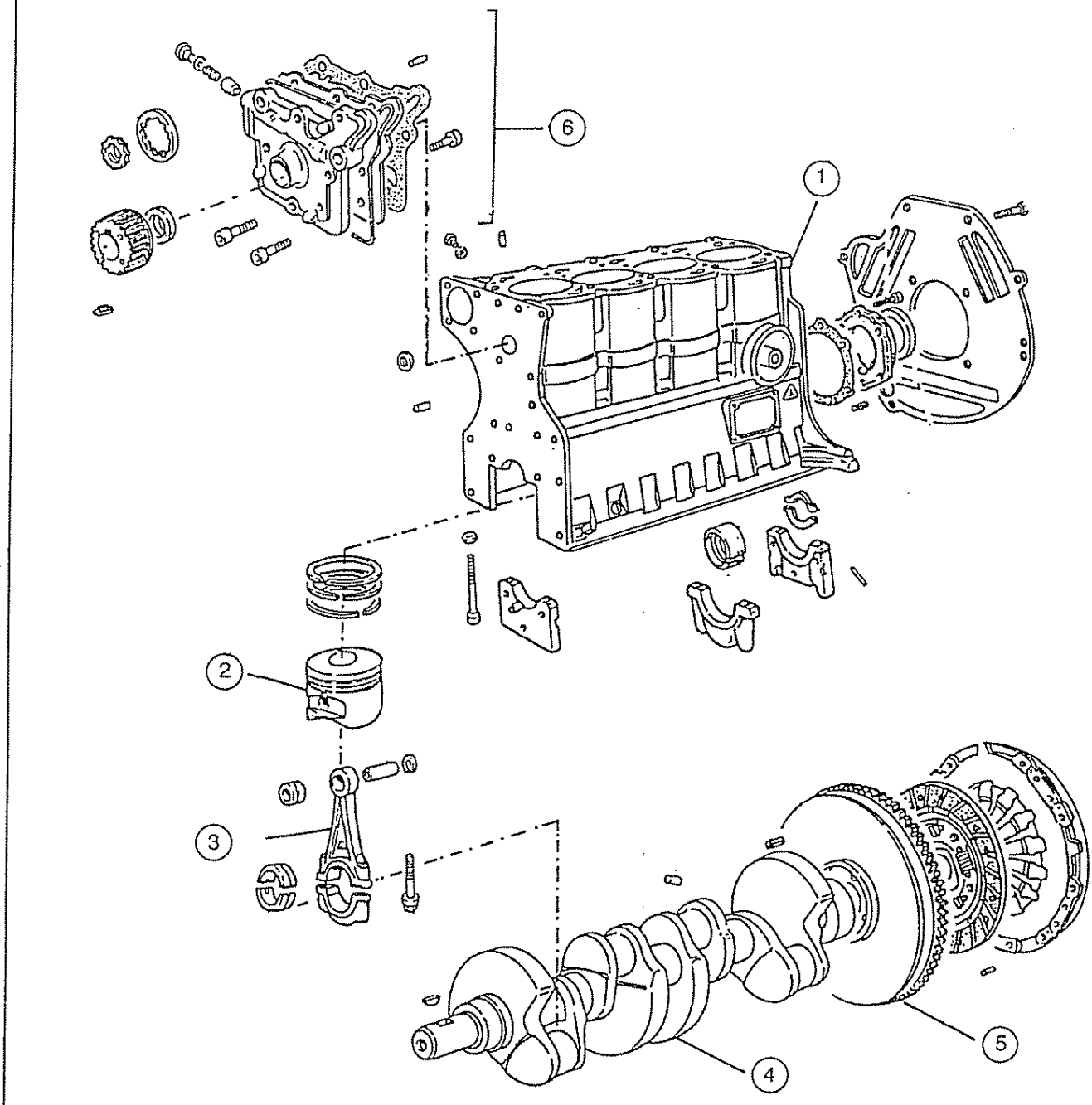


20) Fit the vacuum relief valve, with the related tube. Unscrew the conical-gasket fastening nut straps.



CYLINDER BLOCK

1. COMPONENTS

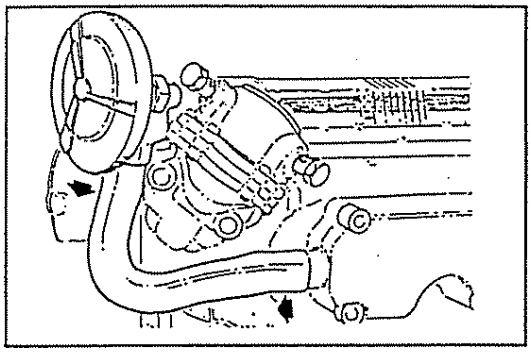


① Cylinder block
② Pistons
③ Connecting rod
④ Crankshaft
⑤ Flywheel
⑥ Oil pump

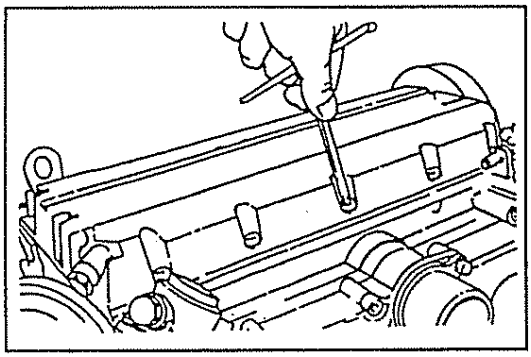
2. PREPARING TO REMOVE THE CYLINDER BLOCK

1) Disconnect the engine-gearbox assembly from the chassis and prepare it for bench overhauling.
   See EM-20.
2) Remove the timing belt. See EM-13.
3) Remove the head following the steps below.

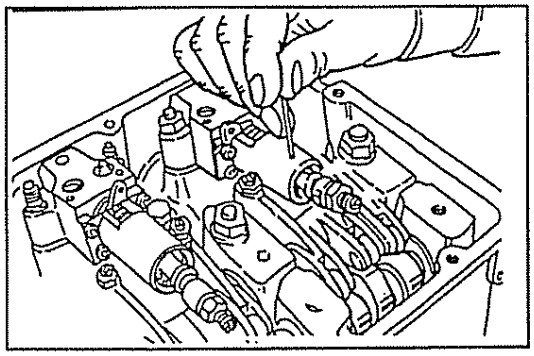
① Disconnect the oil sump from the head cover.



② Remove the head cover.



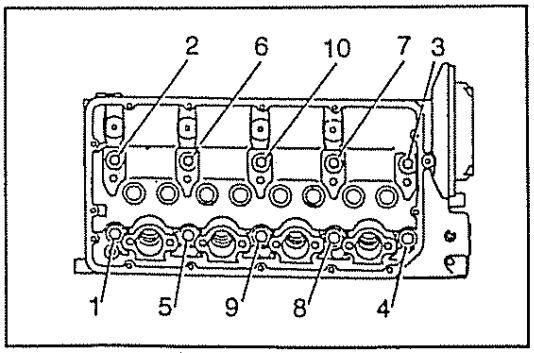
③ Remove the rocking lever pin after having locked injection pumps with a specific pin.



④ Remove the 10 head fastening screws.

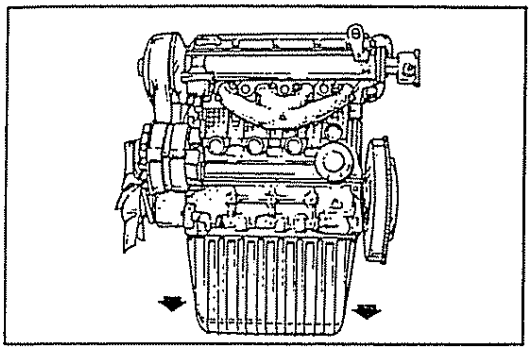
NOTE:

- While removing the head cover, make sure the rubber pipe of condensed vapours isn't coming out from its seating (head cover).
  While removing the head, follow the screw removing steps as indicated on page EM-24.

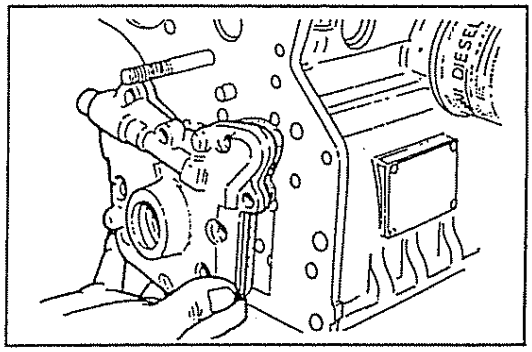


4) Remove the oil pan after loosening the fastening screws. The detach oil pan, use a hammer and a wooden wedge so as not to damage it.

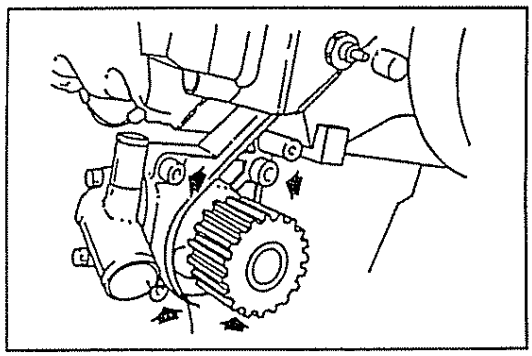
NOTE:
- Take care not to bend the oil return tube; to this end, start the detaching operation from the exhaust side.



5) Loosen the bracket-fastening screw and remove the oil return tube.
6) Remove the oil filter and the oil pump. See LU section.



7) Remove the water pump after loosening its 4 retaining screws.

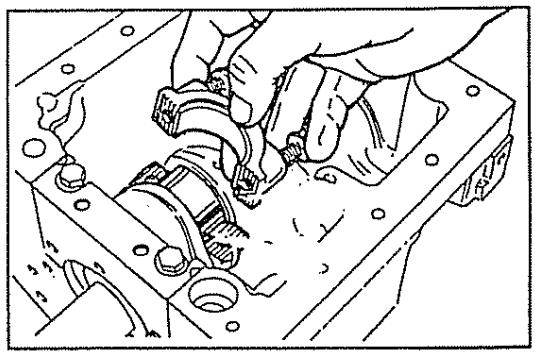


3. REMOVING THE CYLINDER BLOCK

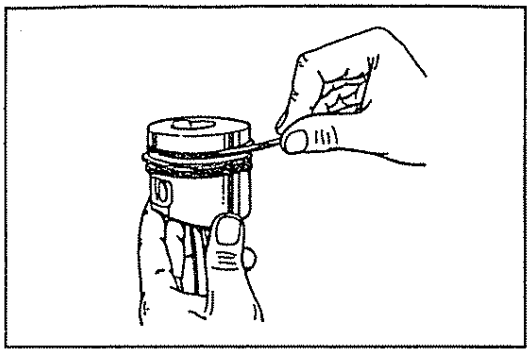
1) Removing the connecting rods and the pistons.

① Mark the position of the connecting rods so as to avoid inverting them during the subsequent fitting.

② Remove the connecting rod cap after loosening its fastening screws. Remove the bronze bearings and, subsequently, the connecting rod-piston assembly. Fit the cap on the connecting rod again. Repeat the operation for the other cylinders.



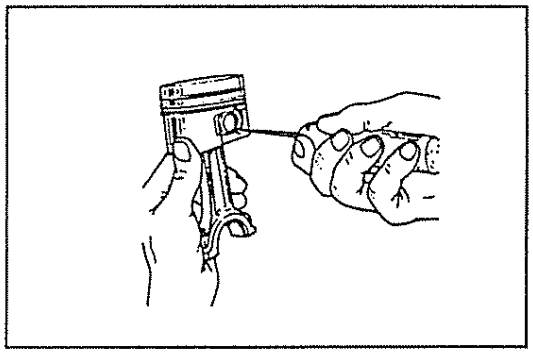
③ Remove the piston rings.



④ Remove the retaining rings of the piston pins and separate the connecting rods from the pistons.

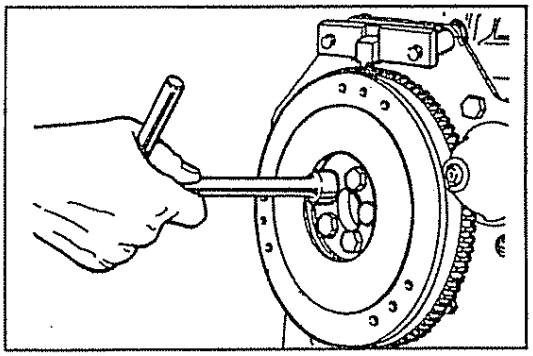
NOTE:

- No specific tooling is required for this operation, as the piston pins have forcings neither on piston nor on the connecting rod.

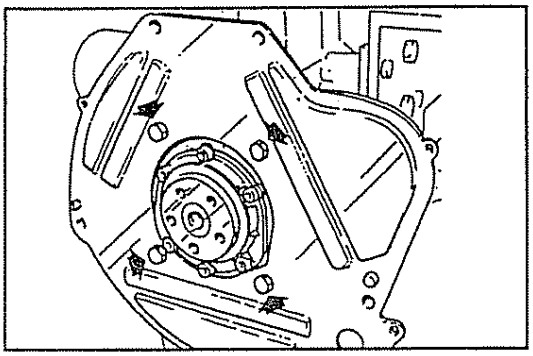


2) Removing the flywheel.

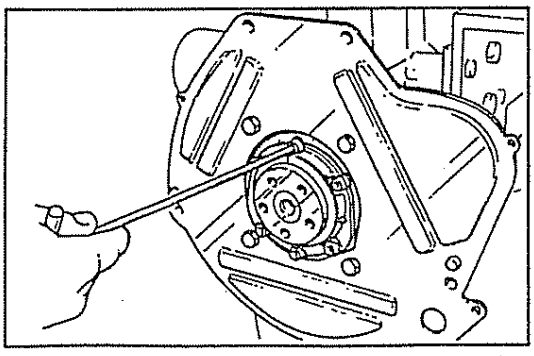
① Apply flywheel-locking tool 19.1.20313 on the cylinder block. Loosen the screws and remove the flywheel. Remove the tool.



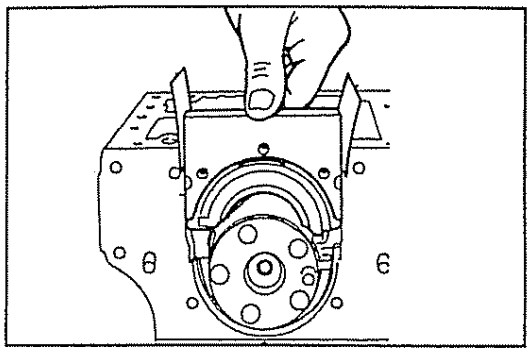
3) Remove the metal sheet protection after unscrewing the 4 screws.



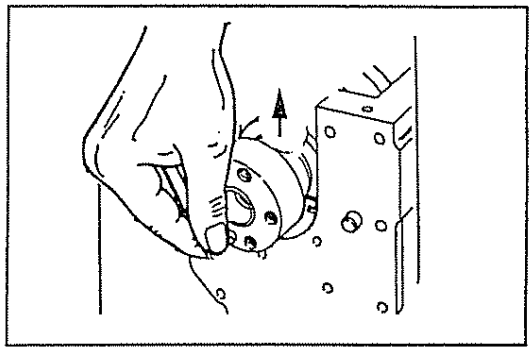
4) Remove the flange fitted with an oil seal.



5) Loosen the screws and remove the crankshaft U-bolts with the related bronze bearings.



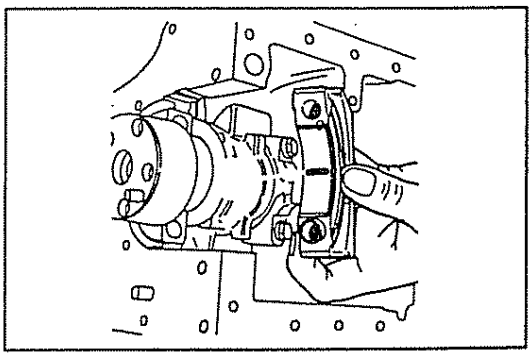
6) Remove the crankshaft and the cylinder block-side bronze bearings.



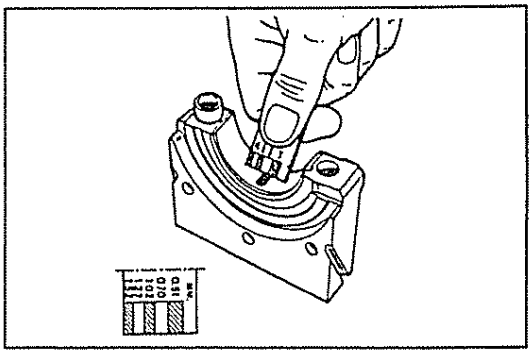
4. CYLINDER BLOCK CHECKS

1) Checking the bronze bearings - crankshaft coupling.

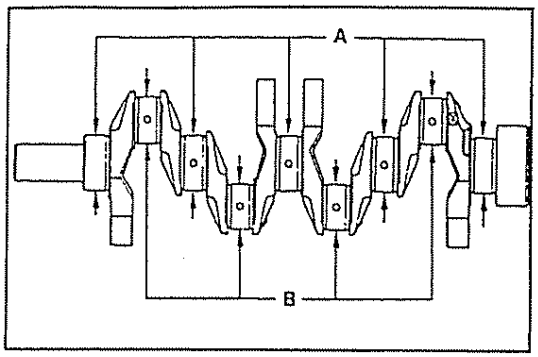
① Fit the crankshaft with U-bolts and bronze bearings. With the aid of some grease, position a calibrated, "Perfect Circle Plastigage"-type thread at the center of the bronze bearings.
Tighten the U-bolts with the prescribed torque.
Prescribed torque: 60 N.m.



② Remove the U-bolts and measure the width of the thread by means of the specific gauge, which makes possible measuring the coupling play.



③ Follow the same procedure to measure the coupling play of the connecting rod bronze bearings. Tightening torque for connecting rod U-bolts: 40 N.m.

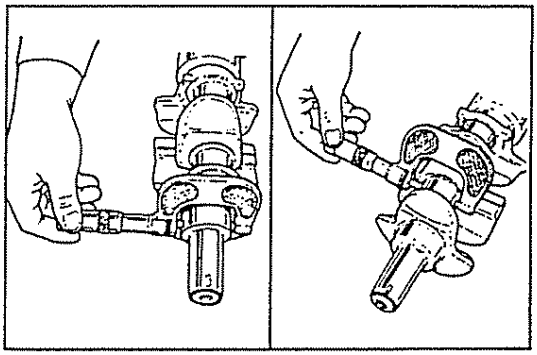


	Standard	Wear limit
Crankshaft - standard main bearings play	0.041÷0.107	0.230
Crankshaft - connecting rod bearings play	0.021÷0.066	0.130

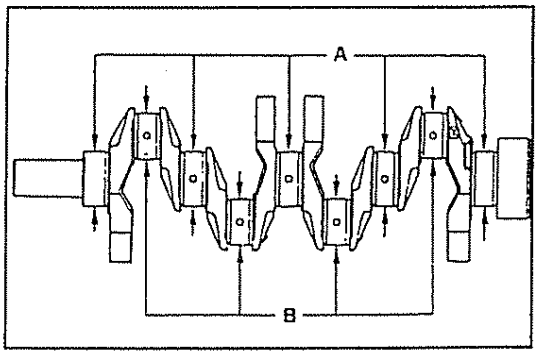
④ If the values obtain exceed the allowable limits, carry out further checks:

a. Measure the inside diameter of the bronze bearings only after tightening them with the prescribed torque. Use a bore meter.

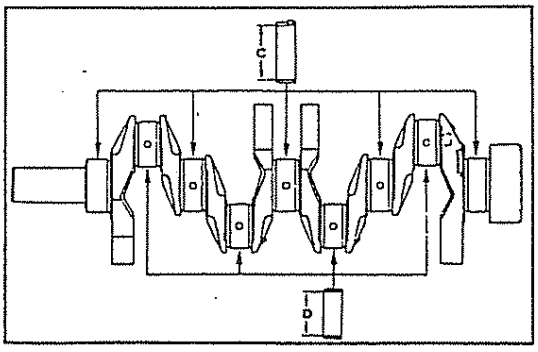
b. Measure the outside diameters of the crankshaft and connecting-rod pins by means of an external micrometer.



Diameters of the crankshaft and connecting-rod pins	
Dimensions (mm)	
A = 48.984 ÷ 48.000	Wear limit = 47.900
B = 39.984 ÷ 40.000	Wear limit = 39.900



Inside diatemers of crankshaft and connecting-rod big end bearings	
Dimensions (mm)	
C = 48.041 ÷ 48.091	Wear limit = 48.130
D = 40.021 ÷ 40.050	Wear limit = 40.100



Measurements refer to tightened bearings.

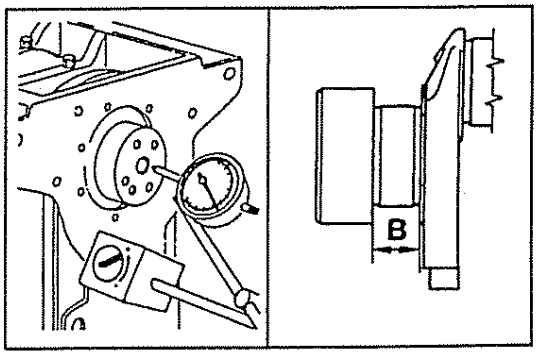
Plays between bearings and related pins	
(mm)	
C-A = 0.041 ÷ 0.107	Wear limit = 0.230
D-B = 0.021 ÷ 0.066	Wear limit = 0.130

NOTE:
- 0.25÷0.50 mm reductions of inside diameter are available for both crankshaft bearings and connecting-rod big end bearings.

c. If the diameters of the crankshaft journals come within the prescribed limits, replace the bronze bearings with standard bearings. If not, grind the crankshaft. 0.25÷0.50 mm reductions of inside diameter are available for both crankshaft bearings and connecting-rod bearings.

Dim. bronze bearings	connecting rod pin Ø	crankshaft journal Ø
Standard size	39.984 ÷ 40.000	47.984 ÷ 48.000
0.25 reduction	39.734 ÷ 39.750	47.734 ÷ 47.750
0.50 reduction	39.484 ÷ 39.500	47.484 ÷ 47.500

⑤ Checking the axial play of the crankshaft.
Install the bronze bearings on the cylinder block. Position the crankshaft.
Fit the levellers on the cylinder block and on the flywheel-side U-bolt. Fit the flywheel-side and timing-side U-bolt and tighten them with the prescribed torque (60 N.m.).



NOTE:
- There is no need to fit the U-bolts with gaskets, as the installation is provisional. Using a magnetic-base comparator, measure the axial play of the crankshaft.

NOTE:
- For the validity of the test, use a screwdriver as shown in the figure, acting in both directions. Measure the axial play.
Prescribed axial play: 0.130 ÷ 0.313 mm.
If the play does not fall within the prescribed range, use thicker levellers.
0.10 mm and 0.20 mm oversizes are available.

NOTE:
- There are 4 levellers: 2 on the cylinder block and 2 on the U-bolt. If an oversize is needed, act on both levellers located on the same side. If required, it is possible to combine a standard and an oversize, or different oversizes.

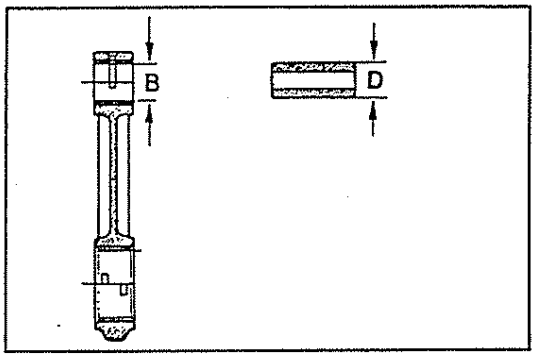
2) Checking the connecting rods.

① For the verification of the inside diameter of the big-end bronze bearings, see "Checking the bronze bearings - crankshaft couplings".
See EM-46.

② Checking the connecting rod - piston pin coupling play.

a. Measure the inside diameter of the connecting rod small end by means of a bore meter.

b. Measure the diameter of the piston pin by means of a millesimal micrometer.

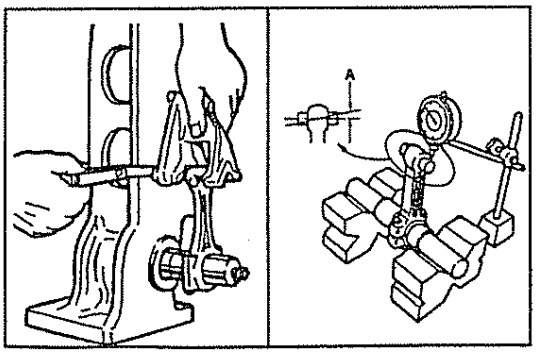


rod pin Ø	B = 18.015 ÷ 18.025 mm	
Piston pin	D = 17.996 ÷ 18.000 mm	
Coupling play 0.015 ÷ 0.029		Wear limit 0.060 mm

NOTE:
- If the calculated plays do not fall within the prescribed range, replace the small-end bronze bearings. Drive it with the lubrication hole aligned and subsequently work it to the prescribed dimension.

③ Aligning the connecting rod.
After overhauling the connecting rod small end, proceed to verify the alignment by means of a surface plate and a comparator (see figure at right).

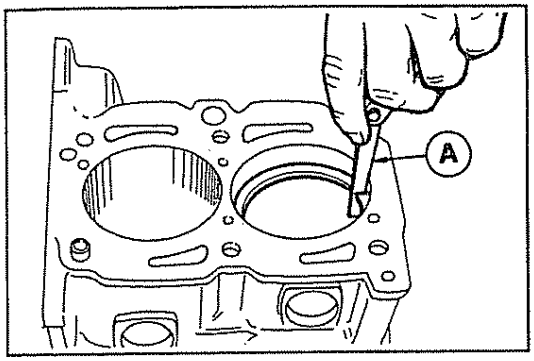
The A Ø measurement on the piston pin must be:
standard = 0 ÷ 0.015
limit = 0 ÷ 0.030



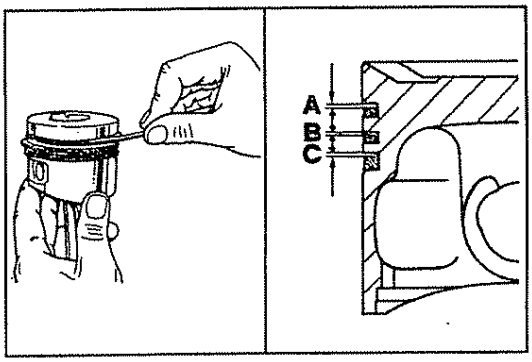
3) Checking the piston ring and piston

① Measure the piston rig end gap.
Place the piston ring into the cylinder and measure the end gap A.
Specification:

1st piston ring:	A = 0.25 - 0.45 mm
2nd piston ring:	A = 0.25 - 0.45 mm
3rd piston ring:	A = 0.25 - 0.45 mm
Wear limit:	1.0 mm

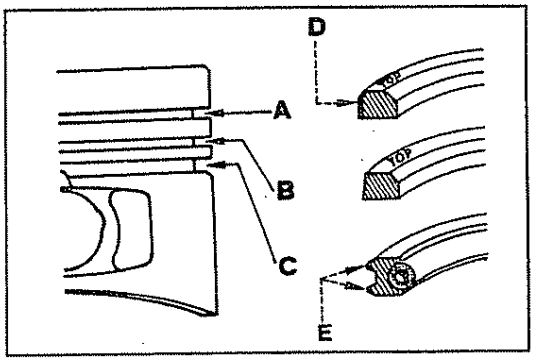


② Measure the piston ring groove clearance.
Specification:
A = 0.090 - 0.125 mm
B = 0.050 - 0.085 mm
C = 0.040 - 0.075 mm



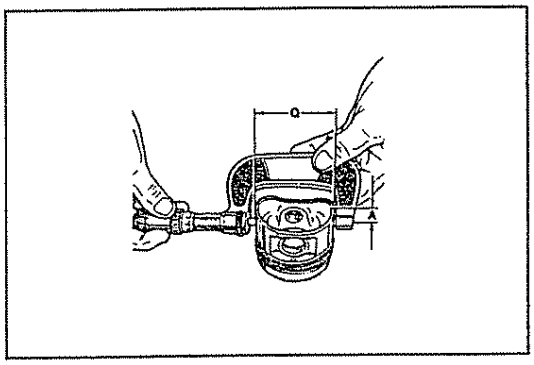
③ Piston installation position
A = 1st (Internal tapered and torsional) ring
B = 2nd (Internal tapered and torsional) ring
C = 3rd oil control ring
D = Chromium-plated potion
E = Chromium-plated potion

NOTE:
- The stamped portion of piston rings should be fitted facing upwards.



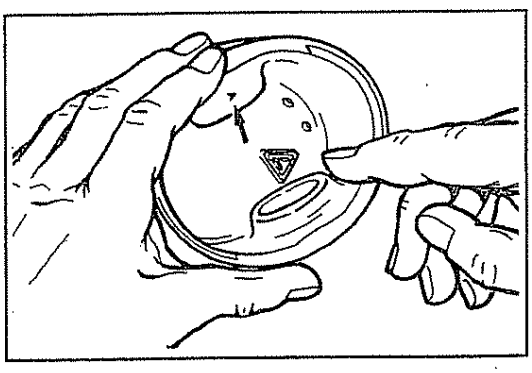
④ Measure the piston diameter Q at A position from bottom of the skirt. (A = 9 mm)

Piston class:
- Depending on their diameter size, pistons are divided into four classes; A, B, C and R.
- The class and logo are specified inside the piston.



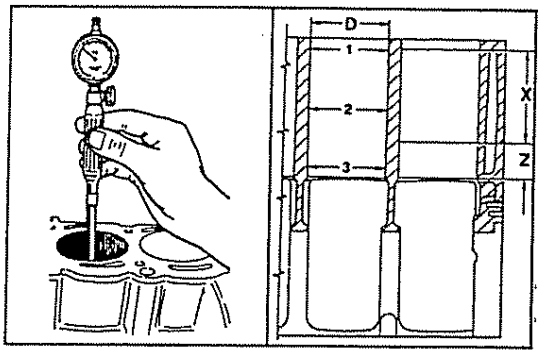
Dimension (mm):

Class	Piston Diameter	Cylinder Diameter	Clearance
A	71.930 - 71.940	71.990 - 72.000	0.050 - 0.070
B	71.940 - 71.950	72.000 - 72.010	
C	71.950 - 71.960	72.010 - 72.020	
R	72.031 - 72.049	72.100 - 72.120	0.051 - 0.089



If the measured diameter is smaller than the allowable minimum, replace the pistons. 0.50 mm and 1.00 mm oversize pistons are available. The diameter of these pistons is stamped on the piston top. Class R pistons have specific rings.

4) Checking the cylinders

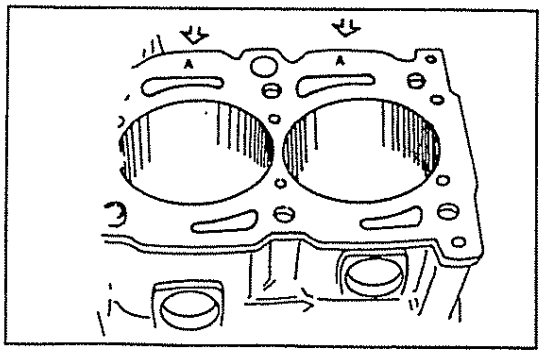


① Set the bore meter to zero with a calibrated ring and measure diameter D at points 1-2-3 by means of a micrometer. Repeat the operation after rotating the bore meter 90° at the same height. Check for wear in X, where the piston rings operate. If wear exceeds 0.05 mm, grind the cylinder.

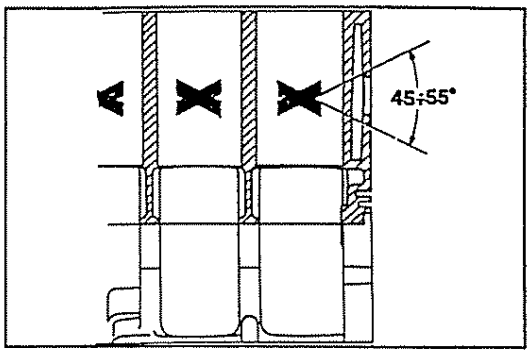
Classes	Cylinders
A	71.990 ÷ 72.000
B	72.000 ÷ 72.010
C	72.010 ÷ 72.020
R	72.100 ÷ 72.120

② To check the coupling play with the pistons, measure the diameter in the "Z" area of each cylinder, perpendicular to the crankshaft.

③ Cylinders are identified by the same classes as the pistons; the letters are stamped at the positions indicated by the arrows.



④ When grinding the cylinders, the working marks must cross one another at an angle of 45° ÷ 55° and be uniform the clear in either direction. Average roughness must be 0.50 ÷ 1.00 mm.



NOTE:

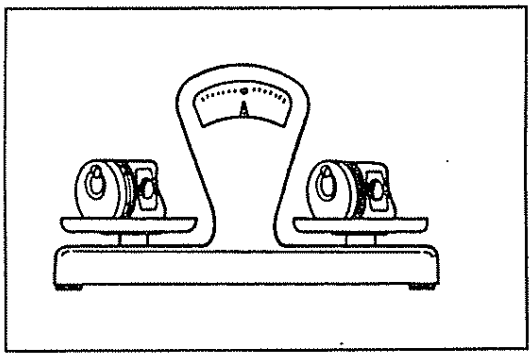
- Do not regrind the cylinder surfaces with emery cloth.

⑤ Piston-cylinder coupling plays

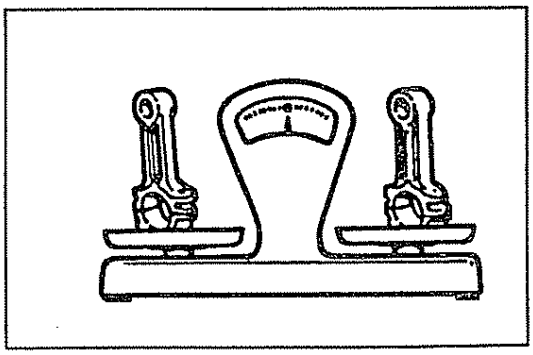
Classes	Cylinder Ø	Piston Ø	Play
A	71.990 ÷ 72.000	71.930 ÷ 71.940	0.050 ÷ 0.070
B	72.000 ÷ 72.010	71.940 ÷ 71.950	
C	72.010 ÷ 72.020	71.950 ÷ 71.960	
R	72.100 ÷ 72.120	72.031 ÷ 72.049	0.051 ÷ 0.089

5) Weighting the pistons and the connecting rods.

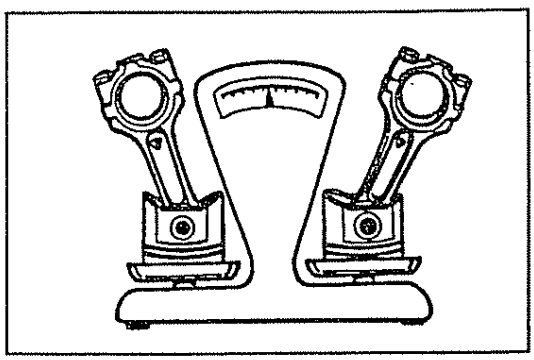
① To avoid a lack of balance, ensure that the pistons have a weight difference of no more than 6 grams.



② Repeat the operation for the connecting rods. The weight difference must not exceed 10 grams.



③ Weight the piston-connecting rod assemblies and make sure that the weight difference does not exceed 14 grams.



6) Checking the cylinder plane.
Using a ground block and a thickness gauge, check the area of contact of the head gasket. The out-of-plane must not exceed 0.10 mm.

NOTE:
- Levelling operations are forbidden.

5. FITTING THE CYLINDER BLOCK

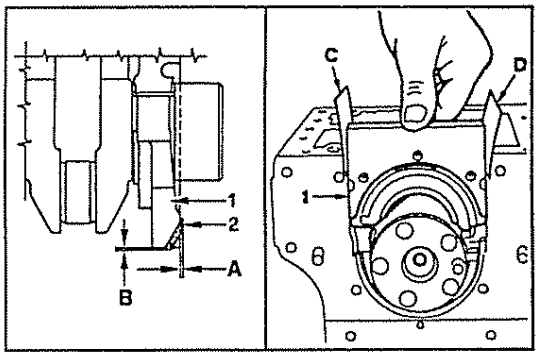
NOTE:
- Before proceeding to install the cylinder block, be sure to properly wash all parts. Remove all gasket and carbon residues from the interior of the lubrication ducts.

1) Fitting the crankshaft.
   ① Fit the cylinder block with bronze bearings having a lubrication hole.

   ② With the aid of some grease, apply levellers having the previously determined thickness to the flywheel-side support and the related U-bolt.

   ③ Lubricate the bronze bearings and position the crankshaft.

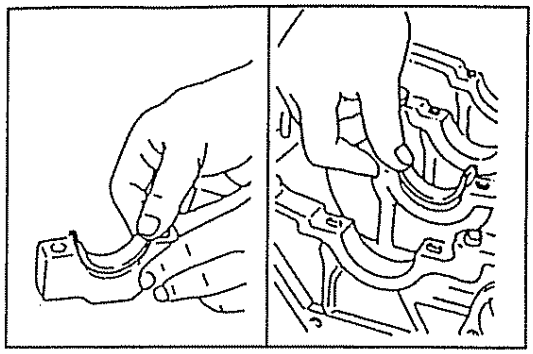
   ④ Fit the rubber gaskets and the bronze bearings on the flywheel-side U-bolt, lubricate the surfaces and fit the U-bolt on the engine using the two strips. Specific tool 19.1.20297.



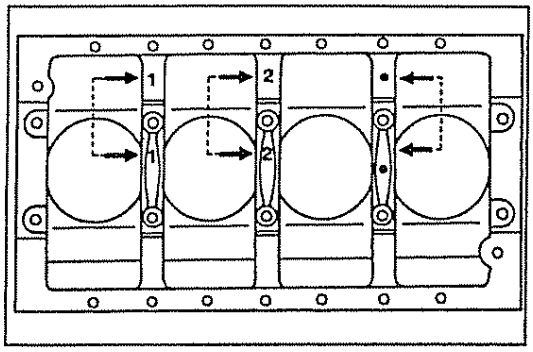
   After provisionally locking the U-bolt, remove the gasket so that it protrudes 0.5 ÷ 1.0 mm.

   ⑤ Repeat the same operation for the timing-side U-bolt.

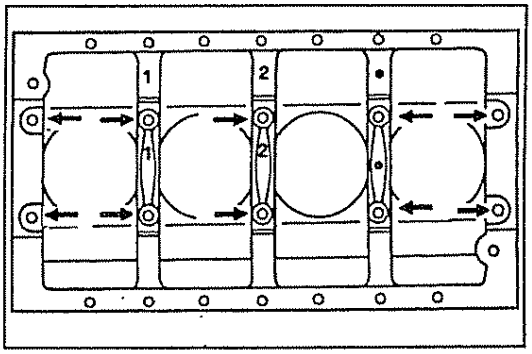
⑥ Fit the bronze bearings on the central supports. Fit the supports on the cylinder block as shown in the figure.



NOTE:
- The reference marks may be numerals of chiselings. Fit the U-bolts with the reference marks on the same side as the marks on the cylinder block.
  In any case, the catches of the bronze bearings must be on the same side. The studs can be positioned either on the U-bolt side or on the cylinder block side.



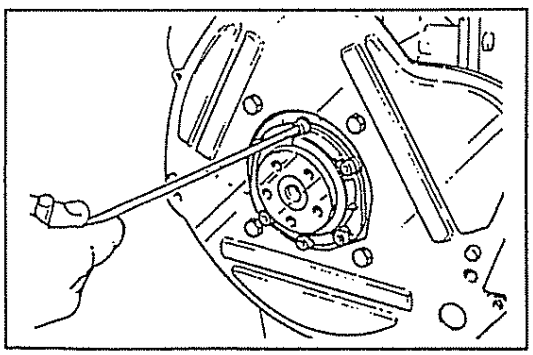
⑦ Gradually tighten the crankshaft bearings to the prescribed torque.
Prescribed torque: 60 N.m.



⑧ Fit a new oil seal on the falge, flywheel side, using specific tool 19.1.20188.

NOTE:
- Before fitting any oil seals, dip them in motor oil for at least 30 minutes.
  If the crankshaft shows signs of wear in the oil seal working area, position the oil seal 2 mm deeper.

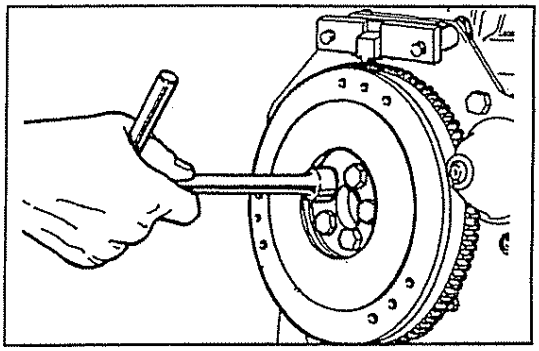
⑨ Position the flange on the crankshaft with a new gasket. Apply a drop of silicone sealant to the ends of the U-bolt gaskets.
Tighten the screws with the prescribed torque.
Prescribed torque: 12 N.m.



⑩ Fit a new oil seal ont the oil pump casing. Install the oil pump on the engine after fitting it with a new gasket.
See LU section

⑪ Fix the metal plate casing by means of the 4 relevant screws.
Fixing torque: 29.6 N·m

⑫ Fit the flywheel and stop tool 19.1.20313 and tighten the 5 screws with the prescribed torque.
Prescribed torque: 80 N.m.

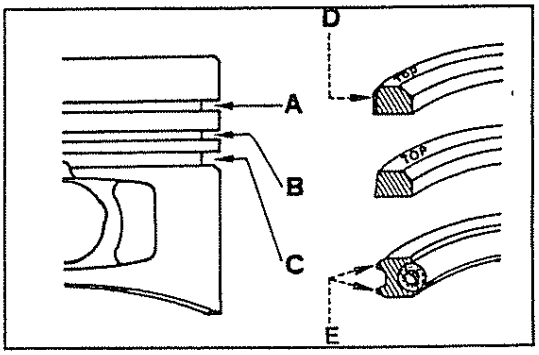


⑬ Fitting the pistons.

a. Lubricate the piston pin, couple the connecting rod and the piston taking care to observe the original assembly position.

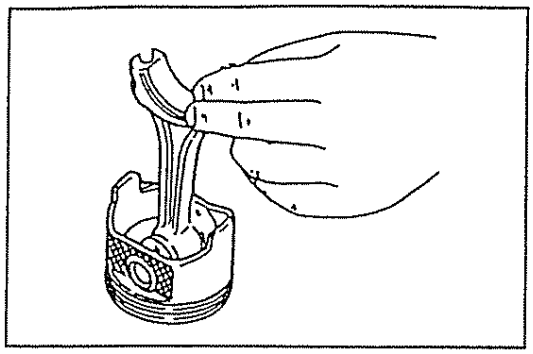
b. Position the piston pin manually and fit the retaining rings.

c. Position the piston rings on the piston. The scraper ring has no fitting direction, whereas the 1st and 2nd rings bear a "TOP" caption or a mark on their tops. At any rate, the 1st and 2nd rings have a bevel on their inside upper part. The 1st ring can be recognized by its chromium-plated outer surface.Place the ring unions at 120°. The scraper ring spring must close in the position diametrically opposed to the opening of the scraper ring.

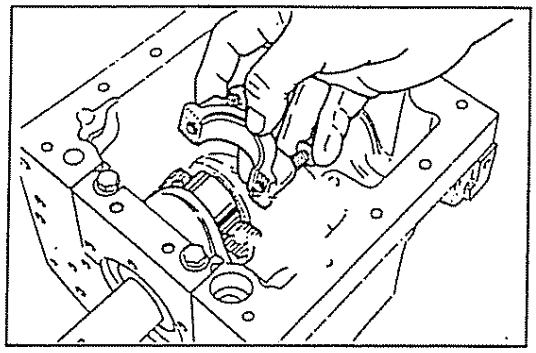


⑭ Fit the bronze bearing on the connecting rod and position the crankshaft so that the cylinder concerned is at the B.D.C.

⑮ Insert the piston-connecting rod assembly, positioning the combustion chamber on the water pump side. Complete the fitting with the aid of tightening tool (for example AWA 499955).

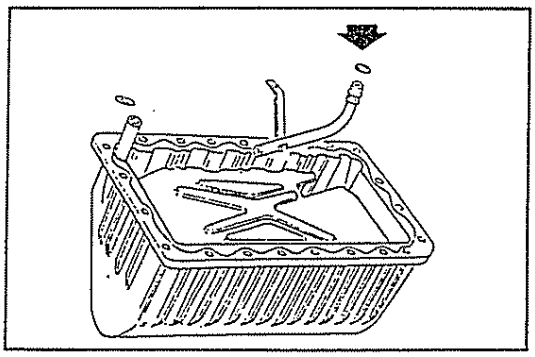


⑯ Position the bronze bearing on the connecting rod cap, lubricate the shaft and fit the cap according to the reference marks set previously. In any case, the catches of the bronze bearings must be on the same side.
Progressively tighten to the prescribed torque: 40 N.m.
Repeat the piston fitting operation for the other cylinders.

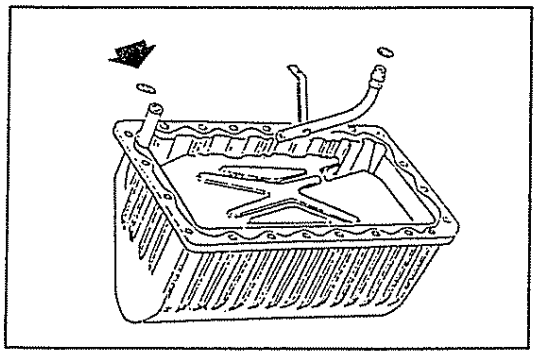


⑰ Fitting the oil sump.

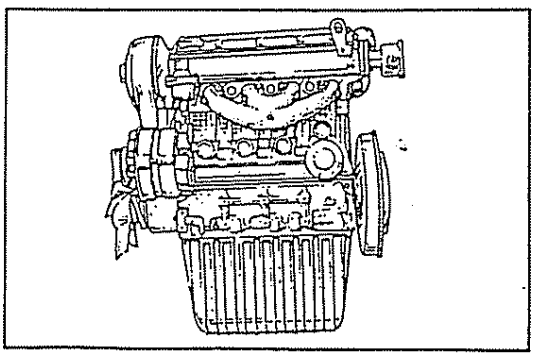
a. Fit a new O-ring seal on the oil return tube. Install the tube on the cylinder block, fastening it with the relevant screw.



b. Fit a new O-ring seal on the sump oil suction tube. Degrease the cylinder block and oil sump sur faces. Apply sealant silicone,DOW CORNING 7019 type to the sump surface.

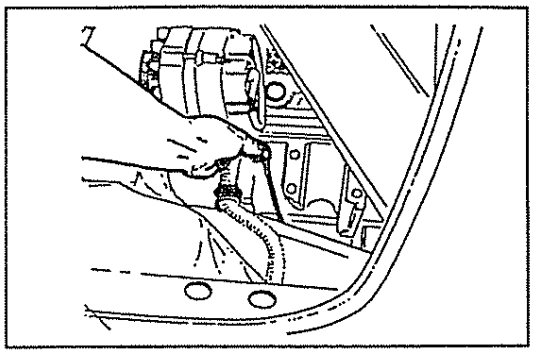


Fit the sump on the cylinder block and gradually tighten the screws with the prescribed torque: 10 N.m.
Check the tightening of the drain plug.
Tightening torque: 40 N.m.



c. Install a new oil filter. Lubricate the gasket and lock it by hand.

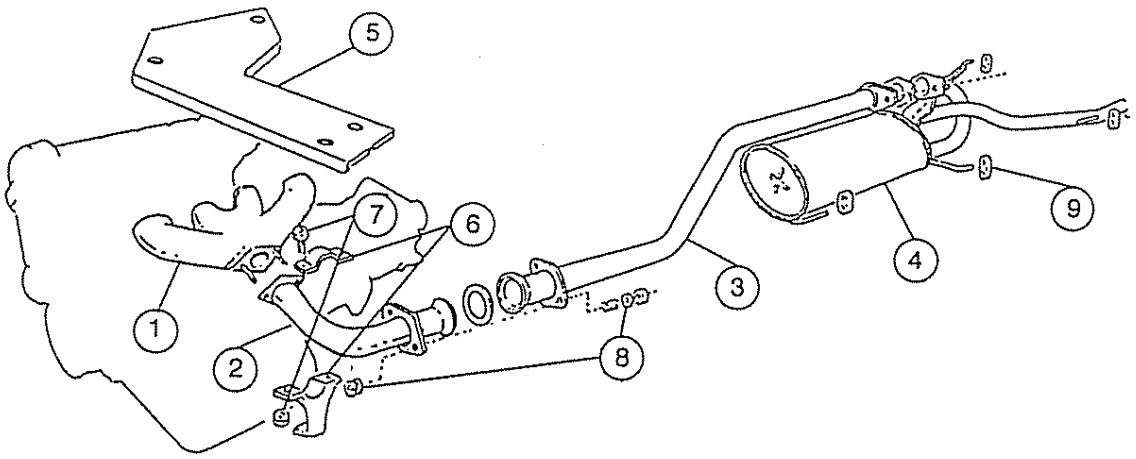
d. Install the oil level gauge.



⑱ To complete the fitting operations, refer to the relevant sections.

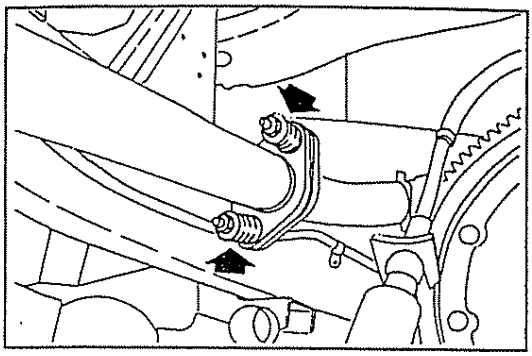
EXHAUST SYSTEM

1. DIAGRAM OF SILENCER ANCHORAGES



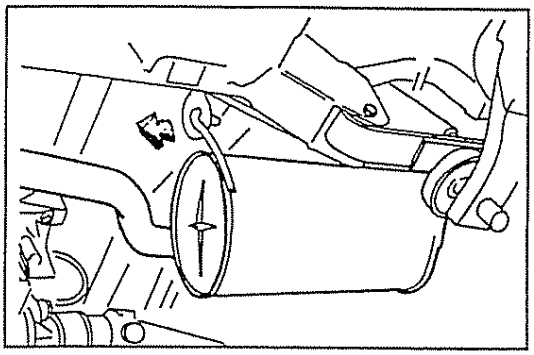
1 - Manifold
2 - Connection pipe
3 - Exhaust pipe
4 - Silencer
5 - Heating protection
6 - Support
7 - N° 2 special supporting bolts
8 - N° 6 Bolts
9 - Elastic supports

2. REMOVING THE EXHAUST SYSTEM

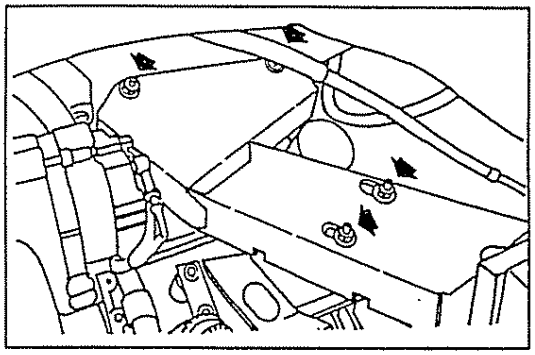


1) Unscrew the two nuts holding the flange between the exhaust pipe and the silencer.

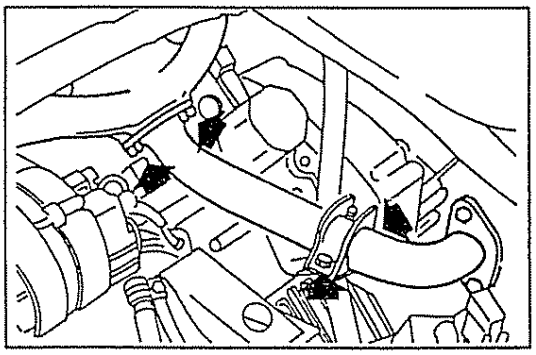
NOTE:
- When fitting again, use a new gasket.



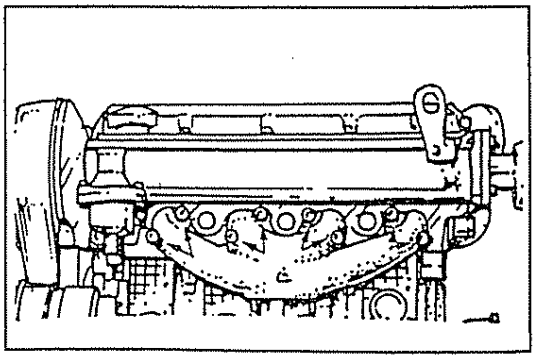
2) Unhook the supports from the circlips, moving the exhaust system toward the front of the vehicle.



3) Loosen the 4 fastening screws and remove the protection. It is now possible to have access to exhaust pipe and the manifold.



4) Loosen the 4 screws shown in the figure and remove the connecting pipe.



5) To complete the operation, loosen the 6 nuts and the 2 special supports shown in the figure and remove the exhaust manifold.
NOTE:
- Four gaskets are fitted between the exhaust manifold and the head. These gaskets must be replaced after each disassembly.

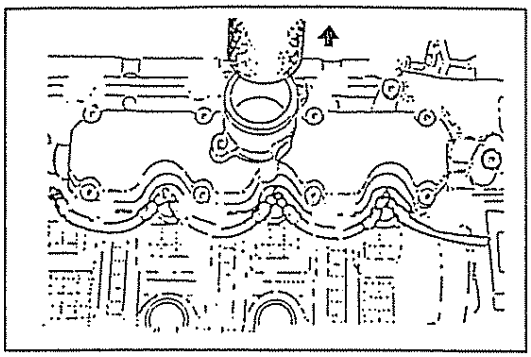
3. FITTING THE EXHAUST SYSTEM

Fit the parts again, following the removing procedure in the reversal order.

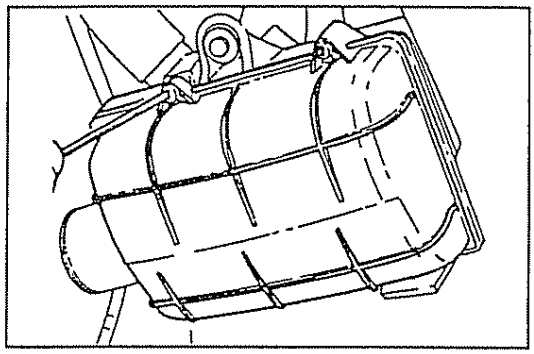
INTAKE SYSTEM

1. REMOVING THE FILTER BOX

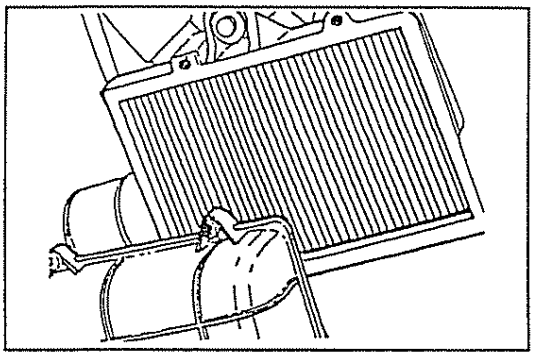
1) Disconnect the sleeve between the intake manifold and the filter box and loosen the 2 straps. Do the same for the sleeve between the filter box and the chassis member.



2) Remove the filter box after loosening the 3 screws fastening it to the bracket.



3) Removing the filter cartridge



① To remove the filter cartridge, release the 2 fasteners with a screwdriver as shown in the figure.
Pickup version
The filter box can be reached from the lower part of the vehicle, as the filter is located under the pedal.
Van version
To have access to the filter box, raise the right-hand seat.

2. FITTING

1) Fit the filter cartridge again, following the removing procedure in the reversal order.

SPECIFIC TOOLS

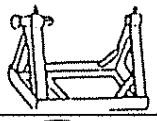
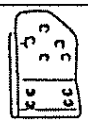
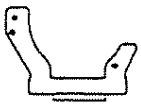
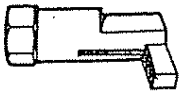
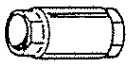
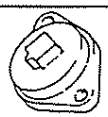
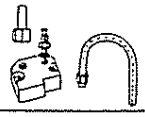
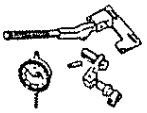
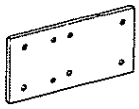
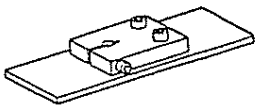
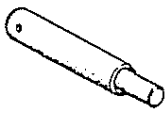
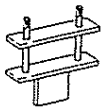
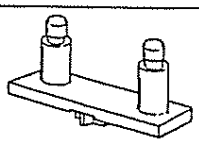
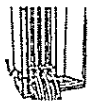
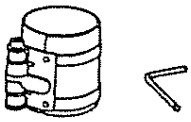
Illustration	Tool reference number	Tool name
	19.1.20172	Timing belt pulley tightening tool
	19.1.20174	Oil seal assembling/ disassembling tool
	19.1.20180	Motor overhauling support
	19.1.20181	Tool for motor overhauling support attachment
	19.1.20182	Gearbox support
	19.1.20295	Driving belt tension tool
	19.1.20296	Wrench for precombustion chamber ring nut fixing
	19.1.20297	Sheet for main bearings
	19.1.20298	Wrench for pumping element ring nut fixing
	19.1.20299	Main shaft locking tool
	19.1.20300	Precombustion chamber orienting pin
	19.1.20301	Checkingl tool for injection advance
	19.1.20302	Advance surveying tool
	19.1.20303	Oil seal extractor

Illustration	Tool reference number	Tool name
	19.1.20304	Extractor
	19.1.20308	Motor support plate
	19.1.20310	Piston protrusion checking tool
	19.1.20311	Tool for valve seal ring assembling
	19.1.20312	Cylinder head support
	19.1.20313	Flywheel locking tool
	19.1.20314	Leveling tool
	On the market, type Beta 1440/1, AWA ref. 499955	Segment tightening tool

SERVICE SPECIFICATIONS

Coolant		Pickup	5.5 l
		Van	5.5 l
Oil capacity		Without oil filter	3.25 l
		With oil filter	3.65 l
Valve clearance (COLD)		Intake	Cam; 0.15 mm, Valve; 0.20 mm
		Exhaust	Cam; 0.15 mm, Valve; 0.20 mm
Injection timing BTDC			11° ± 1°
Idle speed			900 ± 50 rpm
Compression pressure 250/300 rpm		Minimum	28 Bar
Timing belt pulley	Wear limit (Minimum limit)	Camshaft	119.9 mm
		Crankshaft	59.2 mm
Camshaft	Coupling clearance		0.035 ÷ 0.085 mm
	Wear limit		0.170 mm
	Camshaft capacity Ø		36.975 ÷ 37.000
	Cam lobe height	Intake Minimum lumit	29.498
		Exhaust Minimum lumit	29.498
	Cam injection height [Minimum lumit		28.848
Cylinder head	Flatness	Cylinder block side	0.1 mm
		Intake manifold side	
		Eexhaust manifold side	
	Valve seat angle	Intake	59°53' ÷ 60
		Exhaust	44°53' ÷ 45°
Valve guide bushes	Oil clearance	Intake	0.040 ÷ 0.075 mm
		Exhaust	0.045 ÷ 0.080 mm
		Limit	0.10 mm

Valves	Valve seat sealing width		1.6 ÷ 1.7 mm
	Valve seat sealing width Wear limit		2.0 mm
	Valve seat angle	Inlet	60°30' ÷ 60°45'
		Exhaust	45°30' ÷ 45°45'
	Valve thickeness	Inlet	0.9 ÷ 1.5 mm
		Exhaust	1.2 ÷ 1.8 mm
	Valve stem outside diameter		6.970 ÷ 6.990 mm
	Overall length	Inlet	101.65 mm
		Exhaust	101.65 mm
Valve springs	Free length		43.3 mm
Rocker arm and rocker arm pivot	Coupling play between rocker arm and rocker arms pivot		0.015 ÷ 0.041 mm
	Coupling play between rocker arm and rocker arms pivot Wear limit		0.09 mm
	Rocker arm inside diameter		18.15 ÷ 18.30 mm
	Rocker arms pivot outside diameter		17.989 ÷ 18.000
Cylinder block	Head out-of-plane	Standard (STD)	0.1 mm
		Maximum limit	
Cylinder	Riston-cylinder coupling play	Standard (STD)	0.05 ÷ 0.07 mm
		Maximum limit	0.17 mm
	Cylinder bore (when an oversize cylinder is used)	Standard (STD)	71.990 - 72.000 mm
		0.25 oversize	72.240 - 72.250 mm
		0.50 oversize	72.490 - 72.500 mm
Piston and piston rings	Piston class	A	71.930 - 71.940 mm
		B	71.940 - 71.950 mm
		C	71.950 - 71.960 mm
	Piston ring split gap	N. 1	0.25 ÷ 0.45 mm
		N. 2	0.25 ÷ 0.45 mm
		Scraper	0.20 ÷ 0.45 mm
Piston, piston pin	Connecting rod small end - piston pin coupling play Allowable limit		0.060 mm
Connecting rod	Maximum bending		0.030 mm
	Maximum torsion		0.030 mm
Crankshaft	Crankshaft eccentricity		0.06 mm
	Max wear of crankshaft and connecting rod pins		0.01 mm
	Crankshasft and connecting rod pins coupling plays	Crankshaft journals	0.041 ÷ 0.170 mm
		Connecting rod pins	0.021 ÷ 0.066 mm
	Crankshaft axial play		0.130 ÷ 0.313 mm

Flywheel	Eccentricity Allowable limit	0.10 mm
Crankshaft thrust bearing	Bearing centre thickness STD (0.1 mm and 0.2 mm thickness oversize bearings are available)	2.31 ÷ 2.36 mm
Crankshaft journal Ø	STD (0.25 mm and 0.50 mm diameter undersize bearings are available)	47.984 ÷ 49.000
Connecting rod pin Ø	STD (0.25 mm and 0.50 mm diameter undersize bearings are available)	39.984 ÷ 40.000

TIGHTENING TORQUES

Components to be tightened	Tightening torques	
	N·m	Kgf-m
Cylinder head x glow-plug	20	2.04
Cylinder head cover x cylinder head	9	0.9
Crankshaft bronze bearing cap x cylinder block	60	6.12
Cylinder block x oil sump	10	1.02
Connecting rod x connecting rod cap	40	4.08
Flywheel x crankshaft	80	8.15
Crankshaft pulley x crankshaft	360	36.7
Camshaft timing belt pulley x camshaft	80	8.2
Water pump	29.6	3.02
Head x intake manifold	29.6	3.02
Head x exhaust manifold	14.7 ÷ 21.6	1.5 ÷ 2.2
Connecting rod bronze bearing cap x connecting rod	40	4.08

DAIHATSU

S85

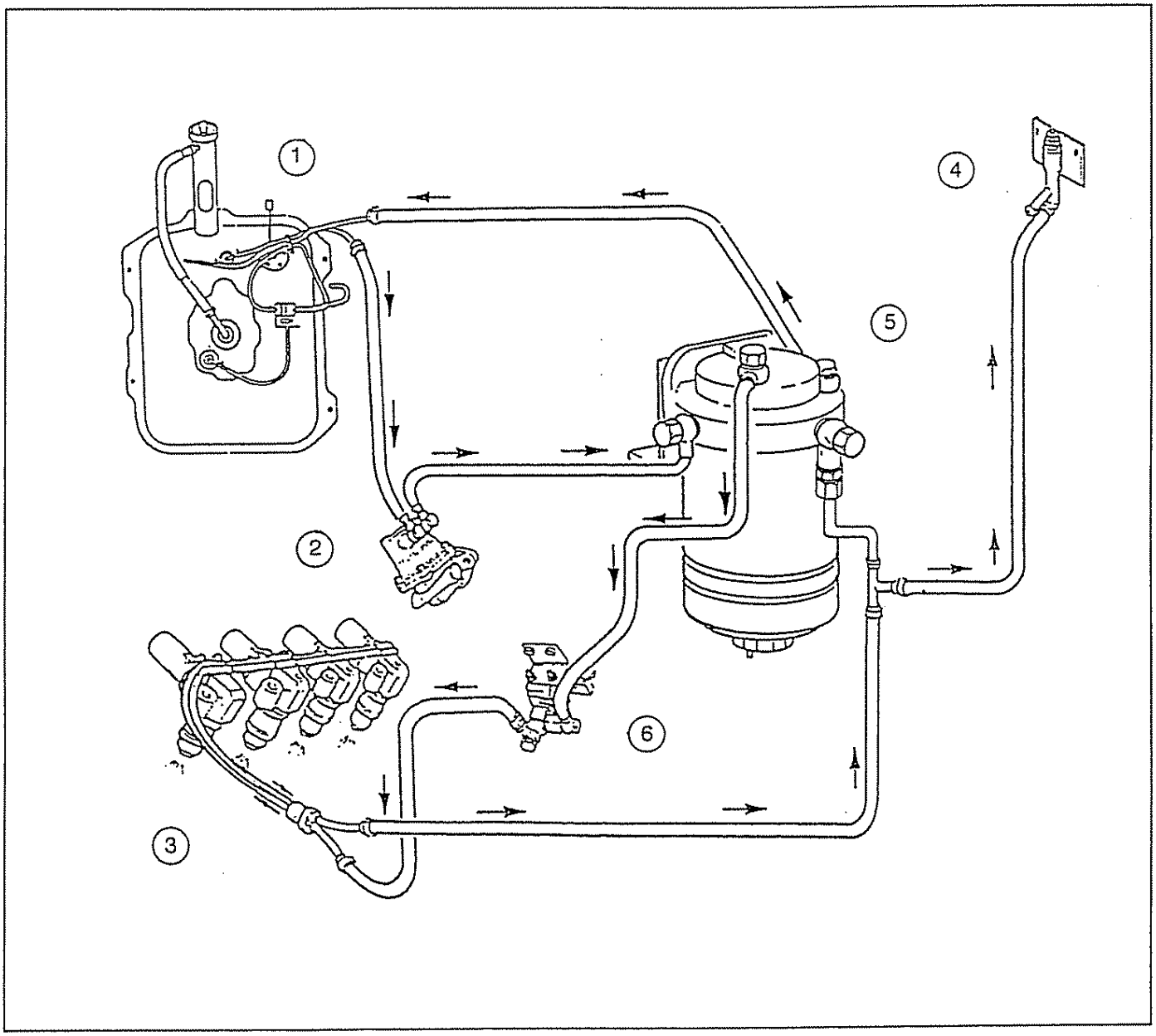
FU

FUEL SYSTEM

NO. 7933-SE

SUPPLYING AND INJECTION SYSTEM

Supplying system includes tank, fuel pump, fuel filter, solenoid valve pump-injectors and relative pipes. The fuel pump sucks the fuel from the tank and conveys it to the fuel filter. A tube in the upper part of the filter goes back to the tank. This tube has a predetermined section to guarantee a correct feed pressure. The circuit, consisting of a tank, a fuel pump, a fuel filter, a solenoid valve and a tube for the injector supplying, is called "Low pressure feeding circuit" (0.3 - 0.45 bar). A tube connects the injectors to the fuel filter, to make sure the fuel surplus coming back.

