

155

REPAIR MANUAL

● MECHANICAL UNITS



GROUP 12 - CLUTCH



GROUP 13 - GEARBOX - DIFFERENTIAL



GROUP 17 - AXLE SHAFTS



GROUP 21 - FRONT SUSPENSION



GROUP 22 - FRONT AND REAR BRAKES



GROUP 23 - STEERING



GROUP 25 - REAR SUSPENSION



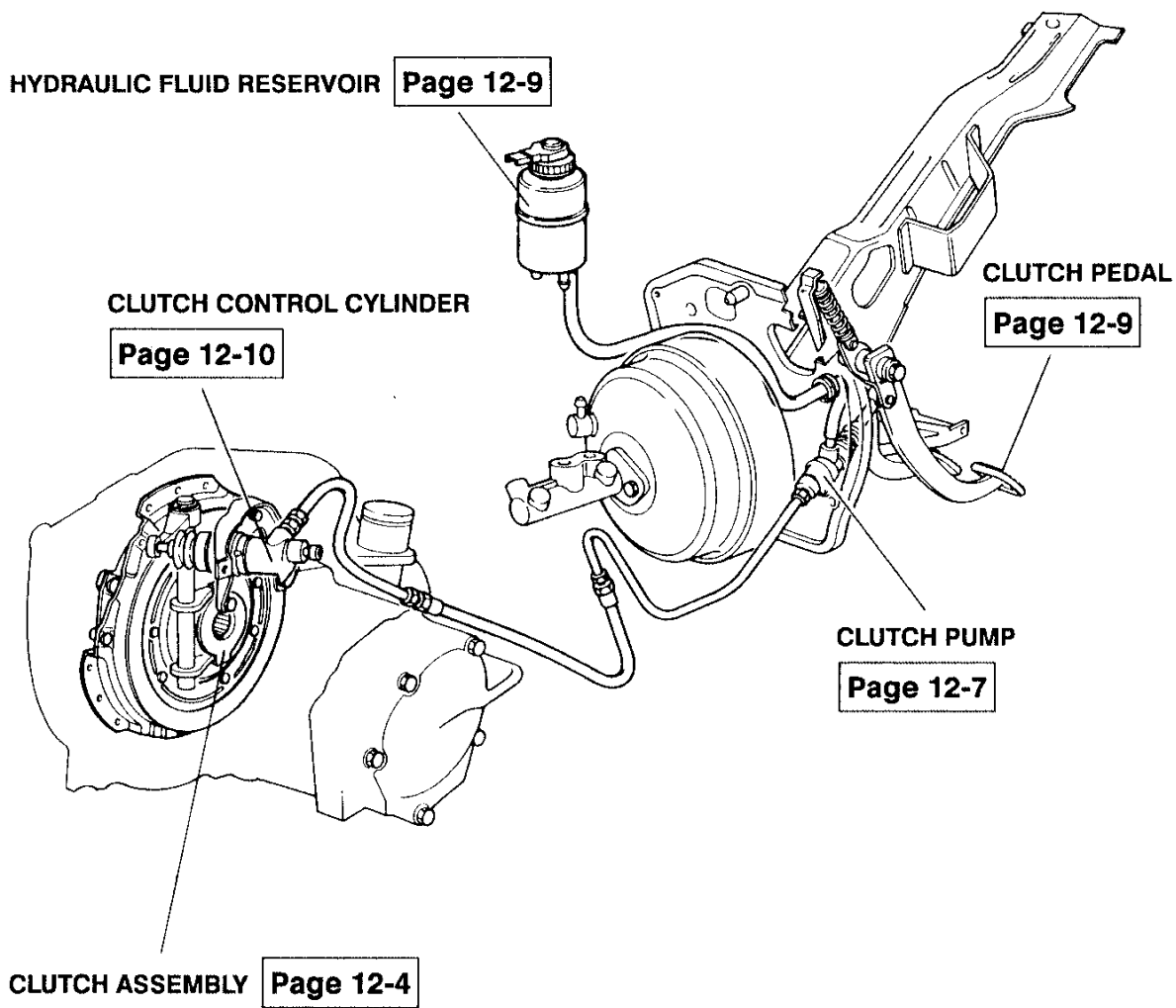
GROUP 28 - WHEELS AND TYRES

**GROUP 12****CLUTCH****INDEX**

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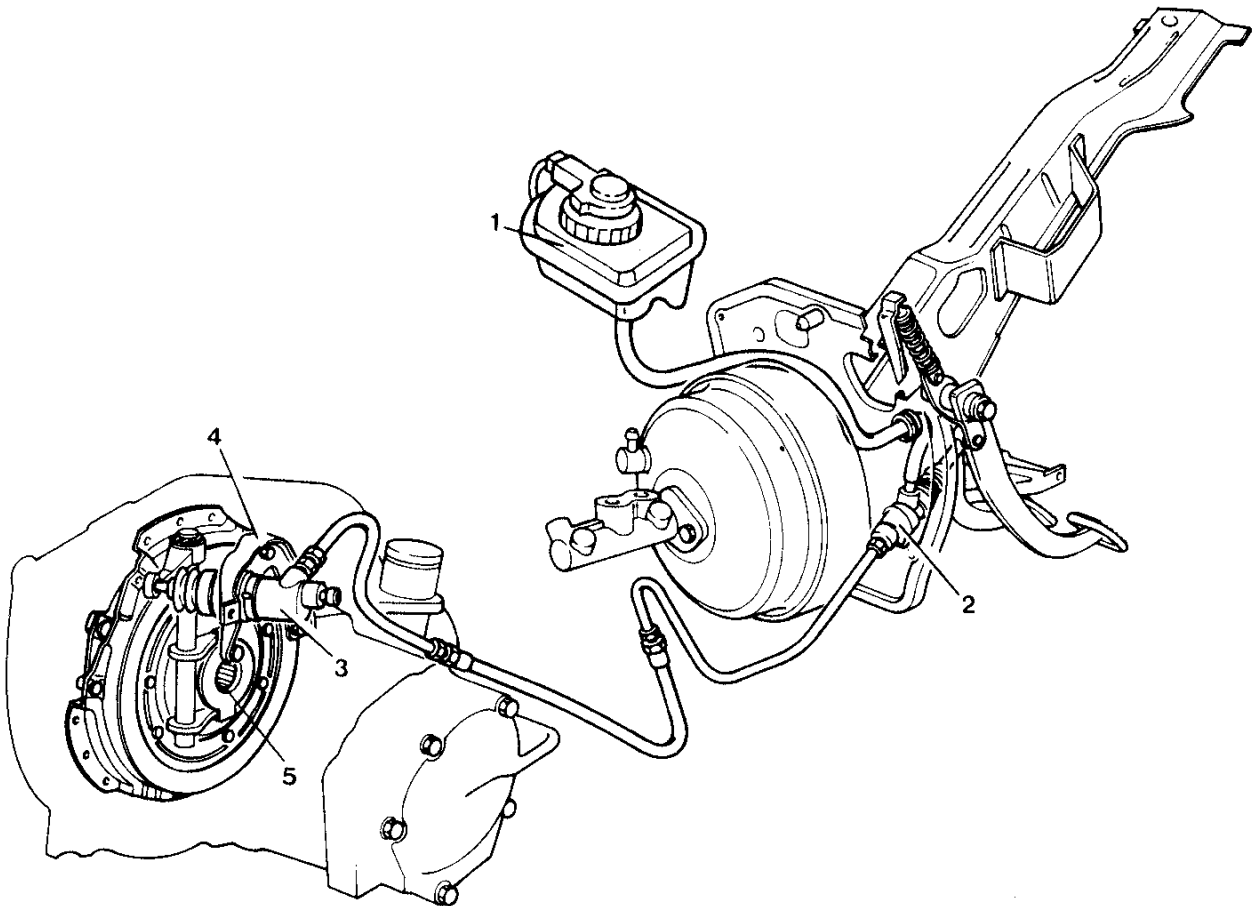


CLUTCH

DESCRIPTION

The clutch adopted for the entire range of Alfa Romeo

167 vehicles is of the dry monodisc type with a diaphragm pressure plate with springs.



This traditional solution is integrated with a series of devices aimed at:

1. respecting the current laws regarding the problem of environmental pollution;
 2. reducing the pressure necessary to depress the clutch pedal;
 3. containing the size of the assembly within acceptable values.
- The problem of pollution has been faced with the addition of friction gaskets and clutch plate employing ecological material (without asbestos) in the same way as for the brake pads.
 - To reduce the effort required to depress the clutch pedal and to facilitate disengagement, a hydraulic disengagement device has been adopted on all the models in the "167" range.

This device is composed of a tank (1) shared with the braking system, a pump (2) secured to the pedal and a cylinder (3) fitted to the gear lever bell by way of a bracket (4) and thrust bearing (5).

The use of a hydraulic device makes it possible to:

- increase reliability in relation to the traditional, mechanical type solution;
- improve progression due to the damping of the hydraulic system during disengagement which avoids jerking particularly when the transmitted torque is high;
- greater operating precision as this device permits a constant adjustment to be made in the height of the clutch pedal;
- increase driving comfort, a result of the reduction in the level of vibrations transmitted to the engine due to the the damping effect of the oil.

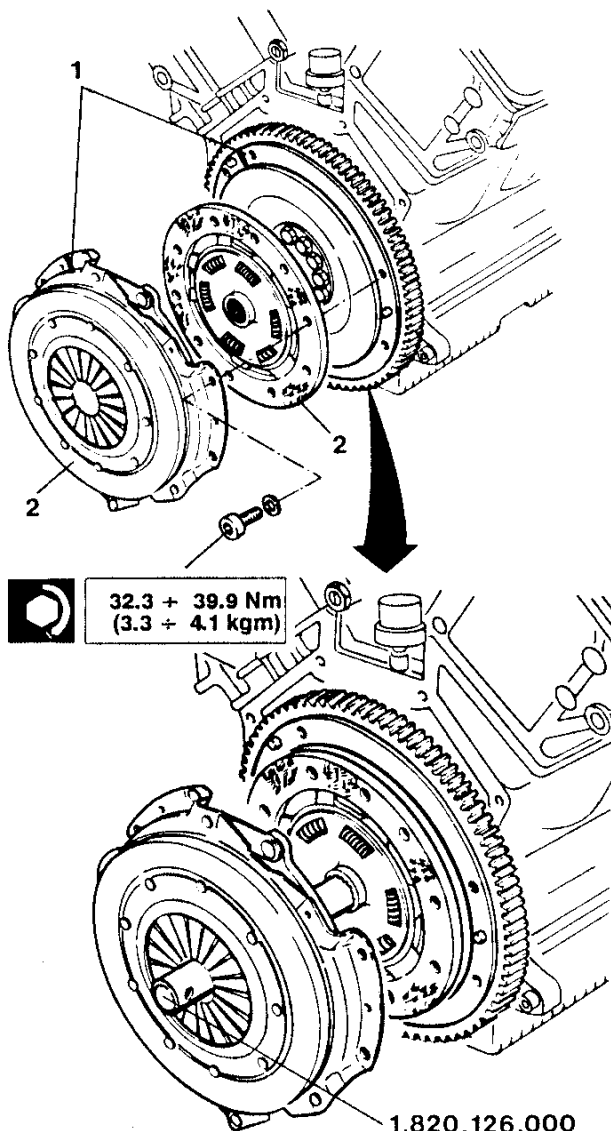
**CLUTCH ASSEMBLY****REMOVAL AND REFITTING**

– Remove the gearbox (see: GR. 13 - GEARBOX-DIFFERENTIAL - Removal and refitting).

1. When replacing the driven gear, mark the relative position between the disk pressure plate and flywheel in order to facilitate refitting.
2. Loosen the six screws securing the pressure plate to the flywheel and remove the pressure plate together with the driven gear.



Refit by reversing the procedure followed for removal and using tool No. 1.820.126.000 to centre the clutch plate, tighten the pressure plate retaining screws to the specified torque.

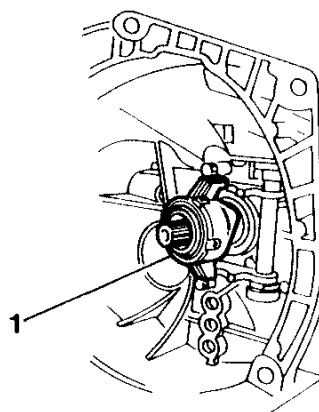


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1. Withdraw the thrust bearing from its sleeve located in the gearlever bell.

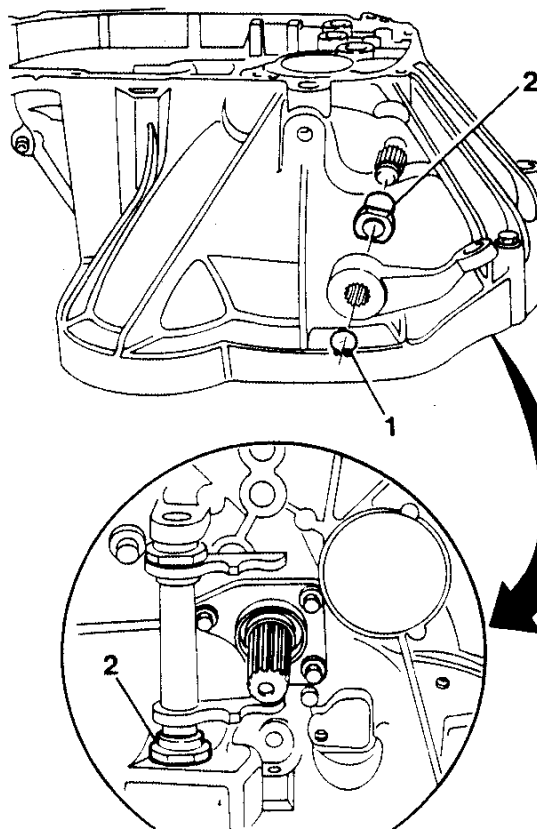


When refitting the bearing it must not show signs of crawling or noise when rotating. If it does then it must be replaced.



– Only if necessary:

1. Remove the seeger ring and withdraw the clutch engagement control lever.
2. Remove the anti-slip bushing from the gearlever bell.



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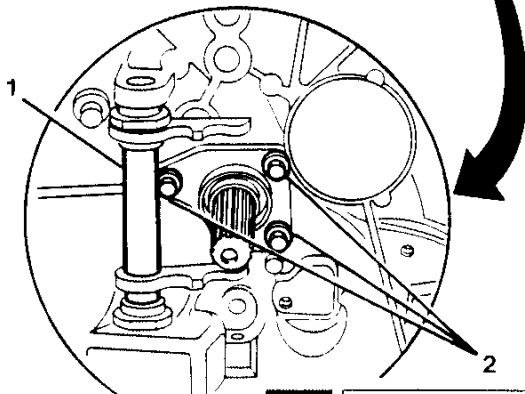
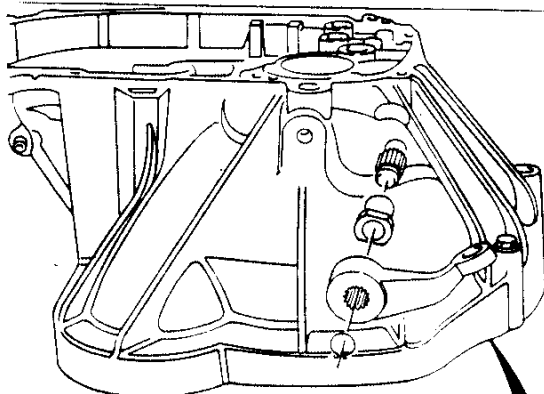


When refitting install a new bushing whenever there is excessive play on the pin.

1. Operating from inside the gearlever bell, withdraw the clutch engagement sleeve control pin and fork.
2. Loosen the screws and remove the thrust bearing sleeve.



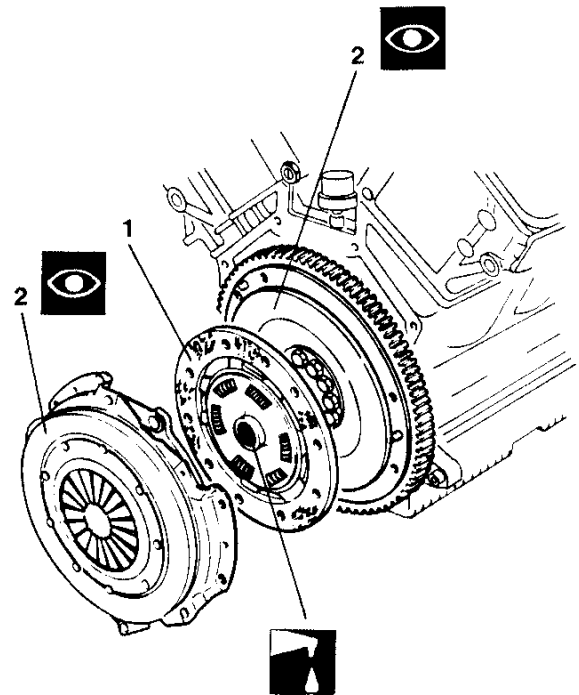
When refitting, grease the bushings and sleeve with the specified product. The sleeve and oil seal should be replaced whenever oil leaks are discovered.



7 + 9 Nm
(0.71 + 0.92 kgm)

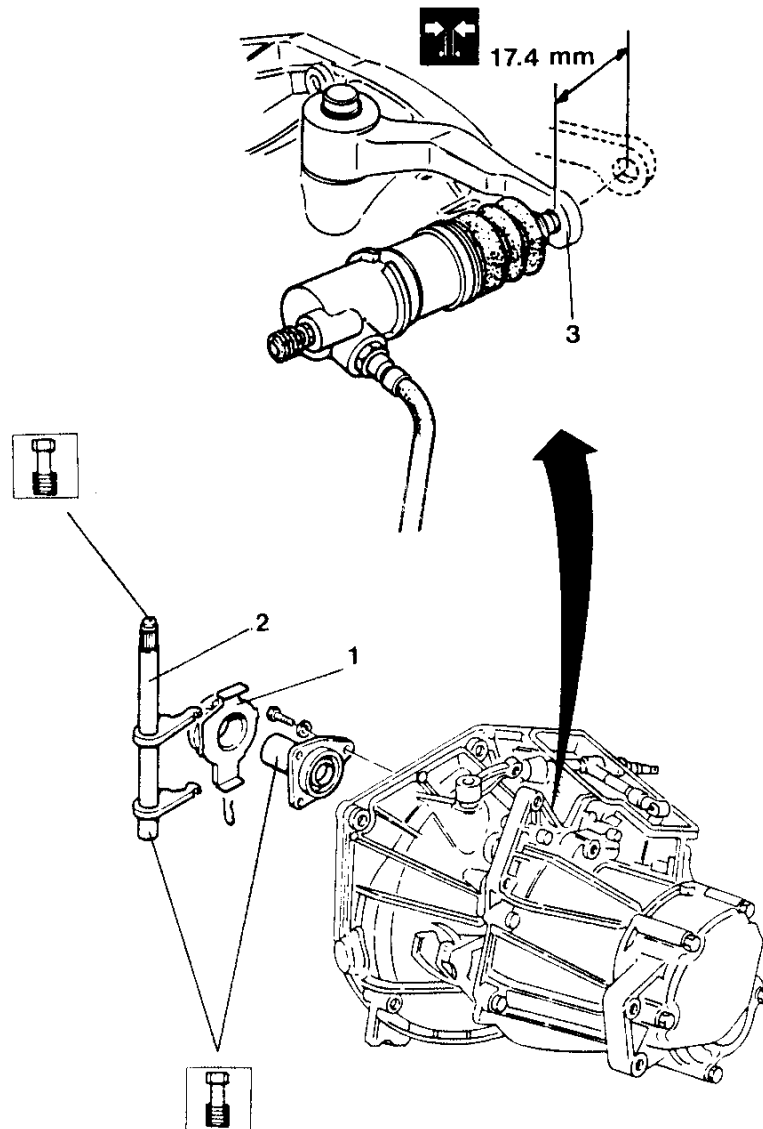
CHECKS AND INSPECTIONS

1. Check the clutch plate for even wear of the gaskets and their minimum thickness. Check for signs of burning or vitrification and the correct installation and integrity of the springs of the flexible coupling. Check the clutch plate hub for damage, freedom of movement and limited play on the power take-off shaft coupling.
2. Check the working surfaces of the flywheel and disc pressure plate for signs of overheating, irregular wear, nicks or parts missing. If necessary replace the disc pressure plate and/or grind the engine flywheel (see: REPAIR MANUAL - ENGINES - GR. 01).





1. Check the thrust bearing for noise, excessive play and freedom of movement in the sheath.
2. Check the fork for cracks, deformation, freedom of movement and excessive wear of the working surfaces.
3. Check that the disengagement stroke of the clutch control lever is 17.4 mm; if the stroke is below this figure, check the efficiency of the hydraulic circuit.





CLUTCH PUMP

REMOVAL AND REFITTING

Using a suitable tool clamp the oil delivery hose to prevent excessive oil spillage during removal.

1. Disconnect the oil delivery hose from the pump.
2. Remove the safety clip and withdraw the pin connecting the pump to the clutch pedal.
3. Loosen the nut securing the pump to the body.
 - Working in the engine compartment, proceed as follows:

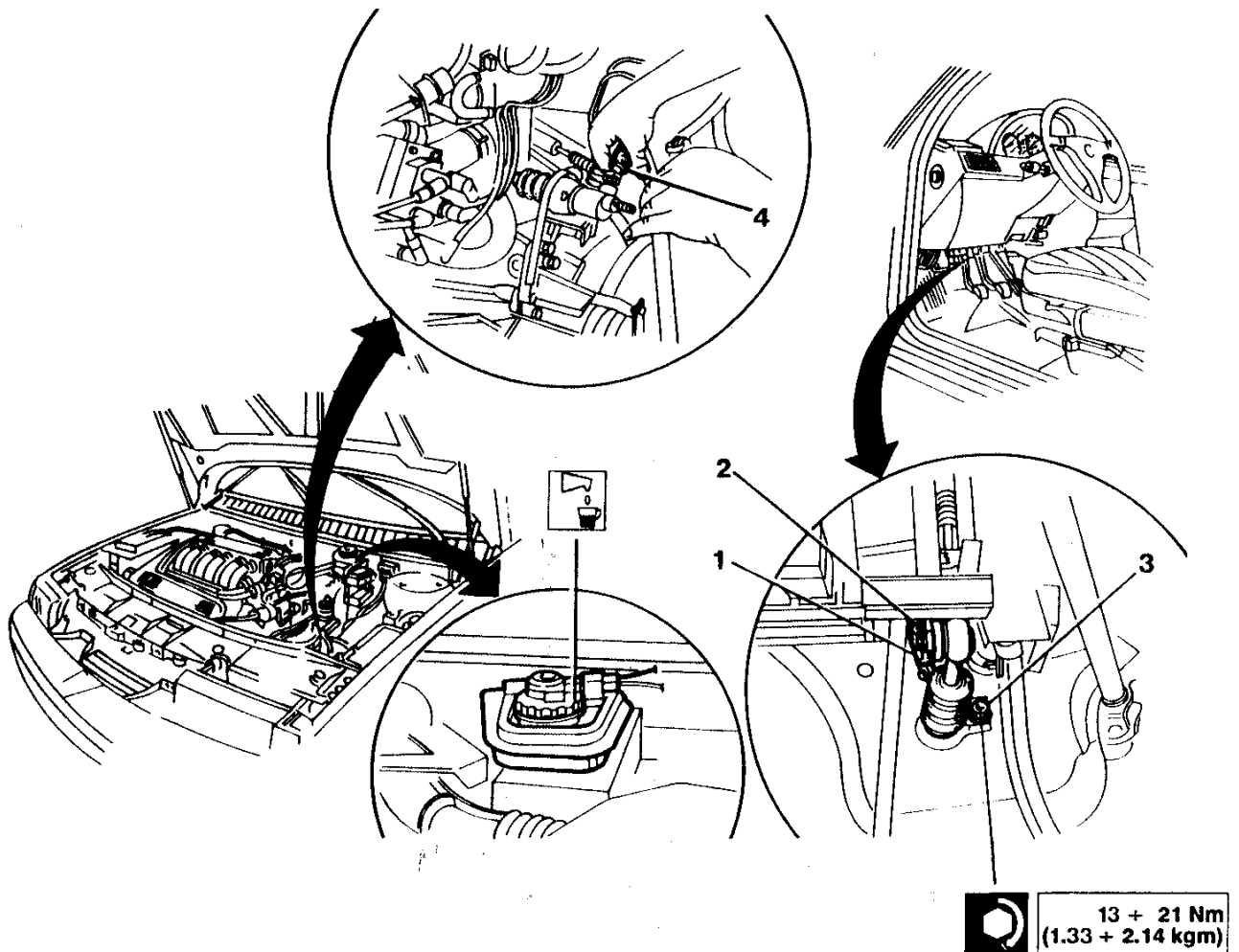
4. Disconnect the flexible hose from the clutch control cylinder.
 - Working from inside the vehicle, withdraw the pump together with the flexible hose carrying the oil to the cylinder.



Refit by reversing the procedure followed for removal and tightening the screw securing the clutch pump to the body to the correct torque.



When refitting the pump bleed air from the system (see: BLEEDING THE HYDRAULIC SYSTEM).



**DISASSEMBLY AND REASSEMBLY**

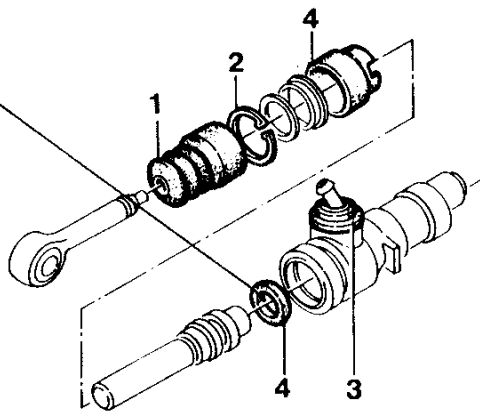
1. Pull off the protective boot from the clutch pump control rod.
2. Remove the spring ring from the clutch pump piston and withdraw the piston from the pump body.
3. Disassemble the gasket and connection located on the inlet of the hose arriving from the hydraulic fluid reservoir.
4. Remove the rubber seal rings.



When refitting install new rings after lubricating with the specified oil and replace the anti-friction gasket.



Refit by reversing the procedure followed for removal.

**CHECKS AND INSPECTIONS**

- Check that the piston and inner surface of the cylinder shows no sign of marking, scoring abrasion or rust.

If traces of abrasion or seizing are found in the cylinder body, replace the pump assembly.



CLUTCH PEDAL

REMOVAL AND REFITTING

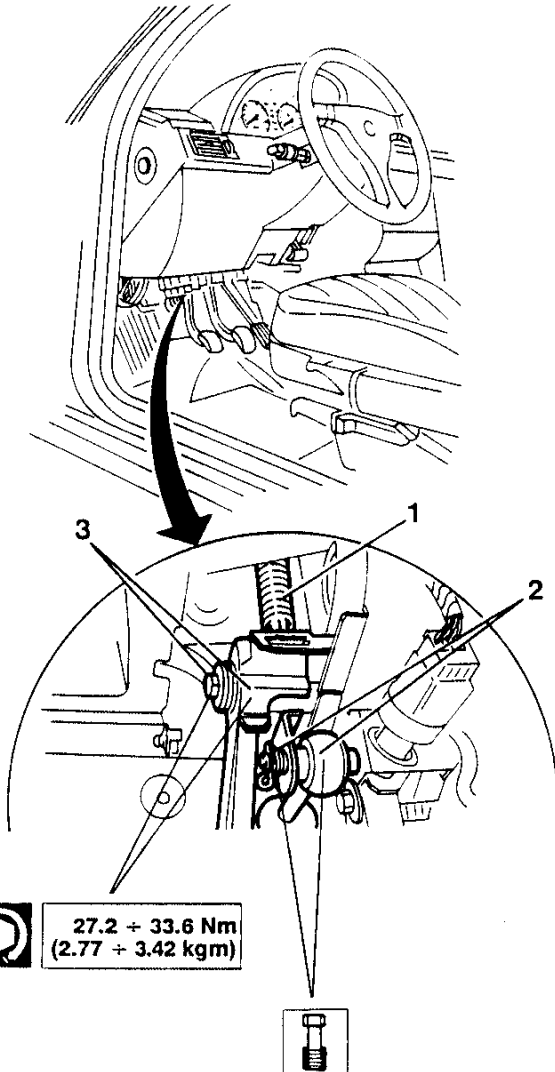
1. Disconnect the clutch pedal return spring.
2. Remove the cotter pin and withdraw the pin connecting the pump to the clutch pedal.
3. Loosen and remove the through screw on the clutch pedal together with the washers and spacers and then disconnect the clutch pedal.



Refit, by reversing the procedure followed for removal and tightening the through screw on the clutch pedal to the correct torque.



When refitting, grease the components securing the clutch pedal using the specified grease.



27.2 + 33.6 Nm
(2.77 + 3.42 kgm)

HYDRAULIC FLUID RESERVOIR

See: GR. 22 - CLUTCH AND BRAKE FLUID RESERVOIR.



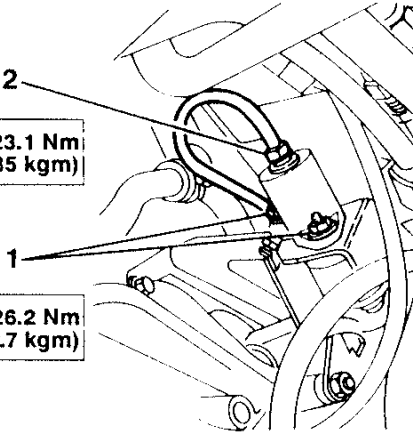
CLUTCH CONTROL CYLINDER

REMOVAL AND REFITTING

- Only for 1.8 - 2.0 T.S. models
- 1. Loosen the screws securing the cylinder to the support.
- 2. Loosen the connection securing the oil delivery hose to the cylinder and remove the cylinder.



20.9 ÷ 23.1 Nm
(2.13 ÷ 2.35 kgm)

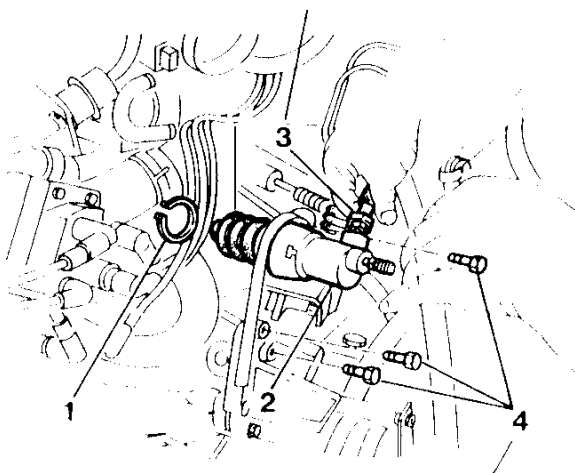


23.7 ÷ 26.2 Nm
(2.4 ÷ 2.7 kgm)

- Only for 2.4 V6 models.
- 1. Remove snap ring.
- 2. Withdraw the clutch control cylinder from its bracket.
- 3. Disconnect the connection on the hose carrying hydraulic fluid to the cylinder and plug the hose.
- 4. If necessary unscrew and remove the screws securing the clutch control cylinder support bracket.



17.1 ÷ 18.9 Nm
(1.74 ÷ 1.93 kgm)



11.9 ÷ 14.7 Nm
(1.21 ÷ 1.49 kgm)



When refitting the cylinder bleed air from the system (see: BLEEDING THE HYDRAULIC SYSTEM).



Refit by reversing the procedure followed for removal and tighten the clutch control cylinder support bracket retaining screws to the correct torque.



DISASSEMBLY AND REASSEMBLY

1. Pull off the rubber protection and remove it together with the control rod.
2. Using a jet of compressed air, remove the piston from the cylinder body.
3. If necessary remove the relief valve screw from the control cylinder body.

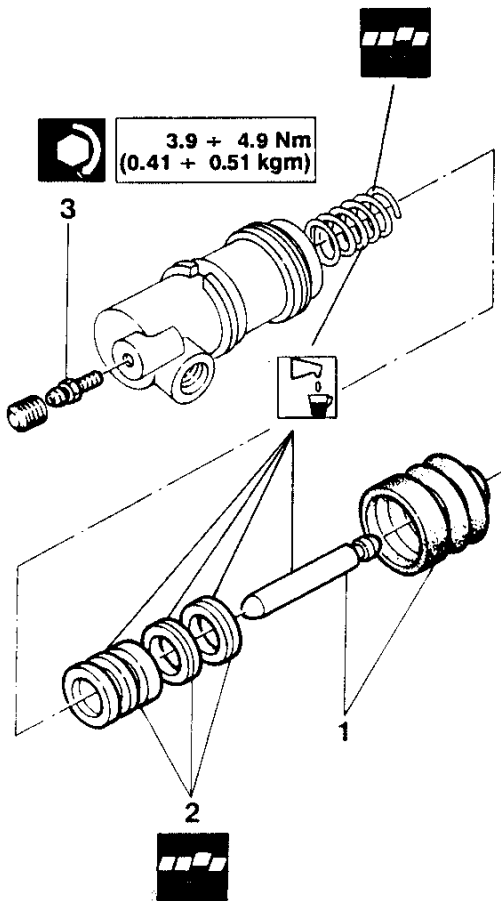


Lubricate the components in the cylinder with the correct oil before refitting.



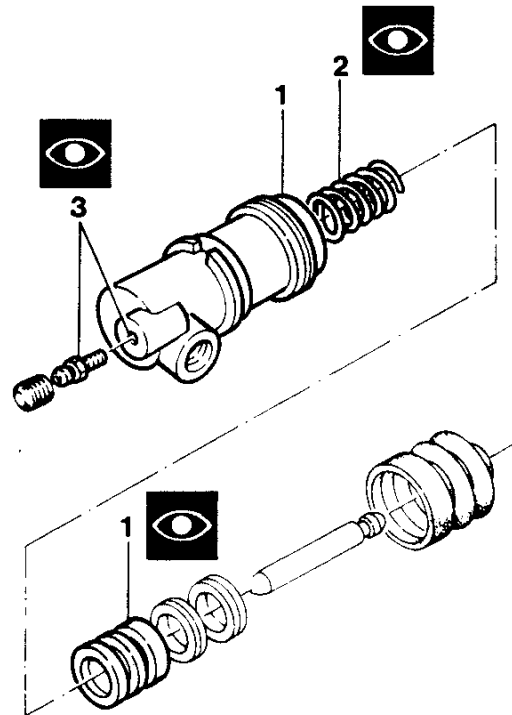
Refit by reversing the procedure followed for removal tightening the relief valve screw to the specified torque if previously removed.

- Substitute all seal rings when refitting.



CHECKS AND INSPECTIONS

1. Check that there are no signs of marking, scoring abrasion or rust inside the cylinder and on the piston. If signs of abrasion or seizing are detected on the cylinder body, replace the assembly.
2. Check the spring for damage.
3. Check that the relief hole is not blocked.





BLEEDING THE HYDRAULIC SYSTEM

**WARNING:**

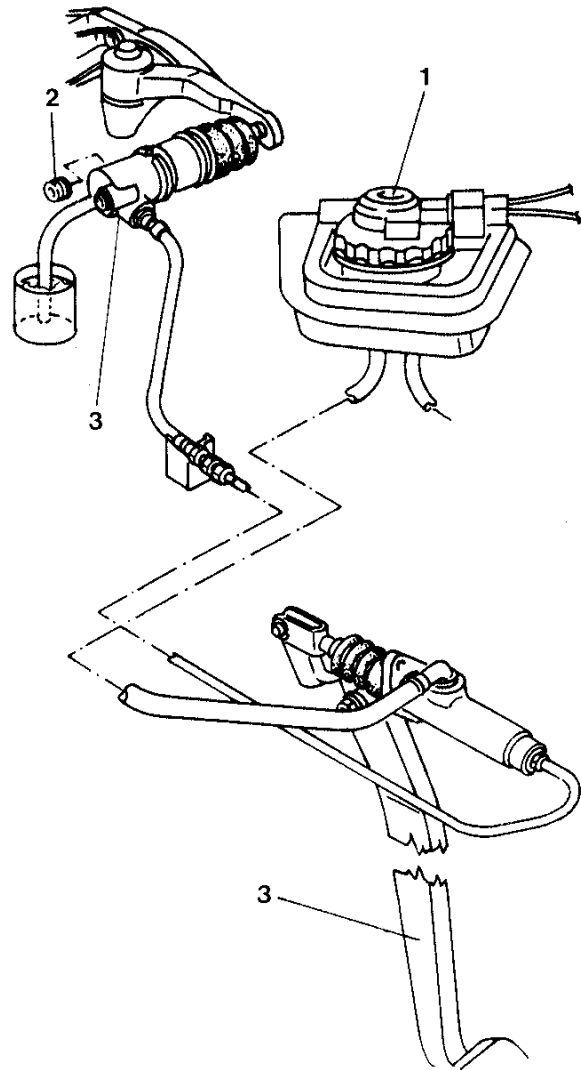
Do not re-use the hydraulic fluid resulting from the bleeding operation.

1. Remove the cap on the clutch and brake fluid supply reservoir and if necessary top up to the correct level with the specified fluid.
2. Remove the protective cap from the relief screw on the cylinder and push a hose onto the screw. Put one end into a transparent container full of hydraulic fluid.
3. Simultaneously loosen the relief screw and fully depress the clutch pedal and allowing it to return slowly. Repeat the operation until all air trapped in the circuit has been eliminated. Then with the clutch pedal fully depressed, close the relief screw, remove the hose and install the protective cap.

Top up the level of fluid in the reservoir and replace the cap.

- During bleeding the fluid in the reservoir must not fall below the "MIN" mark.
- Operate with care in order to prevent the hydraulic fluid from touching paintwork.
- After bleeding check that both the clutch and gears disengage and engage correctly.

If necessary check the disengagement stroke on the clutch control lever.





TECHNICAL CHARACTERISTICS AND SPECIFICATIONS

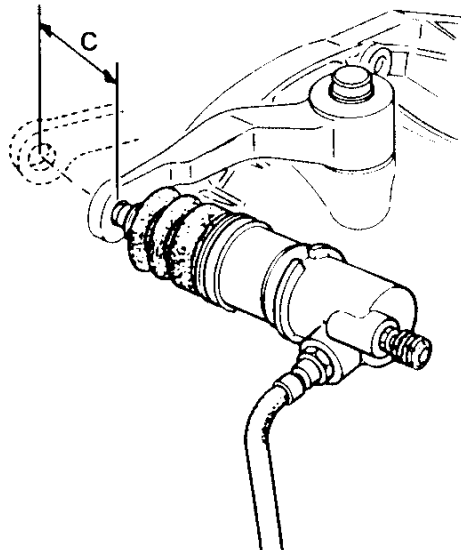
GENERAL INDICATIONS

FLUIDS AND LUBRICANTS

APPLICATION	TYPE	NAME
Clutch disk splined section	OIL	(MILLOIL OBTS250)
Thrust bearing seat and clutch control lever shaft rod	GREASE	TUTELA MR3
Pin connecting clutch pedal/pump	GREASE	SHELL RETINAX G
Lubrication of pump inner components and hydraulic system filling	FLUID Class: DOT 4 SAE J170 3F	ALFA ROMEO BRAKE FLUID SUPER DOT 4

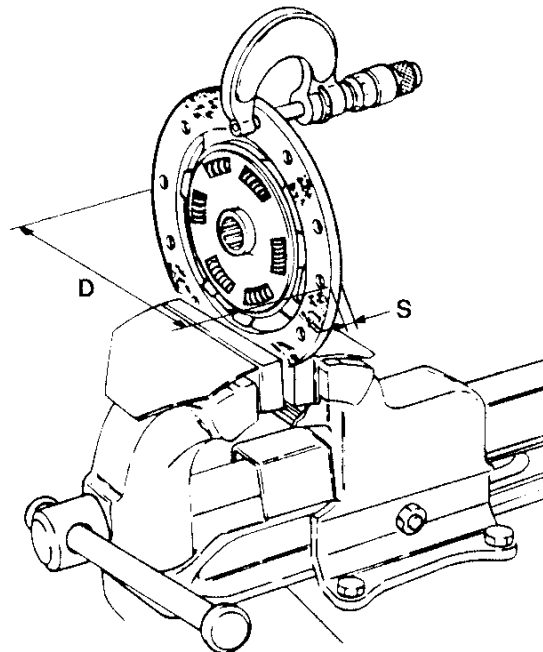
CHECKS AND ADJUSTMENTS

CLUTCH CONTROL LEVER



Clutch control lever disengagement travel C = 17.4 mm

CLUTCH DISK



Clutch disk thickness S = 7.1 ± 0.7 mm
 Clutch disk diameter ... D = (2.4 V6) = 228.6 mm
 (1.8 - 2.0 T.S.) = 215 mm

**TIGHTENING TORQUES: 1.8 - 2.0 T.S.**

Description	N·m	kg·m
Screw with unlosable washer securing clutch mechanism	32.3 ÷ 39.9	3.29 ÷ 4.07
Hexagon nut securing clutch cylinder to bracket	23.75 ÷ 26.25	2.42 ÷ 2.67
Hexagon nut securing bracket to compound screw	20.9 ÷ 23.1	2.13 ÷ 2.35
Union securing pipe to cylinder	17.1 ÷ 18.9	1.74 ÷ 1.92
Nut securing hoses to bracket	17.85 ÷ 22.05	1.82 ÷ 2.25
Union for clutch control/clutch pump hoses	17.1 ÷ 18.9	1.74 ÷ 1.92

TIGHTENING TORQUES: 2.4 V6

Description	N·m	kg·m
Allen screw securing clutch mechanism	17.85 ÷ 22.05	1.82 ÷ 2.25
Clutch control/clutch pump hose connection	17.1 ÷ 18.9	1.74 ÷ 1.92
Hexagonal head screw securing clutch cylinder bracket to gearbox	11.9 ÷ 14.7	1.21 ÷ 1.49

SPECIAL TOOLS

TOOL NUMBER	DESCRIPTION
1.820.126.000	Clutch disk centering spindle
1.821.215.000	Thrust bearing puller (only for clutch version with tie-rods)

**FAULT DIAGNOSIS AND CORRECTIVE ACTION**

SYMPTOMS AND ANOMALIES	FAULT ISOLATION	TEST
CLUTCH SLIPS During acceleration, engine revs increase without corresponding increase in vehicle speed	<ul style="list-style-type: none">- Start engine- apply handbrake- depress clutch pedal and engage 4th gear- accelerate and release clutch pedal gradually; the vehicle does not move and the engine does not stop	A
CLUTCH DOES NOT DISENGAGE PROPERLY Sticking or noises are noted when changing down or when engaging reverse gear	<ul style="list-style-type: none">- Start engine- depress clutch pedal and engage reverse gear after 4 or 5 seconds; noise is noted when changing gear	B
CLUTCH VIBRATES OR JERKS Clutch pedal vibrates when it is being released	<ul style="list-style-type: none">- Start engine- depress and release clutch pedal; vehicle does not pull off smoothly but jerks or vibrates	C
NOISY CLUTCH	<ul style="list-style-type: none">- Start engine- Depress and release clutch pedal; noise is noted during pedal actuation	D
EXCESSIVE PRESSURE REQUIRED TO ACTUATE CLUTCH PEDAL Clutch requires excessive pressure on the pedal	<ul style="list-style-type: none">- Press clutch pedal using the applicable tool; pedal pressure is correct if applied pressure does not exceed the prescribed value	E



CLUTCH SLIPS	TEST A
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TEST PROCEDURE		RESULT	CORRECTIVE ACTION
A1	CHECK PEDAL		
	- Check that clutch pedal returns to proper rest position when released	<input checked="" type="radio"/> OK ▶ <input type="radio"/> OK ▶	Carry out step A3 Carry out step A2
A2	CHECK CLUTCH CYLINDER		
	- Check that clutch cylinder pin returns to proper rest position. Visually check that the exterior of cylinder body is not leaking oil through the piston inner seal	<input checked="" type="radio"/> OK ▶ <input type="radio"/> OK ▶	Carry out step A3 Replace clutch cylinder; if fault persists replace clutch pump
A3	CHECK CONTROL LEVER		
	- Check that the clutch control lever disengagement travel is within prescribed limits	<input checked="" type="radio"/> OK ▶ <input type="radio"/> OK ▶	Carry out step A4 Overhaul clutch unit
A4	CHECK CLUTCH DISK		
	- Check wear of clutch disk lining	<input checked="" type="radio"/> OK ▶ <input type="radio"/> OK ▶	Carry out step A5 Replace clutch disk



CLUTCH SLIPS (continued)

TEST A

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
A5	CHECK FOR CONTAMINATION BY OIL OR GREASE	<input type="radio"/>	Carry out step A6
	- Check for presence of oil or grease on the surfaces of the disk	<input checked="" type="radio"/>	Replace clutch disk and gearbox main shaft oil seal
A6	CHECK FLYWHEEL AND DISK PRESSURE PLATE	<input type="radio"/>	Replace disk pressure plate and/or reface the flywheel (see: REPAIR MANUAL - ENGINES - GR. 01)
	- Check working surfaces of the flywheel and disk pressure plate for traces of overheating, uneven wear, nicks and removed material	<input checked="" type="radio"/>	



CLUTCH DOES NOT DISENGAGE PROPERLY

TEST B

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
B1	CHECK FOR FLUID LEAKAGE	<input type="radio"/> OK ▶	Carry out step B2
	– Visually check for fluid leakage from clutch actuating cylinder, pump or lines	<input checked="" type="radio"/> OK ▶	Replace defective parts
B2	CHECK PUMP INTERNAL LEAKAGE	<input type="radio"/> OK ▶	Carry out step B3
	– Slowly depress clutch pedal and at the same time check that fluid does not flow back into the reservoir – Start the engine, depress clutch pedal, engage first gear and hold the clutch pedal down; wait for about 30 seconds and check that the vehicle does not move	<input checked="" type="radio"/> OK ▶	Replace clutch pump
B3	CHECK FOR TRAPPED AIR	<input type="radio"/> OK ▶	Carry out step B4
	– Check for presence of trapped air in the hydraulic circuit by verifying that the clutch control lever disengagement travel is with the prescribed limits	<input checked="" type="radio"/> OK ▶	Purge trapped air from the circuit
B4	CHECK SPLINED COUPLING	<input type="radio"/> OK ▶	Carry out step B5
	– Check for dirt, rust or dents on splines of clutch disk hub and of gearbox main shaft	<input checked="" type="radio"/> OK ▶	Remove any damage and clean the hub and main-shaft splines; replace clutch disk if necessary
B5	CHECK CLUTCH DISK	<input type="radio"/> OK ▶	Carry out step B6
	– Check that the clutch disk is not distorted	<input checked="" type="radio"/> OK ▶	Replace clutch disk
B6	CHECK DIAPHRAGM SPRING	<input type="radio"/> OK ▶	Replace disk pressure plate
	– Check that the disk pressure plate diaphragm spring is not damaged	<input checked="" type="radio"/> OK ▶	



CLUTCH VIBRATES AND/OR JERKS

TEST C

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
C1	CHECK ENGINE MOUNTS		
	– Check that the engine mounts are not loose or deteriorated (see group 00)	<input type="radio"/> OK ► <input checked="" type="radio"/> OK ►	Carry out step C2 Tighten or replace affected mounts
C2	CHECK CLUTCH DISK		
	– Check clutch disk lining for "vitrification" due to overheating, traces of oil or grease, distortion, wear or loose rivets. Check flexible couplings springs for damage	<input type="radio"/> OK ► <input checked="" type="radio"/> OK ►	Carry out step C3 Replace clutch disk and, if necessary, gearbox main shaft oil seal
C3	CHECK FLYWHEEL AND DISK PRESSURE PLATE		
	– Check working surfaces of flywheel and disk pressure plate for wear or distortion	<input checked="" type="radio"/> OK ►	Replace disk pressure plate and if necessary reface or replace flywheel (see: REPAIR MANUAL - ENGINES - GR. 01)



NOISY CLUTCH	TEST D
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TEST PROCEDURE		RESULT	CORRECTIVE ACTION
D1	CHECK THRUST BEARING		
– Check thrust bearing for wear or binding; check condition of mating surfaces of thrust bearing and disk pressure plate spring		<input checked="" type="checkbox"/> OK ▶ <input type="checkbox"/> OK ▶	Carry out step D2 Replace thrust bearing; replace disk pressure plate if necessary
D2	CHECK FORK		
– Check that the thrust bearing fork does not creak when moved		<input type="checkbox"/> OK ▶	Check fork shaft bushings and replace if necessary

**EXCESSIVE PRESSURE REQUIRED TO ACTUATE CLUTCH PEDAL****TEST E**

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
E1	CHECK PEDAL SPRING		
	– Check clutch booster mechanism spring for damage	►	Carry out step E2
		►	Replace spring
E2	CHECK ACTUATING CYLINDER		
	– Carry out step A2 of TEST A (see step A2)	►	Carry out step E3
		►	(See step A2)
E3	CHECK CLUTCH UNIT		
	– Check clutch unit for internal breakage and damage	►	Replace affected parts inside clutch unit



GROUP 13

GEARBOX - DIFFERENTIAL**INDEX**

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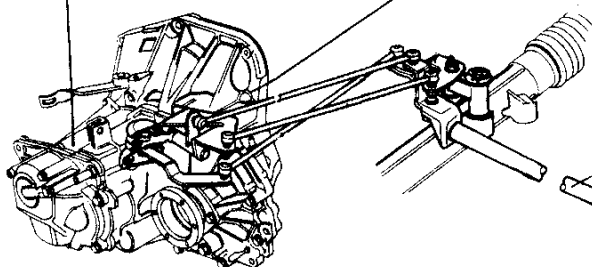
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GEARBOX 2.4 V6

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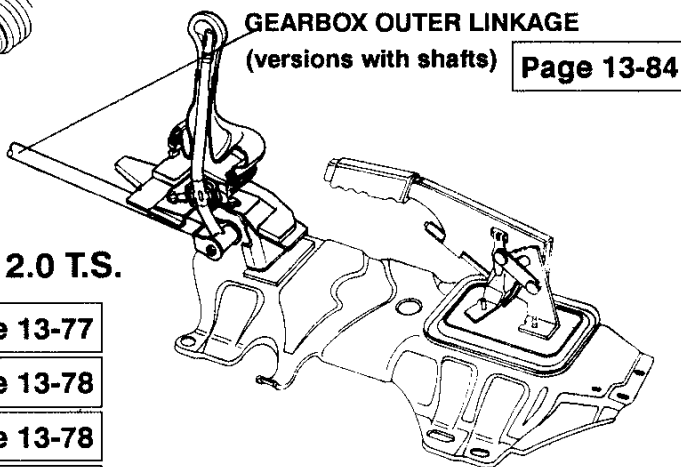


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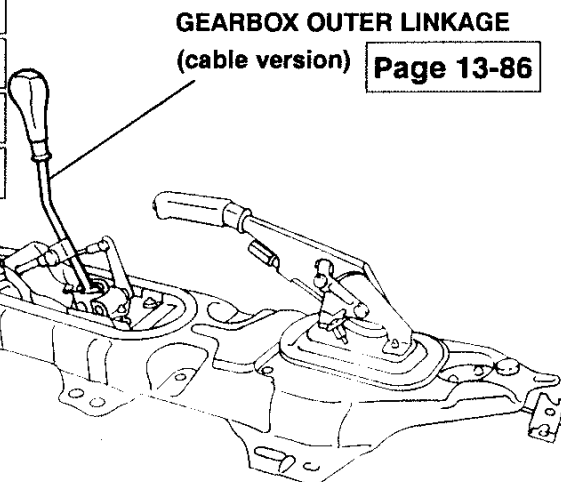
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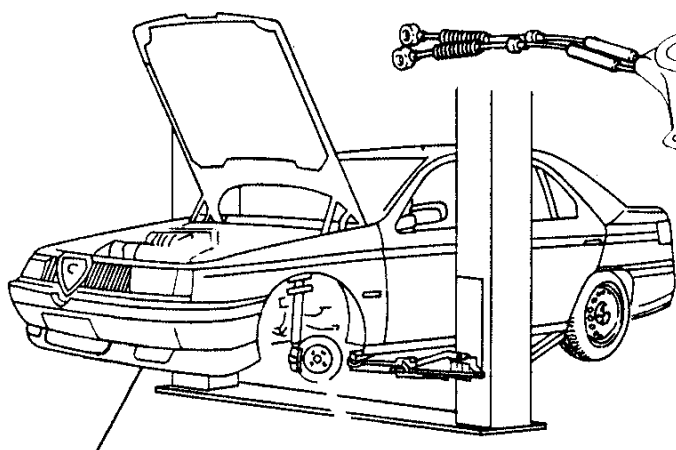
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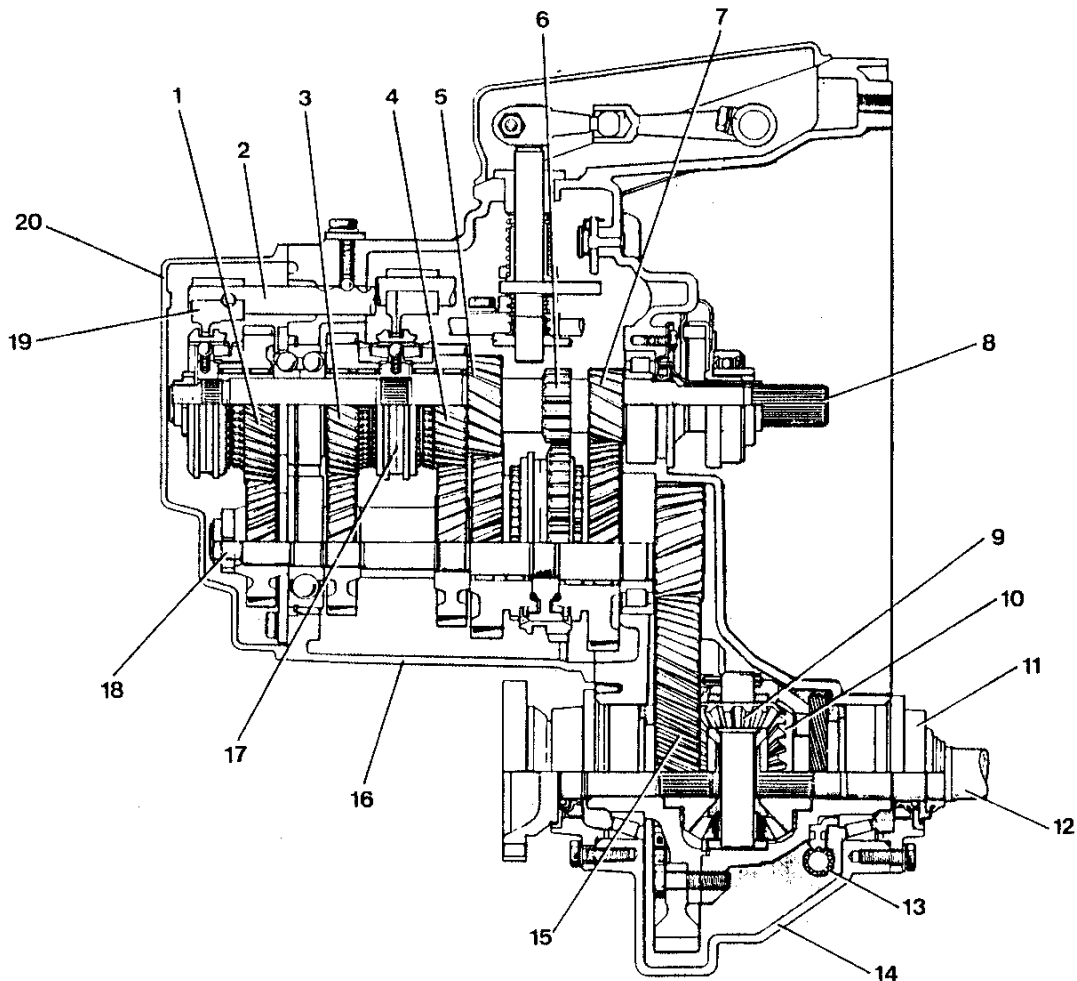


GEARBOX

DESCRIPTION

The gear box is of the transversal "cascade" type with five forward speeds, all synchronized, with perpetually driven gears and a final reduction cylindrical gear pair.

The gearbox is contained in the aluminium casing, whilst the 5th speed gear is contained in the rear cover. The gearbox is connected to the engine through the clutch cone. An oil dipstick, used to check the gearbox oil level (Min-Max), is located on the top of the gearbox on the differential side. To drain the oil, both from the differential side and the gearbox side, there are two drainage holes.



1. 5th speed drive gear
2. Speed engagement rod
3. 4th speed drive gear
4. 3rd speed drive gear
5. 2nd speed drive gear
6. Reverse speed drive gear
7. 1st speed drive gear
8. Main shaft
9. Side pinion
10. Crown wheel

11. Constant speed joint
12. Drive shaft
13. Odometer idle
14. Differential casing
15. Crown gear
16. Gearbox
17. Synchronizer
18. Layshaft
19. Engagement fork
20. Rear cover



Gearbox shape

The shape of the gearbox makes it possible to divide it into three distinct sections.

- The intermediate section forms the actual gearbox and contains and supports the main and lay shafts, the engagement forks and rods and the speed engagement control device.
- The rear section (rear cover) contains the driving and driven gears and the 5th speed engagement fork and the main and lay shaft rear bearings retaining plate.
- The front section (clutch cone) includes the clutch unit and thrust bearing and the relevant actuation system.

Main shaft

The gears for 1st, reverse and 2nd speeds have been machined directly onto the main shaft, while the gears for 3rd, 4th and 5th speeds and relevant synchronizers are installed on bearings; in addition, the main shaft is supported by two ball bearings.

Lay shaft

1st and 2nd speed gears and relevant synchronizers are installed on the lay shaft with bearings whilst the 3rd, 4th and 5th speed gears are keyed to the shaft. The lay shaft is supported by two bearings; the bearing at the pinion end is of the roller type whilst the opposite one is of the ball type.

Gears and synchronizers

Gears for forward speeds are of the helical type with all speeds synchronized; reverse speed gears are of the straight toothing type.

A new feature of this gearbox concerns the 3rd, 4th and 5th speed gears and relevant synchronizers which have been installed on the main shaft to reduce the engagement loads during synchronization phase and noise produced by the gearbox during idle operation.

Unlike other gearboxes, the drive originating from the engine, when the gearbox is idling, is transmitted only to the gears of the 1st and 2nd speeds.

The reverse speed driven gear is machined onto the 1st - 2nd speed engagement sleeve.

The solution reduces the overall dimensions of the gears in the gearbox.

The idle gears are mounted on needle bearings that, reducing friction, minimize radial runout.

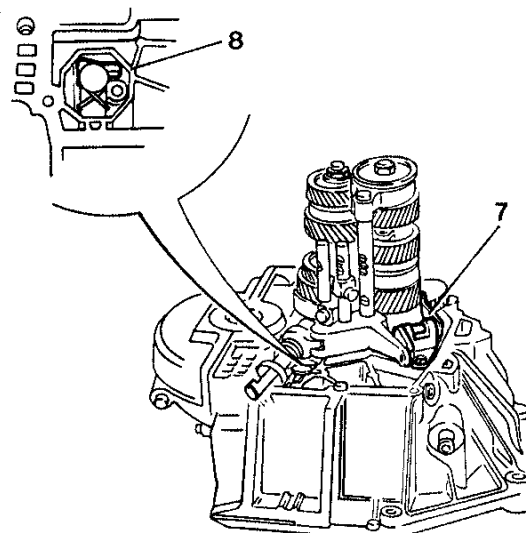
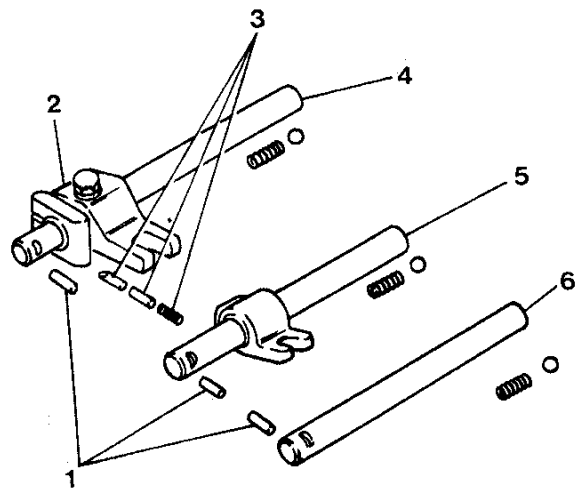
The synchronizers are of the tapered ring, Borg Warner type; they are identical for the 3rd, 4th and 5th speeds and smaller than those for the 1st and 2nd speeds installed on the transmission shaft, thus reducing the noise produced by the gears when in drive.

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Safety devices

The gearbox is fitted with a number of safety devices.

- A first pawl device (1) prevents simultaneous engagement of two speeds whilst.
- A second device (3) (pawl-pin-spring) acts on rods (4) - (5) and (6) to maintain the reverse speed prong (2) in a safe position and prevent dangerous movements of the reverse speed fork (7), and consequent possibility of engaging reverse speed.
- A third device (8) consisting of a lever and a spring prevents inadvertent engagement of reverse speed when shifting from 5th to 4th speed..



- | | |
|------------------------------|---|
| 1. Safety pawl | 5. 3rd and 4th speed rod |
| 2. Reverse speed prong | 6. 1st and 2nd speed rod |
| 3. Reverse speed safety pawl | 7. Reverse speed fork |
| 4. 5th and reverse speed rod | 8. Reverse speed engagement safety device |

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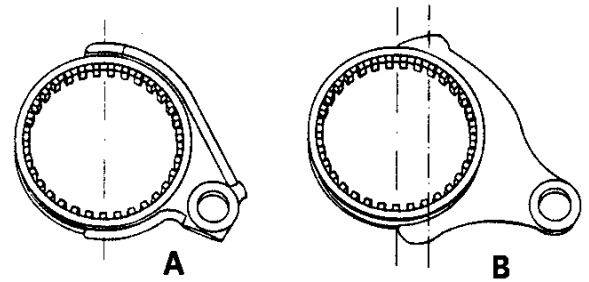
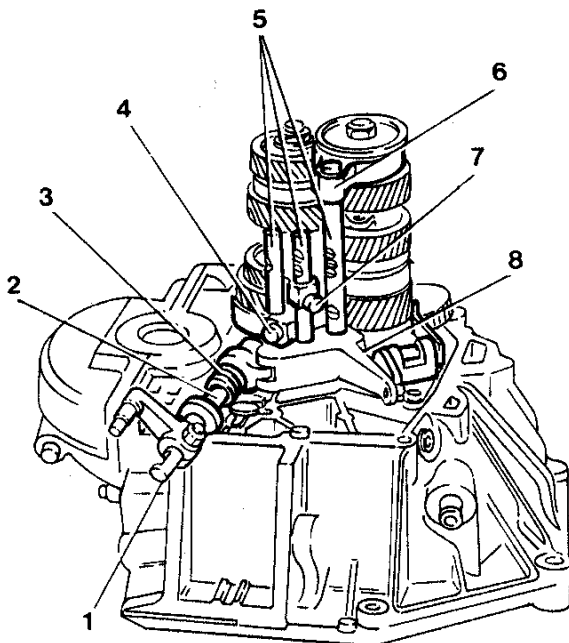
Controls and forks

To reduce friction and increase accuracy of gear engagement, the gearbox has been provided with a spherical control (1) which transmits movement to the selector prong (3) through a shaft (2).

The selector prong actuates the sliding rods (5) carrying the synchronizer sleeve control forks (4, 6, 7, 8).

Therefore a fork (4) and relative rod provide for the engagement of 1st and 2nd speed, another (F) for the engagement of 3rd and 4th speed, another (7) for engagement of 5th speed and a final one (8) for engagement of reverse speed.

An important characteristic of the forks (A) is that the thrust centre coincides with the centerline of the sleeve in order to prevent crawling during speed engagement. This coincidence is not present on forks of conventional gearboxes (B).



- | | |
|--------------------------------------|--------------------------------------|
| 1. Spherical control | 6. 5th speed engagement fork |
| 2. Shaft | 7. 3rd and 4th speed engagement fork |
| 3. Selector prong | 8. Reverse gear engagement fork |
| 4. 1st and 2nd speed engagement fork | |
| 5. Sliding rods | |



REMOVAL AND INSTALLATION

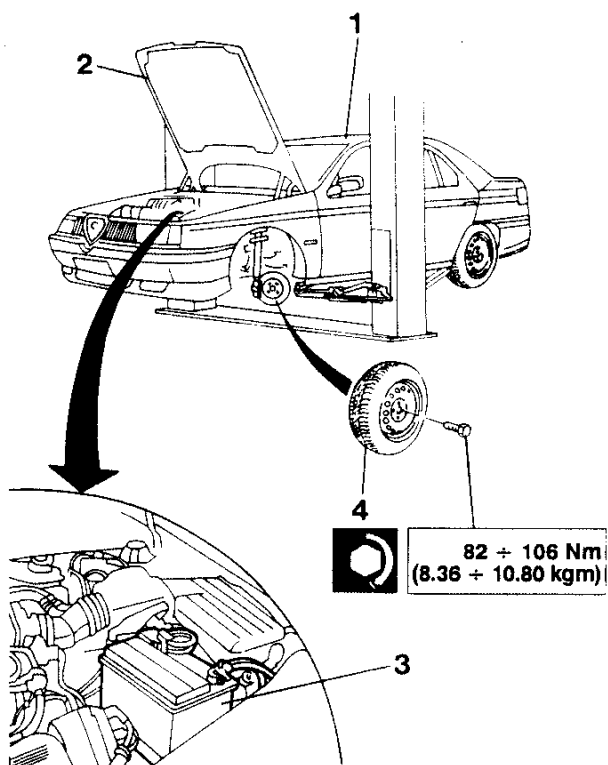
PRELIMINARY OPERATIONS

1. Place the vehicle on an auto lift.
2. Lift the bonnet.
3. Disconnect and remove the battery.
4. Remove the front wheels.

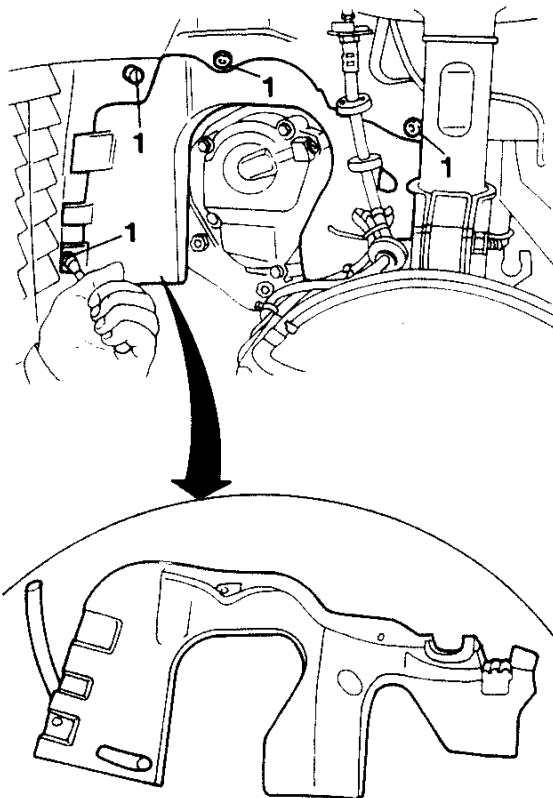


CAUTION:

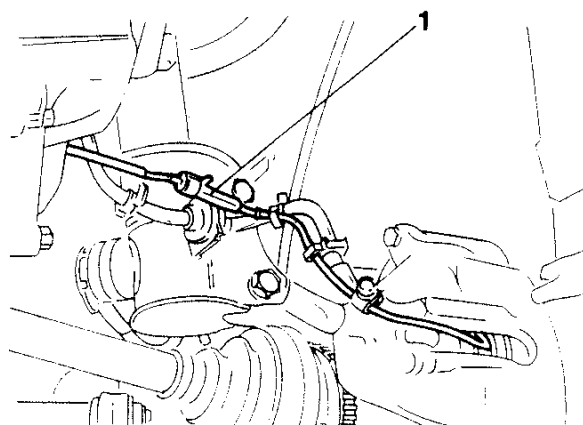
Protect the areas around the engine compartment with soft material in order to avoid damaging the bodywork.



- Raise the vehicle.
1. Operating in the left wheelhousing compartment, unscrew the screws and remove the buttons securing the gearbox side dust guard.



1. Disconnect the brake pad wear sensor connector.



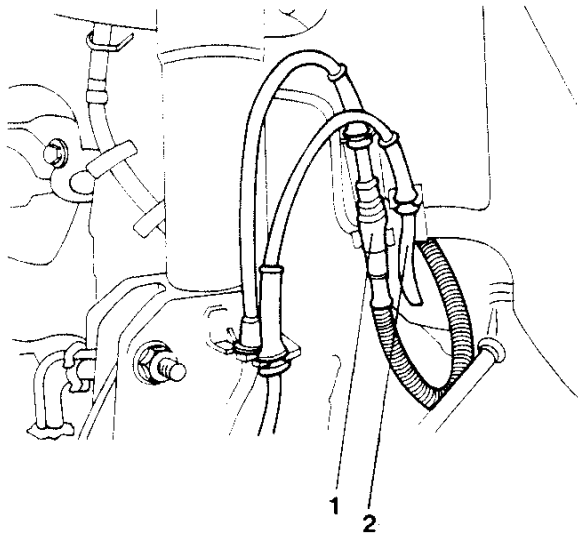


1. (only applicable to vehicles with controlled damping suspension):

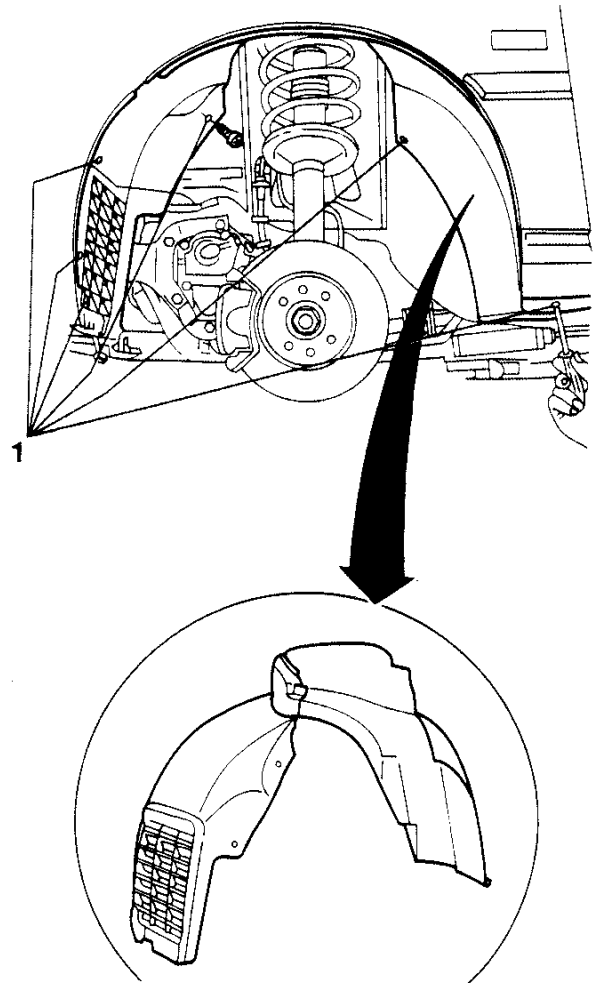
- disconnect the controlled damping system sensor connector.

2. (only applicable to vehicles with ABS system):

- unscrew the screws securing the ABS system wiring support bracket and move it to one side and secure it to the suspension.



1. Unscrew the screws securing the plastic wheelhousing to the body and remove it.



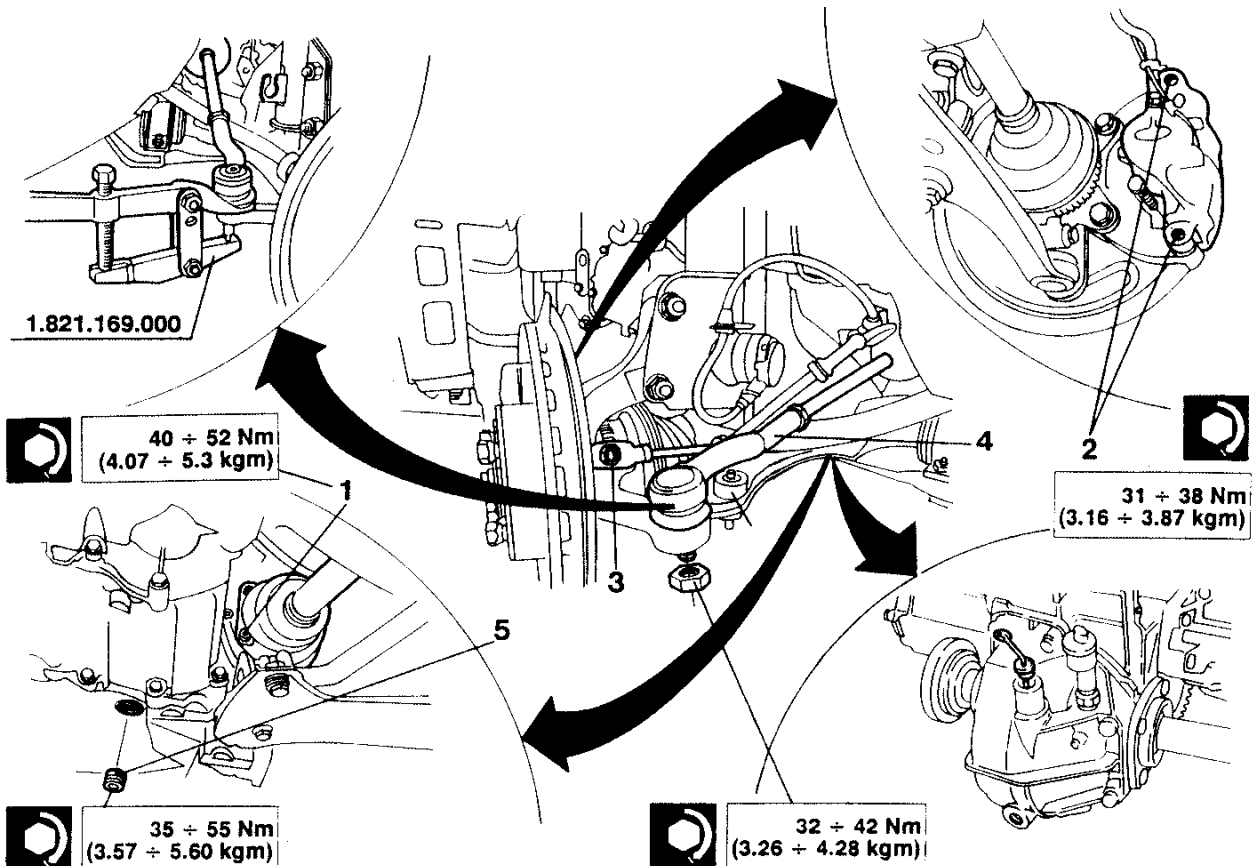


1. Unscrew the six bolts and disconnect the constant speed joint from the differential flange and removing the three safety plates.
2. Unscrew the two bolts securing the brake caliper and remove it together with the pads and arrange it in the upper part of the wheel housing.

**CAUTION:**

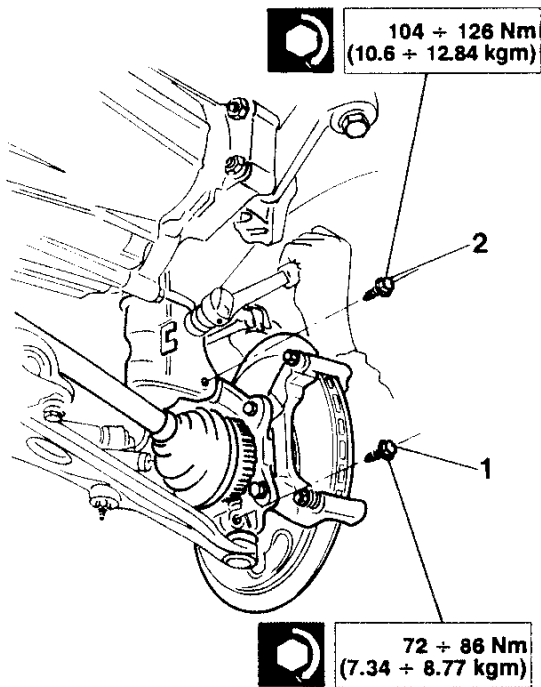
- On installation replace the screws securing the brake caliper body.
- The brake pad and wear sensor must be installed on the inner side of the disc (brake caliper piston side); also check that the discharge duct on the outer part of the pad is placed to the rear of the direction of travel.

3. (only for vehicles equipped with ABS):
 - unscrew the screws securing the ABS sensor and remove it.
4. Unscrew the nut securing the steering cross tie-rod spherical joint and withdraw it using tool-No. 1.821.169.000.
5. Unscrew the plug and drain the oil from the gearbox-differential. (Refill gearbox with the prescribed oil on installation)

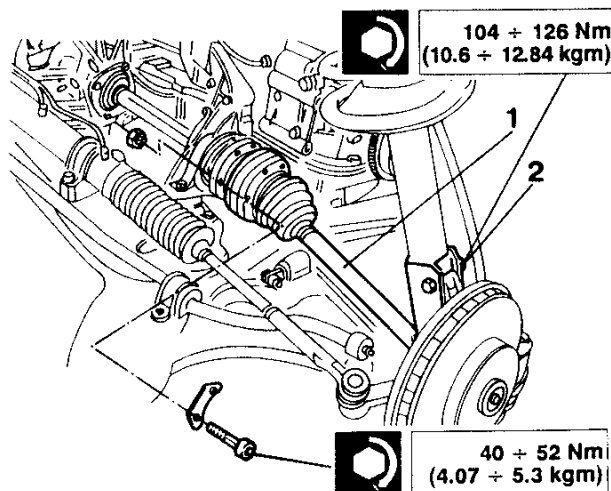




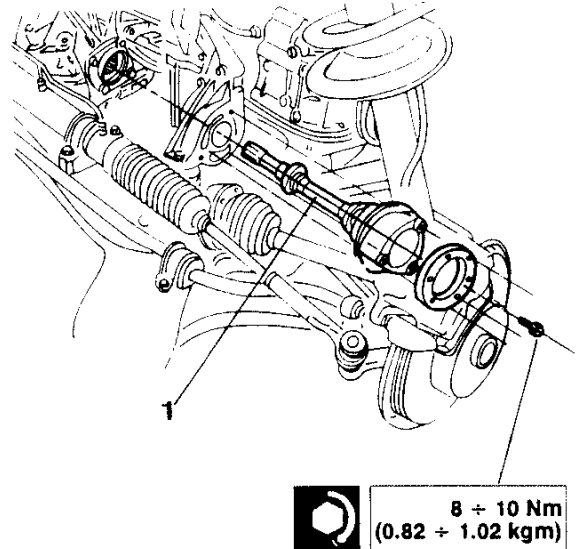
1. Unscrew and remove the bolt securing the wheel support to the spherical joint of the suspension arm.
2. Unscrew the two bolts securing the suspension stem to the wheel support and remove wheel hub, brake disc and drive shaft assembly.



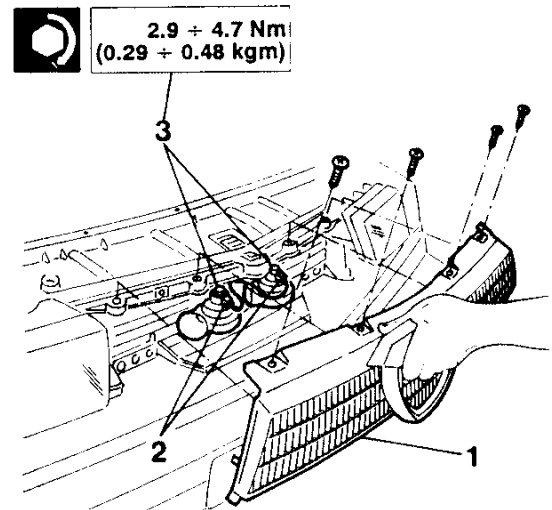
- Proceeding from the right-hand side of the vehicle, operate as follows:
1. Unscrew the six bolts and disconnect the right-hand constant speed joint from the intermediate shaft and remove the three safety plates.
 2. Loosen the two bolts securing the wheel support to the suspension stem and remove the upper one.



1. Unscrew the screws securing the intermediate shaft flange to the engine mounting and withdraw the shaft from the differential.

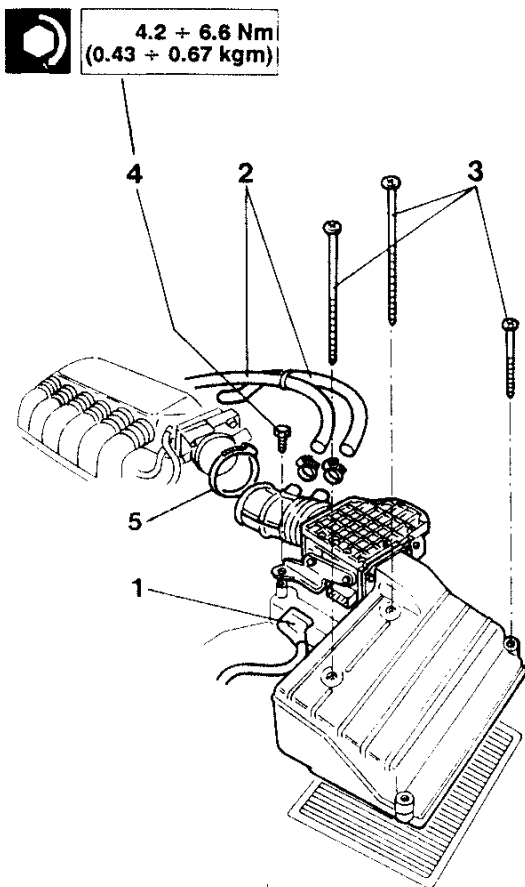


1. Unscrew the four screws and remove the front grill.
2. Disconnect the electrical wiring of the horns.
3. Unscrew the nuts securing the horns to the front cross member and remove the horns.

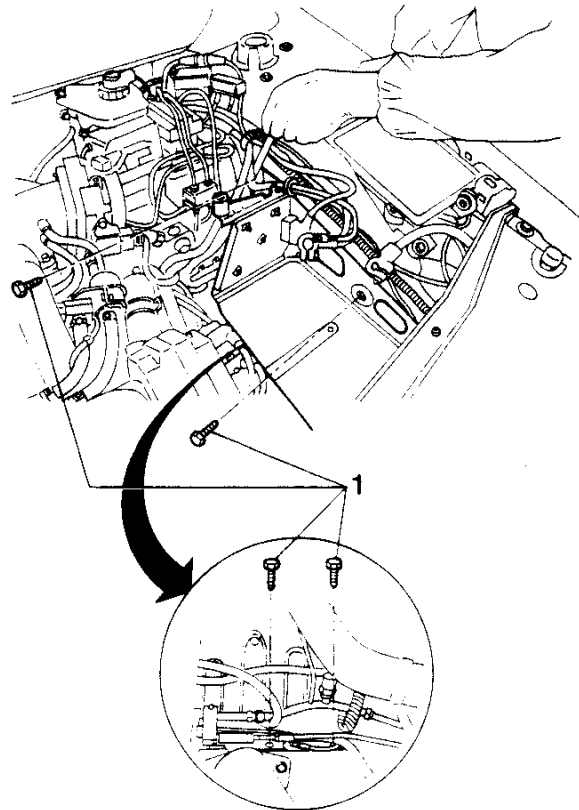


**VARIATIONS FOR 2.4 V6 VEHICLES**

1. Disconnect the connector from the air flow meter.
2. Disconnect the oil vapour recirculation hose and the constant idle speed actuator hose.
3. Unscrew the screws securing the air cleaner cover.
4. Unscrew the screws securing the air flow meter square to the battery support.
5. Loosen the clamps securing the corrugated intake hose from the intake box side and remove the air cleaner cover and air flow meter assembly.