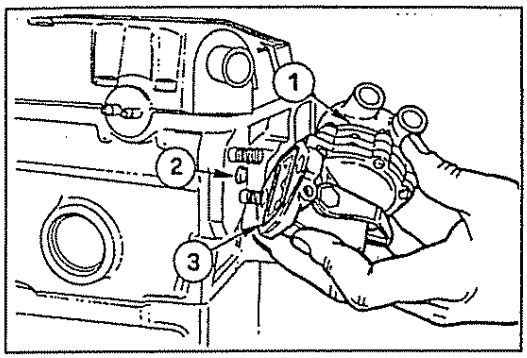


① Fuel tank
② Fuel pump
③ Pump-injectors
④ Bleeding cock
⑤ Fuel filter
⑥ Solenoid valve

FUEL PUMP

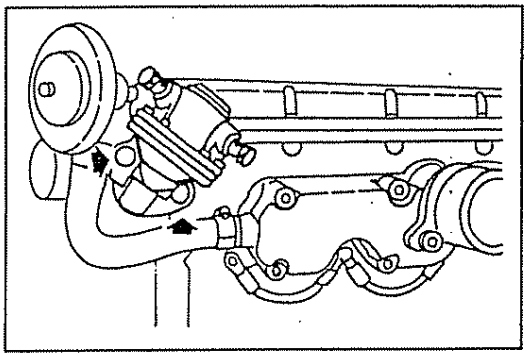
The fuel pump is a membrane-type pump operated by a camshaft eccentric through a rod.
An external lever makes it possible to actuate the pump manually.
Contents:
① Fuel transfer pump
② Push rod
③ Seal ring

Specification:
Pumping capacity: 75 ℓ/h at 1500 rpm
Feed pressure: 0.55 - 0.65 bar

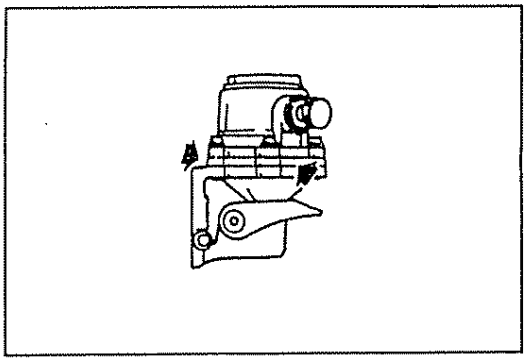


1. Remove the fuel pump
   ① Disconnect the tubes and unscrew the 2 fastening nuts as shown in the figure.

   NOTE:
   - Never reuse the removed O-ring.



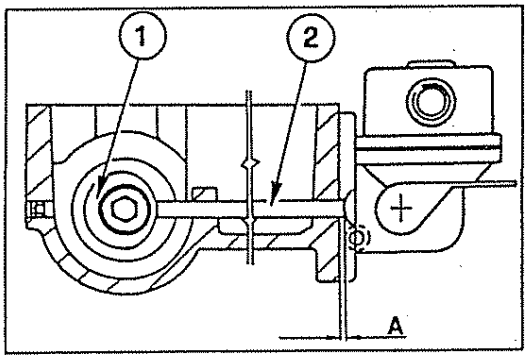
2. Inspection of fuel pump
   Inspect the 2 holes on the plastic spacer to check the condition of the 2 internal membranes.
   - If there is an oil leakage, it is possible to break the inner membrane.
   - If there is a fuel leakage, it is possible to break the outer membrane.



3. Inspection of push rod projection
   ① Check the push rod length and if measurement is not as specified replace the rod.
   Specification:
   Push rod length: 152 ± 0.05 mm

   ② Check the push rod projection A from the cylinder head plane. The measurement of the push rod projection A must be carried out while eccentric 1 is at rest as shown in the right figure.
   Specification:
   Rod projection: 1.6 - 2.4 mm

   NOTE:
   - It is important that the rounded part of the rod should be correctly positioned in housing located on the outer ring of the eccentric.

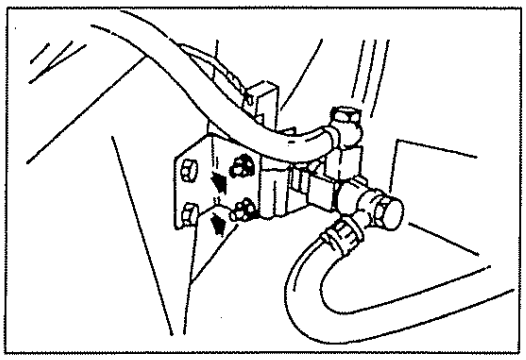


SOLENOID VALVE

The solenoid valve is designed to cut off the fuel flow when the engine is stopped.
The valve is usually closed and is opened when it is electrically supplied through the key switch. Make sure that the valve is completely closed when it is not electrically supplied and vice versa.

1. Removing the solenoid valve
   ① Disconnect the fuel tubes and connector.
   ② Remove the solenoid valve with bracket by loosen 2 fastening screws.

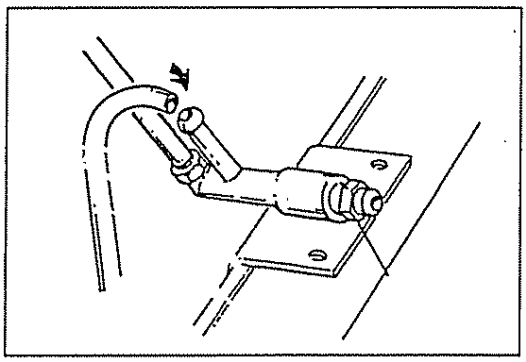
   NOTE:
   - The negative pole of the solenoid valve is located directly on the bracket.



2. System bleeding
   ① Insert a length of tube in a bottle and connect the other end to the bleeding cock.
   ② Loosen the cock screw.
   ③ Turn the key switch to ON position.
   ④ Operate the fuel feed pump manual lever until only fuel flows out.

   CAUTION:
   - Be sure to operate the system bleeding after removing and/or replacement of fuel system components.

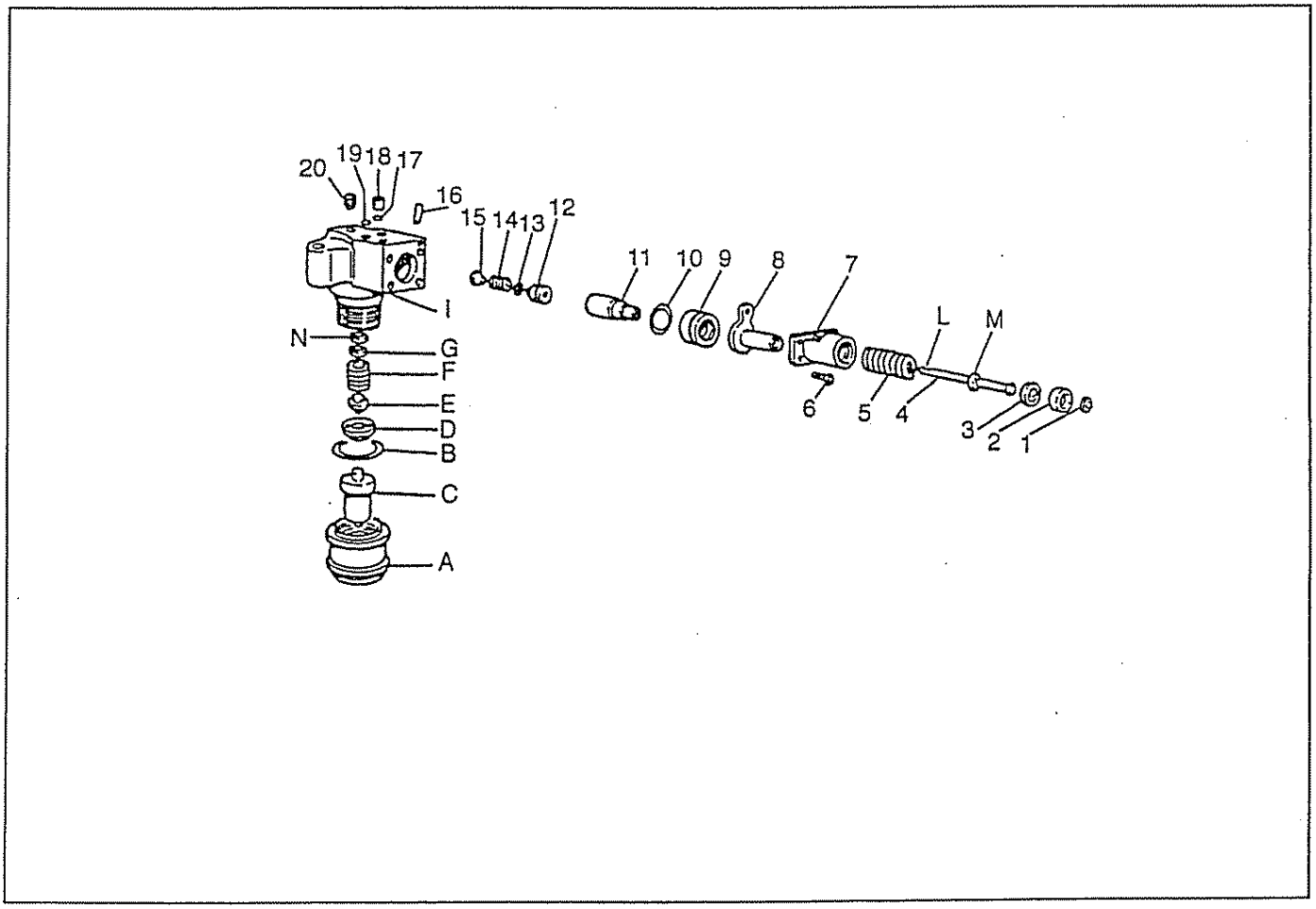
   NOTE:
   - In pump delivery is insufficient, give it an impulse with the starter motor by turning the key switch until maximum efficiency is obtained. After completing the operation, close the bleeder again, remove the tube and turn the key switch of OFF.



PUMP INJECTOR

The use of injectors on small engines has been limited up to now because their traditional shape raises the height of the engines considerably. In fact, the classic unit injector features the pumping part mounted on the injection nozzle axis and actuating cam is on the top.
The problem was solved by designing a new angle-shaped unit injector where the metering body is lying flat over the cylinder head and the camshaft lies on a side.
The patented injection system includes also a one-way fuel feeding system as there is no annular chamber around the plunger barrel, and a non-return valve is fitted on the fuel discharge side.
This system eliminates vapour bubbles and the misfunctioning due to their compressibility, improving injection quality and ensuring instant engine stop by means of a simple electric fuel check valve.
The elimination of high pressure fuel line, together with the delivery valve optimization, has allowed a nearly constant start of injection throughout the entire range of operating speed, thus overcoming the need for an expensive automatic timing control.

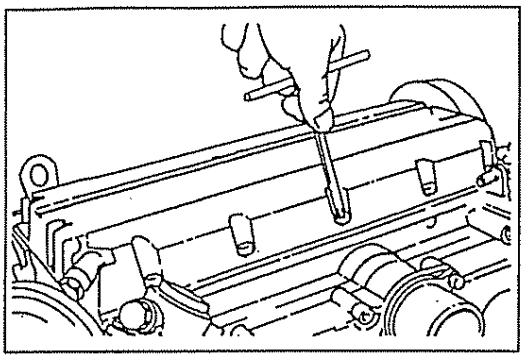
Component



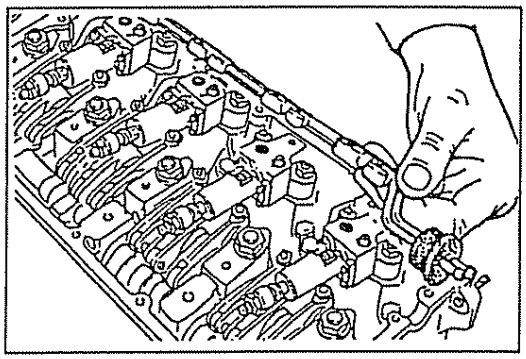
1 Circlip
2 Tappet
3 Stop disc
4 Piston
5 Spring
6 Screw
7 Support
8 Lever
9 Ring nut
10 O-ring seal
11 Cylinder
12 Delivery valve
13 Gasket
14 Spring
15 Filler
16 Peg
17 O-ring seal
18 Nonreturn valve
19 O-ring seal
20 Hole closing screw
A Ring nut
B O-ring seal
C Nozzle
D Spacer
E Pushrod
F Spring
G Adjusting shim
I Body
L Control impeller
M Piston guide
N O-ring seal

NOTE:
- When fitting/reassembling the injector, tighten ring nut A at 68.6 N·m.

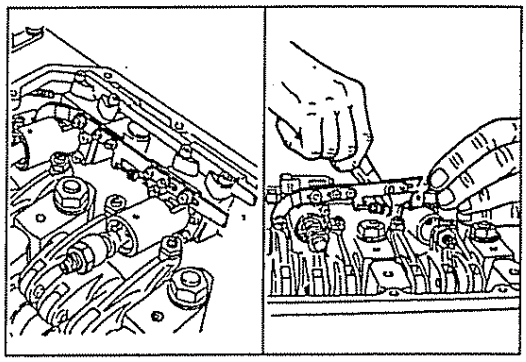
1. Remove the pump injector
   ① Disconnect the oil pressure switch connector and the engine pressure control valve.
   ② Disconnect the fuel delivery pipe.
   ③ Remove the cylinder head cover.



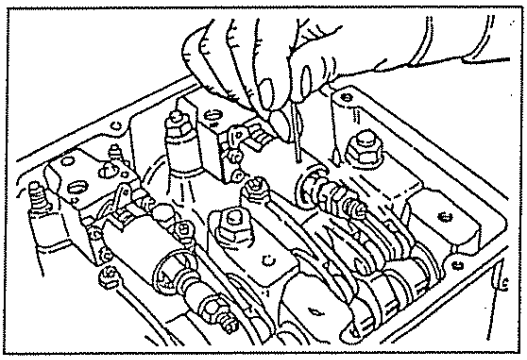
④ Remove the fuel feed connection by loosen 8 screws fastening the connection to the pump injectors.



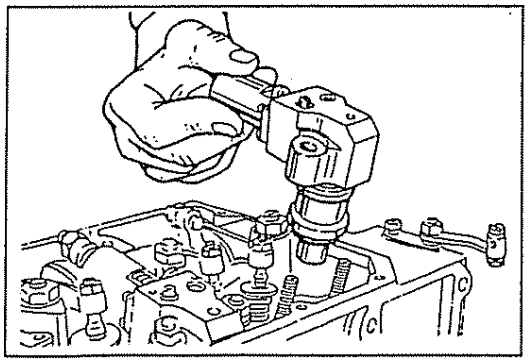
⑤ Remove the pump injector control rod by loosen the screws that fix the rod to the pump levers and unhook the spring.



⑥ Remove the pump injector.
   a. Manually rotate the crankshaft until a plunger reaches its top position.
   b. Insert a peg in the specially-designed hole and the crankshaft again until the rod is freed.

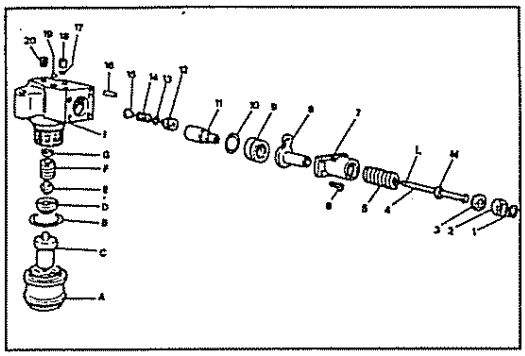


   c. Remove the 2 fastening nuts of pump injector and extract it from the head.
   d. Repeat the operation as above a to c for the remaining pump injector.

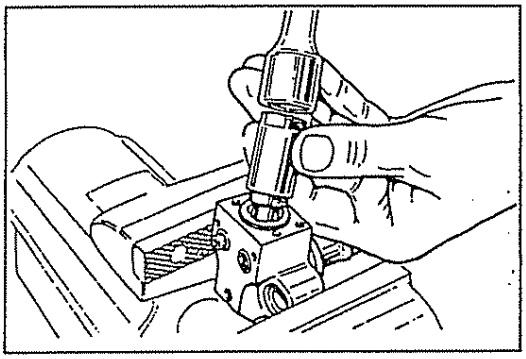


NOTE:
- By following this procedure, the removal can be carried out without altering the injection advance setting. To this end, mark the pumps and the control rods so that they may be fitted again on same cylinder.

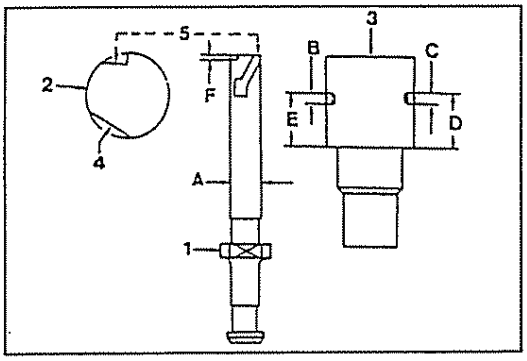
2. Disassembly the pump injector
   ① Remove the circlip from the pump support.
   ② Pull out tappet, stop plate, plunger and spring.
   ③ Remove the pump support and control lever by loosen 4 fasten bolts.



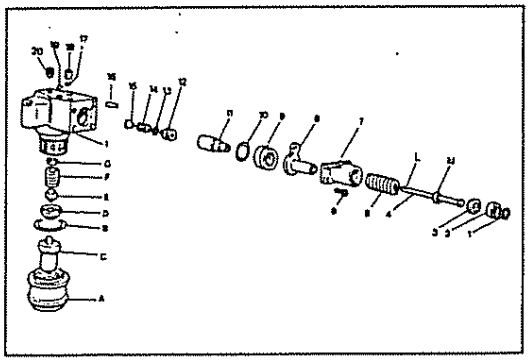
   ④ Remove the ring nut by using the SST No. 19.1. 20294.
   ⑤ Pull out the delivery valve together with O-ring, barrel, spring and filter.
   ⑥ Loosen the cup and remove the relating parts.



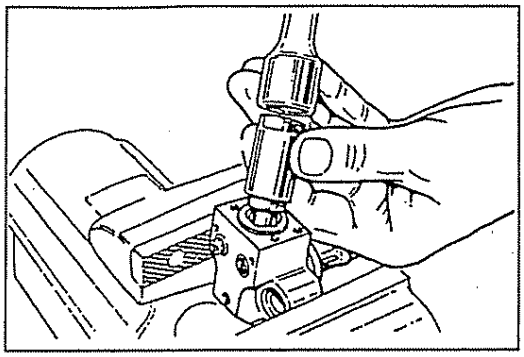
3. Inspect the plunger
   1: Piston
   2: Piston section, upper part
   3: Cylinder
   4: Delay notch
   5: Control slot
   Dimensions (unit = mm):
   A = 6.0 (nominal measurement)
   B = 1.50 - 1.55
   C = 1.50 - 1.55
   D = 10.00 ± 0.035
   E = 9.6 ± 0.035
   F = 0.9



4. Assembly the pump injector
   ① Put into the adjusting shim, spring, pressure rod, spacer, nozzle and O-ring to the pump injector body in order of component figure.
   ② Place the cup to the pump injector body and tighten the cup.
   Tightening Torque: 66.8 N·m

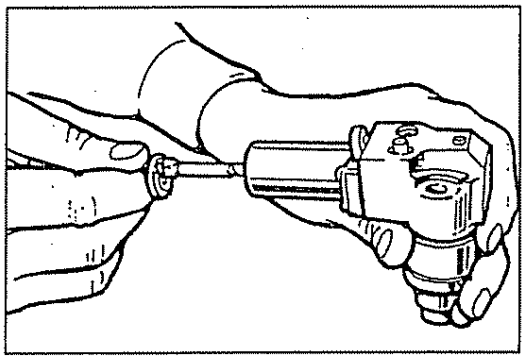


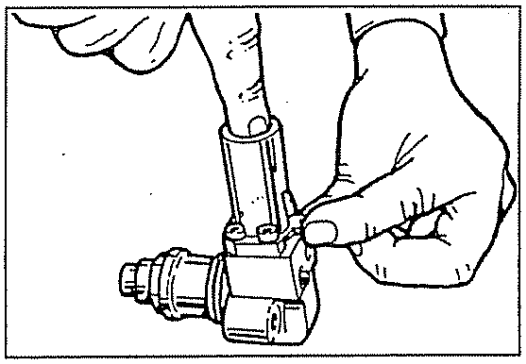
③ Place the spring, gasket, delivery valve, barrel and O-ring to the pump injector body in order of the component figure.
④ Tighten the ring nut.
Tightening Torque: 34 N·m



⑤ Connect the support with lever and tighten 4 bolts.
⑥ Introduce the plunger into the barrel press with a finger and simultaneously turn lever slowly until index fits into the lever seat.

NOTE:
- If the piston is erroneously fitted with the propeller turned in the wrong direction the pump injector will not operate (there is no danger of over-speed).

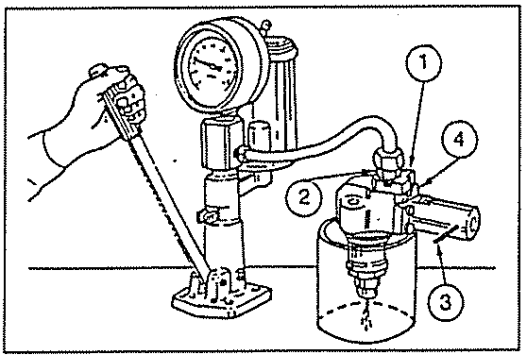




5. Unit inspection
① Checking and adjusting the injector pressure
Connect the injector to a hand pop test machine and check the injection pressure.
Specified injection pressure: 140 - 155 bar

If the injection pressure is not required, change the adjusting shim over spring.

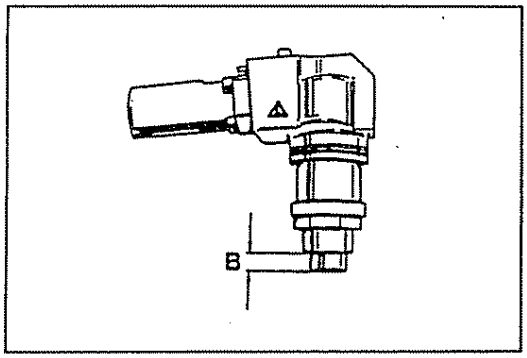
NOTE:
- Eleven different adjustment shims are available as spares measuring from 1 to 2 mm.
- When there is necessary to replace the spring, the injection pressure should be set at 10 bar greater pressure to allow for bedding during operation.



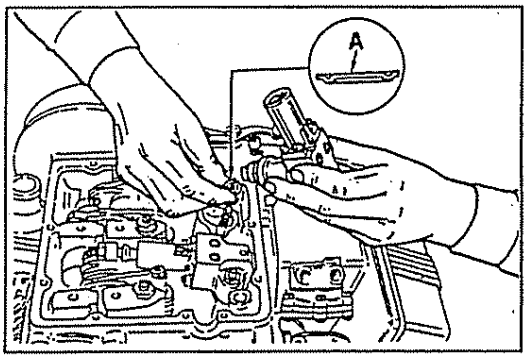
② Plunger leakage test
a. Connect the hand pop test machine.
b. Adjust the injector popping pressure to a level of 350 bar or greater.
The plunger leakage properties are acceptable if 300 bar can be attached.

③ Nozzle protrusion
To avoid any overload of the fire ring check that nozzle protrusion falls within following limits.
Nozzle Protrusion Limit: 6.80 - 7.05 mm

If the nozzle protrusion exceeds the specification, a 0.25 mm copper washer can be used to offset the excess.

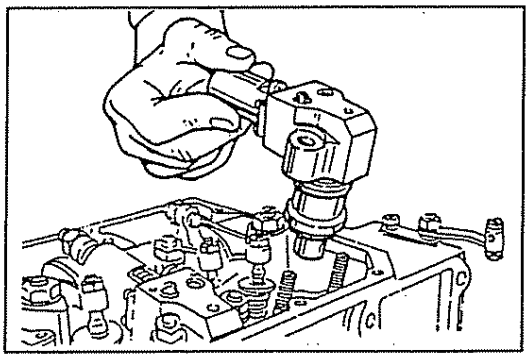


6. Install the pump injector
① Install the injector fire ring.
NOTE:
- Never reuse the fire ring, when the pump injector is removed.
- Make sure that plane A faces upwards to introduce the fire ring into injector housing.

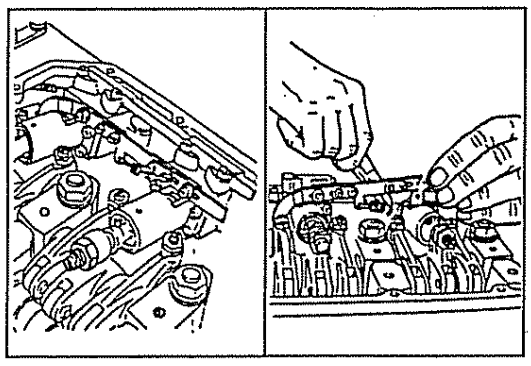


② Place the pump injector to head and tighten 2 nuts.
Tightening Torque: 20 N·m

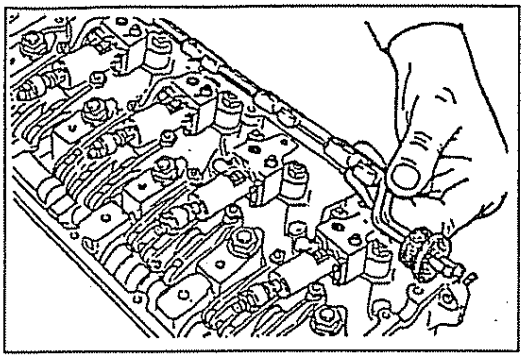
NOTE:
- Tighten the nuts alternately in 5 N·m steps.



③ Connect the pump injector control rod to the pump injector.



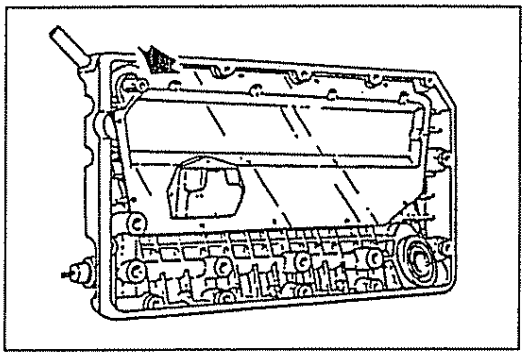
④ Install the fuel feed connection to the pump injector and tighten the fastening screws.

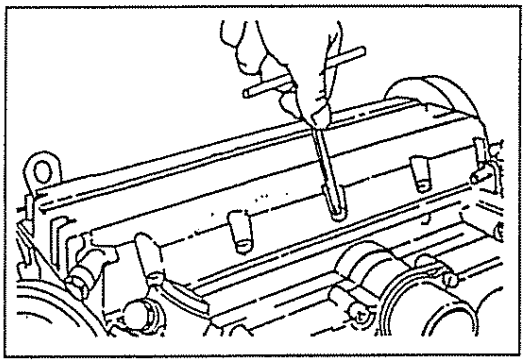


⑤ Install the cylinder head cover and tighten the fasten bolt.

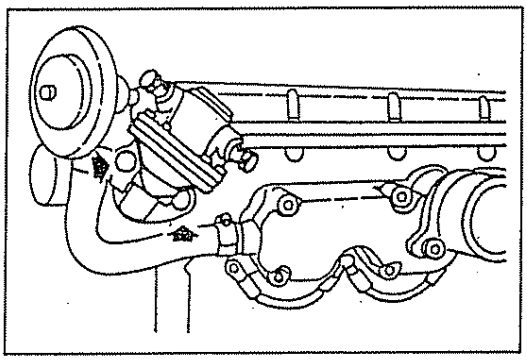
NOTE:

- Make sure to install the rubber tube of the condensed vapours correct position.

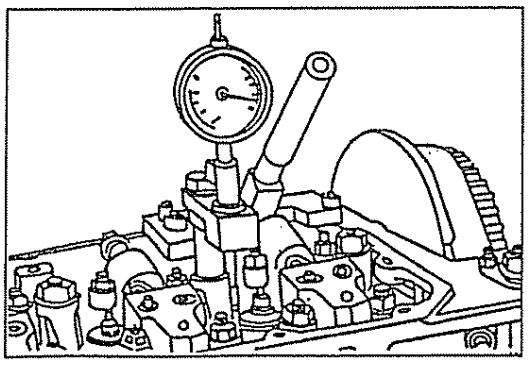


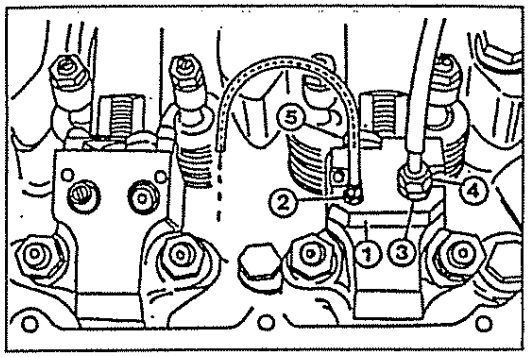


⑥ Connect the fuel delivery pipe, the oil pressure switch connector and the engine pressure control valve.



7. Checking the injection timing
(Refer to EM section)
① Remove the head cover.
② Position the SST No. 19. 1. 20302 and comparator on the cylinder head above cylinder No. 4.
(Set the comparator at the top dead center.)





③ Remove the fuel feed pipe.
④ Connect the SST No. 19. 1. 20301 to the injector No. 1. shown in figure.

NOTE:

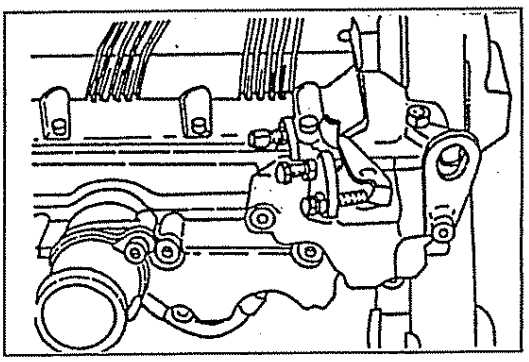
- The SST automatically positions the delivery control lever on maximum delivery.
- The tank of the SST equipment is placed at least 30 cm upper than the plane of the injector.

⑤ Slowly revolve the crankshaft to check the fuel stops following out from plastic tube as SST No. 2 shown in right figure.
⑥ Check the position to bring back the valve into contact with the piston and read the comparator.
Injection Timing: 11 ± 1° BTDC

REFERENCE:

Degrees	13°	12°	11°	10°	9°
Stroke	1.242	1.059	0.891	0.737	0.597

⑦ Repeat above operation ① - ⑥ for each cylinder.
⑧ Remove the SST.
⑨ Install the cylinder head cover.



8. Measure and adjust the idle speed.
   ① Warm up the engine until 2 interventions of the electric fan are obtained.
   ② Measure the idle speed while the electric fan is not operate.
   Idling Engine Speed: 900 ± 50 rpm

   If the measured value is not conform to the specification, adjust the engine speed by turning the screw shown in the figure.

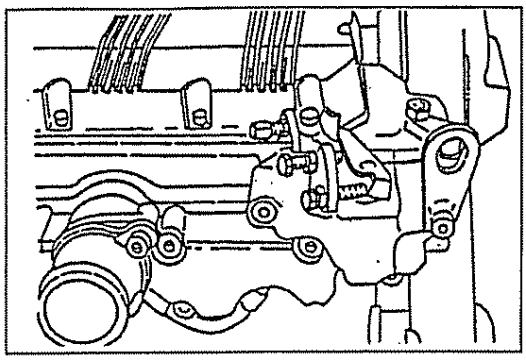
   NOTE:

   - To measure the engine speed, it is possible to use an electric counter to be connected to alternator connection (tacho pulse pick up terminal).

   If the engine speed is not stabilized, check and adjust the injector delivery equalization.
   (Refer to EM section)

9. Measure and adjust the full load stoper.
   ① Warm up the engine until 2 interventions of the electric fan are obtained.
   ② Measure the engine speed while keeping the accelerator pedal fully depressed for a few seconds.
   Specified engine speed: 4900 rpm

   If the measured value is not conform, adjust the engine speed by turning the screw shown in the figure.



NOTE:
- The full load stoper has an inviolability seal.
  This seal must be restored every time the full load stopper has be adjusted.

SERVICE SPECIFICATIONS

Fuel Filter	Type		Filter paper type
Fuel Pump	Type		Mechanical Diaphragm type
	Feeding Capacity (ℓ/h)		75 (at 1500 rpm)
	Feeding Pressure (bar)		0.55 - 0.65
	Push Rod Length (mm)		152 ± 0.05
	Rod Projection (mm)		1.6 - 2.4
Pump Injector	Injection Pressure (bar)		140 - 155
	Delivery Rate	300 rpm (mℓ/stroke)	35 - 38
		1200 rpm (mℓ/stroke)	15 - 24
		3600 rpm (mℓ/stroke)	19 - 23

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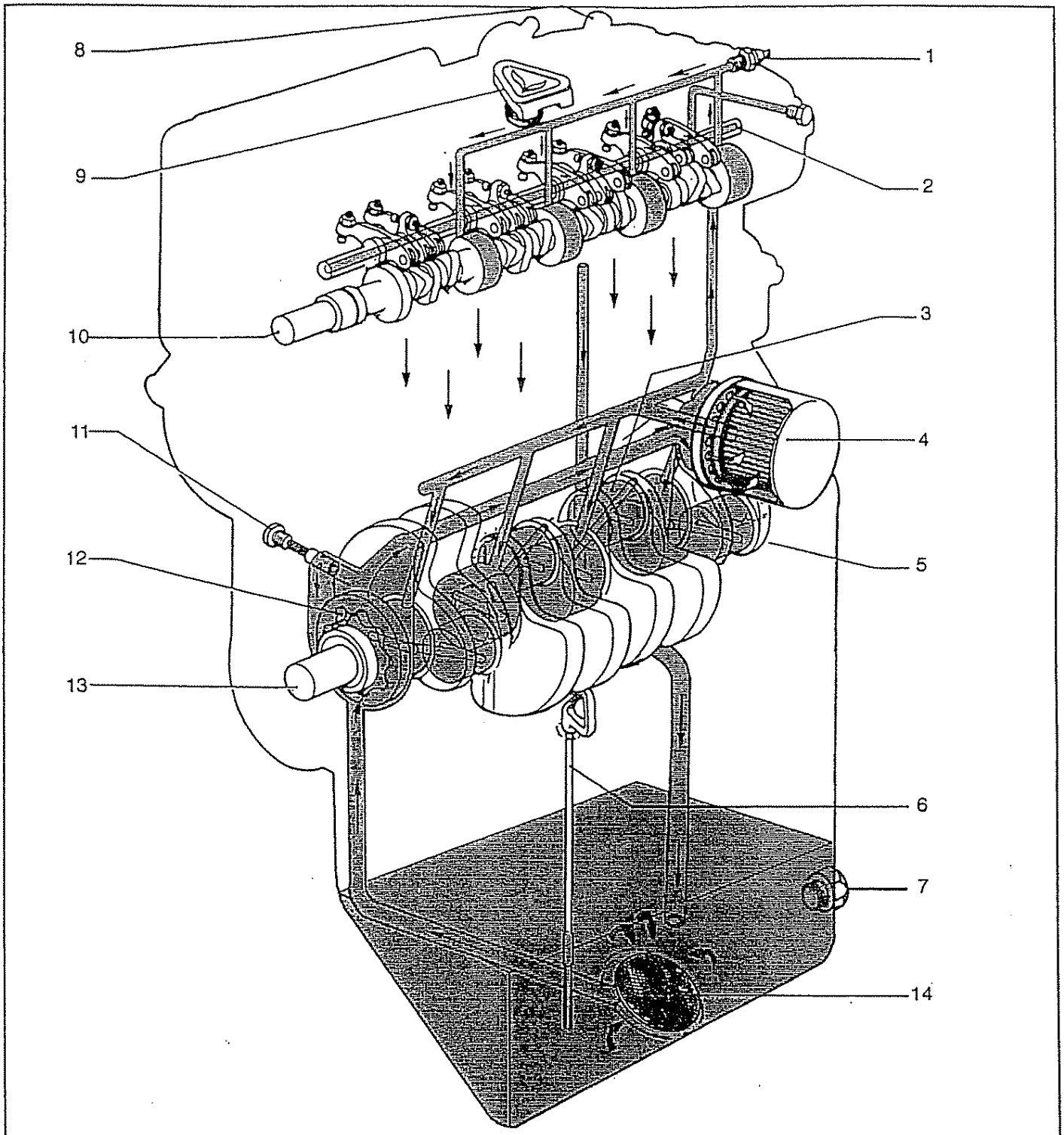
LUBRICATION

NO. 7933-SE

COMPONENTS



① Pressure switch
② Rocker arm shaft
③ Connecting rod big end pin
④ Oil filter cartridge
⑤ Main journal
⑥ Oil level gauge
⑦ Oil drain plug
⑧ Breather
⑨ Oil filler plug
⑩ Camshaft
⑪ By-pass valve
⑫ Oil pump
⑬ Crankshaft
⑭ Intake oil filter

TROUBLESHOOTING

Problem	Possible causes	Remedies
Oil leakage	Cylinder head or oil pump body damaged or cracked	Repair as required
	Oil seal faulty	Replace the oil seal
	Gasket faulty	Replace the gasket
Low oil pressure	Oil leakage	Repair the pump
	Exhaust valve faulty	Replace the valve
	Oil pump faulty	Repair the pump
	Poor quality engine oil	Renew the oil
	Crankshaft bearings worn	Replace the bearings
	Connecting rod bearings worn	Replace the bearings
	Oil filter clogged	Replace the filter
	Low oil level	Check the oil level
High oil pressure	Pressure adjustment valve faulty	Check or replace the valve
Excessive oil consumption	Piston rings worn	Replace
	Valve guides worn	Replace
	Valve sealing rings worn	Replace
	Condensed oil scavenge pipe displaced	Fit again as required
	Inlet manifold gasket worn	Replace

OIL PRESSURE CHECK

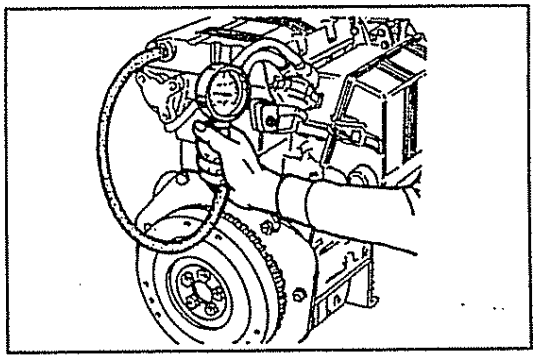
Oil quality check
Check the oil for deterioration, the presence of water, colour alteration or dilution.
If oil quality is poor, change the oil.
Use API-CD or higher degree oil.

Oil level check
The oil level should be between two marks of the dipstick.
If the level is low, check to see if any oil leakage is present.
Add oil till the level reaches the upper mark.

NOTE:
- The amount of oil between the two marks is 1.15 litre.

Oil pressure check
1) Remove the oil pressure bulb.

2) Install an oil pressure gauge.



SST: 19.1.20193

NOTE:
- At operating temperature, max. 120°C, pressure must not be lower than 1.0 bar, at 900 rpm.

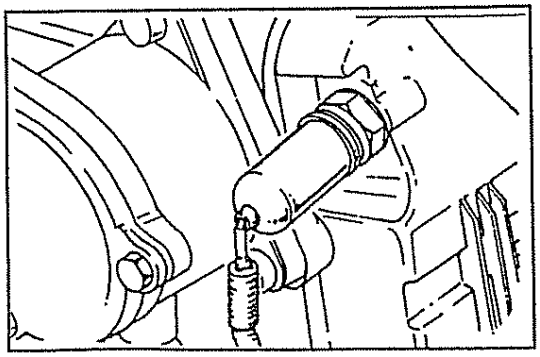
3) Start the engine and warm it to the normal operating temperature (max oil temperature 120°C).
   Oil pressure at 1000 rpm: 3 ÷ 3,5 bars
   Oil pressure at 3600 rpm: 4 ÷ 4,5 bars

4) Remove the oil pressure gauge.

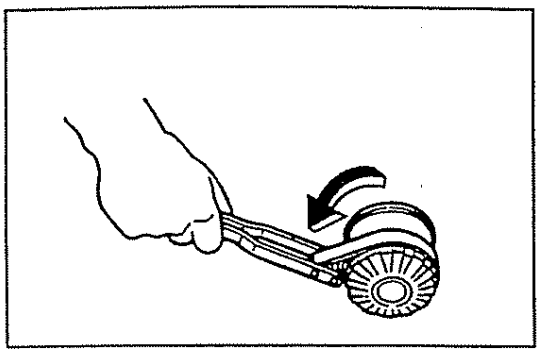
5) Clean the threaded portion of the oil pressure bulb and secure it to the cylinder head cover with a gasket.

   Tightening torque: 25 N.m

6) Connect the cable to the oil pressure bulb.
7) Start the engine and check for oil leakage.
8) Repair the leaky point if oil leakage exists.

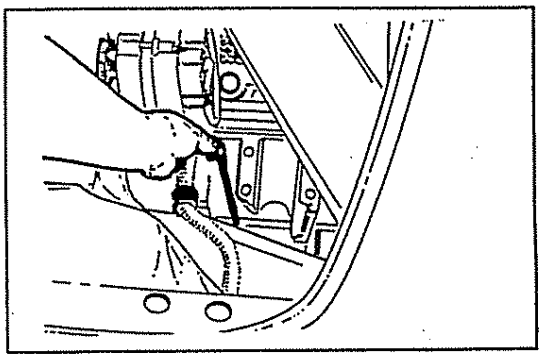


ENGINE OIL CHANGE & OIL FILTER REPLACEMENT



1) Warm up the engine.
2) Drain the engine oil by removing the oil drain plug.
3) Remove the oil filter.
4) Inspect and clean the oil filter installing surface.

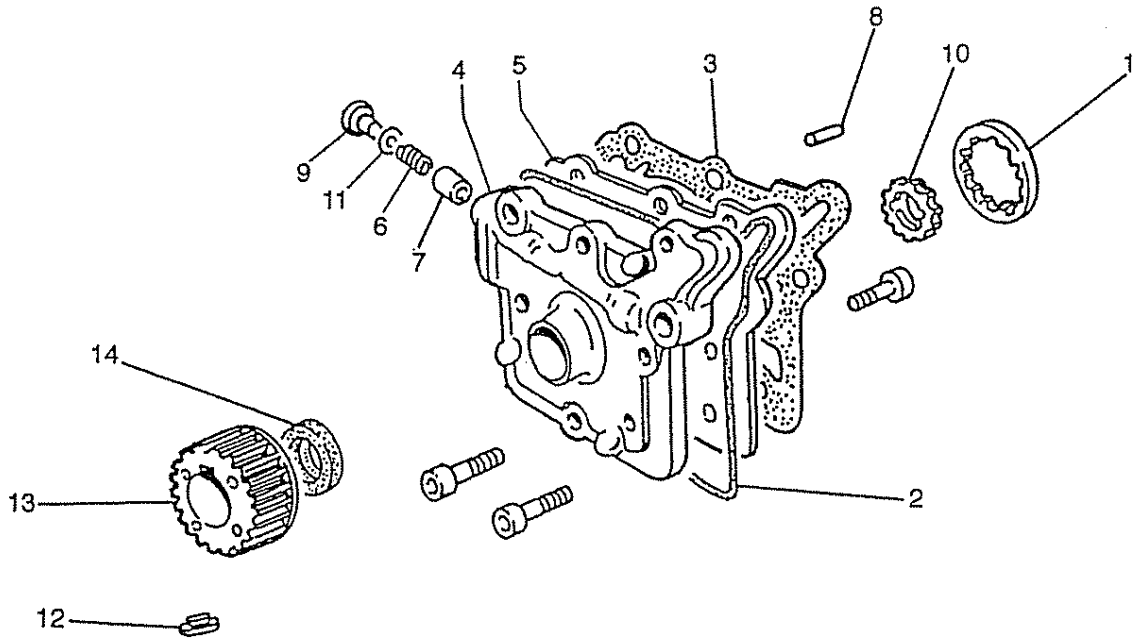
5) Apply engine oil to the O-ring of a new oil filter.
6) Screw the oil filter by hand.
7) Tighten the filter with a specific wrench.



8) Pour oil into the engine until it comes to the dipstick upper level.
   (Recommended degree API/CD or higher)
9) Start the engine and check for oil leakage.
10) Stop the engine.
11) Check the oil level again and restore it if necessary.

OIL PUMP

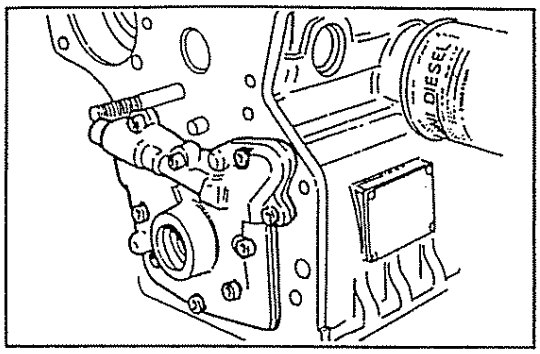
1. COMPONENTS

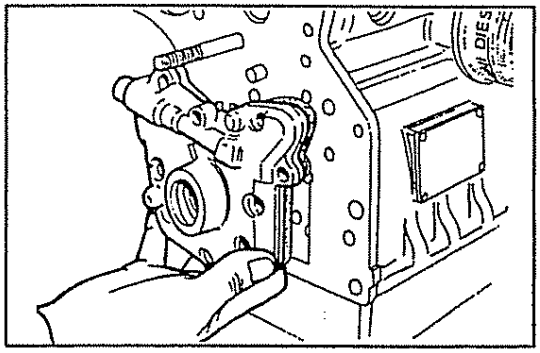


① External rotor
② O-ring seal
③ Gasket
④ Case
⑤ Gasket
⑥ Spring
⑦ Piston
⑧ Pin
⑨ Screw
⑩ Internal rotor
⑪ Washer
⑫ Key
⑬ Driving pulley
⑭ Oil seal

2. OIL PUMP REMOVAL

1) Disconnect the ground cable from the negative (-) terminal of the battery.
2) Remove the timing belt (see EM 13).
3) Loosen the fastening screws and remove the alternator support plate.
4) Remove the pinion.
5) Remove the pinion key.
6) Loosen the 9 oil pump screws and position pistons 1-4 at the TDC.
   Remove the pump assembly from the crankcase.





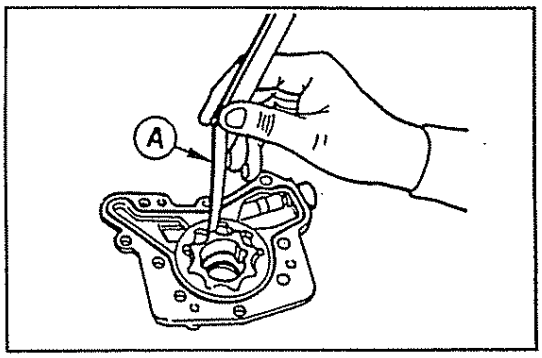
3. OIL PUMP CHECKS

1) Measuring the clearance between the impellers.

   ① Measure tooth clearance A as shown in the figure.

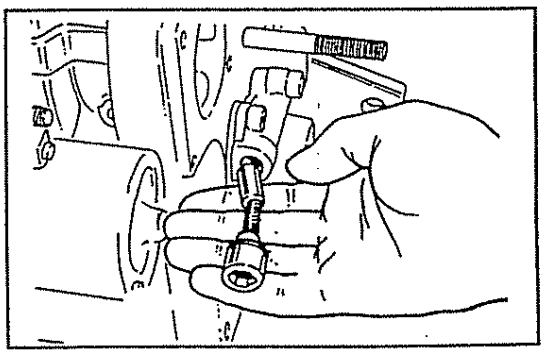
   Maximum assembly clearance: 0.174 mm
   Maximum allowed clearance: 0.250 mm

   If the clearance exceeds the above values, replace the impellers.



2) Visually inspect the contact surfaces between the impellers and the pump body. If they are excessively worn or scored, replace the pump assembly.

3) By-pass valve verification
   ① Check that the piston and its seat are not worn or scored. If necessary, replace the piston or the pump assembly.
   ② Check the spring free length = 27.50÷27.75 mm.



4. INSTALLING THE OIL PUMP

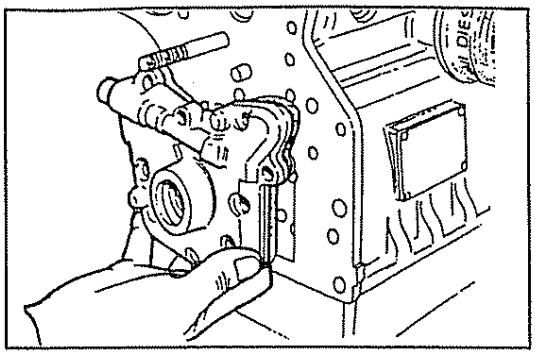
1) To install the oil pump, follow these steps:

   ① Position pistons 1-4 at the TDC.

   ② Use grease and fit a new gasket.

① Position the inner impeller with the key seat in connection with the housing in the sheet metal cover.

② Insert the pump in the crankshaft, taking care to avoid movements capable of altering the positioning obtained.



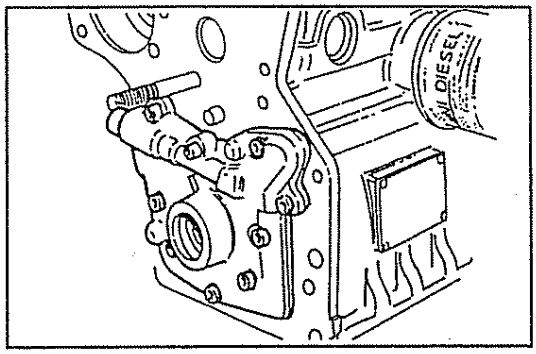
⑤ Fasten the pump with the screws. Mind the position of the 2 special screws (see figure at right).

Tightening torque: 30 N.m.

⑥ Fit the key and the timing pinion.

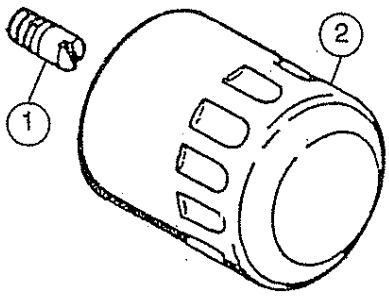
⑦ Fit the alternator support plate.

Tightening torque: 29,6 N·m



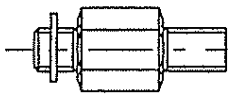
2) Complete the installation, beginning with the timing belt

OIL FILTER



① Oil filter connection
② Oil filter

SSTs

Illustration	Tool no.	Tool name
	19.1.20309	Engine oil pressure gauge, connecton
	19.1.20193	Engine oil pressure gauge

TIGHTENING TORQUES

Components to be tightened	Tightening torque		
	N.m	kgf-m	ft-lb
Cylinder block x oil pressure bulbe	25	2.55	18.4
Oil pan x Drain plug	40	4.08	29.5
Oil pump body x Oil pump cover	10	1.02	7.37
Altenator plate	29.6	3.02	21.8

SERVICE SPECIFICATIONS

Oil pump capacity (100 rpm, oil temperature 120°C) (3600 rpm, oil temperature 120°C)		6 ÷ 6.5 ℓ/min 3 ÷ 3.5 bar 28.5 ℓ/min 4 ÷ 4.5 bar
Engine oil capacity When only oil is changed When oil and filter are changed	Full level Low level	3.25 l 2.10 l 3.65 l
Oil pump	Impeller ends clearance	0.174 mm.
	Oil pressure Idling 3000 rpm	1.5 bar ≥2.5 bar
Oil minimum pressure switch		0.3 bar
Free spring length (Oil pressure valve)		27.5 ÷ 27.75 mm
Oil filter	Max. working pressure	7 bar
	Max. bursting pressure	20 bar
	Filtering level	15 µm
	Calibration of by-pass valve	1.5 ÷ 1.7
	Total filtering	1450 cm²

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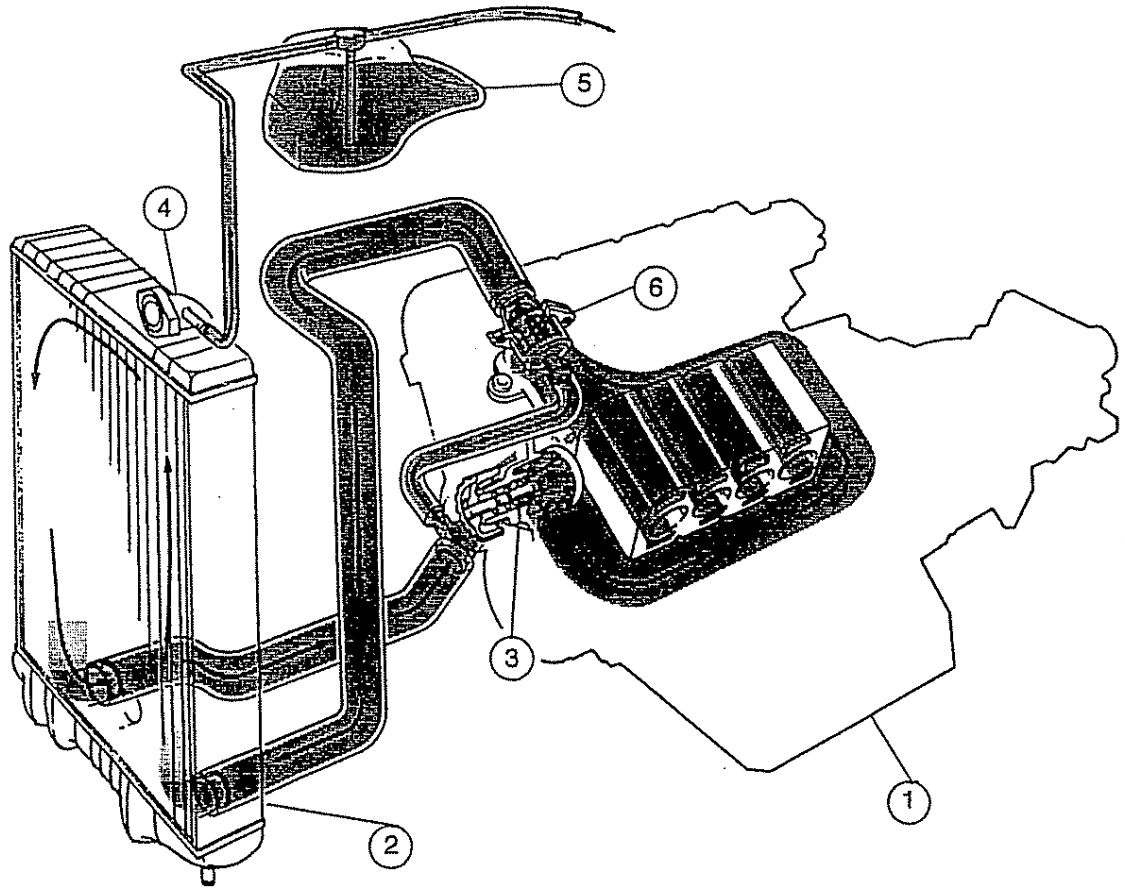
COOLING SYSTEM

NO. 7933-SE

COOLING SYSTEM OUTLINE

The cooling system is a pressurized-circulation type.
The radiator is provided in the front panel section.



① Engine
② Radiator
③ Pump
④ Radiator cap
⑤ Reserve tank
⑥ Thermostat

PRECAUTIONS

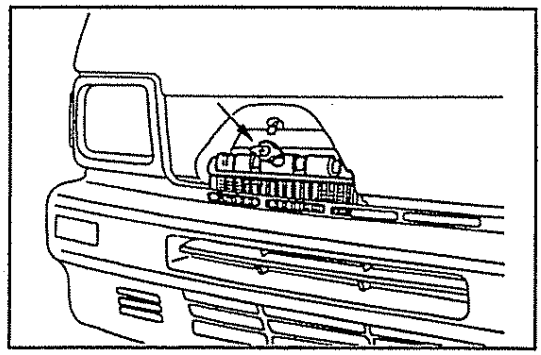
- Use soft water which does not contains salts of minerals, calcium, magnesium and so forth.
- If the coolant gets to the vehicle body, immediately flush away the coolant using water.
- Never open the radiator cap when the cooling water is still hot.
- The inside of the radiator is under pressurized condition when the cooling water is hot.
- If the radiator cap should be removed, the cooling water will blow off, possibly causing injuries such as scald.

CHANGE OF ENGINE COOLANT

1) Drain the collant system.

CAUTION:
- Never open the radiator cap and/or drain plug when the engine is still hot.

① Set the heater control lever to the 'warm' position.
② Remove the radiator cap.



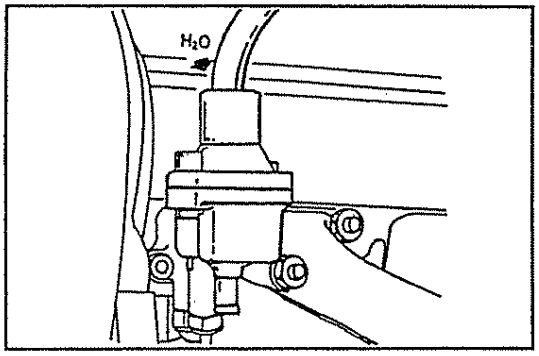
③ Remove the drain plug on the thermostat.

④ Disconnect the two hoses (inlet/oulet) from the radiator sleeves. Now the system is empty.

NOTE:
- No scatter the coolant in the environment.

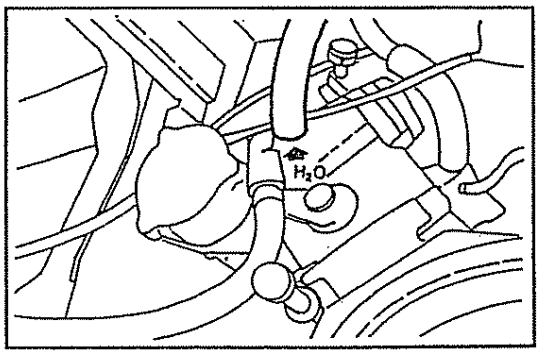
2) System cleaning
① Clean the radiator, with the two hoses still disconnected, with clear water.

3) Hoses-engine cleaning
① Disconnect the pipes of the heating system from the head.
② Connect a hose from a water tap to head outlet. Let the water flow out from the intake pipe, till the water will be clear.



4) Heating circuit cleaning
① Connect the water hose to the inlet heating pipe.

② Operate the heating control device. and let the water flow out from the intake pipe, till the water will be clear.

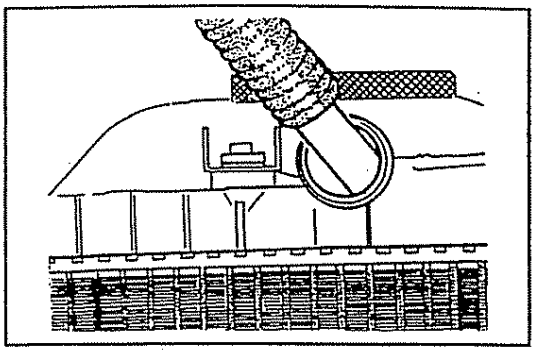


5) Reserve tank cleaning
① Remove the reserve tank from the vehicle and clean it.

6) Cooling system filling
② Connect the radiator pipes and the head outlet.

① Replace the reserve tank.

② Unfasten the drain screw placed on the thermostat cover.



④ Fill cooling water fully through the radiator plug. Fill water until it starts overflowing from the drain port

⑤ Closed the drain port.

⑥ Fill completelly the radiator.

⑦ Operate the heating control device.

⑧ Start the engine.

⑨ Run the engine at average speed untill the heater fan insertion

⑩ Unfasten agin the drain port and check if the coolant flows out.

⑪ Closed the drain port.

⑫ Stop the engine.

⑬ Stop the engine and let the temperature drops. Then check the level at cold temperature.

NOTE:

- The system is equipped with a drain port on the radiator placed near the radiator plug. In normal conditions it is not necessary to operate it because the pump capacity is so high to drain the circuit.

⑭ Close the radiator.

⑮ Fill the expansion tank up to the full line level.

⑯ Start the engine.

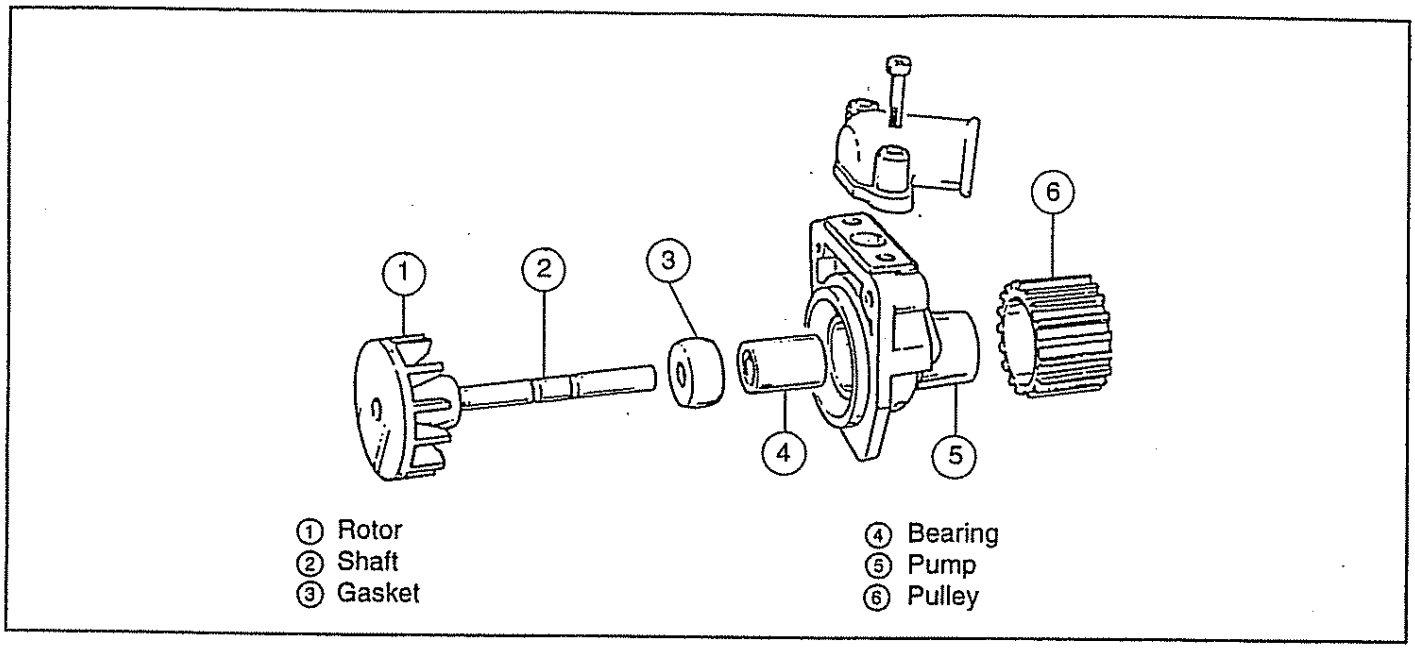
⑰ Heat up the engine.

⑱ Open the thermostat and unfasten the drain screw.Check if only coolant flows out.

⑲ Stop the engine and let the temperature drops. Then check the level at cold temperature.

WATER PUMP

1. COMPONENTS



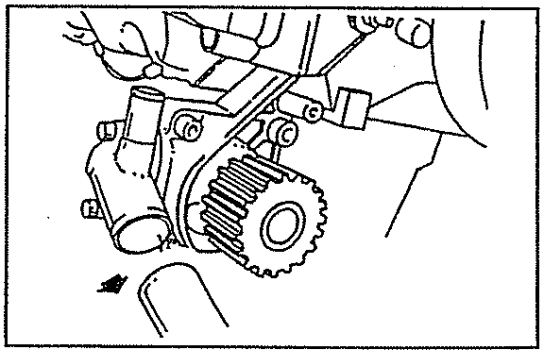
① Rotor
② Shaft
③ Gasket
④ Bearing
⑤ Pump
⑥ Pulley

2. REMOVAL OF WATER PUMP

1) Disconnect the battery ground cable from the negative (-) terminal of the battery.

2) Remove the timing belt

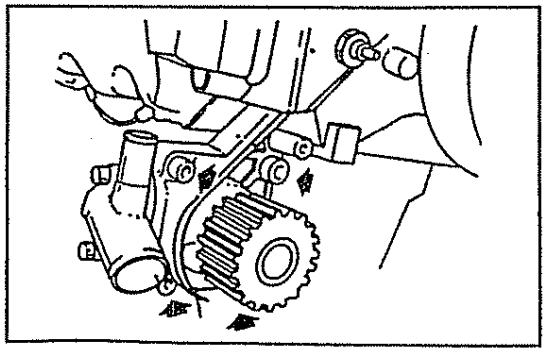
3) Unscrew the 4 screws as in the figure.



4) Remove the intake pump pipe.

5) Uncrew the 2 screws on the pump connection.

6) Unscrews the 4 screws of the pump on the block as in the figure.



7) Remove the pump.

3. INSPECTION OF WATER PUMP

1) Check the water pump retainig ring

   The pump has got 2 drain holes Check the water pump pulley for damage or defor placed on the upper side, to shows only coolant leakages instead of transitory drips, considered normal setting.

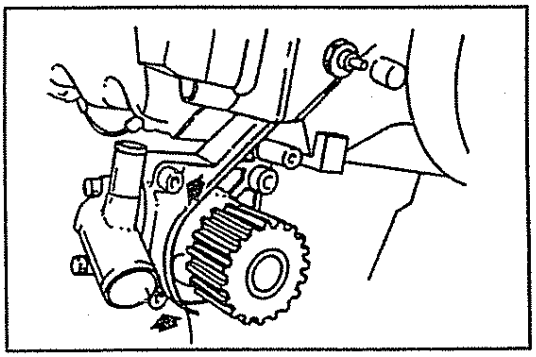
2) Check bearings

   Check the shaft runs rightly and without clearances

3) Check rotor
   The rotor must not exhibit damage or deformation.

If serious damages should occur to the water pump-related parts, replace the water pump.

4. INSTALLATION OF WATER PUMP



1) Remove the gasket material from the water pump installing surface of the cylinder block and of the water pump, using a gasket scraper.

2) Install a new gasket to the cylinder block.
3) Install the water pump to the cylinder block.
4) Tighten the attaching bolts evenly over two or three stages to the specified torque.
   Tightening torque: 30 N.m.

   NOTE:
   - After tightening bolts, ensure that the water pump rotates smoothly by hand.

5) Install the connection with a new gasket.

6) Install the intake pump pipe.

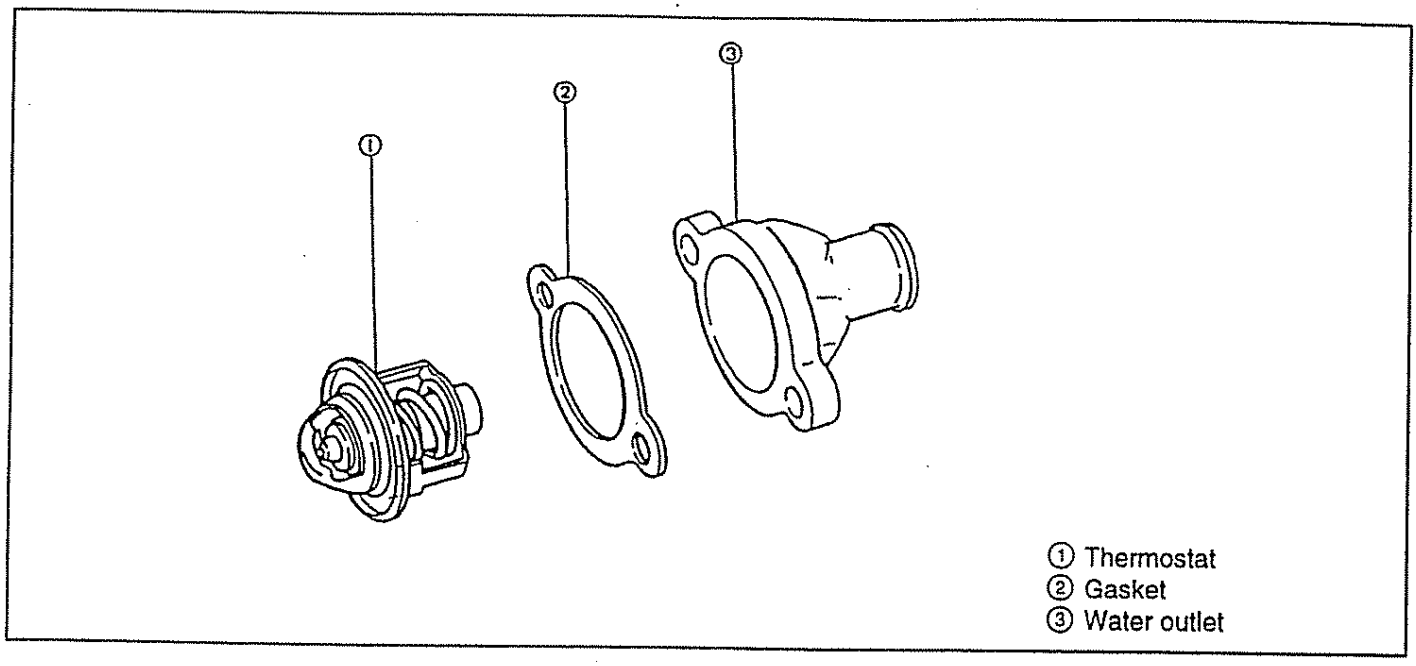
7) Install a new timing belt.

8) Fill coolant (See CO-4).

9) Start the engine. Ensure that no water leakage is present.

THERMOSTAT

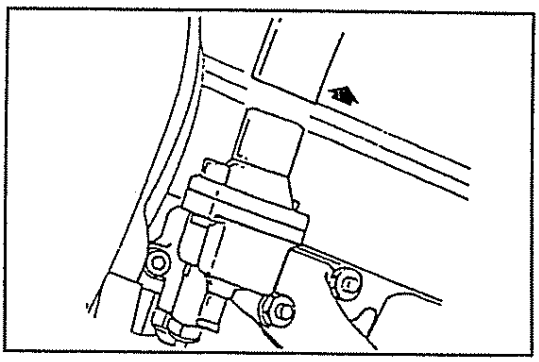
1. COMPONENTS



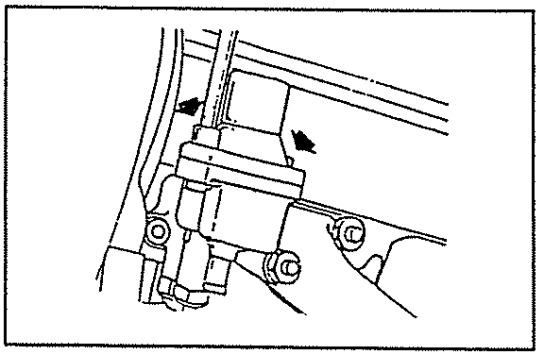
2. REMOVAL OF THERMOSTAT

1) Drain the coolant (See C0-4)

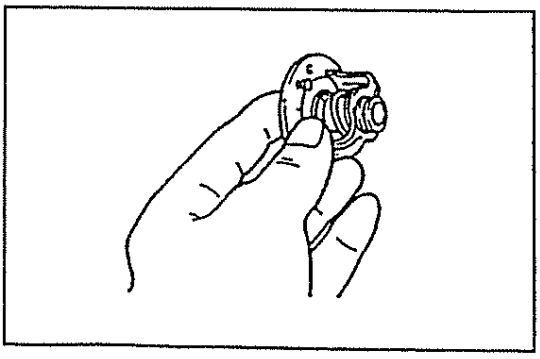
2) Remove the pipe from the thermostat cap.



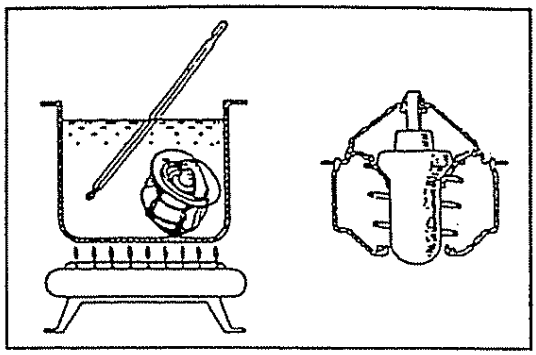
3) Unscrew the two Allen screws and remove the thermostat cap.



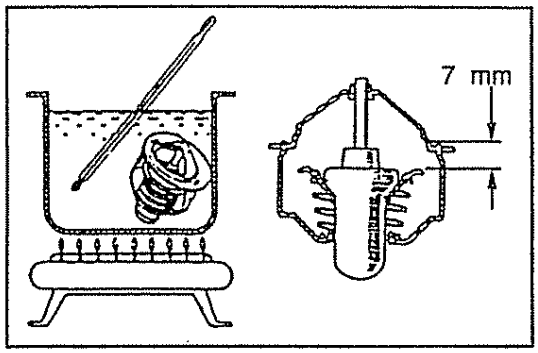
4) Remove the thermostat.



3. INSPECTION OF THERMOSTAT



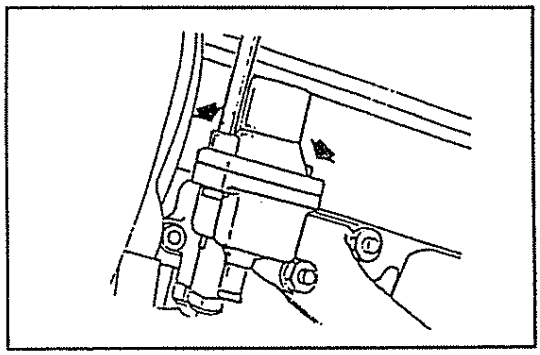
1) Check of thermostat valve opening temperature.
   ① Immerse the thermostat in water, as indicated in the right figure. Heat the water gradually. Ensure that the temperature at which the valve begins to open conforms to the specified value.
   Specified valve opening temperature:
   80 ± 2°C
   If the temperature fails to conform to the specification, replace the thermostat with a new one.



   ② Under the condition described in the step 1), heat the water to 95°C. At this time, ensure that the valve lift is the specified value, shown in the figure (7mm).

   ③ Check if at cold temperature the thermostat is closed. If some inspections should shown negative results replace the thermostat.

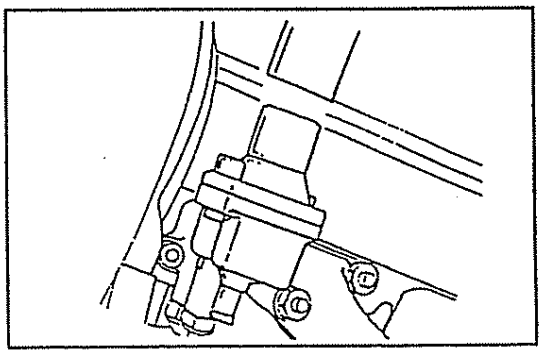
4. INSTALLATION OF THE THERMOSTAT



1) Clean the faying surfaces.

2) Assemble the thermostat cap with a new O-ring.

3) Fasten the 2 screws.
   Tightening torque: 12 N.m.

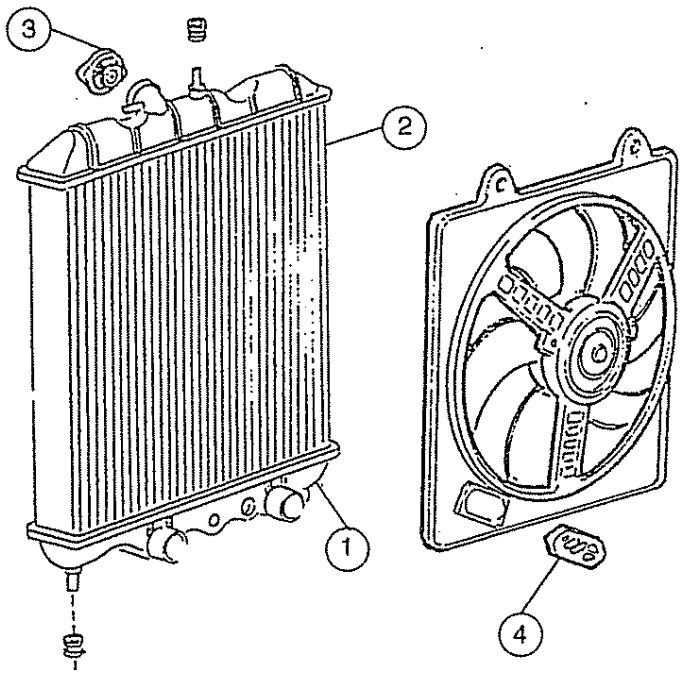


4) Assemble the pipe.

5) Fill with cooling water. (See CO-4).

ELECTRIC COOLING FAN AND RADIATOR

1. COMPONENTS



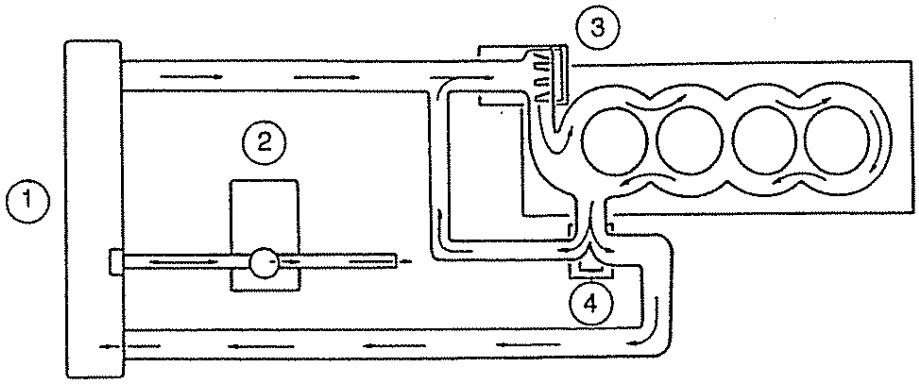
① Radiator fan assembly
② Radiator assembly
③ Radiator cap
④ Resistance

2. IN-VEHICLE INSPECTION OF ELECTRIC COOLING FAN

1) Turn "ON" the ignition switch.
Ensure that the fan motor is not rotating when the coolant temperature is below 83° C.
If the fan motor is rotating, check the radiator thermo-control switch, and wiring for short circuit.

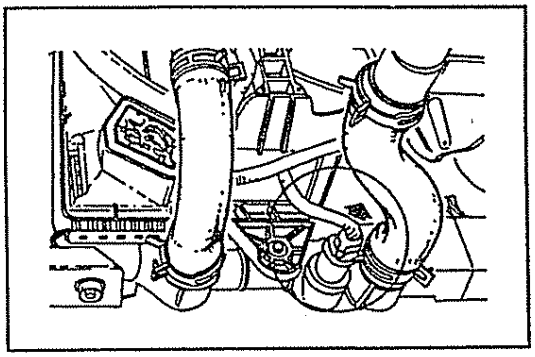
NOTE:
- The electric cooling fan is controlled by the thermo-control switch. It can turn at, two speeds. The slow one is controled by the standard resistance, assemble on the motor; the fast one is controled by a electromagnetic switch and has a direct feeding.
The electric cooling fan can start also when the switch is OFF.

Electrical diagram



1	Electric cooling fan	3	Thermo-control switch
2	Resistance	4	Relay

Low speed: resistance ON, temperature 88 ± 2°C
Normal speed: resistance OFF, temperature 92 ± 2°C.



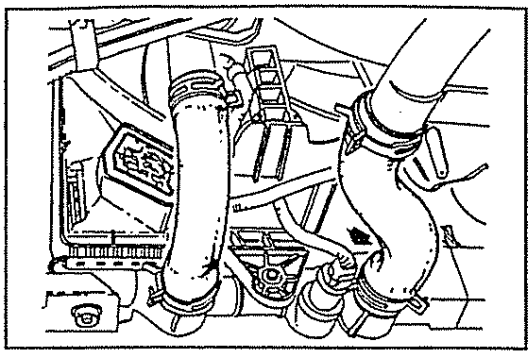
2) Disconnect the connector of the radiator thermo-control switch. Bond alternately:
   black cable with blue cable
   black cable with blue-red cable

3) If the fan does not rotate, check:
   - the fan motor assembly
   - the fuse
   - the fan motor

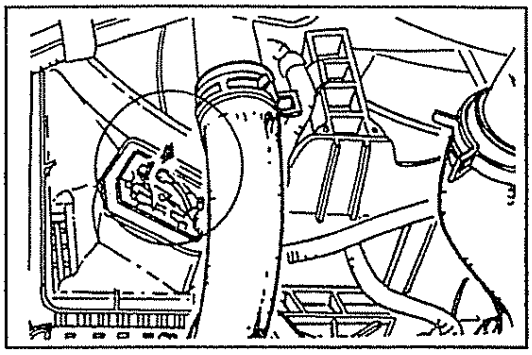
   If there is not the low speed check the resistance continuity.

   If there is not the fast speed check the electromagnetic switch and its feeding.

4) Connect the connector to the radiator thermo-control switch.

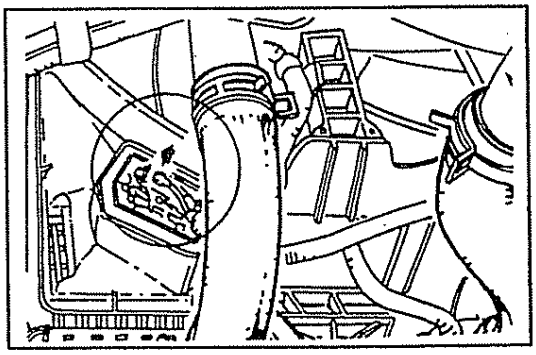


5) Disconnect the a resistance cable



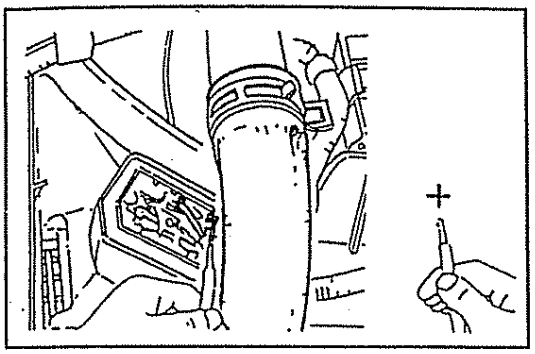
6) Start the engine. Ensure that the fan motor is rotating when the coolant temperature rises above the 92°C.

7) Connect the resistance cable when the fast speed starts.
WARNING:
- Be carefully during this operation because the fan is turning. However, the resitance is place in a protected area.



8) The fan must work at high speed and then at low speed, than it stops. Otherwise, check the thermo-control switch.

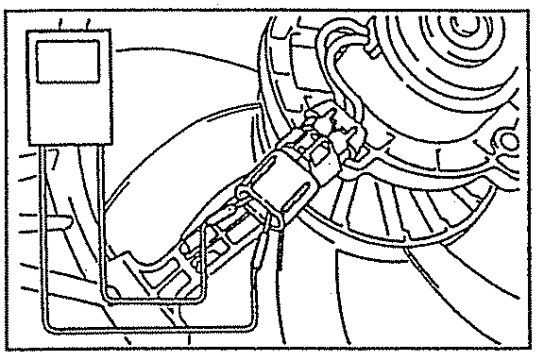
9) Inspection of resistance
Start the engine and with fan at low speed, check the feeding tension of the electric fan.
Connect a tester to (+) cable of the battery and the (-) cable of the battery to the brown cable of the resistance.
The tension should be ~ 8÷9 v.



10) Inspection of electric cooling fan
① Disconnect the connector of the electric cooling fan

② Connect an ohmeter, as in the figure.

③ Check if continuity exists across the two terminals.

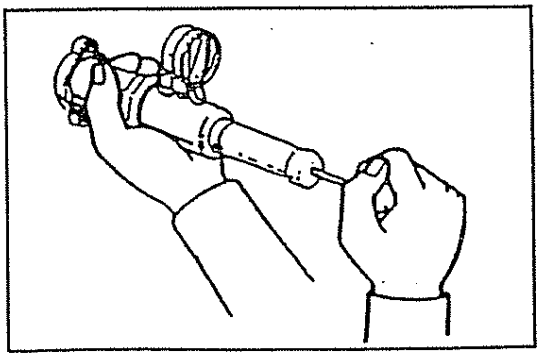


11) Inspection of radiator

① Clean the radiator
Using water or steam cleaner, remove mud and dirt from the radiator core.

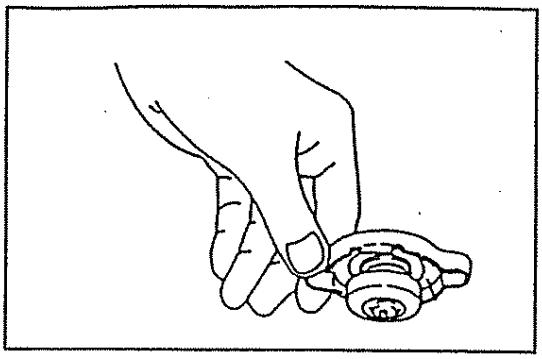
CAUTION:
- When using a high-pressure type cleaner, be very careful not to deform the radiator core fins.
- Keep a distance of more than 40-50 cm between the radiator core and the cleaner nozzle when the cleaner nozzle pressure is 30-50 kg/cm².
- Also, the injection angle of pressurized water should be right angles to the radiator..
- Failure to observe this caution will cause the radiator fins to be deformed.

Check of radiator cap
a. Check the radiator cap by means of a radiator cap tester to see if the relief valve opens at a pressure of 0,6 ÷ 1 bar.
If the radiator cap fails to conform to the specification, replace the radiator cap.

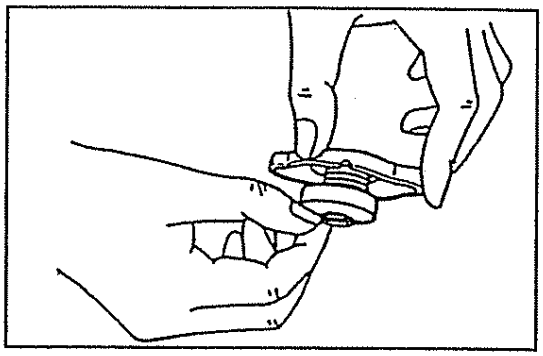


CAUTION:
- Never open the radiator cap when the engine is still hot.
- Failure to observe this caution will cause you to get scalded.

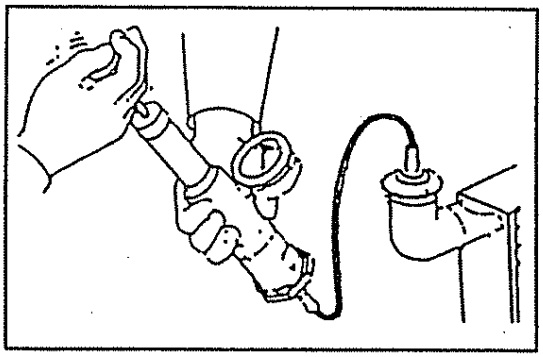
b) Check the seal packing of the radiator cap for damage. Replace the radiator cap with a new one, if any damage exists.



c) Lift the valve at the vacuum side with your fingers. Ensure that the valve is functioning properly. Replace the radiator cap with a new one, if the valve fails to function.



12) Check of cooling system for leakage.



① Drain the system.

② Apply the radiator cap tester.

③ Warm up the engine.
Apply a pressure of 0.9 bar to the cooling system by means of a radiator tester.
If the pressure drops, check the hoses, radiator, water pump and heater for evidence of leakage.
If no external leakage is found, check the heater core, cylinder block, cylinder head and gasket for evidence of leakage.
Check the hoses for deterioration, cracks, bulge or damage.

④ Replace the defective part(s) if necessary.

Remove the radiator cap tester from the radiator.

CAUTION:
- Never open the radiator cap or drain cap when the coolant is still hot. Failure to observe this caution will cause you to get scalded.

⑤ Secure the radiator cap.

3. REMOVAL OF ELECTRIC COOLING FAN AND RADIATOR

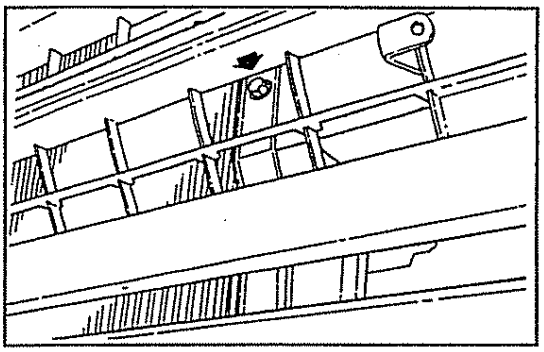
1) Disconnect the ground cable terminal from the negative (-) terminal of the battery.

2) Drain the coolant (CO-4).

3) Disconnect the wire connection.

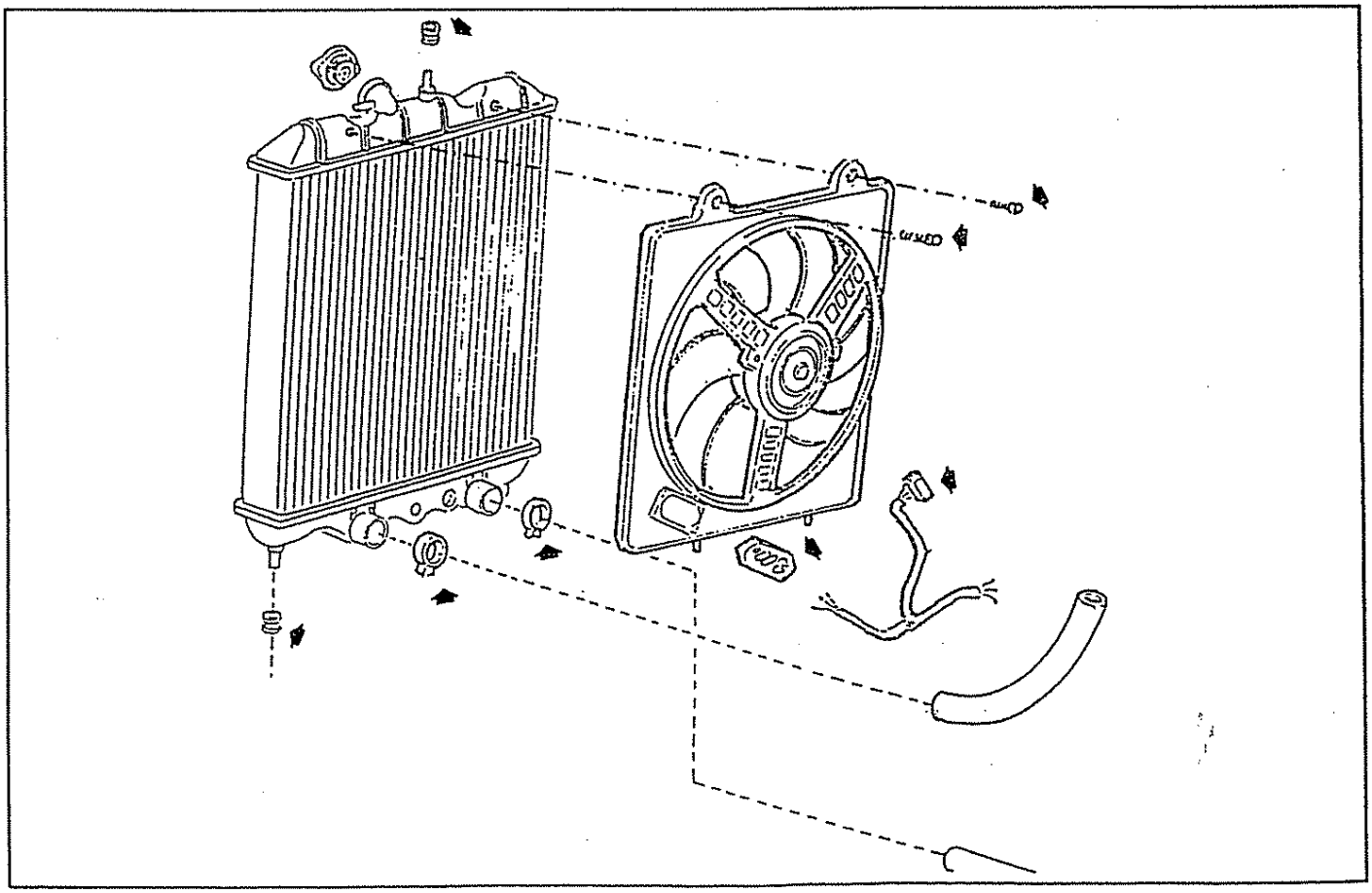
4) Disconnect the connecting pipe to the reserve tank

5) Remove the 4 fixing bolts of the two brackets which hold the radiator and remove it from the upper fixing devices.



4. DISASSEMBLY OF ELECTRIC FAN

To remove the electric fan from the engine, unfasten the fixing bolts and the wire connection, as shown in the figure.



5. ELECTRIC COOLING FAN

1) To assemble the electric fan follow the same disassembling operations in the inverted order.

2) To assemble the radiator assy on the vehicle follow the same disassembling operations in the inverted order. Fill the system and drain it. (CO-5).

6. INSPECTION OF RADIATOR THERMO-CONTROL SWITCH

1) Removal of radiator thermo-control switch.

① Disconnect the ground cable terminal from the negative (-) terminal of the battery.

② Disconnect the connector from radiator thermo-control switch.
Remove the radiator thermo-control switch draining the coolant.

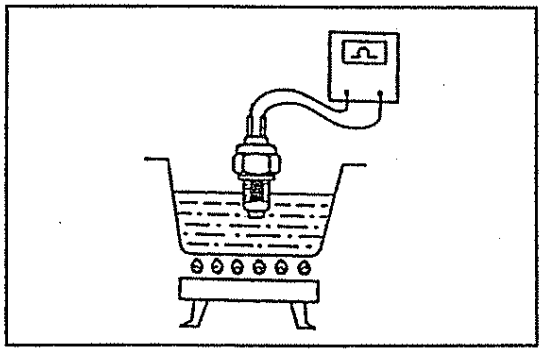
③ Connect an ohmmeter to the wire connection 3-2 and 3-1.

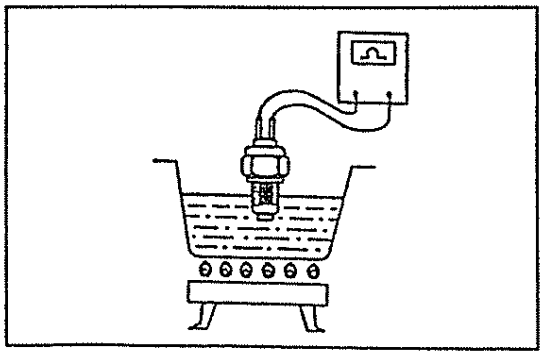
④ Submerge the threaded section of the radiator thermo-control switch into water whose temperature is below 83°C.

⑤ Ensure that no continuity exists. If continuity exists, replace the radiator thermo-control switch.

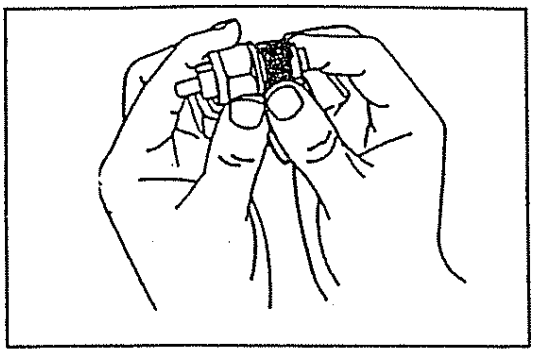
⑥ Warm up the water to a temperture higher of 87° C. Ensure that contunuity exists across 3 and 2.

⑦ Warm up the water to at least 92° C.
Ensure that contunuity exists across 3 and 7.
If it should not occur replace the thermo-control switch.

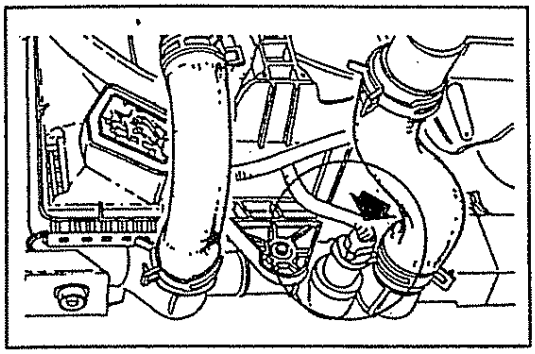




3) Installation of radiator thermo-control switch
   ① Clean the threaded portion of the radiator thermo-control switch.



   ② Install the thermo-control switch on the radiator
   Tightening torque: 30 N·m



   ③ Fill coolant (CO-4).
   Start the engine and check for water leakage.

SERVICE SPECIFICATIONS

Coolant capacity (including expansion tank)	Van	5.5 l.
Thermostat	Valve opening temperature	80 ± 2° C
	Valve full opening temperature	94° C . Not less than 7 mm.
Thermo control switch	1st opening/closing	87/83
	2nd opening/closing	92/88
Radiator cap	relief valve opening pressure	0.6 -1 bar

TIGHTENING TORQUE

Tightening components	Tightening torque	
	N.m	kgf-m
Water outlet x Cylinder head	30	3.06
Radiator thermo control switch	30	3.06
Water pump x Cylinder block	12	1.22

DAIHATSU

S85

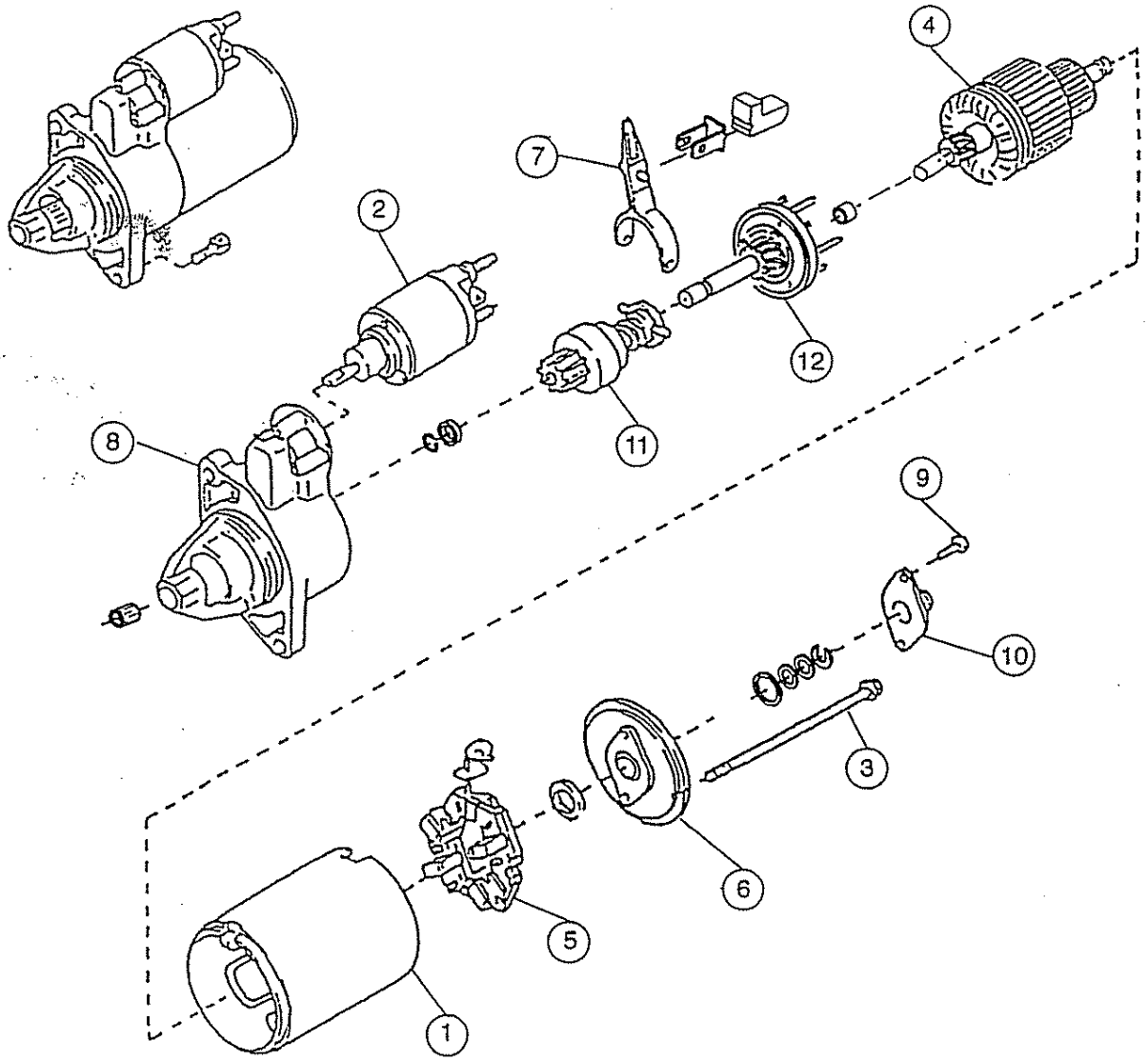
ST

STARTING SYSTEM

NO. 7933-SE

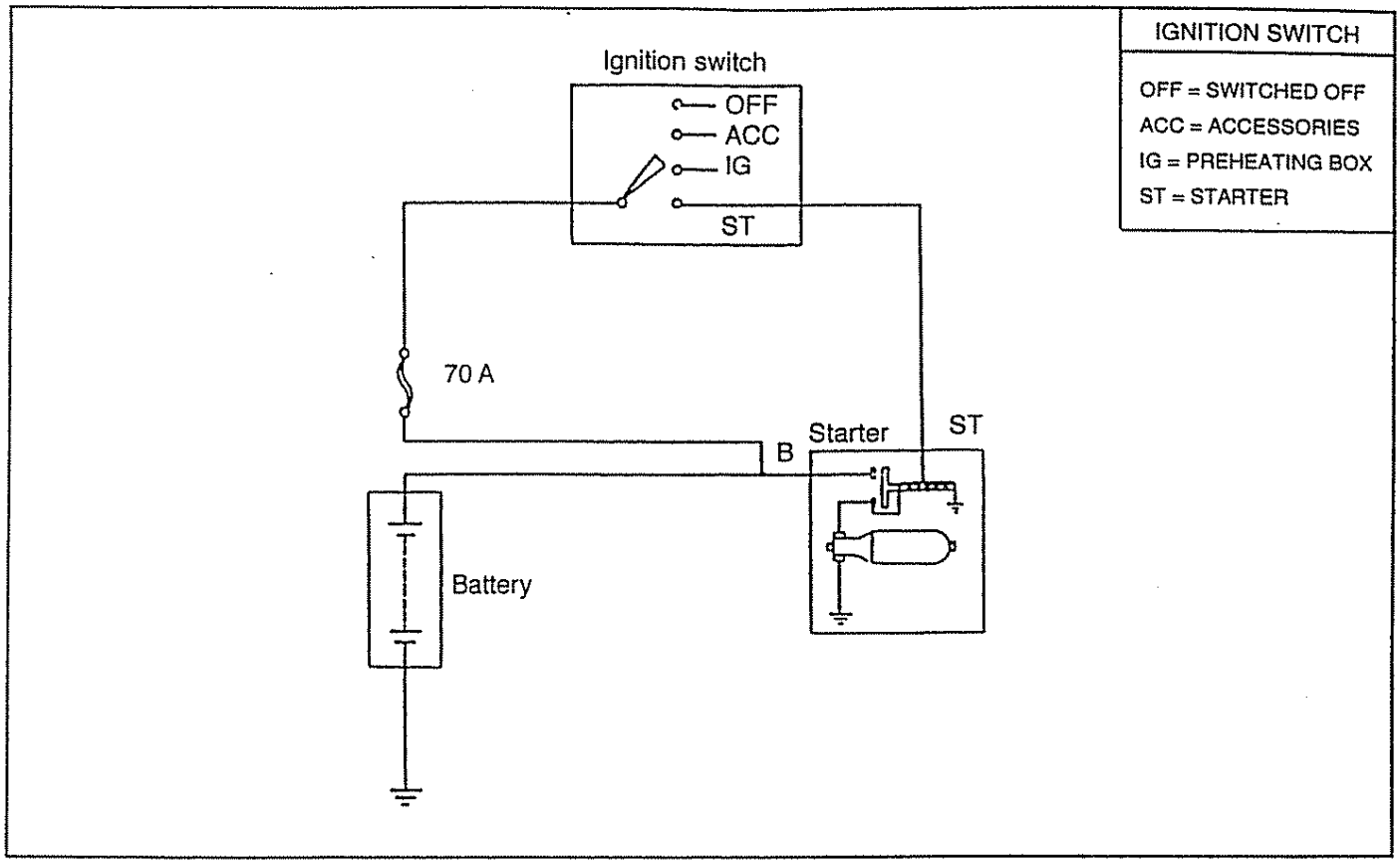
1. GENERAL DESCRIPTION AND COMPONENTS

The starter motor is a 4-pole, permanent-magnet, overhaulable motor controlled by a relay switch which allows pinion coupling and feed consent. The motor is directly fed by the battery and actuated via the ignition switch.



① Starting motor stator
② Electromagnet & switch unit
③ Bolt
④ Starting motor rotor
⑤ Starting motor brush holder
⑥ Brush unit cover
⑦ Lever
⑧ Starting motor box
⑨ Bolt with washer
⑩ Starting motor cover
⑪ Starting motor clutch
⑫ Screw

2. STARTING SYSTEM CIRCUIT



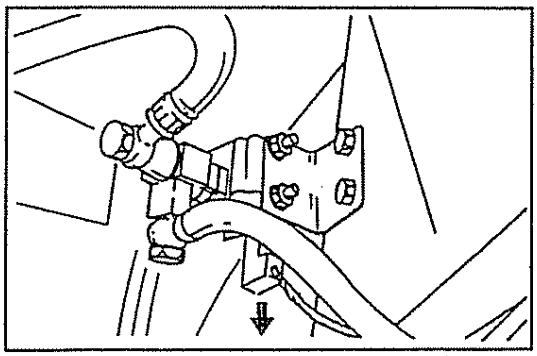
3. TROUBLESHOOTING

Problem	Possible cause	Remedies
Engine will not crank	Battery not fully charged	Charge or replace battery
	Battery cables loose, corroded or worn	Repair or replace cables
	Fusible link blown	Replace fusible link
	Starter faulty	Repair starter
	Ignition switch faulty	Replace ignition switch
Engine cranks slowly	Battery not fully charged	Charge or replace battery
	Battery cables loose, corroded or worn	Repair or replace cables
	Starter faulty	Repair starter
Starter keeps running	Starter faulty	Repair starter
	Ignition switch faulty	Replace ignition switch
Starter spins - engine will not crank	Pinion gear teeth broken or starter faulty	Repair starter
	Flywheel teeth broken	Replace flywheel

4. STARTER SERVICING INSTRUCTIONS

1) When connecting the starter terminal or battery terminal, perform positive tightening so as to avoid poor connection.
   If poor connection should exist, there is a serious risk of a large amount of current flowing during starter operation, with consequent overheating.
2) When removing the starter, first disconnect the negative (-) terminal of the battery. Then, disconnect the terminals (30, 50) at the starter side. Since the battery voltage is always applied to the starter 30 terminal, failure to observe this removing sequence may lead to battery short, which is extremely dangerous.
3) When installing the starter, be sure to tighten the attaching bolts to the specified torques. Improper installation can cause premature wear of the (pinion or flywheel ring gear teeth or even) cause breakage of the crankcase.

5. IN-VEHICLE INSPECTION

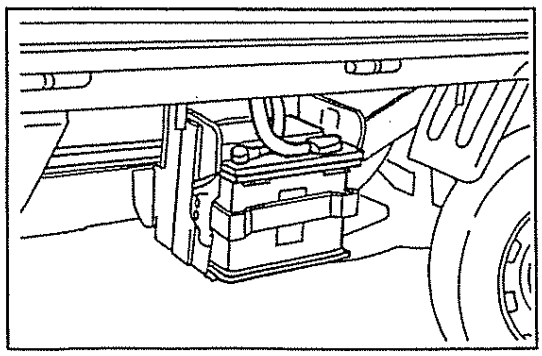


1) Place the shift lever in the neutral position. Apply the parking brake lever.
2) Disconnect the (electrovalve on diesel fuel delivery) coil so that the engine will not start.

3) Set the ignition switch to the ST position. Check if the engine starts.
   ① Check the battery and the cables.
   ② Check the fuse.
   ③ Check the ground.
   ④ Check that the ignition switch feeds relay switch terminal 50

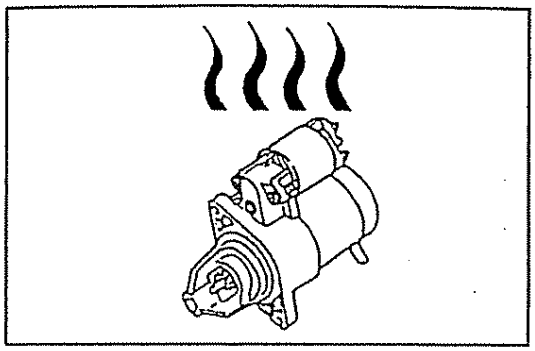
   If the outcome of the above checks is positive, remove the starter motor to overhaul it.

6. REMOVAL



1) Disconnect the negative battery terminal.
2) Disconnect the wires the starter circuit wires.
3) Remove the starter motor from its housing.

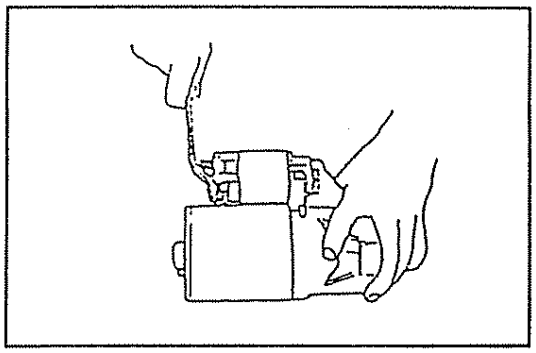
7. CHECKING THE STARTER MOTOR



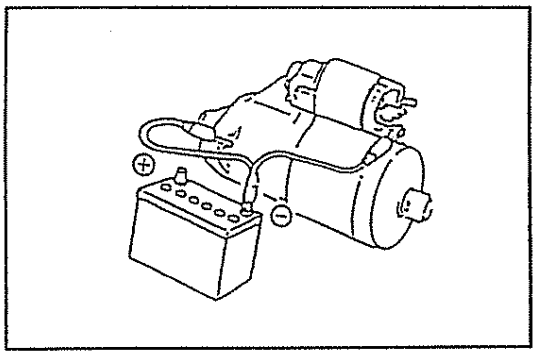
CAUTION:
- Each of the following tests must be performed for no more than three to five seconds. Failure to observe this precaution result in overheating.

1) Pull-in test

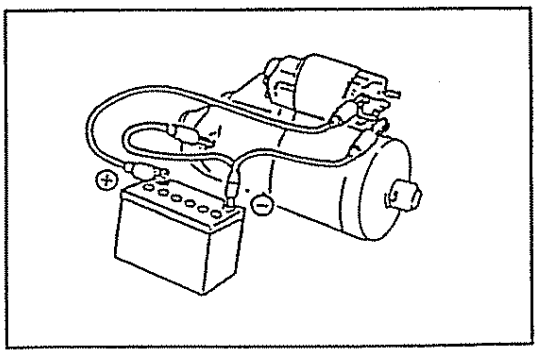
① Disconnect the lead wire from the magnetic switch terminal.



② Connect the negative (-) terminal of the battery to the starter body and magnetic switch terminal.

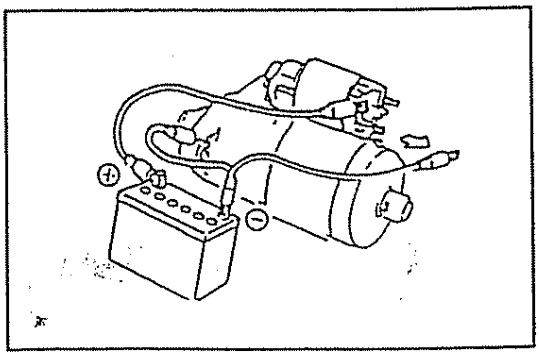


③ Connect the postive (+) terminal to the terminal 50; Ensure that the pinion is pushed outward.
If the drive pinion fails to move out, replace the magnetic switch.



2) Hold-in test

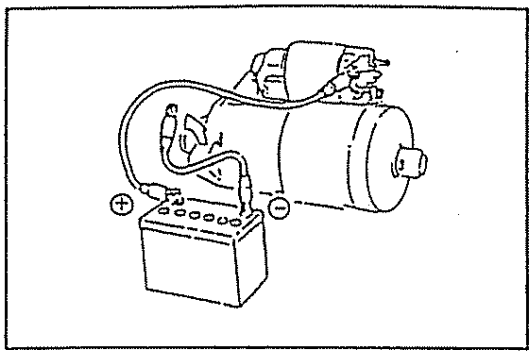
After the check has been performed following the same procedure as with the pull-in test, disconnect the negative terminal of the magnetic switch terminal.
Ensure that the drive pinion is held in a pushed-out state.
If the drive pinion fails to be held, replace the magnetic switch.



3) Verification of plunger return

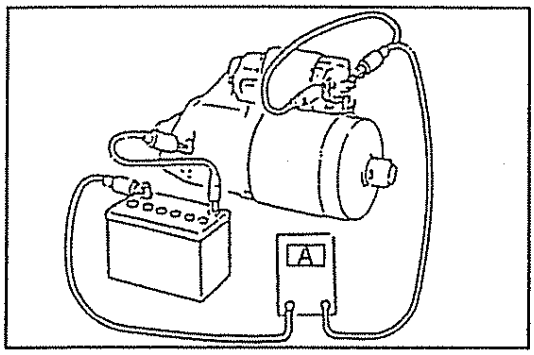
After the check has been performed following the same procedure as with the hold-in test, disconnect the ground terminal of the starter body. Ensure that the drive pinion is drawn into the drive housing.

If the drive pinion fails to be drawn, replace the magnetic switch.



4) Verification of no-load performance

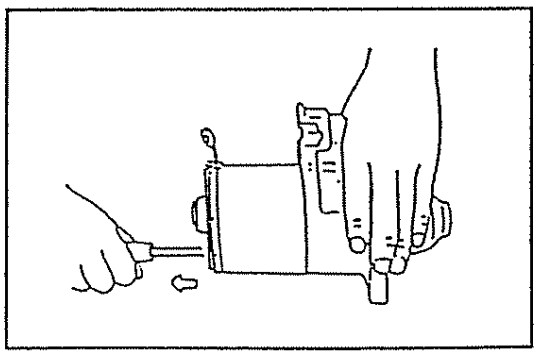
Connect the battery to the starter motor by interposing an ammetter as shown in the figure. Make sure that the starter motor revolves normally while the pinion moves forward. Measure the current as show in the figure with an 11 V tension. The current must be < 50 A.



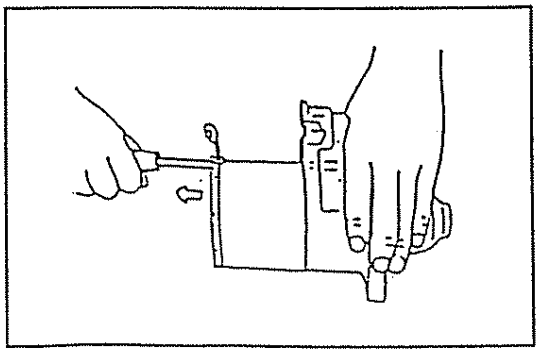
8. REMOVING THE STARTER MOTOR

1) To remove the starter motor, follow these steps:

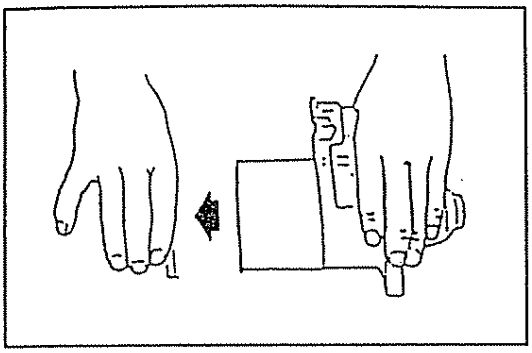
① Remove the starter motor from the engine (ST-4)
② Loosen the two screws (see figure) and remove the cover.
③ Remove the retainer and the clearance adjustments.



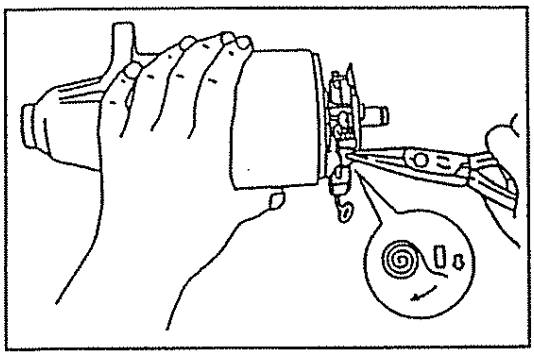
④ Remove the frame and cover two fastening screws.



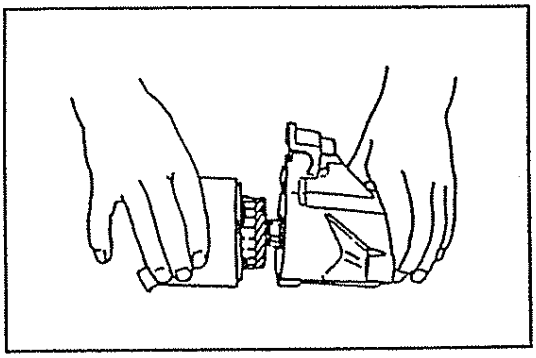
⑤ Remove the cover while supporting the frame.



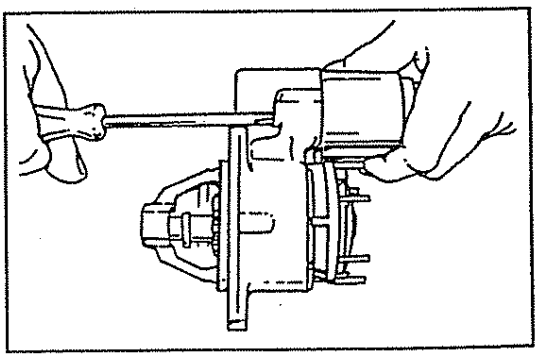
⑥ Remove the brush-holding plate



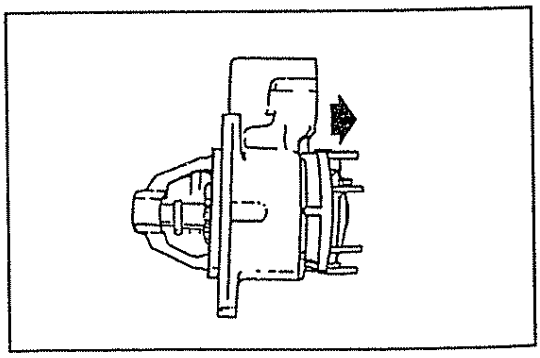
⑦ Remove the frame and armature from the starter motor bracket.



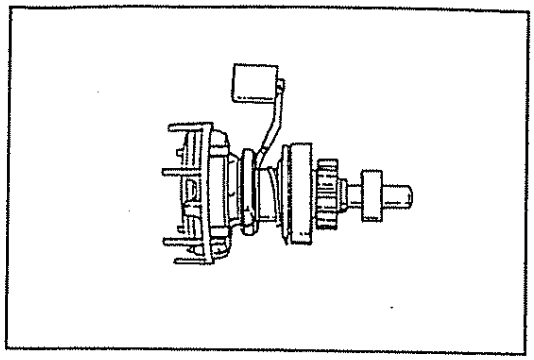
⑧ Remove the 3 electromagnet screws.



⑨ Remove the rubber pad.

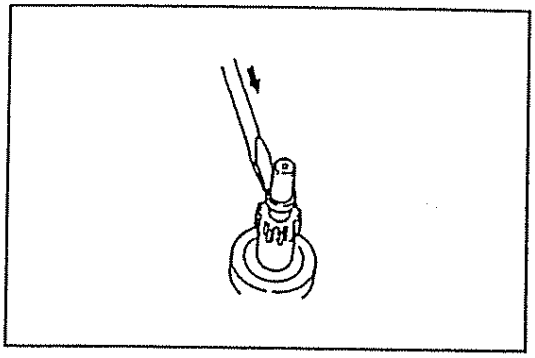


⑩ Remove the pinion - reduction unit and the electro-magnet

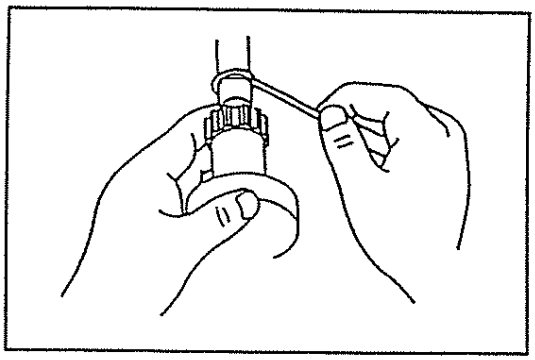


2) Removing the pinion

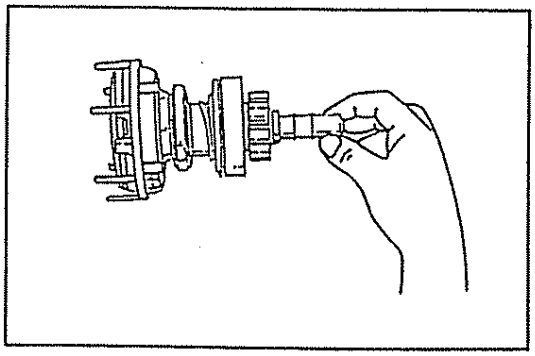
① Remove the stop collar from the circlip with a screw driver.



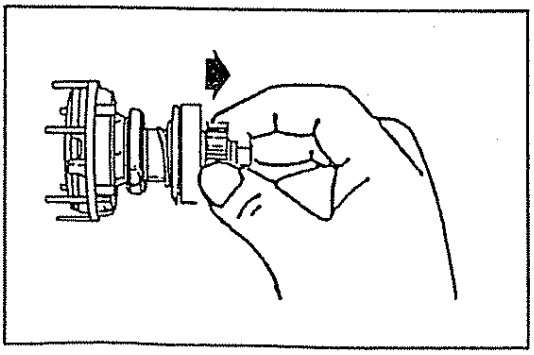
② Remove the circlip with a screwdriver.



③ Remove the collar.



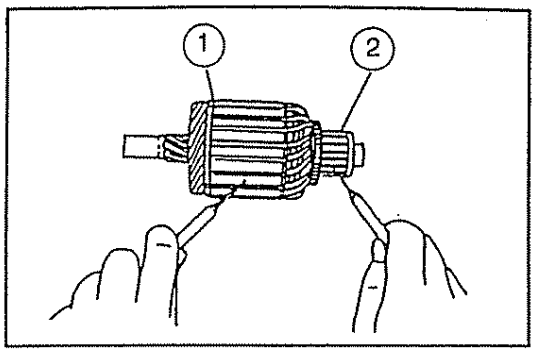
④ Remove the pinion.