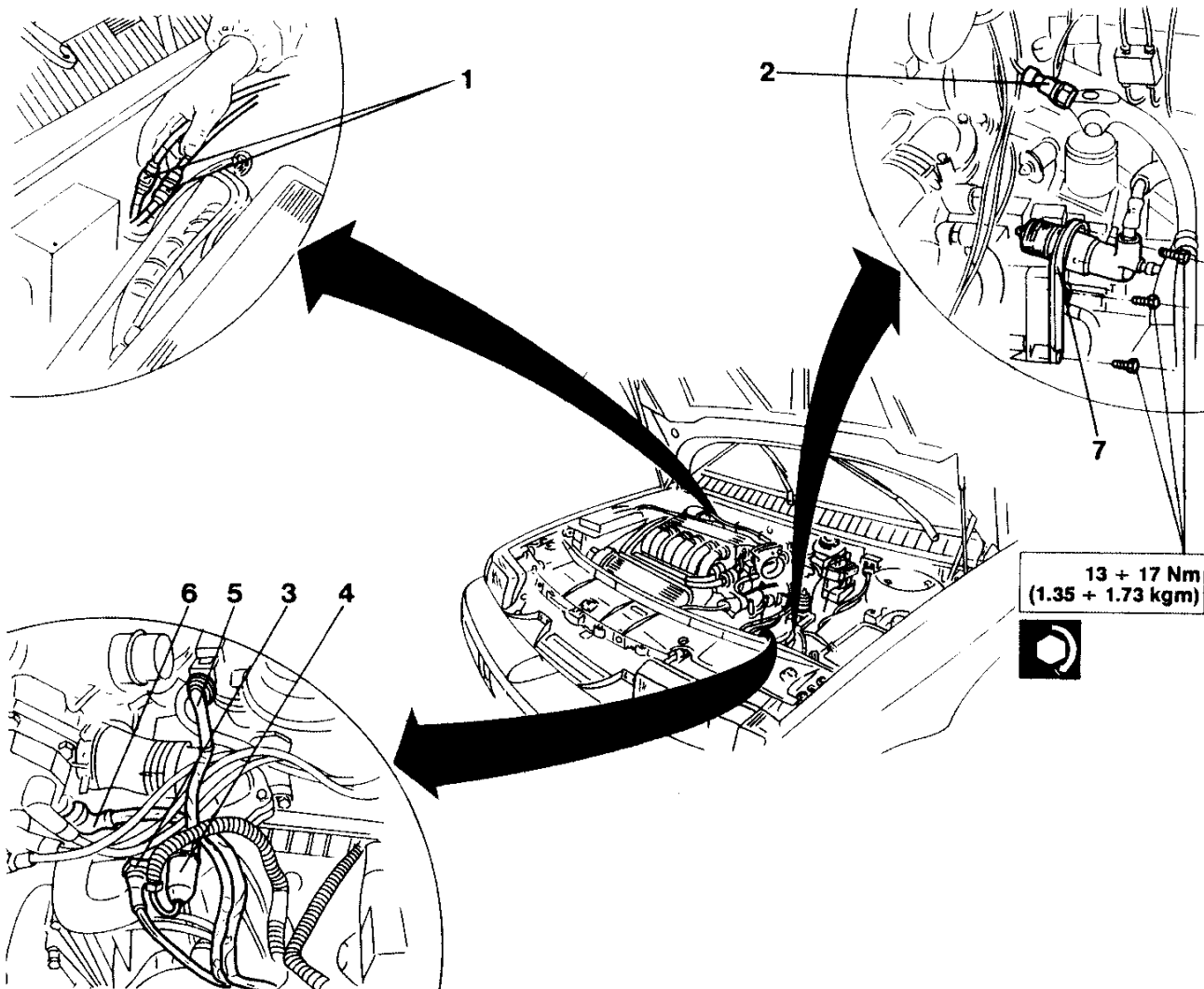
1. Unscrew the screws securing the battery support to the body and remove the support.





- Disconnect the connectors of the following devices:
1. (only for vehicles with catalyzed exhaust system):
 - two cables of the Lambda probe located near the service tank;
 2. (only for vehicles with controlled damping suspension):
 - controlled damping system sensor on brake pump;
 3. reverse gear switch.

4. water temperature sensor bulb, engine cooling system;
5. throttle valve switch (minimum-maximum);
6. ignition device.
7. Unscrew the three bolts and remove the clutch engagement cylinder bracket together with the earth lead. Secure the previously disconnected cylinder and relative wiring to the side panel.





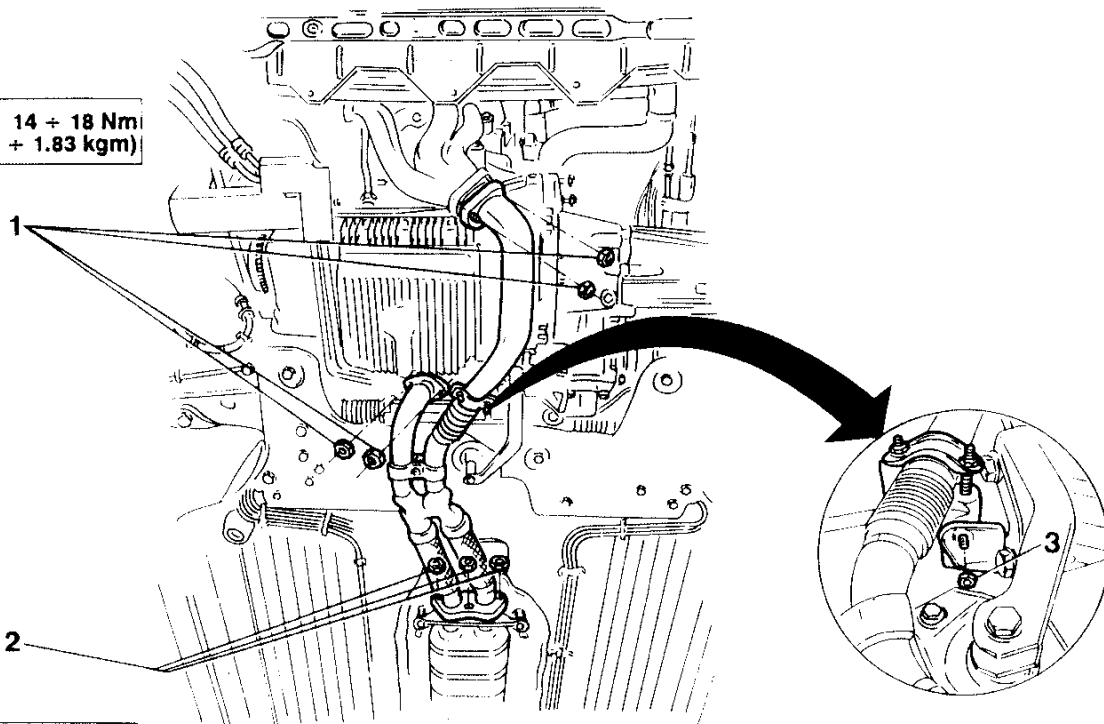
1. Unscrew the nuts securing the forward section of the exhaust pipe to the exhaust manifolds.
2. Unscrew the nuts securing the forward section of the exhaust pipe to the intermediate section.
3. Unscrew the nut securing the exhaust pipe support bracket to the gearbox central support and remove the exhaust pipe.

**CAUTION:**

Pay particular attention when removing the forward section of the exhaust pipe in order to avoid damaging the wiring of the Lambda probe.



14 + 18 Nm
(1.43 + 1.83 kgm)



14 + 18 Nm
(1.43 + 1.83 kgm)



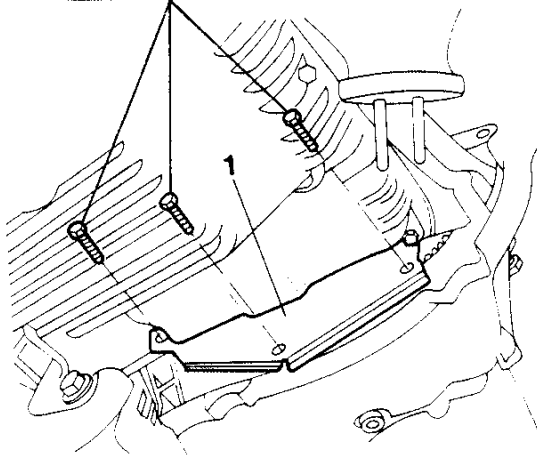
21 + 26 Nm
(2.14 + 2.65 kgm)



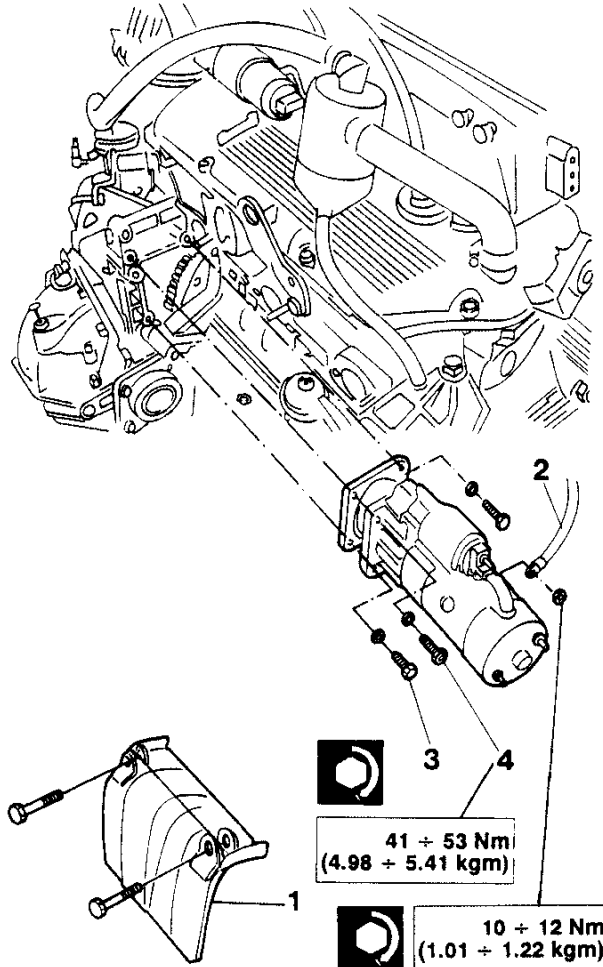
1. Unscrew the screws and remove the engine flywheel lower cover.



24 + 31 Nm
(2.14 + 2.65 kgm)



1. Unscrew the screws securing the starter motor protective heat shield and remove both parts of the shield.
2. Unscrew the nut securing the starter motor supply cable and disconnect the cable.
3. Unscrew the starter motor retaining screws.
4. Unscrew the engine-gearbox retaining bolt located under the starter motor.



41 + 53 Nm
(4.98 + 5.41 kgm)



10 + 12 Nm
(1.01 + 1.22 kgm)

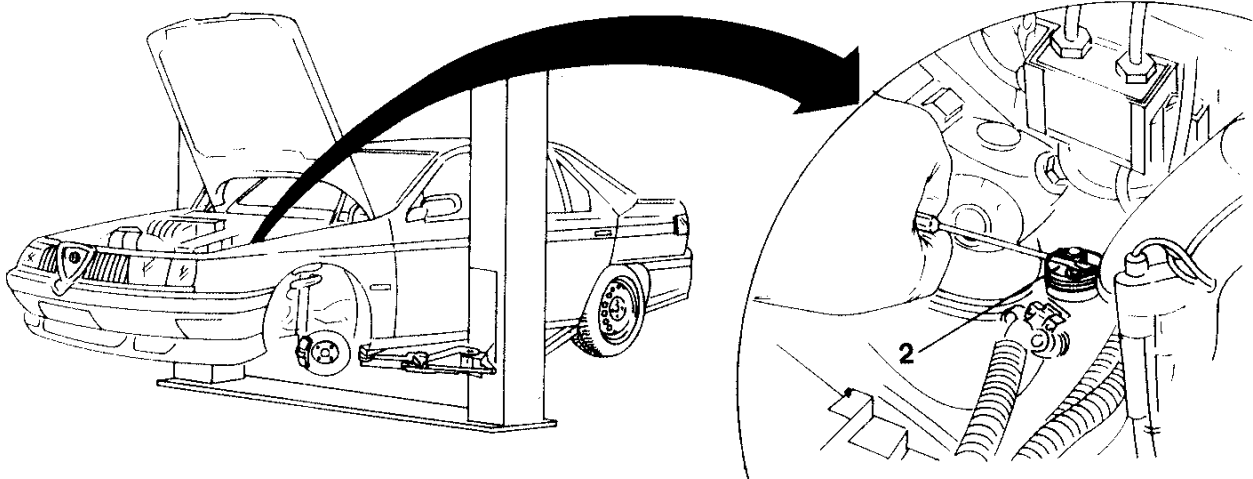
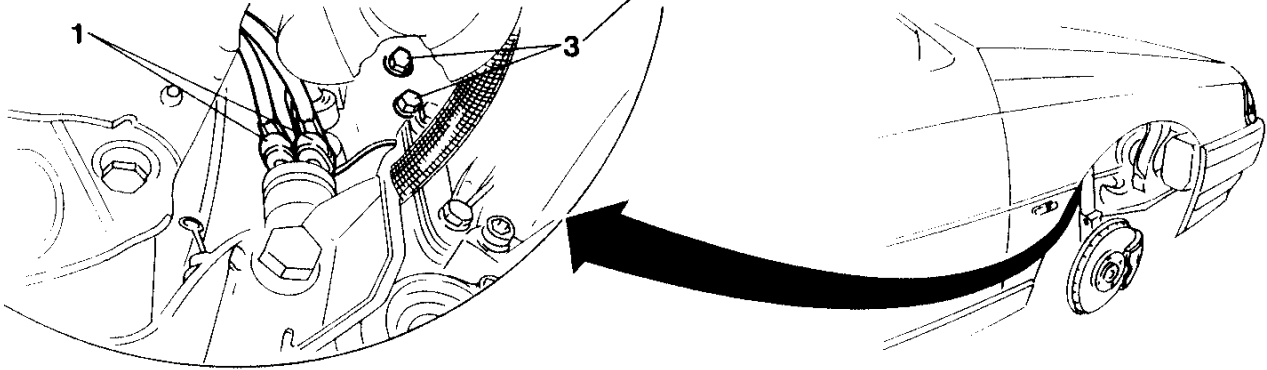


1. Disconnect the odometer sensor connector.
2. Disconnect the clips securing the gearbox control-cables to the speed engagement device.

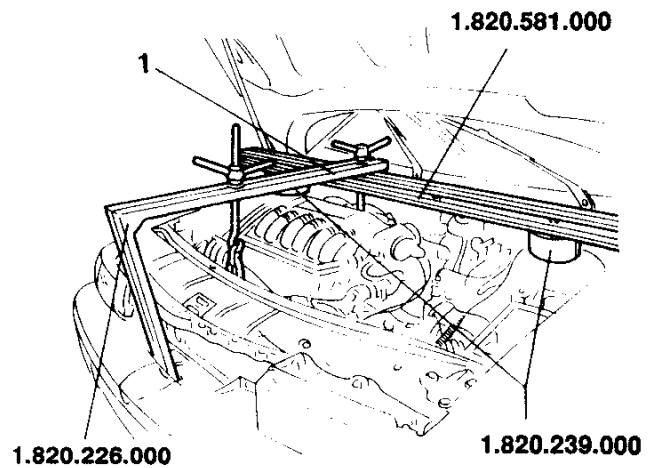
3. Unscrew the three bolts securing the gearbox control cable reaction bracket and move it.



14 + 18 Nm
(1.43 + 1.83 kgm)

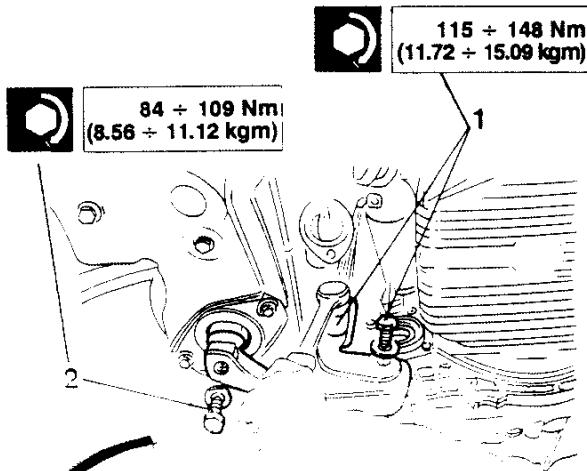


1. Position support Nos. 1.820.239.000, cross member No. 1.820.581.000 and engine support No. 1.820.226.000, and hook up the engine after having positioned suitable support hooks.

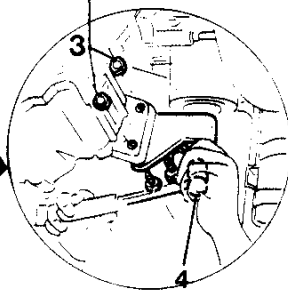




1. Unscrew the screws securing the engine central mounting bracket to the flexible pad and remove the bracket.
2. Unscrew the screws securing the engine central mounting bracket to the differential.
3. Unscrew the screws securing the front left engine mounting bracket to the gearbox.
4. Unscrew the screw securing the front left engine mounting bracket to the flexible block and remove the bracket.

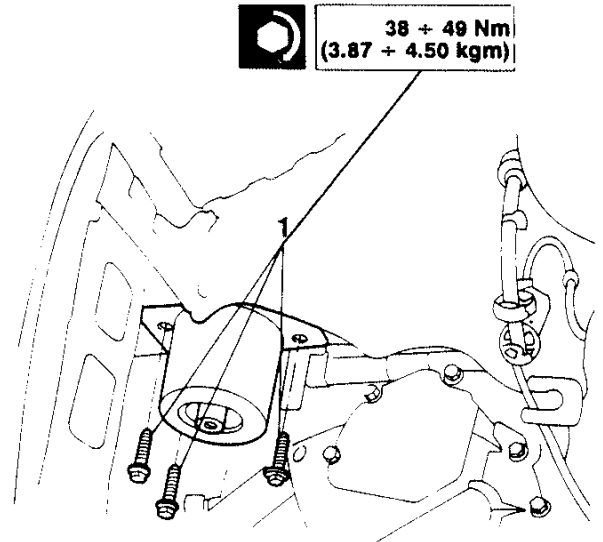


$53 \pm 68 \text{ Nm}$
($5.40 \pm 6.93 \text{ kgm}$)

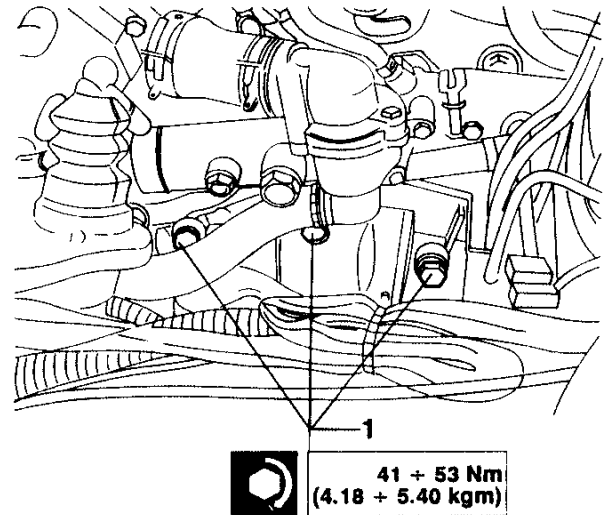


$84 \pm 109 \text{ Nm}$
($8.56 \pm 11.12 \text{ kgm}$)

1. Remove the three screws securing the front left engine mounting brackets to the body and remove the mounting.



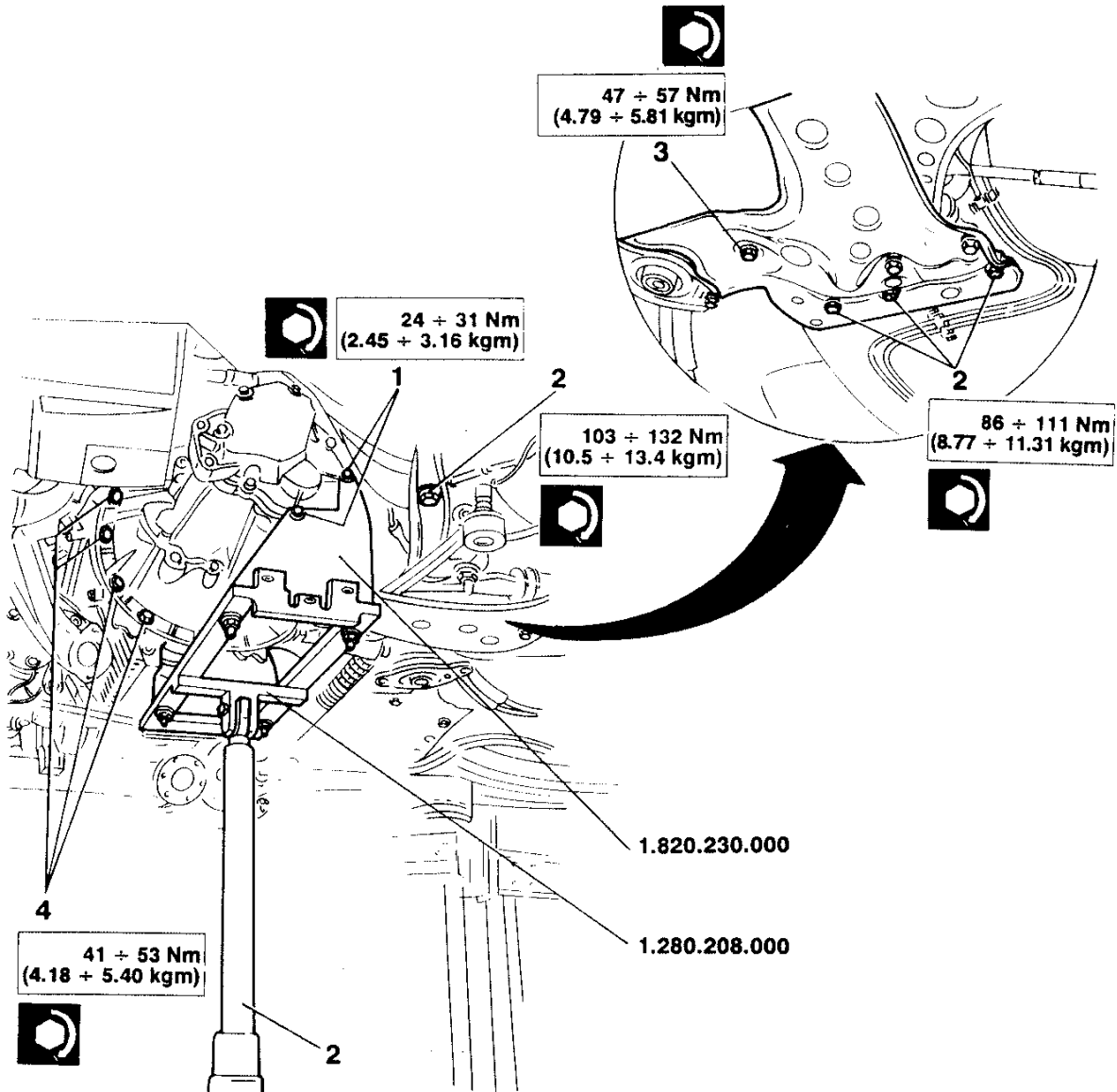
1. Operating inside the engine compartment, unscrew the three upper engine-gearbox retaining screws.





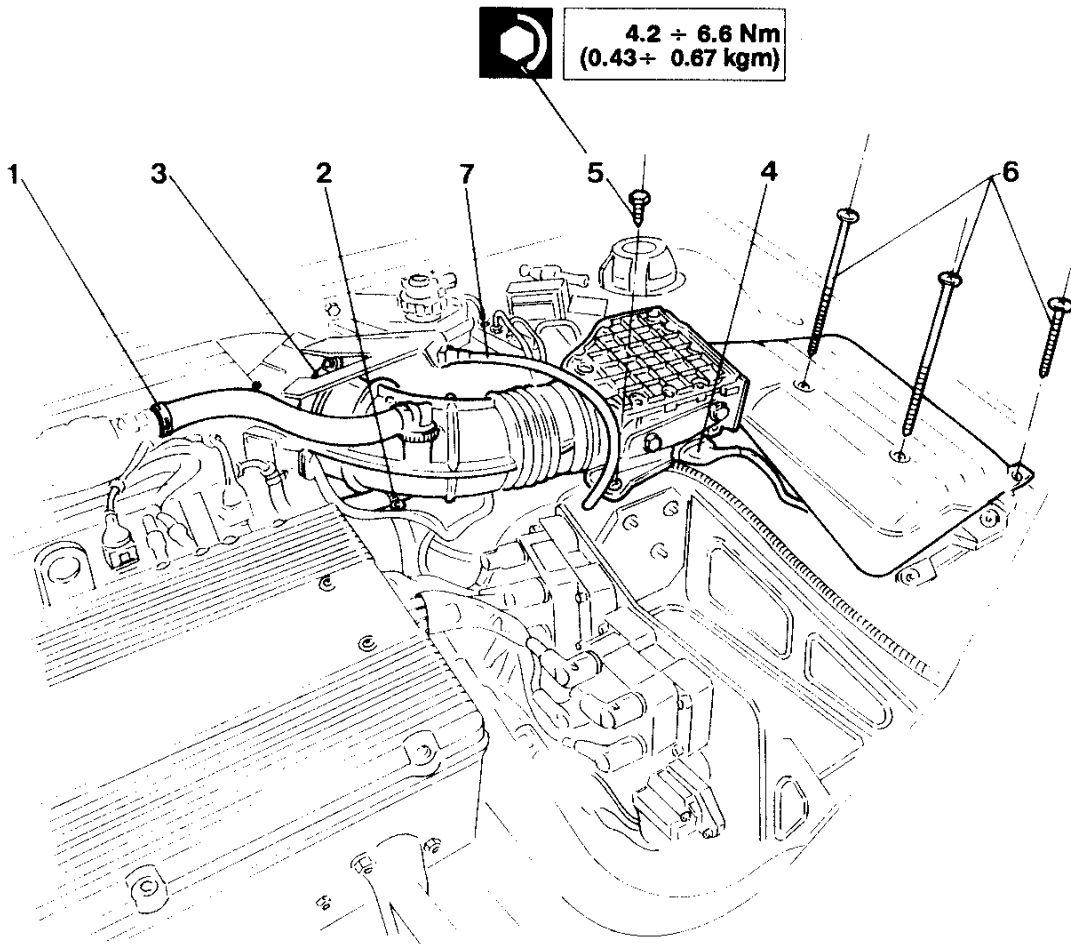
- Working underneath the vehicle proceed as follows:
1. Unscrew the two screws securing the gearbox cover and install brackets No. 1.820.230.000 and support No. 1.820.208.000.
 2. Using a hydraulic lift, take the weight of the gearbox assembly and unscrew the screws securing the front suspension cross member to the body as indicated in the illustration.

3. Loosen the two central screws securing the cross member to the steering box.
4. Unscrew the screws securing the gear lever bell to the engine and disconnect the gearbox from the engine.



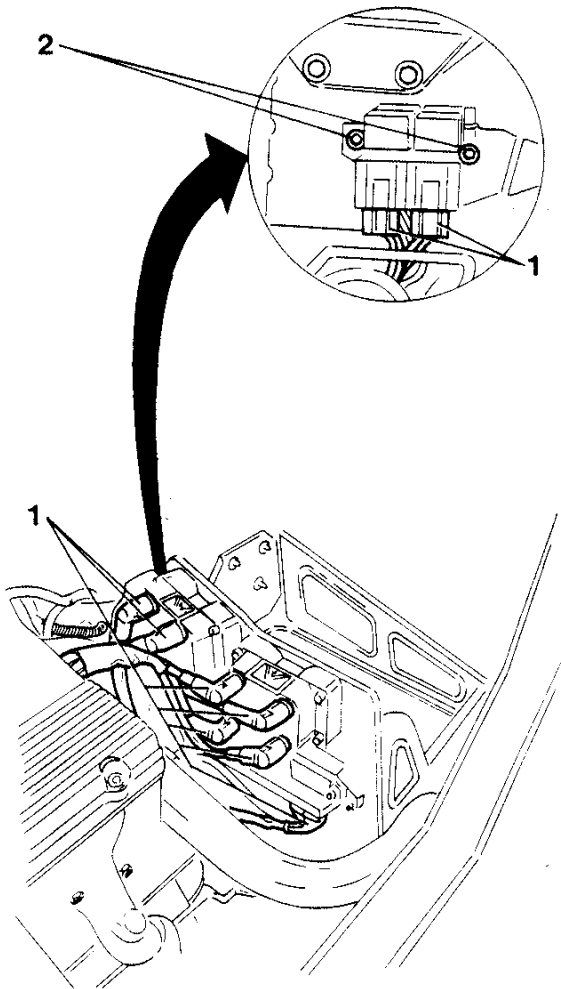
**VARIATIONS FOR 1.8 - 2.0 T.S. VEHICLES**

1. Loosen the clamps securing the oil vapour decanter hose and disconnect the hose.
2. Loosen the clamps holding the constant idle speed actuator hose and disconnect the hose.
- (only for vehicles with catalytic exhaust system): disconnect the connectors of the two cables of the Lambda probe located near the service tank.
3. Loosen the clamps holding the suction manifold.
4. Disconnect the air flow meter connector.
5. Unscrew the screws of the air flow meter bracket.
6. Unscrew the three screws securing the intake box and remove it.
7. Free the accelerator cable and the positive cables of the battery from the anchor point on the battery holder.

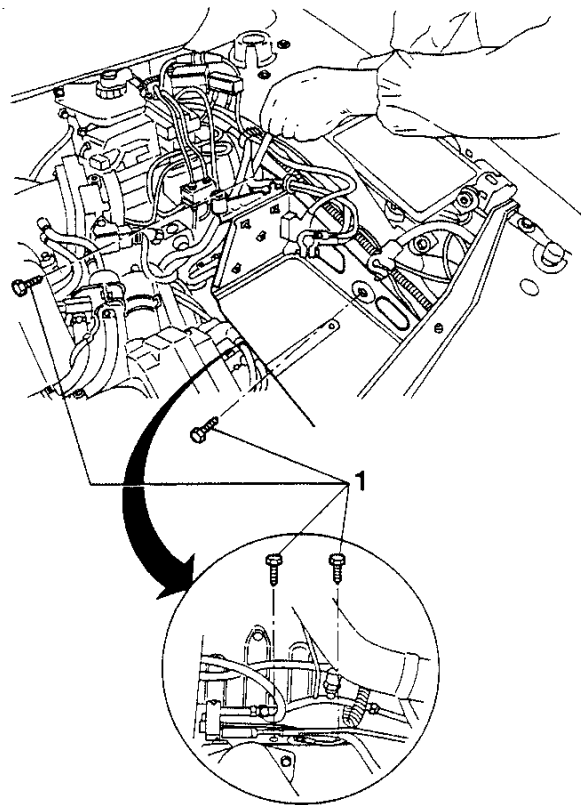




1. Disconnect the ignition coil wiring and connectors located on the battery holder.
2. Unscrew the two screws securing the relay support bracket to the battery holder and remove it.



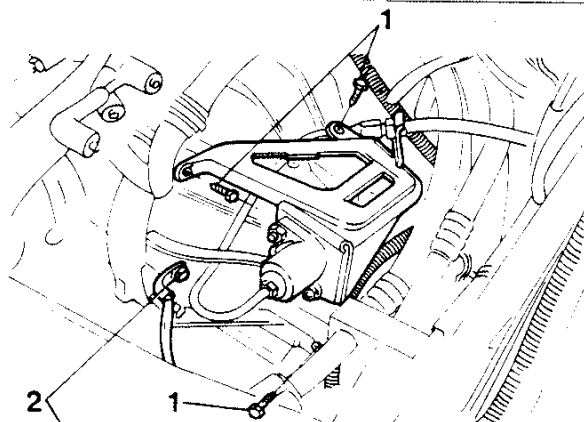
1. Unscrew the screws securing the battery holder to the body and remove the plate.



1. Unscrew the three screws securing the clutch engagement cylinder support bracket to the gear lever bell and remove the bracket and cylinder.
2. Unscrew the screw securing the earth lead to the gear lever bell and remove the cable.



20.9 ÷ 23.1 Nm
(2.13 ÷ 2.35 kgm)



20.4 ÷ 25.2 Nm
(2.08 ÷ 2.57 kgm)



- Raise the vehicle and proceed as follows:
1. Unscrew the nuts securing the exhaust pipes to the manifolds.
 2. Unscrew the screws securing the exhaust pipe support bracket to the engine block.
 3. Unscrew the nut securing the exhaust pipe support bracket to the central engine mounting.

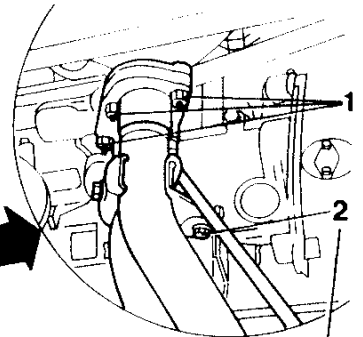


CAUTION:
(only for vehicles with catalyzed exhaust system) Pay particular attention when removing the forward section of the exhaust pipe in order to avoid damaging the wiring of the Lambda probe.

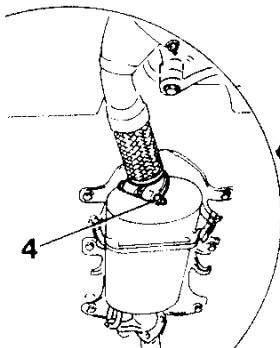
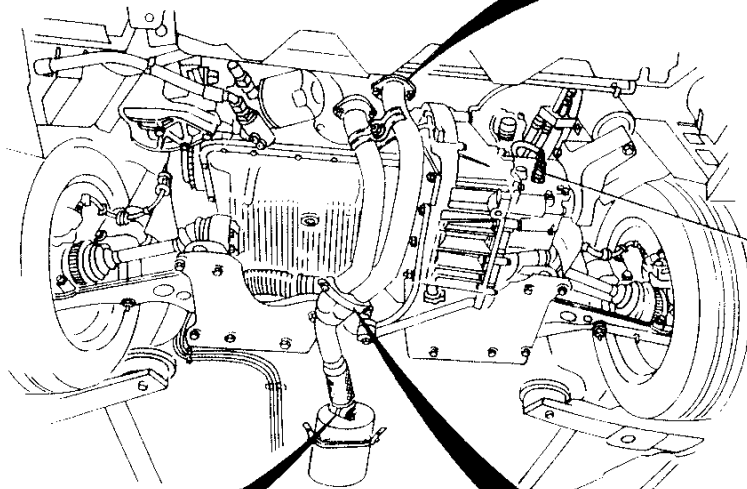
4. Unscrew the nut tightening the metal band connecting the forward and central sections of the exhaust pipe and remove the forward section.
5. Disconnect the reversing lamp wiring connector.



18 ÷ 19.95 Nm
(1.83 ÷ 2.03 kgm)



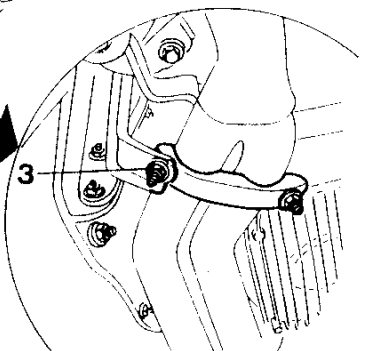
20.4 ÷ 25.2 Nm
(2.08 ÷ 2.57 kgm)



31.85 ÷ 51.45 Nm
(3.25 ÷ 5.24 kgm)



20.4 ÷ 25.2 Nm
(2.08 ÷ 2.57 kgm)

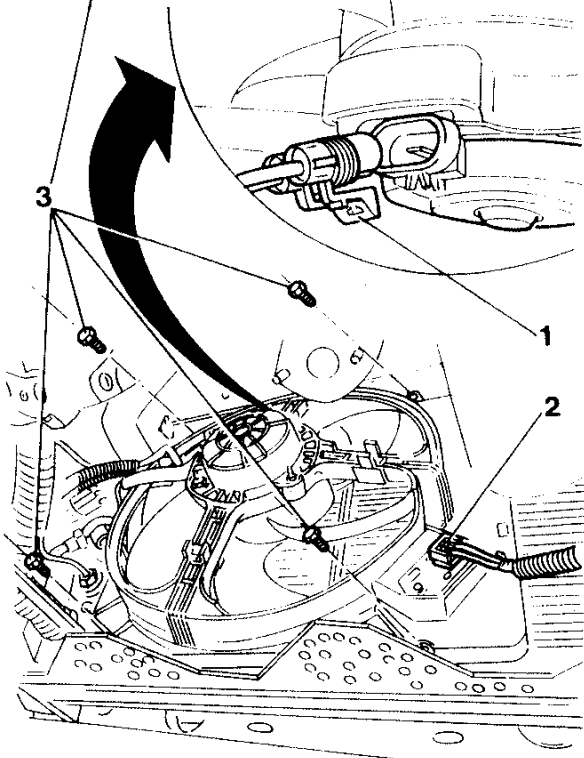




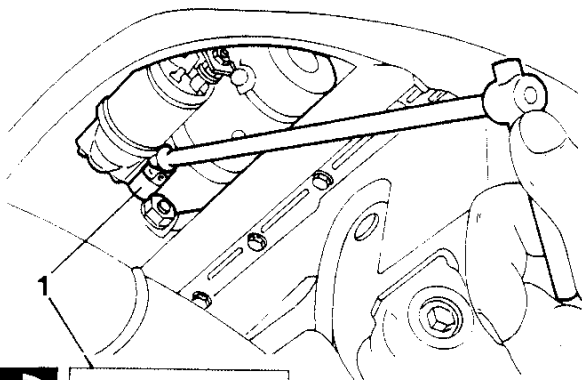
1. Disconnect the electric fan supply wiring connector.
2. Disconnect the electric fan additional resistance wiring connector.
3. Unscrew the four screws securing the electric fan and remove it.



5.1 ÷ 6.3 Nm
(0.52 ÷ 0.64 kgm)

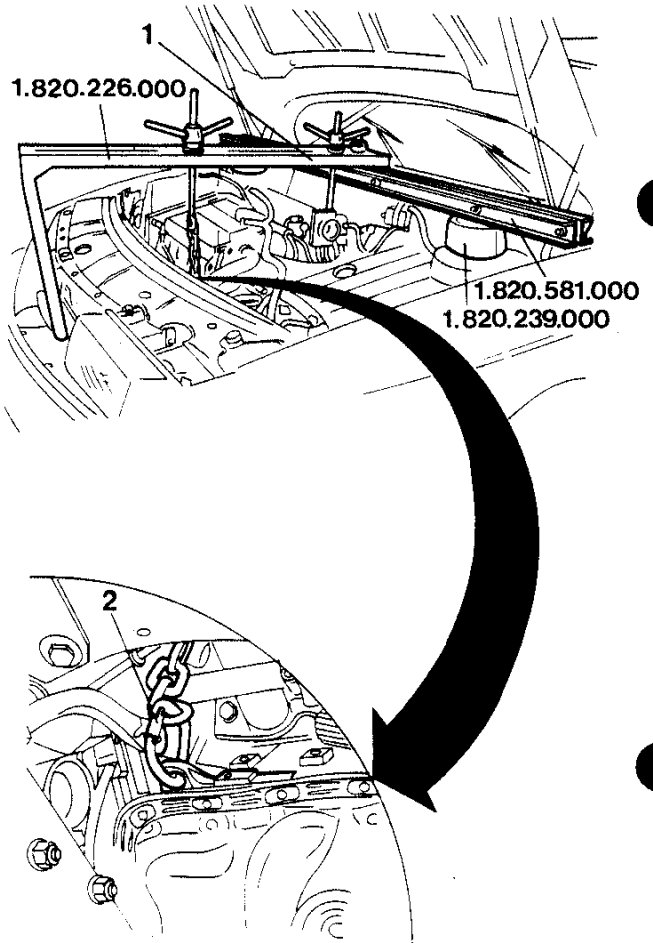


1. Unscrew the screws securing the starter motor to the gear lever bell.



17.85 ÷ 22.05 Nm
(1.82 ÷ 2.25 kgm)

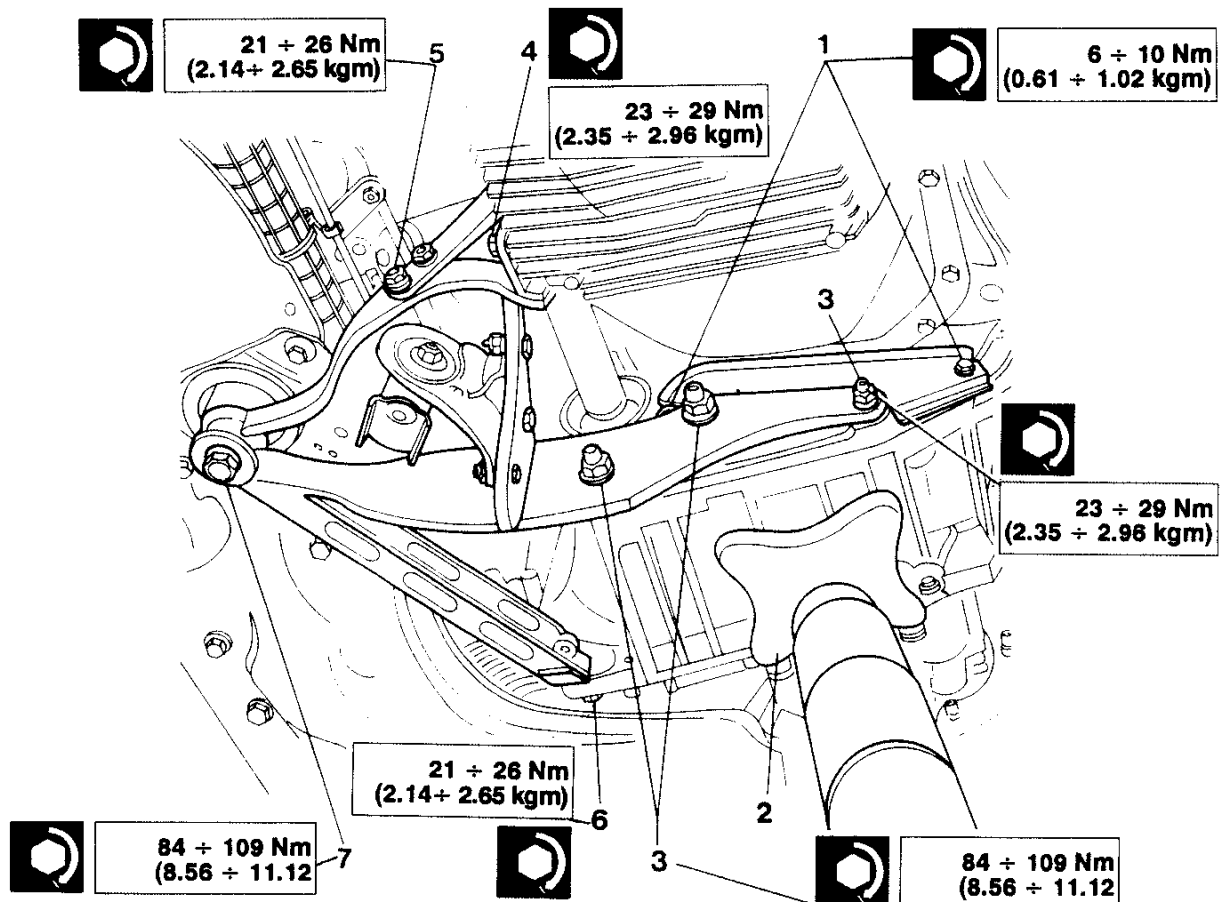
- Lower the vehicle and proceed as follows:
1. Position supports No. 1.820.239.000, cross member No. 1.820.581.000 and engine support No. 1.820.226.000.
 2. Secure the engine to the cross member with suitable support rings.