9. INSPECTION

1) Checking armature insulation.

Ensure that no continuity exists between the commutator and the armature coil, using an ohmmeter.

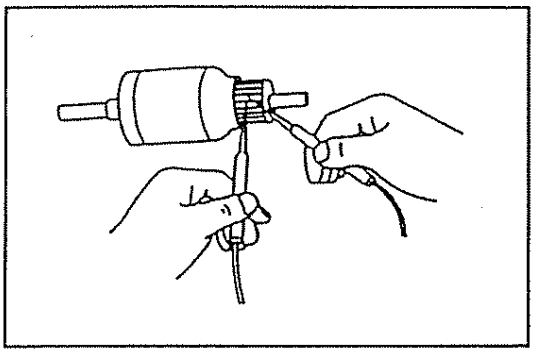


If continuity exists, replace the armature.

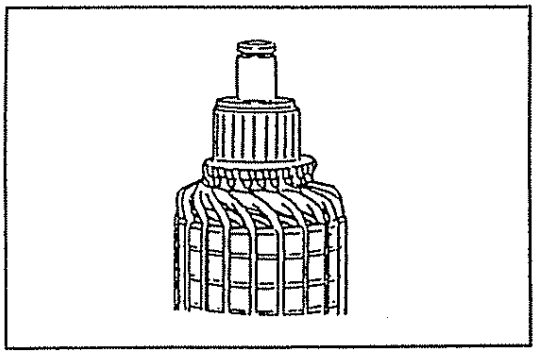
2) Checking commutator continuity.

Check continuity between adjacent segments of the commutator, using an ohmmeter.

If no continuity exists between any adjacent segments, replace the armature.

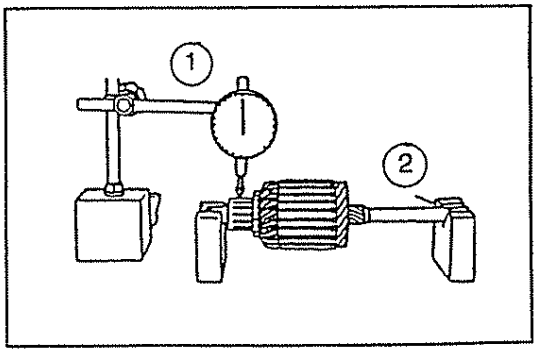


3) Check each contact surface of the commutator segments with the brushes for burning.
If the surfaces are dirty or burnt, correct the commutator surfaces, using abrasive paper (No. 400) or a lathe.



4) Checking the commutator for circle runout.

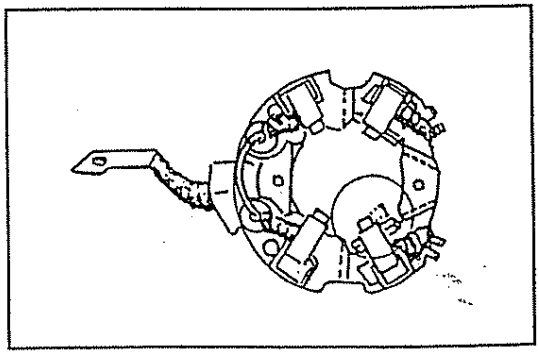
Support the armature at both ends on a Vee block.
Check the commutator for cicle runout, using a dial gauge.
Circle runout limit: 0.05 mm (0.002 inch).



If the circle runout exceeds the allowable limit, reface the commutator on a lathe.

5) Checking the projection of the brushes use a gauge to measure the projection of the brushes.

Standard projection: 10.6 mm
Minimum allowable projection: 5 mm

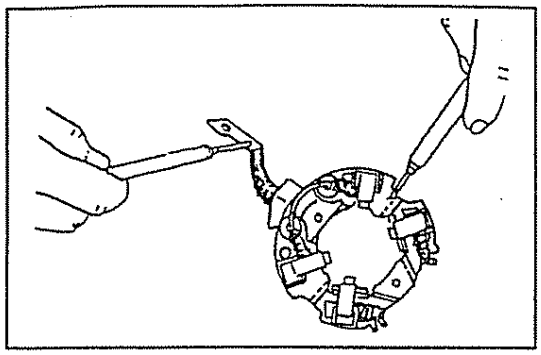


If the projection is shaller, replace the brush holder assembly.

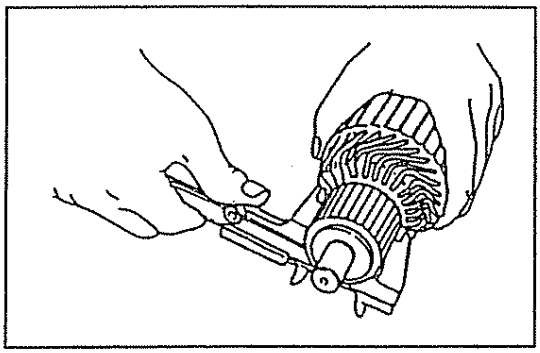
6) Checking the brush holder insulation using an ohmmeter, measure the resistance between the positive and negative terminals of the brush holder.

Resistance ≥ 100 Ω

If the resistance is smaller, replace the brush holder.



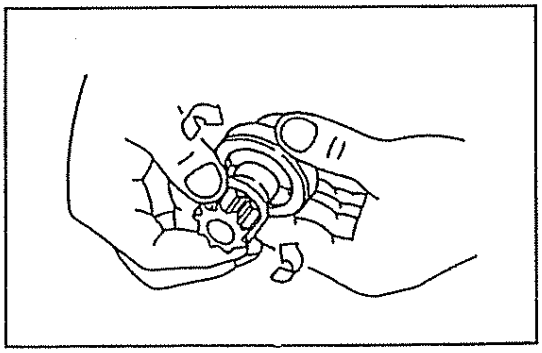
7) Make sure that the commutator is not excessively worn (max ~ 1 mm on Ø).



8) Checking the clutch

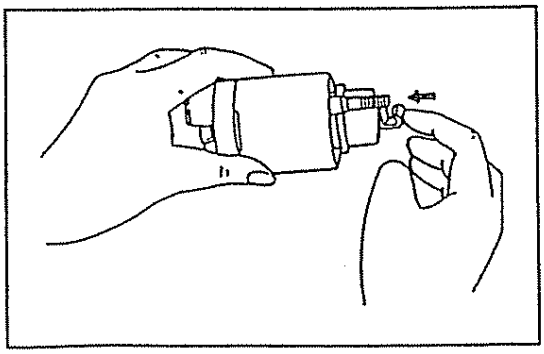
① Check the pinion gear teeth and grooves for possible wear or damage. If signs of wear or damage are present, replace the pinion.
Also check the flywheel ring gear for possible wear or damage.

② Checking the pinion idler wheel.
Hold the pinion idler wheel and rotate the pinion
Then attempt to rotate the pinion clockwise: the pinion must not rotate. If it does, replace the starter motor pinion.



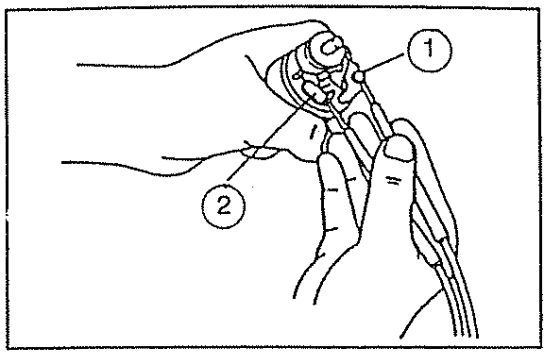
9) Checking the relay switch

① Push the piston in by applying pressure with the fingers. Check that, when the piston is released, it immediately goes back to its starting position. If not, replace the relay switch.



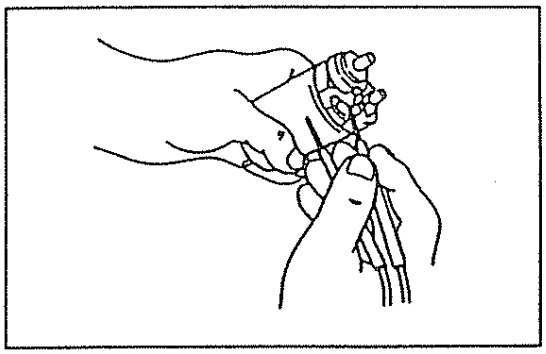
② Checking the pull-in coil

Using an ohmmeter, make sure there is continuity between terminals 50 and the starter motor.
If not, replace the relay switch.



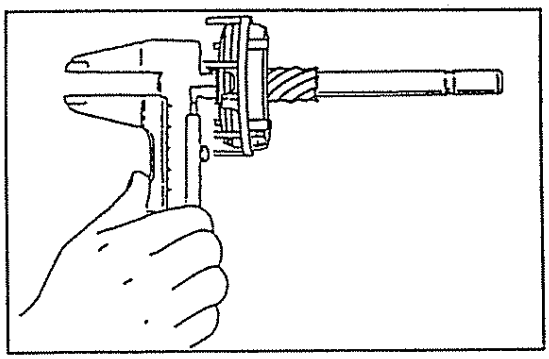
③ Checking the hold-in coil

Using an ohmmeter, make sure there is continuity between terminals 50 and the relay switch body.
If not, replace the relay switch.

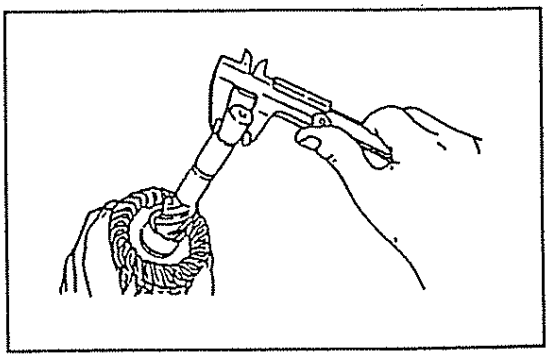


10) Checking the bearings

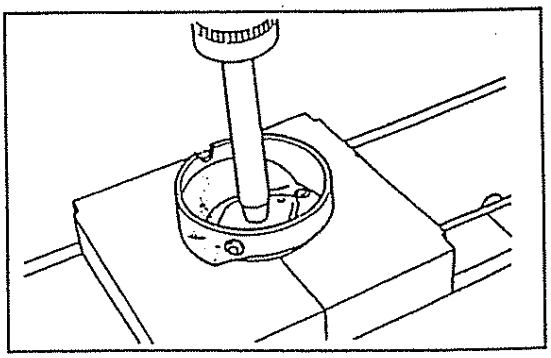
① Measure the inside diameter of the housing bushes and armature shafts.



② Measure the outside diameter of the armature and of the reduction unit shaft.



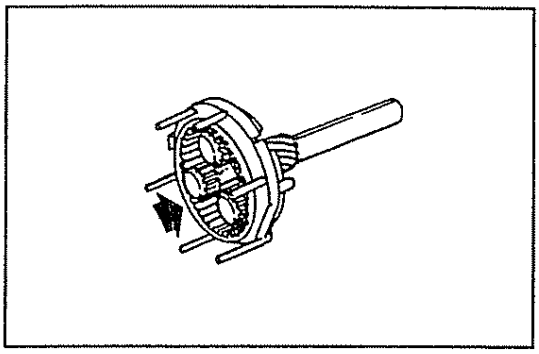
③ To determine the clearances, subtract the outside diameters from the inside diameters of the bushes.
Limit clearance: ~ 0.2 mm



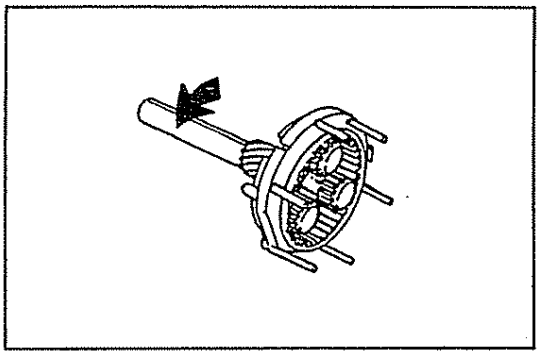
11) Checking the reduction unit

① Visually check the plastic parts for possible breakage.

② Check the wear of the gears and of the related pins. Make sure that the reduction unit rotates freely.



③ If the outcome of the above check is negative, replace the reduction unit.

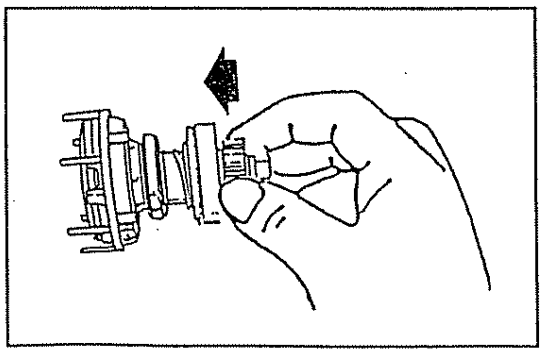


If the result of the rest should be negative replace the reduction unit.

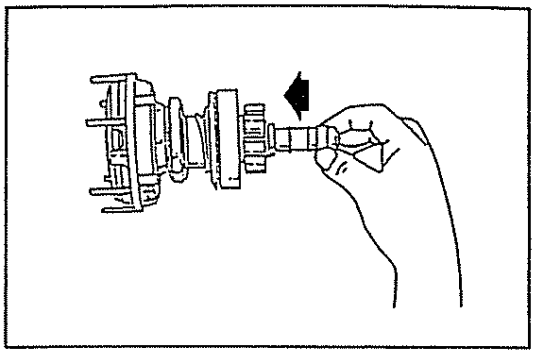
10. REASSEMBLING

NOTE:
- To lubricate the bushes, use grease for high temperatures.

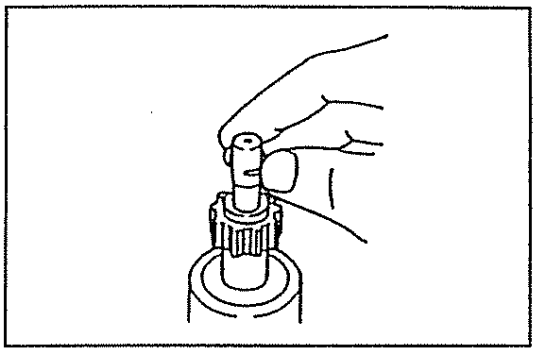
1) Fit the pinion on the reduction unit.



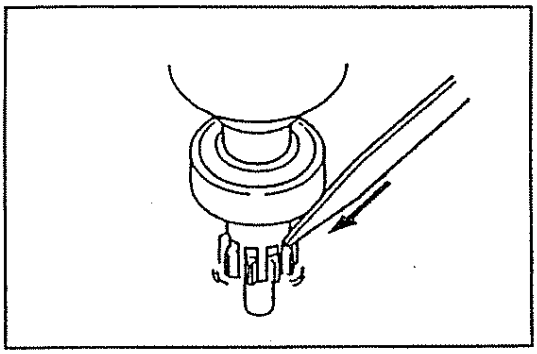
2) Fit the collar on the reduction unit shaft.



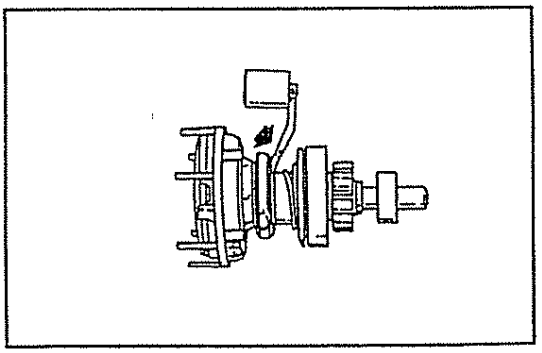
3) Position the circlip on the reduction unit shaft.



4) Using a screwdriver, apply pressure to the pinion so that the collar is positioned on the circlip.



5) Fit the control lever and the reduction unit in the relevant housing.
NOTE:
- Apply grease for high temperatures to the armature and control lever sliding sections.



6) Fit the rubber plug and the electromagnet.
7) Fit the brush holder on the armature.
8) Fit the armature - brush holder assembly on the frame.
NOTE:
- Be careful during this operation, as the strong magnetic fields may attract the armature and move it away from the brush holder.

9) Install the frame armature on the starter motor bracket.

10) Fit the cover and screw the two tie-rods.

11) Assemble the supplied spacers.

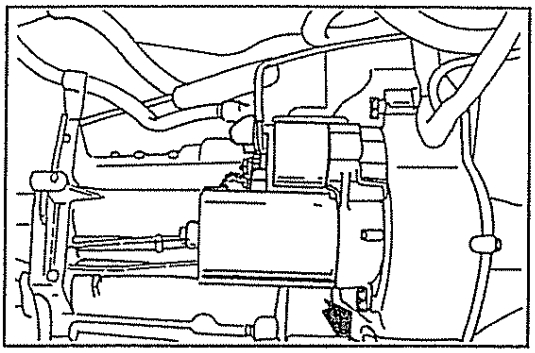
12) Fit the retainer and the plug with the gasket and screw.

13) Connect the engine feeder cable to the relay switch.

11. INSTALLATION ON THE ENGINE

Before the installation, carry out the operation checks (see ST-5). Install the starter motor, observing the prescribed tightening torque.

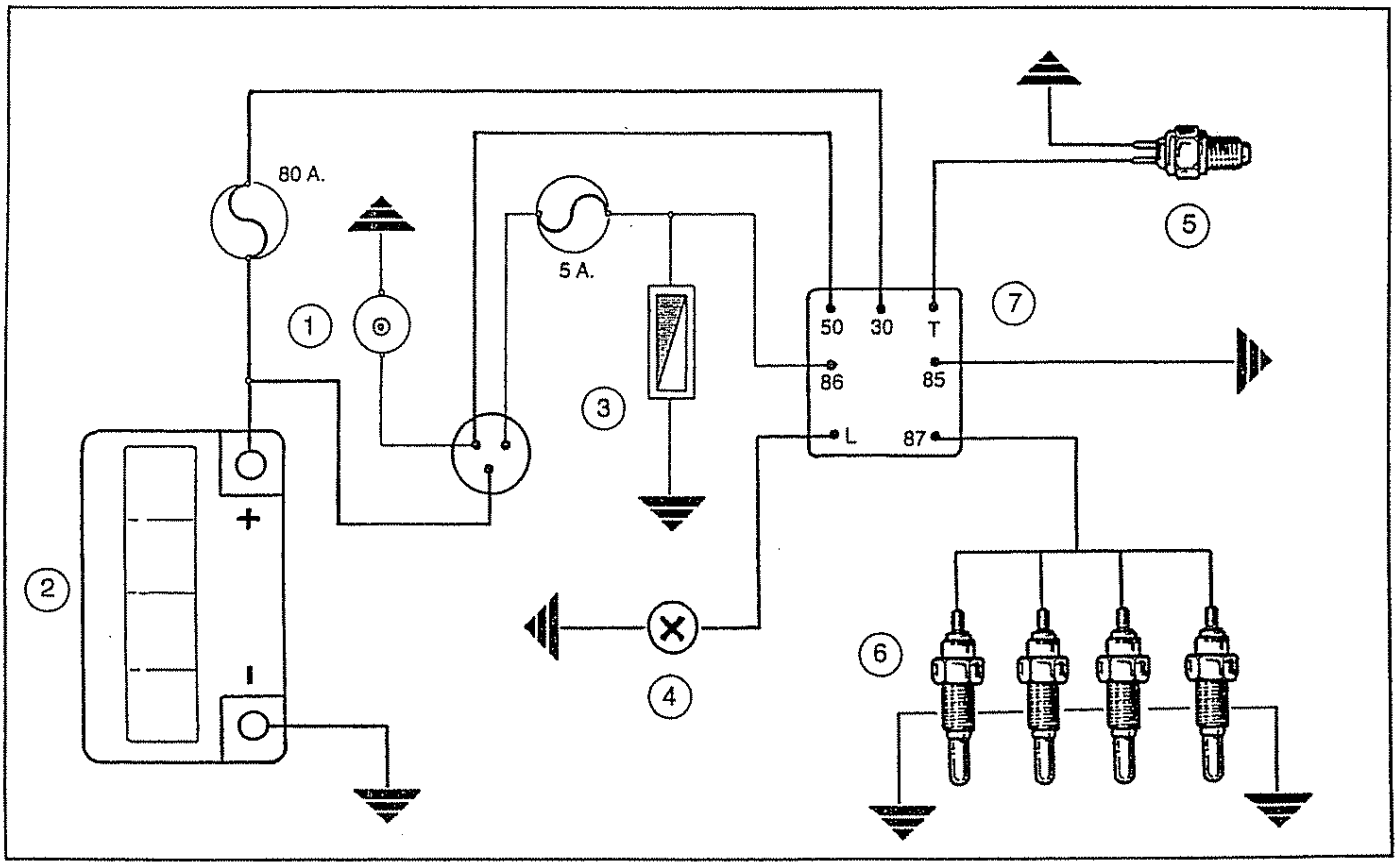
Tightening torque 52.5 N.m./5.36 kgf-m.



PREHEATING SYSTEM

Parts composing the preheating system: a key switch, a Control box, 4 preheating glow plugs, a coolant sensor, glow indicator lamp, 2 fuses. Control box and solenoid valve share the same supplying system during Diesel delivery.

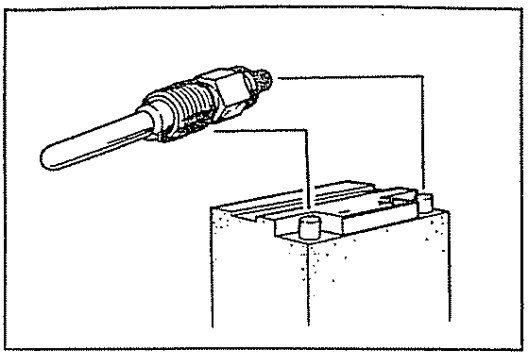
ELECTRIC TABLE



① Starting motor
② Battery
③ Solenoid valve
④ Glow indicator
⑤ Coolant sensor
⑥ 4 preheating glow plugs
⑦ Preheating control box

1. PREHEATING GLOW PLUGS: REMOVAL AND CHECK

1) Disconnect battery negative pole.
2) Remove bonds connecting to the candles
3) Remove the candles from their head.
4) Check glow plug condition

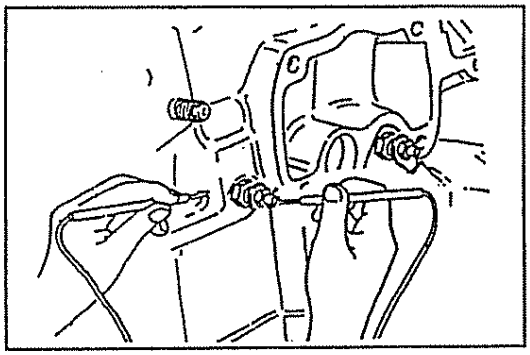


① Verify that the glow plug warms up starting from the side opposite to the base thread when appllying a12v voltage (as shown in the figure).

CAUTION:
- Applying a 12v voltage is very dangerous because the glow plugs reach high temperatures; therefore they may cause burns. Pay attention, don't touch them.

WARNING:
- The operation must be executed in a few seconds to avoid the plug damaging.

2. PREHEATING GLOW PLUG INSTALLATION

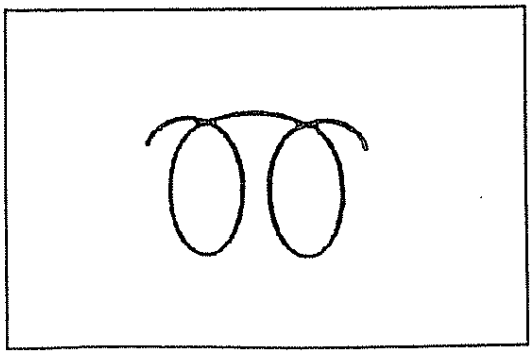


① Screw the head plugs and tighten to the prescribed tightening torque 20 N·m.
② Check glow plug continuity with an ohmmeter.
③ Replace the glow plug if losing continuity after the installation.
④ Install the bonds.

Specifications
Voltage rating: 12.5V
Electrical input after 5": 13.5 ÷ 16.5 A
Sheat superficial temperature: 720 ÷ 820° C after 5"

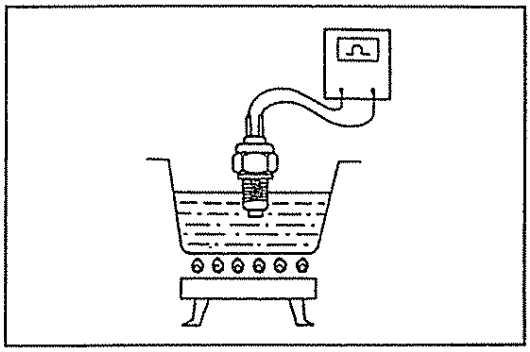
3. PREHEATING SYSTEM CHECK

Light the glow indicator lamp by turning "ON" the switch. The light refers to the waiting time, which is determined by the coolant temperature; a sensor, placed on the thermostat, takes the temperature (see fig.).



When the indicator lamp goes out, the plugs will be powered for ~ 4" more, without activating the starting device (Waiting time).
When starting, a signal will be sent to the Control box, to allow the plugs being powered for 5" more (Preheating time).
If the coolant temperature is over 50°C, the plugs wont be powered. Anyway, the tell tale lamp will light up for a few seconds.

3. Coolant temperature sensor
The sensor sends a variable signal to the Control box depending on the coolant temperature; this allows the plug action being optimized.
Check the working , by connecting an ohmmeter to the sensor and measuring the resistance according to the different coolant temeperatures. Compare with the data in table below.



A 5 second post-heating avoids white smoke production after starting, see the table below.

Transducer		Heating time (sec.)	
Resistance (Ohm)	Coolant temperature °C	Pre-heating	Post-heating
7000 2400 1000 460	-20 0 +20 +40	26.5 ± 3 15.0 ± 1.5 9.5 ± 1 7.0 ± 1	5^{+2}_{-1}
≤320	+50	Heating stop	

If the system doesn't work, check the following parts:
① Battery
② 80A Fuse
③ Switch
④ 5A Fuse (On the passenger feet vehicle right side)
⑤ Harness
⑥ Preheating control box
⑦ Temperature sensor

NOTE:
- The 5A fuse protects both pre-heating section and solenoid valve during Diesel delivery.
The tell tale lamp won't signale if plugs don't absorb or if 80A fuse stops working.

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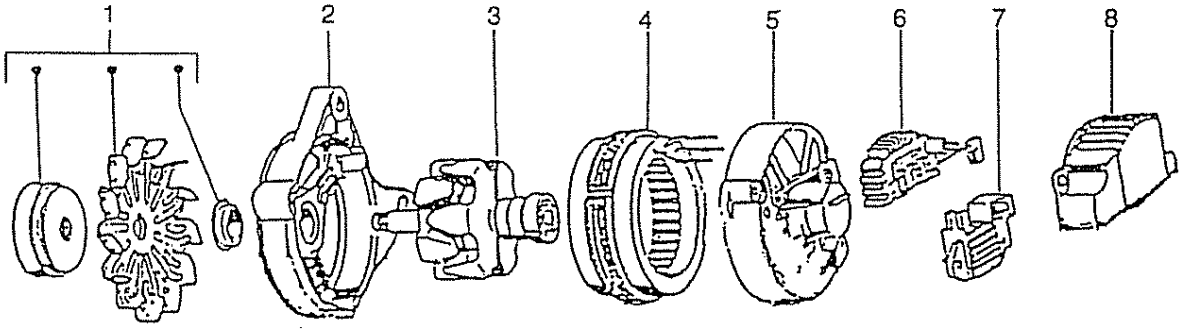
CHARGING SYSTEM

NO. 7933-SE

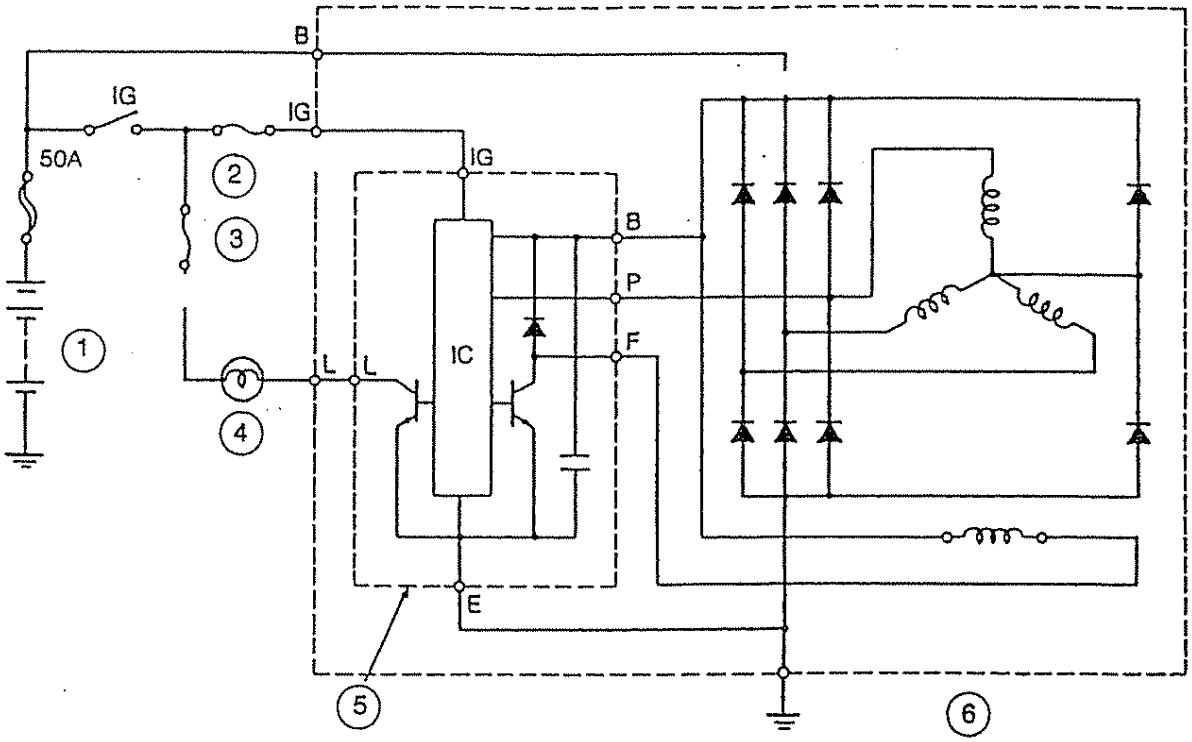
ALTERNATOR

1. COMPONENTS



1. Pulley, fan, rod
2. Case
3. Rotor
4. Stator
5. Case
6. Rectifier
7. Brush holder
8. Plastic protection

2. CHARGING SYSTEM CIRCUIT



① Battery
② Fuse (engine)
③ Fuse (heating)
④ Warning light (battery change)
⑤ Regulator
⑥ Alternator

Rated voltage 14V
Rated current 65A
Continuous top r.p.m.
14,000 r.p.m.

3. TROUBLESHOOTING

Problem	Possible causes	Remedies
Battery charge warning lamp does not light up when ignition switch is in ON position.	Fuse blown	Check fuse
	Lamp bulb burnt out	Replace bulb
	Cable connections unsteady	Restore connections
	Cables disconnected.	Repair or replace
Battery charge warning lamp does not go out, even when engine is running.	Belt slack or worn	Adjust or replace
	Battery cables slack or corroded	Repair or replace cables
	Regulator or alternator faulty	Check charging circuit
	Wiring defective	Repair or replace

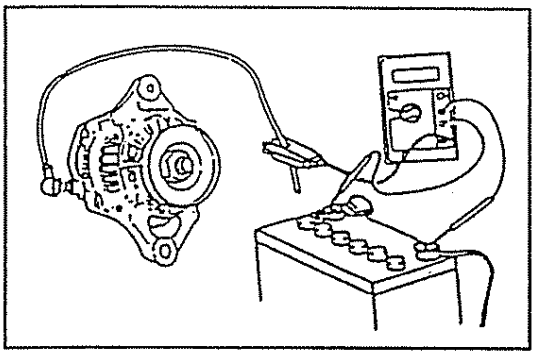
4. ON-VEHICLE VERIFICATIONS

1) Before starting the on-vehicle verifications, carry out the following checks:

   ① Inspection and installation of battery terminals
   ② Belt tension
   ③ Fuse
   ④ Wiring
   ⑤ Abnormal noise of alternator while engine is running

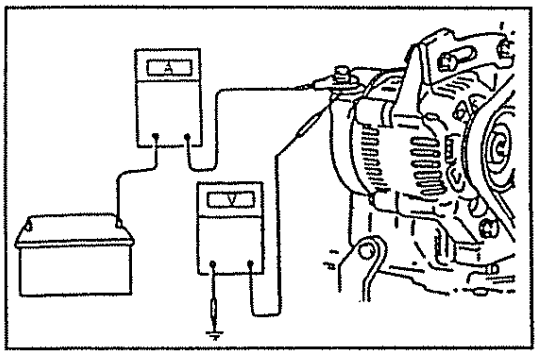
2) No-load delivered-power test.
   ① Make sure that all consumers are turned OFF.

   - Headlamps
   - Heater blower
   - Rear defogger
   - Van compartment lamp, etc.



   ② Gradually rev up the engine to 2500 r.p.m.
   Measure the voltage and current values.
   - current: not exceeding 10A
   - voltage: 14.2 ÷ 14.8 V

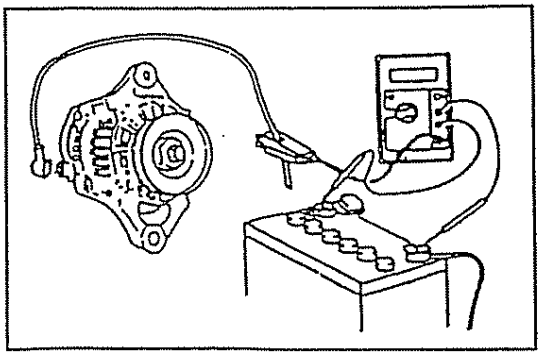
   NOTE:
   - The current value may exceed 10A immediately after starting the engine. This is not to be considered abnormal.



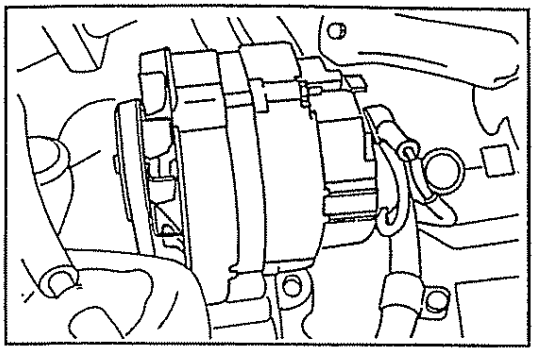
3) Loaded delivered-power test.
   ① To apply electric loads, follow these steps:
   a. Set the headlamps to the high-beam position.
   b. Set the heater blower control to the "High" position.

   ② With the engine running at 2500 r.p.m., check the the output current is at least 20A

   NOTE:
   - When the battery is fully charged, the measured current may be lower than the above value. This is not to be considered abnormal. Now increase the electric load, e.g. by switching on the rear defogger. Subsequently check whether the delivered current has increased.



5. REMOVING THE ALTERNATOR



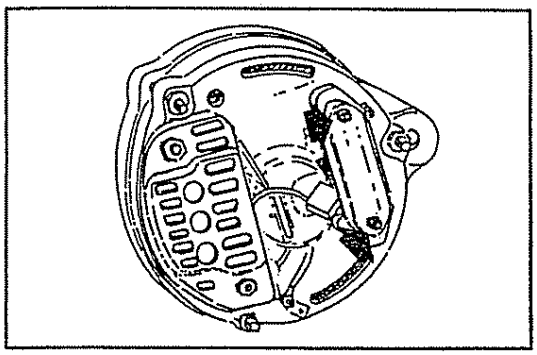
1) Disconnect the negative (-) terminal of the battery.

2) Remove terminals B+ and D+.

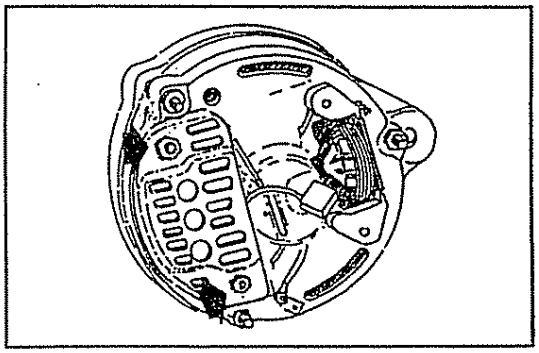
3) Remove the two alternator fasteners.

4) Remove the alternator V-type belt.

6. DISASSEMBLING THE ALTERNATOR



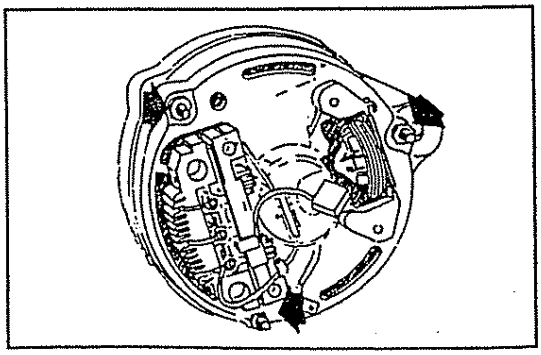
1) Removing the regulator.
   ① Loosen the two clamping screws.
   ② Disconnect the electric terminal.



   ③ Remove the regulator, taking care not to damage the brushes.
   ④ Remove the brush plastic protection.

2) Removing the fan, the pulley and the spacer.

   The fan, the pulley and the spacer are fixed without a tab, even if they present the treatments required for its utilization.



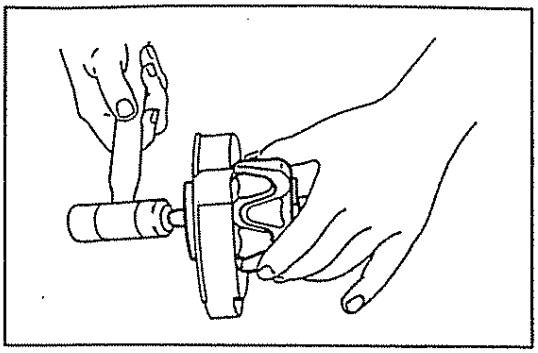
3) Alternator casing separation

   To separate the alternator casing halves, unscrew the 3 fasteners. Before detaching the casing halves, mark them so that they may coupled properly upon reassembling.

   NOTE:
   - The stator and the rectifier must remain on the same carter half, as the terminals are soldered.

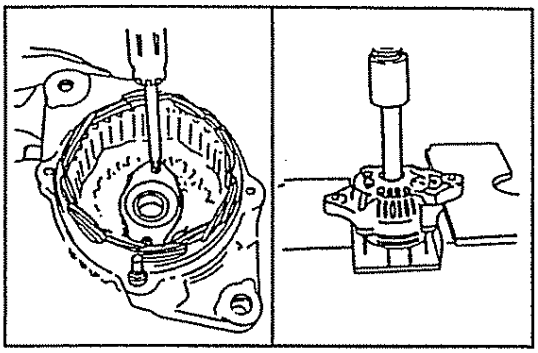
4) Removing the armature.

Eject the rotor by means of a mallet or a press.



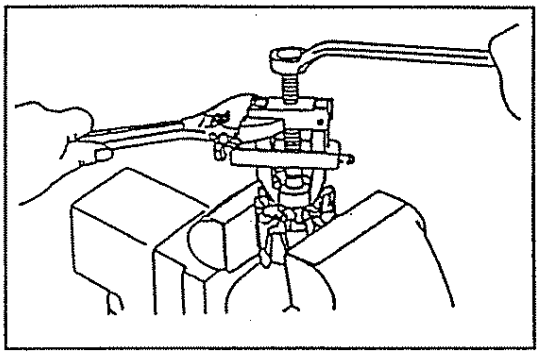
5) Removing the casing-pulley bearing.

Loosen the two retaining plate screws and expel the bearing with a punch.



6) Replacing the rotor bearing.

Use specific tool 19.1.20234 as shown in the figure.

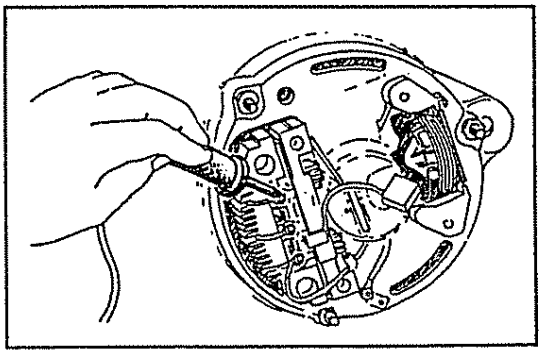


7) Removing the stator.

Unsolder the 3 cables from the rectifier.

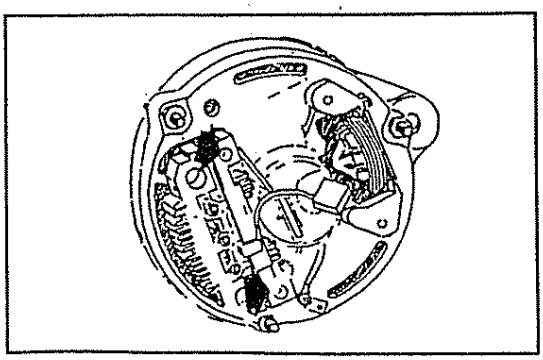
NOTE:
- Also disconnect the wire from terminal W.

Remove the stator.

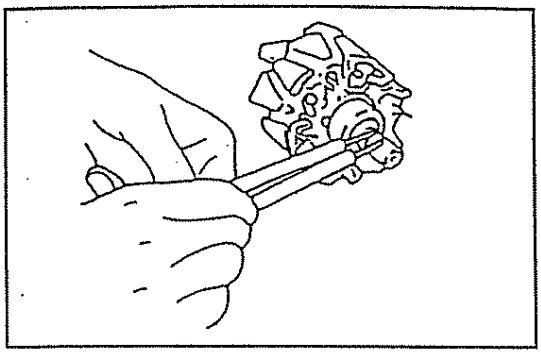


8) Removing the rectifier.

Loosen the 2 screws and remove the rectifier from the casing.



7. CHECKS

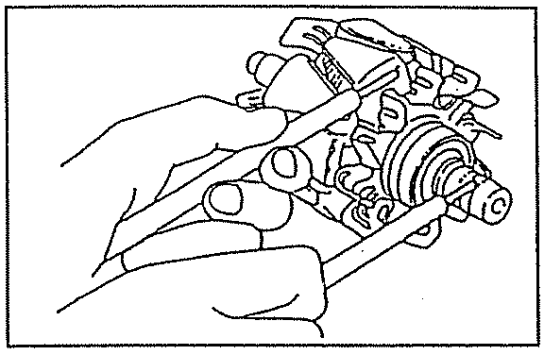


1) CHECKING THE ROTOR

① Checking the rotor (continuity).

Using an ohmmeter, check that the resistance between the commutator rings is 2.7 W.

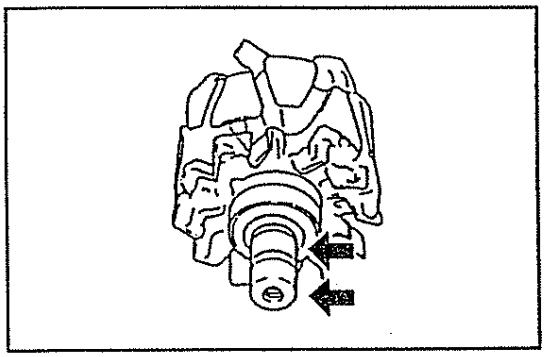
If not, replace the rotor.



② Checking the rotor (insulation).

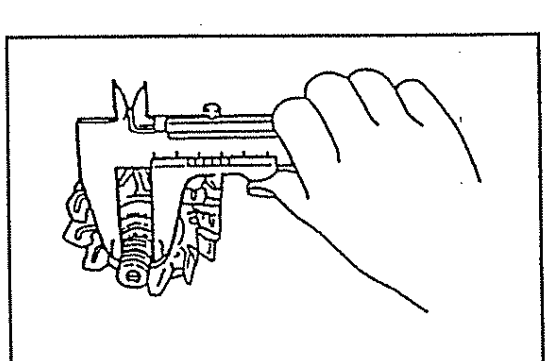
Make sure there is no continuity between the commutator rings and the rotor body.

If there is, replace the rotor.



③ Checking the commutator rings.

a. Check the the ring surfaces show no signs of wear, burning, etc.

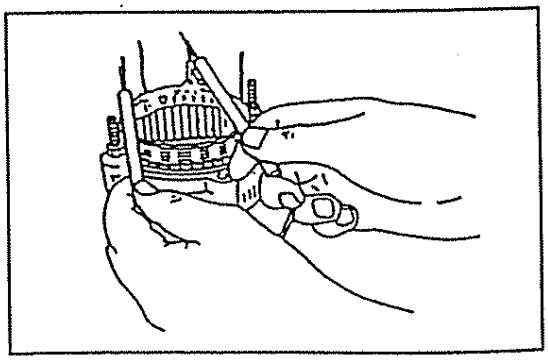


b. Using a vernier caliper, measure the outside diameter of the commutator.

Standard diameter: 27.65 mm

Minimum diameter: 26 mm

If the outside diameter of the commutator is smaller than the prescribed minimum, replace the rotor.



2) CHECKING THE STATOR

① Checking the stator (continuity)

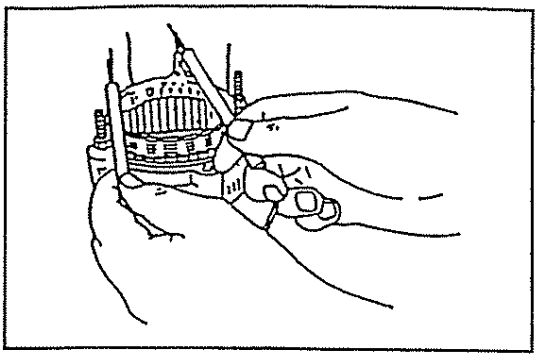
Using an ohmmeter, check if there is continuity between the terminals of the stator coils.

If not, replace the stator assembly.
Resistance: approx. 0.05 W

① Checking the stator (insulation).

Using an ohmmeter, check if there is insulation between the stator cables and the body.

If there is continuity, replace the stator.

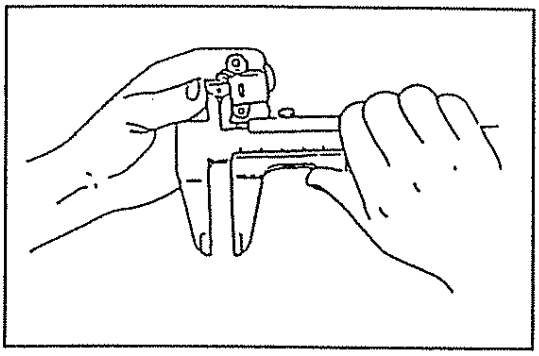


3) CHECKING THE BRUSHES AND THE BRUSH HOLDER

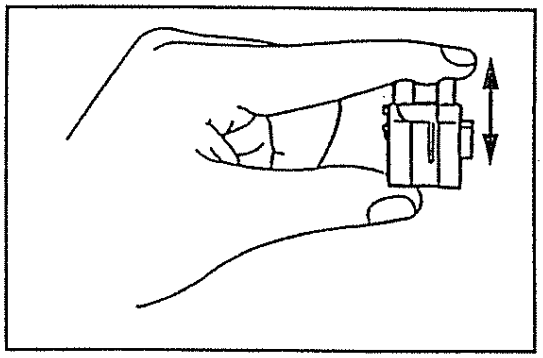
① Checking the brush protrusion.

Using a vernier caliper, measure the brush protrusion.
Standard protrusion: 10.6 mm
Minimum protrusion: 5 mm

If the measured protrusion is shorter than the prescribed minimum, replace the regulator and the brush holder.



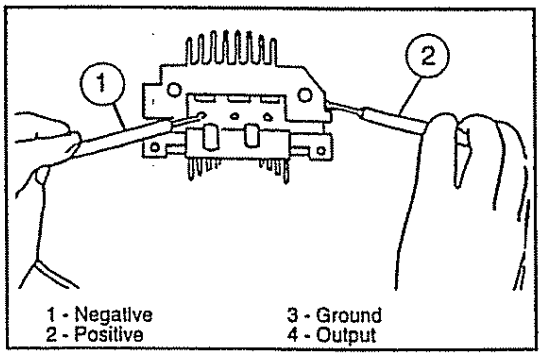
Ensure that the brushes slide normally in their housing.



4) CHECKING THE RECTIFIER

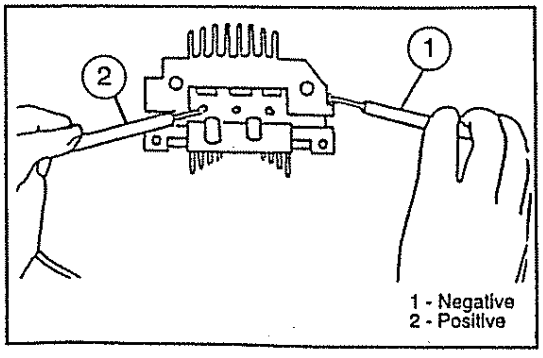
① Checking the rectifier (positive + side)

a. Using an ohmmeter, connect one probe to the positive terminal of the rectifier and the other in succession to each of the terminals of the rectifier diodes (see figure).



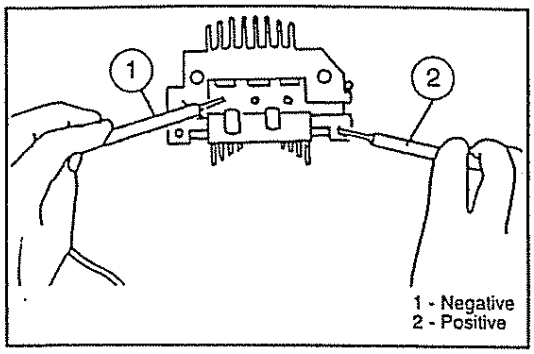
b. Repeat the operation, inverting the ohmmeter probes.
c. Make sure there is insulation in test (a) and continutity in test (b).

If conditions other than these occur, replace the rectifier support.



② Checking the rectifier (negative - side)

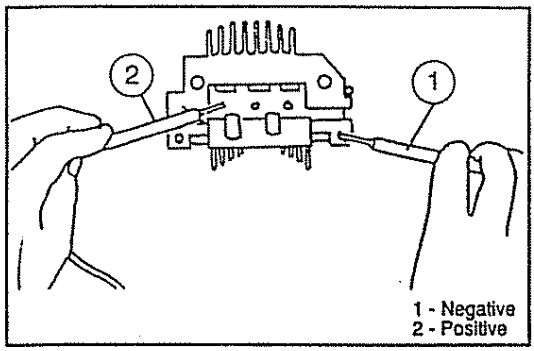
a. Using an ohmmeter, connect probe (-) of the ohmmeter to the negative terminal of the rectifier. Connect the other probe to each of the terminals of the rectifier diodes in succession.



b. Repeat the operation after inverting the polarity of the multimeter.

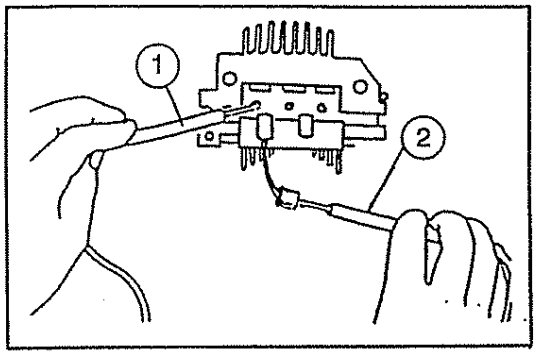
c. Make sure there is insulation in test (a) and continuity in test (b).

If conditions other than these occur, replace the rectifier support.



③ Checking the rectifier.

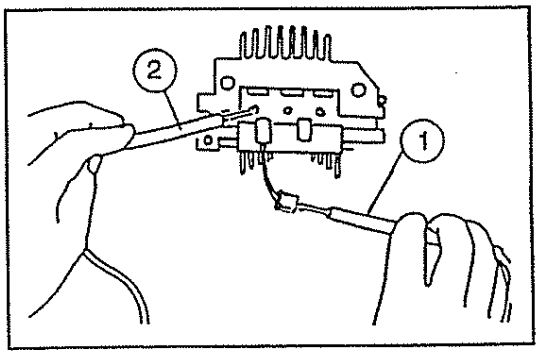
a. Using an ohmmeter, connect the (+) probe of the ohmmeter to the terminal for the regulator. Connect the (-) probe to each of the terminals of the rectifier diodes in succession.



b. Repeat the operation after inverting the polarity of the multimeter.

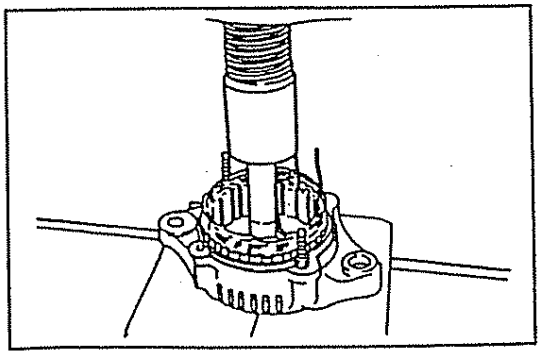
c. Make sure there is insulation in test (a) and continuity in test (b).

If conditions other than these occur, replace the rectifier support.

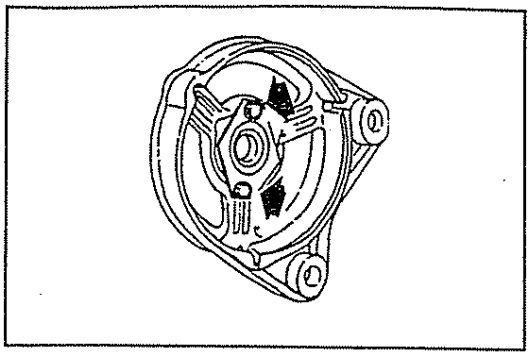


8. ASSEMBLY

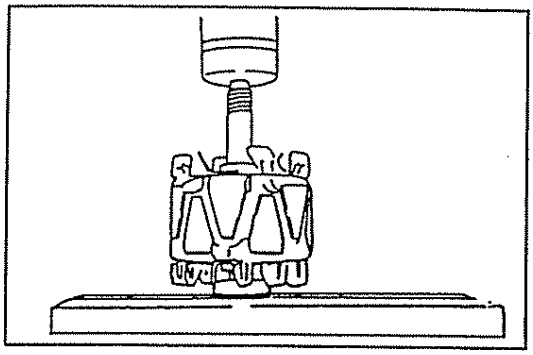
1) Using a press, position a new bearing in the pulley-side casing half.



2) Fit the bearing retaining plate and tighten the two fixing screws.

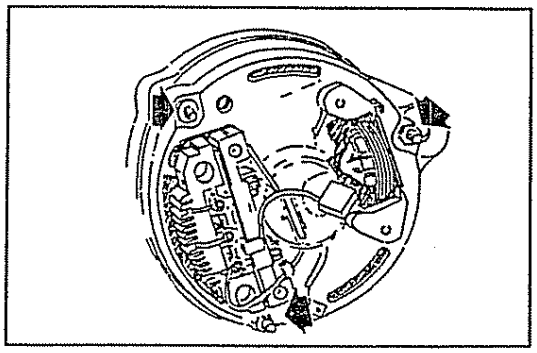


3) Using a press, position a new bearing on the armature.

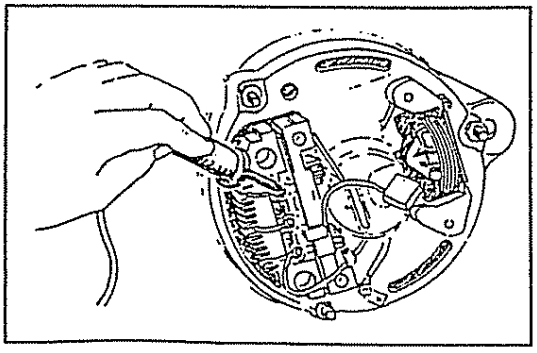


4) Place the armature on the pulley-side casing half.
NOTE:
- If necessary, give light blows with a mallet to facilitate the insertion.

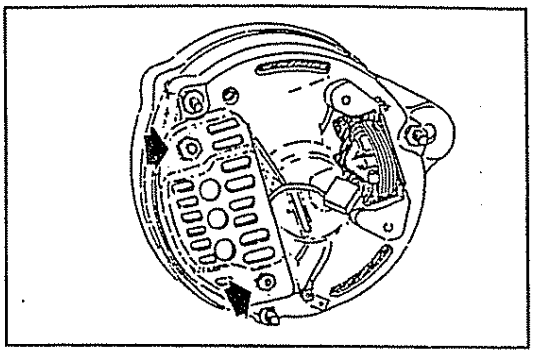
5) Assemble the 2 casing halves taking care to observe the reference marks created during disassembly. Take care to position the stator so that the electric terminals are not damaged. Finally lock the 3 fasteners.



6) Fix the rectifier with the 2 screws. Soft-solder the 3 stator terminals and the connection cable (W). Finally fit the plastic protection.



7) Fit the brush holder regulator, taking care to properly insert the plastic protection. Connect the rectifier terminal to the regulator.



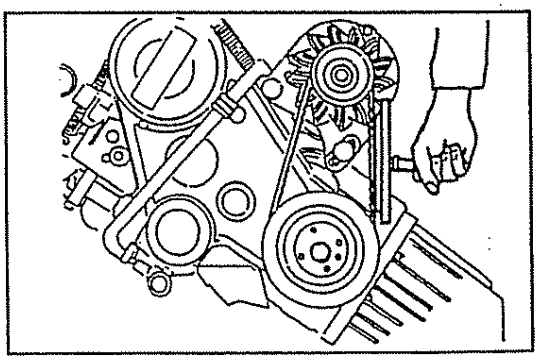
8) Fit the spacer, the fan and the pulley in succession. Tighten the nut with the prescribed torque.

   Tightening torque: 60 (+3/-21 N.m. N.m.)

9. INSTALLATION

1) Temporarily install the alternator on the motor by means of the two attachment bolts.
2) Properly fit the alternator belt.

3) Adjust the belt tension so that, when a 100 N pressure is applied on the middle point between the pulleys, the resulting sag is: 10÷15 mm.

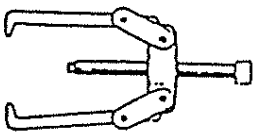


   NOTE:
   - A belt is considered to be new if it has been used on a running engine for less than five minutes.

4) Fasten cables B+ and D- to the alternator.
5) Reconnect the ground terminal to the negative (-) pole of the battery.

   NOTE:
   - If the alternator has been overhauled, let the engine idle for a few minutes.

SPECIFIC TOOLS

Illustration	Tool number	Tool name
	19.1.20234	Alternator bearing extractor
	On market, type CZ DM 91 AWA ref. 445361	Electrical equipment tester

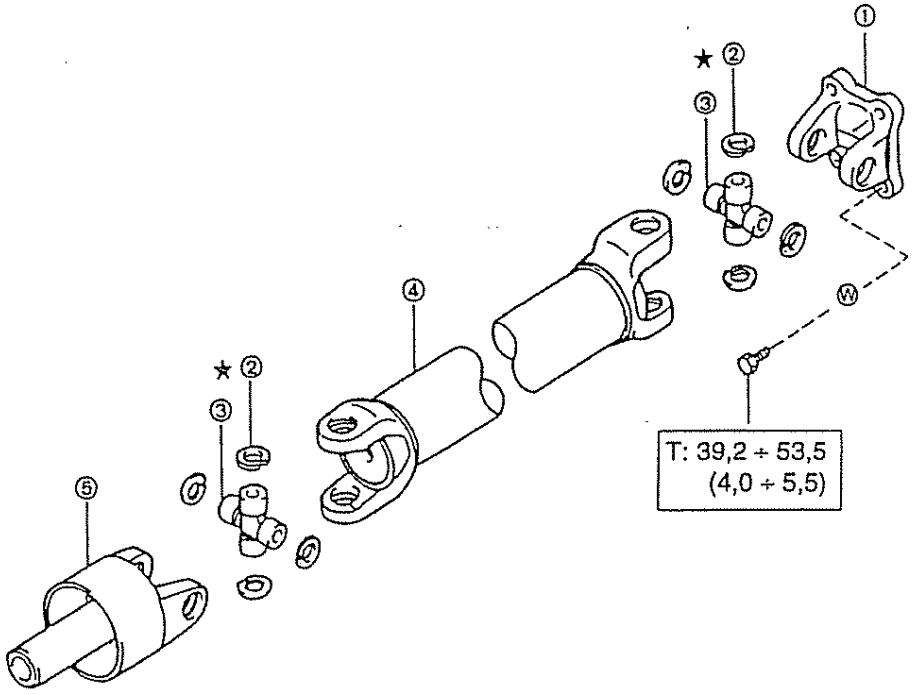
DAIHATSU

S85

PR

PROPELLER SHAFT

1. COMPONENTS



T	:	Tightening torque
Unit	:	N·m (kgf-m, ft-lb)
*	:	Non-reusable parts

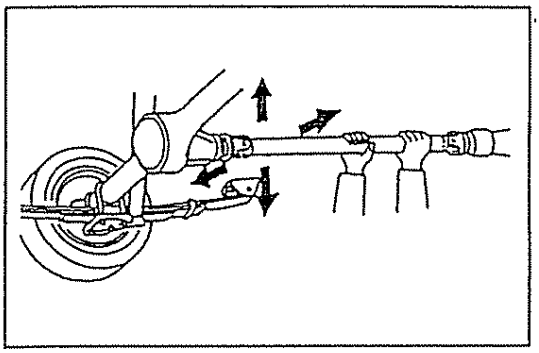
① Flange yoke
② Hole snap ring
③ Universal joint spider
④ Propeller shaft assembly
⑤ Universal joint sleeve yoke subassembly

2. TROUBLE SHOOTING

Symptom	Possible causes	Checking points
Abnormal noise and vibration	• Universal joint improperly lubricated • Universal joint spider section damaged • Runout or damage of propeller shaft	• Lubrication to grease nipple • Check universal joint • Check propeller shaft for runout

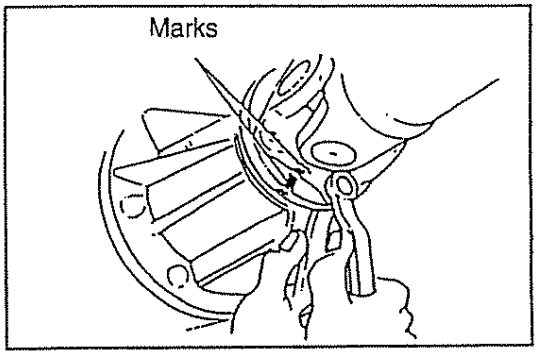
3. IN-VEHICLE INSPECTION

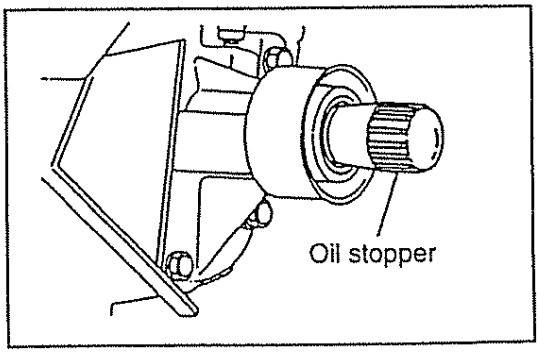
Ensure that the universal joint section of the propeller shaft exhibits no excessive play by turning it by your hand in up-and-down and right-and-left directions.
If any defect is present, replace the propeller shaft or spider kit.