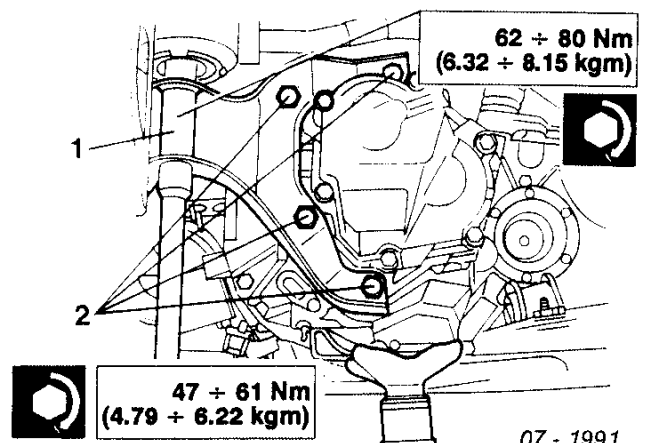


– Raise the vehicle and proceed as follows:

1. Unscrew the screws securing the engine flywheel cover and remove the cover.
2. Take the weight of the gearbox with a hydraulic lift.
3. Unscrew the nuts securing the central engine support bracket to the gearbox.
4. Unscrew the screws securing the arm of the central engine support bracket to the engine block.
5. Unscrew the screws securing the arm of the central engine support bracket to the strut of the engine block.
6. Unscrew the screw securing the strut of the central engine support bracket to the gearbox.
7. Unscrew the screws securing the central engine support bracket to the flexible pad and remove the bracket.
8. Unscrew the screws securing the steering box to the cross member.
9. Unscrew the screws securing the cross member to the body and remove the cross member.



1. Unscrew the screws securing the gearbox support to the flexible pad.
2. Unscrew the screws securing the mensola to the gearbox and remove it.

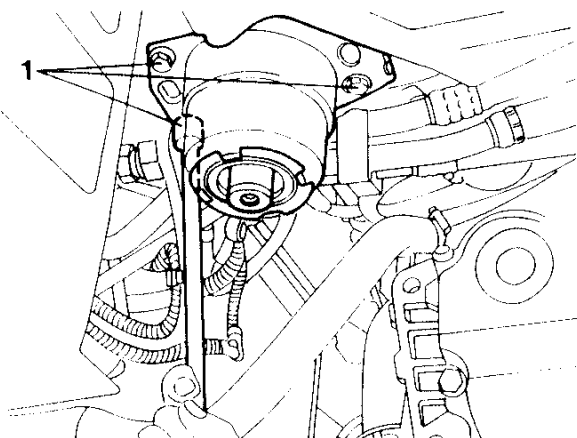




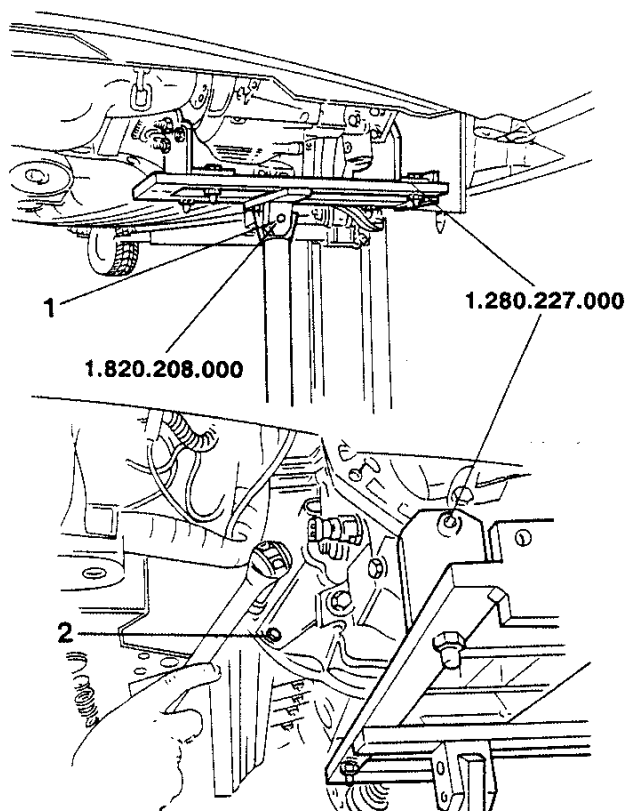
1. Unscrew and remove the flexible pad from the body.



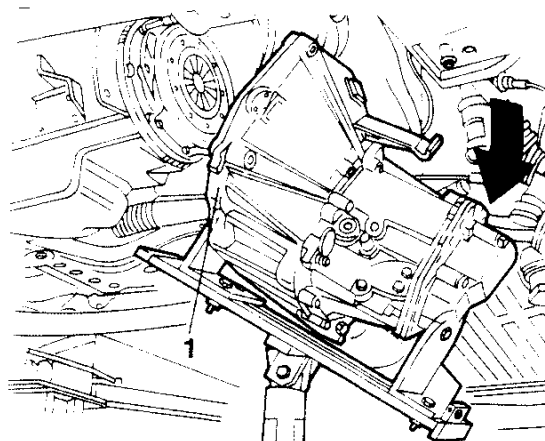
38 ÷ 49 Nm
(3.57 ÷ 4.99 kgm)



1. Set the gearbox support tool No. 1.820.208.000 with brackets 1.820.227.000 on a hydraulic jack and secure the gearbox as shown in the diagram.
2. Unscrew the engine-gearbox retaining screws.



1. Manoeuvre the gearbox - differential assembly in order to free it from the centering pins on the engine and to withdraw the clutch shaft from the driven disc. Lower the jack and remove the gearbox - differential group from the engine compartment.



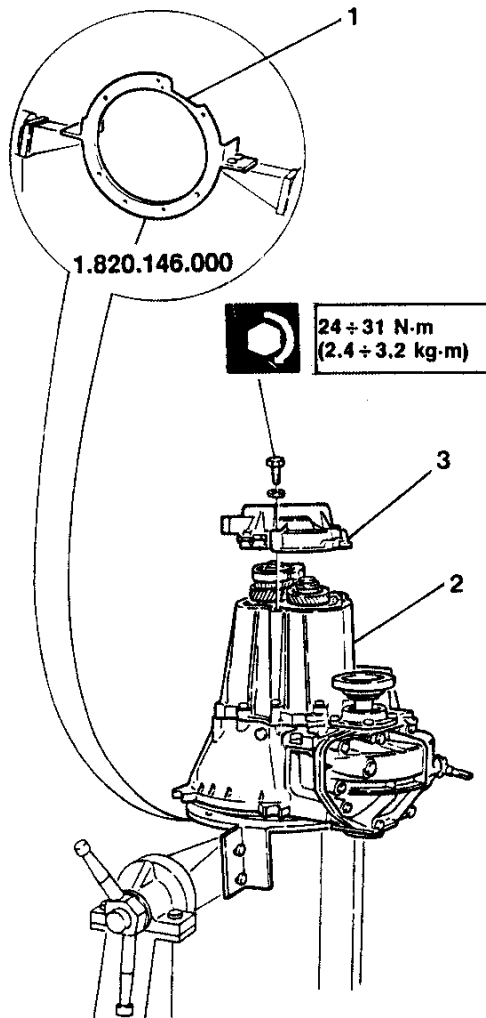
NOTE: Re-install the gearbox - differential assembly by reversing the sequence of operations described above. These procedures are also valid for vehicles and/ or versions equipped with special systems and/or devices.

**CAUTION:**

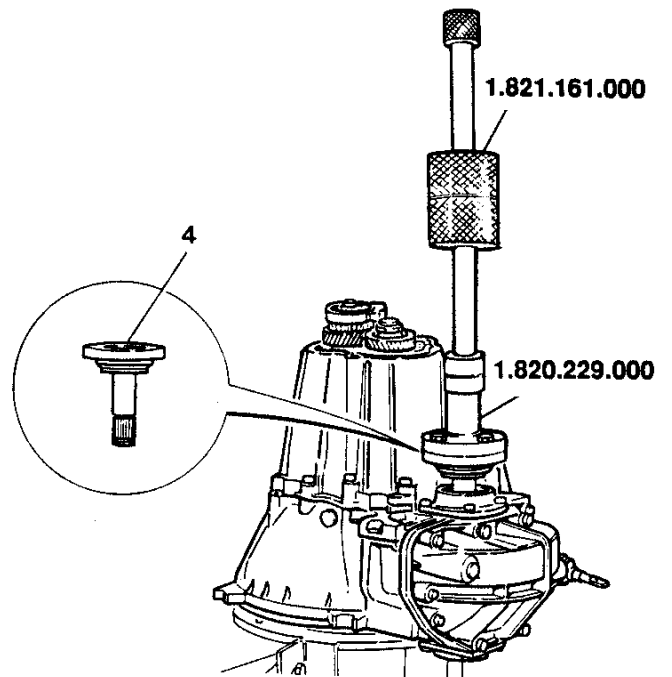
After installing the gearbox - differential assembly, check and if necessary adjust the height of the clutch pedal (see: GR. 12).

**DISASSEMBLY 2.4 V6****BENCH DISASSEMBLY**

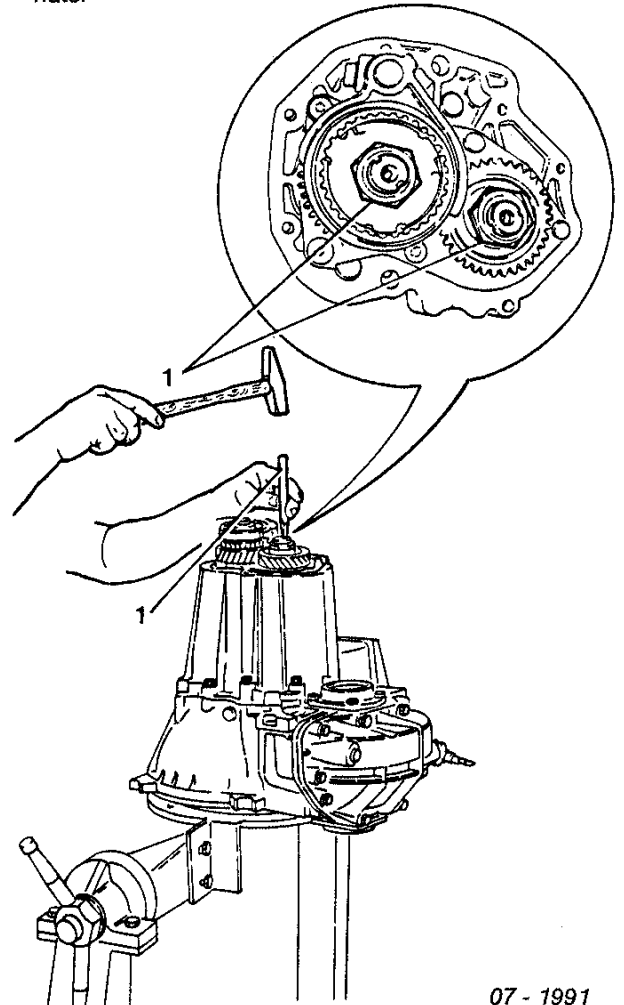
1. Fix support plate No. 1.820.146.000. to gearbox flange.
2. Install gearbox on rotary stand.
3. Remove rear cover.
4. Extract flange from differential using tools No. 1.821.161.000 and No. 1.820.229.000.



PA4655C 1000000



1. Straighten the caulking of main and lay shaft ring nuts.



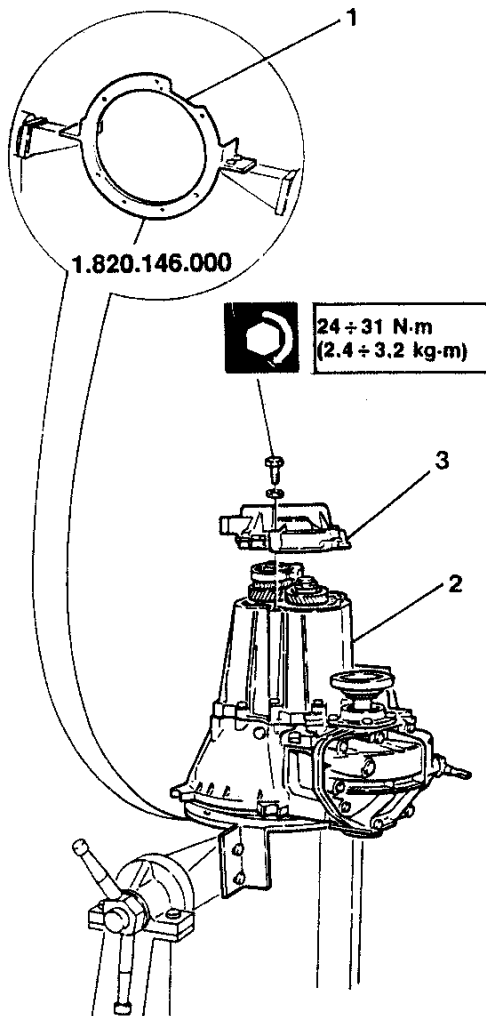
07 - 1991



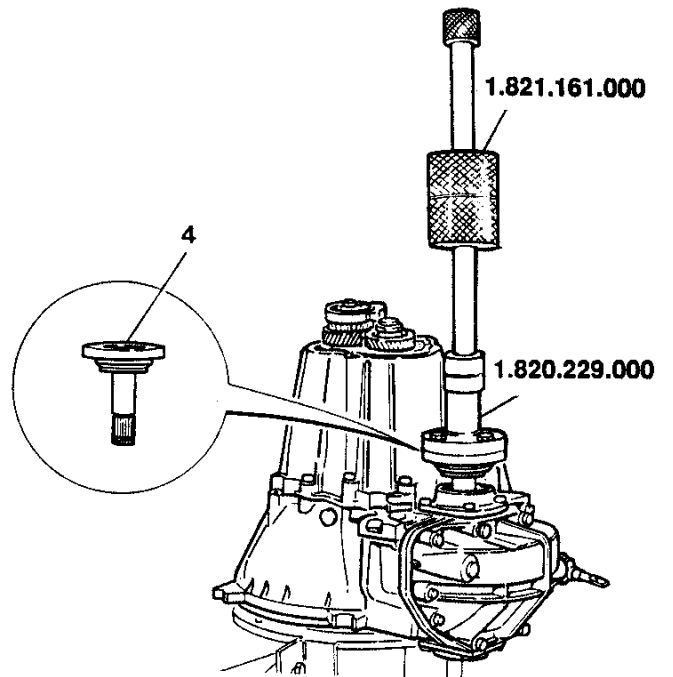
DISASSEMBLY 2.4 V6

BENCH DISASSEMBLY

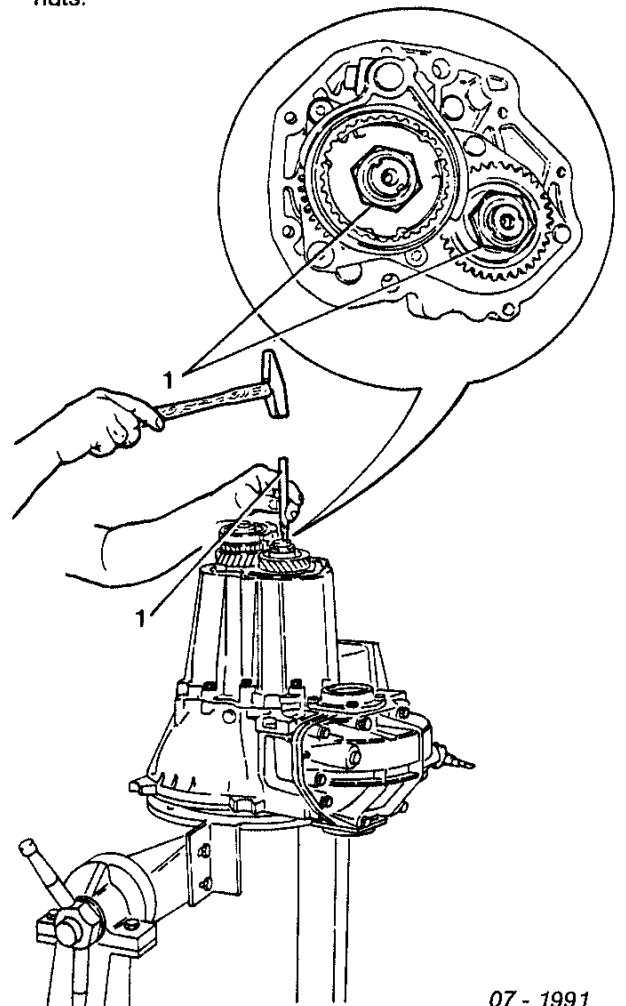
1. Fix support plate No. 1.820.146.000. to gearbox flange.
2. Install gearbox on rotary stand.
3. Remove rear cover.
4. Extract flange from differential using tools No. 1.821.161.000 and No. 1.820.229.000.



PA4655C100000



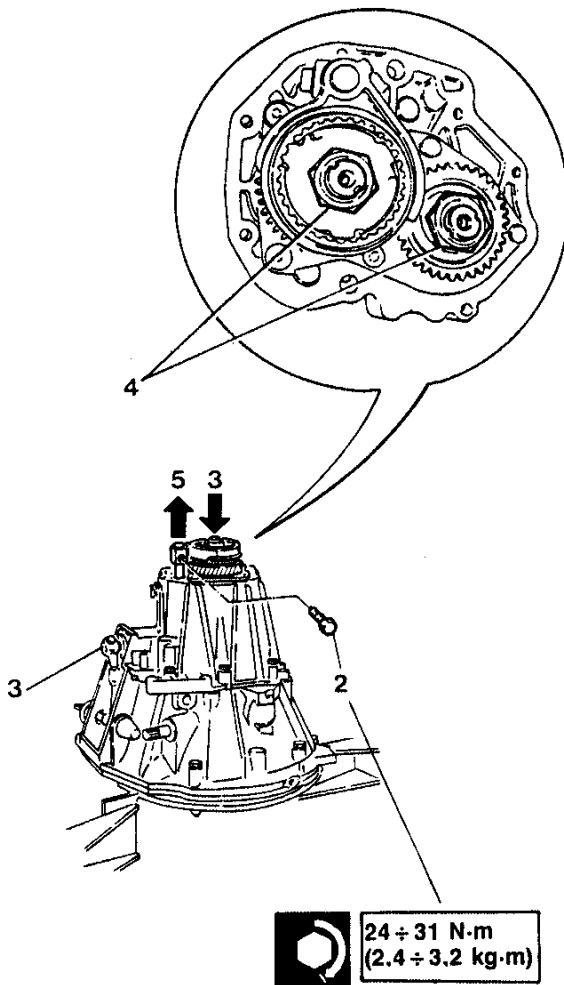
1. Straighten the caulking of main and lay shaft ring nuts.



07 - 1991

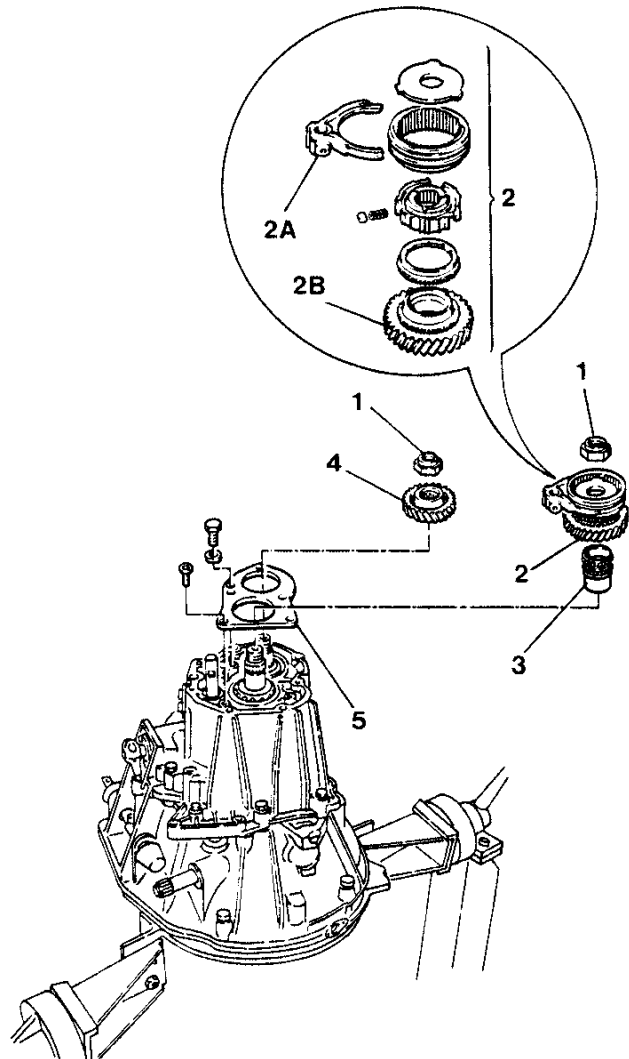


2. Remove the bolt securing 5th speed engagement fork to main shaft.
3. Lock gearbox shafts engaging 5th speed by hand (pressing the fork on main shaft) and engaging a speed using the selector lever.
4. Loosen the main and lay shaft ring nuts.
5. Return main shaft fork to idle position.



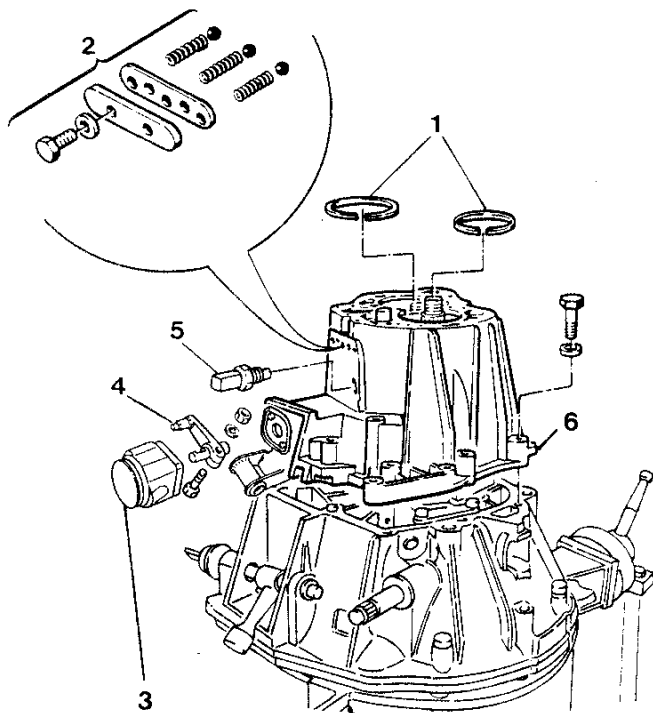
1. Remove the ring nuts securing main and lay shaft gears.
2. Withdraw hub-sleeve assembly with fork (2A) and drive gear (2B) with 5th speed synchronizer ring from main shaft.

3. Withdraw roller bearing and bushing of 5th speed gear from main shaft.
4. Withdraw 5th speed driven gear from layshaft.
5. Remove gearbox rear bearings retaining plate.

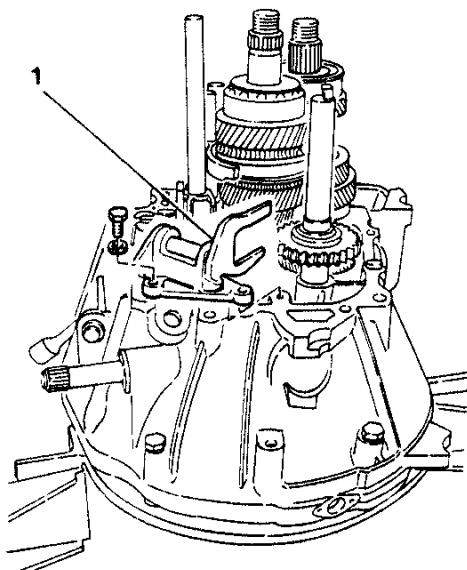




1. Remove flexible retaining rings securing gearbox rear bearings.
2. Remove retaining cover of speed control rod positioning balls and springs.
3. Remove the rubber protection.
4. Remove the speed engagement idler arm and relative support.
5. Remove the reversing light switch.
6. Remove gearbox casing by backing speed control shaft.

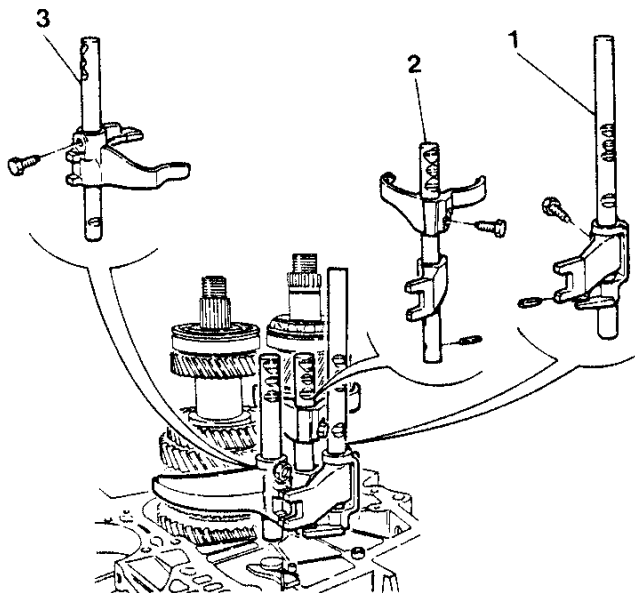


1. Remove reverse speed idle gear fork lever.

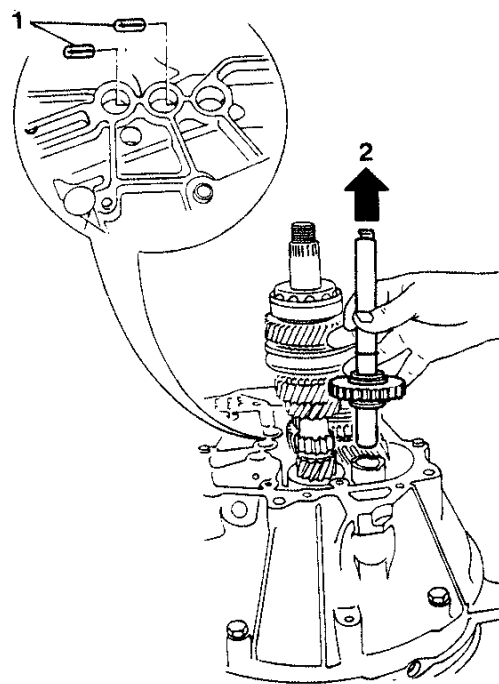


PA4655C100000

1. Remove the 5th and reverse speed rod.
2. Remove the 3rd and 4th speed rod and fork.
3. Remove the 1st and 2nd speed rod and fork.



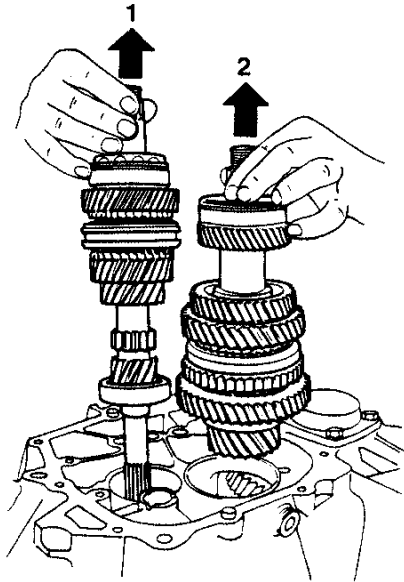
1. Remove safety pawls.
2. Remove reverse speed idle gear and shaft.



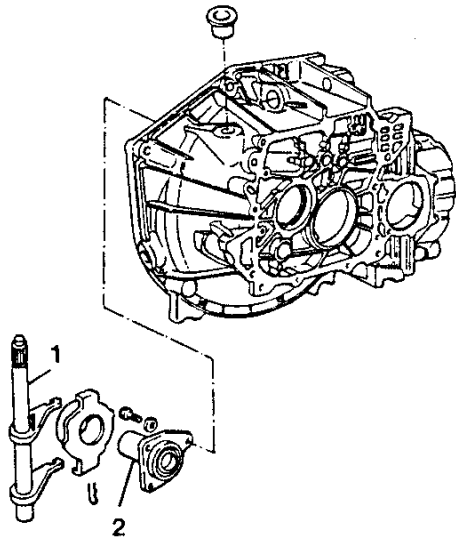
07 - 1991



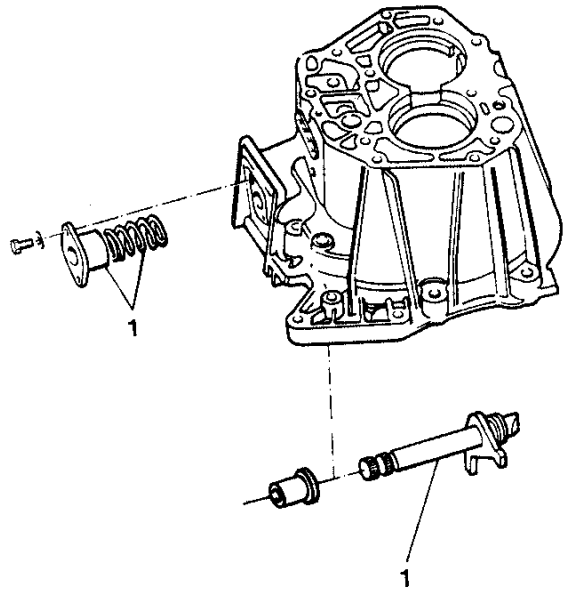
1. Remove the main shaft assembly.
2. Remove the lay shaft assembly.



1. Remove thrust bearing control shaft and fork.
2. Remove thrust bearing sleeve.



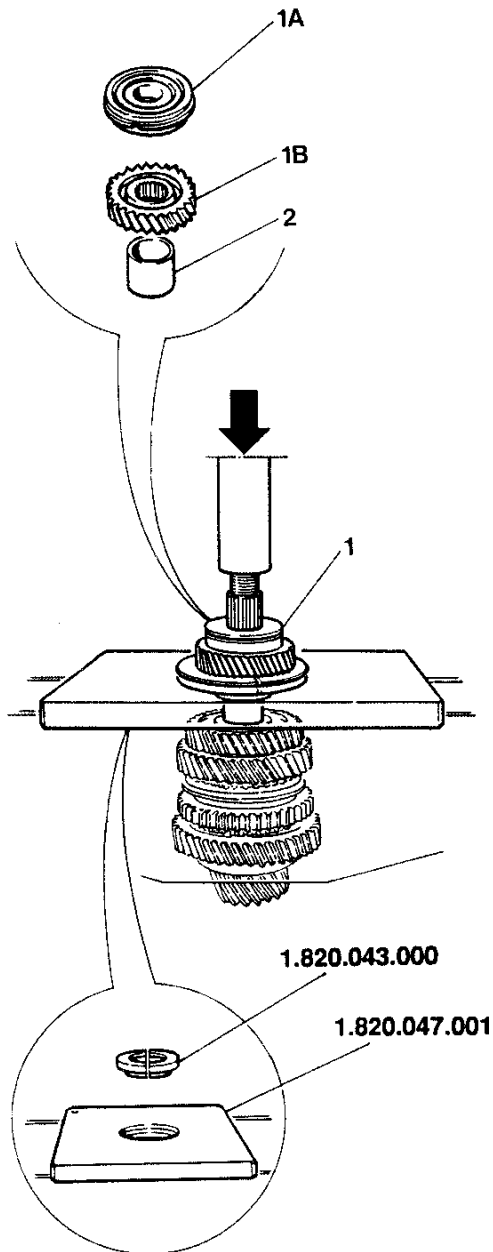
1. Remove complete speed control rod.



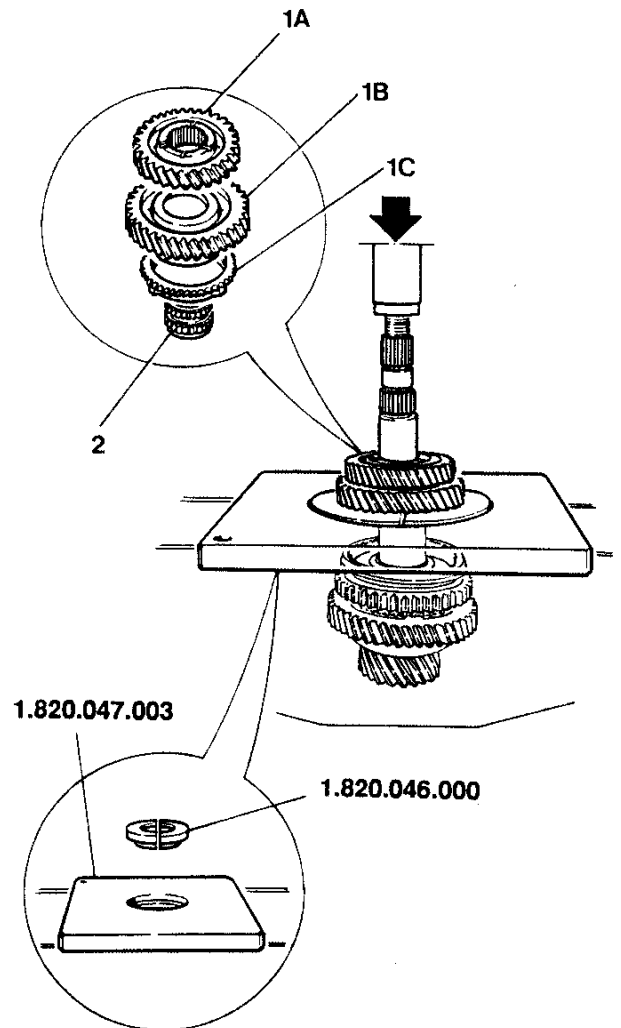


LAYSHAFT DISASSEMBLY

1. Using a press and suitable equipment, remove rear bearing (1A), and 4th speed driven gear (1B).
2. Withdraw spacer.

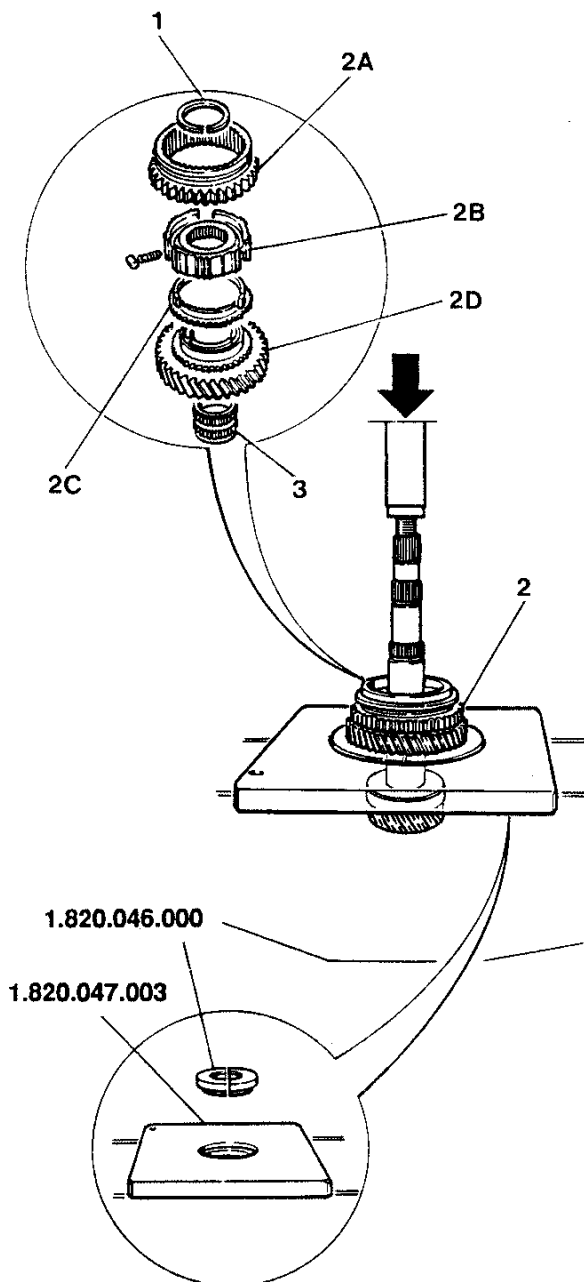


1. Using a press and suitable equipment, remove 2nd and 3rd driven gears (1A - 1B) and 2nd speed synchronizer ring (1C).
2. Withdraw bearing and rollers for 3rd speed driven gear

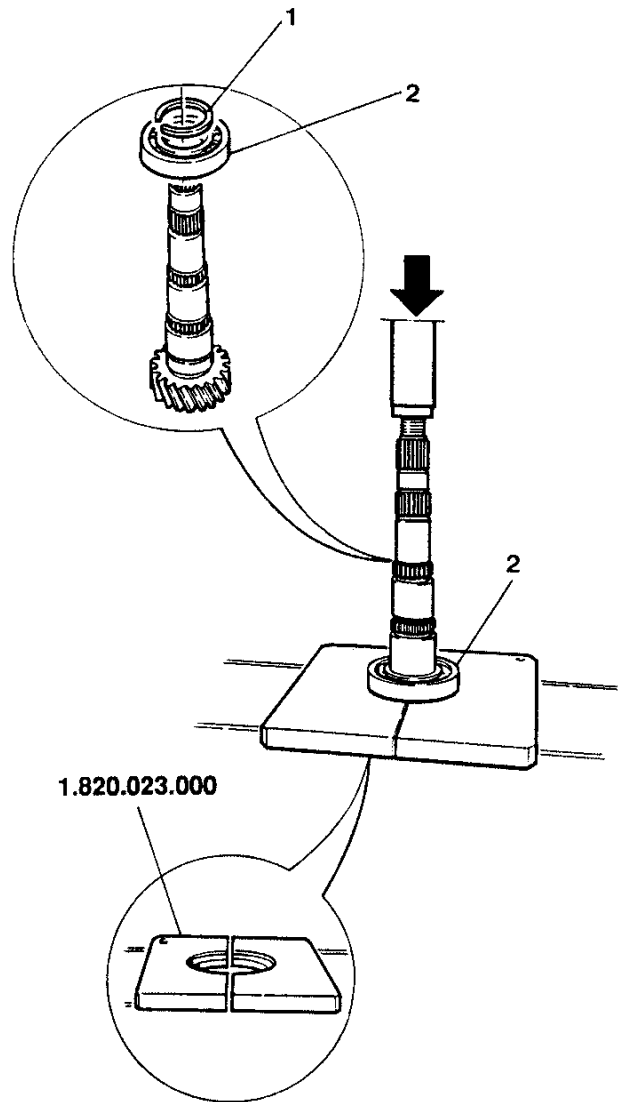




1. Remove flexible retaining ring securing 1st and 2nd speed engagement sliding hub.
2. Using a press and suitable equipment, remove 1st and 2nd speed engagement sliding sleeve and reverse gear (2A) hub (2B), 1st speed synchronizer ring (2C) and 1st speed driven gear (2D).
3. Withdraw 1st speed driven gear roller bearing.