4. REMOVAL

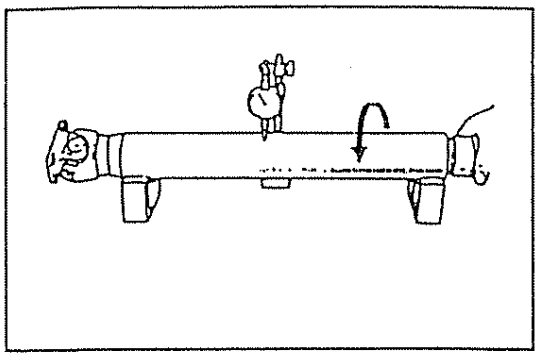
1) Jack-up the vehicle and support it with rigid racks.
2) Remove the propeller shaft assembly.
   NOTE:
   - Put mate marks on the flange yoke and companion flange respectively.
   - Also be sure to install the suitable oil stopper so that no gear oil may flow out.



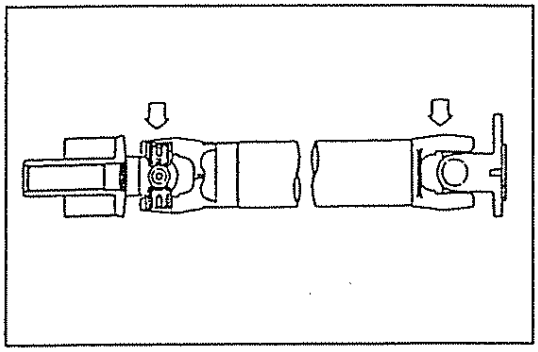


5. INSPECTION

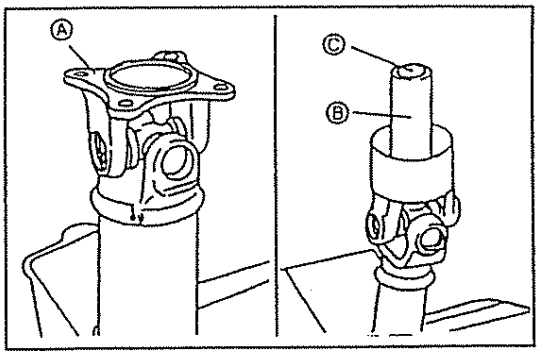
1) Check the propeller shaft for evidence of damage or bend.
   Limit of Bend: 0.5 mm (0.020 inch)



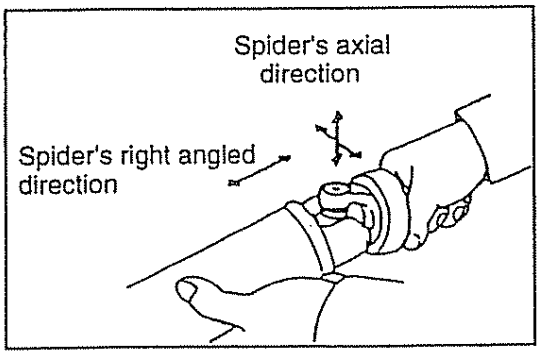
2) Check the spider bearing cup-fitting section, sliding shaft section and boot for damage.



3) Check the flange yoke and sleeve yoke.
   ① Inspect to see whether any damage is present at the differential drive pinion companion flange-contact section.
   ② Check the oil seal sliding section Ⓑ for damage or wear. Check the spline Ⓒ for damage or wear.
   ③ Fit the sleeve yoke onto the sliding spline of the transmission output shaft.
   ④ Ensure that the spline exhibits no looseness in the rotation direction and the sleeve can slide freely in the axial direction on the spline.

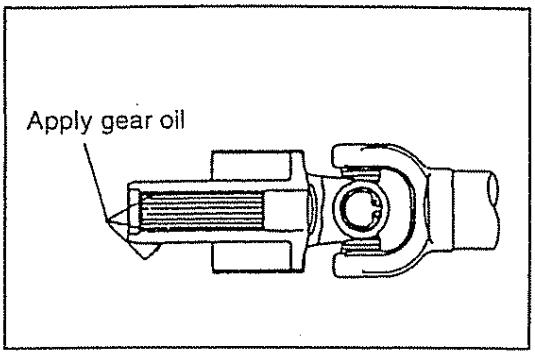


4) Check the universal joint for looseness as follows:
   ① Check the spider for looseness as follows:
   ② Check the spider for looseness in the right angled direction.
   ③ Check the spider for smooth rotation.

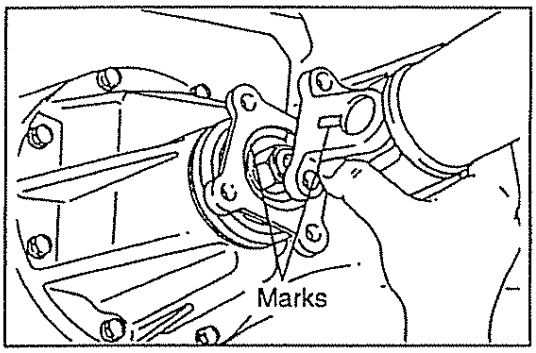


6. INSTALLATION

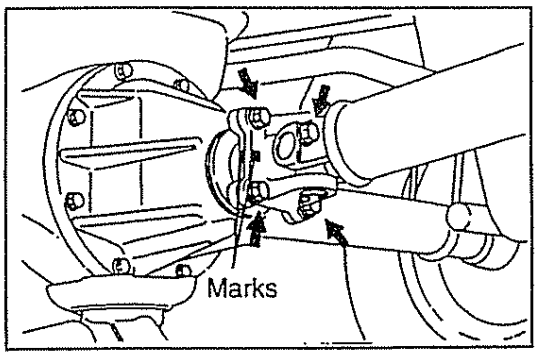
1) Apply gear oil to both the inner and outer sides of the sleeve.
2) Insert the propeller shaft into the transmission side.



3) Assemble the propeller shaft while aligning with the mating mark put on the companion flange of the differential.



4) Install the attaching bolts with new washers interposed.
5) Tighten the attaching bolts gradually.
   Tightening Torque: 4.0 ÷ 5.5 kgf-m



6) While turning the propeller shaft, ensure that the propeller shaft turns smoothly without exhibiting abnormal noise and/ or binding.

SERVICE SPECIFICATION

Unit: mm (inch)

Item	Specified value	Allowable limit	Remarks
Propeller shaft runout	—	0.5 (0.020 inch)	

TIGHTENING TORQUE

Unit: mm (inch)

Tightening components	Tightening torque
Yoke x Flange	4.0 ÷ 5.5 kgf-m

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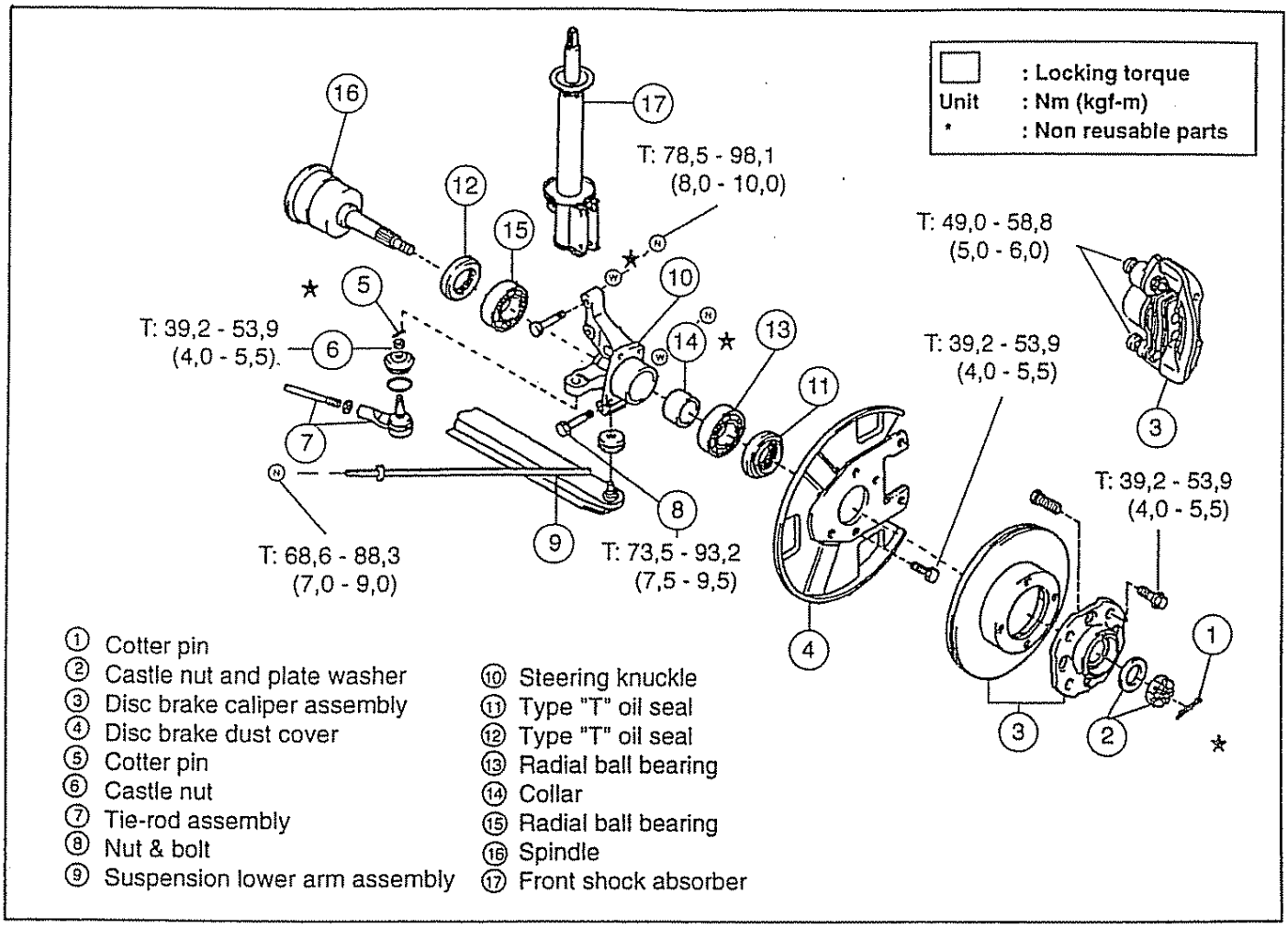
S85

FS

FRONT AXLE & SUSPENSION

FRONT AXLE

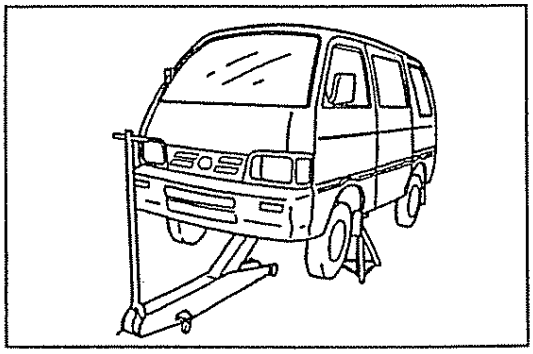
1. COMPONENTS



① Cotter pin
② Castle nut and plate washer
③ Disc brake caliper assembly
④ Disc brake dust cover
⑤ Cotter pin
⑥ Castle nut
⑦ Tie-rod assembly
⑧ Nut & bolt
⑨ Suspension lower arm assembly
⑩ Steering knuckle
⑪ Type "T" oil seal
⑫ Type "T" oil seal
⑬ Radial ball bearing
⑭ Collar
⑮ Radial ball bearing
⑯ Spindle
⑰ Front shock absorber

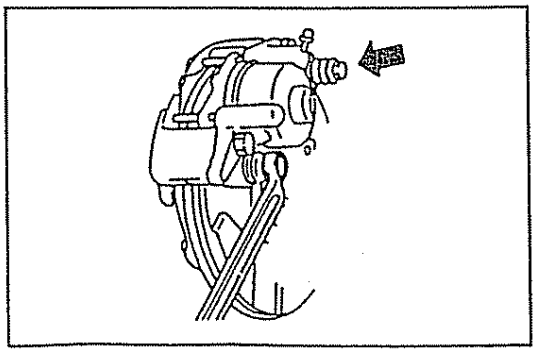
2. REMOVAL

1) Jack up the vehicle
   NOTE:
   - Be sure to support the vehicle securely with safety stands.



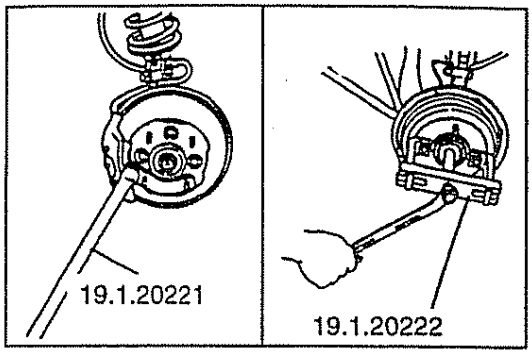
2) Remove the front wheel.

3) Disconnect the brake hose from the caliper.
4) Remove the caliper assembly by removing the two bolts.
   NOTE:
   - Be sure to cover the connection of brake hose/tube with cloth or the like so that it may not be avoided from the dust until connecting.

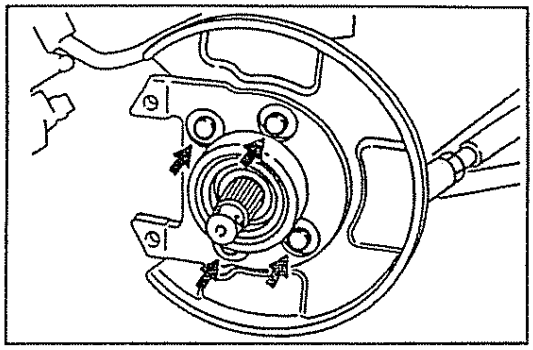


5) Disc assembly removal
   ① Remove the cotter pin
   ② Remove the castle nut using the following SST.
   SST: 19.1.20221

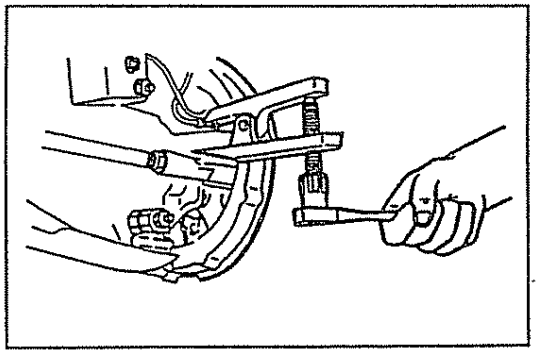
6) Remove the disc brake assembly using the following SST.
   SST: 19.1.20222



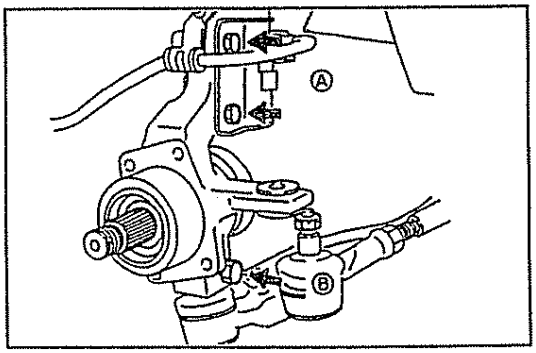
7) Remove the disc brake dust cover.



8) Remove the tie-rod end using the SST.
   SST: 19.1.20231

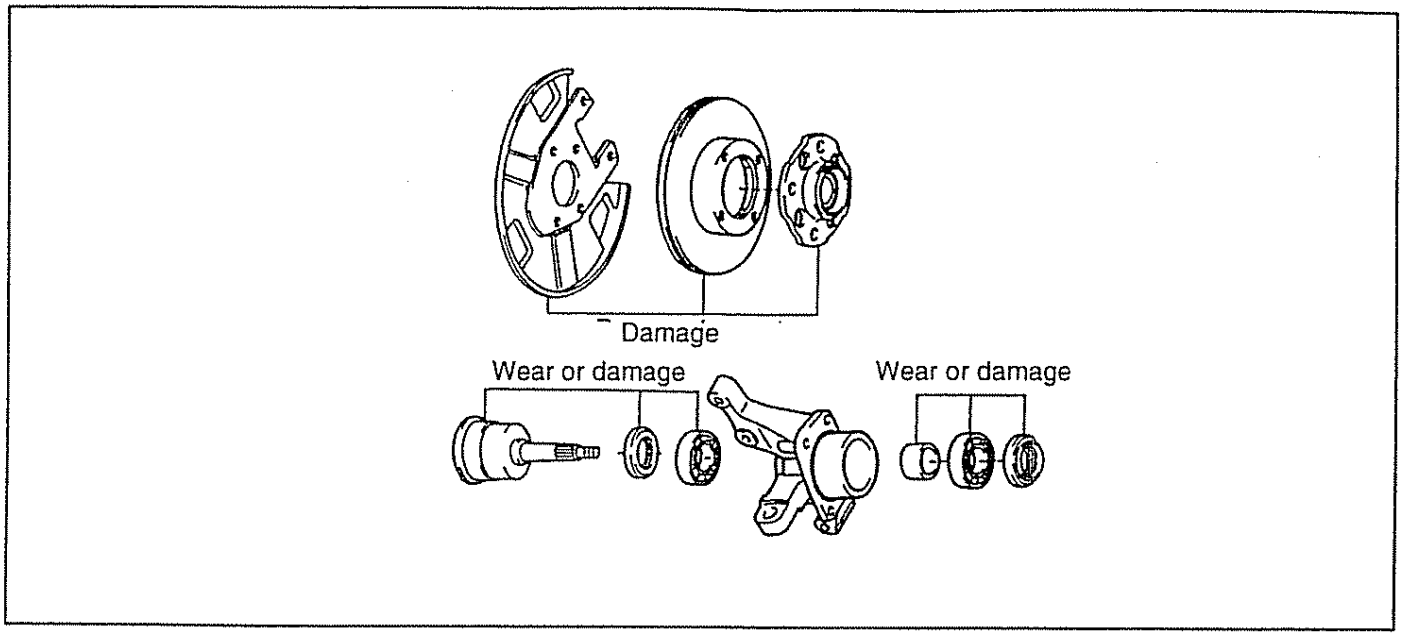


9) Remove the steering knuckle by removing the bolts Ⓐ and Ⓑ

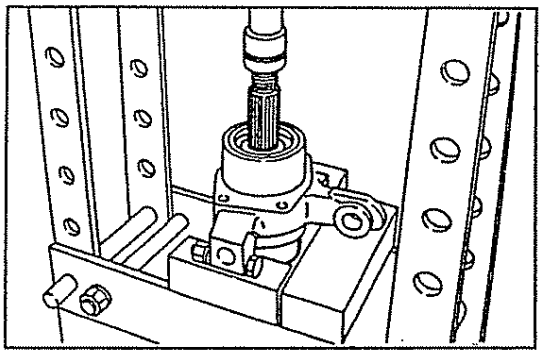


3. INSPECTION

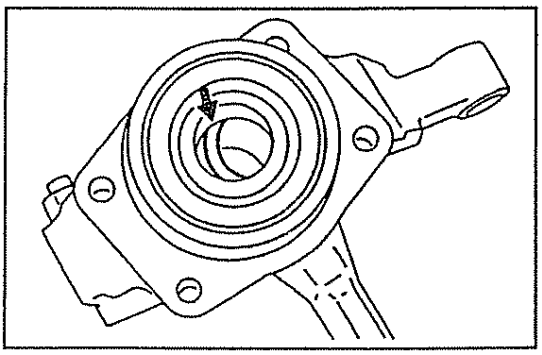
Inspect the following parts. Replace any parts which exhibit defects.



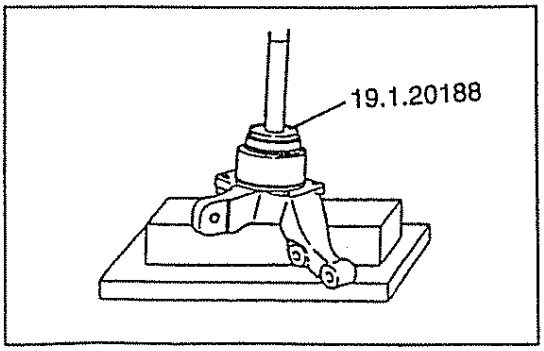
1) Replacement of front axle bearing.
   ① Remove the spindle from the knuckle using the press.



   ② Move the collar as shown in the figure. Remove the bearing by pressing the collar.

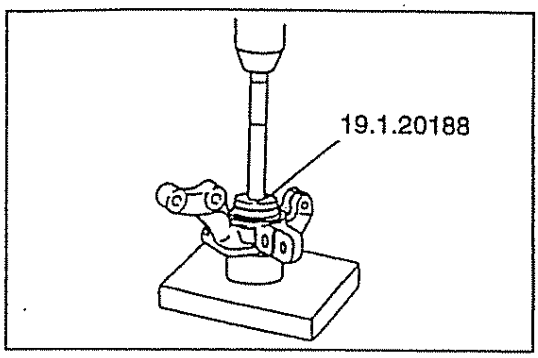


2) Front axle bearing installation.
   ① Press the radial ball bearing inner into the position using the following SST.
   SST: 19.1.20188 that is a part of the SST set.



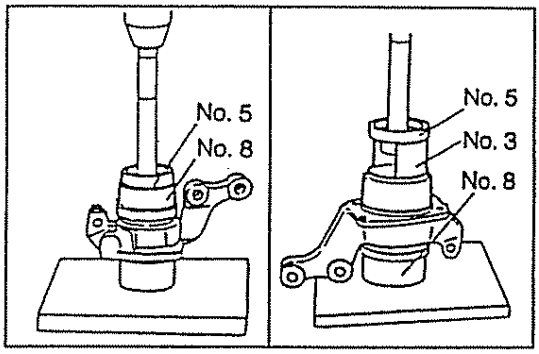
NOTE:
- Be sure to contact the bearing with the retaining section of the steering knuckle.

② Press the radial ball bearing outer into the position using the following SST.
SST: 19.1.20188

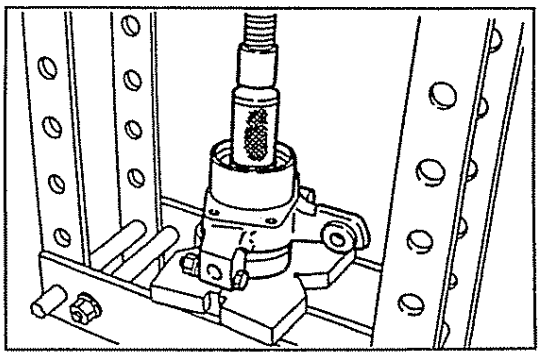


NOTE:
- Be sure to contact the bearing with the retaining section of the steering knuckle.

③ Press the Type "T" oil seal inner and outer into the position using the following SST.
SST: Use the pieces NO. 5 and N. 8 that are parts of the SST set 19.1.20223 (for inner).
SST: Use the pieces No. 3, No. 5, and No. 8 that are parts of the SST set 19.1.18119/25 (for outer).

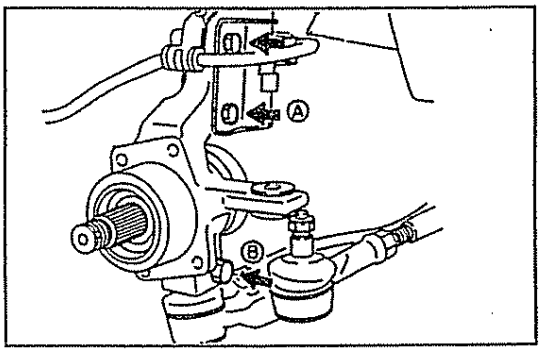


3) Press the spindle into the knuckle using the following SST: 19.1.20224



4. INSTALLATION

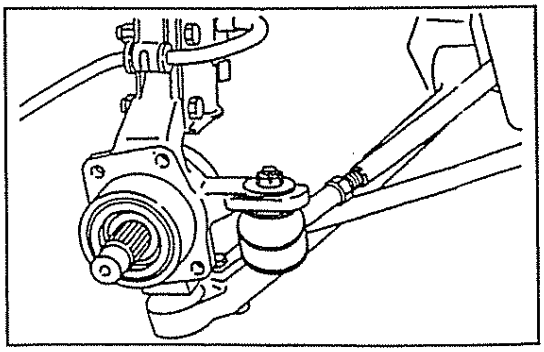
1) Install the steering knuckle.
Tightening Torque:
Ⓐ 78.5 ÷ 98.1 N·m (8.0 ÷ 10.0 kgf-m)
Ⓑ 73.5÷ 93.2 N·m (7.5 ÷ 9.5 kgf-m)



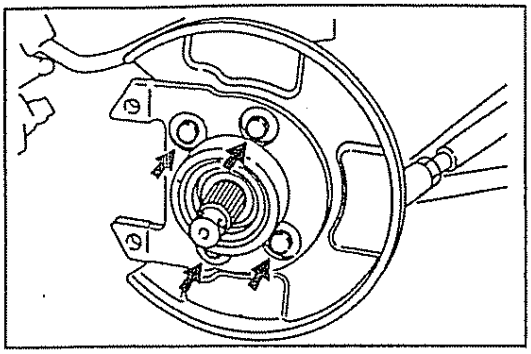
2) Install the tie-rod end to the knuckle.
Tightening Torque: 39.2 ÷ 53.9 N·m (4 ÷ 5.5 kgf-m)

NOTE:
- At this time, align the recess in the castle nut with the hole.

3) Install a new cotter pin to the castle nut.

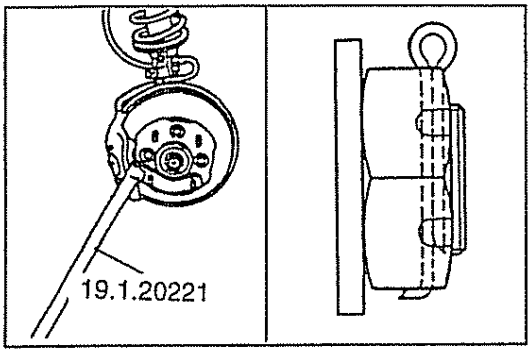


4) Install the disc brake dust cover.
   Tightening Torque: 39.2 ÷ 53.9 N·m (4.0 ÷ 5.5 kgf-m)



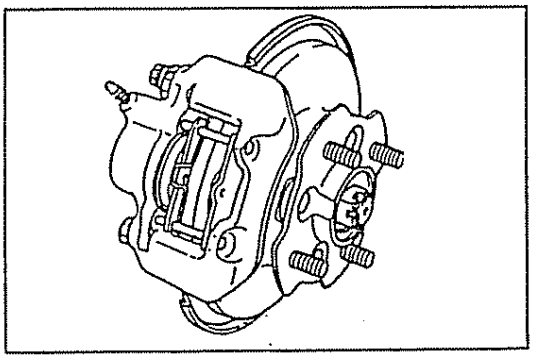
5) Install the hib and disc assembly and tighten the castle nut, using the SST 19.1.20221.
   Tightening Torque: 177 ÷ 216 N·m
   (18 ÷ 22 kgf-m, 130 ÷ 159 ft-lb)

NOTE:
- At this time, align the recess in the castle nut with the hole.



6) Install a new cotter pin to the castle nut.
7) Install the caliper assembly with the two bolts.
   Tightening Torque: 49.0 ÷ 58.8 N·m
   (5.0 ÷ 6.0 kgf-m, 36.2 ÷ 43.2 ft-lb)

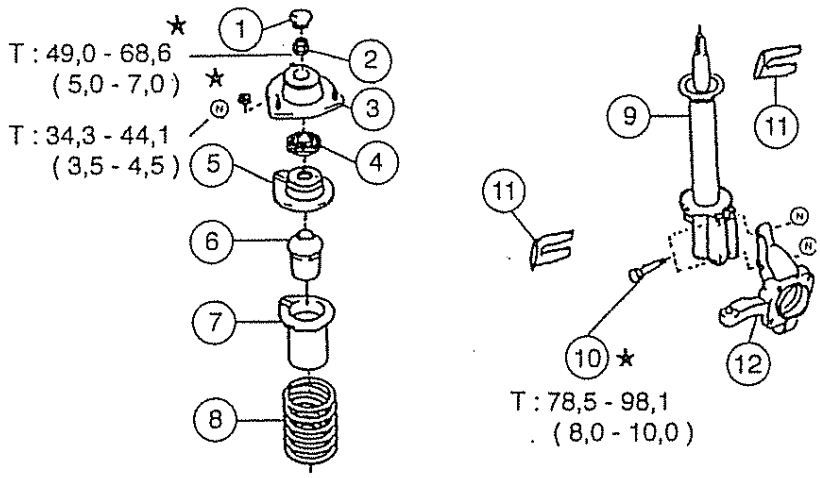
NOTE:
- At this time the boot must not be pinched.



8) Connect the brake hose to the caliper.
9) Perform the air-bleeding securely.

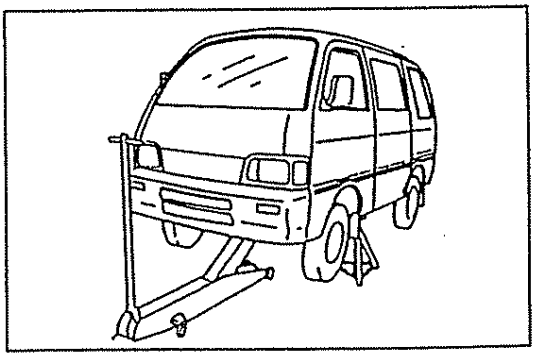
FRONT SHOCK ABSORBER AND COIL SPRING

1. COMPONENTS



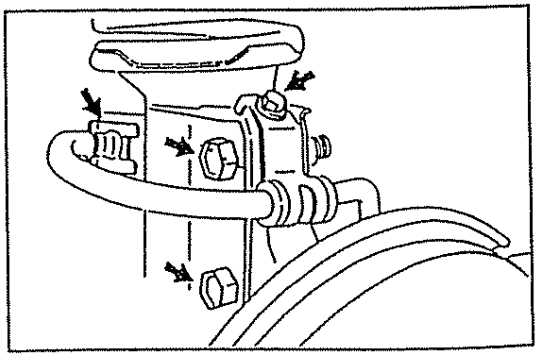
① Bearing dust cover
② Lock nut
③ Front suspension support
④ Bush
⑤ Front spring upper seat
⑥ Front seat bumper
⑦ Shock absorber dust cover
⑧ Front coil spring
⑨ Front shock absorber
⑩ Bolt
⑪ Clamp
⑫ Steering knuckle

2. REMOVAL



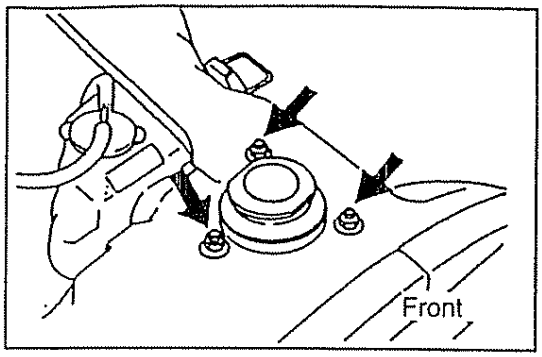
1) Jack up the vehicle.
   NOTE:
   - Be sure to support the vehicle securely with safety stands.

2) Remove the front wheel.
3) Open the front seat;



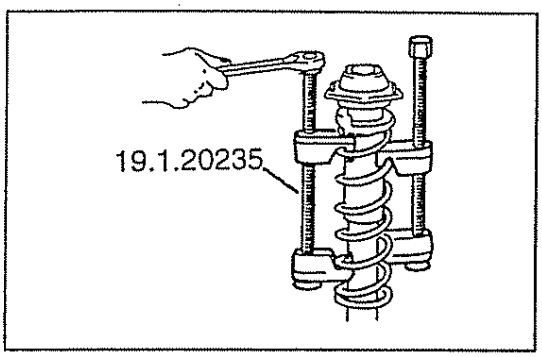
4) Detach the clamp at the shock absorber side.
5) Disconnect the brake hose from the caliper.
6) Shock absorber removal.
   ① Remove the attaching nuts. Leave the bolts in their inserted conditions.

② Remove the three attaching nuts of the suspension.
③ Remove the steering knuckle attaching bolts. Draw out the shock absorber from the body.



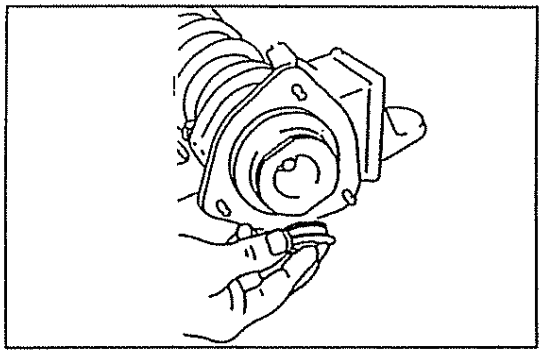
3. DISASSEMBLY

1) Compress the coil spring, using the following SST.
SST: 19.1.20235

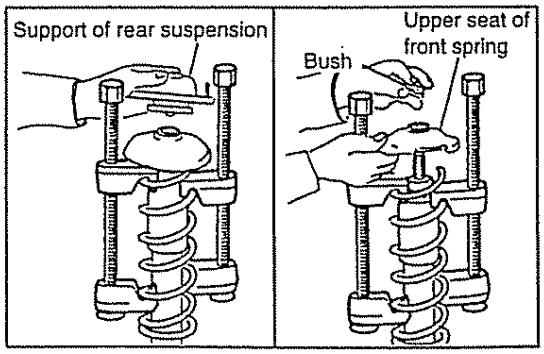


2) Coil spring disassembly
① Clamp the front suspension support in a vice.
② Remove the bearing dust cover.
③ Loosen the nut.

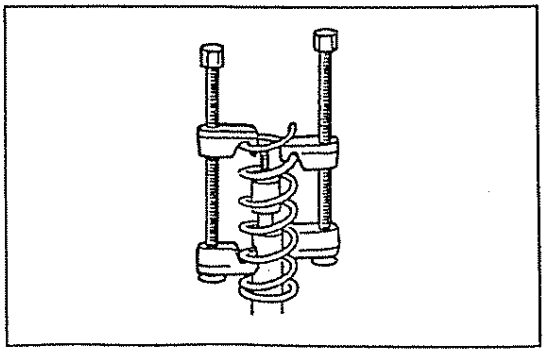
NOTE:
- Never place the nut by applying impacts on it, using an impact wrench or the like.



④ Remove the front suspension support.
⑤ Remove the bush and the front spring upper seat.

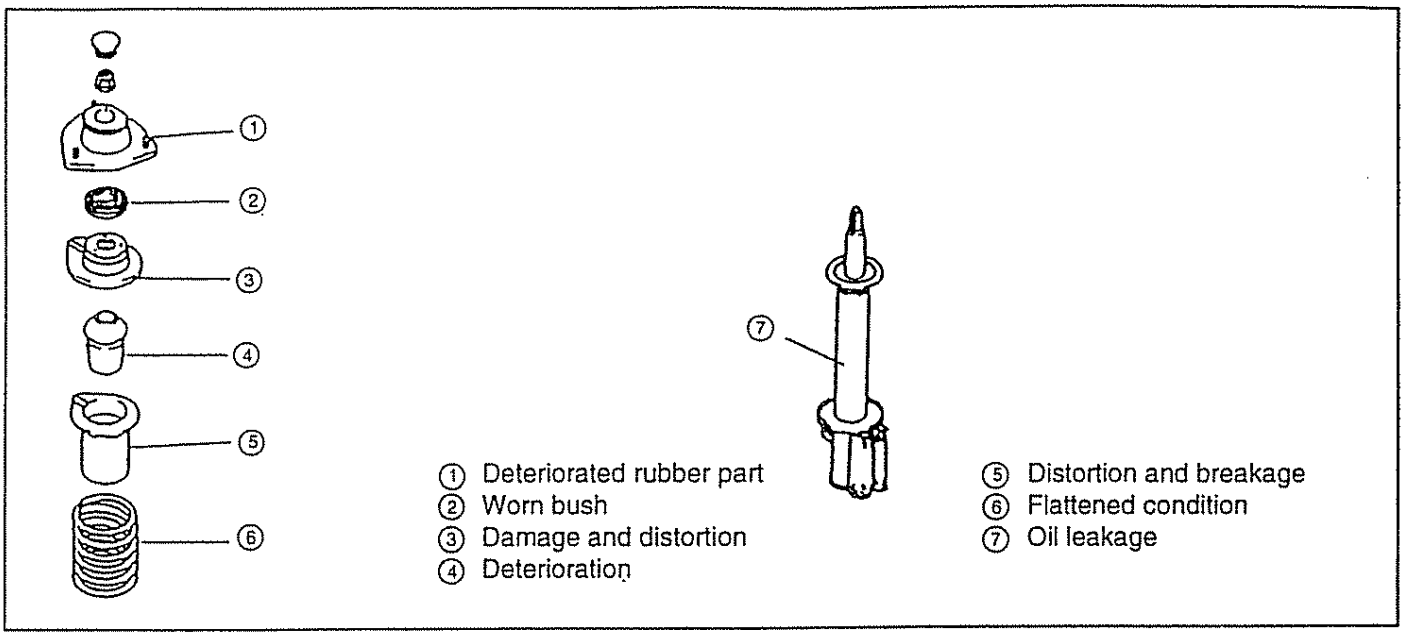


⑥ Remove the coil spring, dust cover and spring bumper.



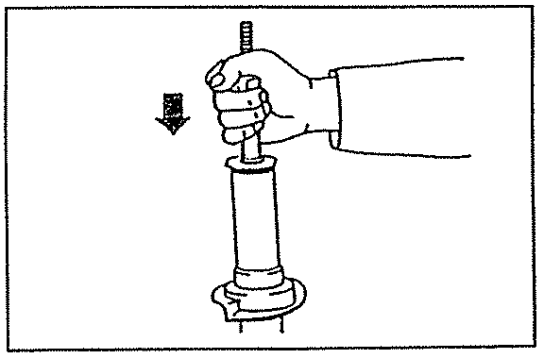
4. INSPECTION

1) Inspect the following parts.



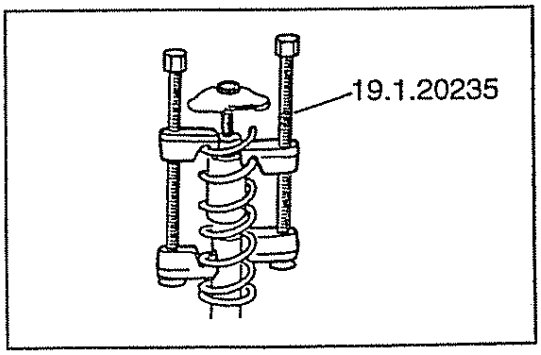
2) Shock absorber operation inspection
   ① While pushing the piston rod, check that the pull throughout the stroke is even, and there is no abnormal resistance or noise.
   ② Push the piston rod in fully and release it. Check that it returns at a constant speed throughout.
   ③ If the absorber operations is defectiv, replace the absorber, as an assembly.

   CAUTION:
   • Release the gas completely, before discarding the shock absorber.

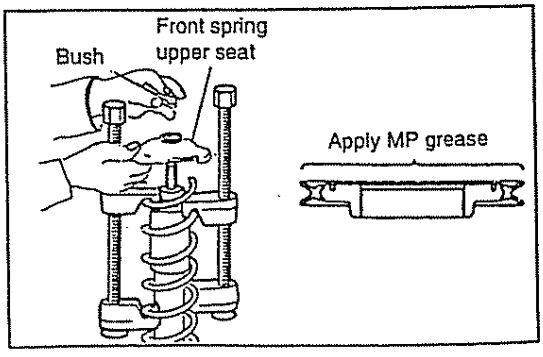


5. ASSEMBLY

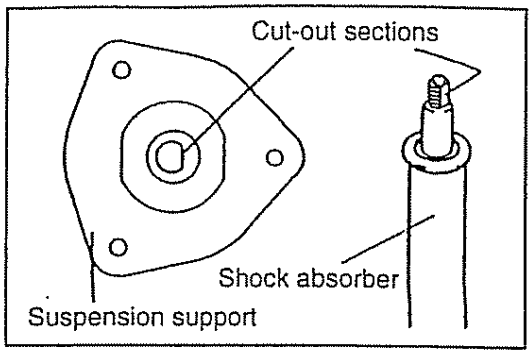
1) Insert the dust cover and spring bumper to the piston rod.
2) Compress the coil spring, using the following SST.
   SST: 19.1.20235



3) Install the spring upper seat and bush.
   NOTE:
   • Apply the 0.5 gram or more of MP grease to the upper surface of bush.

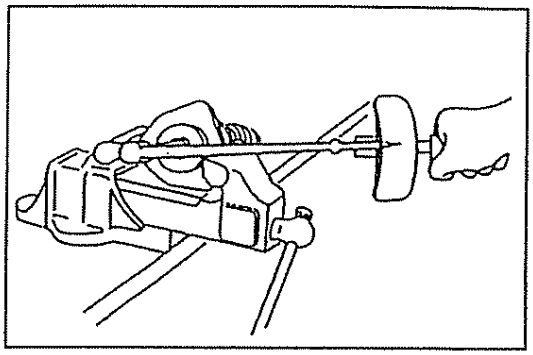


4) Install the front suspension support.
NOTE:
- Be sure to align the cut-out section of the front suspension support with that of the piston rod during assembly.

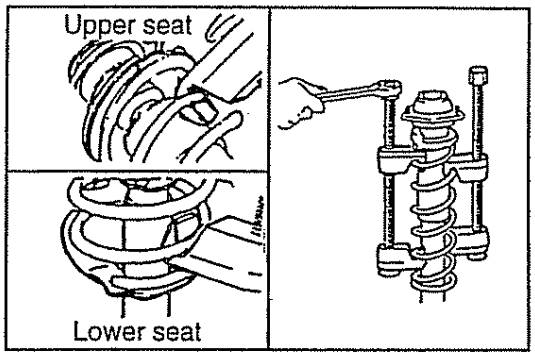


5) Temporarily tighten the nut.

6) Clamp the front suspension support in a vice. Tighten the suspension support, using a new nut.
Tightening Torque: 49.0 ÷ 68.6 N·m
(5.0 ÷ 7.0 kgf-m, 36.2 ÷ 50.6 ft-lb)

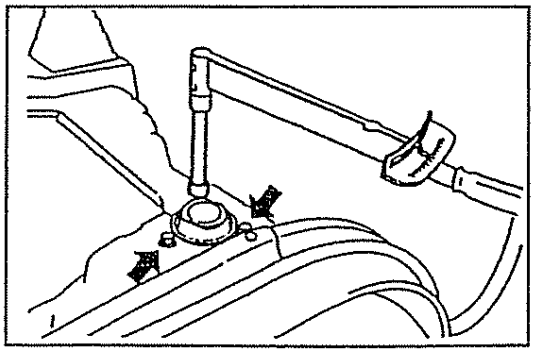


7) Install the bearing dust cover.
8) Align the coil spring end with the recessed section of the upper and lower seats. Proceed to remove the SST.

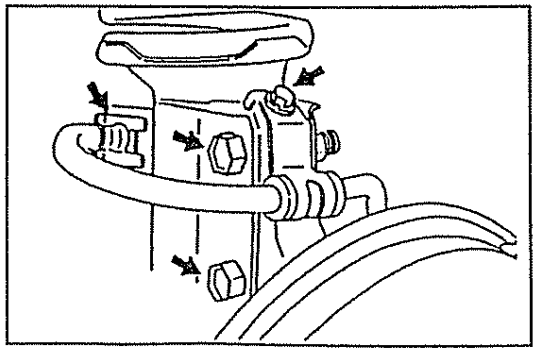


6. INSTALLATION

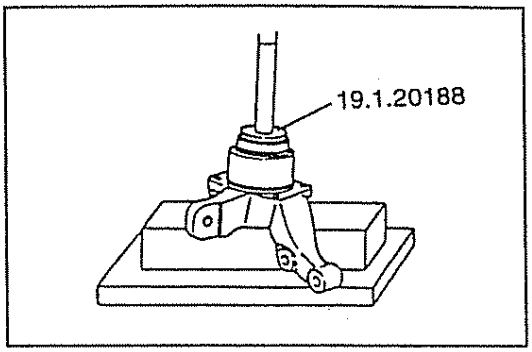
1) Install the suspension support.
(Use new nuts)
Tightening Torque: 34.3 ÷ 44.1 N·m
(3.5 ÷ 4.5 kgf-m, 25.3 ÷ 32.5 ft-lb)



2) Installation of steering knuckle section
① Mount the steering knuckle on the shock absorber lower bracket.
② Install the new bolts and the new nuts in place and temporarily tighten them.
3) Connect the brake hose to the caliper.
4) Install the clamp at the shock absorber side.
5) Perform the air bleeding securely.



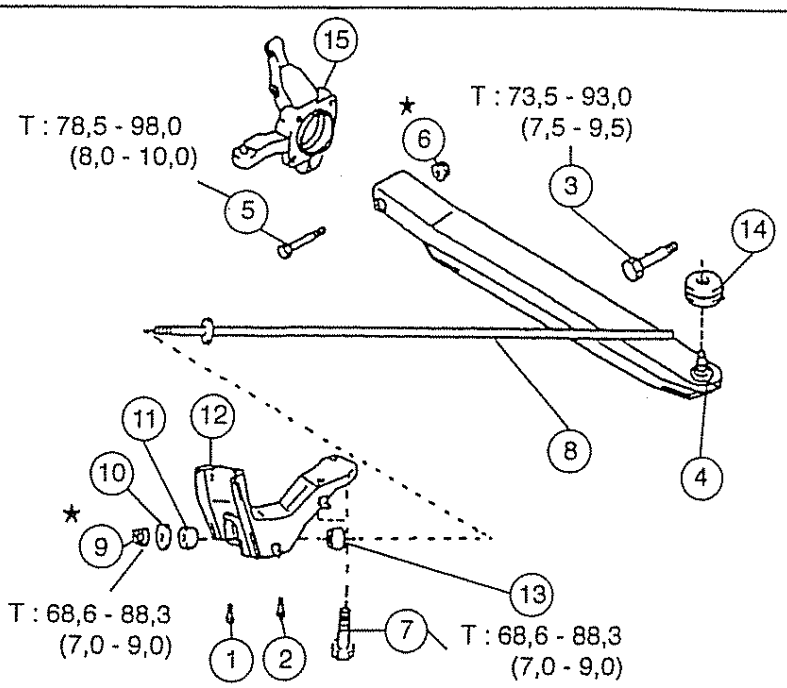
6) Rock the vehicle with unloaded state in an up-and-down direction so as to settle the suspension.



7) Proceed to tighten the following section.
   ① Bolt and nut (Shock absorber/ Steering knuckle)
   Tightening Torque: 78.5 ÷ 98.0 N·m
   (8.0 ÷ 10.0 kgf-m, 57.9 ÷ 72.3 ft-lb)

SUSPENSION LOWER ARM

1. COMPONENTS

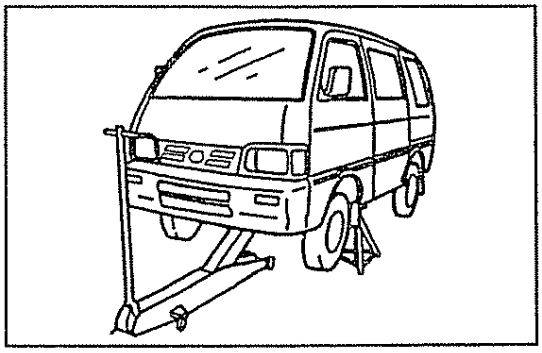


: Locking torque
Unit : Nm (kgf-m)
* : Non reusable parts

① Bolt (for clamping accelerator cable)
② Bolt (for clamping speedometer cable)
③ Nut & bolt
④ Bolt stud (not available as separate part)
⑤ Bolt
⑥ Lock nut
⑦ Hexagon bolt
⑧ Suspension lower arm subassembly
⑨ Lock nut
⑩ Plate washer
⑪ Strut bar cushion
⑫ Strut bar bracket subassembly
⑬ Strut bar cushion
⑭ Lower ball joint dust cover
⑮ Steering knuckle

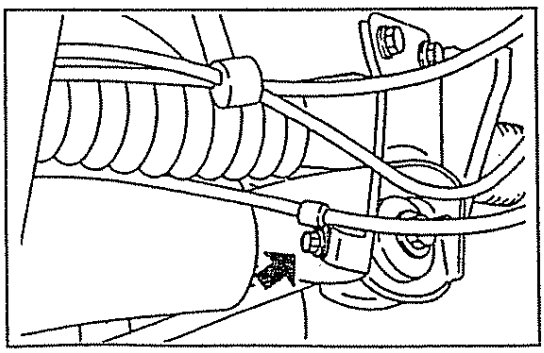
2. REMOVAL

1) Jack up the vehicle.
NOTE:
- Be sure to support the vehicle securely with safety stands.

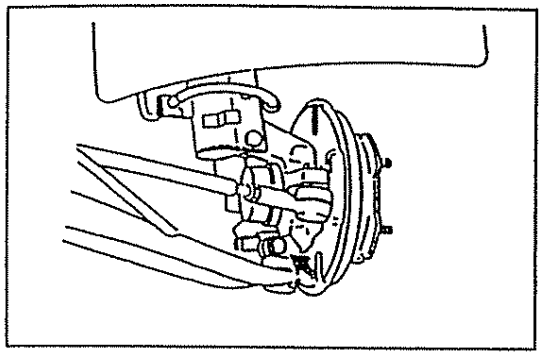


2) Remove the front wheel.

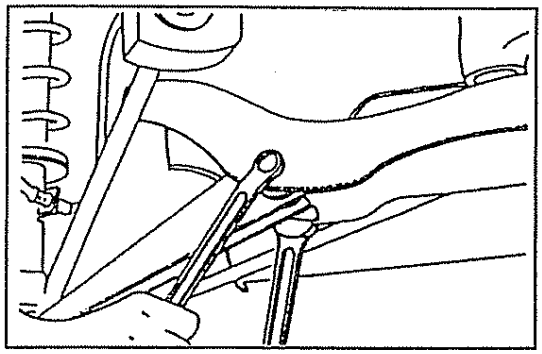
3) Remove the clutch cable clamps by removing the bolt at the underneath of strut bar bracket subassembly.



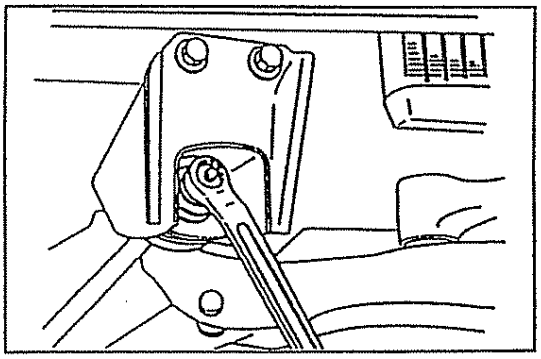
4) Suspension lower arm subassembly removal
   ① Remove the bolt and nut attaching to the steering knuckle.
   ② Detach the suspension lower arm subassembly from the steering knuckle.



   ③ Remove the suspension lower arm subassembly by removing the bolt and lock nut at the cross member.

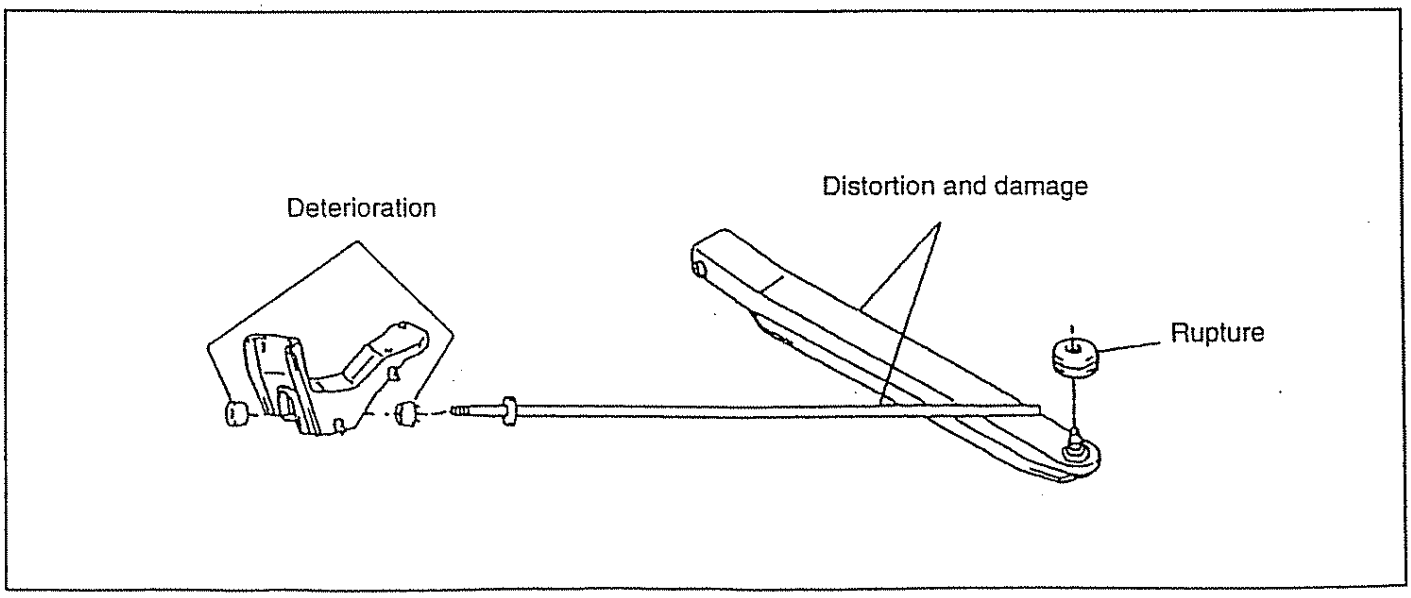


   ④ Remove the suspension lower arm subassembly by removing the lock nut at the strut bar bracket.
   ⑤ Remove the suspension lower arm subassembly from the vehicle



8) Remove the strut bar bracket subassembly by removing the four hexagon bolts.

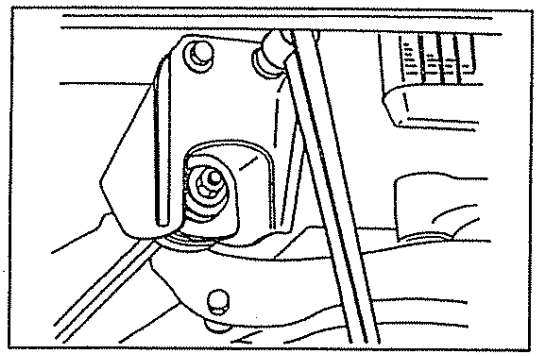
3. INSPECTION



4. INSTALLATION

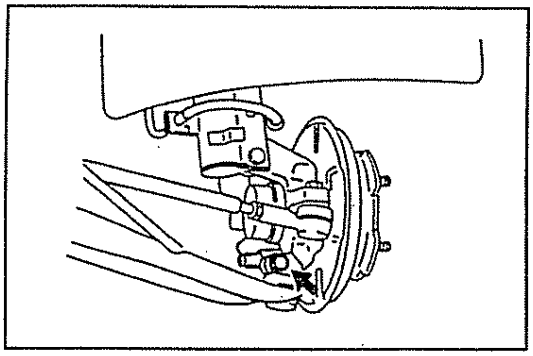
1) Insert the strut bar cushion to the suspension lower arm subassembly;
2) Temporarily install the strut bar bracket subassembly to the body
3) Install the strut bar cushion, plate washer to the strut bar bracket subassembly and temporarily tighten the lock nut.

4) Install the strut bar bracket subassembly with the four hexagon bolts.
   Tightening Torque: 68.6 ÷ 88.3 N·m
   (7.0 ÷ 9.0 kgf-m, 50.6 ÷ 65. ft-lb)

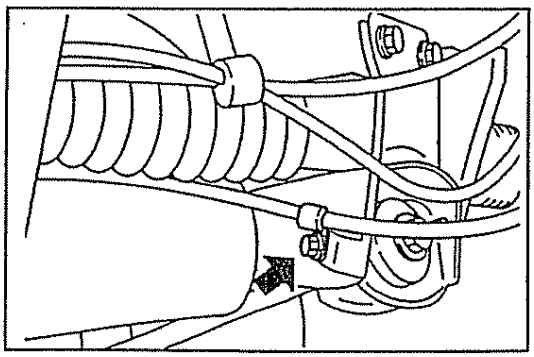


5) Attach the stud ball to the steering knuckle and insert the bolt.
   NOTE:
   - Make sure that no grease or oil etc. gets to the stud ball attaching bolt and nut.

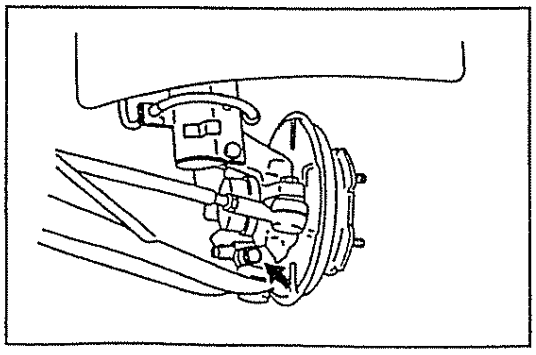
6) Temporarily install the bolt and lock nut.



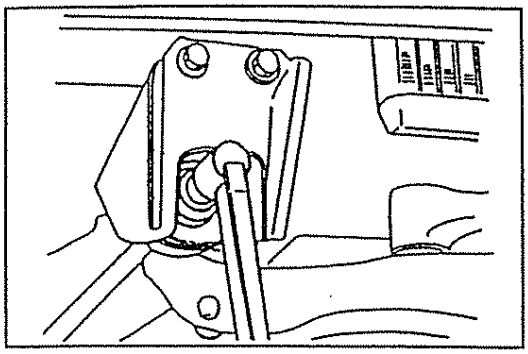
7) Install the clutch cable clamps with the bolt.
8) Install the front wheel.



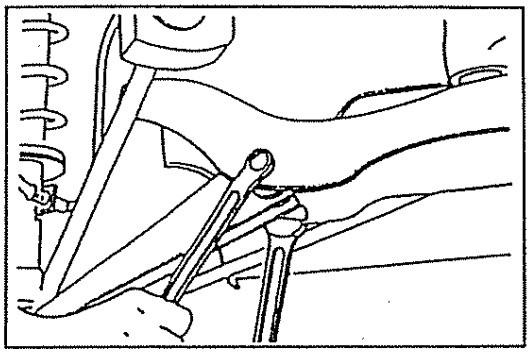
9) Jack down the vehicle. Rock the vehicle with unloaded state in an up-and-down direction so as to settle the suspension. With the vehicle in an unloaded state (lower arm is horizontal), tighten the following sections.
10) Proceed to tighten the following section.
    ① Bolt and nut (Suspension lower arm x Steering knuckle)
    Tightening Torque: 73. 5 ÷ 93.2 N·m
    (7.5 ÷ 9.5 kgf-m, 54.2 ÷ 68.7 ft-lb)



② Lock nut (Suspension lower arm/ Strut bar bracket subassembly).
Tightening Torque: 68.6÷ 88.3 N·m
(7.0 ÷ 9.0 kgf-m, 50.6 ÷ 65.1 ft-lb)



③ Bolt and nut (Suspension lower arm subassembly/ Cross member)
Tightening Torque: 78.5 ÷ 98.0 N·m
(8.0 ÷ 10.0 kgf-m, 57.9 ÷ 72.3 ft-lb)



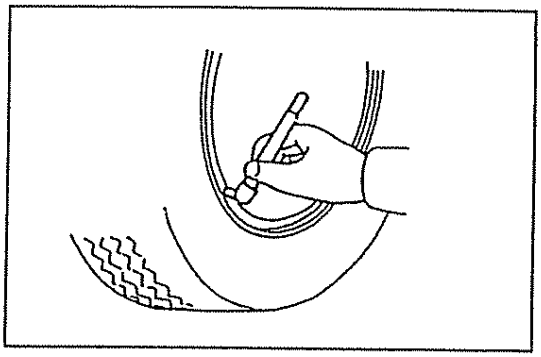
11) Front wheel alignement adjustement and inspection.

FRONT WHEEL ALIGNMENT

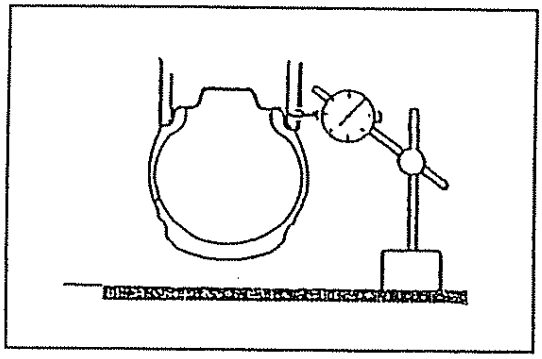
	Shape	Nomenclature	Use
Tools		CCK gauge compensator (CCK-IN) Supplied by Banzal, Ltd.	Attachment for camber, caster and kingpin gauge
	Brake pusher hexagon wrench key (width across flats: 8 mm)		
Instruments	Turning radius gauge, tire pressure, camber, caster, kingpin gauge and dial gauge		

CHECKS PRIOR TO WHEEL ALIGNMENT MEASUREMENT

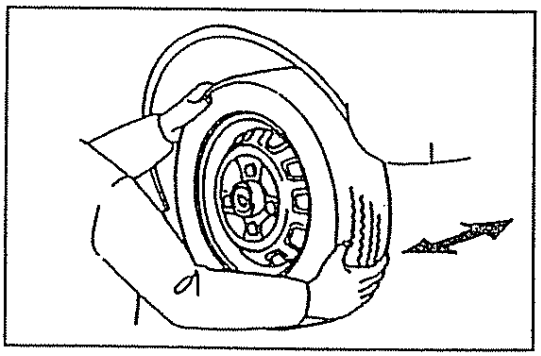
1) Check of tires of wear
2) Check of tires for correct air pressure



3) Check of bolts of related sections for tightened condition

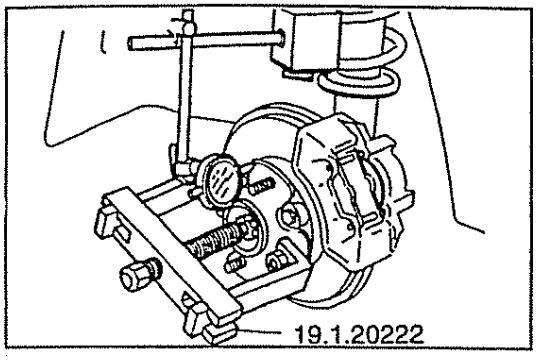


4) Check of related sections for excessive amount of play
   ① Jack up the vehicle. Alternately push and pull the upper and lower parts of each tire. Ensure that the tire exhibits no eccessive play.
   ② If the tire exhibits excessive amount of play, perform the following check while the brake pedal is being depressed.
   - The excessive amount of play disappears: This indicates that the front wheel bearing is loose
   - The excessive amount of play still persists: This indicates that the knuckle section, axle car rier section or suspension is loose.



③ If the wheel bearing is judged as being loose, proceed to check the play in the axial direction, using the following SST and a dial gauge.
SST: 19.1.20222

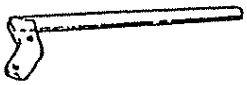
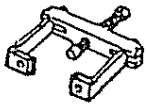
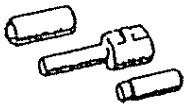
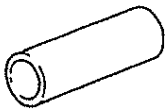
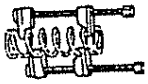
(Front wheel bearings)
Specified Value
Maximum Limit: Not to exceed 0.05 mm (0.002 inch)



Wheel alignment specified values

Item			2WD
Front wheel alignment	Camber angle		1° $^{+40'}_{-50}$
	Caster angle		3°02' ± 1°
	Kingpin angle		11°25' ± 1°
	Toe-in mm (inch)		-2.0 $^{+1}_{0}$
	Wheel turning angle	Inner	36° $^{+0°}_{-3°}$
		Outer	34.8° $^{+0°}_{-3°}$

SST

Figure	Part number	Part name
	19.1.20221	Brake drum stopper
	19.1.20222	Front hub & drum puller
	19.1.20188	Axle hub & drive pinion bearing tool set
	19.1.20231	Tie-rod end puller
	19.1.20190	Camber caster gauge attachment
	19.1.20223	Front suspension arm bush remover & replacer
	19.1.20224	Front coil spring compressor
	19.1.20235	Remover & replacer, connecting rod bush

TIGHTENING TORQUES

Tightening components	Tightening torque	
	N·m	kgf-m
Front axle hub x Castle nut	177.0 ÷ 216.0	18.0 ÷ 22.0
Suspension lower arm x Strut bar bracket	68.6 ÷ 88.3	7.0 ÷ 9.0
Suspension lower arm X Cross member	78.5 ÷ 98.0	8.0 ÷ 10.0
Strut bar bracket x Body	68.6 ÷ 88.3	7.0 ÷ 9.0
Steering knuckle x Suspension lower arm	73.5 ÷ 93.2	7.5 ÷ 9.5
Steering knuckle x Tie-rod end	39.2 ÷ 53.9	4.0 ÷ 5.5
Steering knuckle x Brake dust cover	39.2 ÷ 53.9	4.0 ÷ 5.5
Front shock absorber x Steering knuckle	78.5 ÷ 98.1	8.0 ÷ 10.0
Front suspension support x Shock absorber	49.0 ÷ 68.6	5.0 ÷ 7.0

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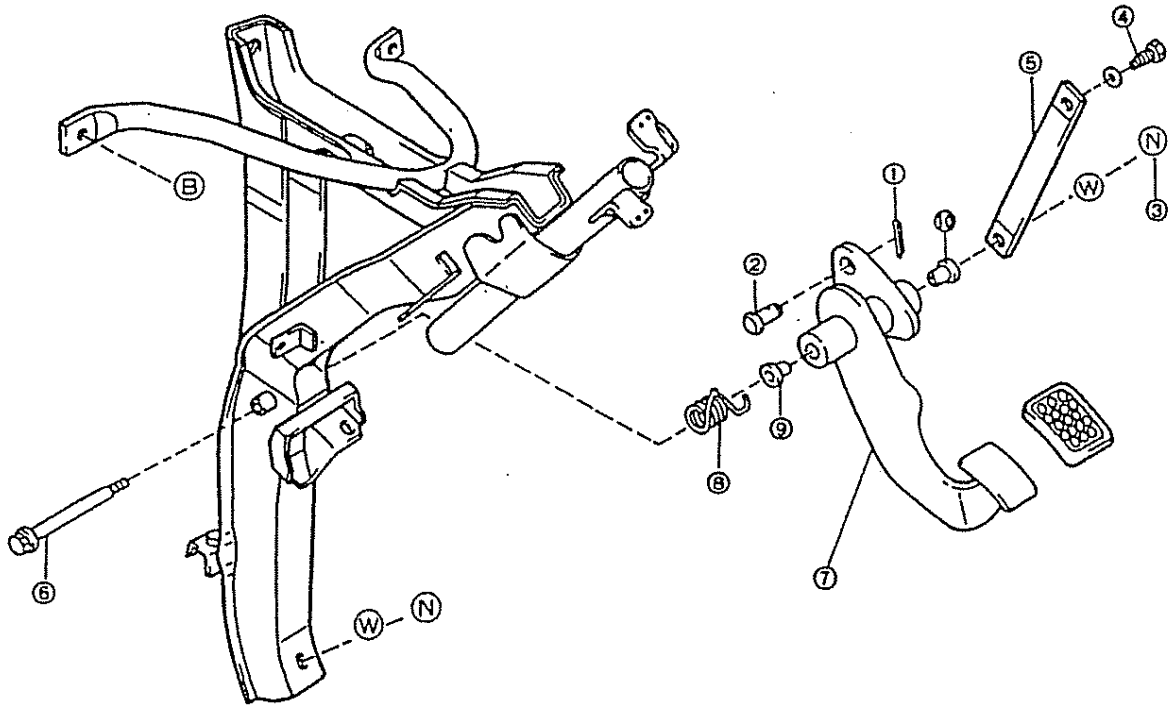
BRAKE

BRAKE PEDAL

1. REMOVAL

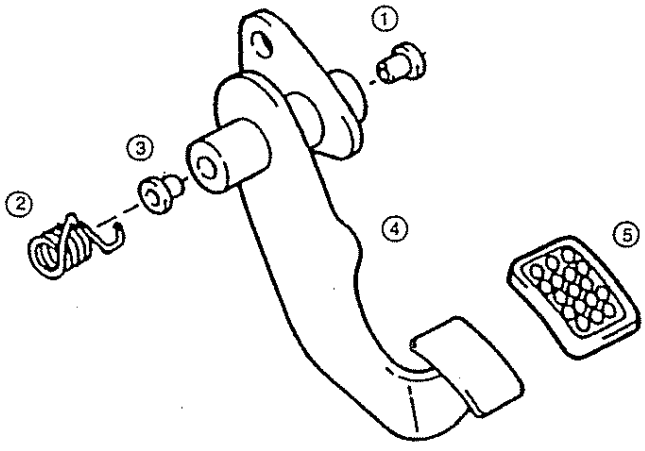
Remove the parts in the numerical order shown in the figure below.



① Cotter pin
② Pin with ball
③ Nut
④ Bolt
⑤ Pedal shaft lock plate
⑥ Pedal shaft
⑦ Brake pedal
⑧ Spring
⑨ Bush
⑩ Bush

2. INSPECTION AND REPAIRS

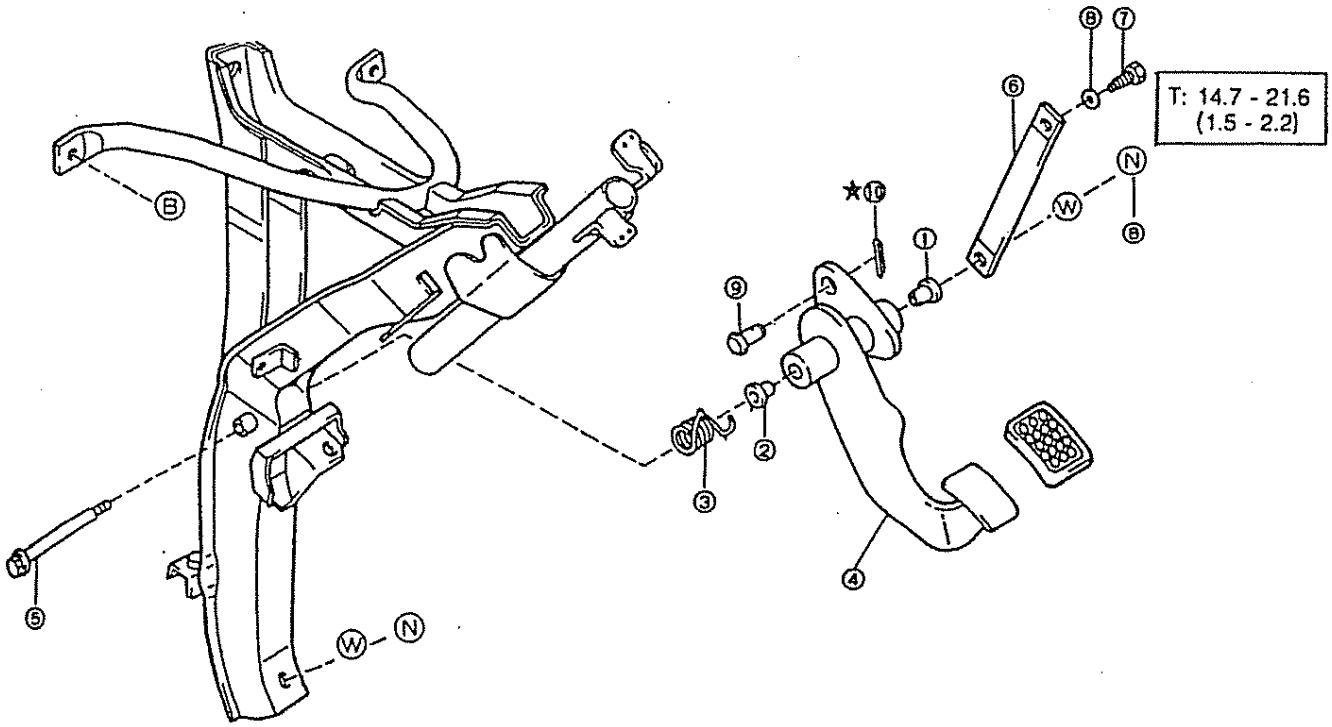
Inspect the following parts. Replace any parts which exhibit defects.



① Wear
② Flattened condition
③ Wear
④ Bend and twist
⑤ Wear

3. INSTALLATION

Install the parts in the numerical order shown in the figure below.



T : Tightening torque
Unit : N·m kgf-m, ft-lb)
*** : Non- reusable parts**

① Bush
② Bush
③ Spring
④ Brake pedal assembly
⑤ Pedal shaft
⑥ Pedal shaft lock plate
⑦ Bolt
⑧ Nut
⑨ Pin with ball
⑩ Cotter pin

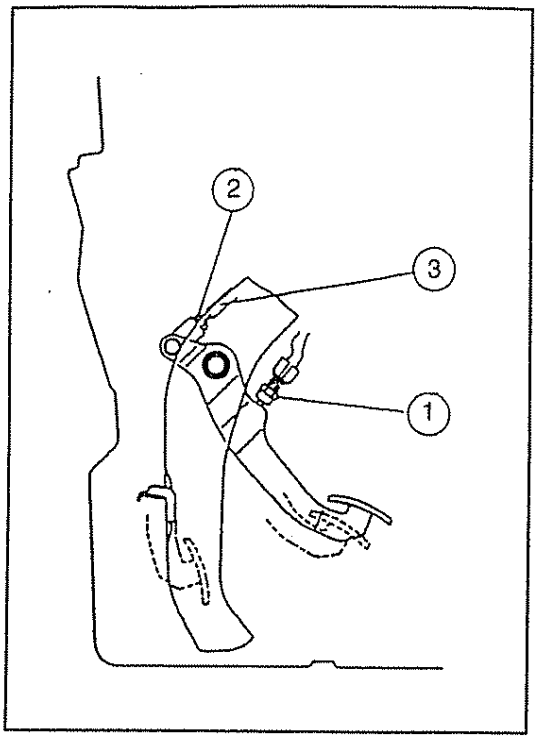
Specified values

Item		Specified value
Pedal height	mm	132 ÷ 142
Pedal free travel	mm	2 ÷ 7
Pedal reserve travel		Not less than 85 mm [When pedal applying force is 30 kg]

4. ADJUSTEMENT

Pedal height adjustement

1) Remove the pin of the push rod clevis.
2) Disconnect the connector of the stop lamp switch. Slacken the nut ①and turn the switch so that the pedal height is adjusted to the specification.
   Then lock the nut ①.
3) Slacken the nut ② and turn the push rod ③to align the clevis with the pin hole. Install the pin.
4) Adjust the pedal free travel and lock the nut ②.
5) After the adjustement has been completed, make sure that the stop lamp functions properly.



Pedal free travel adjustement

1) Slacken the nut ② and turn the push rod ③ to adjust the pedal free travel.
2) After the adjustement has been completed, make sure that the pedal height is the specified value and that the stop lamp functions preperly.

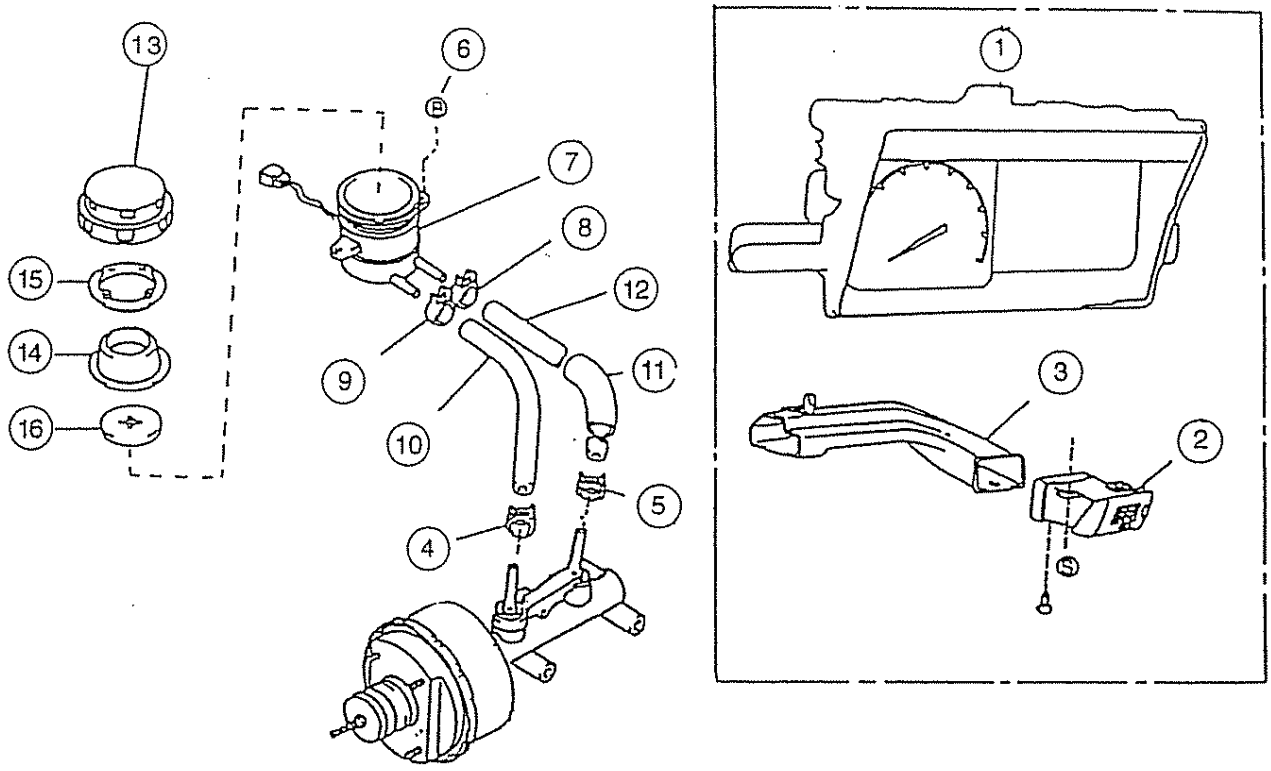
Brake pedal reserve travel adjustement

1) Run the engine at the idling speed.
2) With the parking brake lever in its returned state, depress the brake pedal with a pedal applying force of 30 kg. Then measure the distance between the stopped brake pedal and the front panel.
   Specified Value: Not less than 85 mm

BRAKE RESERVOIR

1. REMOVAL

Remove the parts in the numerical order shown in the figure below.



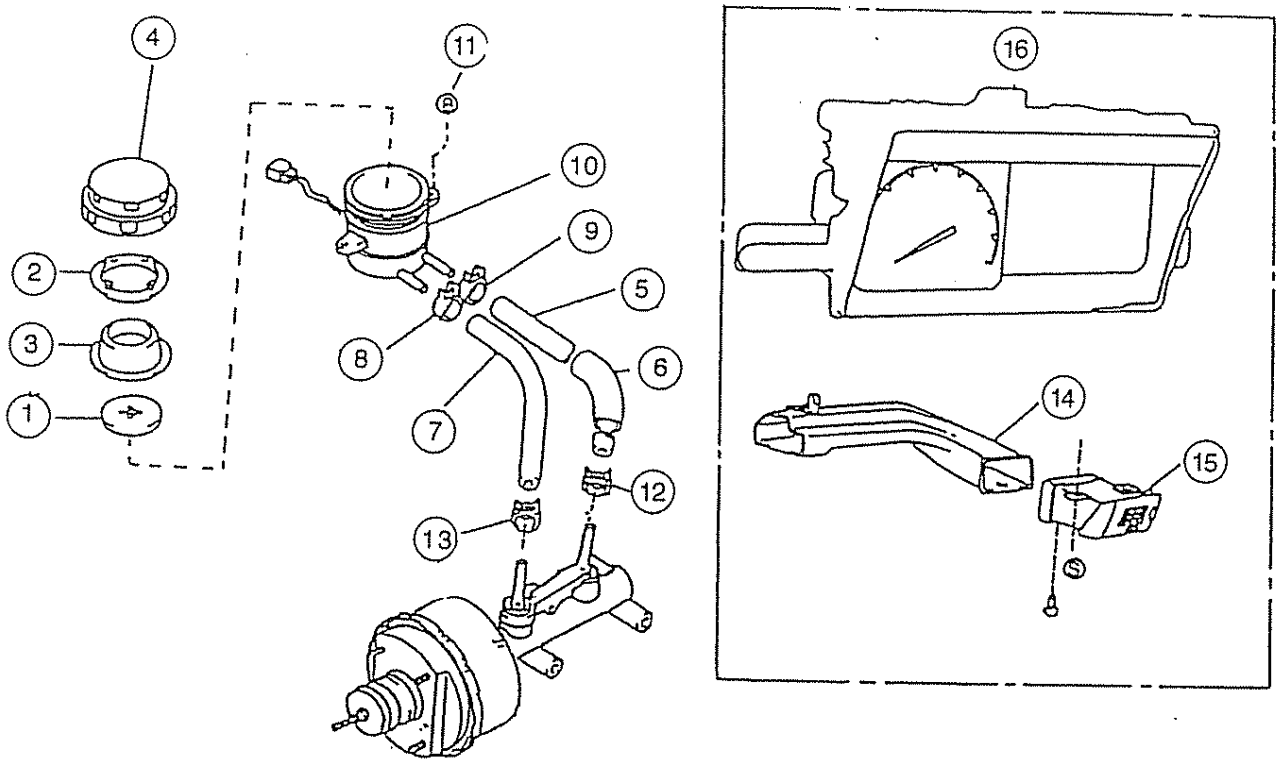
① Combination meter assembly
② Instrument panel No. 1 register subassembly
③ Heater to resistor No. 4 duct subassembly
④ Clip
⑤ Clip
⑥ Bolt
⑦ Master cylinder reservoir assembly
⑧ Clip
⑨ Clip
⑩ Reservoir tube
⑪ Hose
⑫ Reservoir No. 2 tube
⑬ Reservoir cap
⑭ Reservoir diaphragm
⑮ Spacer
⑯ Master cylinder reservoir float

NOTE:

- **The installation and removal of the master cylinder reservoir assembly are performed, working from the lower side of the instrument panel.**

2. INSTALLATION

Install the parts in the numerical order shown in the figure below.



① Master cylinder reservoir float
② Spacer
③ Reservoir diaphgram
④ Reservoir cap
⑤ Reservoir No. 2 tube
⑥ Hose
⑦ Reservoir tube
⑧ Clip
⑨ Clip
⑩ Master cylinder reservoir assembly
⑪ Bolt
⑫ Clip
⑬ Clip
⑭ Heater to resistor No. 4 duct subassembly
⑮ Instrument panel No. 1 register subassembly
⑯ Combination meter assembly

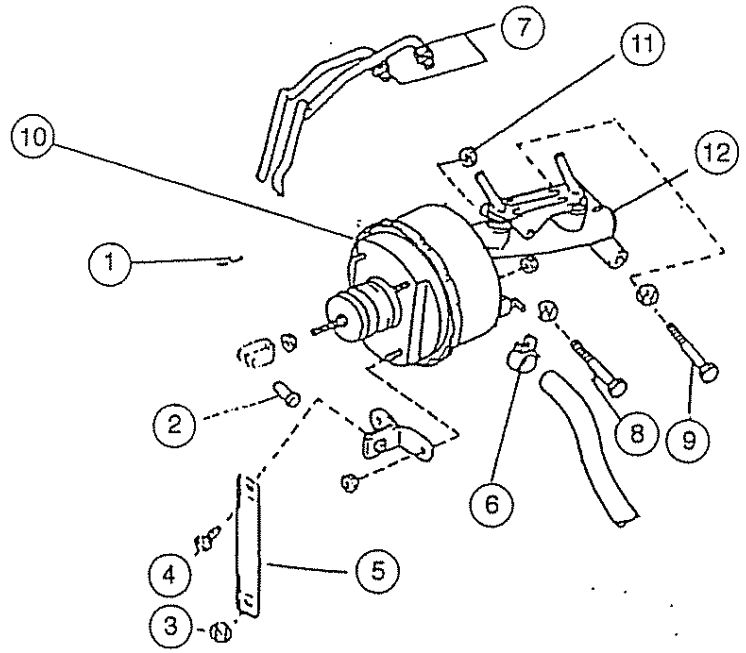
NOTE:

- **The installation and removal of the master cylinder reservoir assembly are performed, working from the lower side of the instrument panel.**

BRAKE MASTER CYLINDER

1. REMOVAL

Remove the parts in the numerical order shown in the figure below.



① Cotter pin
② Pin with ball
③ Nut
④ Bolt
⑤ Pedal shaft lock plate
⑥ Clip
⑦ Brake tube union nut
⑧ Hexagon bolt
⑨ hexagon bolt
⑩ Cylinder/booster
⑪ Nut
⑫ Brake master cylinder assembly

2. BOOSTER CHECK PROCEDURE AFTER INSTALLATION

Simple booster check

1. Booster air-tight performance ..... Requirements: After stopping the engine depress the brake pedal several times. The brake pedal position should become higher progressively at the second and third applications than the original height.

2. Booster operation ..... Requirements: Start the engine while depressing the brake pedal. The brake pedal should move in slightly during the engine starting period.

3. Booster air-tight performance under loaded state ..... Requirements: After shopping the engine, the brake pedal height should indicate no change.

Booster does not conform to requirements.

Booster check using tester

4. Connection of booster tester

5. Booster air-tight performance ..... Requirements: After stopping the engine, the negative pressure should not show any drop for 15 seconds.

6. Booster air-tight performance under loaded state ..... Requirements: After shopping the engine, the brake pedal height should indicate no change.

7. No-boosting operation ..... Requirements:

Brake pedal applying force	Hydraulic pressure
10 kg	3.13 MPa
30 kg	3.07 MPa

8. Boosting operation ..... Requirements: Vacuum 59.9 kPA

Brake pedal applying force	Hydraulic pressure
5 kg	568.7 kPa
10 kg	1.81 MPa
15 kg	3.05 MPa
20 kg	4.3 MPa

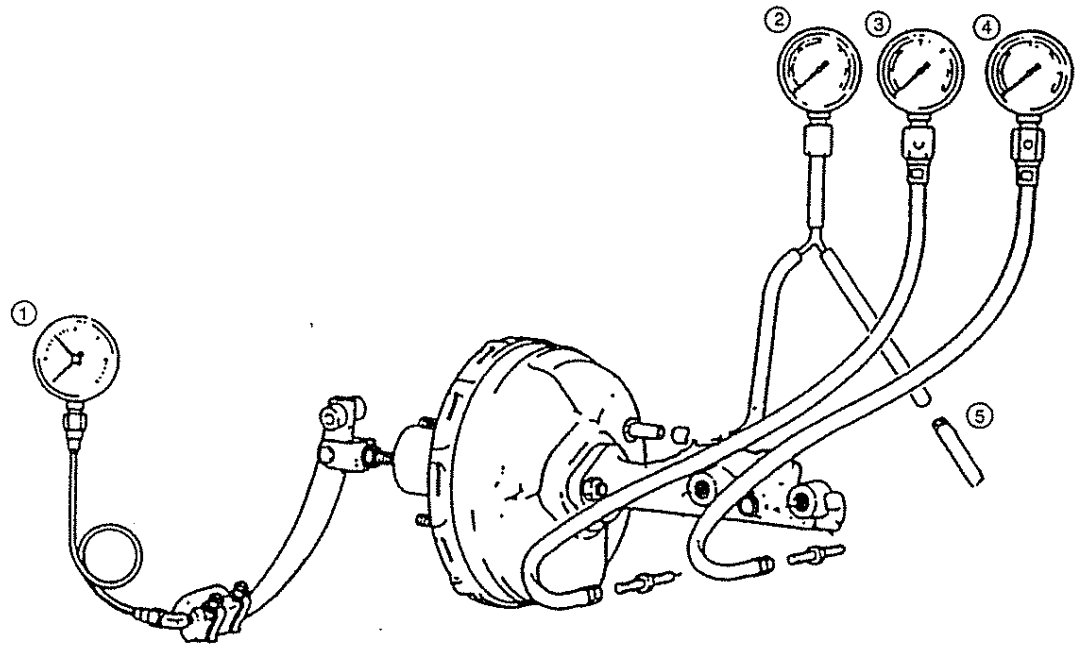
: As for those items enclosed by heavy lines, the main points of their operations are described in the main text.

1) **Booster air-tight performance check**
Start the engine. After running the engine for one to two minutes, stop the engine. Depress the brake pedal several times, applying a force which would be used during normal brake application. If the brake pedal's position rises progressively at the second and third applications and so on, it indicates that the brake booster is functioning properly.
NOTE:
- Intervals between the first and second applications as well as between the second and third applications should be at least five seconds.

2) **Booster operation check**
With the engine stopped, depress the brake pedal several times, applying the nearly same force at each brake application. Then start the engine while depressing the brake pedal. If the brake pedal moves in slightly, it indicates that the booster is functioning properly.

3) **Booster air-tight performance check under loaded condition**
With the engine running, depress the brake pedal. While maintaining this condition, stop the engine. If the brake pedal height remains at the same level at least for a period of 30 seconds, it indicates that the booster is functioning properly.

4) **Connection of booster tester**
Connect the booster tester as indicated in the figure. Carry out air bleeding operation of the booster tester. Then conduct the following checks listed below.



① Pedal applying force meter
② Vacuum hose
③ Pressure gauge
④ Pressure gauge
⑤ Negative pressure gauge

5) **Booster air-tight performance check**
Start the engine. When the negative pressure gauge registers about 500 mmHg, stop the engine. Then proceed to check the booster air-tightness.

6) **Booster air-tight performance check under loaded condition**
With the engine running, depress the brake pedal with a pedal applying force of 20 kg. Stop the engine when the negative pressure gauge registers about 500 mmHg. Then proceed to check the booster air-tightness..

7) **No-boosting operation check**
With the engine stopped, set the reading of the negative pressure gauge to zero. Under this condition check the relationship between the pedal applying force and the hydraulic pressure.

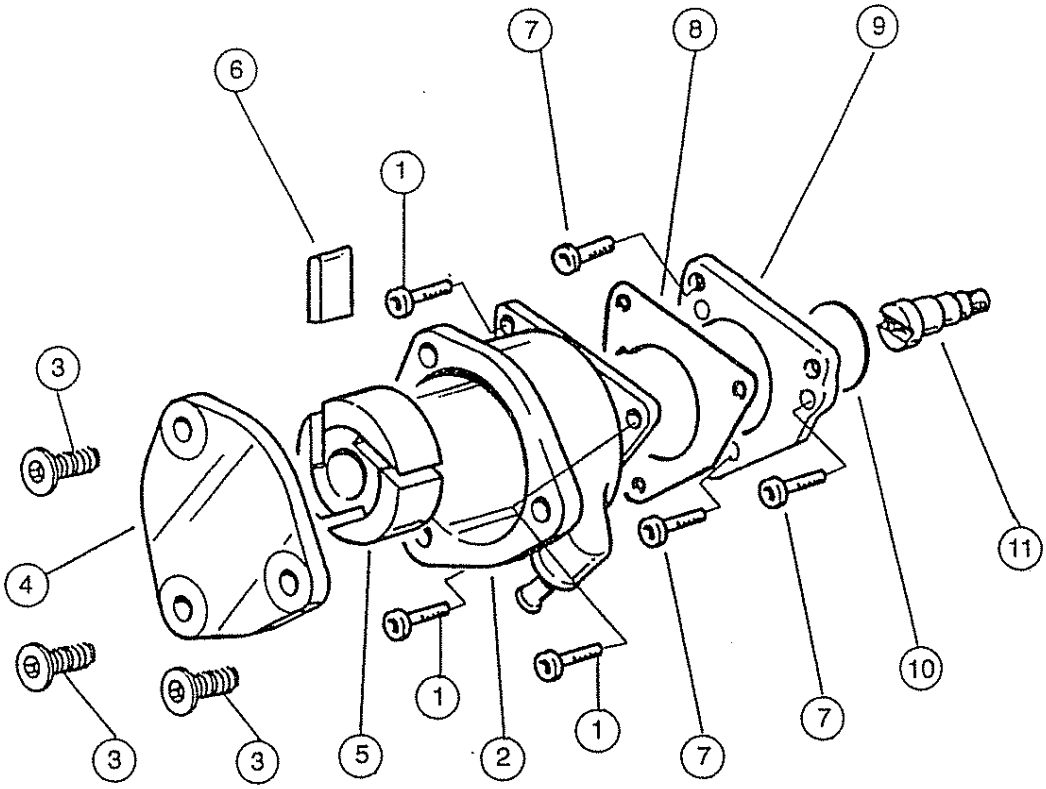
8) **Boosting operation check**
With the engine running, set the reading of the negative pressure gauge to about 500 mmHg. Under this condition depress the brake pedal. Then check the relationship between the pedal applying force and the hydraulic pressure.

VACUUM PUMP

1. DISASSEMBLY

Disassemble as shown in the figure below.

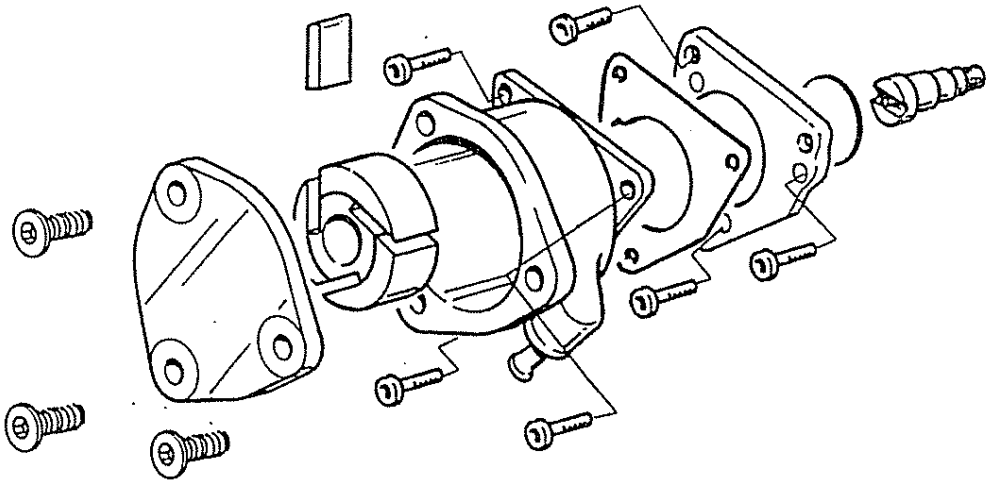
Vacuum pump (exploded view)



① Screw
② Vacuum pump
③ Screw
④ Pump cover
⑤ Rotor
⑥ Blade
⑦ Screw
⑧ Joint
⑨ Flange
⑩ O-ring
⑪ Drive

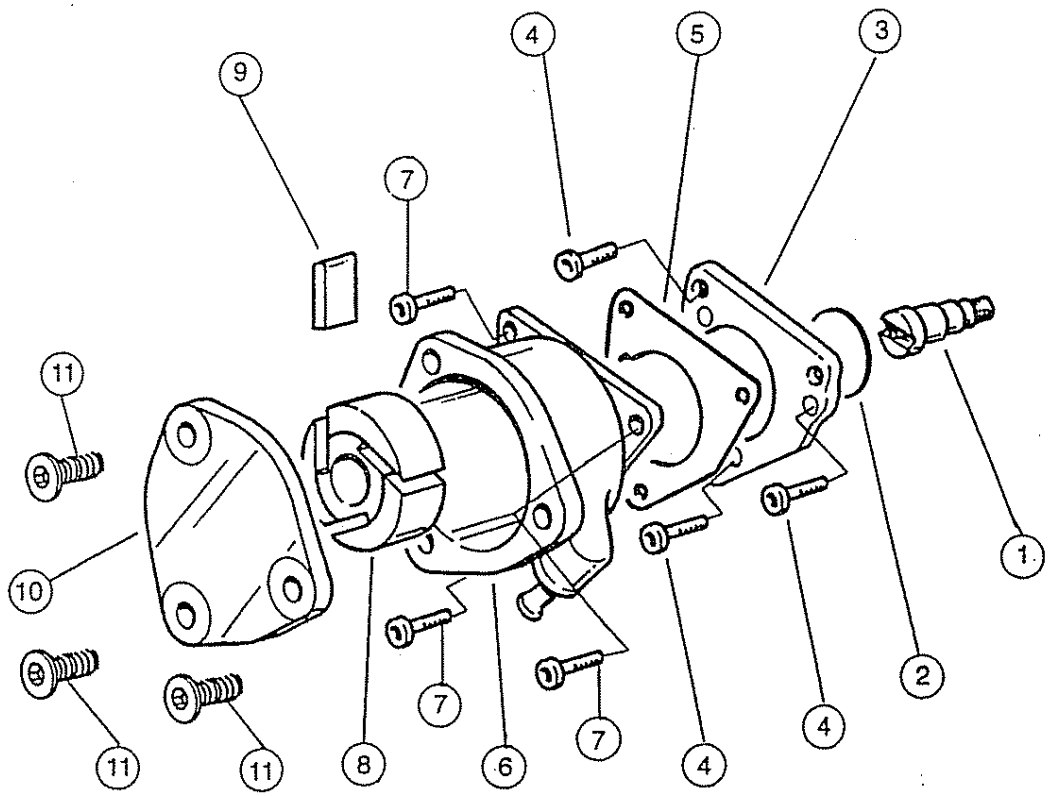
2. CHECK

Check the following parts and replace the faulty ones.



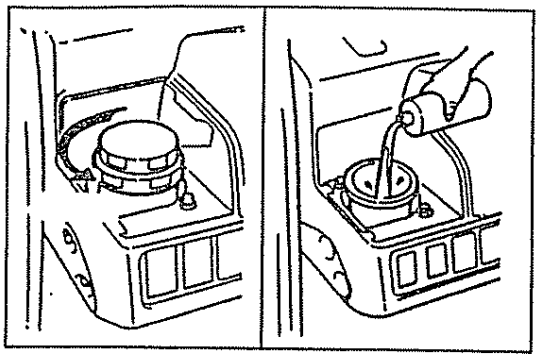
3. ASSEMBLY

Assemble the parts as shown in the figure below.



① Drive
② O-ring
③ Flange
④ Screw
⑤ Joint
⑥ Vacuum pump
⑦ Screw
⑧ Rotor
⑨ Blade
⑩ Pump cover
⑪ Screw

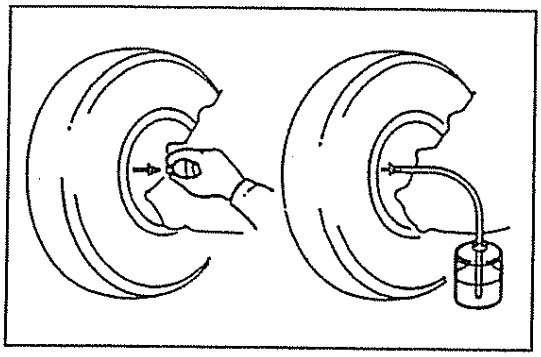
AIR BLEEDING FOR BRAKE SYSTEM



1) **Pouring of brake fluid**

NOTE:

- If the brake fluid is spilled over the paint-finish surfaces of the motor vehicle inadvertentenly, quickly wipe off the brake fluid.
  Then clean the area using white gasoline or the like.

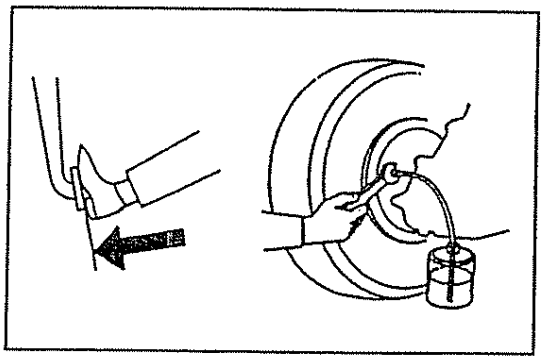


2) **Connection of vinyl hose to bleeder plug of wheel cylinder**

Submerge one end of the vinyl hose in a container filled with the brake fluid. Connect the other end of the vinyl hose to the wheel cylinder bleeder plug of the motor vehicle.

3) **The air bleeding operation should be performed in the following sequence.**

① Left rear wheel
② Right rear wheel
③ LPSV
④ Left front wheel
⑤ Right front wheel



4) **Air bleeding**

The following points must be observed for the motor vehicle equipped with the LPSV.

① Perform the operation by two persons. Be sure to keep always the brake fluid tank full.
② The other worker slackens the bleeder plug 1/3 through 1/2 turn at a time. Be certain to depress the pedal slowly one time and hold.
③ Tighten the bleeder plug and release the brake pedal.
④ Repeat the steps ② and ③ above, until you observe no longer bubbles in the fluid. Perform the same proceeding for the 4 wheels.

NOTE:

- This proceeding can be performed also by using a MITY-VAC pump.

5) **Checking of brake fluid leakage**

Depress the brake pedal and ensure that each section of the pipe line exhibits no fluid leakage.

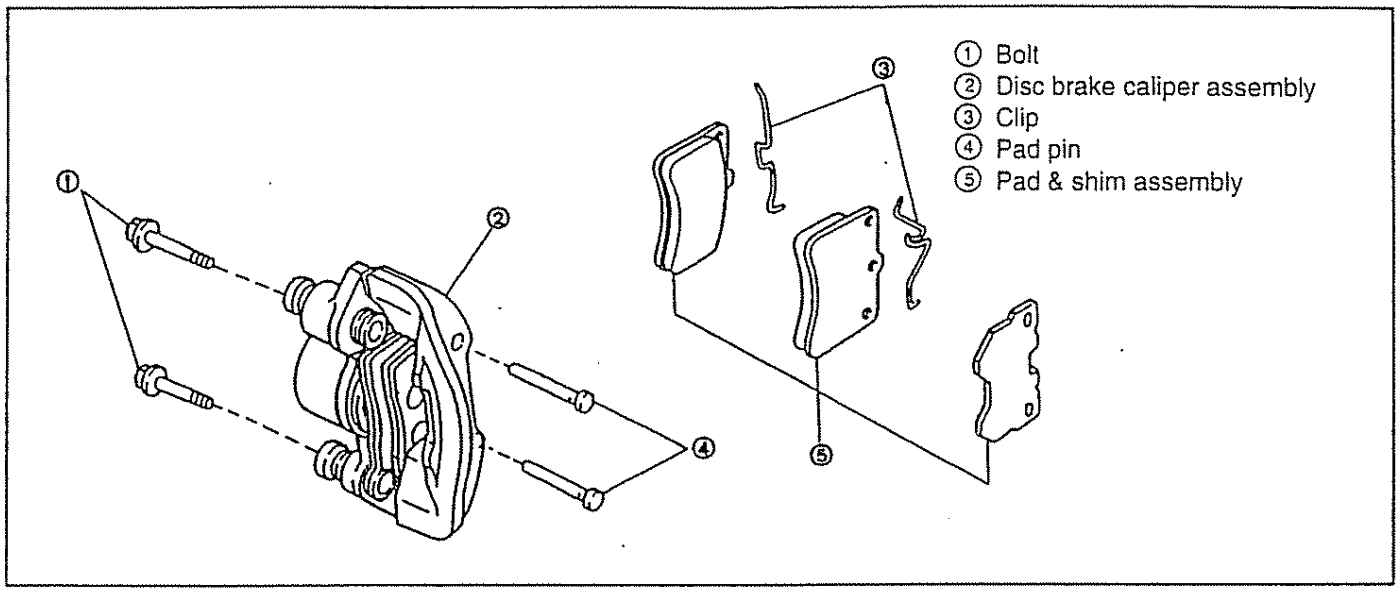
6) **Checking of rear wheel cylinder hydraulic pressure**

Refer to the section under "Hydraulic Pressure Check".

FRONT DISC BRAKE PAD

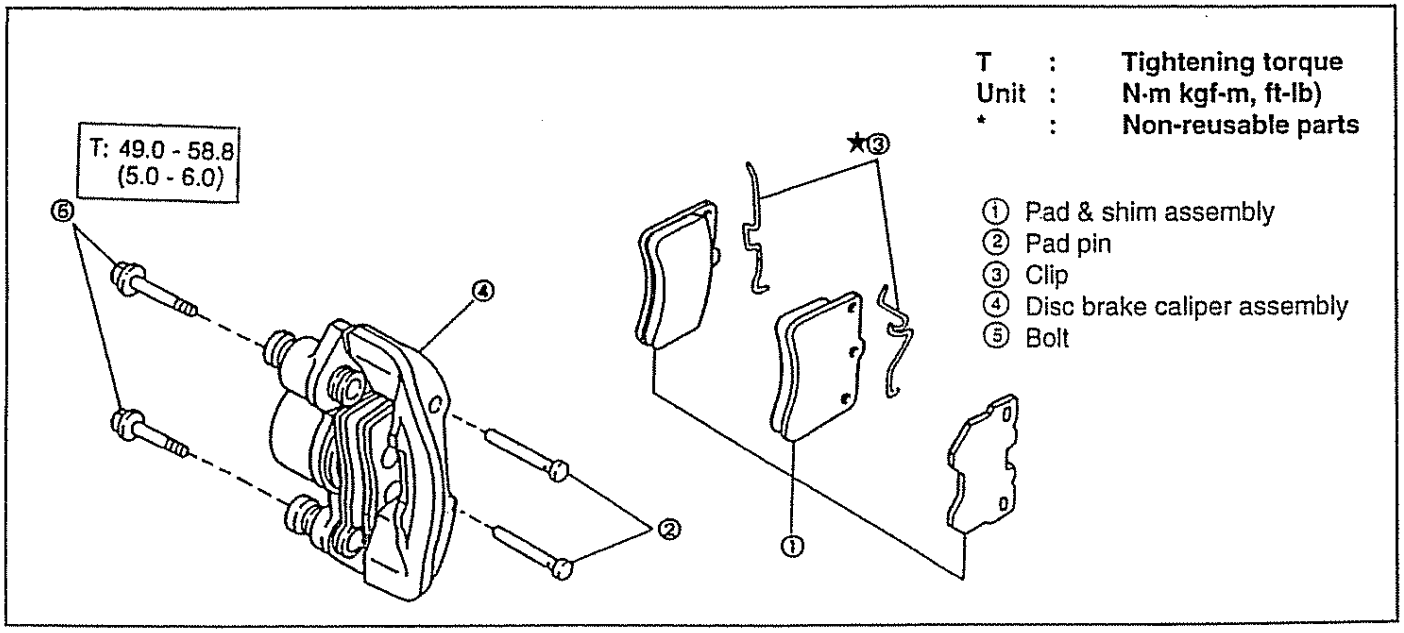
1. REMOVAL

Remove the parts in the numerical order shown in the figure below.



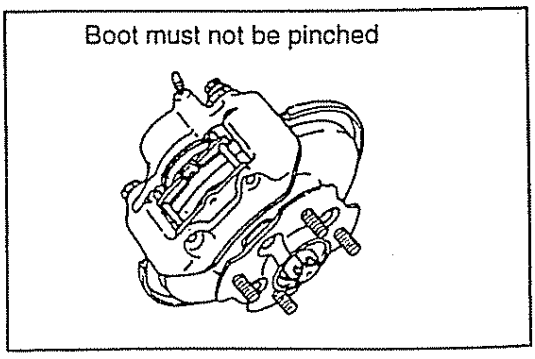
2. INSTALLATION

Install the parts in the numerical order shown in the figure below.



NOTE:

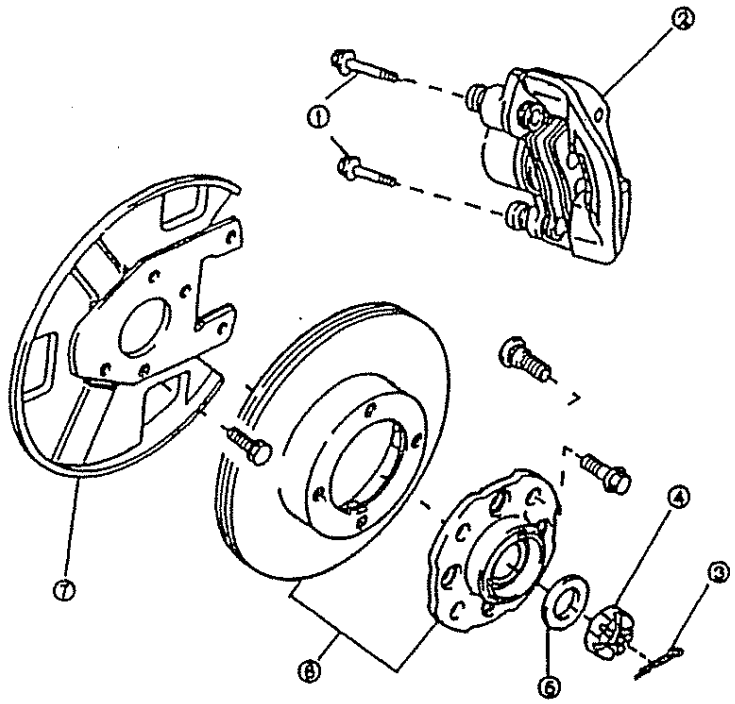
- When installing this part, care must be exercised that the piston boot can not be pinched.



FRONT DISC BRAKE

1. REMOVAL

Remove the parts in the numerical order shown in the figure below

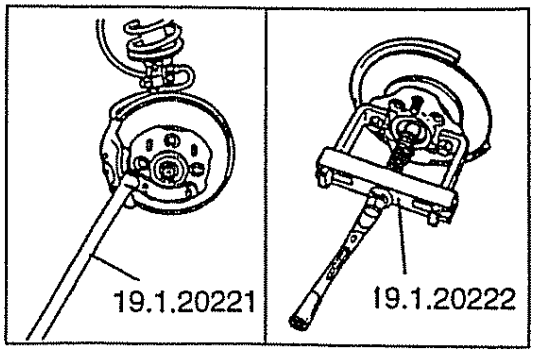


① Bolt
② Disc brake caliper assembly
③ Cotter pin
④ Castle nut
⑤ Washer plate
⑥ Hub & disc assembly
⑦ Disc brake dust cover

1) Disconnect the flexible hose.

2) Remove the castle nut using the following SSt given below.
SST: 19.1.20221

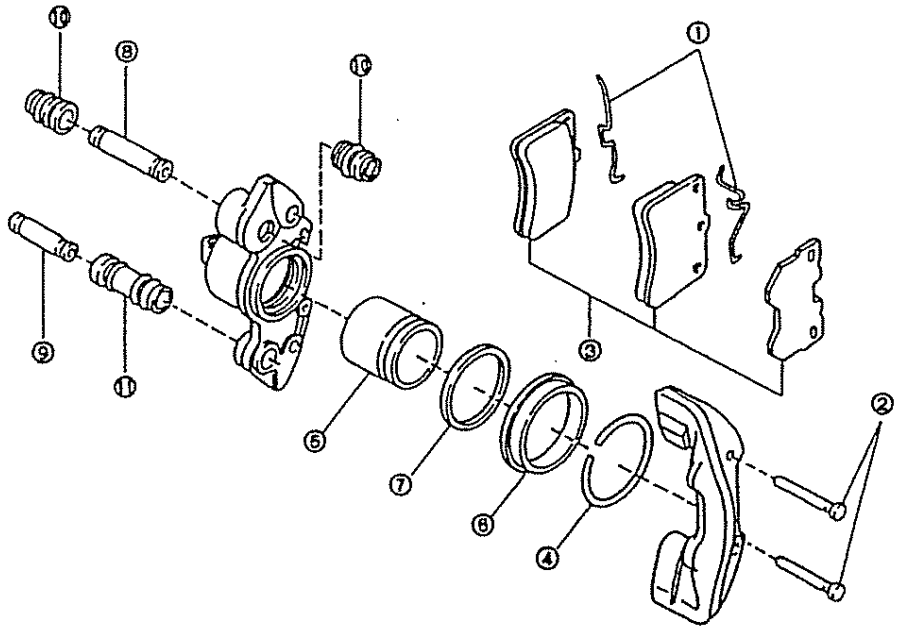
3) Remove the hub & disc using the following SST given below.
SST: 19.1.20222



FRONT DISC BRAKE CALIPER

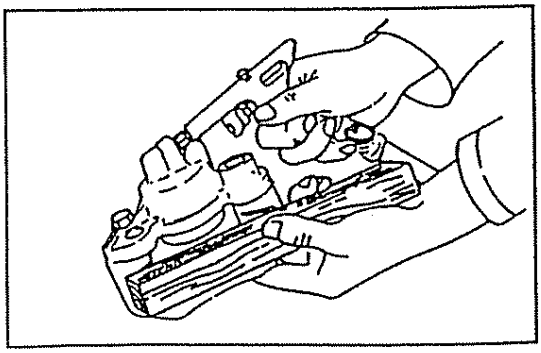
1. DISASSEMBLY

Disassemble the parts in the numerical order shown in the figure below.



① Clip
② Pad pin
③ Pad & shim assembly
④ Retaining ring
⑤ Piston
⑥ Piston boot
⑦ Piston seal
⑧ Main sleeve
⑨ Sub sleeve
⑩ Pin boot
⑪ Bush

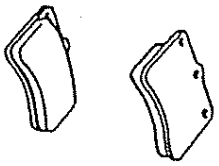
1) With a wooden piece or a cloth placed at the end of the disc brake cylinder drive out the piston using compressed air
NOTE:
- During this operation care must be exercised as to the piston being jumped out from position.



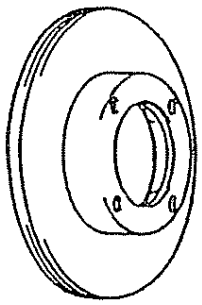
2. INSPECTION

Inspect the following parts. Replace any parts which exhibit defects.

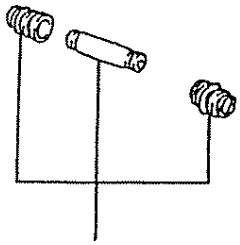
Pad thickness and uneven wear
Specified thickness: 9 mm
Limit: 1 mm



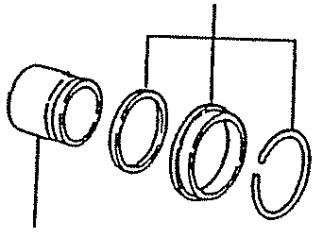
Disc thickness and uneven wear
Specified thickness: 16.0 mm
Limit: 15.0 mm



Replace with new parts



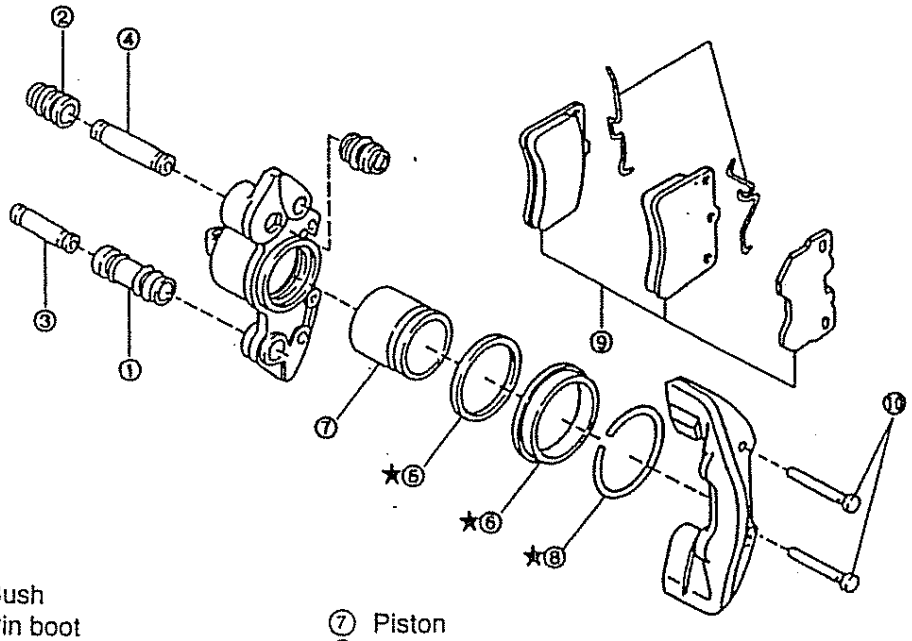
Damage and deterioration



Uneven wear and damage of piston

3. ASSEMBLY

Install the parts in the numerical order shown in the figure below.

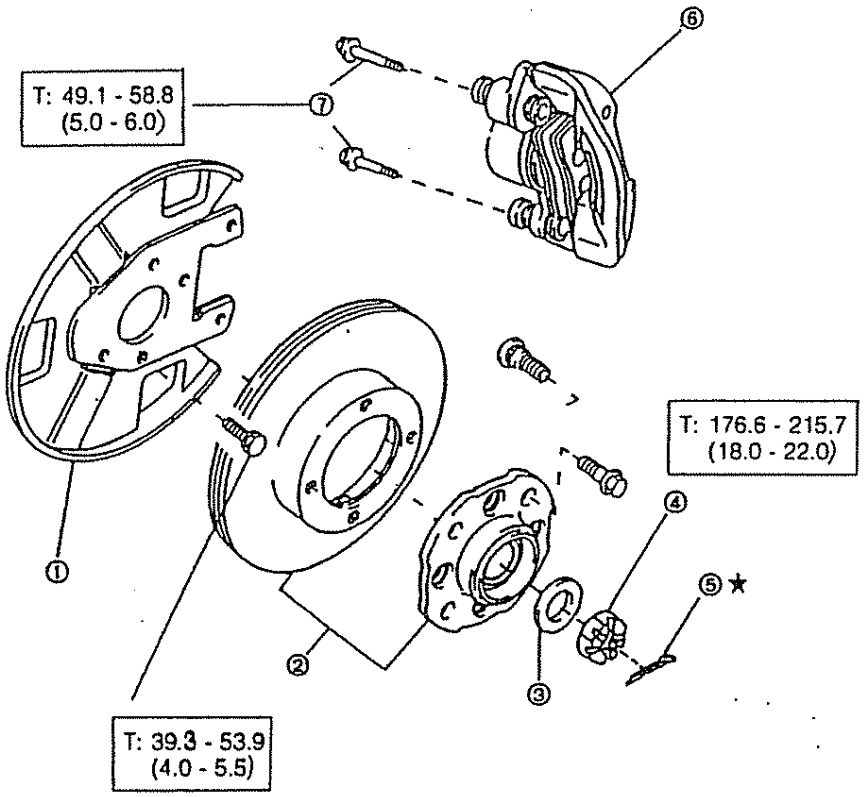


* : Non-reusable parts

① Bush
② Pin boot
③ Sub sleeve
④ Main sleeve
⑤ Piston seal
⑥ Piston boot
⑦ Piston
⑧ Retaining ring
⑨ Pad & shim assembly
⑩ Pad pin
⑪ Clip

4. INSTALLATION

Install the parts in the numerical order shown in the figure below.



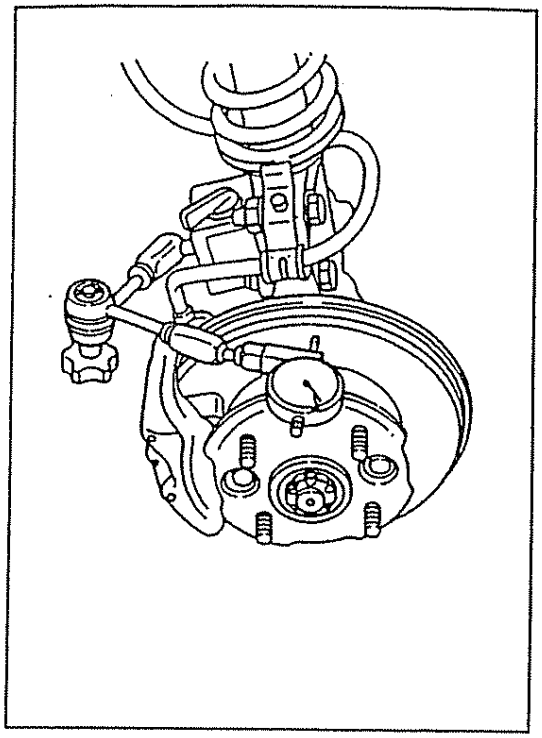
T	:	Tightening torque
Unit	:	N·m kgf-m, ft-lb)
*	:	Non-reusable parts

① Disc brake dust cover
② Hub & disc assembly
③ Washer plate
④ Castle nut
⑤ Cotter pin
⑥ Disc brake caliper
⑦ Bolt

5. OPERATION AFTER INSTALLATION

Pedal height adjustement

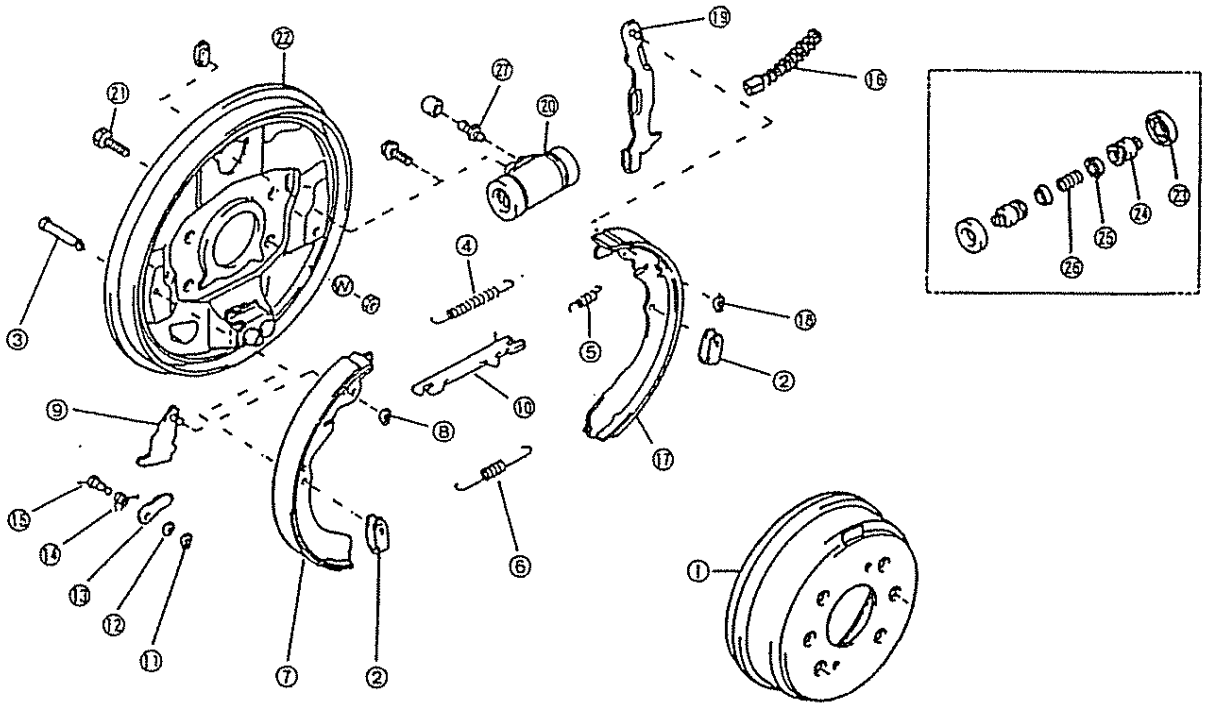
1) Disc run out check
   ① Prior to the disc run-out check, ensure that the front wheel bearings exhibit no excessive looseness.
   ② Measure the run-out of the disc rotor at the outer edge.
   Limit: 0.15 mm
   [At point 10 mm inboard from motor outer periphery]
   If the run out of the disc rotor exceeds the limit, replace the disc rotor
2) Adjust the brake pedal installation height.
   Refer to page BR-4)



REAR BRAKE

1. REMOVAL

Remove the parts in the numerical order shown in the figure below.



① Brake drum assembly
② Shoe hold-down spring
③ Shoe hold-down pin
④ Tension spring
⑤ Tension spring No. 4
⑥ Tension spring
⑦ Rear brake shoe No. 1 assembly
⑧ C-ring
⑨ Automatic adjusting lever subassembly
⑩ Parking brake shoe strut
⑪ C-ring
⑫ Washer
⑬ Automatic adjusting latch
⑭ Torsion spring
⑮ Automatic adjusting lever pin
⑯ Parking brake cable assembly
⑰ Rear brake shoe No. 2 assembly
⑱ C-ring
⑲ Parking brake shoe lever subassembly
⑳ Rear wheel brake cylinder assembly
㉑ Bolt
㉒ Brake backing rear plate subassembly
㉓ Wheel cylinder boot
㉔ Wheel brake cylinder piston
㉕ Cylinder cup
㉖ Compression spring
㉗ Bleeder plug

2. INSPECTION

Inspect the following parts. Replace any parts which exhibit defects.