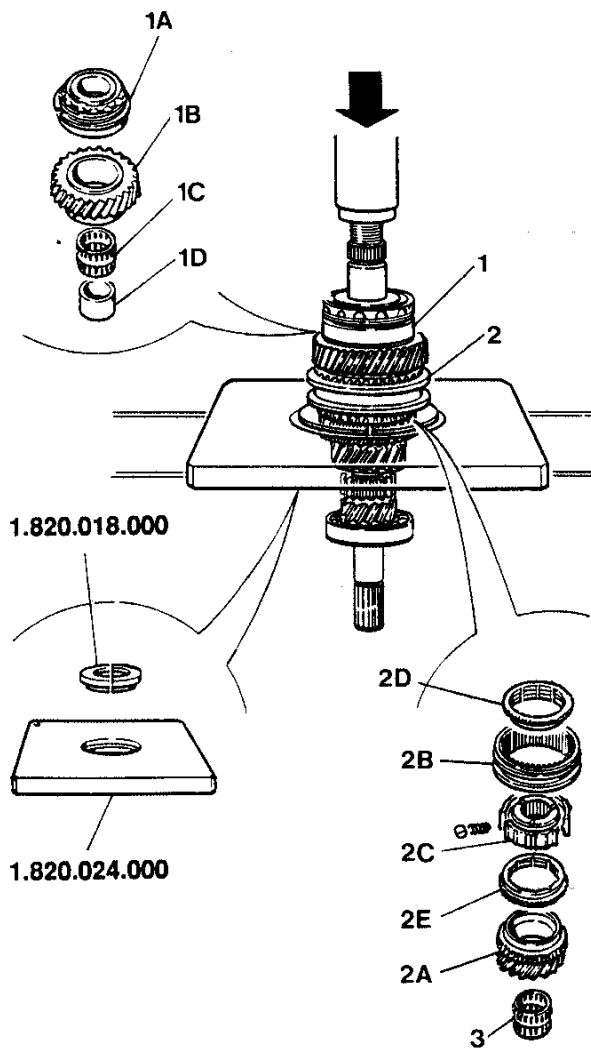
1. Remove flexible retaining ring securing front bearing.
2. Using a press and suitable equipment remove front bearing from transmission shaft.



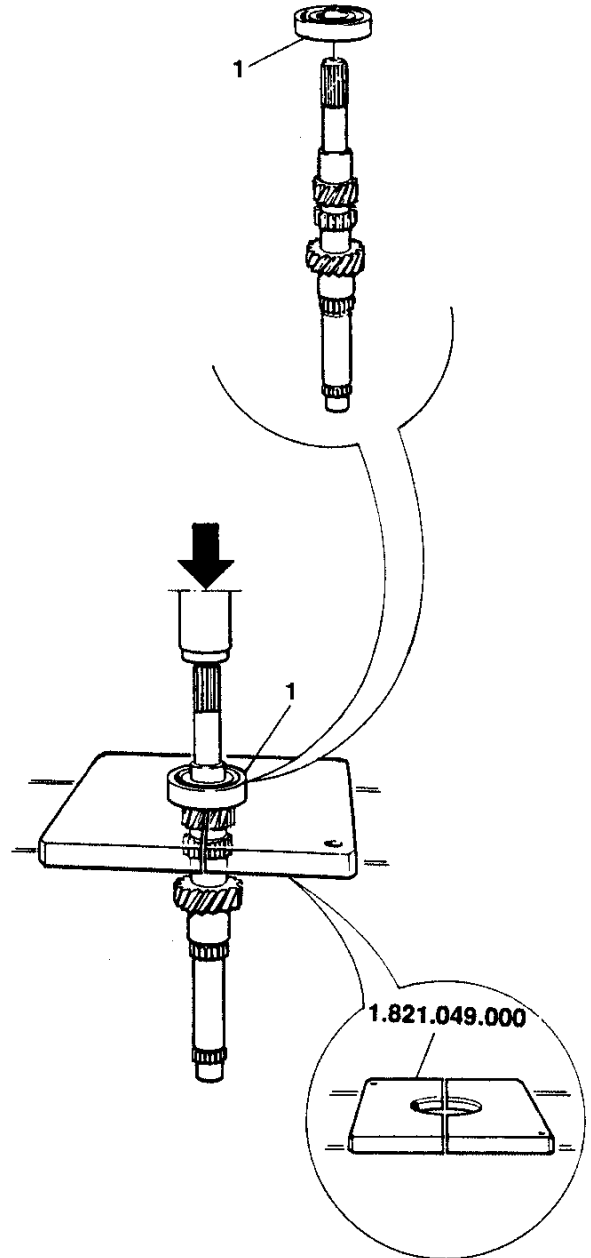


MAIN SHAFT DISASSEMBLY

1. Using a press and suitable equipment remove rear bearing (1A) and 4th speed drive gear assembly (1B) with relevant roller bearing (1C) and bushing (1D).
2. Withdraw 3rd speed drive gear (2A) and 3rd - 4th speed sliding sleeve assembly (2B) together with hub (2C) and 4th (2D) and 3rd (2E) speed synchronizer rings.
3. Withdraw 3rd speed drive gear roller bearing.



1. Using a press and suitable equipment remove front bearing from main shaft.

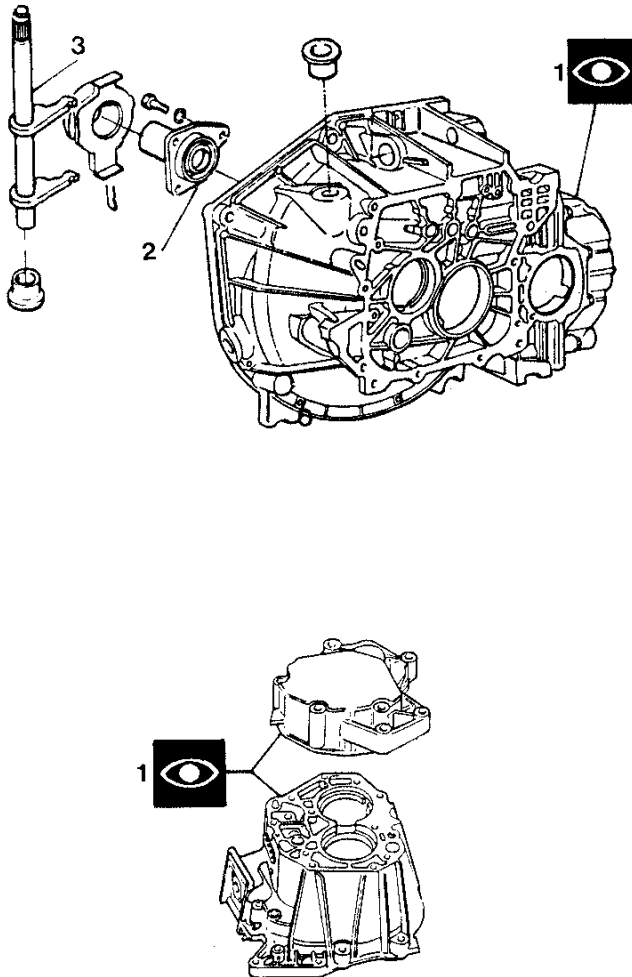




CHECKS AND INSPECTIONS 2.4 V6

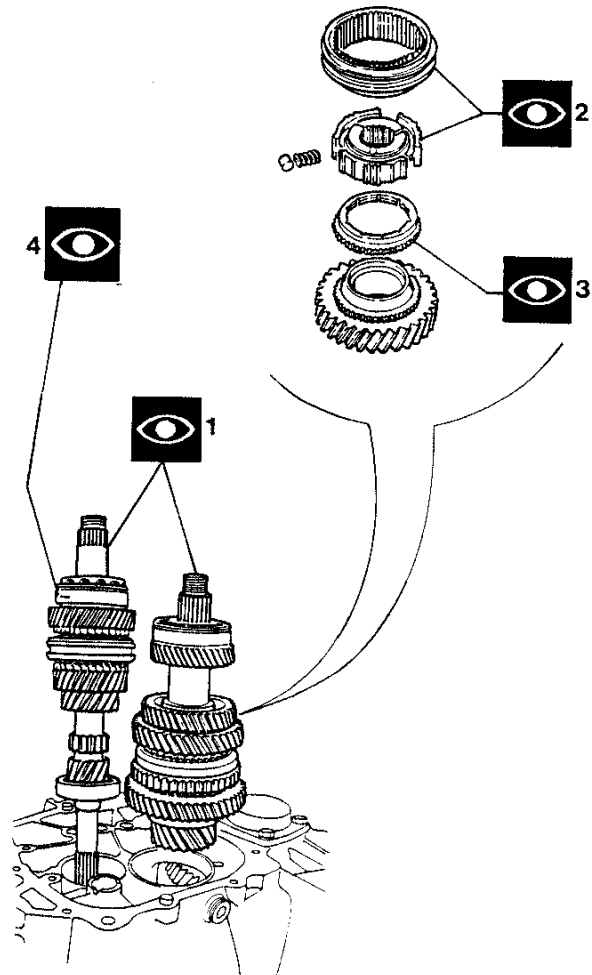
GEARBOX SUPPORT - CENTRAL CASING - COVER

1. Check rods and bearing seats for cracks, wear or damage. Check that the contact surfaces are level (minor defects can be removed with a fine file).
2. Check for oil leaks; replace sleeve and seal assembly if necessary.
3. Check fork control shaft for excessive play; replace bushings if necessary.



MAIN AND LAY SHAFTS

1. Check gear teeth for nicks or excessive wear and inner surfaces for seizing or abnormal wear.
2. Check hubs and sliding sleeves for nicks, freedom of movement, excessive play and seizing. Check sleeve inner teeth for excessive wear.
3. Check synchronizer rings for ovalization of inner surface.
4. Check rear bearing for scoring of outer race, inner ring and balls, signs of overheating or excessive wear.



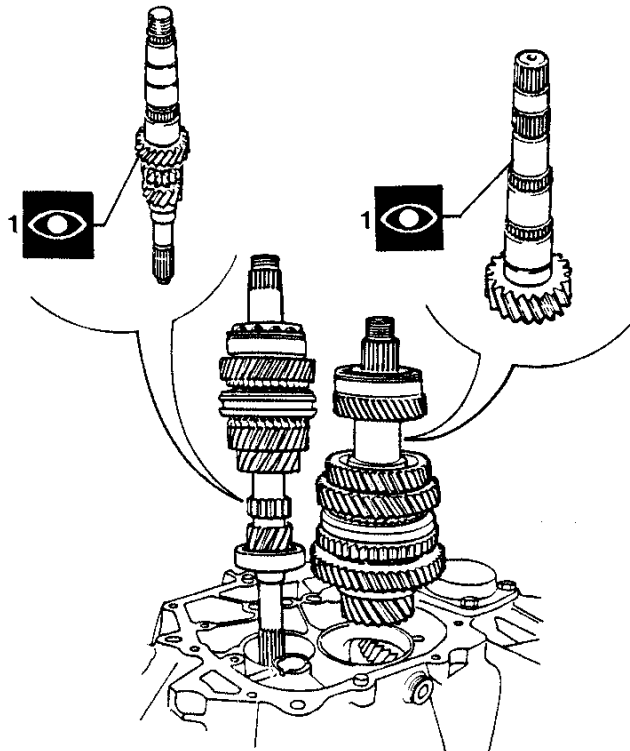


1. Check main and transmission shaft gears for nicks or excessive wear.



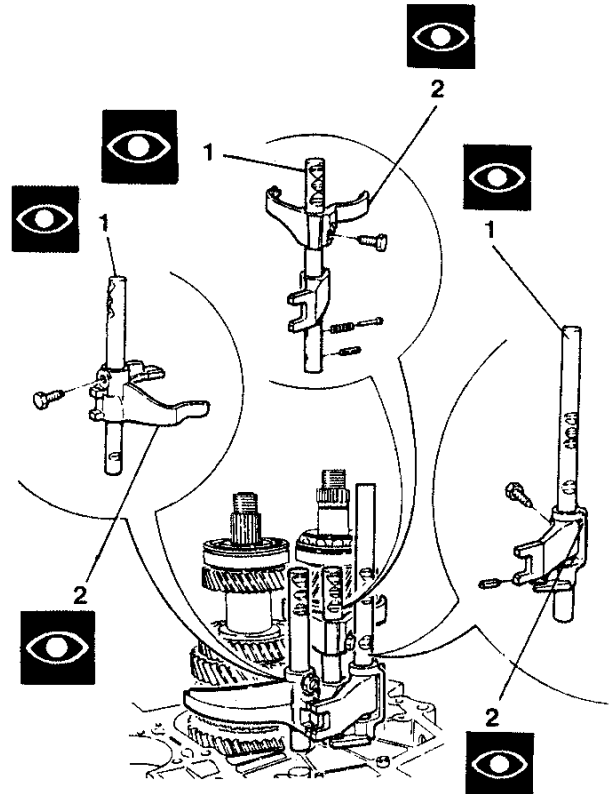
CAUTION:

- When replacing main shaft (after high mileage) replace all layshaft gears.
- When replacing layshaft also replace differential ring gear.



RODS AND FORKS

1. Check rods for distortion, wear and freedom of movement without excessive play.
2. Check forks for distortion or wear of surfaces mating the sliding sleeves.



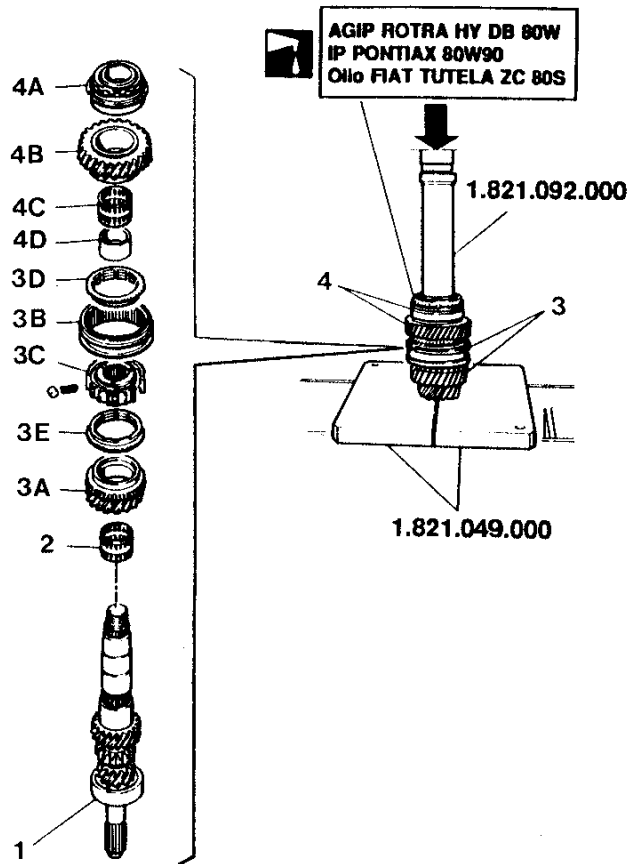
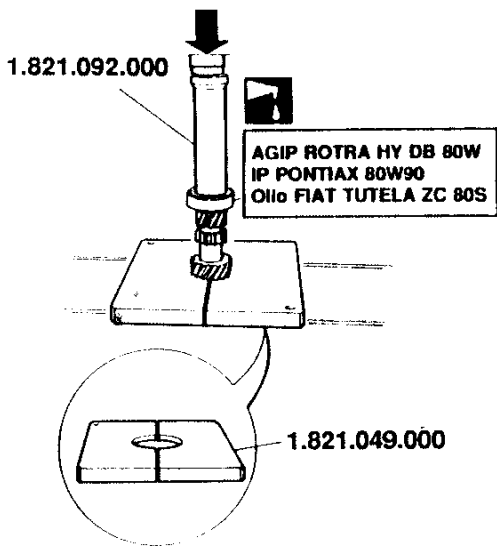


REASSEMBLY 2.4 V6

MAIN SHAFT REASSEMBLY

1. Using a press and suitable tool, install front bearing.
2. Install 3rd speed drive gear roller bearing.

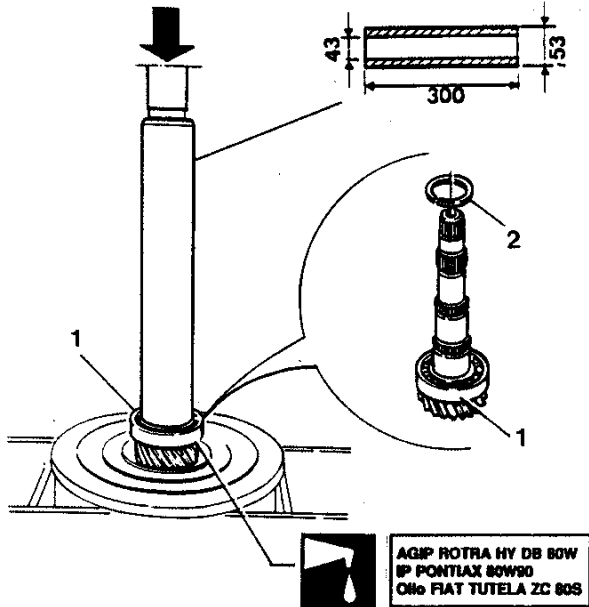
3. Install 3rd speed drive gear (3A) and 3rd - 4th speed engagement sleeve assembly (3B) together with hub (3C) and 4th (3D) and 3rd (3E) speed synchronizer rings.
4. Install 4th speed drive gear (4B) with relative roller bearing (4C) and bushing (4D), then using a press and suitable tool, install the rear bearing (4A).



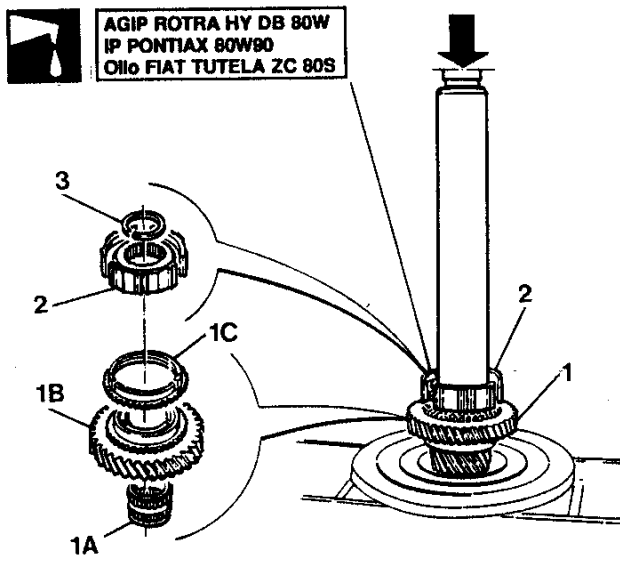


LAYSHAFT REASSEMBLY

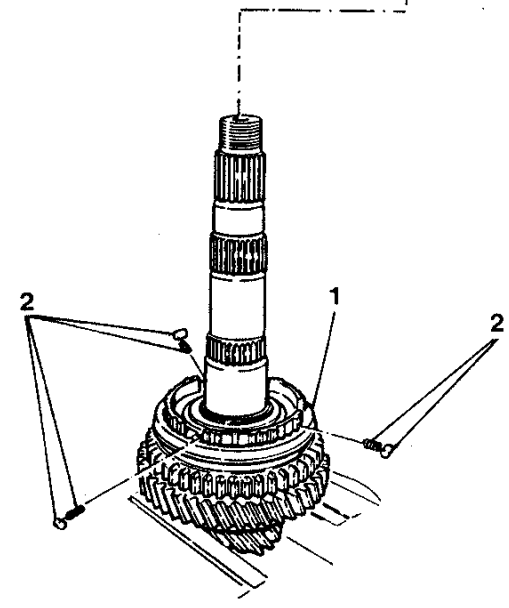
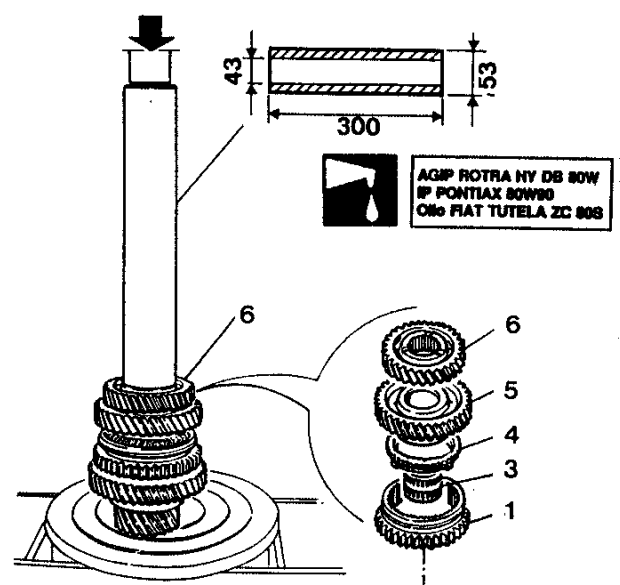
1. Using a press and suitable tool, install front bearing.
2. Install the flexible retaining ring securing bearing.



1. Install roller bearing (1A), 1st speed driven gear (1B), and 1st speed synchronizer ring (1C).
2. Using a press and suitable tool install 1st and 2nd speed sliding sleeve hub.
3. Install flexible retaining ring securing hub.

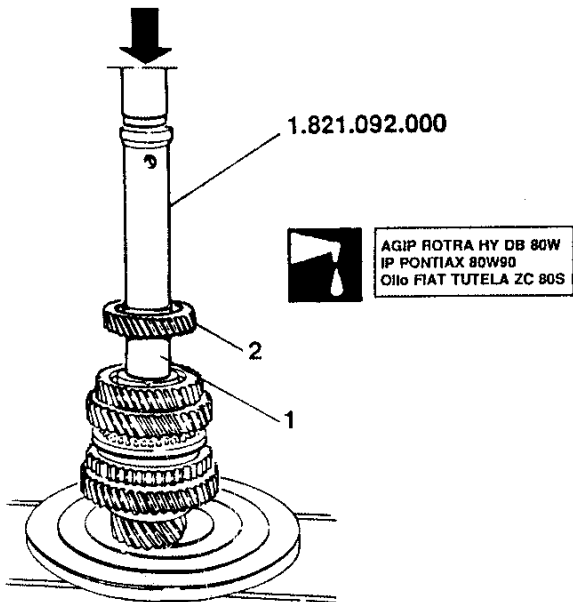


1. Install 1st and 2nd speed engagement sliding sleeve - reverse speed gear.
2. Insert springs and pins into hub.
3. Install 2nd speed driven gear roller bearing.
4. Install 2nd speed flexible synchronizer ring.
5. Install 2nd speed driven gear.
6. Using a press and suitable tool install 3rd speed driven gear.

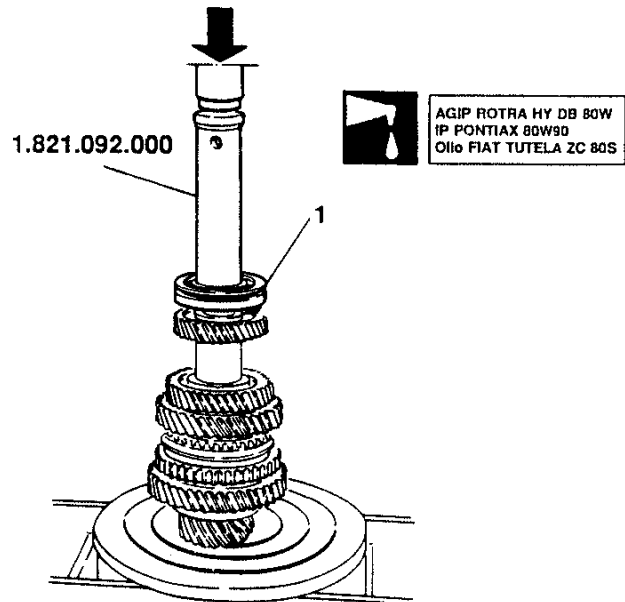




1. Install spacer.
2. Using a press and suitable tool, install 4th speed driven gear.



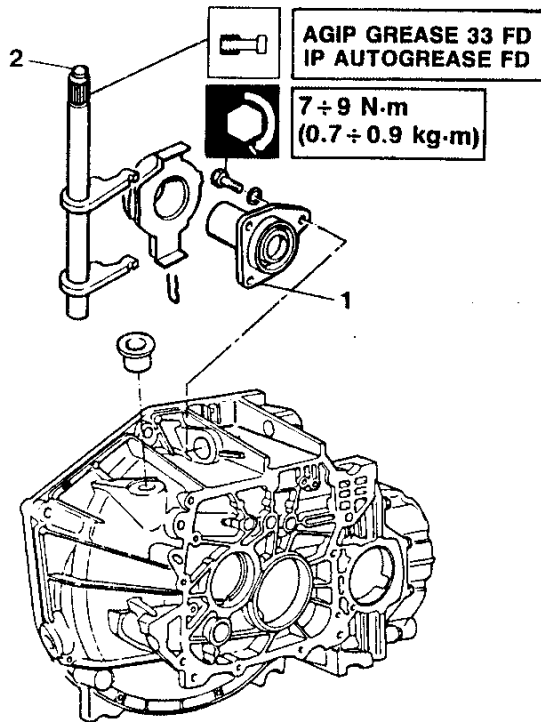
1. Using a press and suitable tool, install rear bearing.



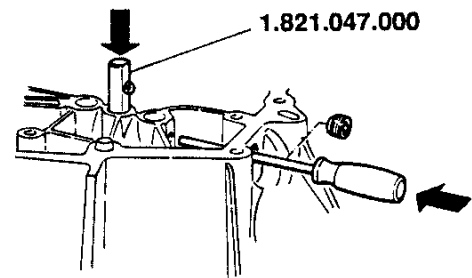
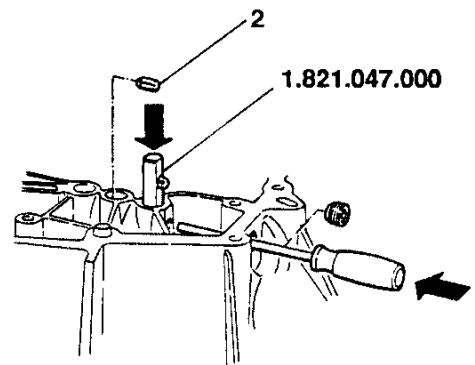
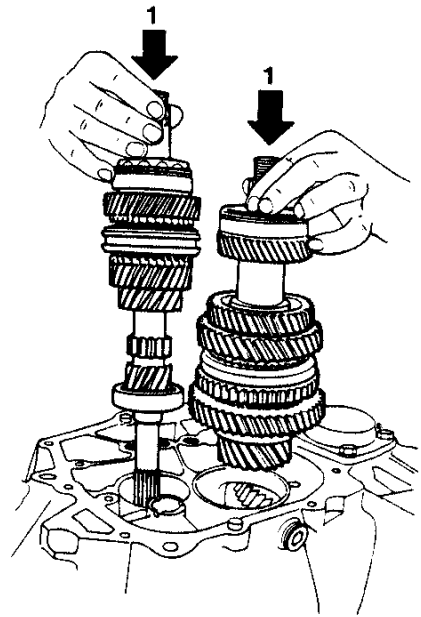


BENCH REASSEMBLY

1. Install thrust bearing sleeve.
2. Install thrust bearing engagement rod and fork.



1. Insert main and lay shafts.
2. Insert safety pawls (use tool No. 1.821.047.000).

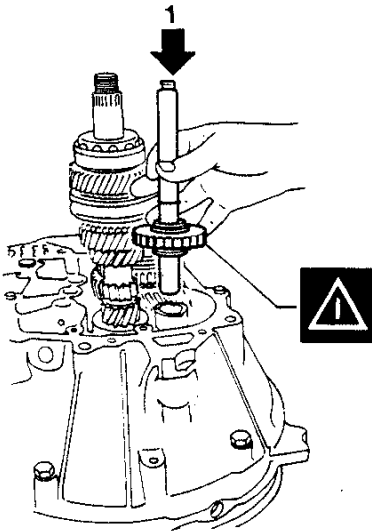




1. Install reverse speed shaft and idle gear.



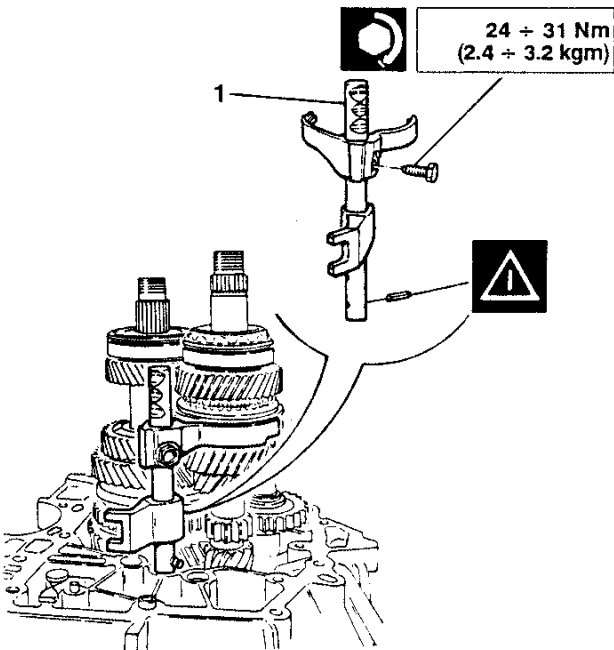
CAUTION:
Ensure gear engagement toothing faces downwards.



1. Install 3rd and 4th speed rod, fork and prong.



CAUTION:
Before installing rod, install safety pawl into rod.

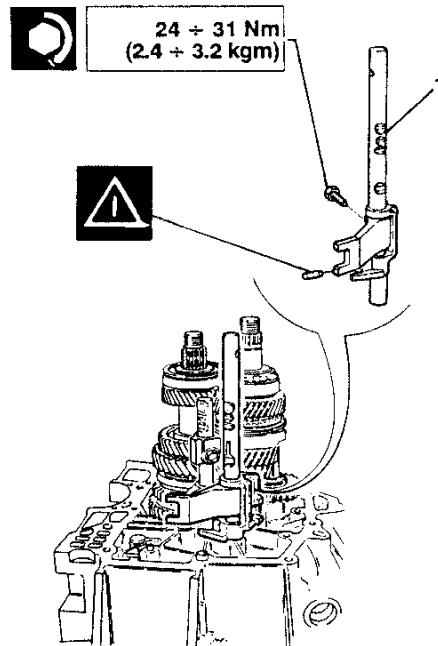


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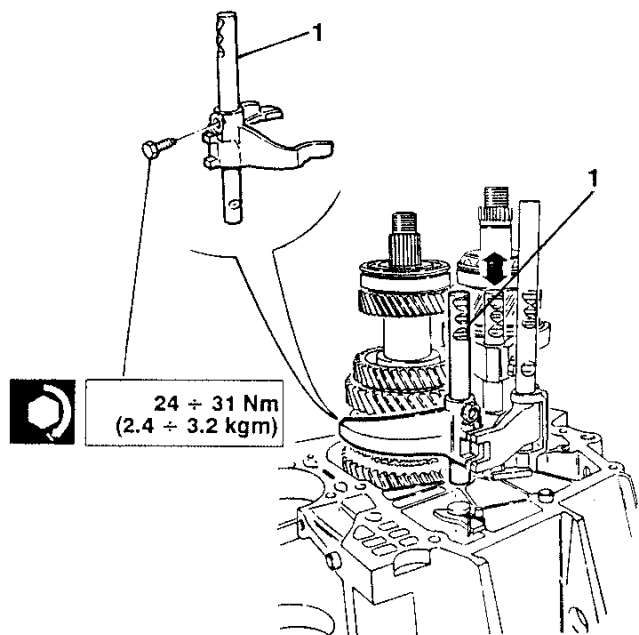
1. Install 5th and reverse speed rod and control prong.



CAUTION:
Before installing prong, install safety pawl into prong.



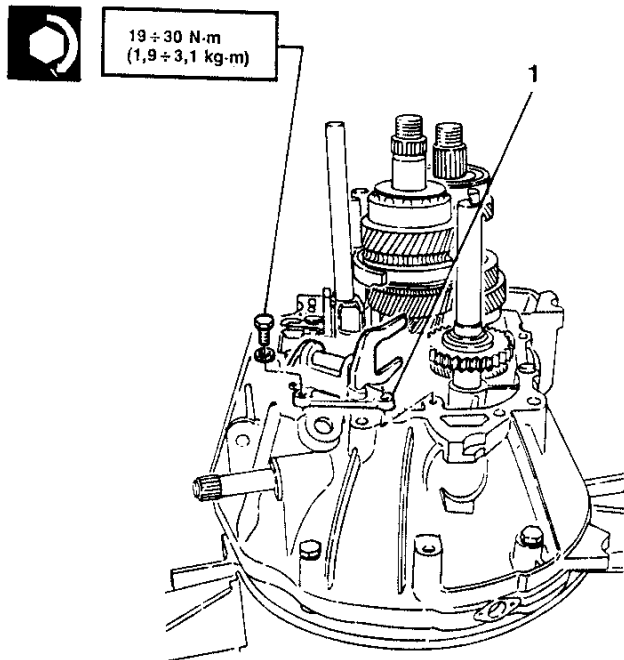
1. Install 1st and 2nd speed rod and fork. Move 3rd and 4th speed control rod to facilitate installation.



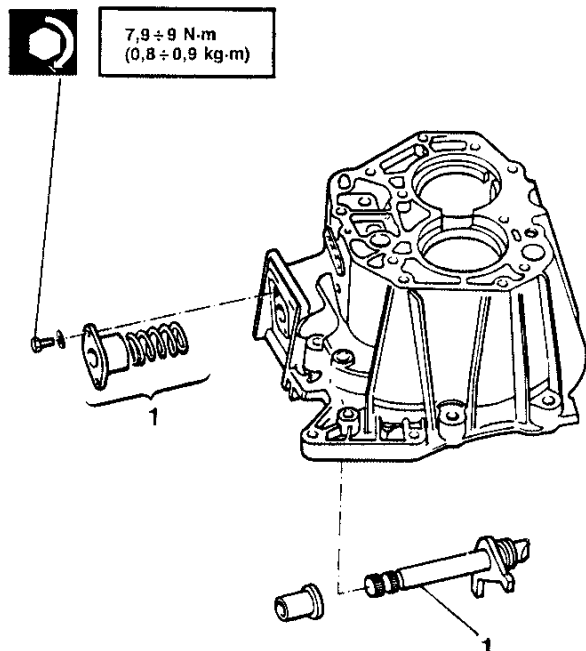
07 - 1991



1. Install reverse speed idle gear fork lever.



1. Install speed control shaft into cover without tightening retaining screws.



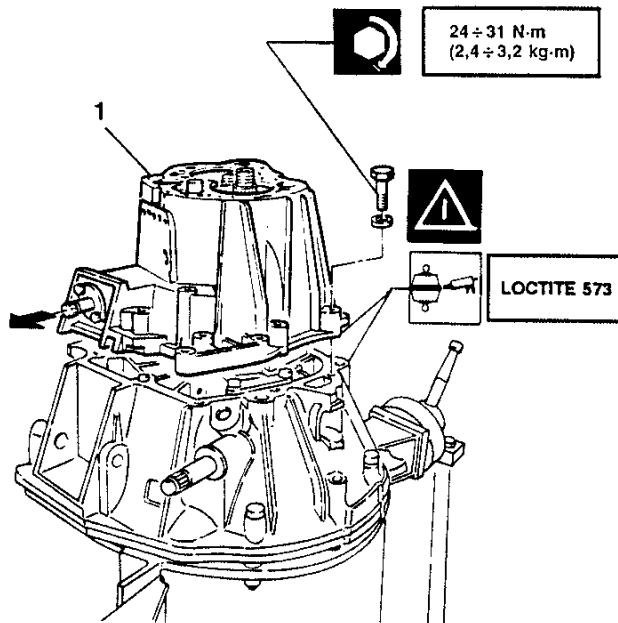
1. Install gearbox casing backing speed control shaft to facilitate engagement.

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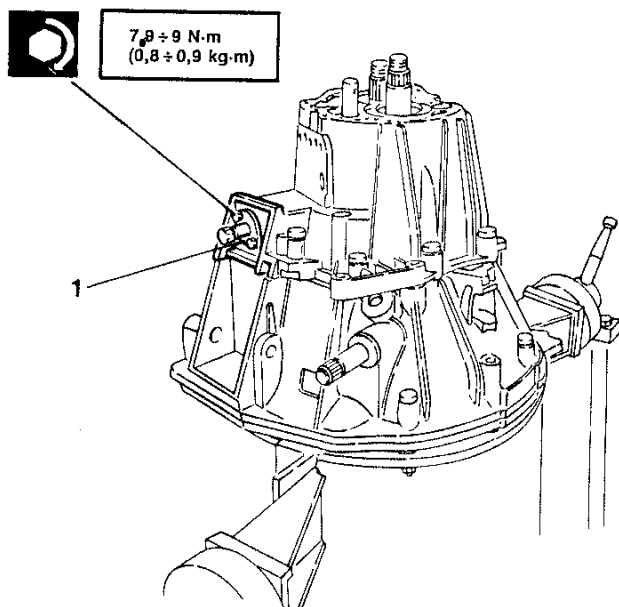


CAUTION:

Wipe contact surfaces with sealant.



1. Tighten screws securing speed control shaft bushing.



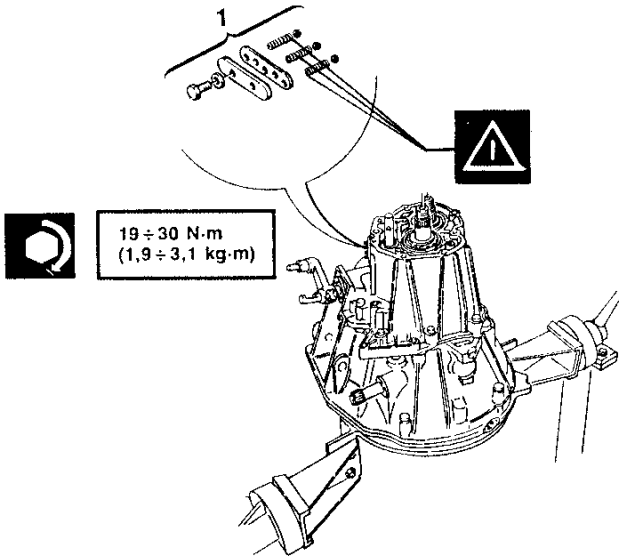


1. Install speed control rods, positioning balls and springs.

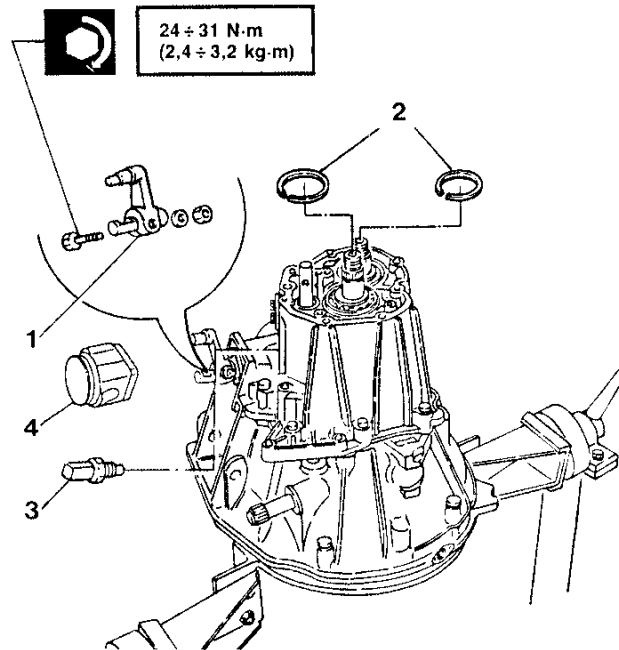


CAUTION:

Install spring made with wire of larger diameter on 5th and reverse speed control rod.



1. Install speed engagement idler arm and relative support.
2. Install flexible retaining rings securing bearings.
3. Install reversing light switch.
4. Install rubber protection.

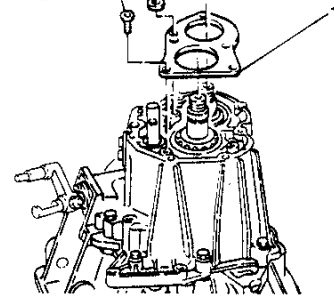


PA4655C1000000

1. Install rear bearings retaining plate.



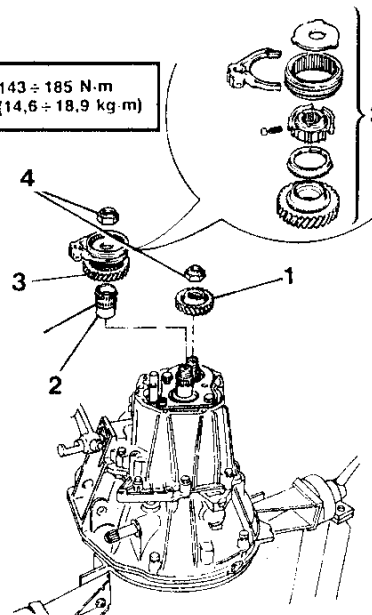
24 ÷ 31 N·m
(2,4 ÷ 3,2 kg·m)



1. Install 5th speed driven gear onto layshaft.
2. Install 5th speed drive gear bushing and roller bearing onto main shaft.
3. Install 5th speed drive gear with synchronizer ring and hub-sliding sleeve assembly with fork and rollers and springs retaining flange.
4. Install ring nuts securing main and lay shaft gears. Perform caulking after tightening.