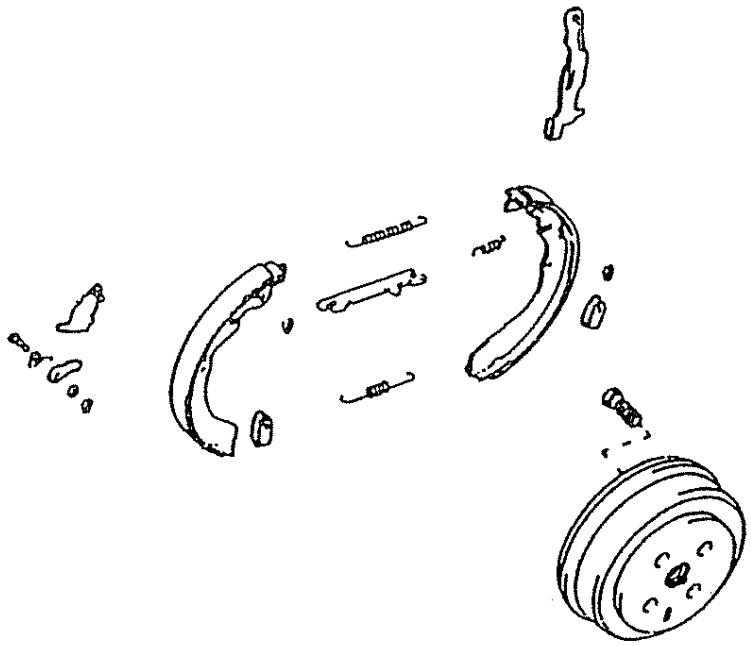
① Damage and deformation of shoe

② Wear of lining

Specified value:	4.0 mm
Limit:	1.0 mm

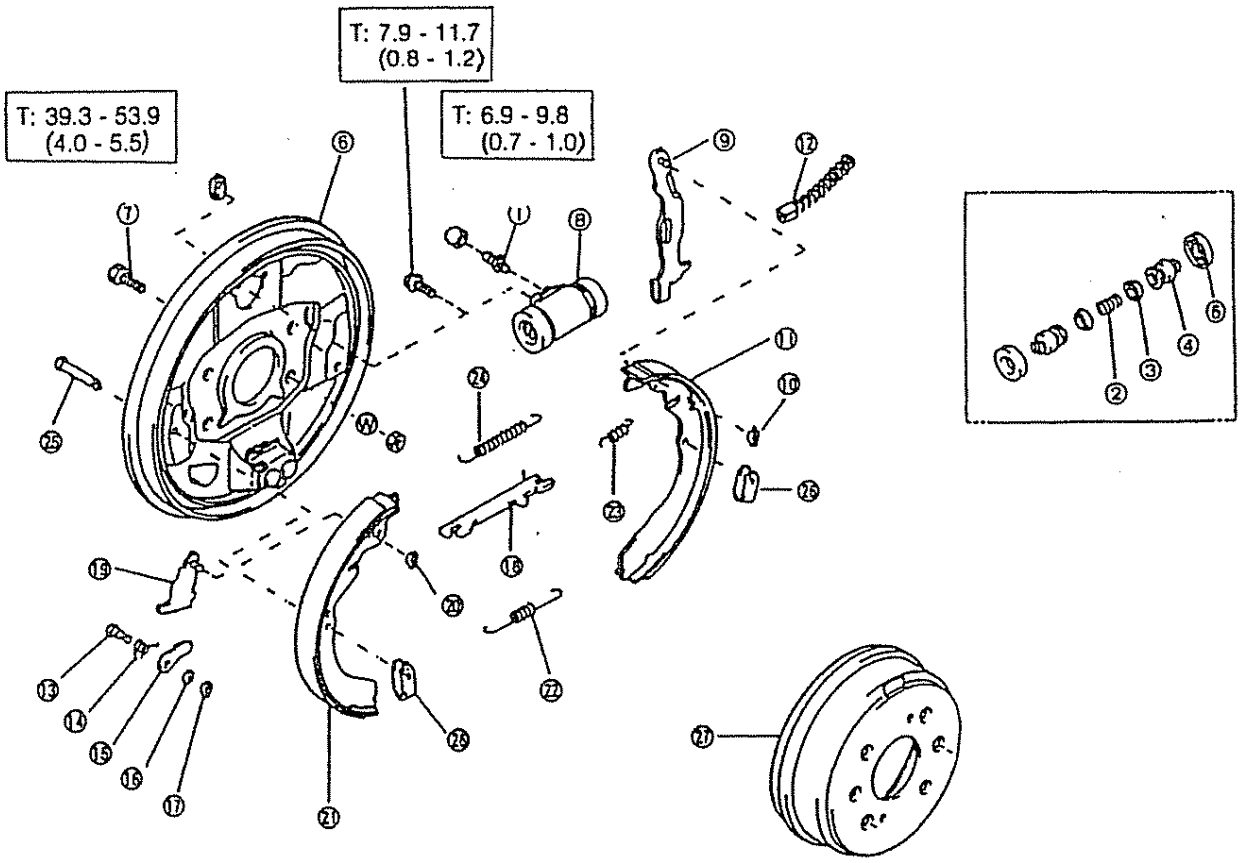
Wear and damage of brake drum

Specified value:	200 mm
Limit:	201.5 mm



3. INSTALLATION

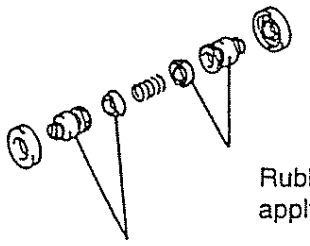
Install the parts in the numerical order shown in the figure below.



T : Tightening torque
Unit : N·m kgf-m, ft-lb)
*** : Non-reusable parts**

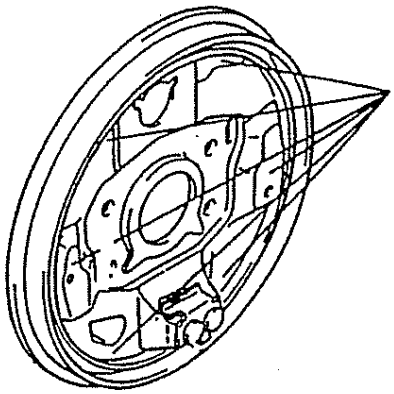
① Bleeder plug
② Compression spring
③ Cylinder cup
④ Wheel brake cylinder piston
⑤ Wheel cylinder boot
⑥ Brake backing rear plate subasssembly
⑦ Bolt
⑧ Rear wheel brake cylinder assembly
⑨ Parking brake shoe lever subassembly
⑩ C-ring
⑪ Rear brake shoe No. 2 assembly
⑫ Parking brake cable assembly
⑬ Automatic adjusting lever pin
⑭ Torsion spring
⑮ Automatic adjusting lever pin
⑯ Parking brake cable assembly
⑰ Rear brake shoe No. 2 assembly
⑱ C-ring
⑲ Parking brake shoe lever subassembly
⑳ Rear wheel brake cylinder assembly
㉑ Bolt
㉒ Brake backing rear plate subassembly
㉓ Wheel cylinder boot
㉔ Wheel brake cylinder piston
㉕ Cylinder cup
㉖ Compression spring
㉗ Bleeder plug

1) Apply the rubber grease and brake grease to the following points specified in the figure below.



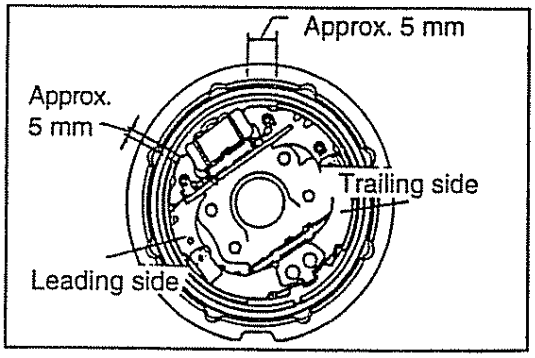
Rubber grease applying points

Rubber grease applying points

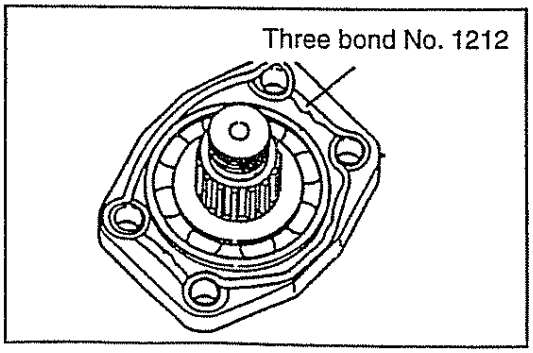


Brake grease applying points (6 points at ridge surface)

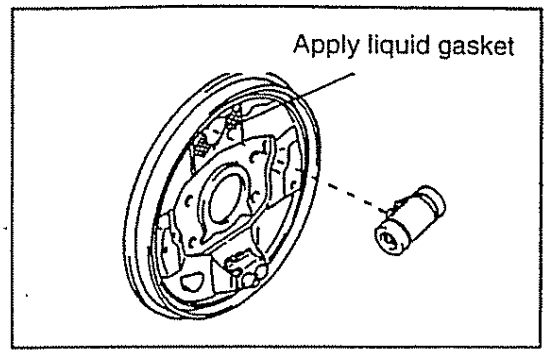
NOTE:
The lining position of the brake shoe assembly differed between the leading side and the trailing side.



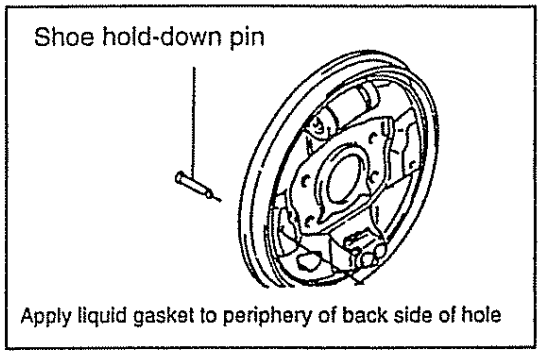
2) Apply the three bond No. 1212 to the end section of the rear axle housing, as indicated in the right figure. Then install the backing plate to the rear axle.



3) Apply liquid gasket (Three bond THK-520) to the section where the wheel cylinder is installed on the backing plate, as indicated in the right figure.



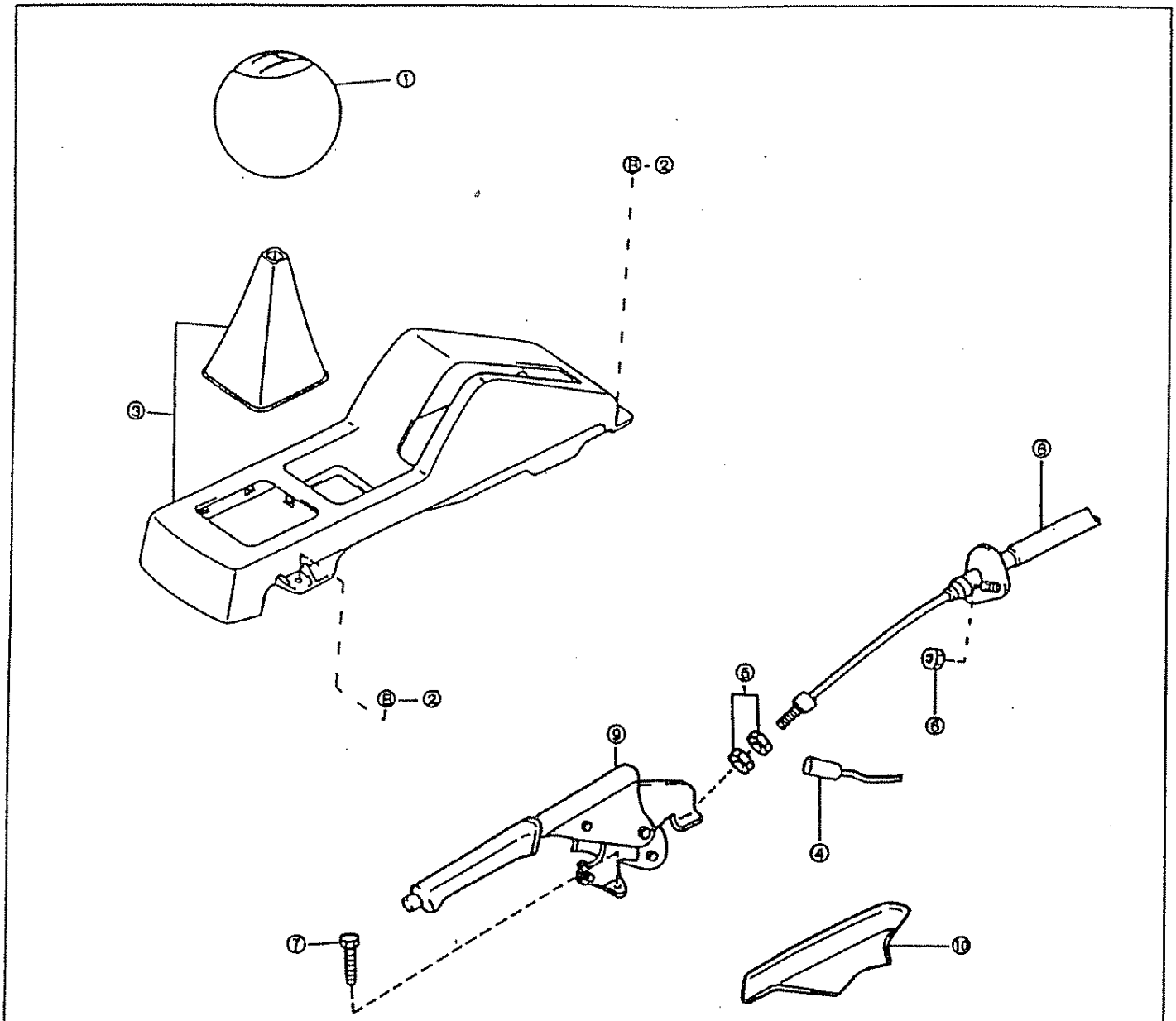
4) Apply liquid gasket (Three bond No. THK 520) to the section where the shoe hold-down pin is installed to the backing plate, as indicated in the right figure.



5) Brake adjusting procedure
   ① Depres the brake pedal four or five times, after performing air bleeding). Ensure that the automatic adjusting mechanism is operating by listening to an operating sound.
   ② Adjust the installation height of the brake pedal. (Refer to page BR-4)
   ③ Adjust the working travel of the parking brake lever. (Refer to page BR-27)

PARKING BRAKE LEVER

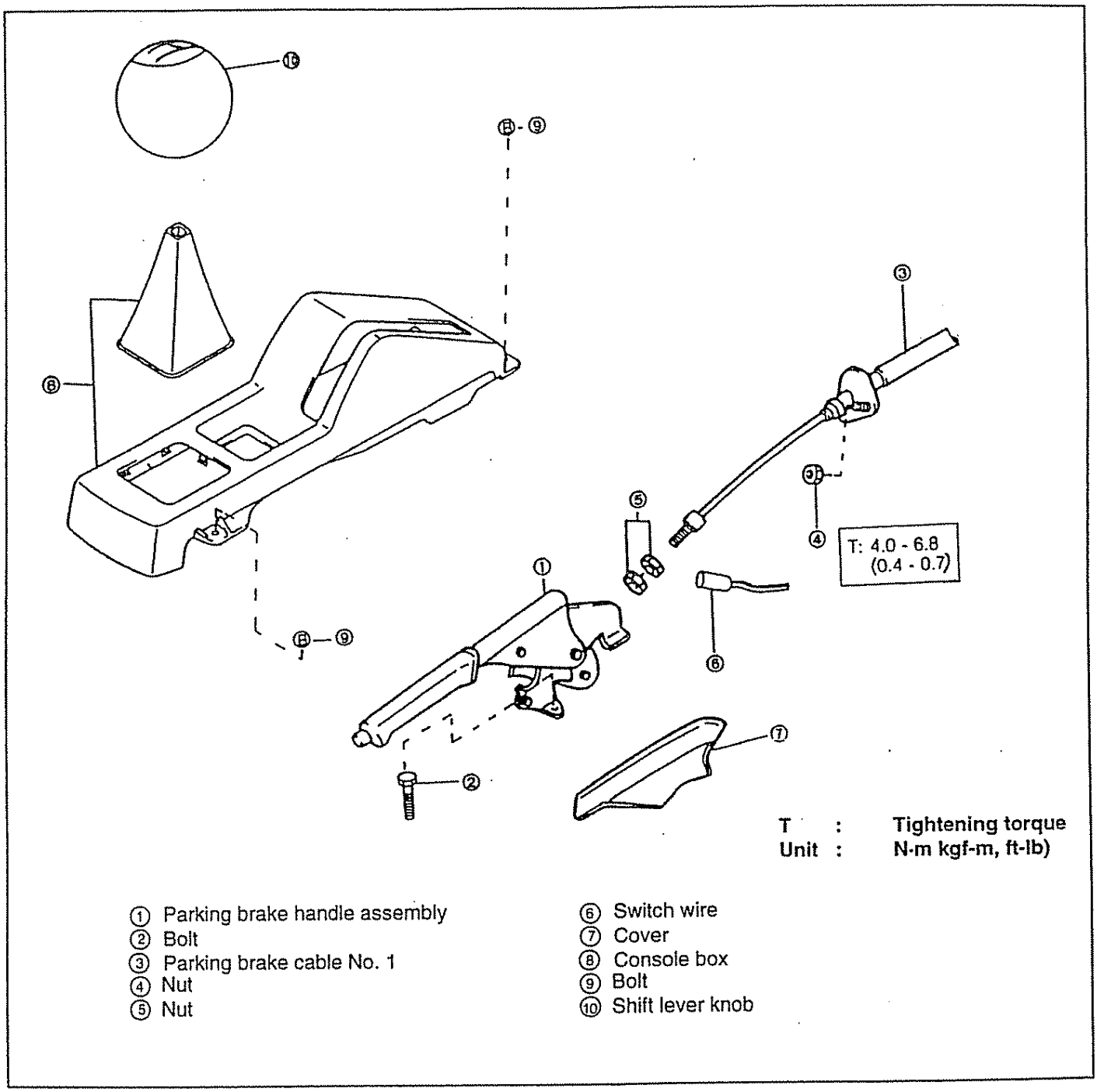
1. REMOVAL



① Shift lever knob
② Bolt
③ Console box
④ Switch wire
⑤ Nut
⑥ Nut
⑦ Bolt
⑧ Parking brake cable No. 1
⑨ Parking brake handle assembly
⑩ Cover

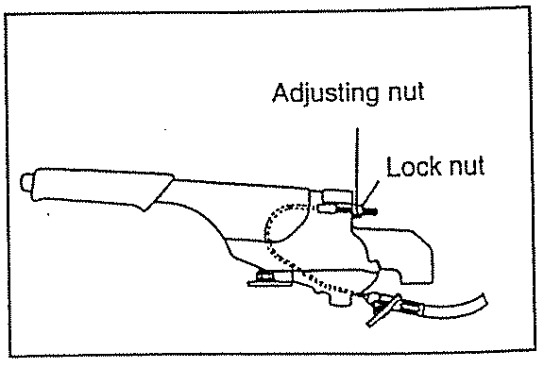
2. INSTALLATION

Install the parts in the numerical order shown in the figure below.



① Parking brake handle assembly
② Bolt
③ Parking brake cable No. 1
④ Nut
⑤ Nut
⑥ Switch wire
⑦ Cover
⑧ Console box
⑨ Bolt
⑩ Shift lever knob

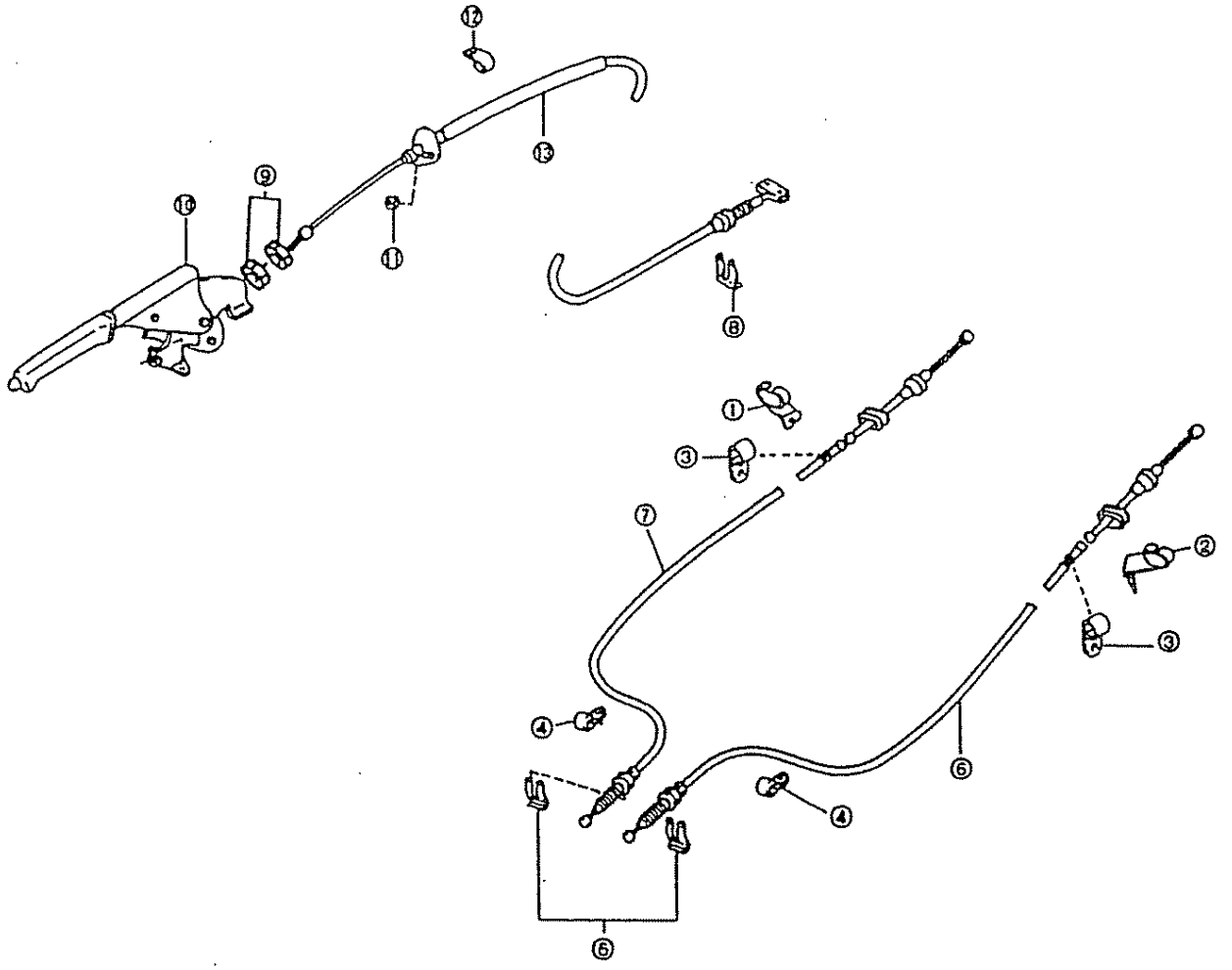
1) Turn adjusting nut to adjust the working travel of the parking brake lever.
   Specified Value: 6 - 10 Notches
   (When pulled upward by force of 20 kg)
   NOTE:
   - The parking brake lever adjustment should be performed when the rear brake shoe clearance complies with the specification.



PARKING BRAKE CABLE

1. REMOVAL (Pick up)

Remove the parts in the numerical order shown in the figure below.



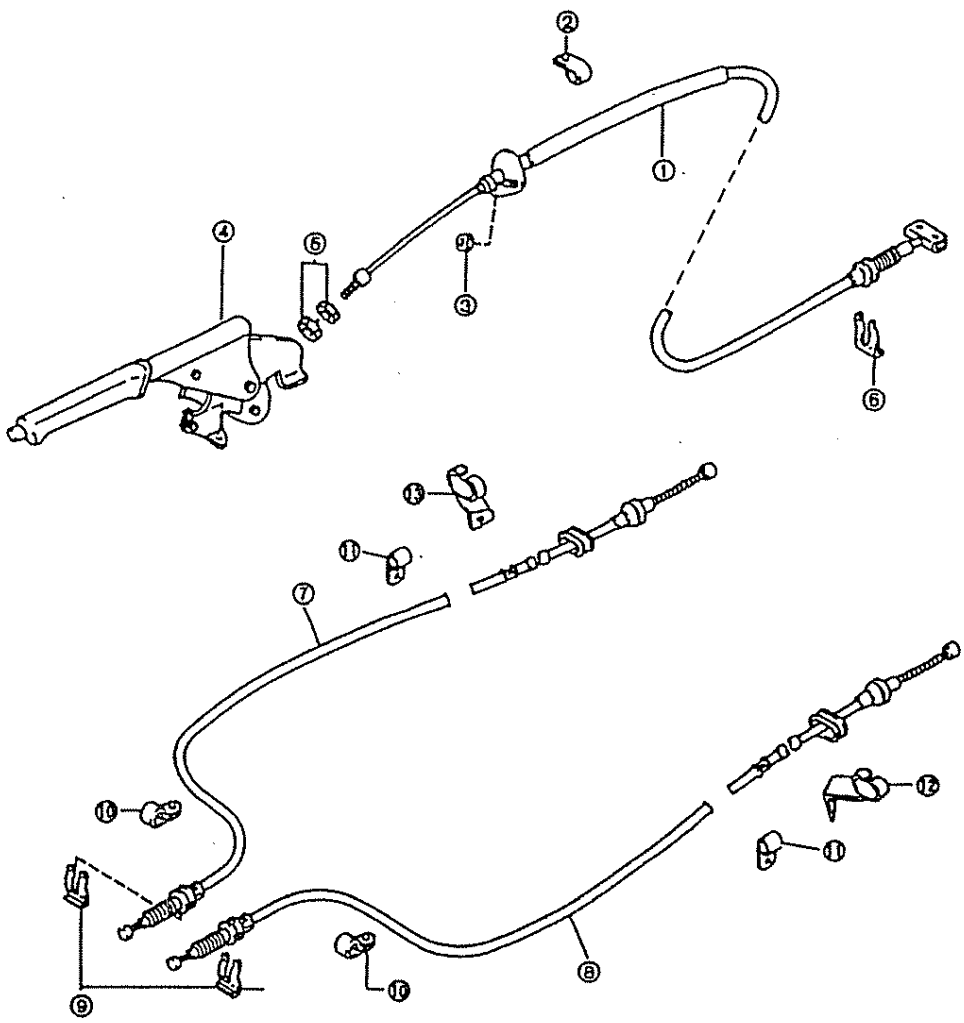
① Parking brake cable right guide
② Parking brake cable left guide
③ Clamp
④ Cable clamp
⑤ Cable clamp
⑥ Parking brake cable asssembly
⑦ Parking brake cable assembly
⑧ Cable clamp
⑨ Nut
⑩ Parking brake handle assembly (Refer to page BR-27)
⑪ Nut
⑫ Clamp
⑬ Parking brake with equalizer cable assembly

Operation prior to removal

1) Remove the engine sevice hole cover.
2) Raise the front/left seat.
3) remove the rear brake drum. Detach the parking brake cable from the rear brake.
   (Refer to page BR-21)

2. INSTALLATION

Install the parts in the numerical order shown in the figure below.



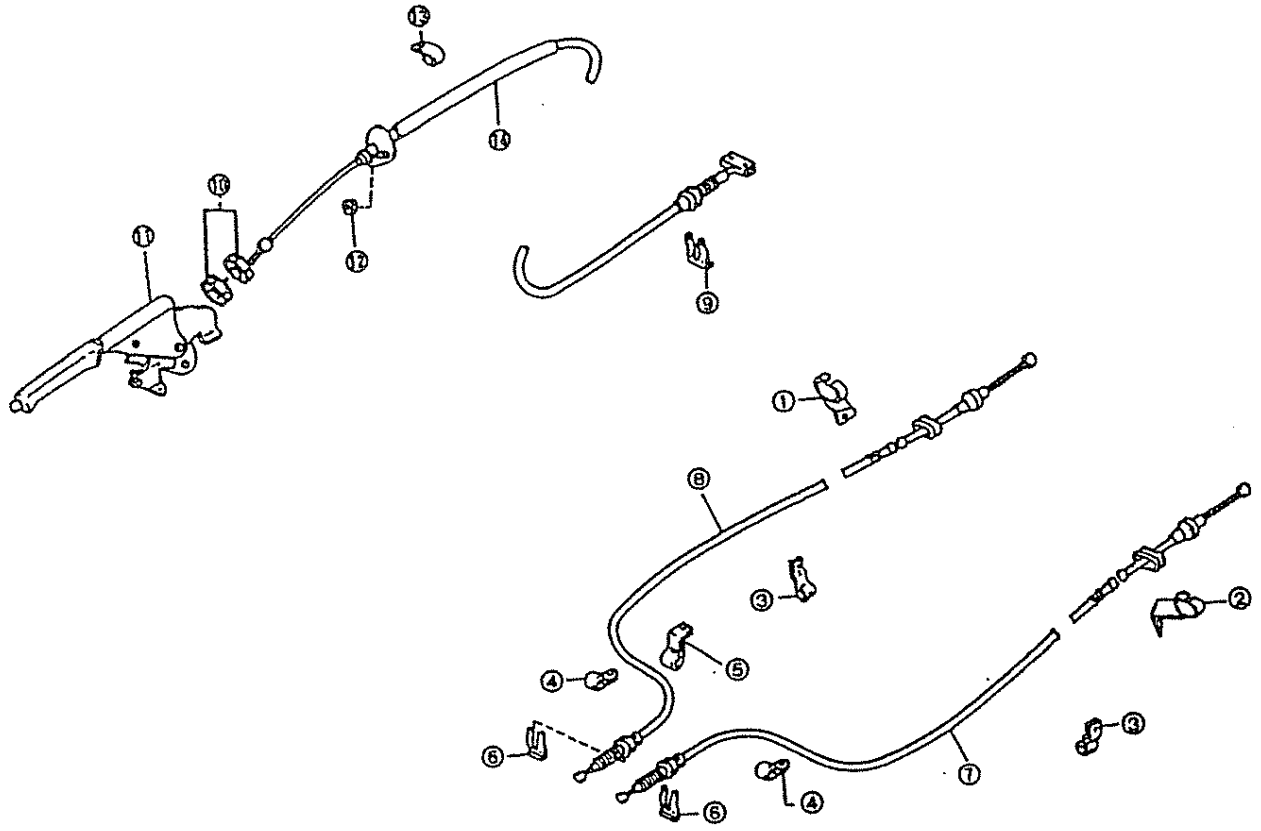
① Parking brake with equalizer cable assembly
② Clamp
③ Nut
④ Parking brake lever unit (Refer to BR-27)
⑤ Nut
⑥ Clamp
⑦ Parking brake cable unit
⑧ Parking brake cable unit
⑨ Clamp
⑩ Cable clamp
⑪ Cable Clamp
⑫ Parking brake cable left guide
⑬ Parking brake cable right guide

Operation after installation

1) Adjust the rear brake. Refer to page BR-25)
2) Adjust the parking brake. Refer to page BR-27)

3. REMOVAL (Van)

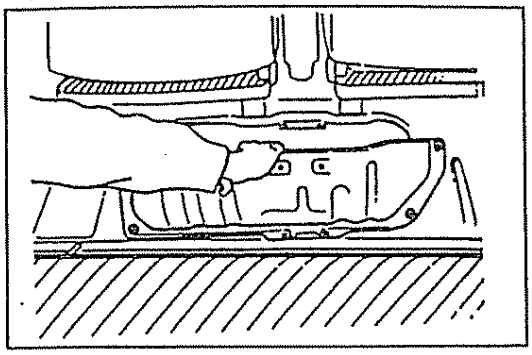
Remove the parts in the numerical order shown in the figure below.



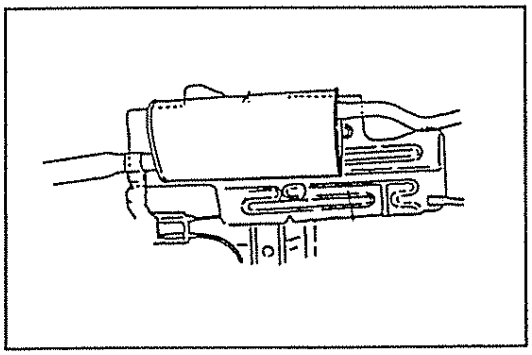
① Parking brake cable right guide
② Parking brake cable left guide
③ Clamp
④ Cable clamp
⑤ Cable clamp
⑥ Cable clamp
⑦ Parking brake cable assembly
⑧ Parking brake cable assembly
⑨ Cable clamp
⑩ Nut
⑪ Parking brake handle assembly (Refer to page BR-26)
⑫ Nut
⑬ Clamp
⑭ Parking brake with equalizer cable assembly

Operation prior to removal

1) Remove the engine service hole covers.
2) Raise the front/left seat
3) Remove the rear brake drum. Disconnect the rear brake and the parking brake cables.

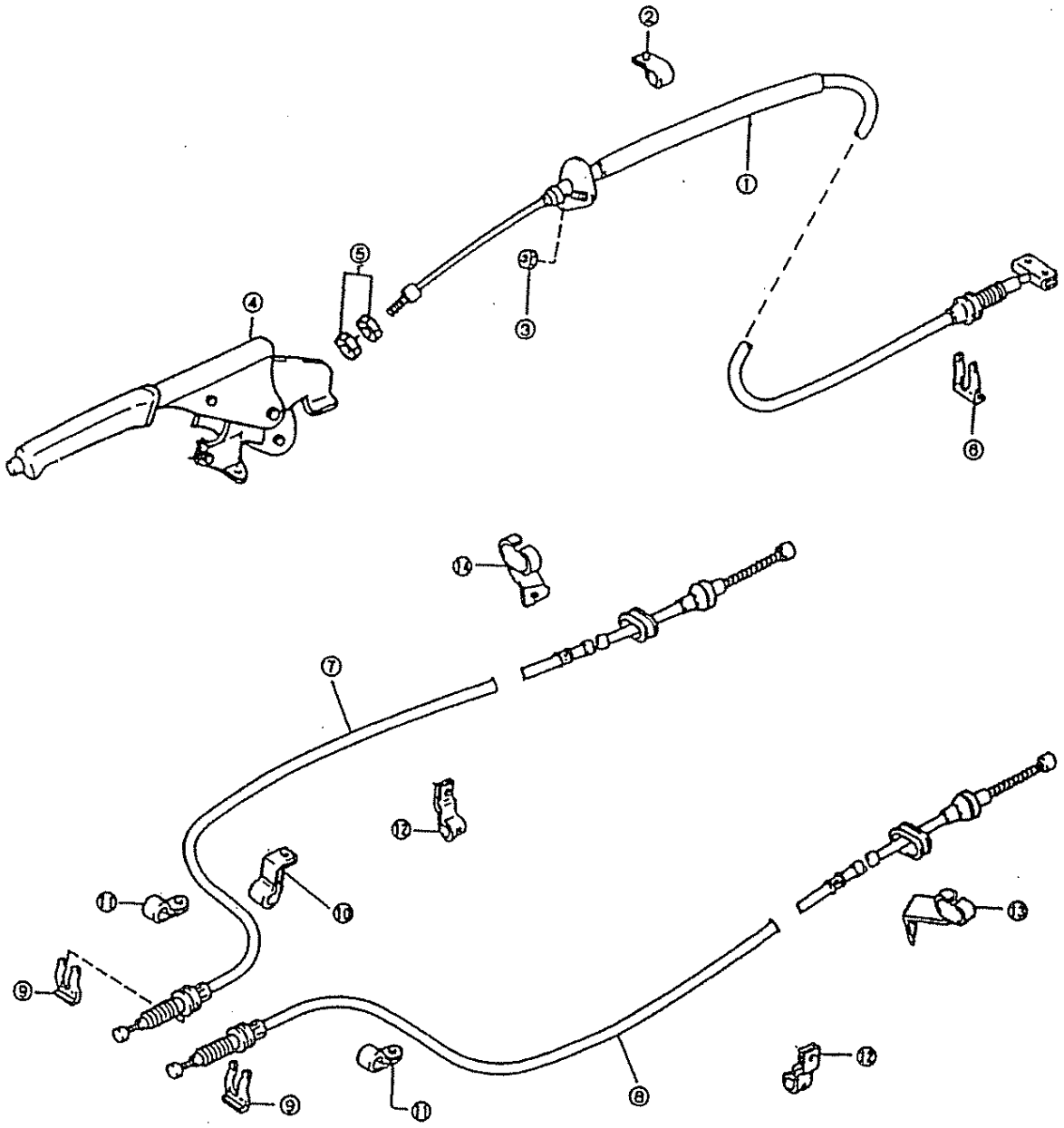


4) Remove the spare tire carrier and remove the heat insulator.



4. INSTALLATION

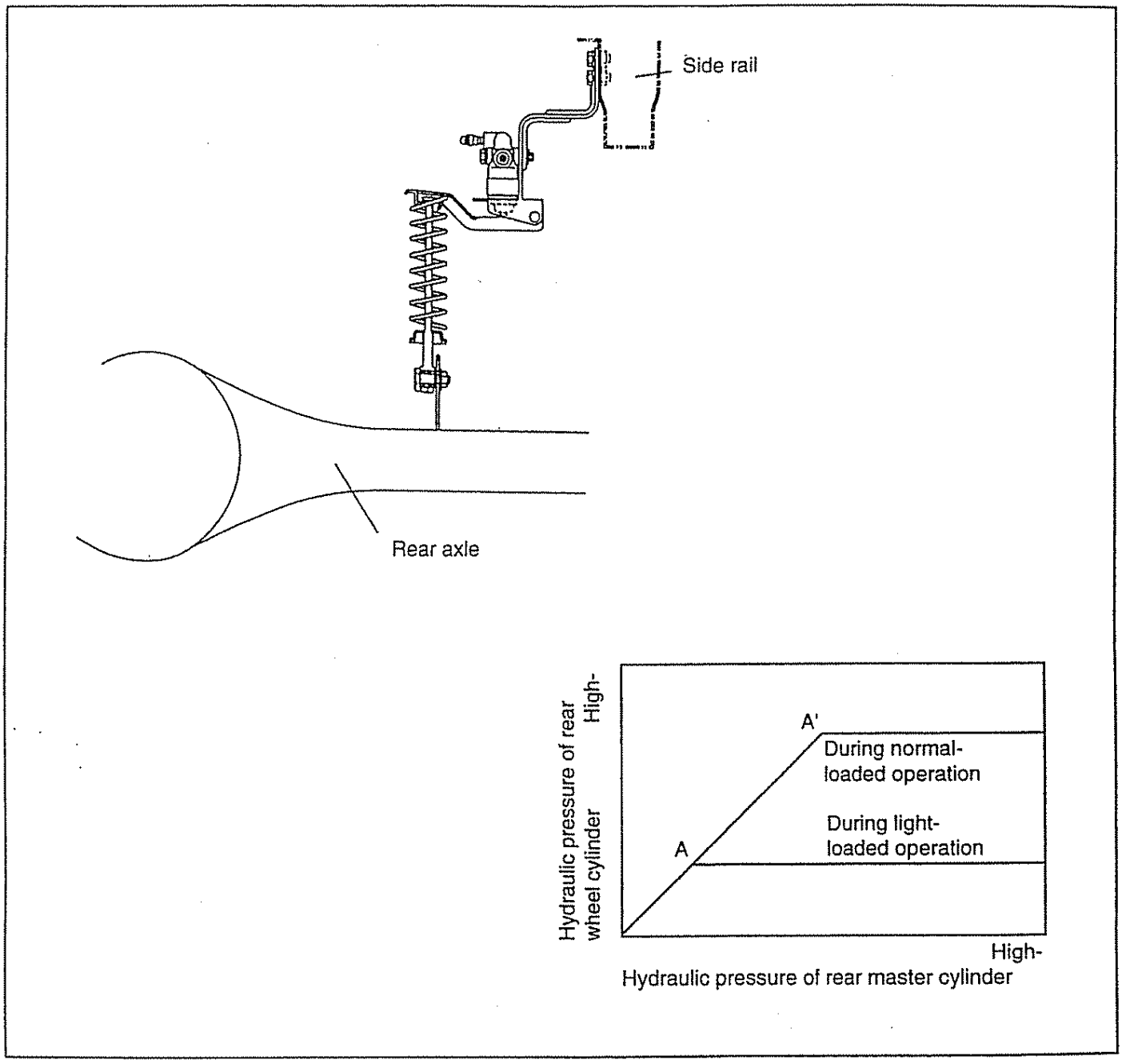
Install the parts in the numerical order shown in the figure below.



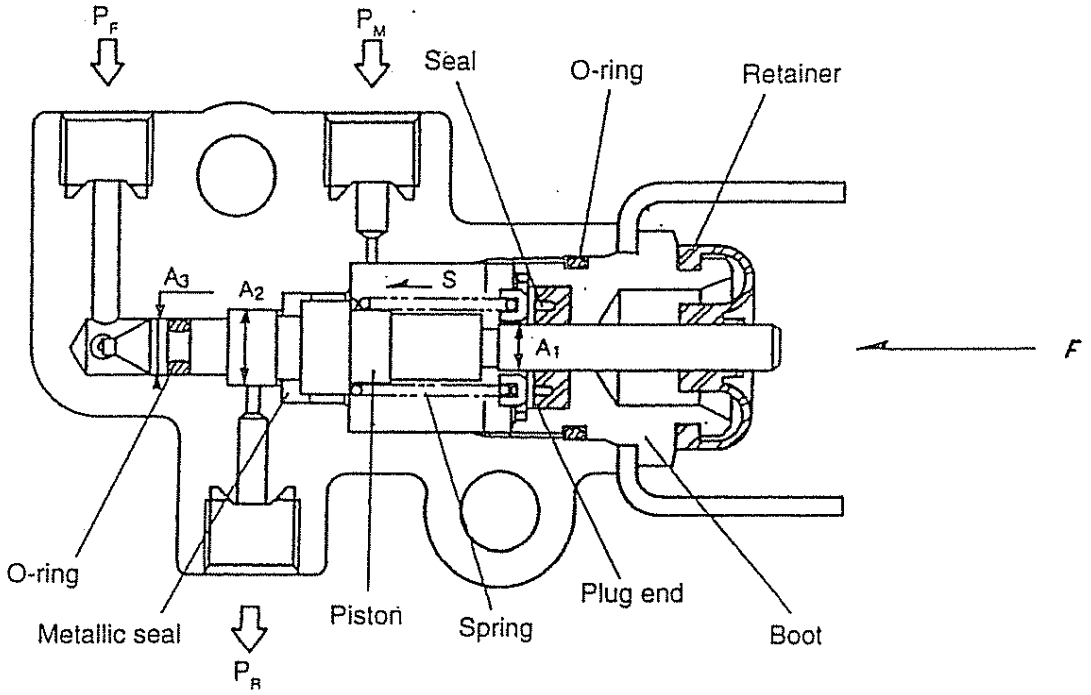
① Parking brake with equalizer cable assembly
② Clamp
③ Nut
④ Parking brake handle assembly (Refer to page BR-27)
⑤ Nut
⑥ Cable clamp
⑦ Parking brake cable assembly
⑧ Parking brake cable assembly
⑨ Cable clamp
⑩ Cable clamp
⑪ Cable clamp
⑫ Clamp
⑬ Parking brake cable left guide
⑭ Parking brake cable right guide

LOAD SENSING PROPORTIONING VALVE (LSPV)

The LSPV adjusts the turning point of hydraulic pressure of the proportioning valve in accordance with the weight being applied to the rear axle of the vehicle.

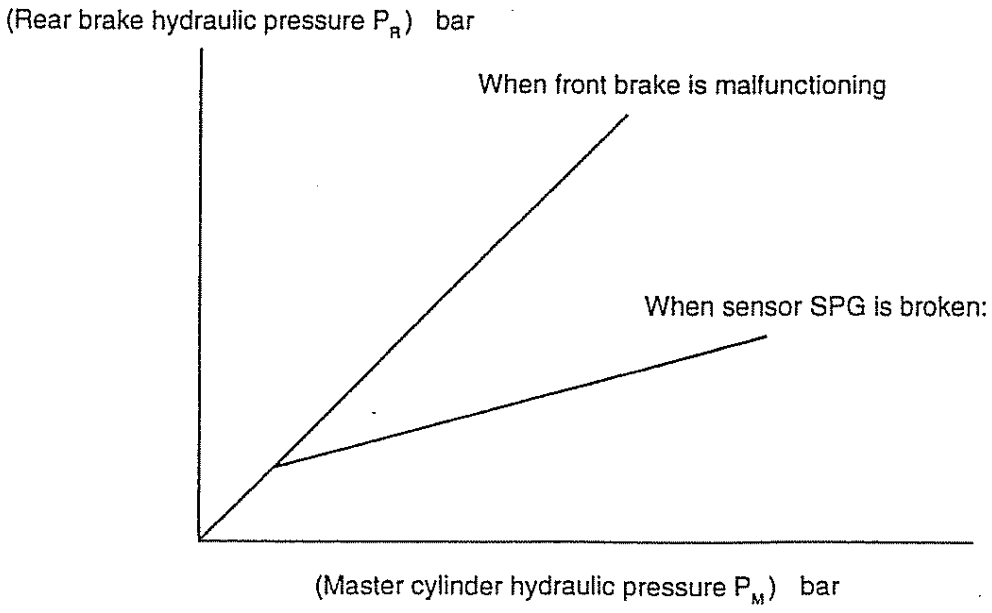


1. DESCRIPTION



P_M	: Master cylinder hydraulic pressure	bar	P_R	: Hydraulic pressure of rear brake	bar
P_F	: Hydraulic pressure of front brake	bar	F	: Pushing force of piston	kg
S	: Pushing force of SPG	kg	A_1	: Sectional area of small-diameter section of piston	cm^2
A_2	: Sectional area of large-diameter section of piston	cm^2	A_3	: Sectional area of medium-diameter section of piston	cm^2

Performance Diagram



5) Reference.

With one person seated on the vehicle, set the rear axle weight as follows.

	Rear axle weight (kg)	Difference between right and left (kg)
Pick-up	350 ± 5	Not to exceed 10
Van	435 ± 5	Not to exceed 10

At this time, depress the brake pedal so that the check hydraulic pressure of the front brake may become 100 kgf/cm²).

Ensure that the hydraulic pressure of the rear brake conforms to the specifications.

Pick-up: 19±2 kgf/cm²).
Van: 22±2 kgf/cm²).

2. ADJUSTMENT

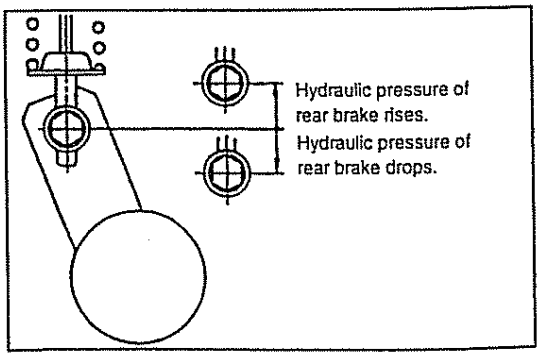
1) Calculation of moving amount of LSPV link end
The hydraulic pressure of the rear brake changes about 0.13 MPa 1.3 kgf/cm²) when the LSPV link end is moved 1 mm in an up-&-down direction. Therefore calculate the required moving amount, using the following formula.

$$\frac{\text{Deviation in hydraulic pressure MPa kgf/cm}^2)}{\text{0.13 MPa/mm 1.3 kgf/cm}^2\text{/mm)}} = \text{Moving amount of LSPV end) mm}$$

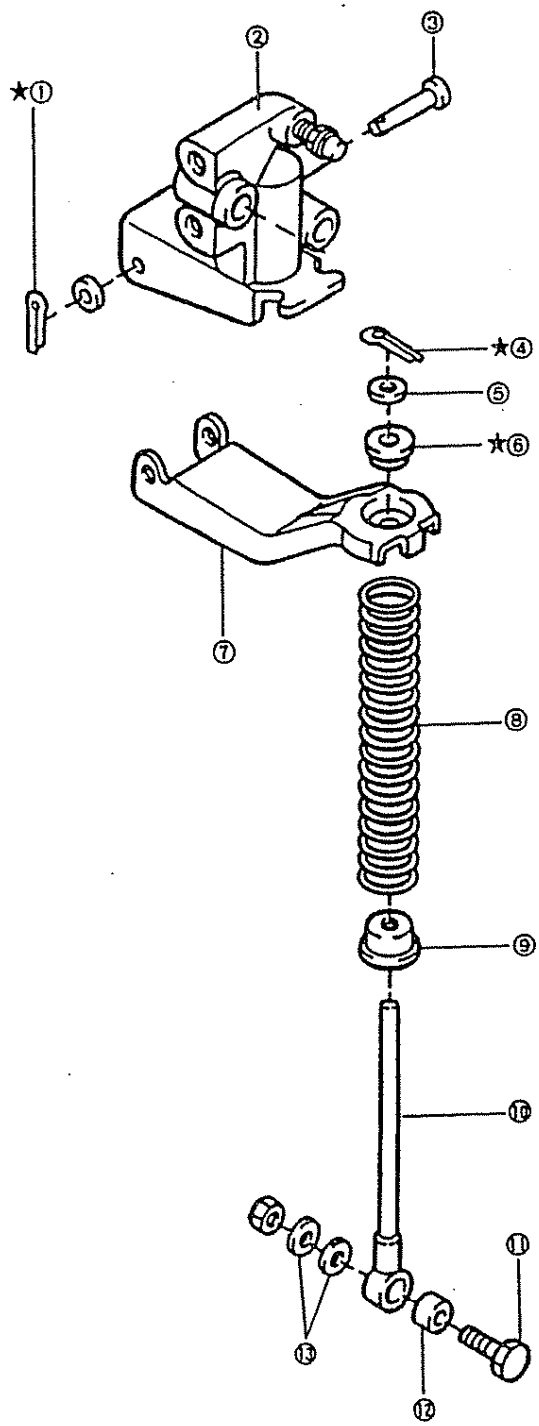
2) Loosen the attaching nut of the LSPV link at the axle side. Move the LSPV link end by the amount calculated in the step 1).
Specified Torque: 9.8 - 15.7 N·m
1.0 - 1.6 kgf-m, 7.2 - 11.6 ft-lb)

NOTE:
- When moving the LSPV link, be sure to put a mark so as to determine the position of the nut. However never scribe or punch on the part surface.

3) Check the hydraulic pressure again. Ensure that the LSPV hydraulic pressure is within the specified range.



3. COMPONENTS

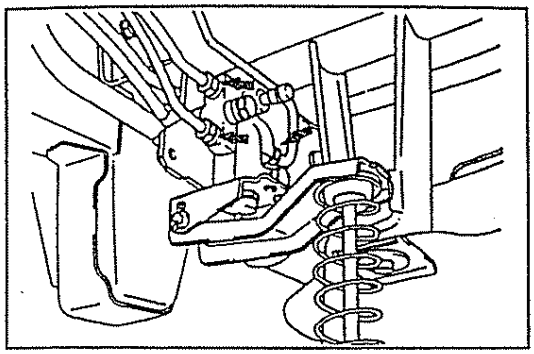


* : Non-reusable parts

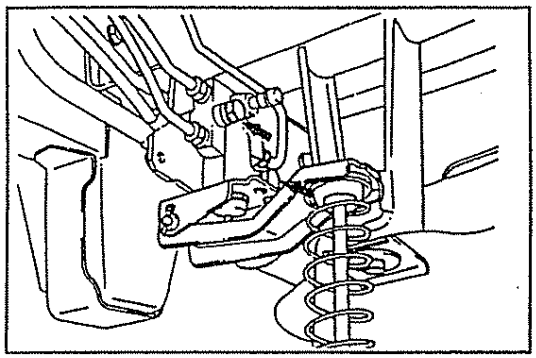
① Cotter pin
② LPSV assembly
③ Pivot pin
④ Cotter pin
⑤ Plate washer
⑥ Load sensing No. 1 bush
⑦ Valve control lever
⑧ Load sensing spring
⑨ Spring retainer
⑩ Valve control rod
⑪ Bolt
⑫ Load sensing No. 2 bush
⑬ Plate washer

4. REMOVAL OF LSPV

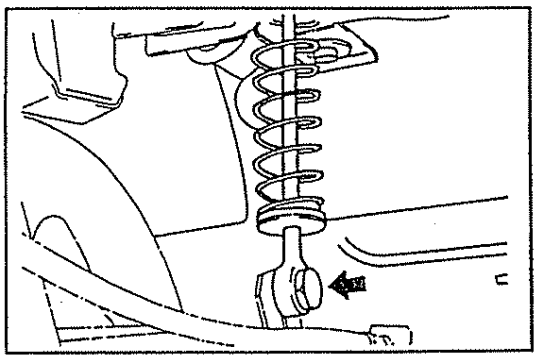
1) Disconnect the brake pipe from the valve body.



2) Remove the valve control bolt.

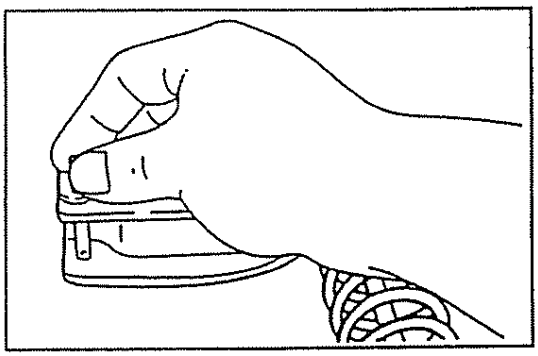


3) Remove the valve bracket mounting bolts.

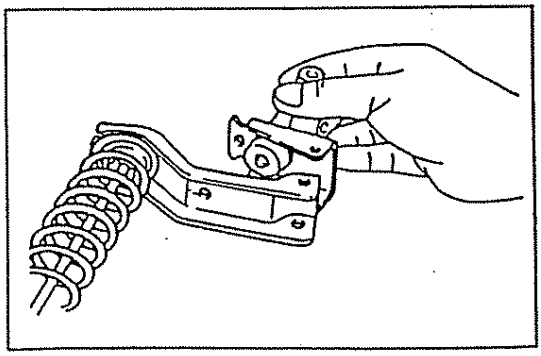


6. DISASSEMBLY

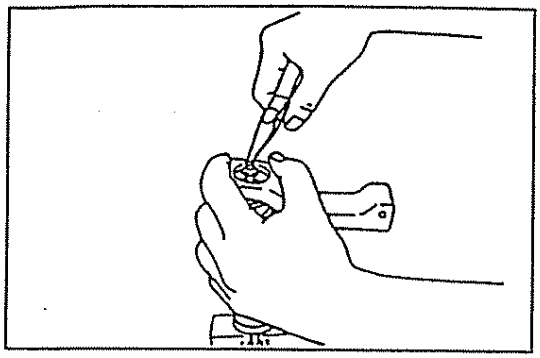
1) Remove the cotter pin, then remove the pivot pin.



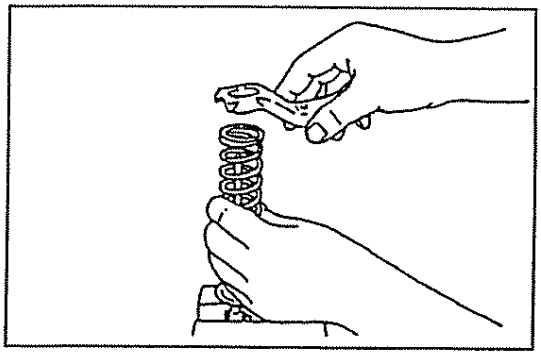
2) Remove the LSPV with the bracket.
NOTE:
- Never attempt to disassemble the LSPV.



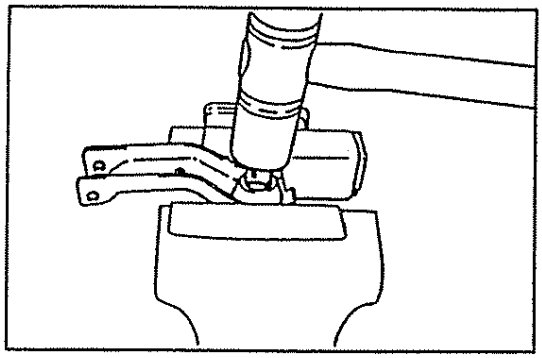
3) Remove the cotter pin.



4) Remove the following parts.
   ① Valve control lever
   ② Plate washer
   ③ Guide bush
   ④ Load sensing spring
   ⑤ Spring retainer
   ⑥ Valve control rod



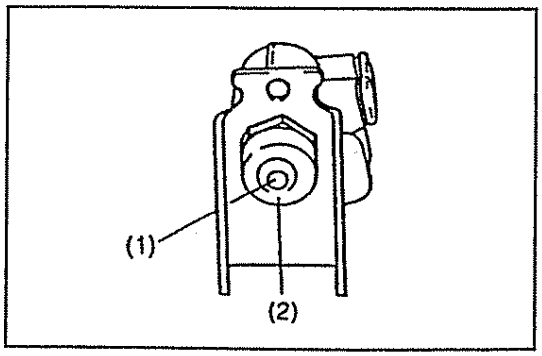
5) Remove the guide bush by tapping with the plastic hammer.



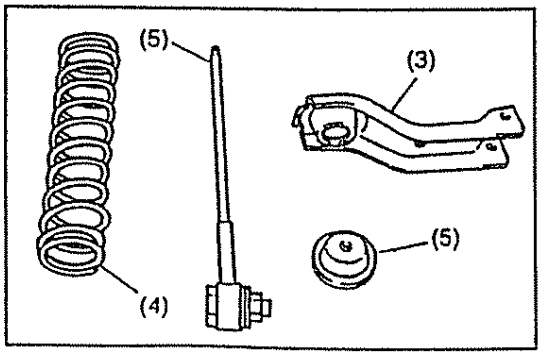
6. INSPECTION

Inspect the following items. Replace any parts which exhibit defects.

1) Worn piston
2) Deteriorated rubber part

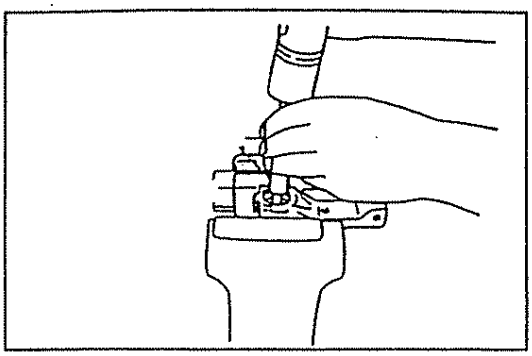


3) Damage and distortion
4) Flattened condition
5) Distortion and damage

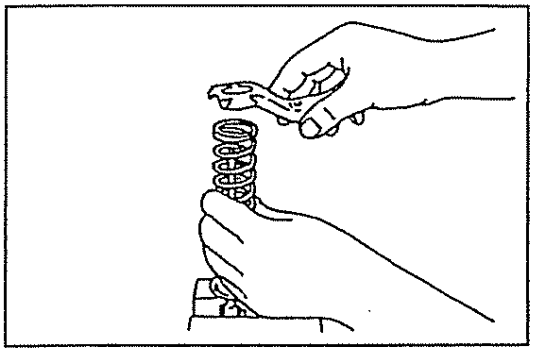


7. ASSEMBLY OF LSPV

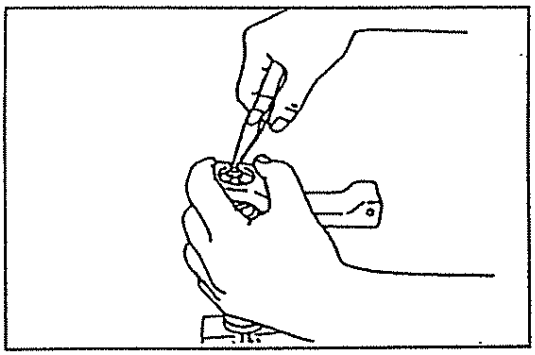
1) Install the new guide bush, using the following SSTs



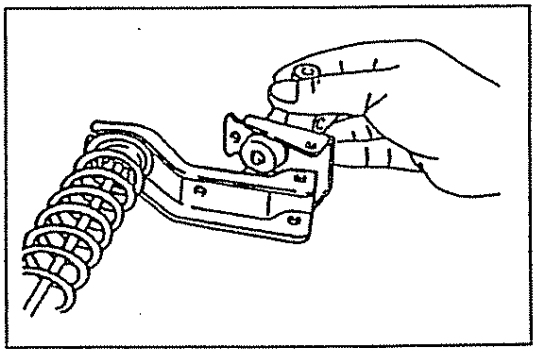
2) Assemble the following parts to the rod.
   ① Spring retainer
   ② Load sensing spring
   ③ Valve control lever
   ④ Guide bush
   ⑤ Plate washer



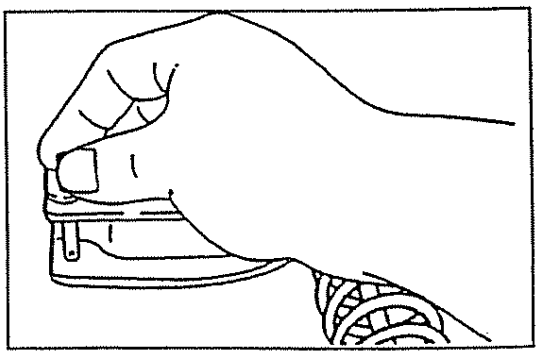
3) Install the new cotter pin.



4) Install the LSPV with the bracket on the control lever and install the pivot pin.

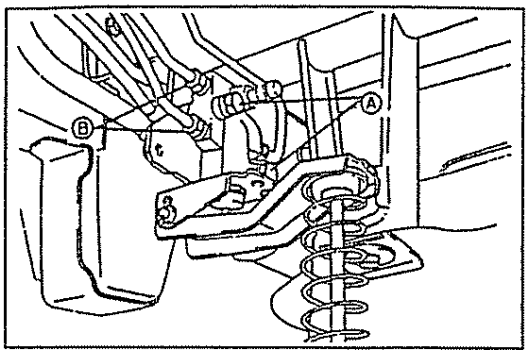


5) Install the cotter pin.

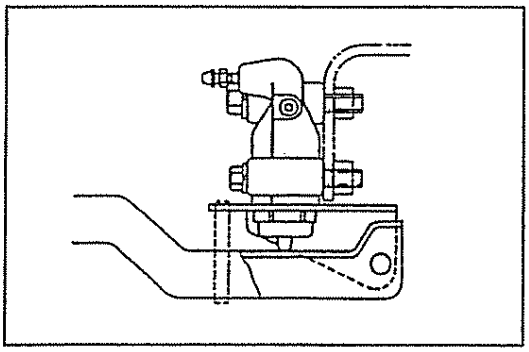


8. INSTALLATION

1) Install the LSPV asembly to the frame. Then connect the brake tube.
   Specified Torque:
   A, 14.7 - 21.6 N·m
   (1.5 - 2.2 kgf-m, 10.8 - 15.9 ft-lb)
   B, 12.7 - 17.7 N·m
   (1.3 - 1.8 kgf-m, 9.4 - 13.1 ft-lb)



2) Secure the lever of the LSPV link to the bracket of the valve proper by means of a band or the like.
   NOTE:
   - Make sure that the LSPV piston end comes in full contact with the link lever when securing.



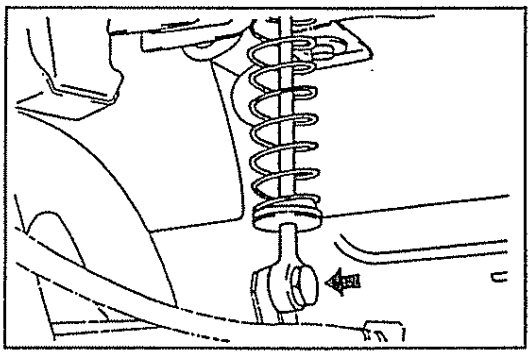
3) Set the rear axle weight as follows.

	Rear axle weight kg)	Difference between right and left kg)
Pick-up	350 ± 5	Not to exceed 10
Van	435 ± 5	Not to exceed 10

4) Slowly drive the vehicle about 1 m forward and backward. Apply the parking brake.

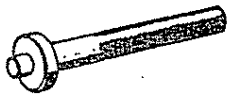
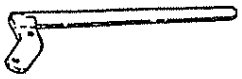
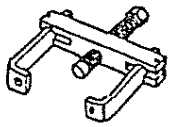
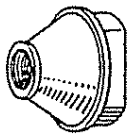
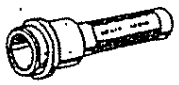
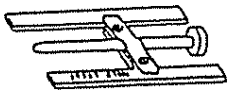
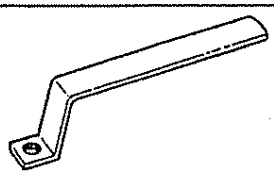
5) Install the LSPV link end to the bracket at the axle side. Tighten the nut to the specified torque.
   Specified Torque: 9.8 - 15.7 N·m
   (1.0 - 1.6 kgf-m, 7.2 - 11.6 ft-lb)

   NOTE:
   - Never push up or down the LSPV end when assembling the LSPV link end to the bracket at the axle side.