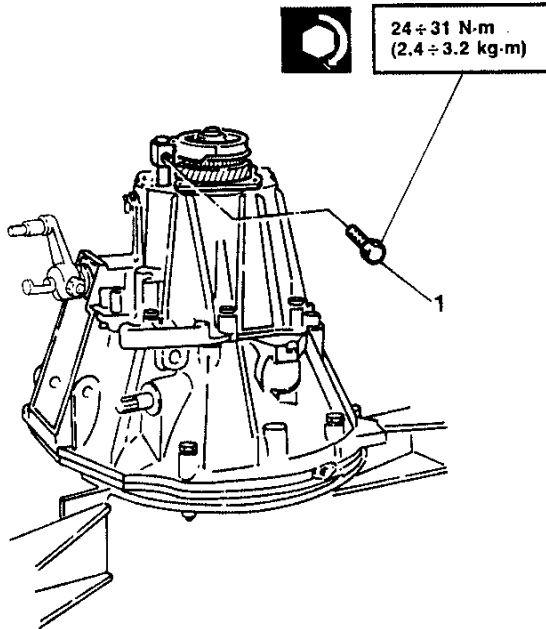
143 ÷ 185 N·m
(14,6 ÷ 18,9 kg·m)



07 - 1991



1. Install 5th speed engagement fork retaining screw.

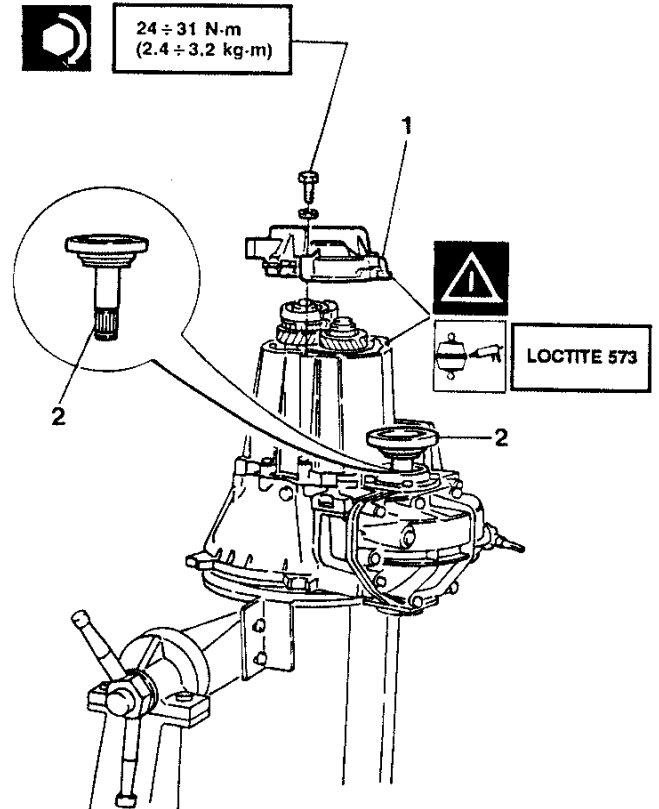


1. Install rear cover.



CAUTION:
Wipe contact surfaces with sealant.

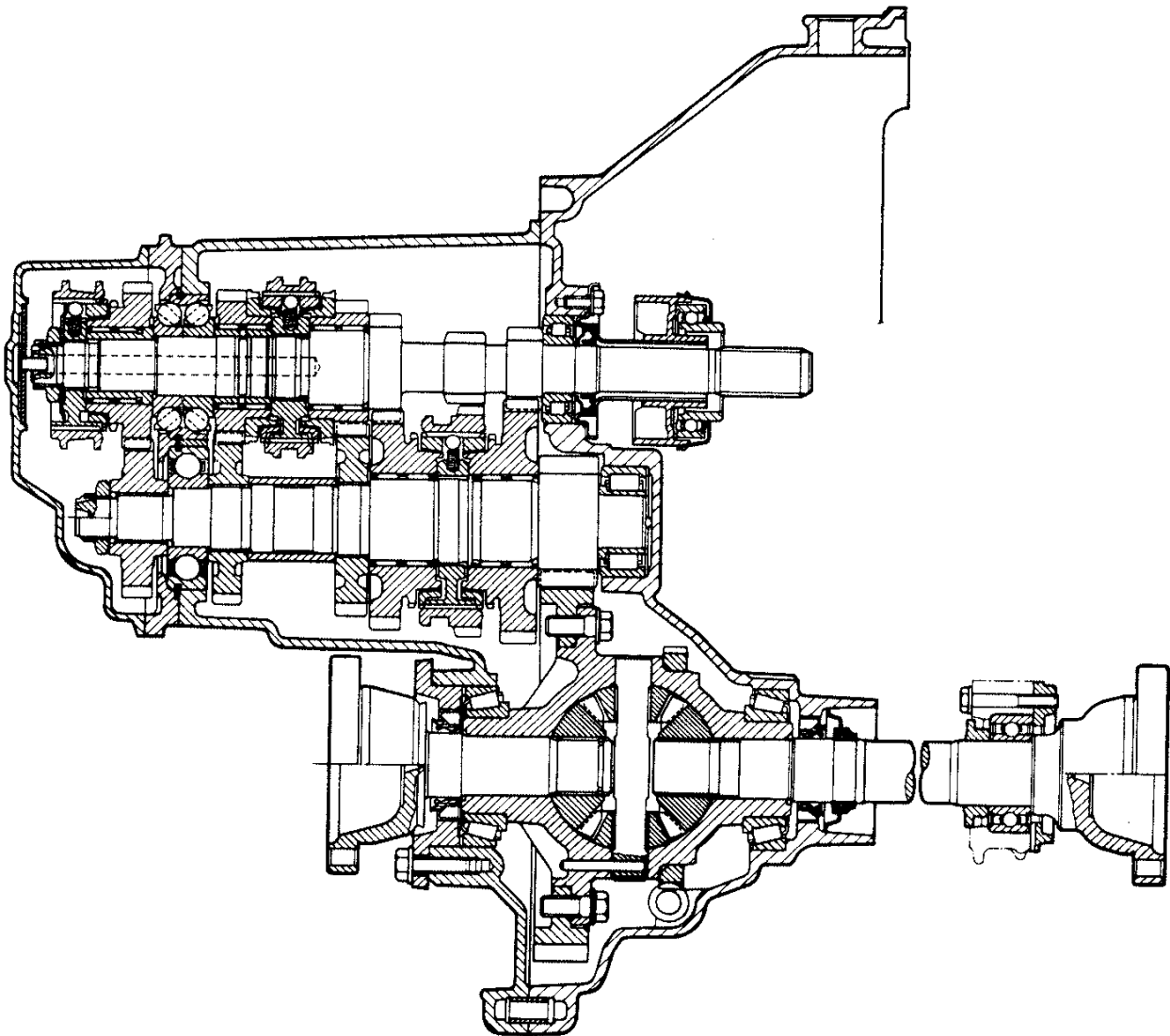
2. Install flange.





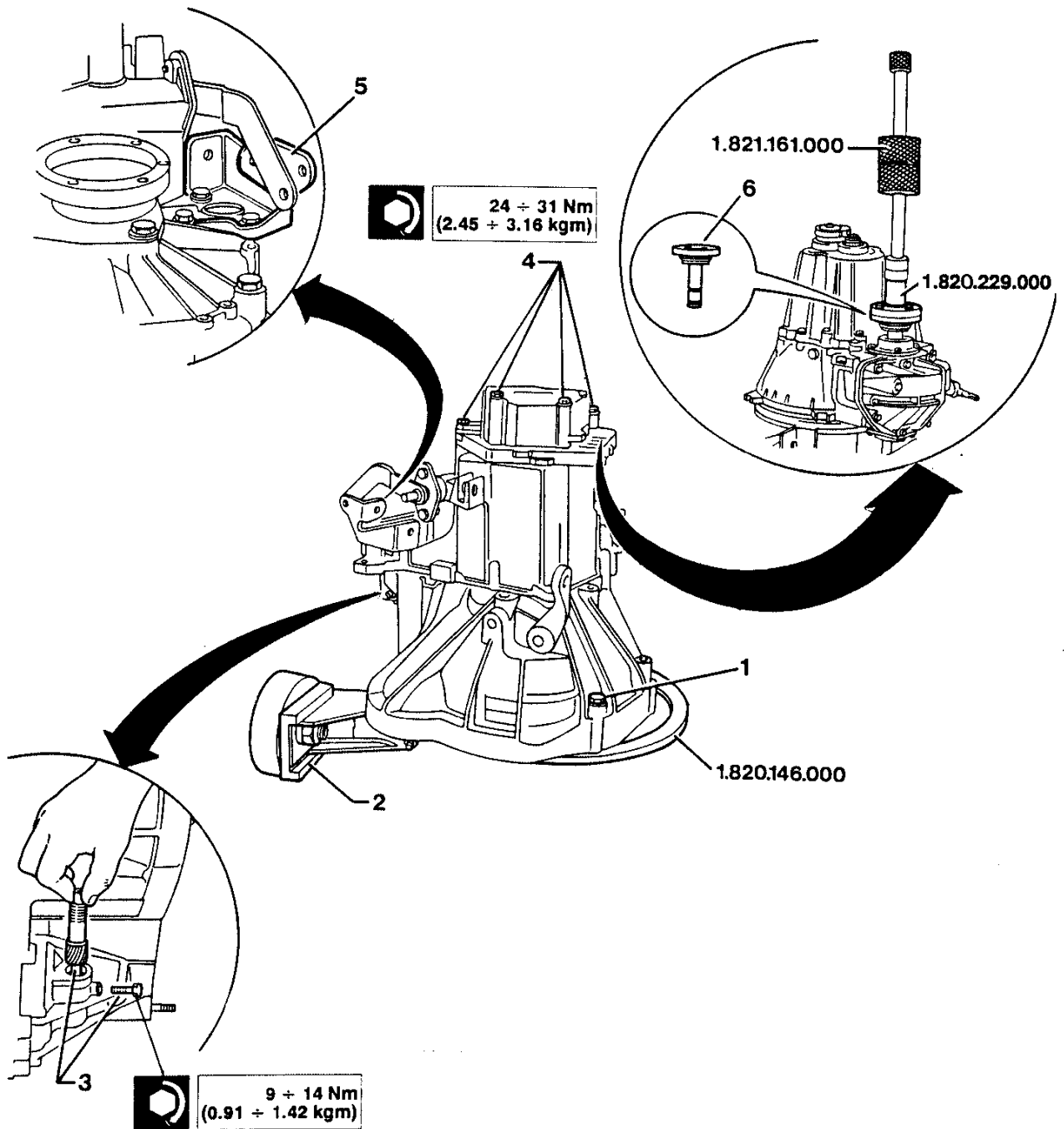
DISASSEMBLY 1.8 - 2.0 T.S.

BENCH DISASSEMBLY





1. Fix support plate No. 1.820.146.000 to the gearbox flange.
2. Place gearbox on a rotary stand.
3. Unscrew the retaining screw and remove the odometer idle gear.
4. Unscrew the six retaining screws and remove the rear cover.
5. Unscrew the retaining screws and remove the bracket supporting the speed engagement device.
6. Extract the flange from the differential using tool No. 1.821.161.000 and tool No. 1.820.229.000.



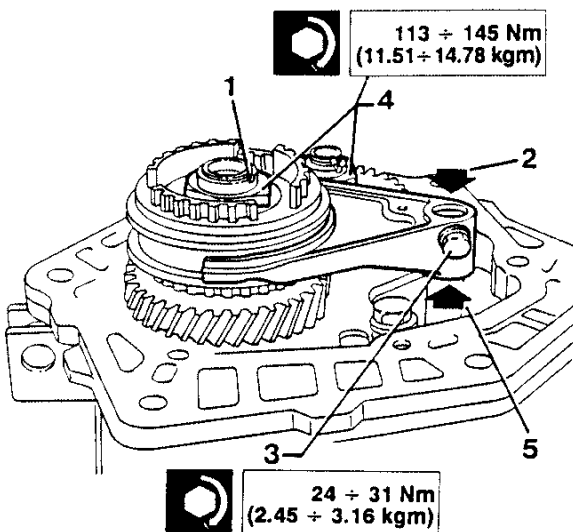


1. Straighten the caulking of the main and layshaft ring nuts.
2. Lock the gearbox shafts by engaging 5th gear by hand (pressing the fork on the main shaft) and engaging a speed using the selector lever.

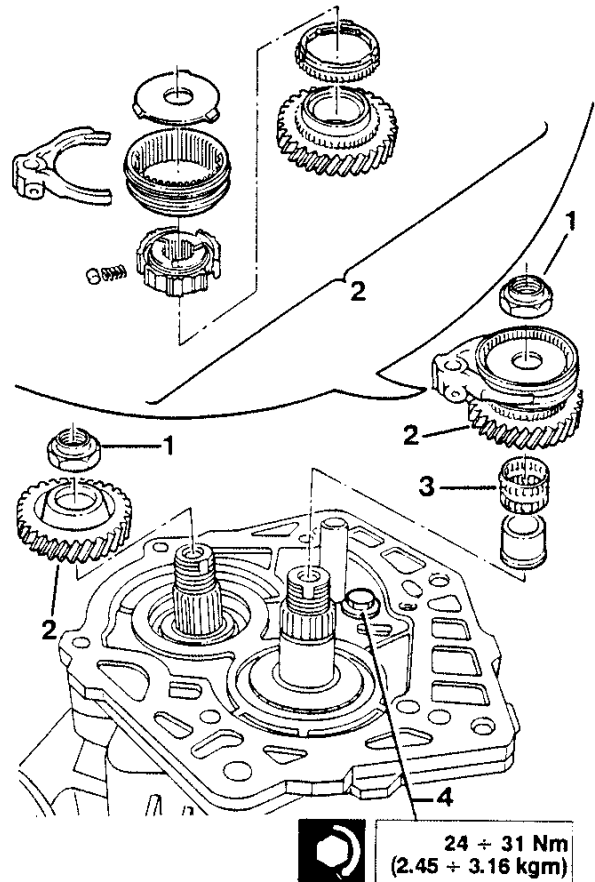
NOTE: Engagement of two speeds at the same time leads to a locking of the gearbox shafts; this operation is necessary in order to unlock the nuts which hold the gears.

3. Remove the bolt securing the 5th speed engagement fork to the main shaft.
4. Loosen the main and layshaft ring nuts.
5. Return the main shaft fork to the idle position.

NOTE: Returning the main shaft fork to the idle position is necessary to prevent the loss of the synchronizer rollers.

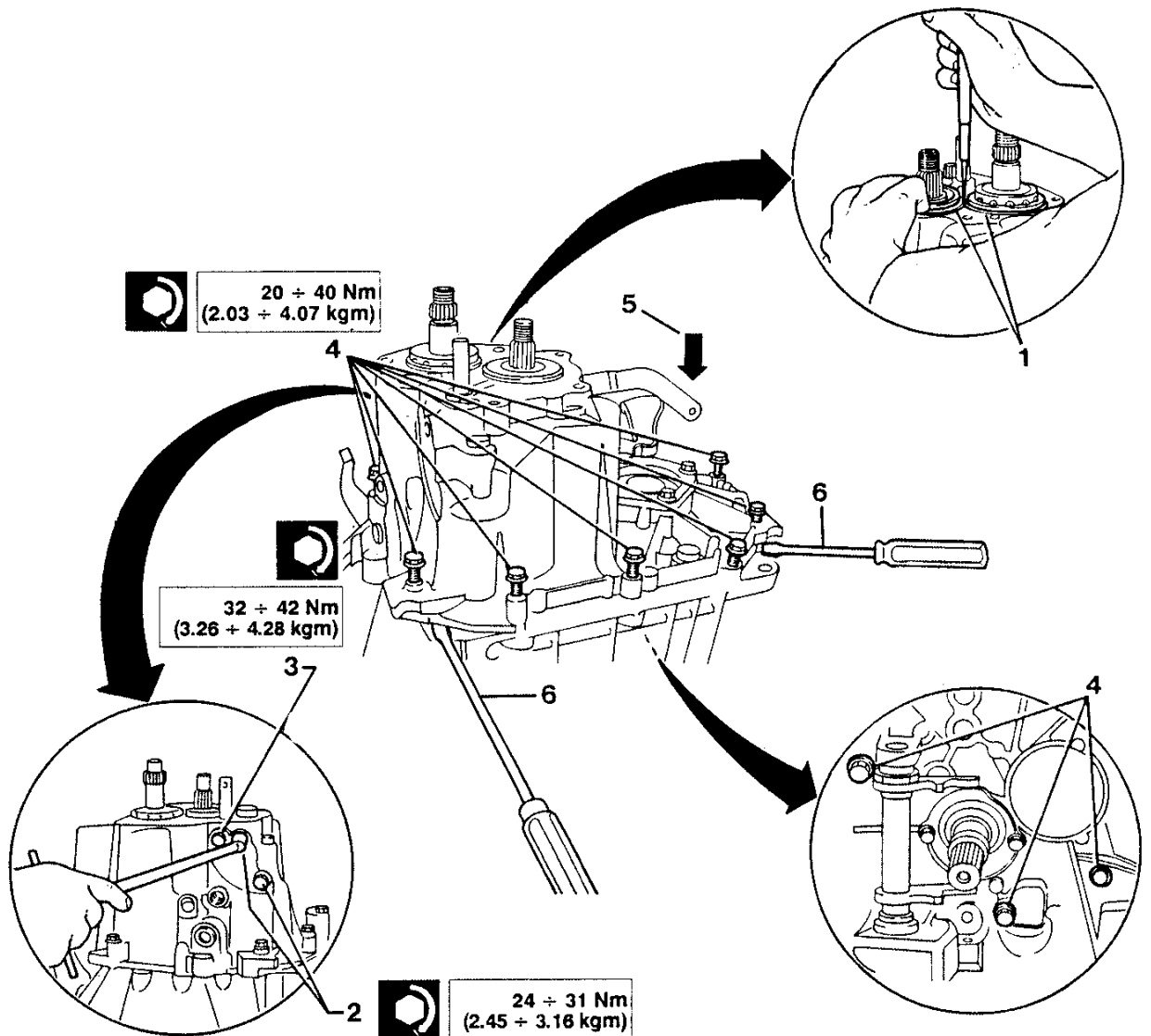


1. Remove the ring nuts securing the main and layshaft gears.
2. Remove the hub, fork and sleeve and 5th speed gears.
3. Withdraw the 5th speed drive gear roller bearing with the bushing.
4. Unscrew the bolt securing the rear bearings retaining plate to the gearbox and remove the plate.



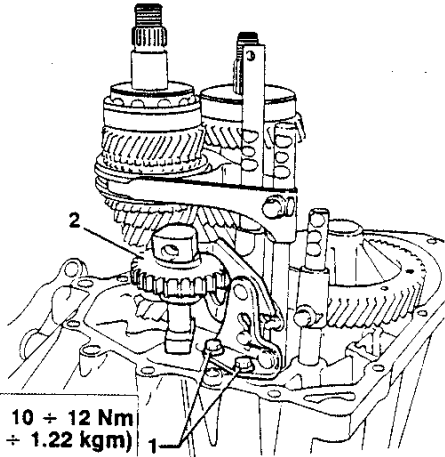


1. Remove the flexible retaining rings securing the rear bearings.
2. Remove the retaining caps and withdraw the speed control rod positioning springs and balls.
3. Unscrew the reverse speed shaft retaining screw.
4. Unscrew the thirteen screws (three of which are inside the support union) securing the gearbox to the engine-gearbox support union.
5. Push the clutch engagement control lever downward as indicated in the illustration.
6. Acting on the special lugs, lift the gearbox and remove it using two screw-drivers as levers.



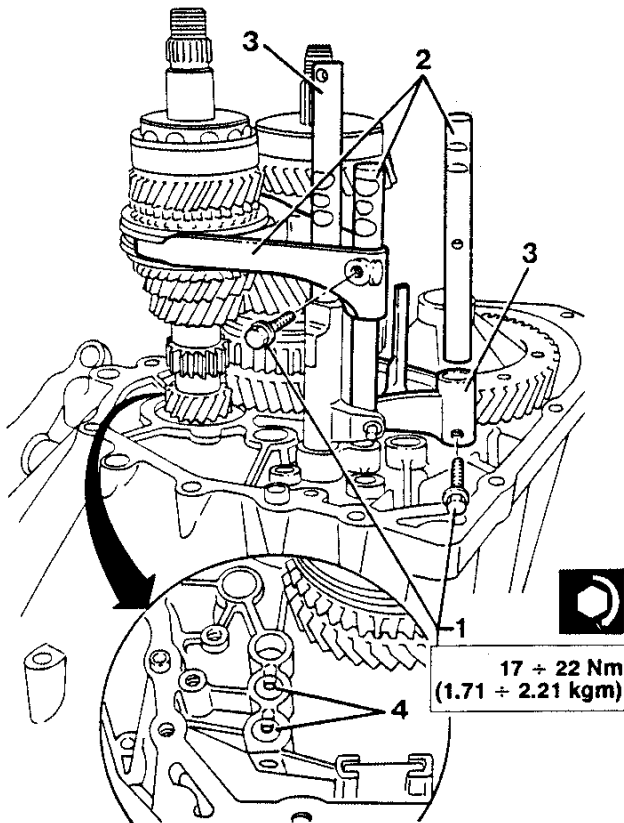


1. Unscrew the two retaining screws and remove the bracket supporting the reverse speed fork.
2. Remove the reverse speed idle gear and rod.



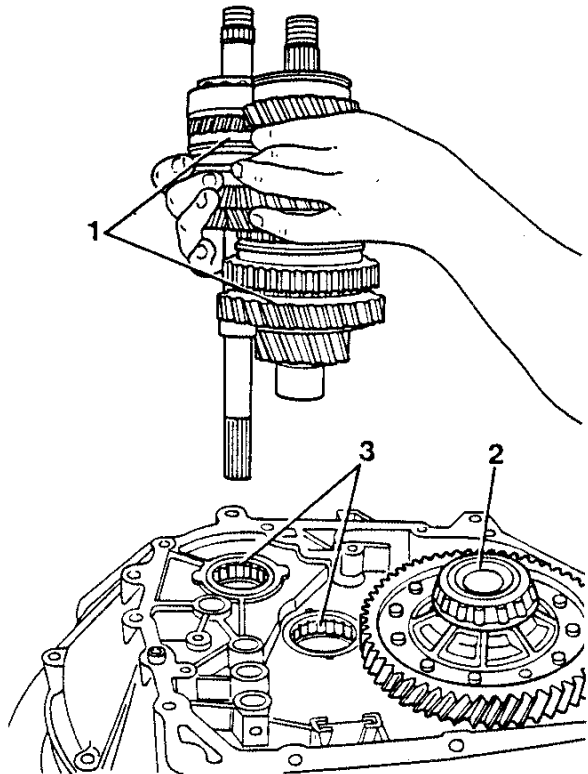
10 + 12 Nm
(1.01 + 1.22 kgm)

1. Unscrew the screws securing the 1st-2nd and 3rd-4th speed control forks.
2. Extract the following from their housings:
1st-2nd speed control rod together with the relative fork and the 3rd-4th speed control rod.
3. Remove the 5th-reverse speed control rod and the 3rd-4th speed fork.
4. Remove the speed engagement safety pawls.



17 + 22 Nm
(1.71 + 2.21 kgm)

1. Withdraw the main and layshaft assemblies.
2. Remove the differential assembly.
3. Remove the main and layshaft front bearings from their seatings.





1. Remove the magnet and clean off any ferrous residues.
2. Remove the Seeger ring and withdraw the clutch engagement control lever.
3. Slide off and remove the anti-slip bushing from the engine-gearbox support union.

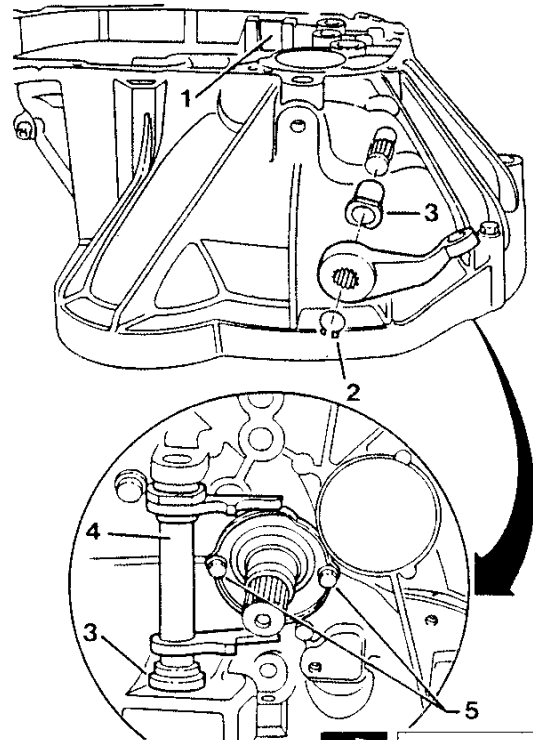


During reassembly install a new bush if there is excessive play in the pin.

4. Acting from inside the engine-gearbox support union, withdraw the clutch engagement sleeve control forked pin.
5. Unscrew the two screws and remove the thrust bearing sleeve.



During installation, replace the sleeve and seal if there are signs of oil leakage.



7 ÷ 9 Nm
(0.71 ÷ 0.92 kgm)

1. If necessary remove the outer race of the differential support roller bearing using tool No. 1.821.003.000.

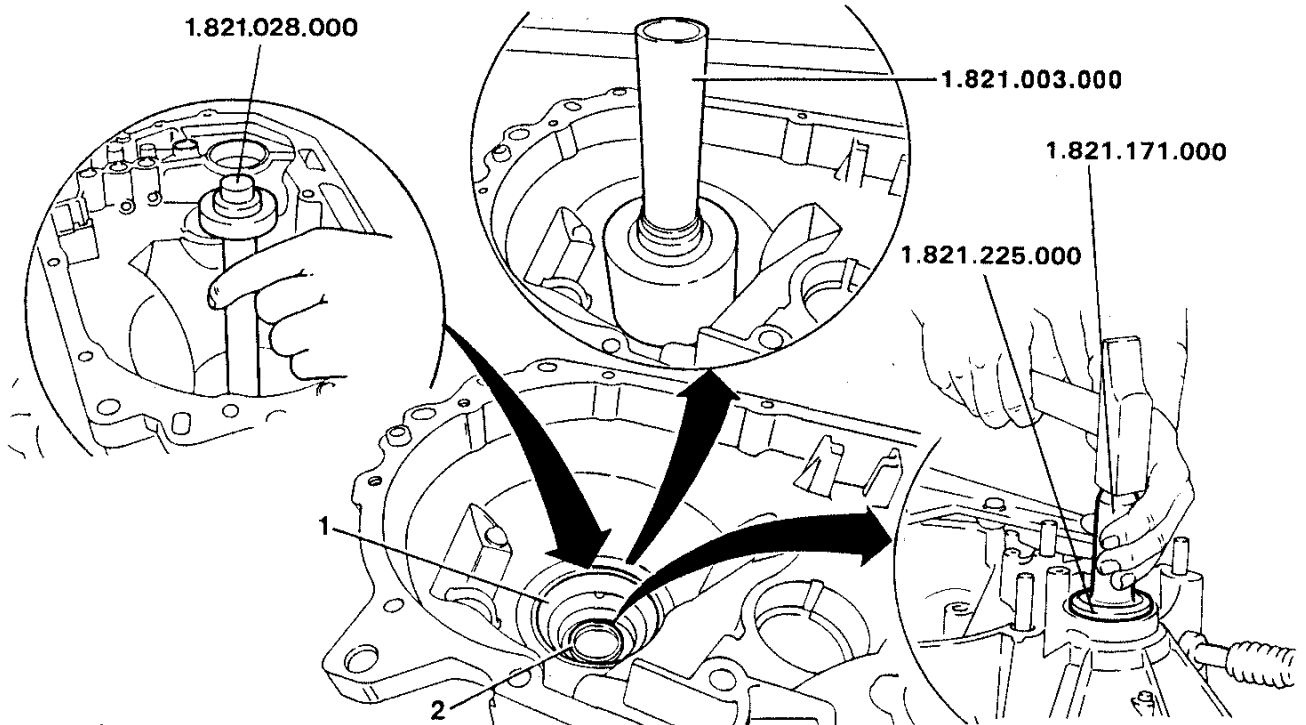


During installation introduce the new race using tool No. 1.821.028.000.

2. If necessary remove the differential casing oil seal on the engine side.

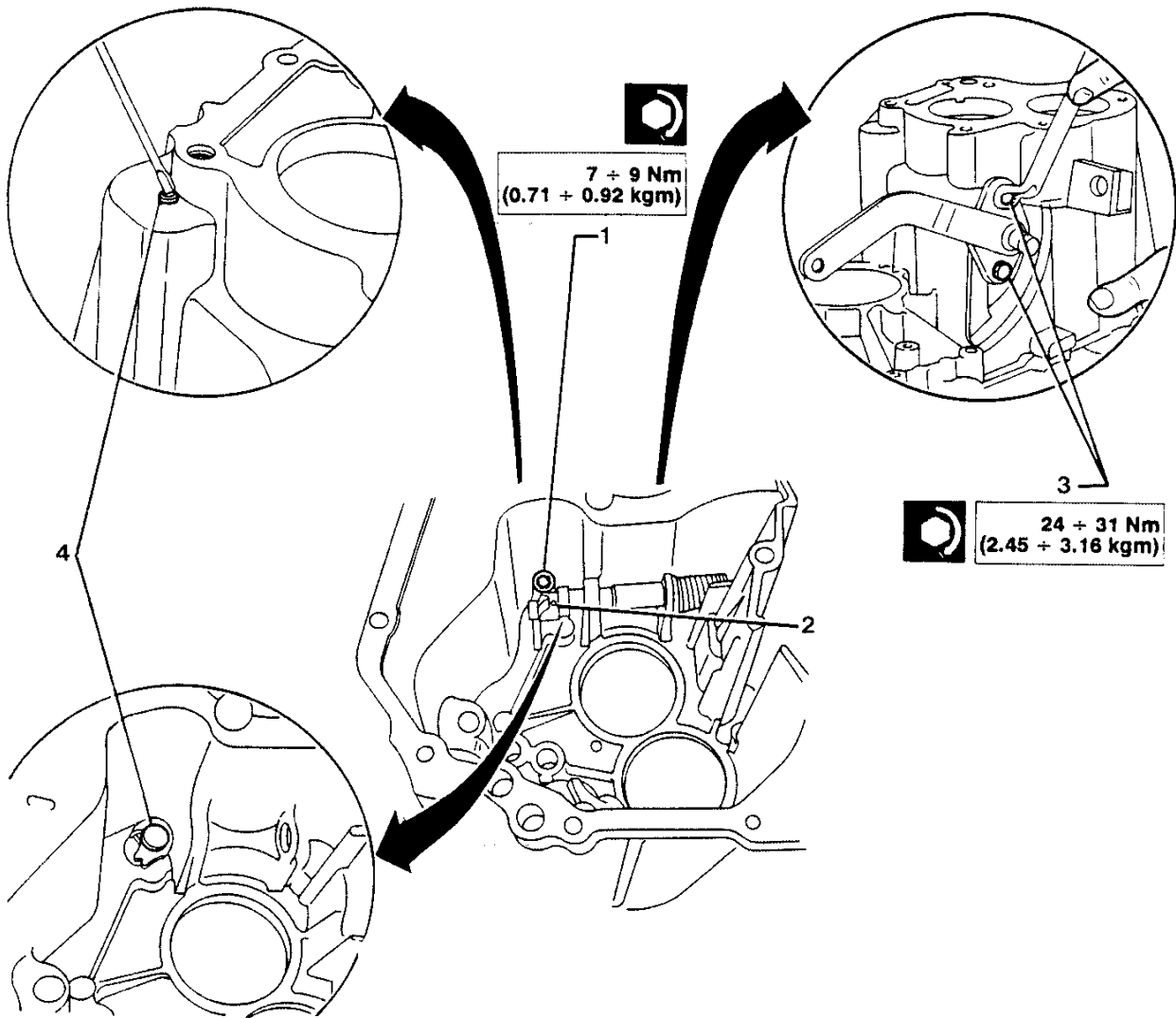


During reassembly insert a new oil seal using tools No. 1.821.171.000 and 1.821.225.000.



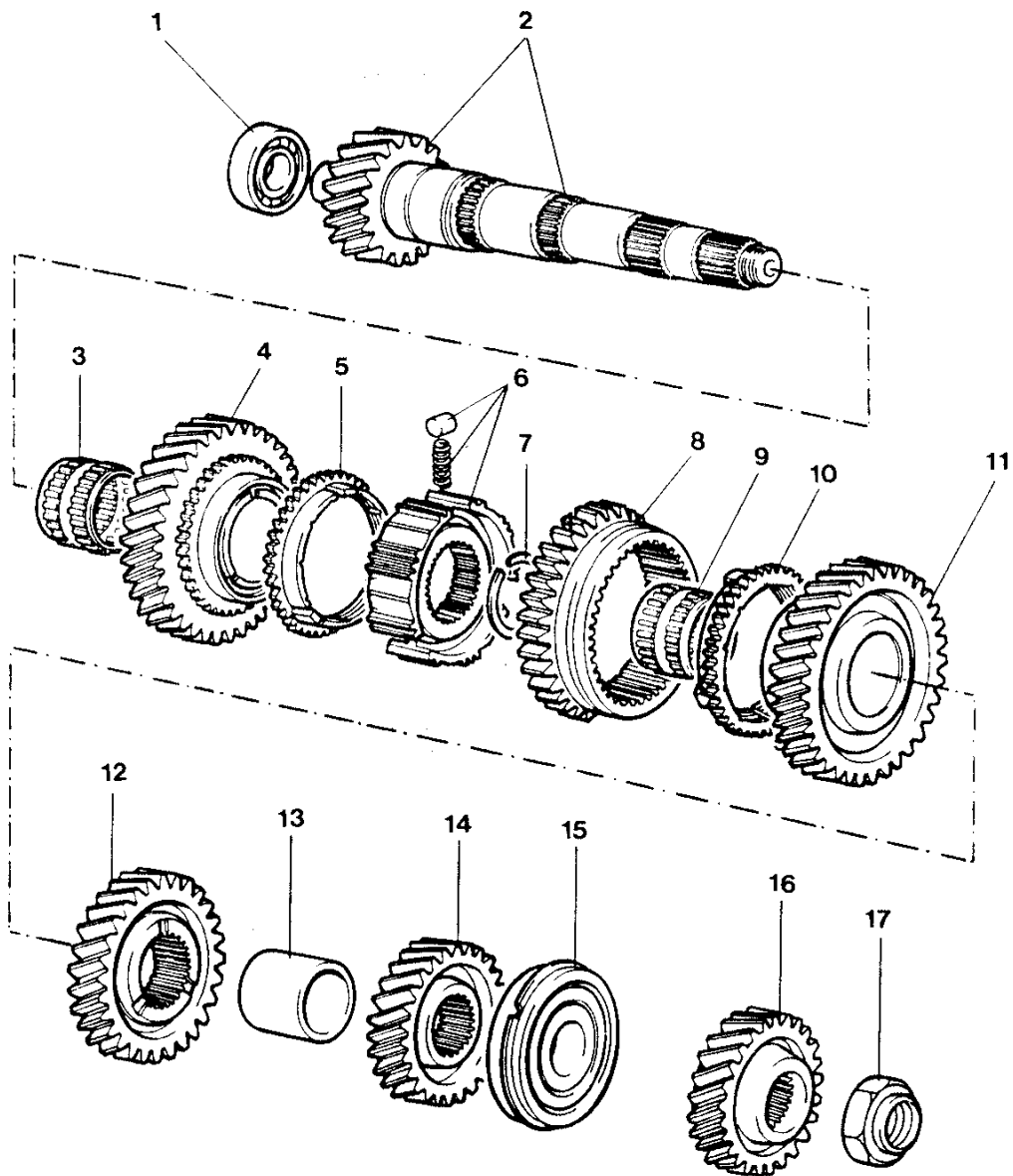


1. Unscrew the speed control prong retaining screws.
2. Withdraw the speed control prong retaining pin.
3. Unscrew the two screws securing the lever to the gearbox and remove the lever.
4. If necessary when removing the reverse speed engagement guide pin, first remove the external caulking and then withdraw the pin.





LAYSHAFT DISASSEMBLY

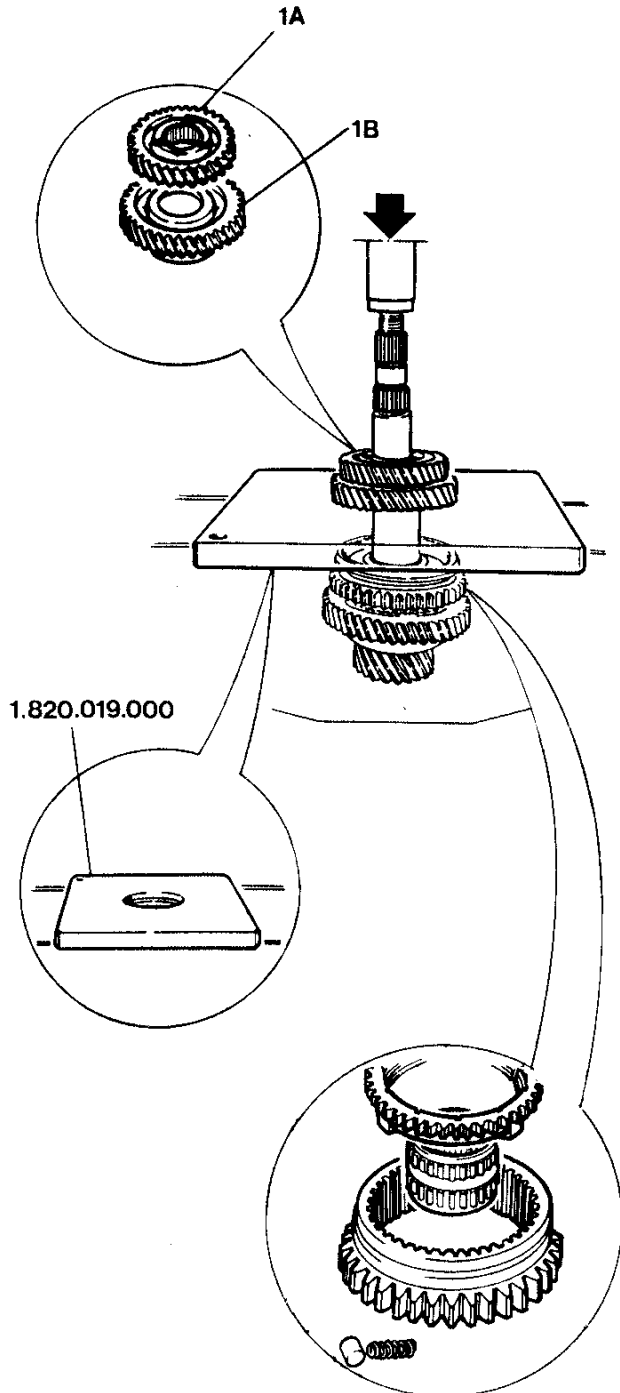
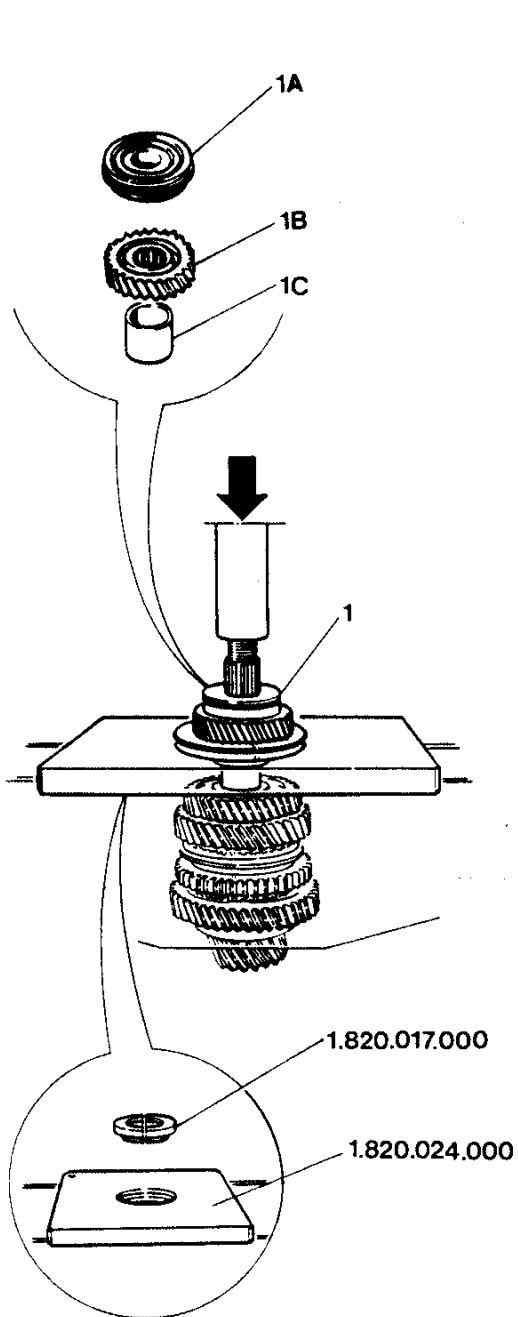


1. Layshaft front bearing.
2. Layshaft-pinion for taper for cylindrical crown gear
3. Roller bearing for 5th speed gear
4. 1st speed driven gear
5. 1st speed synchronizer ring
6. Hub complete with rollers and springs for 1st and 2nd speed engagement sliding sleeve
7. Flexible retaining ring
8. 1st and 2nd speed engagement sliding sleeve and reverse speed gear

9. 2nd speed gear roller bearing
10. 2nd speed synchronizer ring
11. 2nd speed driven gear
12. 3rd speed driven gear
13. Spacer between 3rd and 4th speed
14. 4th speed gear
15. Layshaft rear bearing
16. 5th speed driven gear
17. Layshaft gear locking nut



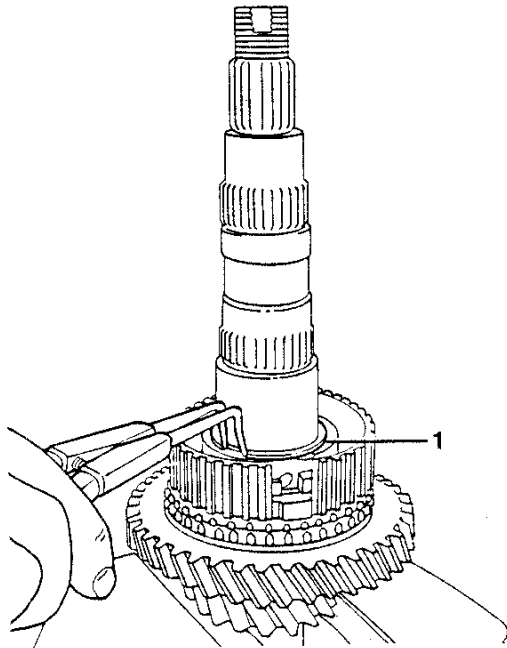
1. Using a hydraulic press, plate No. 1.820.024.000 and half rings No. 1.820.017.000, withdraw the 4th speed driven gear (1B) from the shaft together with the rear bearing (1A) and the spacer (1C).