6) Remove the band securing the LSPV link lever.
7) Check the hydraulic pressure. If the hydraulic pressure fails to conform to the specifications, adjust the pressure. (Refer to page BR-42)

SSTs

Illustration	Tool No.	Tool name
	19.1.20198	Input shaft front bearing replacer
	19.1.20222	Front hub & drum puller
	19.1.20221	Brake drum stopper
	19.1.20217	Brake drum replacer nut
	19.1.20218	Rear axle shaft bearing replacer
	19.1.20219	Rear axle shaft oil seal replacer
	19.1.20220	Brake booster push rod gauge
	19.1.20210	Brake booster push rod wrench
	Mity VAC pump AWA Ref. 445359	Suction pressure pump

SERVICE SPECIFICATIONS

Brake pedal

Unit: mm (inch)

Item	Specified value	Allowable limit	Remarks
Installation height	132 - 142 (5.20 - 5.59)	—	
Free travel	2 - 7 (0.08 - 0.27)	—	
Reserve travel	Not less than 85 (3.34)	—	When pedal applying force is 30 kg

Front brake

Unit: mm (inch)

Item			Specified value	Allowable limit	Remarks
Disc brake	Pad thickness		9.0 (0.35)	1.0 (0.4)	
	Disc	Thickness	16.0 (0.63)	15.0 (0.59)	
		Run-out	—	0.15 (0.006)	

Rear brake

Unit: mm (inch)

Item		Specified value	Allowable limit	Remarks
Brake drum	Inner diameter	200 (7.87)	201.5 (7.93)	
Brake lining	Thickness	4 (0.16)	1.0 (0.04)	

TIGHTENING TORQUE

Tightening component	Tightening torque		
	N·m	kgf-m	ft-lb
Master cylinder x Pedal bracket	29.5 - 44.1	3.0 - 4.5	21.7 - 32.5
Backing plate x Wheel cylinder	9.9 - 12.7	1.0 - 1.3	7.2 - 9.4
Wheel cylinder x Bleeder plug	6.9 - 9.8	0.7 - 1.0	5.1 - 7.2
Brake tube x Wheel cylinder	12.8 - 17.6	1.3 - 1.8	9.4 - 13.0
Brake tube flare nut	12.8 - 17.6	1.3 - 1.8	9.4 - 13.0
Brake booster x Pedal lock shaft plate	17.7 - 21.5	1.8 - 2.2	13.0 - 15.9
Disc brake dust cover x Steering knuckle	39.3 - 53.9	4.0 - 5.5	28.9 - 39.8
Disc brake caliper assembly x Disc brake dust cover	49.1 - 58.8	5.0 - 6.0	36.2 - 43.4
Front hub or drum x Front drive shaft or front axle	176.6 - 215.7	18.0 - 22.0	130.2 - 159.1
Backing plate x Steering knuckle	39.3 - 53.9	4.0 - 5.5	28.9 - 39.8
Parking brake cable x Floor panel	4.0 - 6.8	0.4 - 0.7	2.9 - 5.1
LSPV x Flam	14.7 - 21.6	1.5 - 2.2	10.8 - 15.9
LSPV x Rear axle	9.8 - 15.7	1.0 - 1.6	7.2 - 11.6

DAIHATSU

S85

HW

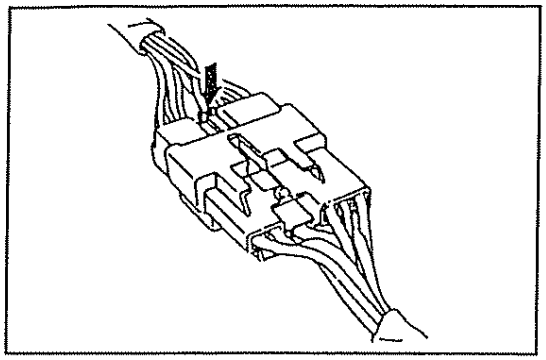
HARNESS AND WIRING DIAGRAM

HANDLING INSTRUTIONS OF LOCK TYPE CONNECTOR

HANDLING AND INSPECTION

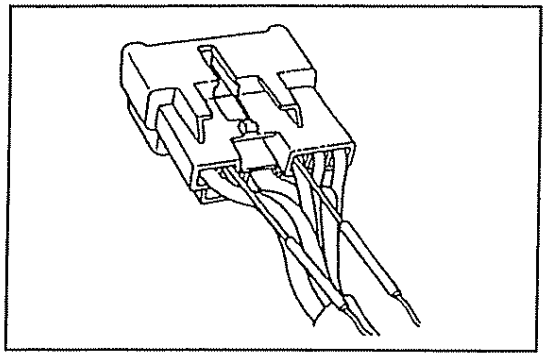
Removal

To disconnect the connector, simply pull out the connector while the lock lever is being pressed down, as indicated in the right figure.



Inspection

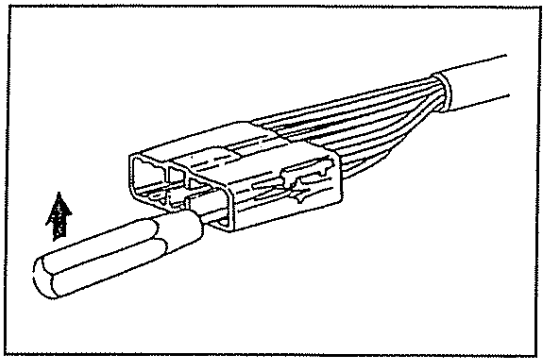
When you conduct continuity checks or voltage checks using a circuit tester, if you insert a test probe from the connector side, it is impossible to get an adequate fitting. Hence, be sure to positively insert the test probe from the harness side, as indicated in the right figure.



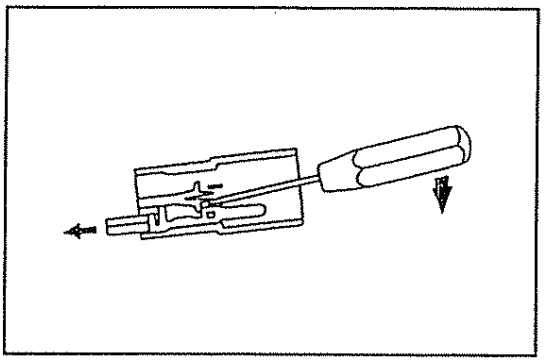
REPLACEMENT

Removal

1) From the aperture, insert a miniature type common screwdriver into between the locking lug and the terminal.

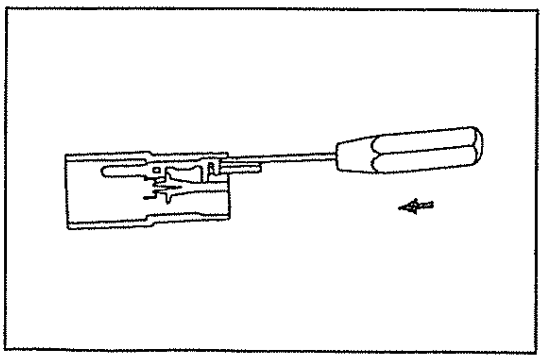


2) While the locking lug is being pried upward by means of a screwdriver, pull out the terminal from the backside.

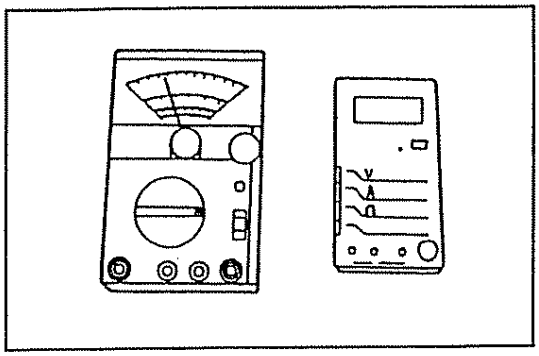


Installation

1) Insert the terminal, until the locking lug is locked positively.
2) Ensure that the locking lug is locked positively by raising the wire.



INSPECTION

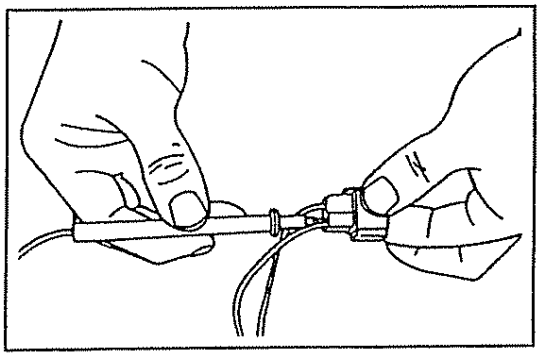


Tester (Volt/ohmmeter)

For the inspection, use a tester having an internal resistance of more than 10 kΩ/V.
Use of a tester with a low internal resistance may cause wrong measurement or secondary troubles.

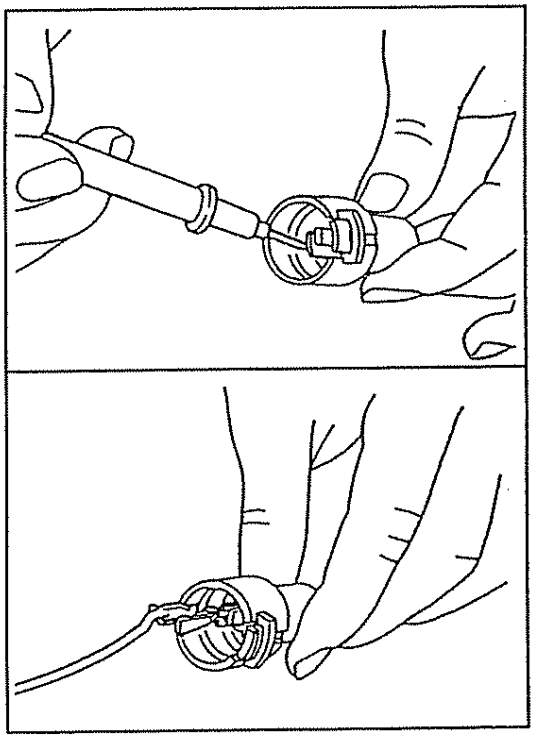
Conventional type connector

When resistance measurement and/or voltage measurement is conducted at the connector section, insert the measuring probe from the back of the connector, being very careful not to damage the harness-to-terminal connections.



Water-proof type connector

When resistance measurement and/or voltage measurement is conducted at the connector section, bring the measuring probe into contact with the terminal at the connection side of the connector. Be very careful not to apply excessive force to the terminal at the connector side. Failure to observe this caution may deform the terminal, causing poor continuity. As an alternative method, insert a male or female terminal into the connector terminal or connect an adequate attachment. Then, connect the measuring probe.



CONNECTION

Perform the connection, until the lock is completely engaged.

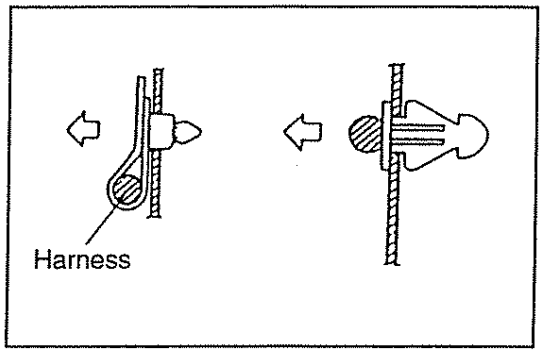
NOTE:

- To confirm whether the lock type connector has been locked or not, lightly pull the connector. Make sure that the connector will not be disconnected. Be sure to press the connector again before finishing the confirmation.

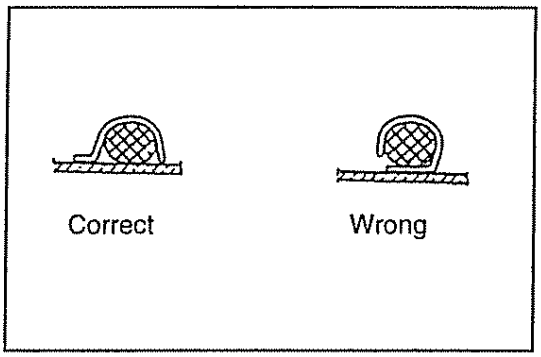
OPERATION OF WIRE HARNESS

1. General Instructions

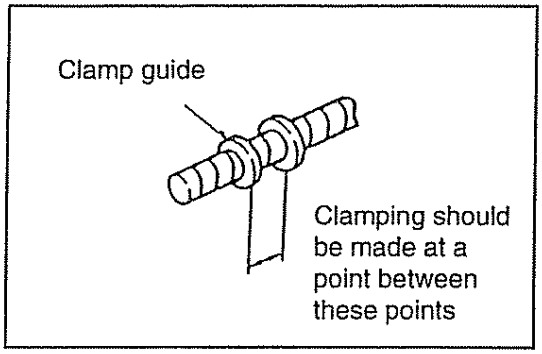
1) Never pull the connectors or step on them during the wire harness transport or assembly. (Prevention of pulling-out of terminals, connector cracks, deformation and so forth)
2) Care must be exercised to ensure that no scratch is made to the wire harness by burrs or edges during the wire harness transport or assembly. (Prevention of scratches to the outer trim, electrical insulators and so forth)
3) Clamping method
   In the case of resin clamps, ensure that the clamp section is fitted in the body hole.
   NOTE:
   - Ensure that the clamp will not be detached when it is pulled lightly in the arrow-headed direction. (Prevention of interference due to the detachment of the clamp)



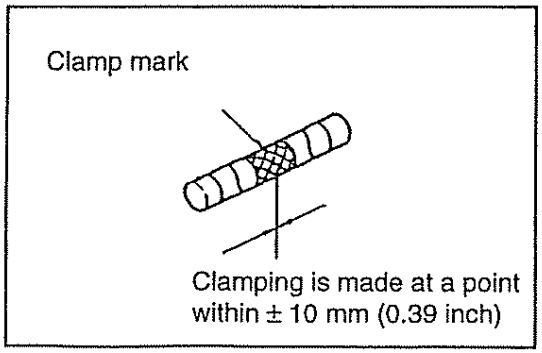
- In the case of metal sheet welded clamps, be sure to assemble the harness in such a way that the harness will not come in contact with the welded surface. (Prevention of wire harness damage due to welding burrs)



- In case that the locating guide of the clamp position or the clamp mark is clamped, make sure that the clamp is located within the guide. As for the clamp at the clamp mark section, ensure that the clamping is made at a point within ± 10 mm (0.39 inch).



(Prevention of slackness or interference)

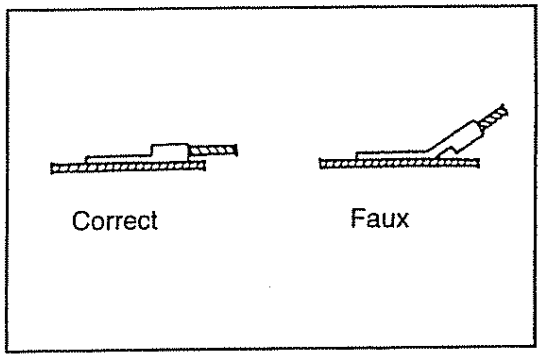


Cablage

4) Terminals and connectors

- Perform the connection of connectors positively
  - Connector with lock ..... Ensure that the locking is made.
  - Connector without lock ..... Connect the connector positively until it stops.

- Retention by screws
- When the tightening torque is specified, be sure to observe the specification strictly.
  (The tightening torque is posted in the table sepa rately).
- Ensure that the staked section may not come on the assembling surface.
- After completion of the tightening operation, lightly pull out the terminal. Ensure that there is not slackness.



- When performing other operations, care must be exercised to ensure that no connected connector is detached by pulling out the wire harness forcibly.

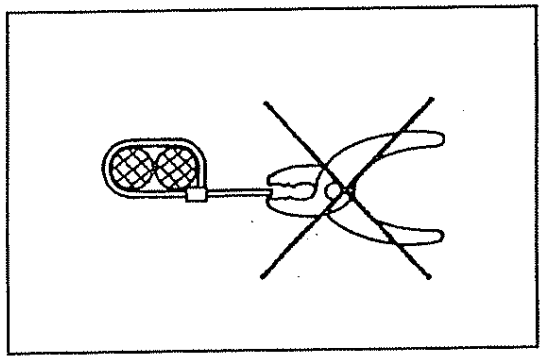
2. Work Procedure for Tightening-up Type Resin Clamps

<Work procedure>

When the tightening-up type resin clamps are employed, do not use any pliers, cutting pliers or the like.

<Reason>

Prevention of clamps being cut or scratched.



WIRING HARNESSES

WARNING:

The wire diameter and capacity of each harness have been determined to assure the normal operation of the electrical system.

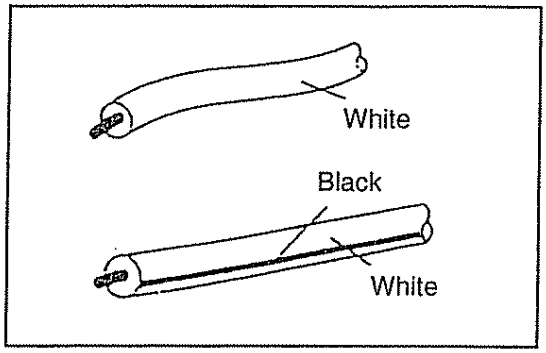
Hence, do not take power for accessories carelessly through the original wiring harness. Failure to observe this caution may cause system malfunction or fire.

Wiring Color Code

- For identification purpose, each wire has its own color. Each color bears a code as described in the right table. These codes are used in the wiring diagram and will be helpful during trouble shooting.

Code	A	M	N
Color	Light blue	Brown	Black
Code	B	R	V
Color	White	Red	Green
Code	G	L	Z
Color	Yellow	Blue	Violet

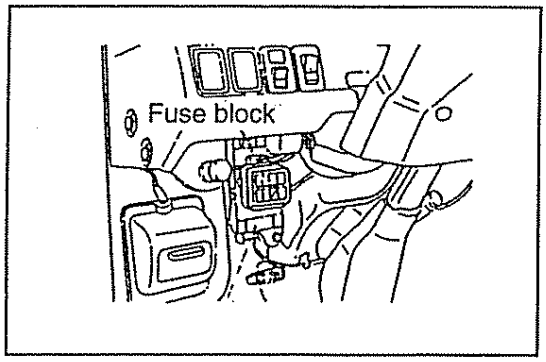
- The wire color comes in two kinds: single color and composite color. In the case of single color, the whole outer coat of the harness is of a single color. In the case of composite color, a fine line of the second color is drawn on the harness basic color. In this case, the code is composed of the basic color code which comes first and the second color code which comes after a hyphen.



FUSE BLOCK

Installing position

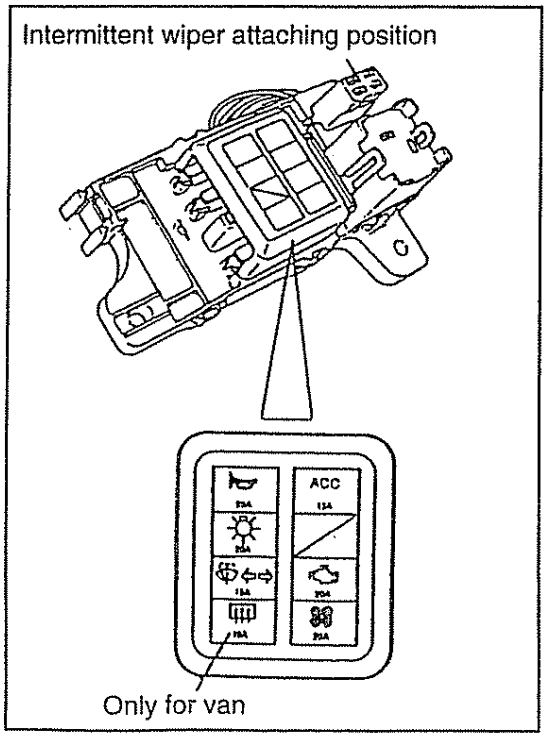
The fuse block is located at the left side of the steering wheel both on the L.H.D. vehicles and on the R.H.D. vehicles.



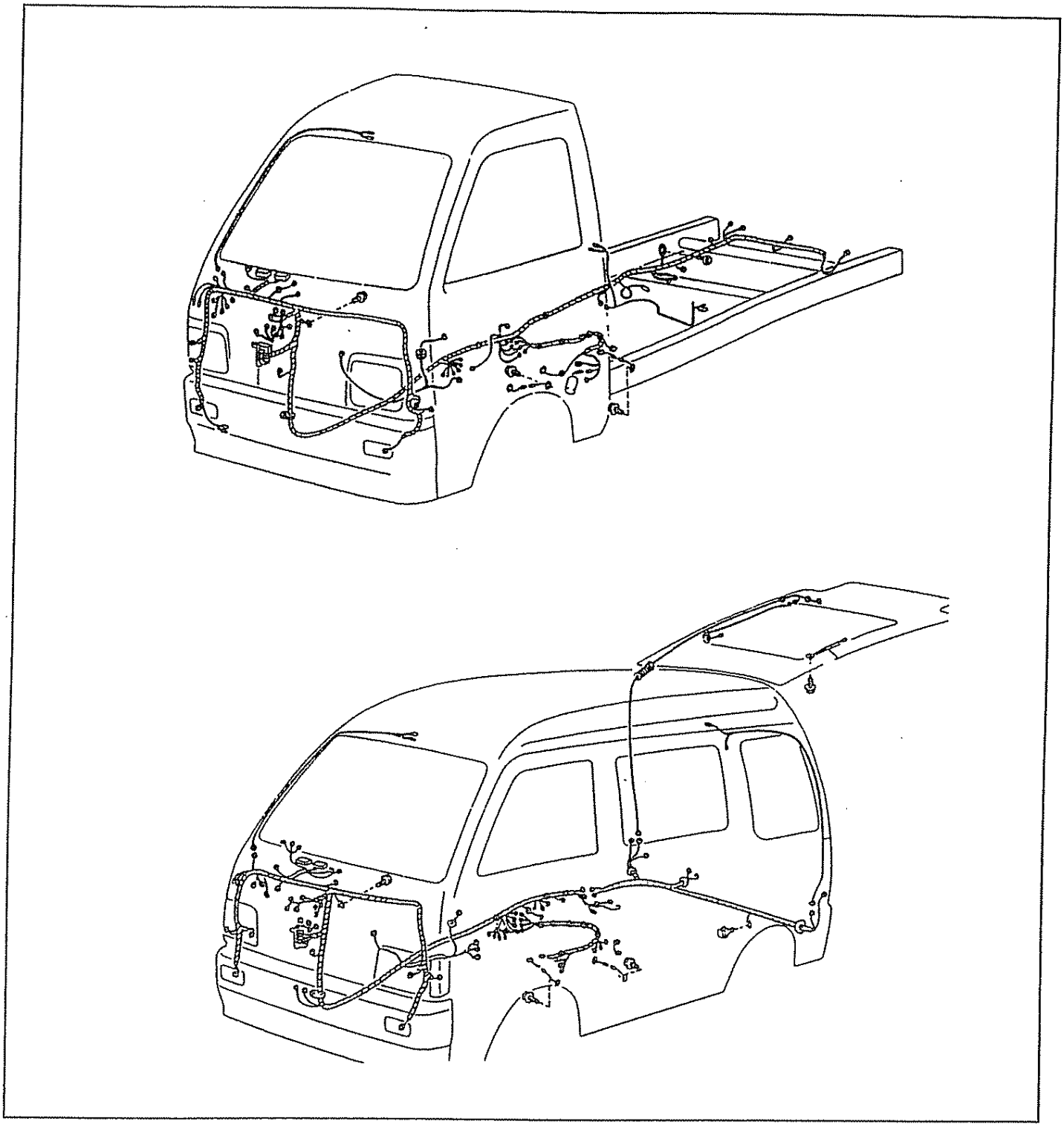
REPLACEMENT OF FUSES & FUSIBLE LINK

PRECAUTION:

1. Determine the causes of melting of the fuse and/or fusible link. Remedy the problem. Then, connect a new fuse and/or fusible link.
2. Before the fuses are removed or installed, be sure to turn OFF the ignition switch.
3. Be sure to use a pair of pliers when removing or installing the fuses.
4. Be very careful not to pry out fuses when removing or installing fuses.
5. When replacing a fuse with a new one, be sure to install a fuse having a capacity specified at the caution plate.



WIRE HARNESS



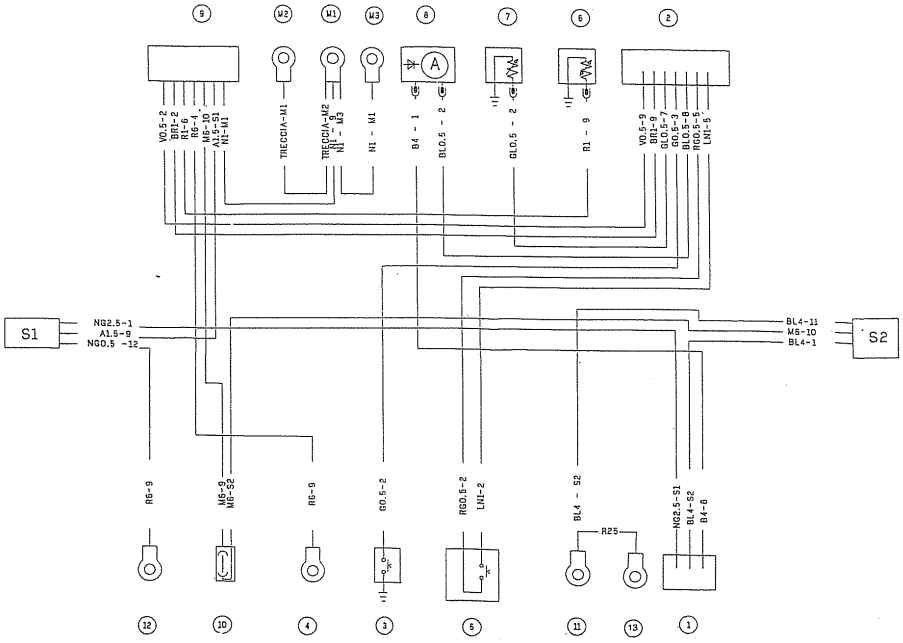
	Name of wiring harness		Name of wiring harness
①	Engine wire*	⑤	Roof wire No. 2
②	Cowl wire *	⑥	Back door wire No. 1 *
③	Frame wire *	⑦	Rear window wire No. 1
④	Roof wire	⑧	Rear window wire No. 2

* Detail shows following pages

MOTOR HARNESS

Keys

1) Board panel connection wire
2) Board panel connection wire
3) Oil pressure contactor
4) Preheating
5) Backing light contactor
6) Preheating sensor
7) H2O temperature sensor
8) Alternator
9) Box
10) 80A fuse
11) Starter
13) Battery
M1 Left earth
S2 Node



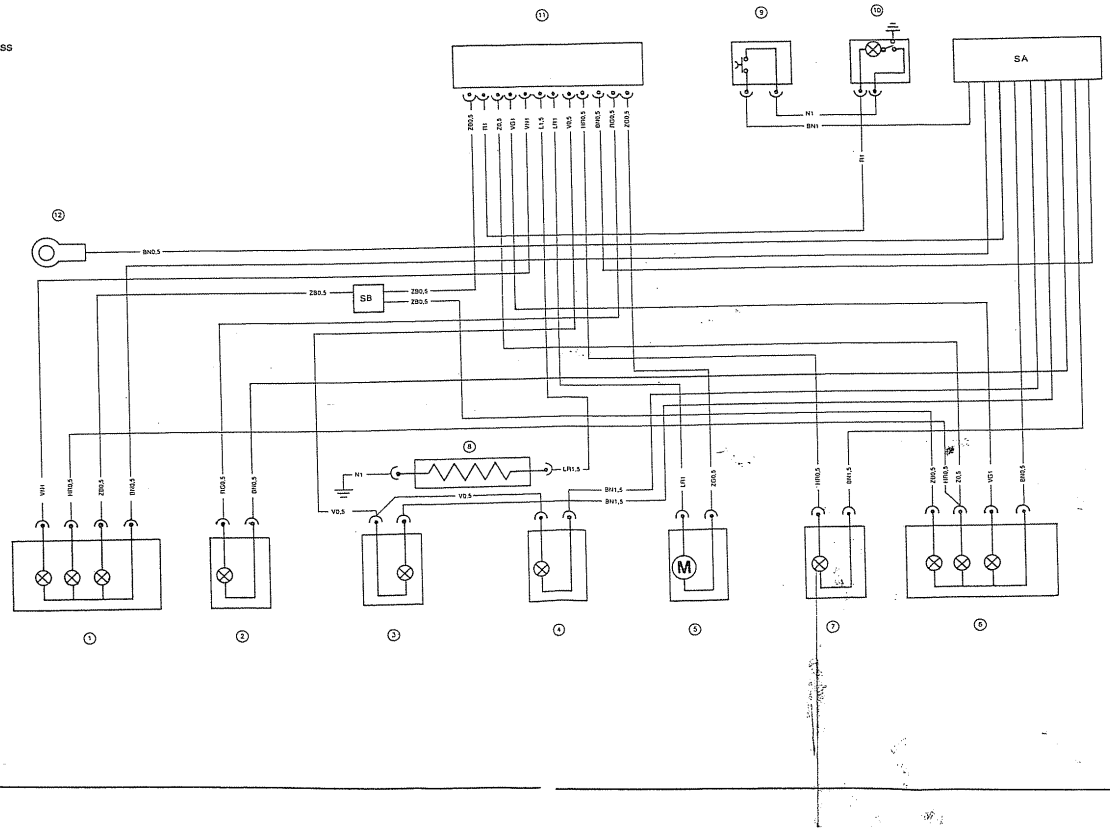
NOMINAL DIMENSIONS			INDIVIDUAL CABLE		FROM NODE TO NODE		FROM NODE TO DERIV.		FROM COLLAR TO COLLAR	
			+	-	+	-	+	-	+	-
	200	(mm)	15	0	10	10	20	0	5	5
200	500	(mm)			20		30	5		
500	1000	(mm)	20	0	30	20	40	10	10	10
1000	2000	(mm)	30						-	-
2000		(%)	2	0	1,5	1,0	2,0	0,5	-	-

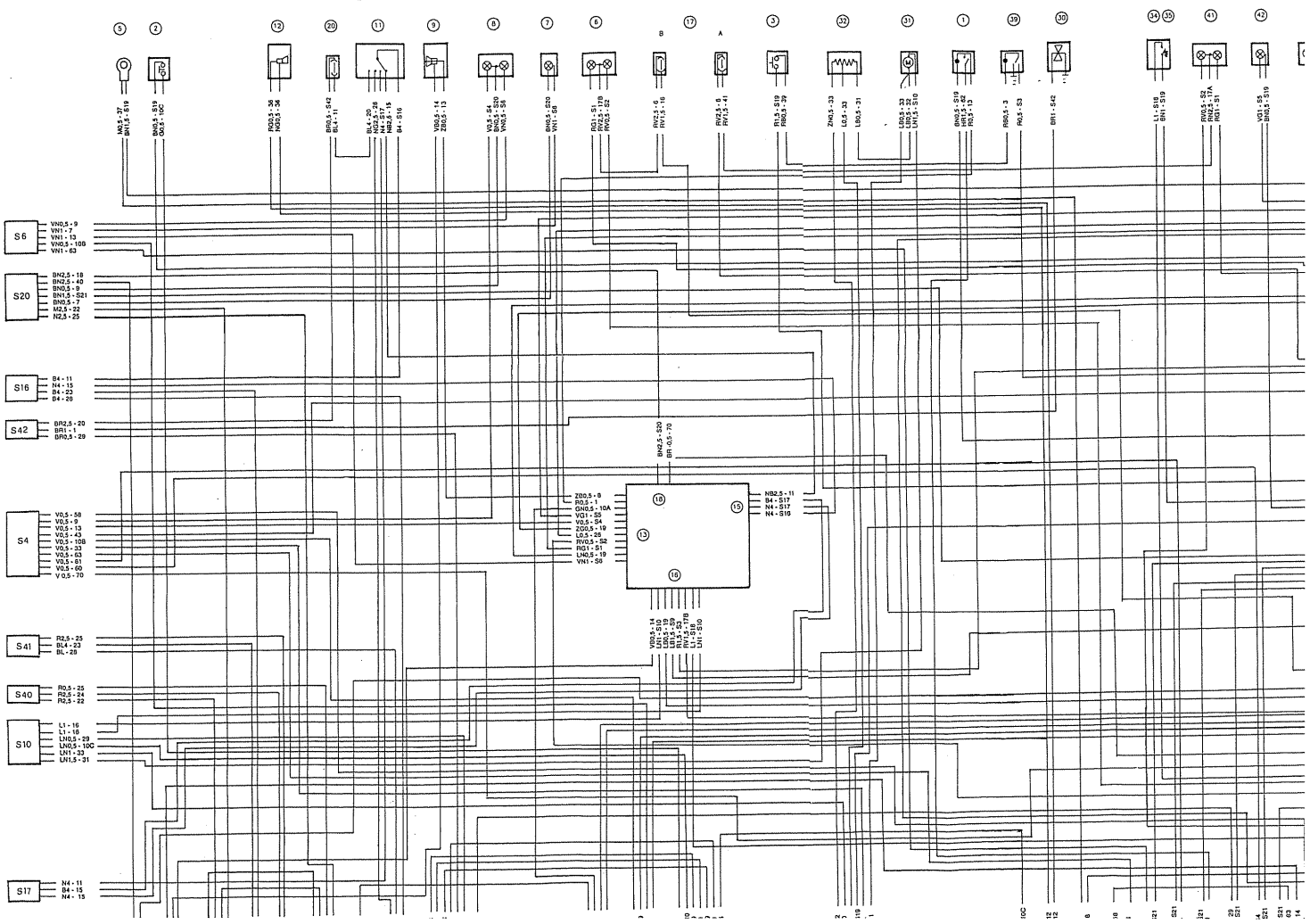
COLOUR CODE

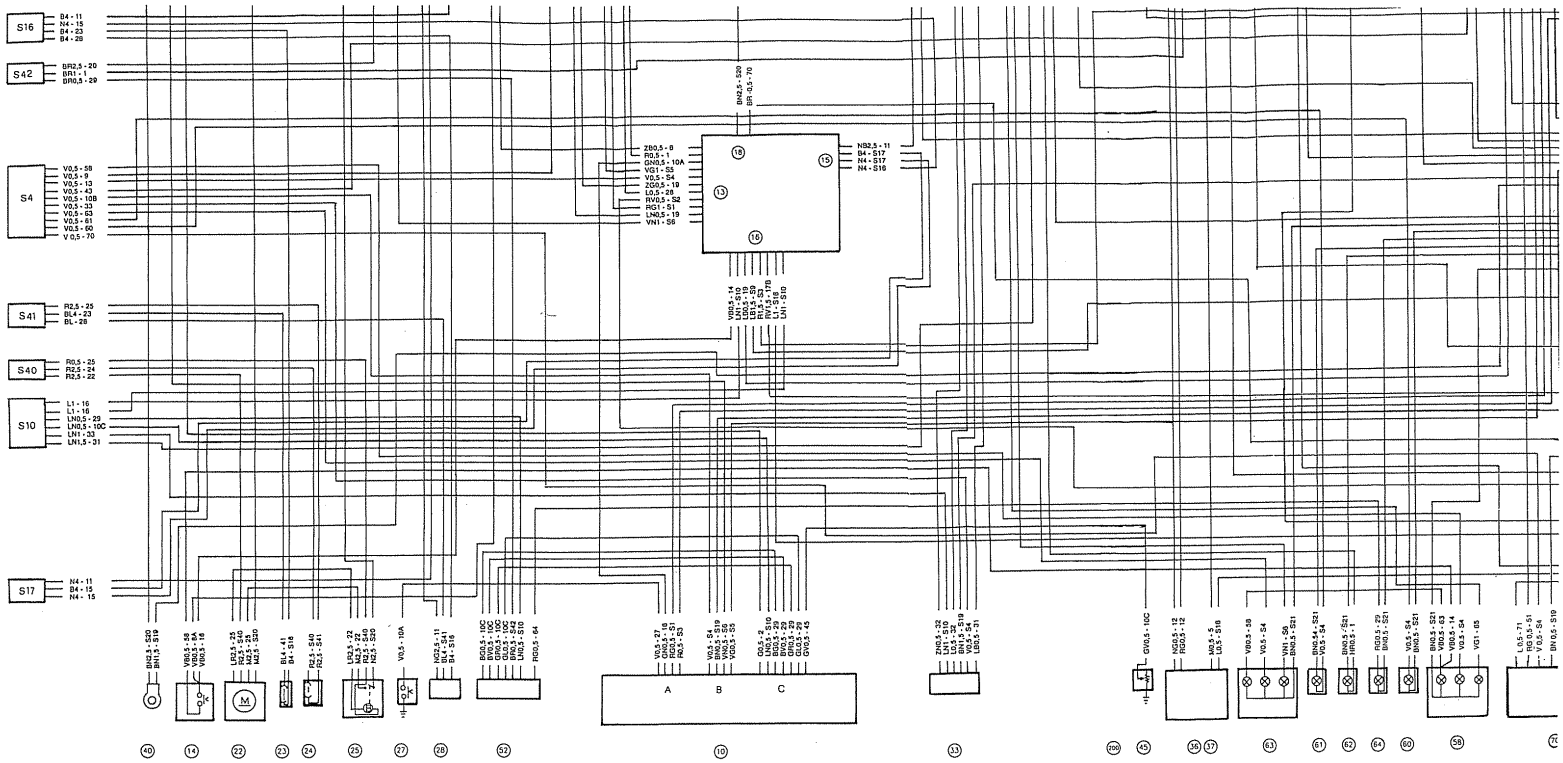
CODE	COLOUR
A	LIGHT BLUE
B	WHITE
G	YELLOW
M	BROWN
N	BLACK
R	RED
V	GREEN
BL	WHITE-BLUE
BR	WHITE-RED
GL	YELLOW-BLUE
BN	BLUE-BLACK
NG	BLACK-YELLOW
RG	RED-YELLOW

SCHEME OF REAR DOORS (VAN)

1) Rear left light
2) Backing light
3) Left plate light
4) Right plate light
5) Rear window wiper
6) Rear right light
7) Backing light
8) Heated rear window
9) Rear ceiling bowl switch
10) Rear ceiling bowl
11) Connection with main harness
12) Rear heart
SA) Node
SB) Node



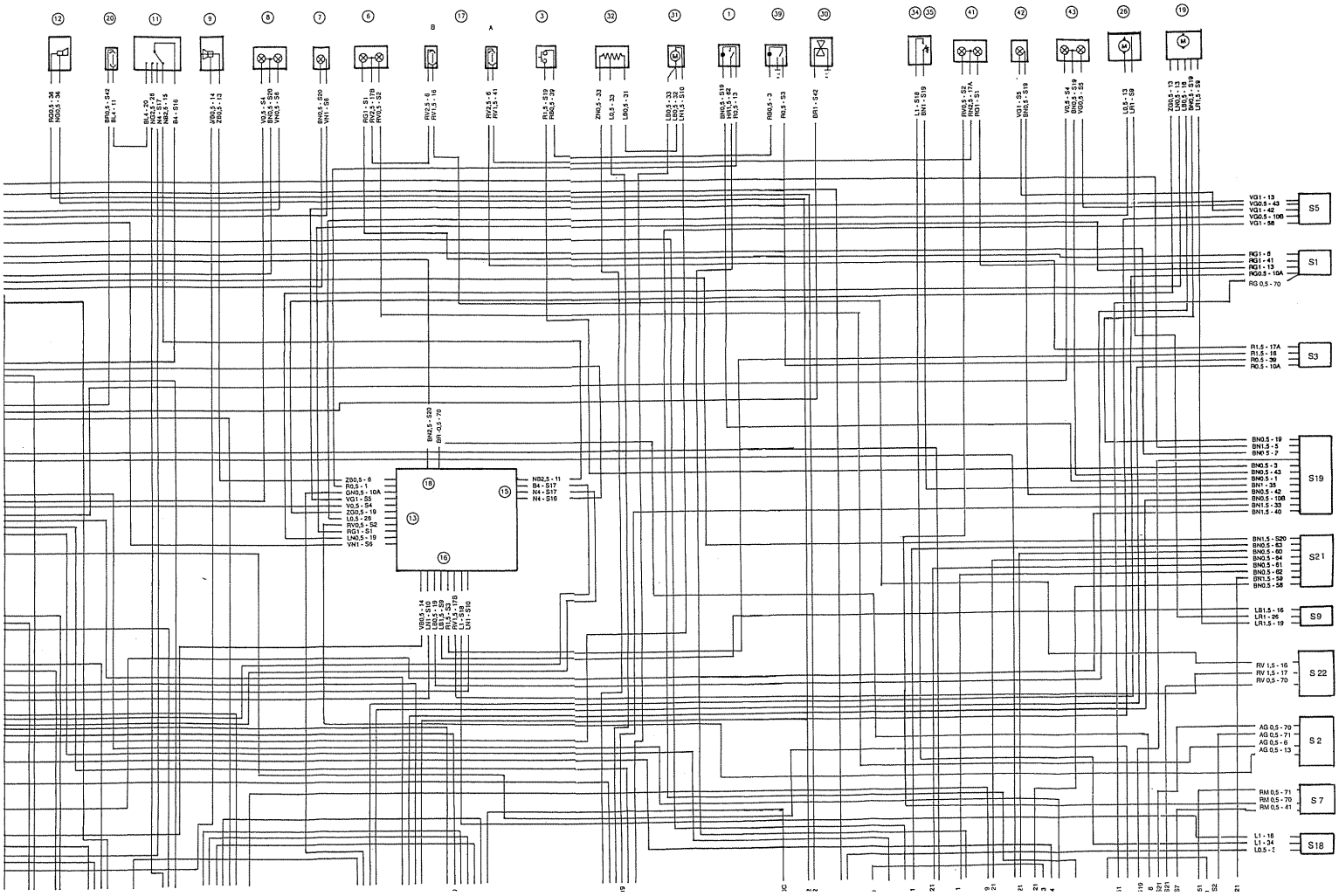


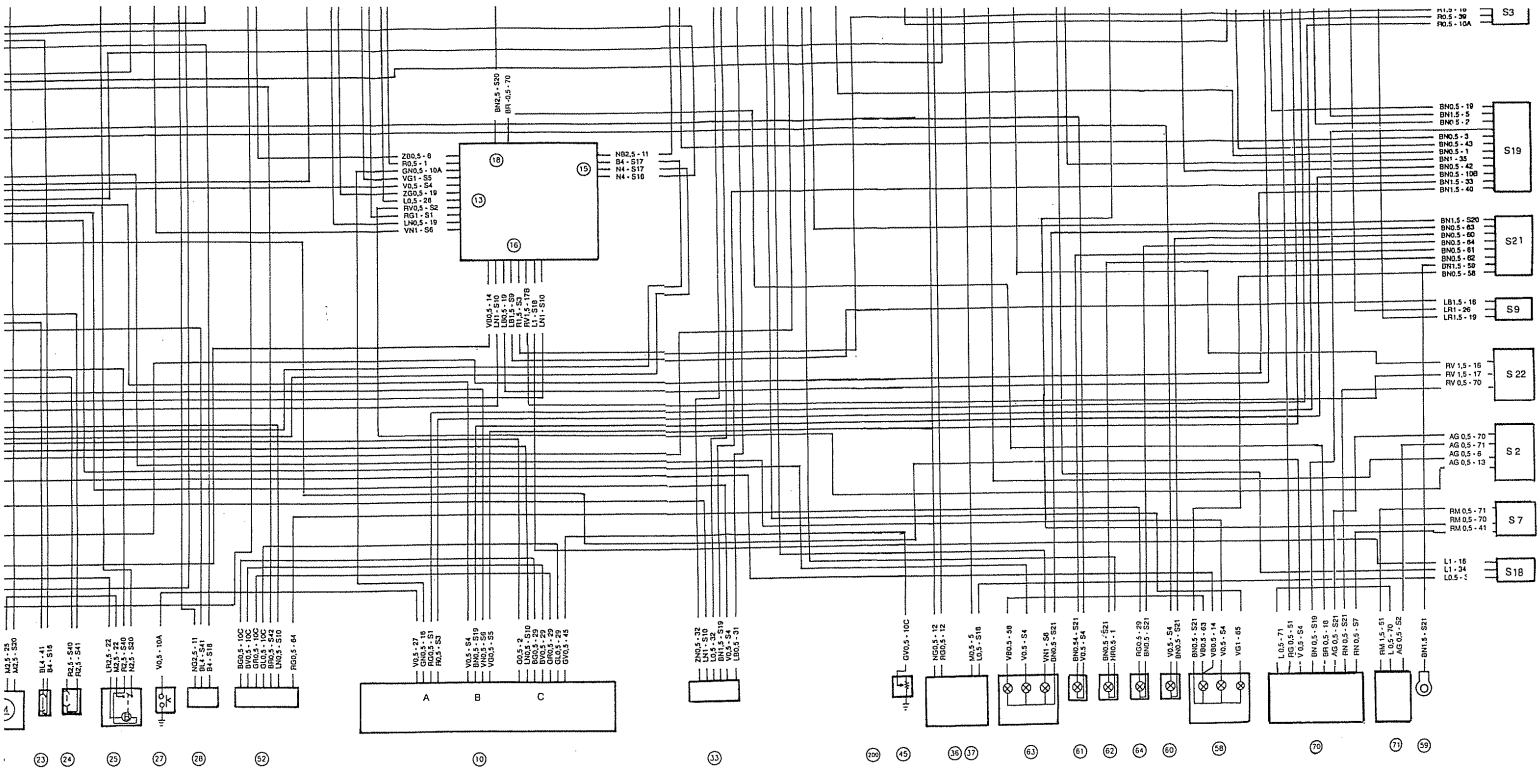


PICK-UP DIAGRAM KEYS

1) Rear fog light switch
2) Brake fluid level
3) Left button
5) Left heart
6) Left traffic and driving beam
7) Left blinker
8) Horn
9) Tail light + left blinker
10) Board table
11) Key switch
12) Loudspeaker
13) Fuse box connection
14) Stop light contactor
15) Fuse box connection
16) Fuse box connection
17) Left traffic/ driving beam supplying fuse
Right traffic/ driving beam supplying fuse
18) Fuse box connection
19) Screen wiper motor
20) Motor fuse
22) Fan radiator
23) 50A fuse
24) 30A fuse
25) Electric fan supplying relay
26) Screen washing pump
27) Emergency brake contactor
28) Motor unit connection
30) Fuel solenoid valve
31) Heater motor resistor
32) Heater motor resistor
33) Heater switch
34) Lighter
36) Radio
39) Ceiling bowl
40) Right heart
41) Right driving/ traffic light
42) Right blinker
43) Rear left blinker
45) Fuel level
52) Motor unit connection
58) Rear right light
59) Rear earth
60) Right plate light
61) Left plate light
62) Rear fog light
63) Rear left light
64) Backing light

"S" before a number indicates a node.
200) Buzzer





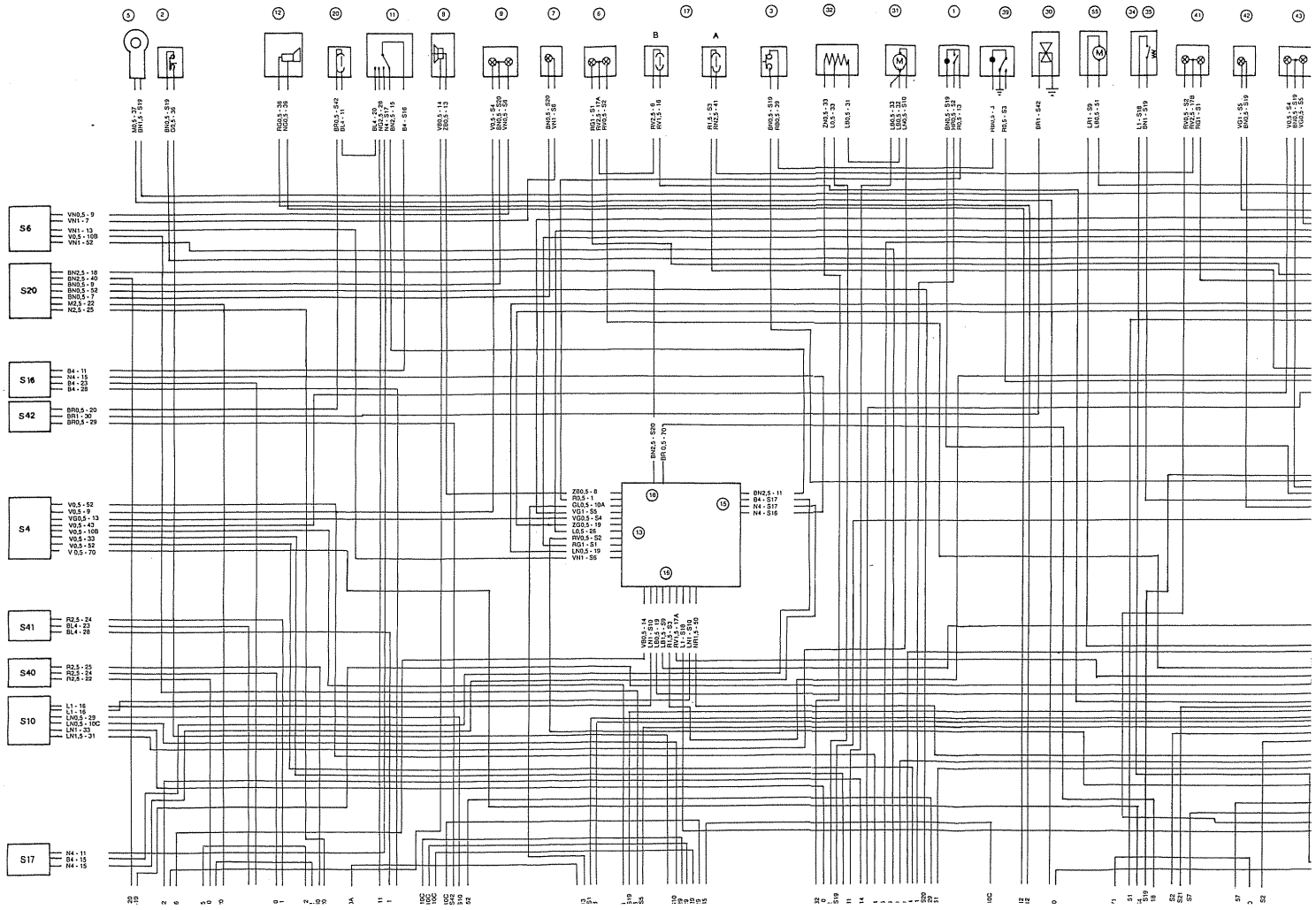
12) Loudspeaker
13) Fuse box connection
14) Stop light contactor
15) Fuse box connection
16) Fuse box connection
17) Left traffic/ driving beam supplying fuse
Right traffic/ driving beam supplying fuse
18) Fuse box connection
19) Screen wiper motor
20) Motor fuse

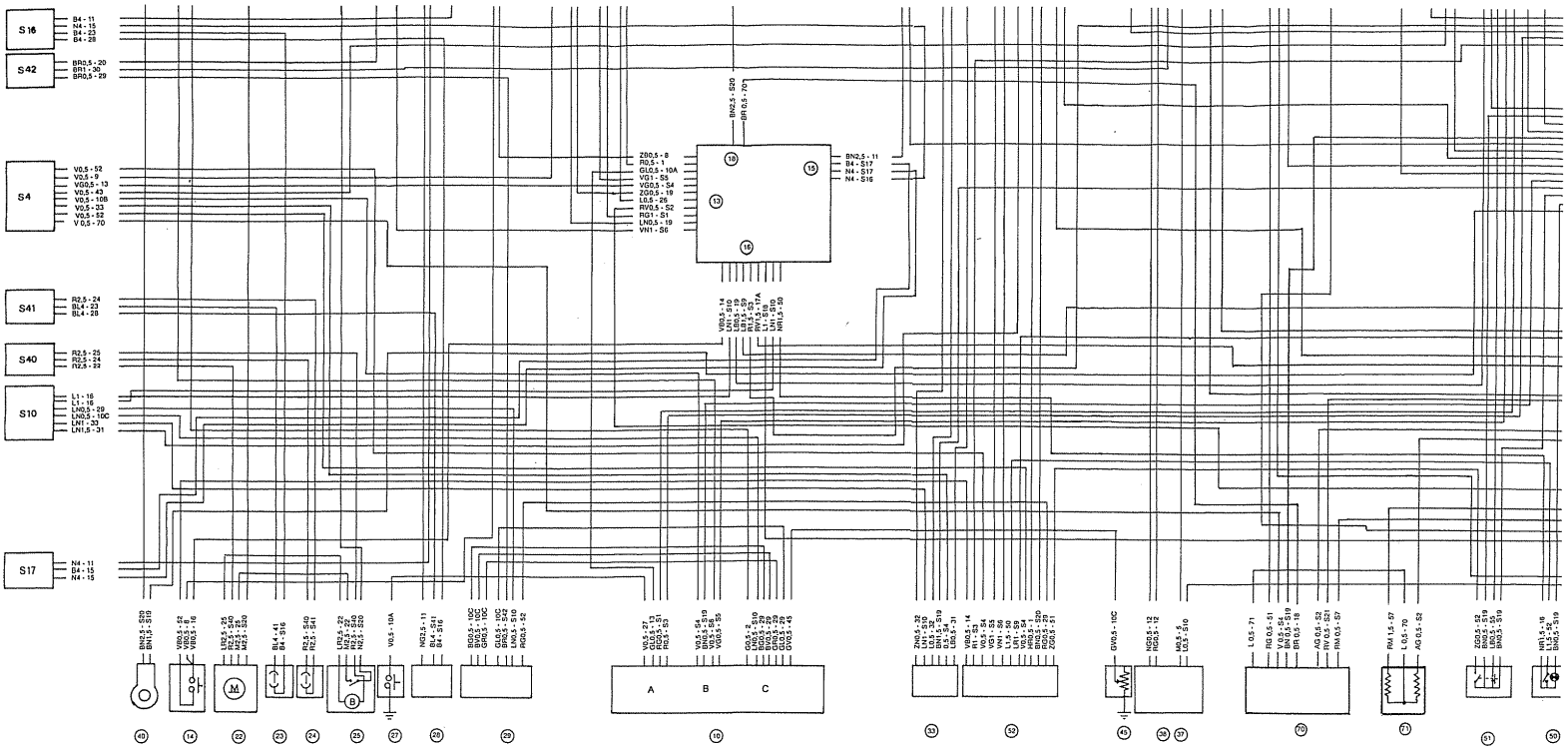
22) Fan radiator
23) 50A fuse
24) 30A fuse
25) Electric fan supplying relay
26) Screen washing pump
27) Emergency brake contactor
28) Motor unit connection
30) Fuel solenoid valve
31) Heater motor resistor
32) Heater motor resistor

33) Heater switch
34) Lighter
36) Radio
39) Ceiling bowl
40) Right heart
41) Right driving/ traffic light
42) Right blinker
43) Rear left blinker
45) Fuel level
52) Motor unit connection

58) Rear right light
59) Rear earth
60) Right plate light
61) Left plate light
62) Rear fog light
63) Rear left light
64) Backing light

"S" before a number indicates a node.
200) Buzzer

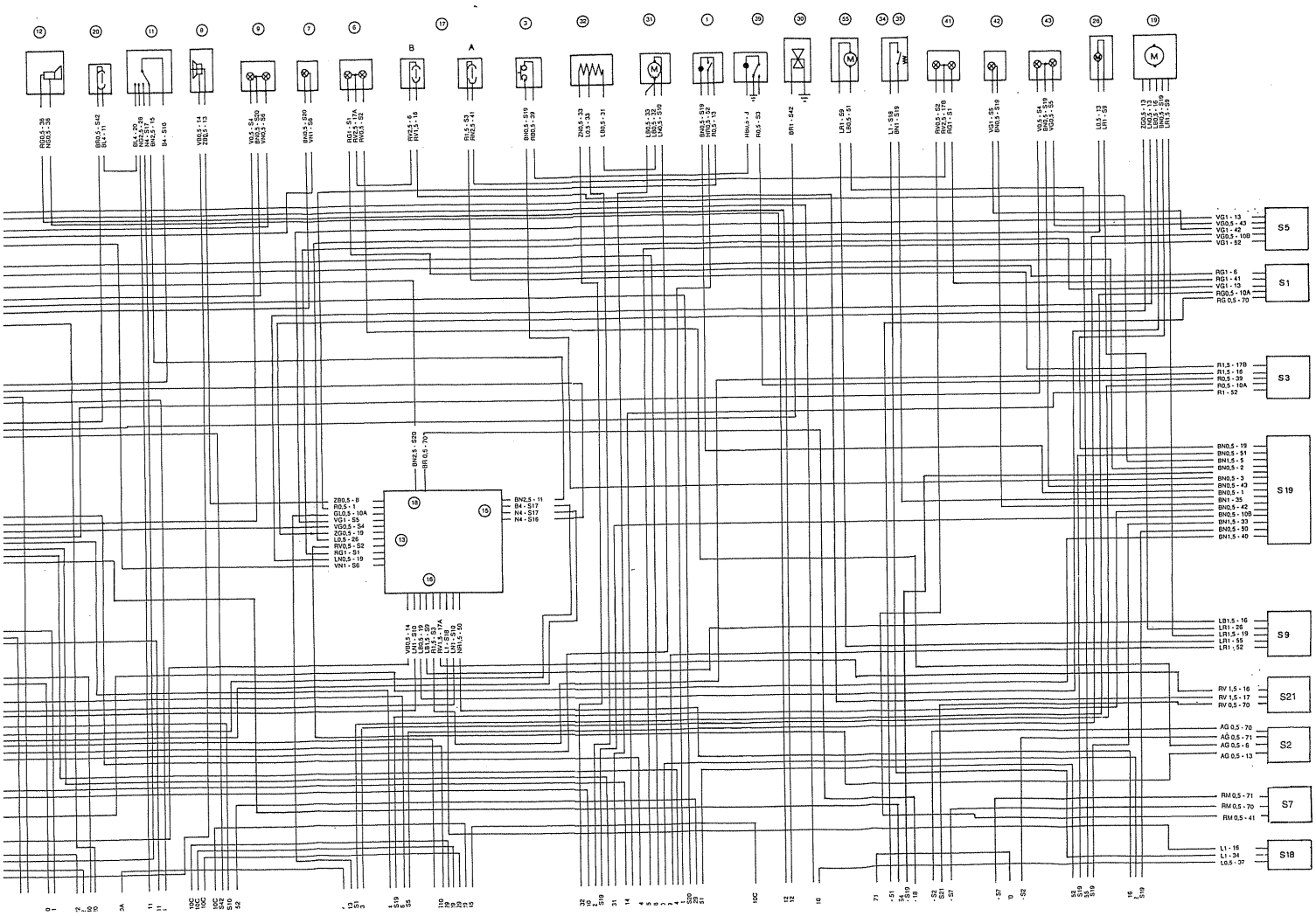


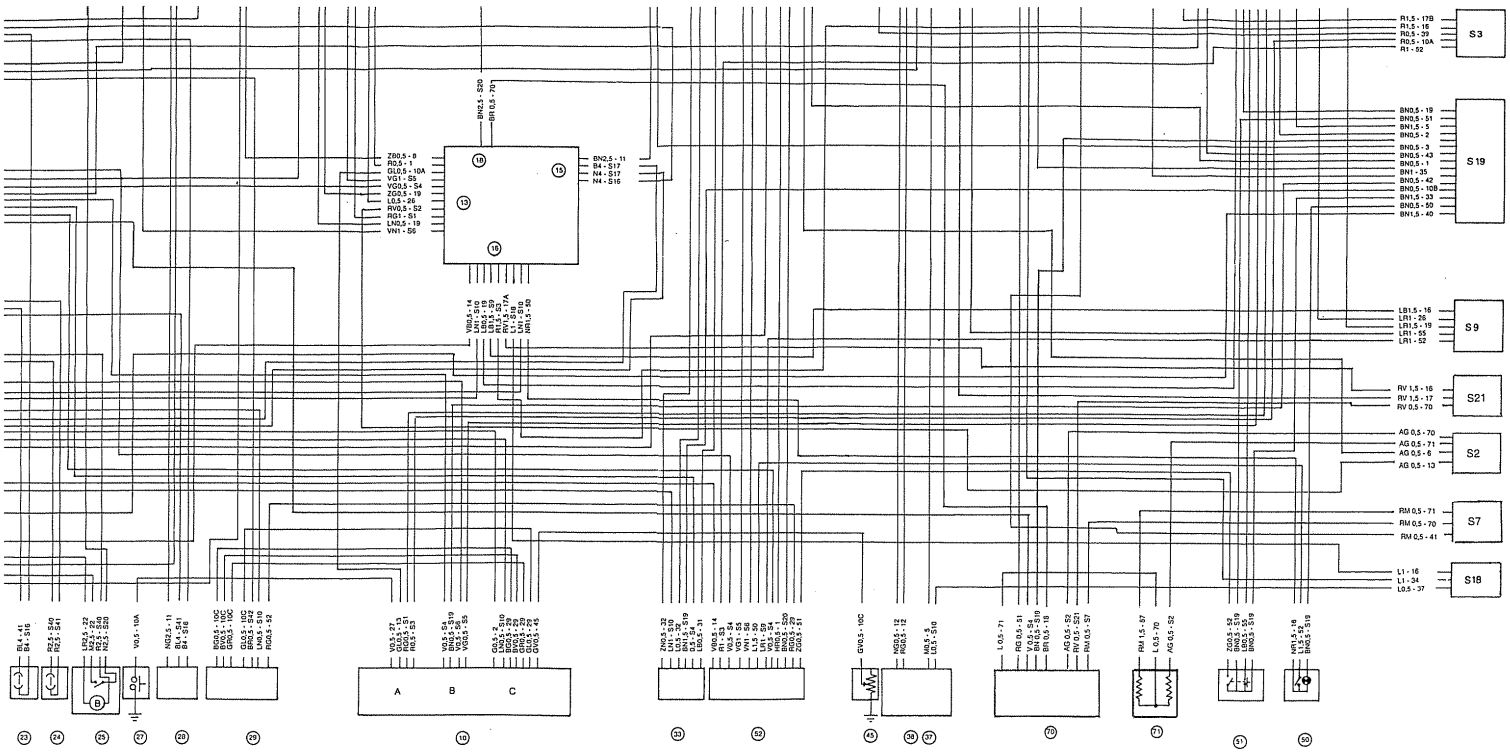


VAN DIAGRAM KEYS

1) Rear fog light switch
2) Brake fluid level
3) Left button
5) Left heart
6) Left traffic and driving beam
7) Left blinker
8) Horn
9) Tail light + left blinker
10) Board table
11) Key switch
12) Loudspeaker
13) Fuse box connection
14) Stop light contactor
15) Fuse box connection
16) Fuse box connection
17) Left traffic/ driving beam supplying fuse
Right traffic/ driving beam supplying fuse
18) Fuse box connection
19) Screen wiper motor
20) Motor fuse
22) Fan radiator
23) 50A fuse
24) 30A fuse
25) Electric fan supplying relay
26) Screen washing pump
27) Emergency brake contactor
28) Motor unit connection
30) Fuel solenoid valve
31) Heater motor resistor
32) Heater motor resistor
33) Heater switch
34) Lighter
36) Radio
39) Ceiling bowl
40) Right heart
41) Right driving/ traffic light
42) Right blinker
43) Rear left blinker
45) Fuel level
50) Heated rear window switch
51) Rear window wiper switch
55) Rear window washing switch

"S" before a number indicates a node.
200) Buzzer





Loudspeaker
Fuse box connection
Stop light contactor
Fuse box connection
Fuse box connection
Left traffic/ driving beam supplying fuse
Right traffic/ driving beam supplying fuse
Fuse box connection
Screen wiper motor
Motor fuse

22) Fan radiator
23) 50A fuse
24) 30A fuse
25) Electric fan supplying relay
26) Screen washing pump
27) Emergency brake contactor
28) Motor unit connection
30) Fuel solenoid valve
31) Heater motor resistor
32) Heater motor resistor

33) Heater switch
34) Lighter
36) Radio
39) Ceiling bowl
40) Right heart
41) Right driving/ traffic light
42) Right blinker
43) Rear left blinker
45) Fuel level
50) Heated rear window switch

51) Rear window wiper switch
55) Rear window washing switch

"S" before a number indicates a node.
200) Buzzer