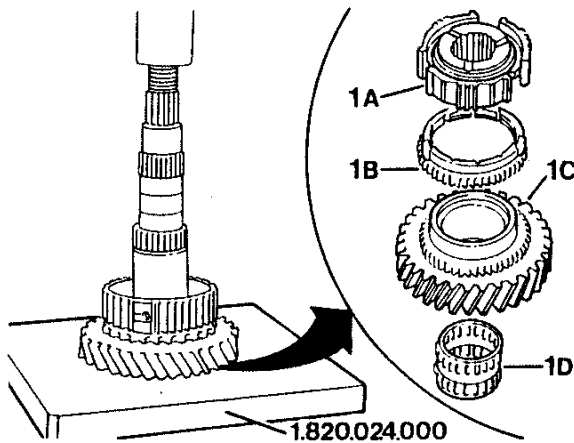
1. Using a hydraulic press and plate No. 1.820.019.000 withdraw the 2nd (1A) and 3rd (1B) speed driven gears and withdraw the 1st and 2nd speed engagement sliding sleeve (1C) together with springs and rollers (1D), 2nd speed synchronizer ring (1E) and the 2nd speed roller bearing (1F).



1. Remove the flexible hub-retaining ring.



1. Using a hydraulic press and plate No. 1.820.024.000 extract the complete hub (1A) of the, 1st and second speed sliding sleeve, 1st speed synchronizer ring (1B), 1st speed driven gear (1C) and withdraw the 1st speed gear roller bearing.



NOTE: When replacing the layshaft front bearing remove the bearing inner race from the shaft as follows.

1. Using a suitable tool slightly move the bearing race from the gear which is machined onto the shaft.



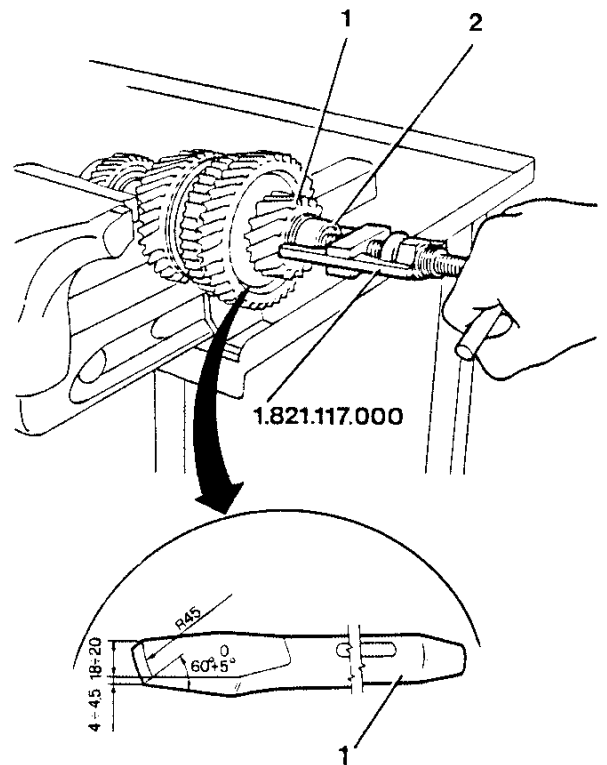
CAUTION:

Extreme caution should be used when operating with the chisel in order to avoid damaging the tothing and the shaft.

2. Using puller No. 1.821.117.000 remove the bearing race.

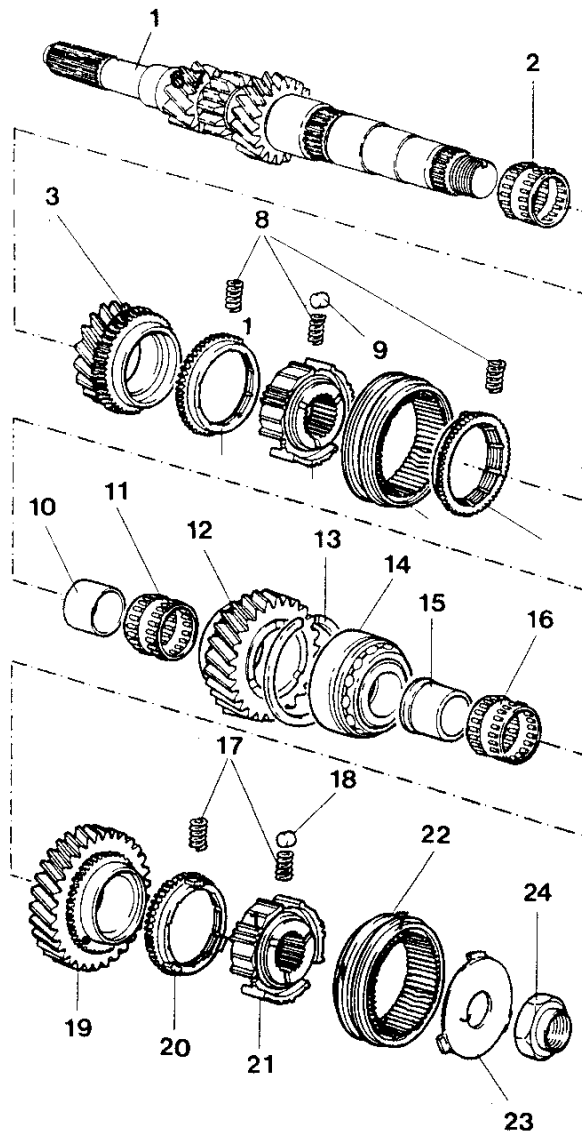


During installation, insert the new race using a hydraulic press and a generic flat base inserting tool.





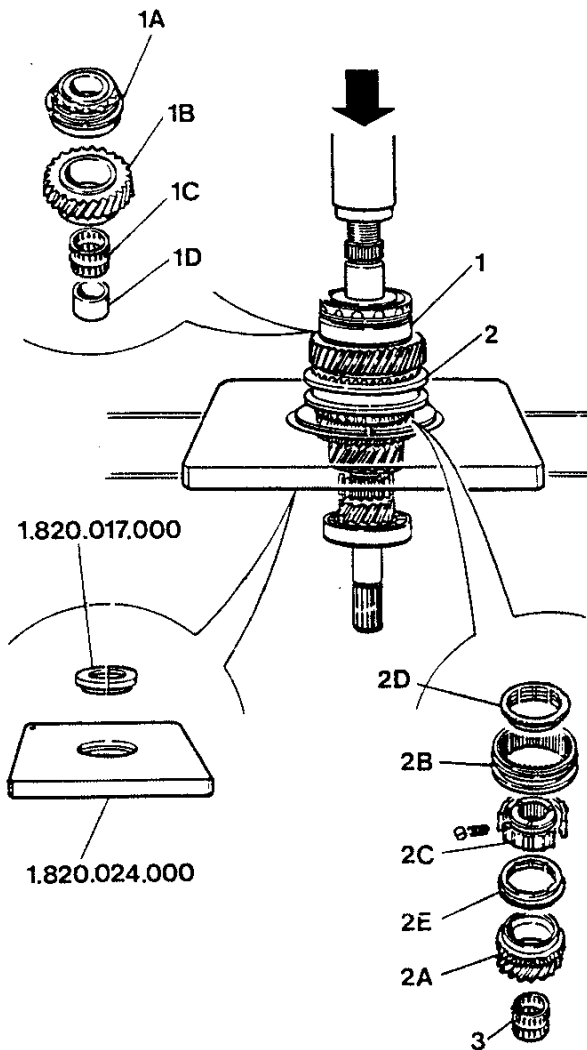
MAIN SHAFT DISASSEMBLY



1. Main shaft
2. 3rd speed gear roller bearing
3. 3rd speed drive gear
4. 3rd speed synchronizer ring
5. Hub for 3rd-4th speed sliding sleeve
6. 3rd-4th speed sliding sleeve
7. 4th speed synchronizer ring
8. Springs for 3rd-4th speed
9. Rollers for 3rd-4th speed hub
10. Bush for 4th speed drive gear
11. Roller bearing for 4th speed drive gear
12. 4th speed drive gear
13. Flexible ring
14. Rear bearing
15. Bush for 5th speed drive gear
16. Roller bearing for 5th speed drive gear
17. Springs for 5th speed hub
18. Rollers for 5th speed hub
19. 5th speed drive gear
20. 5th speed synchronizer ring
21. Hub for 5th speed engagement sliding sleeve
22. 5th speed engagement sliding sleeve
23. Flange securing 5th speed synchronizer rollers and springs
24. Nut securing gears to main shaft.



- Using a hydraulic press, plate No. 1.820.024.000 and half rings No. 1.820.017.000 disassemble as follows;
- 1. Withdraw the rear bearing (1A) and 4th speed drive gear (1B) assembly. Withdraw the roller bearing (1C) and bushing (1D) from the 4th speed drive gear.
- 2. Withdraw the 3rd speed drive gear (2A) and the 3rd and 4th speed engagement sliding sleeve (2B) assembly together with the hub (2C) and 4th speed (2D) and 3rd speed (2E) synchronizer rings.
- 3. Withdraw the 3rd speed drive gear roller bearing.



NOTE: When replacing the main shaft front bearing, remove the bearing inner race from the shaft as follows.

1. Using a suitable tool slightly move the bearing race from the gear which is machined onto the shaft.



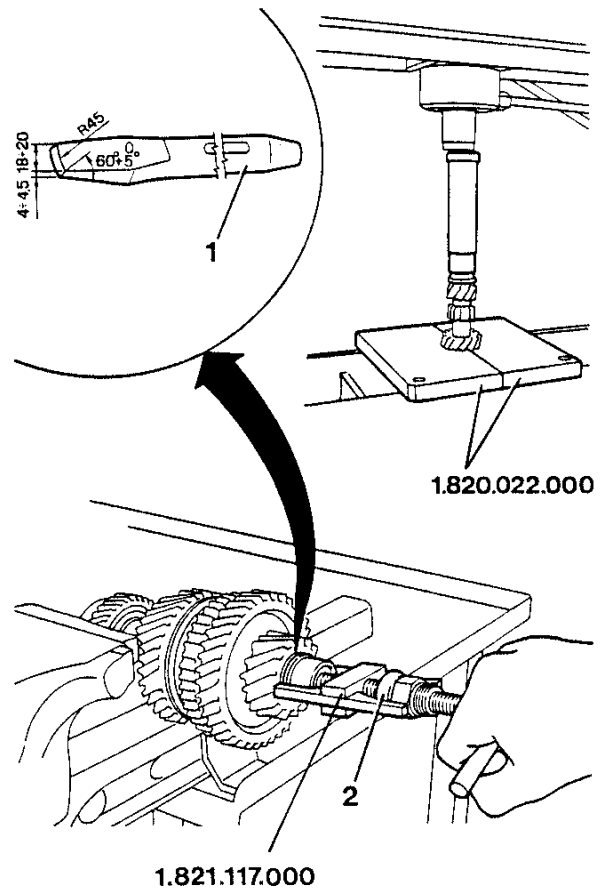
CAUTION:

Extreme caution should be used in order to avoid damaging the tooting or the shaft.

2. Using universal puller No. 1.821.117.000, remove the bearing race.



During installation, using a hydraulic press, half plates No. 1.820.022.000 and a suitable inserting tool, re-install the inner race of the front bearing.



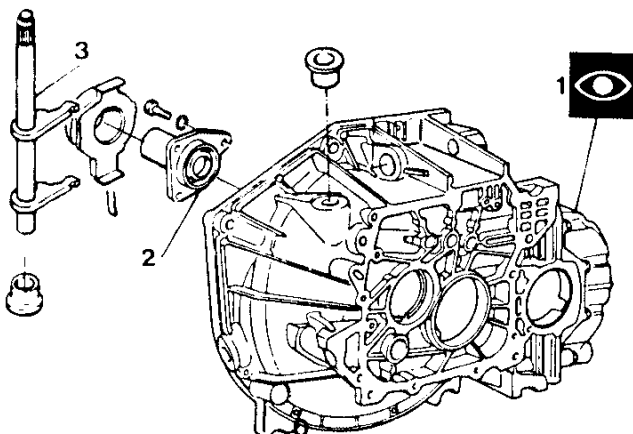
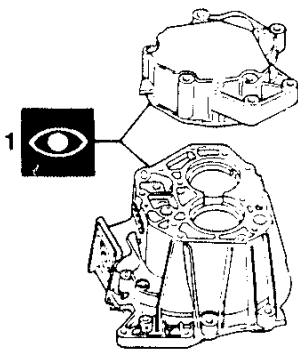


CHECKS AND INSPECTIONS

1.8 - 2.0 T.S.

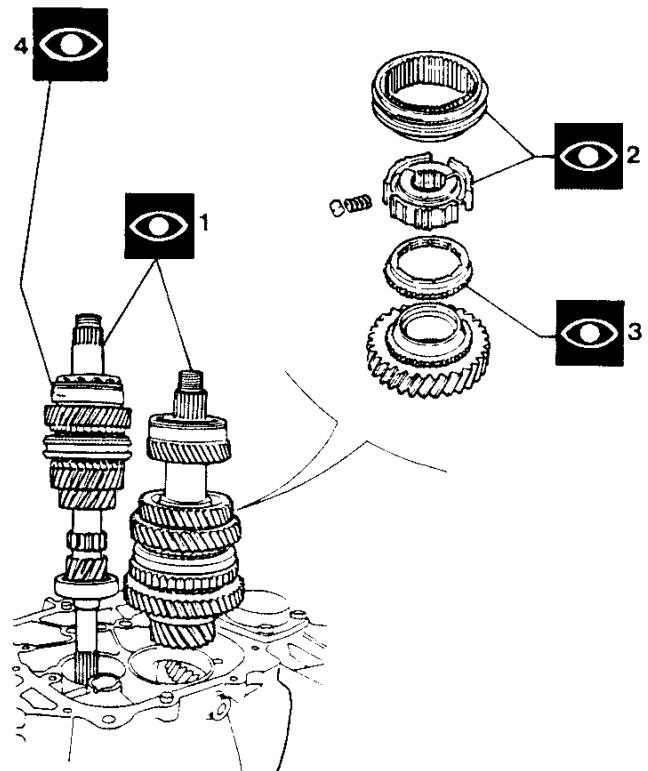
GEARBOX SUPPORT - CENTRAL CASING - COVER

1. Check the rod and bearing seatings for cracks, wear or damage. Check that the contact surfaces are level (minor defects can be removed with a fine file).
2. Check for oil leaks; replace the sleeve and washer assembly if necessary.
3. Check the fork control shaft for excessive play; replace the bushings if necessary.



MAIN AND LAY SHAFTS

1. Check the gear teeth for nicks or excessive wear and inner surfaces for seizing or abnormal wear.
2. Check hubs and sliding sleeves for nicks, freedom of movement, excessive play and crawling. Check sleeve inner teeth for signs of excessive wear.
3. Check the synchronizer rings for signs of ovalization on the inner surfaces.
4. Check the rear bearings for scoring on the outer race, inner ring and balls, signs of overheating or excessive wear.





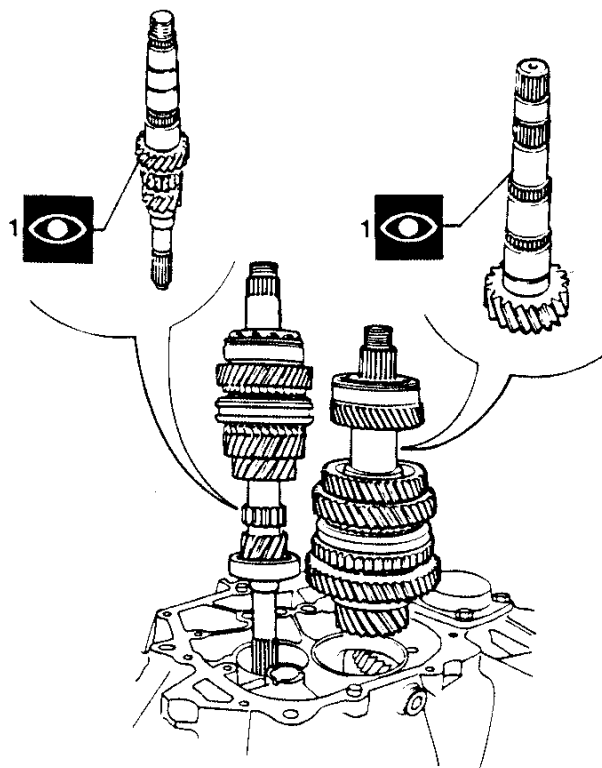
1. Check the main and layshaft gears for nicks or excessive wear.



CAUTION:

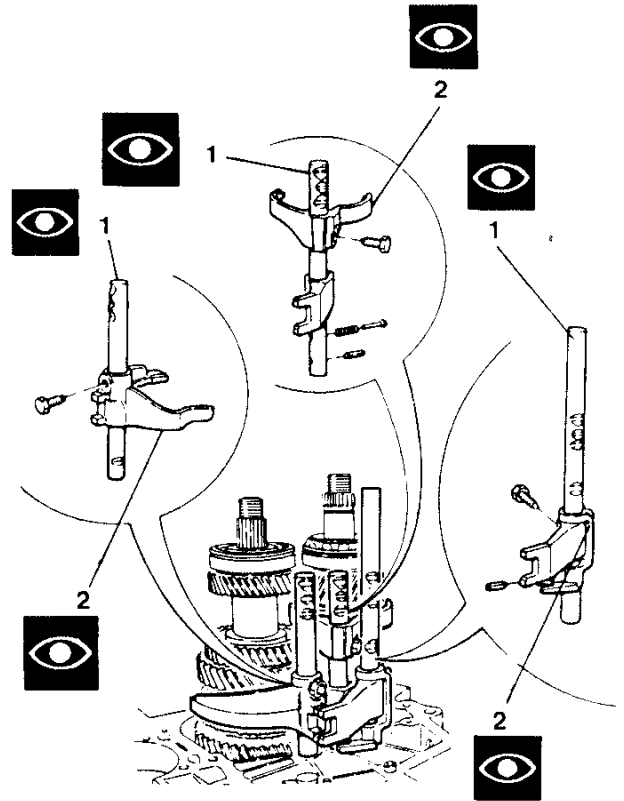
When replacing the main shaft (after high mileage), all the gears on the layshaft should also be replaced.

When replacing the layshaft, the differential ring gear should also be replaced.



RODS AND FORKS

1. Check the rods for distortion or wear, and freedom of movement without excessive play.
2. Check the forks for distortion or wear on the surfaces in contact with the sliding sleeve.



**REASSEMBLY 1.8 - 2.0 T.S.****MAIN SHAFT REASSEMBLY**

– Operating with the shaft suitably fitted in a vice or, where indicated, in a press, reassemble as follows;



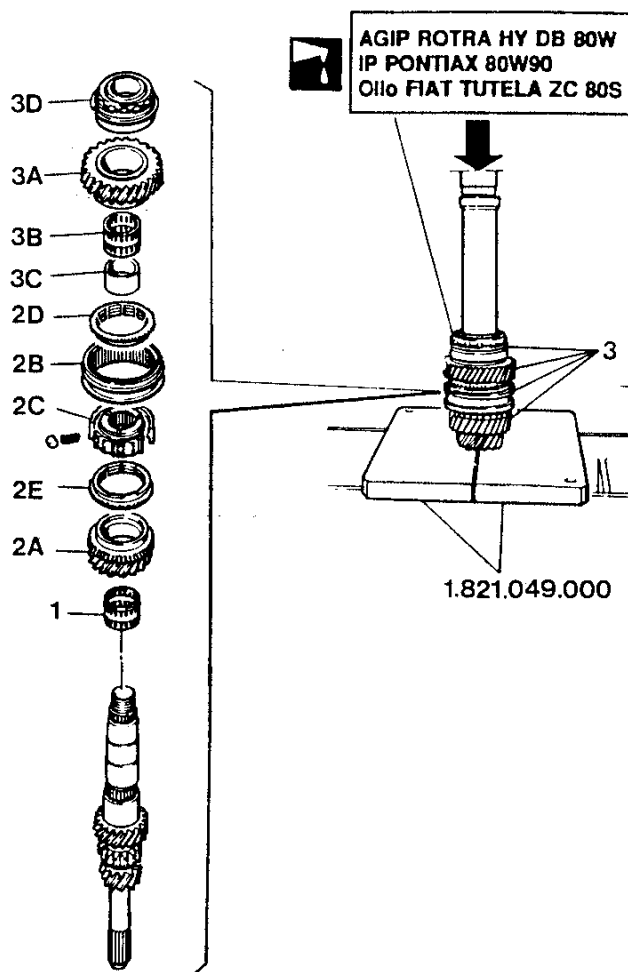
Before installation lubricate all parts with the prescribed oil.

1. Install the 3rd speed drive gear roller bearing.
2. Install the 3rd speed drive gear (2A) and the 3rd and 4th speed sliding sleeve assembly (2B) together with hub (2C), 4th speed (2D) and 3rd speed (2E) synchronizer rings.

**CAUTION:**

In order to avoid losing the synchronizer rollers and springs, the sliding sleeve should be set in the idle position.

3. Using a press and half plate No. 1.821.049.000, install the 4th speed drive gear (3A) and relative roller bearing (3B) and bushing (3C). Using the inserting tool shown in the illustration, install the rear bearing (3D).



**LAYSHAFT REASSEMBLY**

Operating with the shaft suitably fitted in a vice, or where indicated, in a press, reassemble as follows;

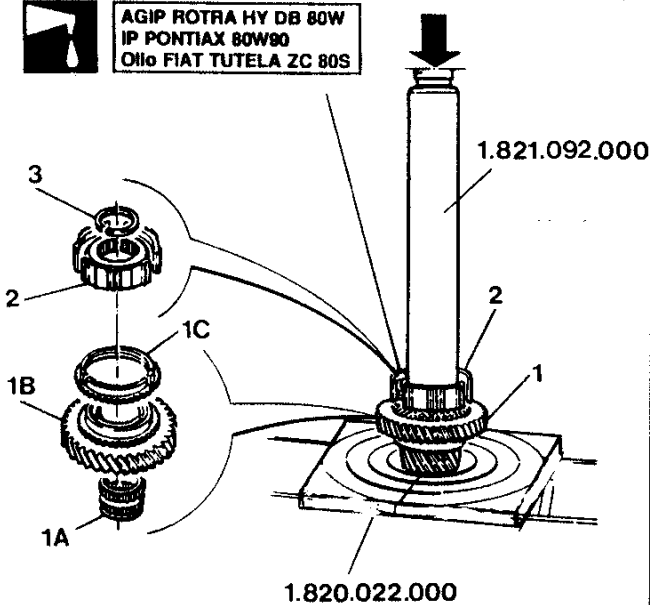


Before installation lubricate all parts with the prescribed oil.

1. Install the roller bearing (1A), the 1st speed driven gear (1B) and the 1st speed synchronizer ring (1C).
2. Using a press, half plates Nos. 1.820.022.000 and inserting tool No. 1.821.092.000, install the 1st and 2nd speed engagement sliding sleeve hub.
3. Install the flexible ring securing hub.

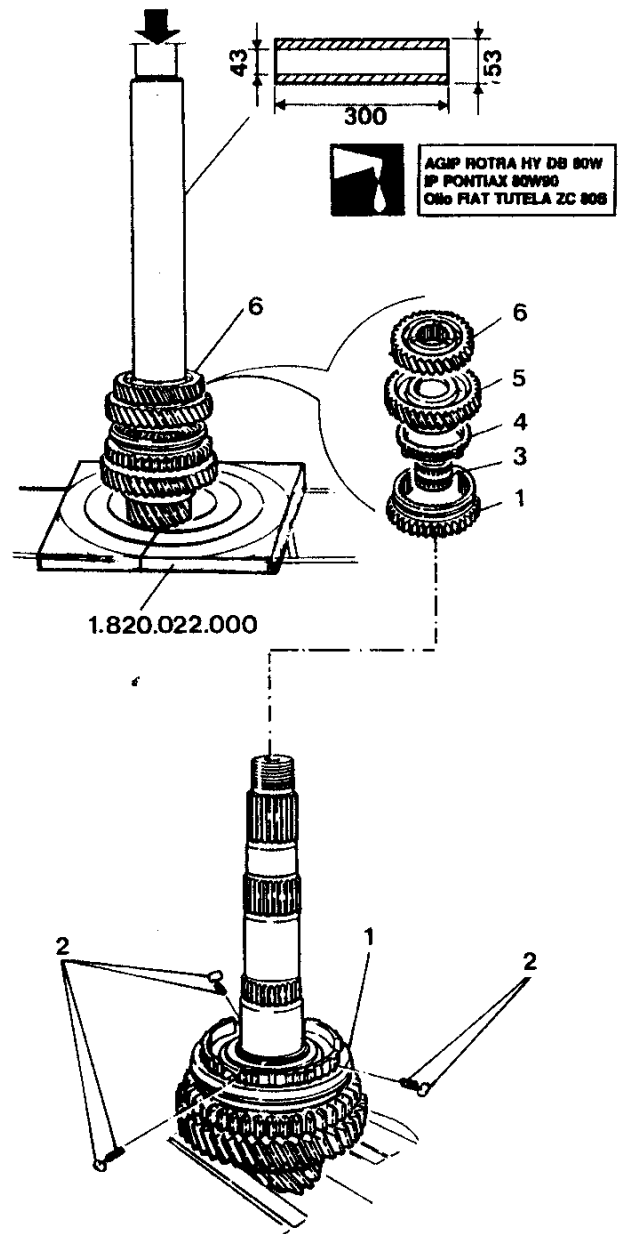


AGIP ROTRA HY DB 80W
IP PONTIAX 80W90
Olio FIAT TUTELA ZC 80S

**CAUTION:**

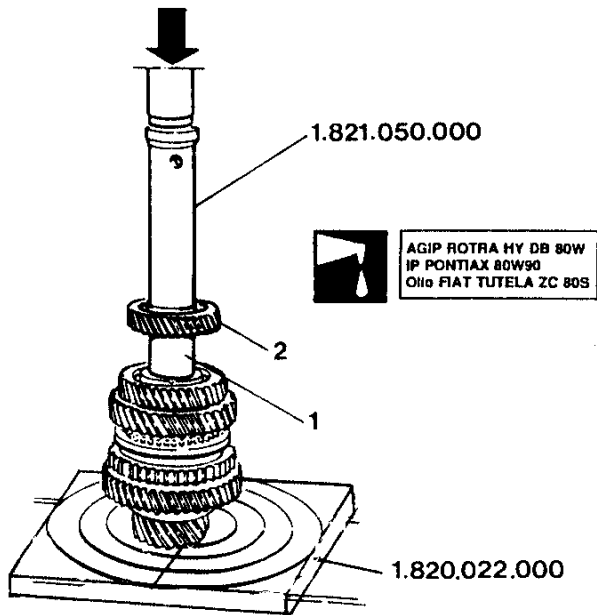
In order to avoid losing the synchronizer rollers and springs, the sliding sleeve should be set in the idle position.

1. Install the 1st and 2nd speed - reverse speed gear engagement sliding sleeve.
2. Insert the springs and rollers in the hub.
3. Install the 2nd speed driven gear roller bearing.
4. Install the 2nd speed synchronizer ring.
5. Install the 2nd speed driven gear.
6. Using a press and suitable tool, install the 3rd speed driven gear.

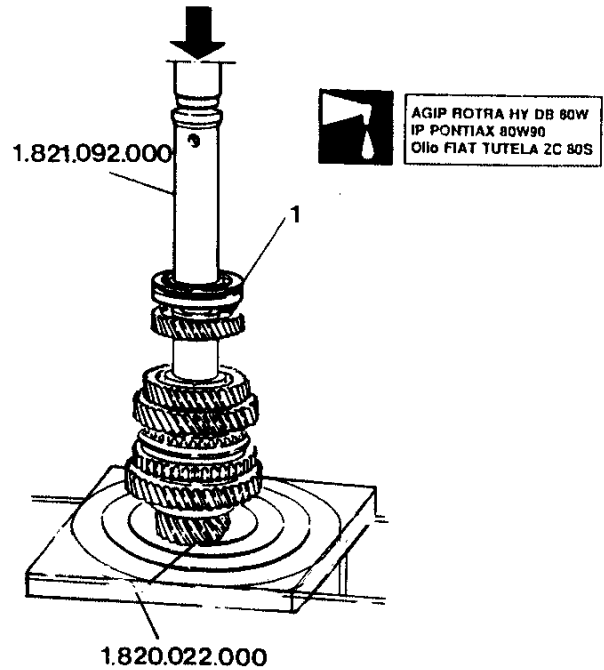




1. Install the spacer.
2. Using a press, half plates No. 1.820.022.000 and inserting tool No. 1.821.092.000, install the 4th speed driven gear.



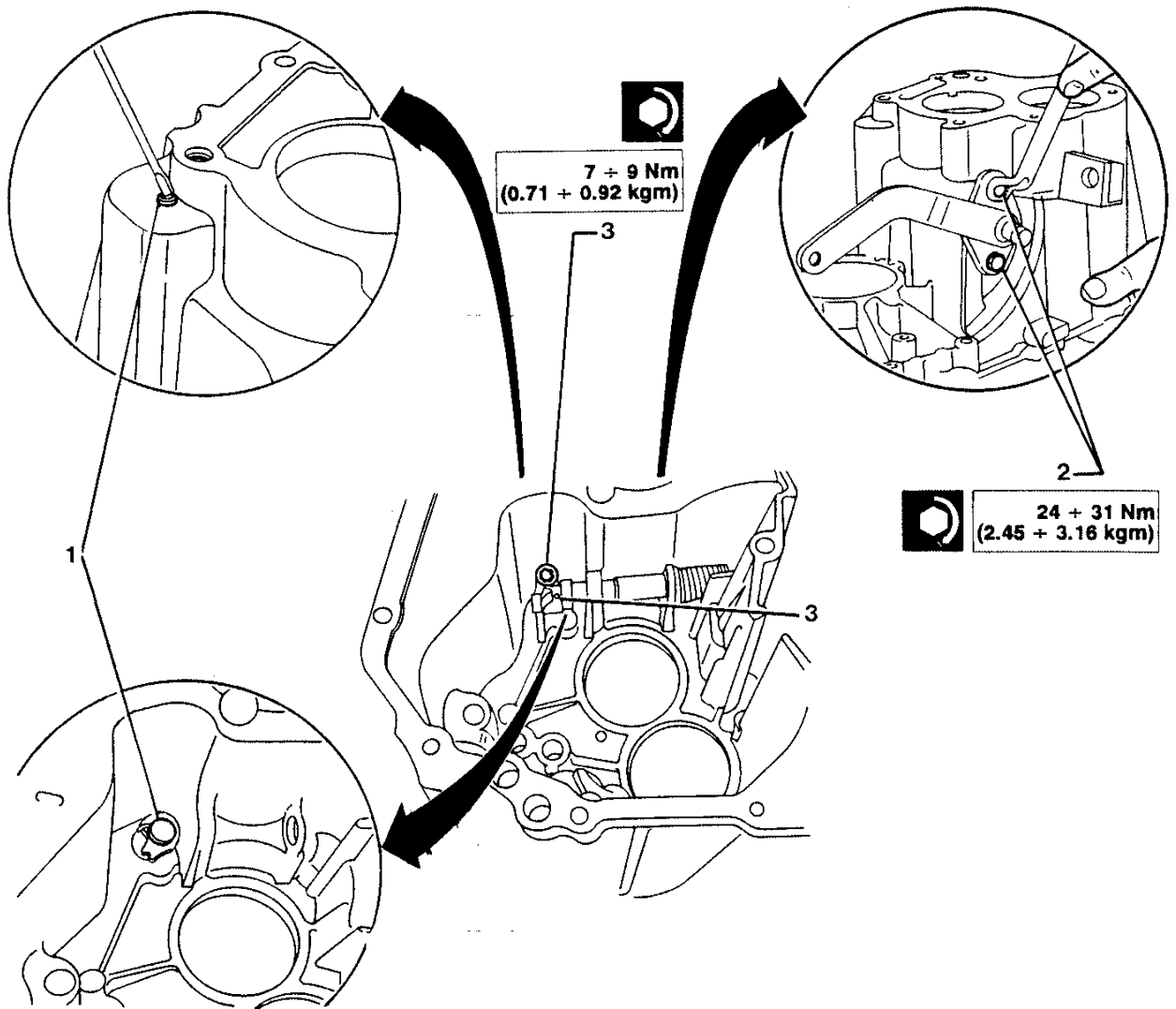
1. Using a press, half plates No. 1.820.022.000 and inserting tool No. 1.821.092.000, install the rear bearing.



**BENCH REASSEMBLY**

1. If previously removed, install a new guide pin for the engagement of reverse gear and caulk the outer tip.
2. Install the speed control lever, securing it to the gearbox using the two screws which should then be tightened to the prescribed torque.

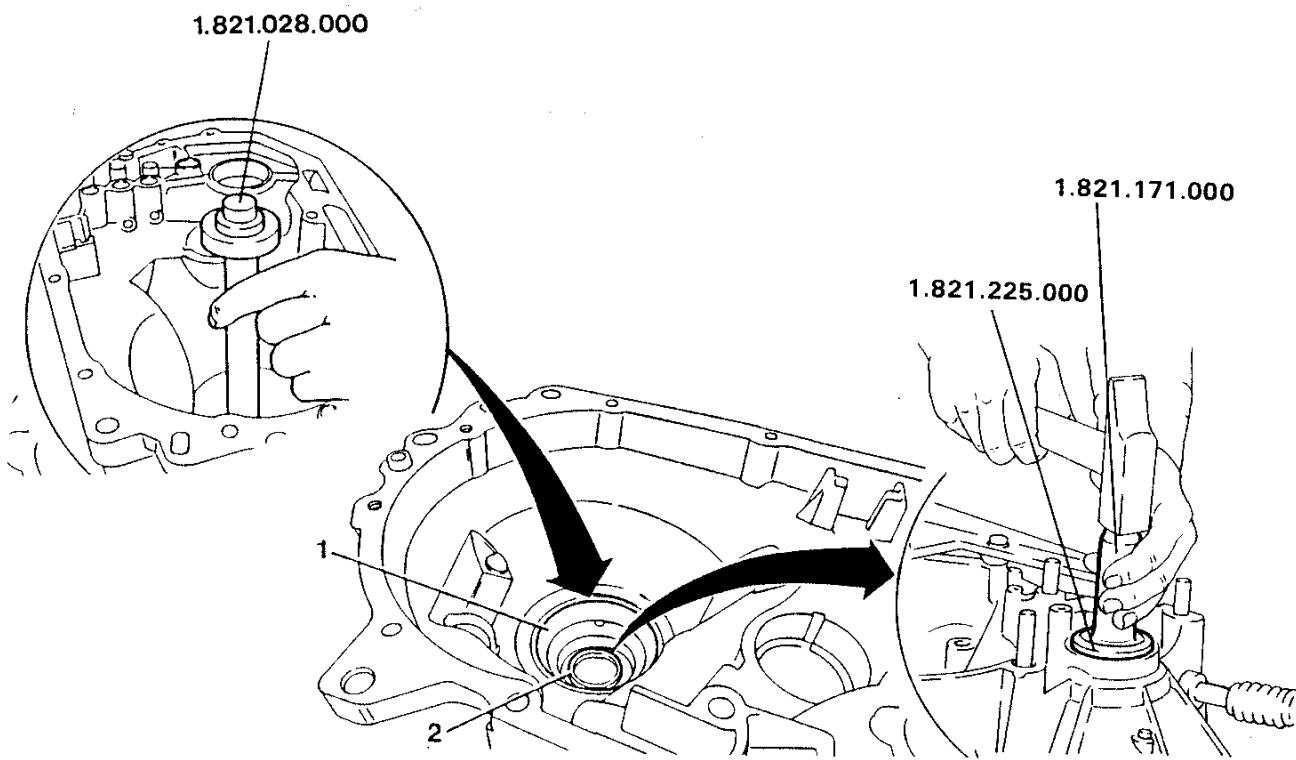
3. Install the speed control prong by inserting the relative securing pin and tightening the screw to the prescribed torque.





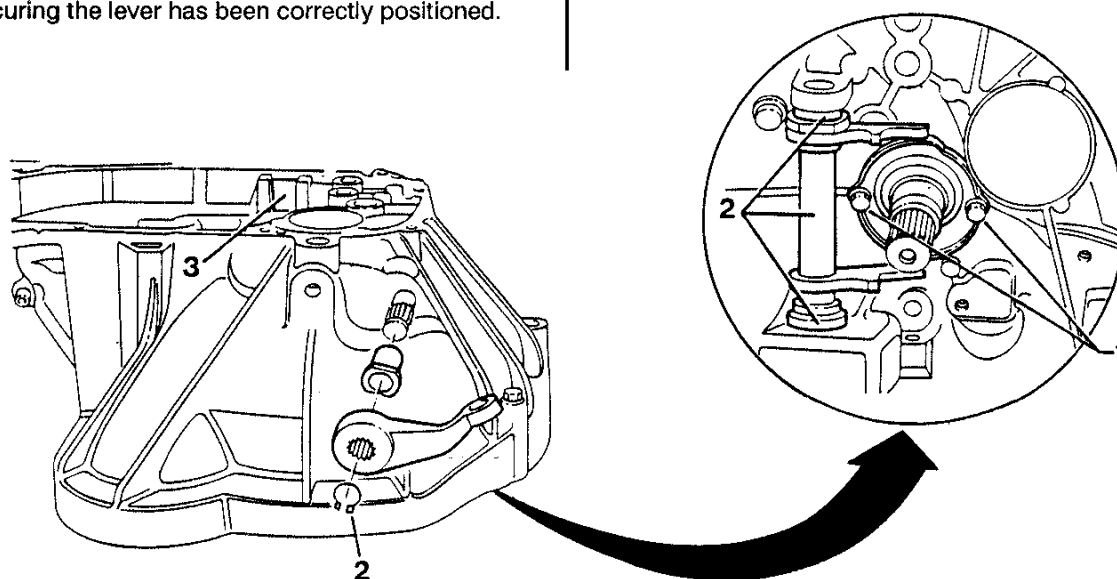
1. If previously removed, install the new differential casing oil seal using tools No. 1.821.171.000 and No. 1.821.225.000.

2. If previously removed, insert the new outer race of the differential support roller bearing using tool No. 1.821.028.000.



1. Install the thrust bearing sleeve and tighten the screws to the prescribed torque.
2. Install the pin and relative bushings, the thrust bearing engagement control fork, and the clutch engagement control lever, ensuring that the Seeger ring securing the lever has been correctly positioned.

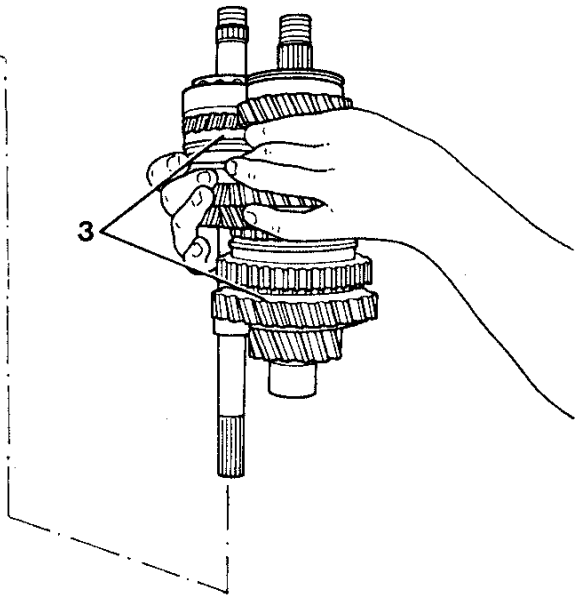
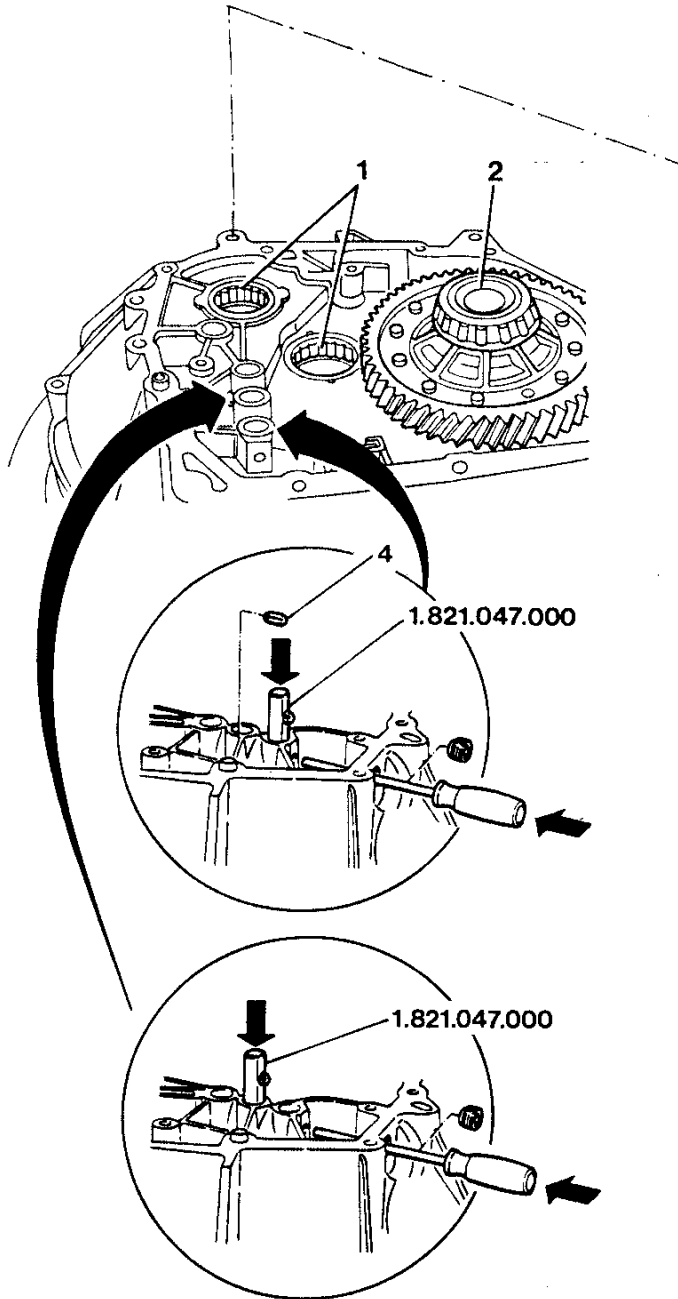
3. Install the magnet





- 1. Install the main and lay shaft front bearings.
The bearings must be replaced if they show signs of scoring or excessive play or wear.

- 2. Install the differential assembly
- 3. Insert the main and lay shafts.
- 4. Insert the speed engagement safety pawls using tool No. 1.821.047.000.





1. Install the reverse speed idle gear.



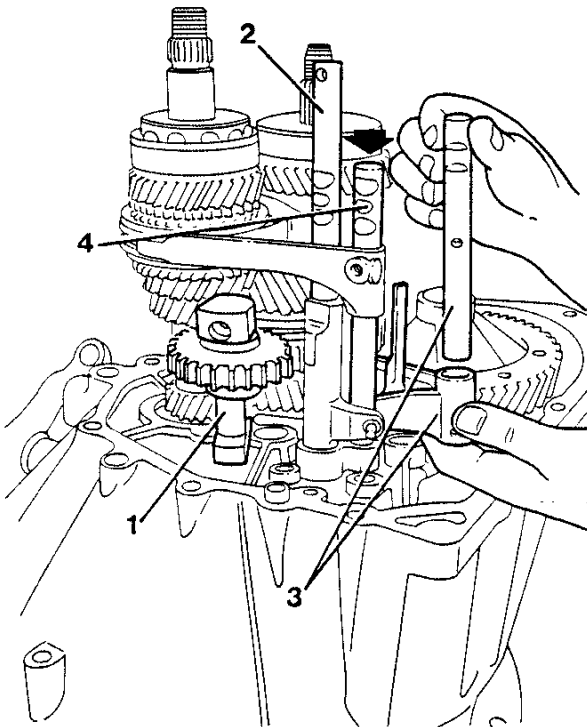
CAUTION:
Ensure that the gear engagement tooting faces downwards.

2. Install 5th and reverse speed control rod.
3. Position the 3rd and 4th speed fork and install the relative control rod.

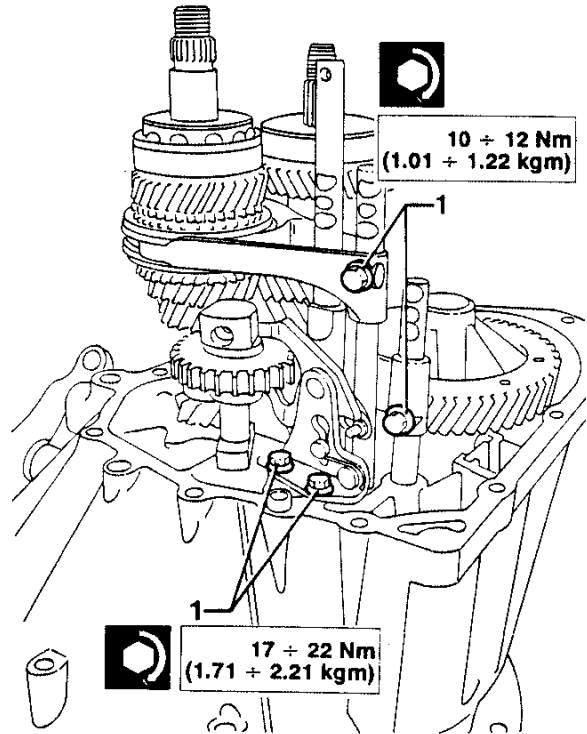


CAUTION:
Position the safety pawl on the rod before installing the rod in its seating.

4. Install 1st and 2nd speed control rod and fork. To facilitate installation, move the 3rd and 4th speed control rod as shown in the illustration.



1. Tighten to the prescribed torque, the screws securing the gear control forks and bracket supporting the reverse speed fork. Move all forks to the idle position.





1. Holding up the gear selector lever, install the gearbox checking that the gear selector prong is inserted in the 3rd - 4th speed fork.



CAUTION:

Before installing the gearbox, wipe the contact surfaces with "LOCTITE 537" flat surface sealant.

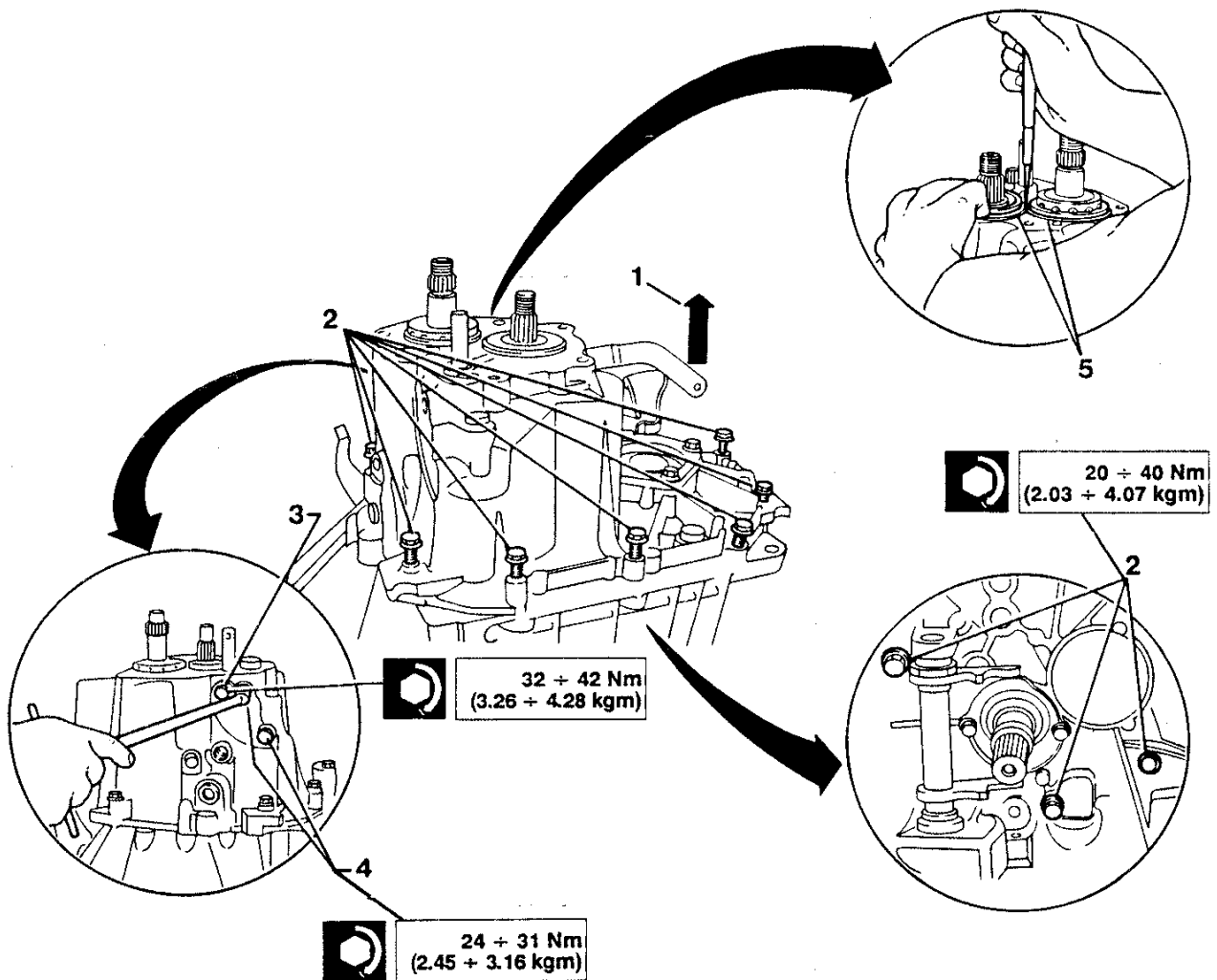
2. Tighten the thirteen the screws to the prescribed torque, three of which are located inside the gearbox-engine support union.

3. Insert the speed control rod idle positioning balls and springs and tighten the caps to the prescribed torque.
4. Tighten to the prescribed torque, the screws securing the reverse speed shaft.
5. Install the flexible rings securing the rear bearings.



CAUTION:

To facilitate the installation of the flexible rings, adjust them so that the frontal opening is in the position shown in the illustration.





1. Tighten the rear bearings retaining plate screws to the prescribed torque.

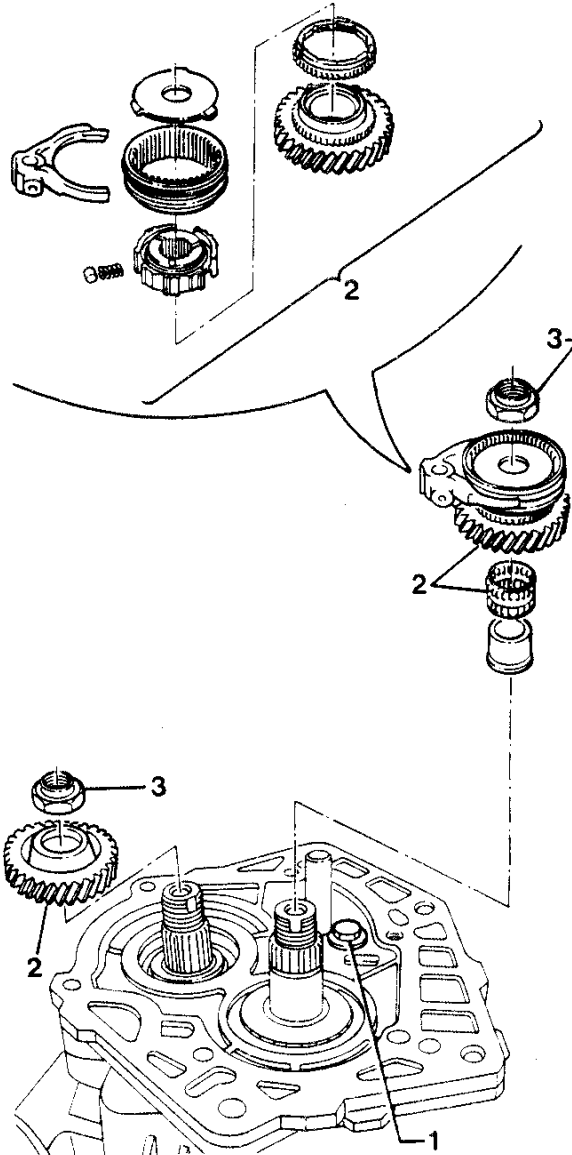


CAUTION:
Before installing the gearbox, wipe the contact surfaces with "LOCTITE 573" flat surface sealant.

2. Position the hub, fork, sleeve and 5th speed gear on the main and lay shafts.
3. Tighten to the prescribed torque and then caulk the main and lay shaft locking ring nuts.



CAUTION:
The ring nuts securing the gears must be substituted each time they are removed.

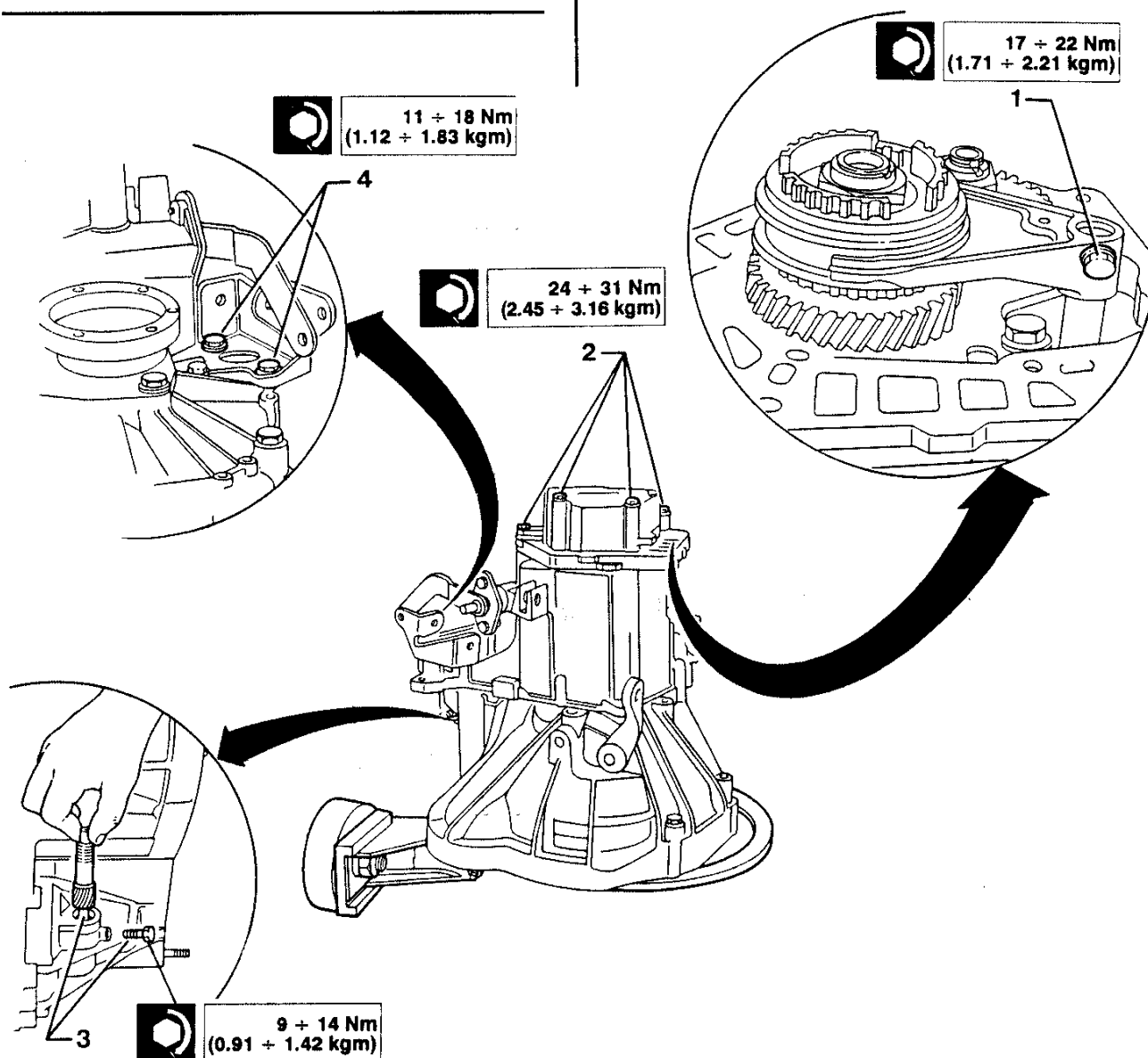




1. Tighten the screws securing the 5th speed engagement fork to the main shaft.
2. Position the rear gearbox cover and tighten the retaining screws.
3. Install the odometer idling gear and tighten it to the prescribed torque.
4. Install the bracket supporting the gear engagement device and tighten the screws to the prescribed torque.



CAUTION:
Before installing the rear gearbox cover, wipe the contact surfaces with "LOCTITE 573" flat surface sealant.



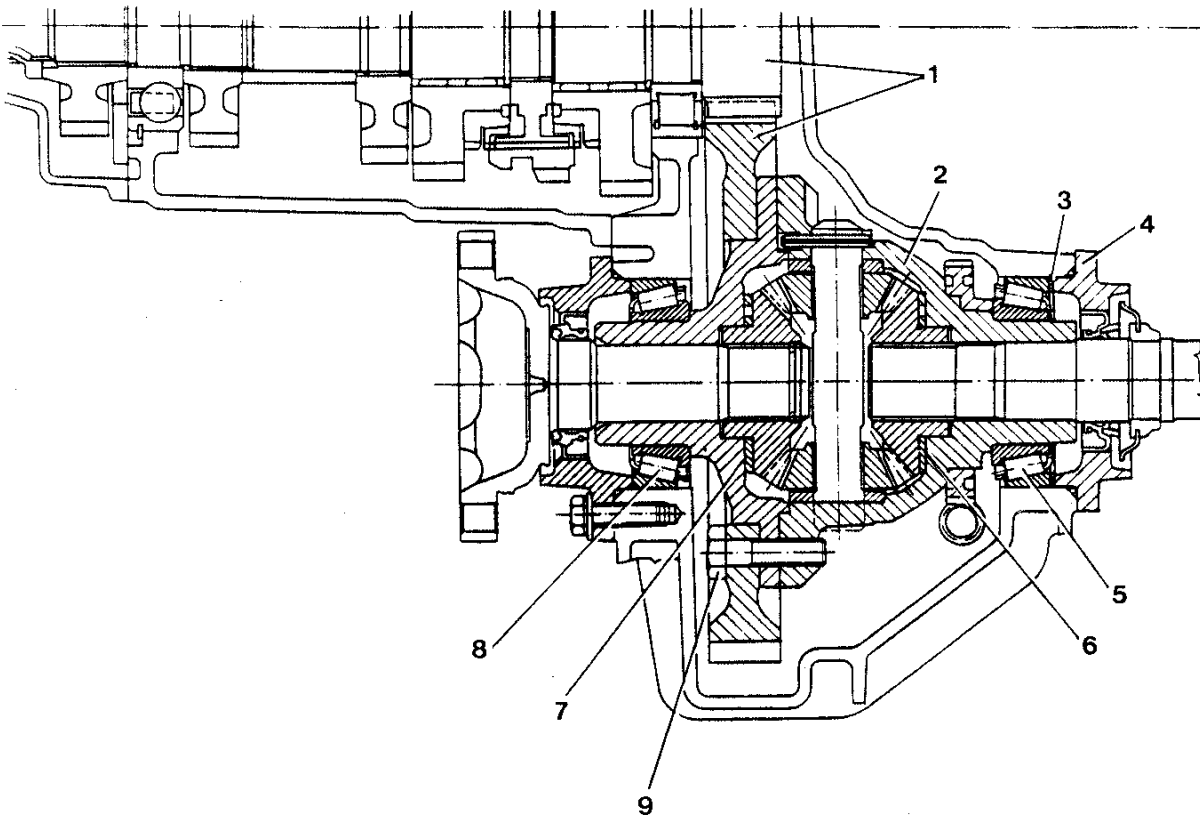


DIFFERENTIAL 2.4 V6

DESCRIPTION

The differential consists of a reduction pair (1) and a differential casing (2) including crown wheels and side pinions. The differential casing is supported by two taper bearings (5 and 8) and is divided into two sections united by the same screws (9) securing the cylindrical crown

gear. The odometer gear, made of teflon, is installed on the outer surface of the casing. The backlash between crown wheels and side pinions is determined using variable thickness rings (6 and 7) placed below the crown wheels. The pre-load adjustment system of the differential taper bearings is similar to that of other known groups, and is obtained using variable thickness rings (3) located below the relevant seal cover (4).

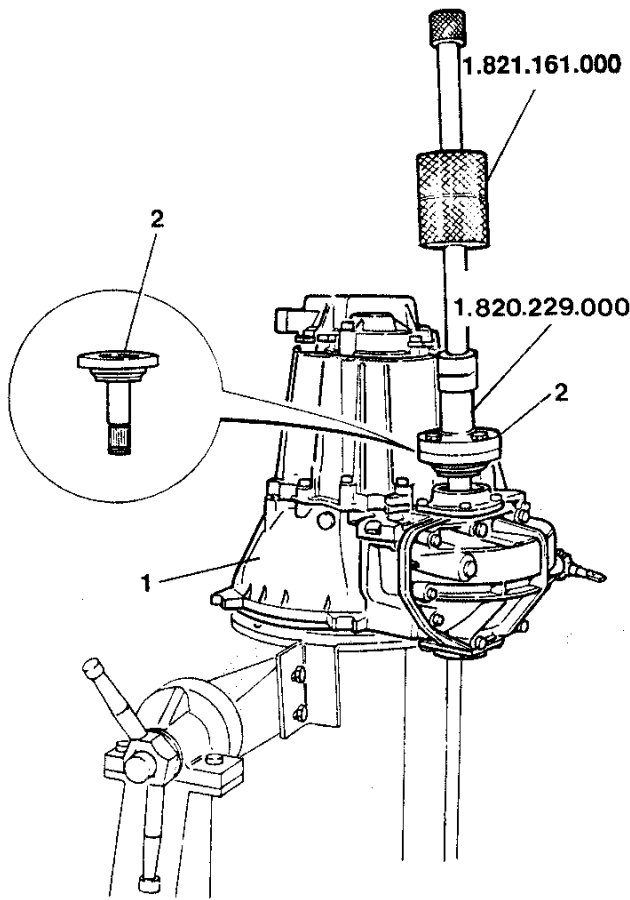


- | | |
|-------------------------------|--|
| 1. Cylindrical reduction pair | 6. Ring |
| 2. Differential casing | 7. Ring |
| 3. Ring | 8. Taper bearing |
| 4. Seal cover | 9. Differential casing half retaining screws |
| 5. Taper bearing | |



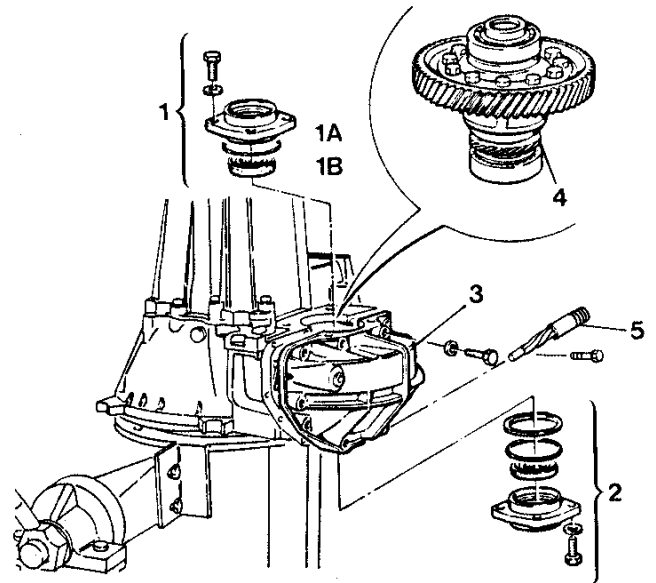
REMOVAL

1. Remove gearbox and place it on a suitable stand (see: GEARBOX BENCH DISASSEMBLY).
2. Withdraw flange from differential (using tool No. 1.821.161.000 and No. 1.821.229.000).



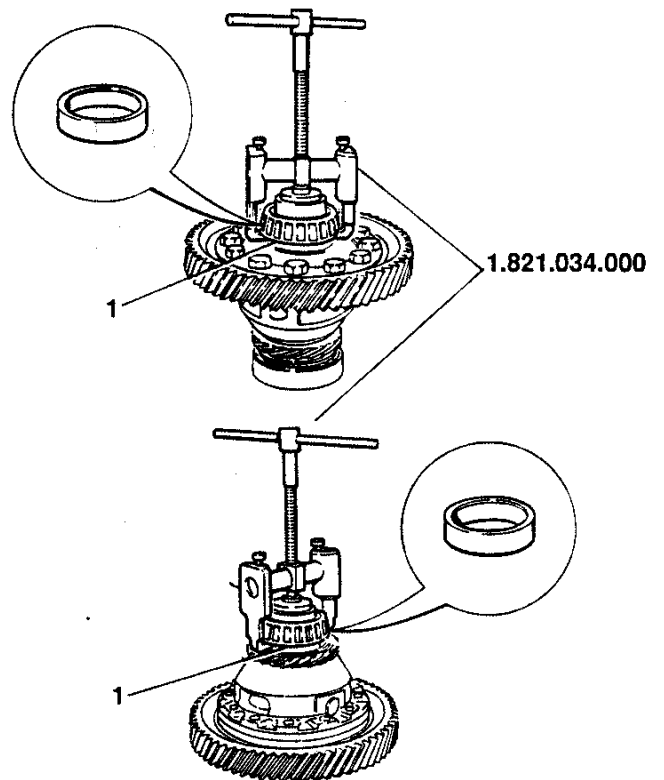
1. Remove differential casing seal cover - gearbox side with O- ring 1A and seal 1B.
2. Remove the differential casing seal cover - engine side, and shim ring 2A.
3. Remove differential cover.
4. Remove differential assembly.
5. Remove odometer driving-gear.

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BENCH DISASSEMBLY

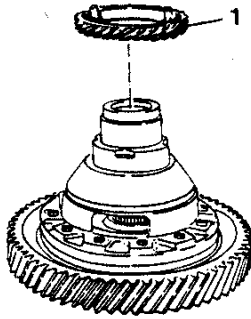
1. Extract the roller bearings using tool No. 1.821.034.000.



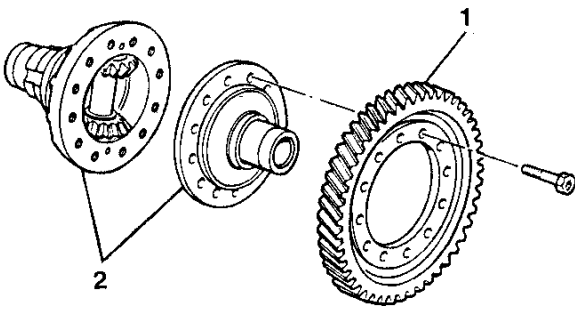
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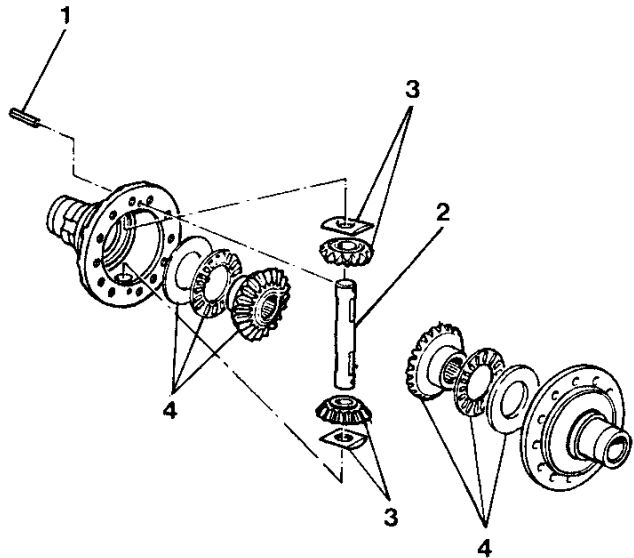
1. Remove odometer gear.



1. Remove differential casing crown gear.
2. Remove differential casing halves.



1. Remove the spring pin securing side pinion shaft.
2. Remove side pinion shaft from casing half.
3. Remove side pinions and relevant shoulder washers.
4. Remove crown wheels from casing halves together with roller cages and shim rings.





CHECKS AND INSPECTIONS

GEARING

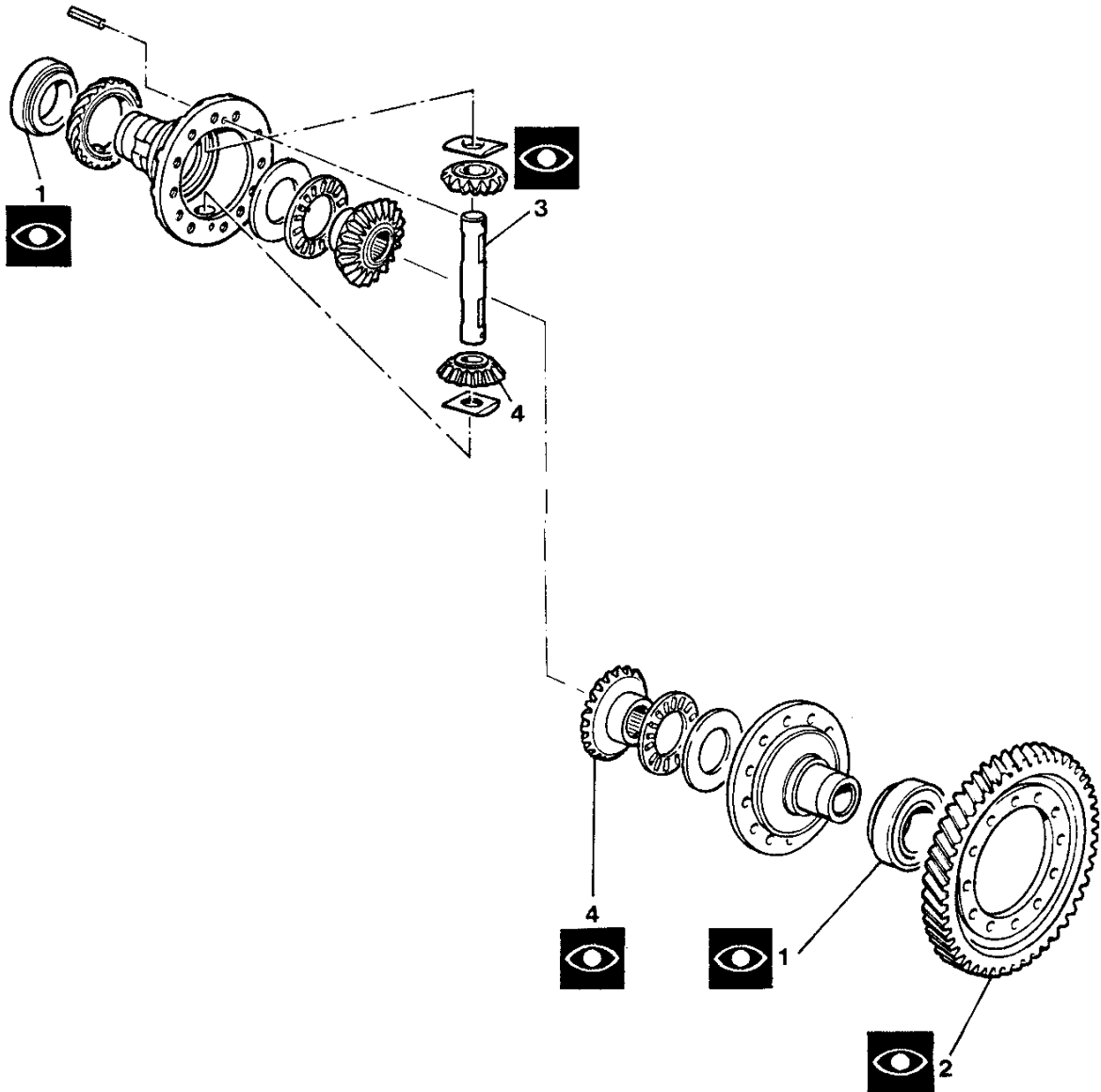
1. Check bearing for scoring or traces of over heating or excessive wear.
2. Check crown gear for nicks or excessive wear.



CAUTION:

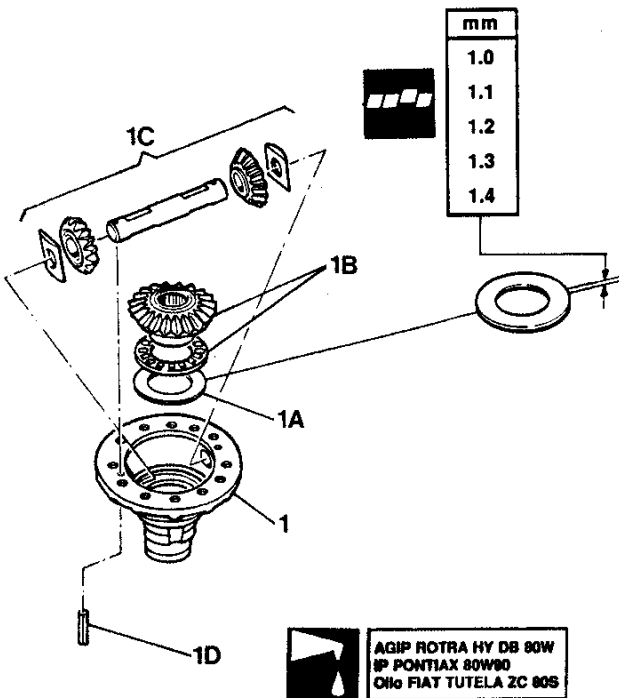
When replacing crown gear (after high mileage) also replace gearbox layshaft.

3. Check side pinions shaft for seizing, wear or excessive play into casing half.
4. Check side pinions and crown wheels for nicks or wear of working surfaces.



**CROWN WHEELS AND SIDE PINIONS BACKLASH CHECK**

1. Install shim ring (1A), crown wheel (1B) and relevant roller cage, complete side pinion shaft (1C) and relative retaining pin (1D) into casing half.

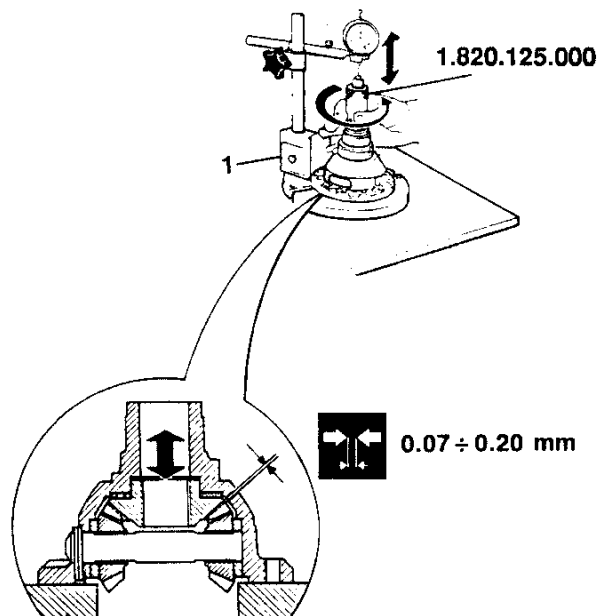


1. Insert tool No. 1.820.125.000 and install a magnetic base dial gauge with its probe contacting upper end of tool.

Rotate and move tool axially; check that the average axial play is between 0.07 and 0.20 mm.

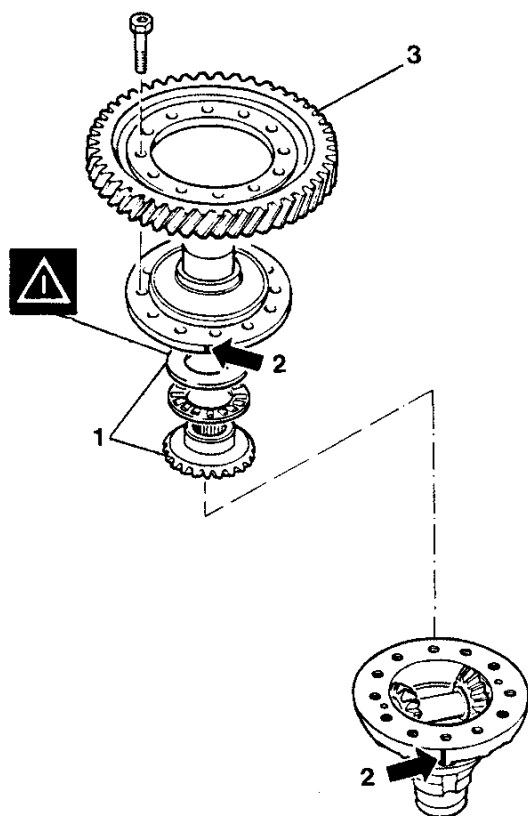
NOTE: Check that the variation in axial play in one complete revolution of the tool is ≤ 0.10 mm (otherwise replace crown wheel and/or side pinions).

If necessary, insert new shim rings of a suitable thickness.





1. Install second crown wheel and relevant roller cage (on new format differentials) and shim ring with thickness equal to that of previously installed ring.
2. Join the two casing halves aligning the reference notches.
3. Install crown gear and lock it momentarily.



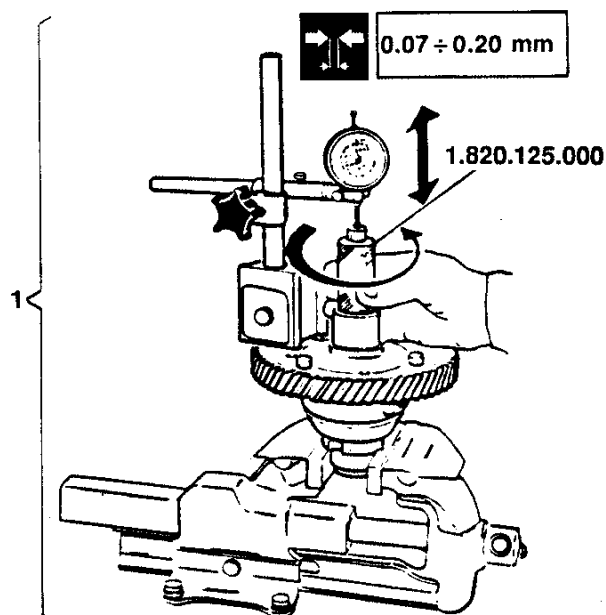
1. Insert tool No. 1.820.125.000 and install a magnetic base dial gauge with its probe contacting the upper end of the tool. Rotate and move the tool axially and check that the average axial play is between 0.07 and 0.20 mm.

If necessary insert new shim rings of suitable thickness.

NOTE: Check that the variation in axial play in one complete revolution of the tool is ≤ 0.10 mm (otherwise replace crown wheel).

**CAUTION:**

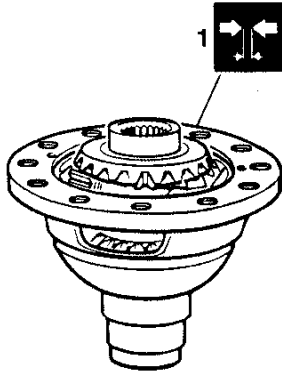
Shim rings installed on crown wheels must be of the same thickness.



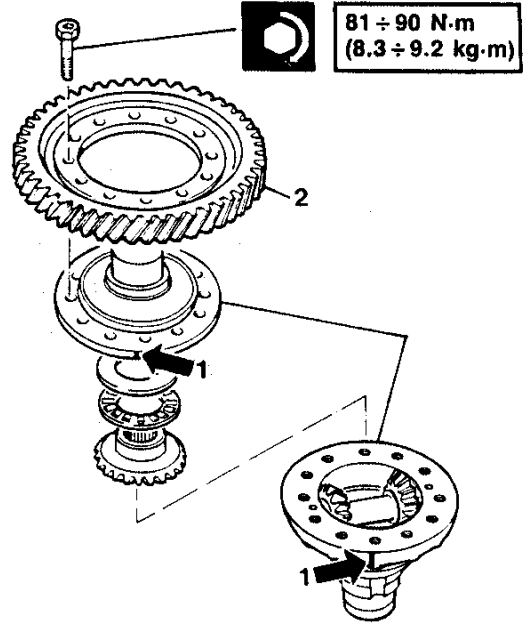


REASSEMBLY

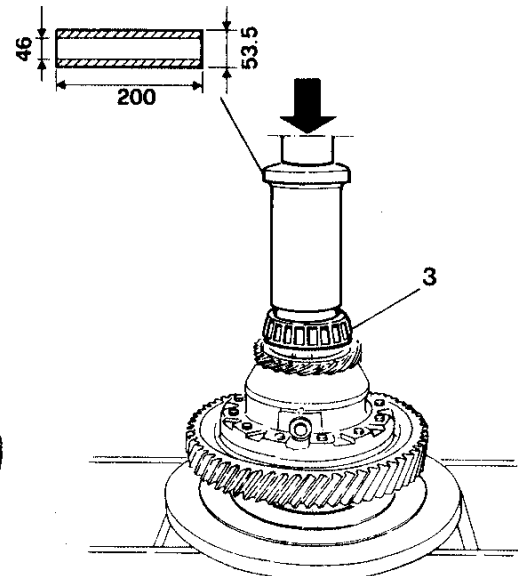
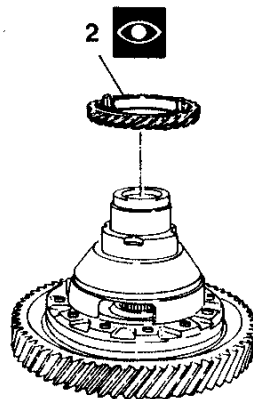
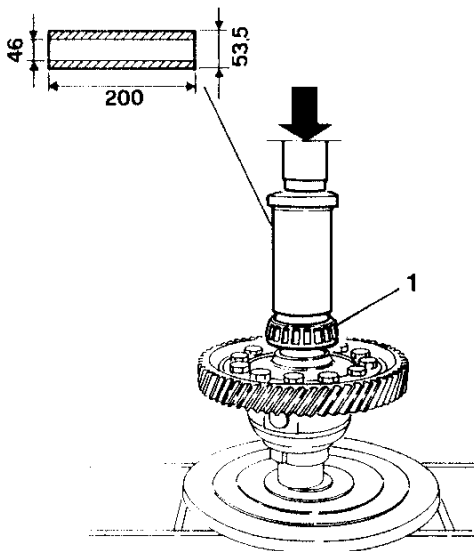
1. Carry out crown wheels and side pinions backlash checks before reassembly (see CHECKS AND INSPECTIONS).



1. Join the two casing halves aligning the reference notches.
2. Install crown gear.



1. Using a press and suitable tool, install roller bearing.
2. Install odometer gear.
3. Using a press and suitable tool, install bearing.

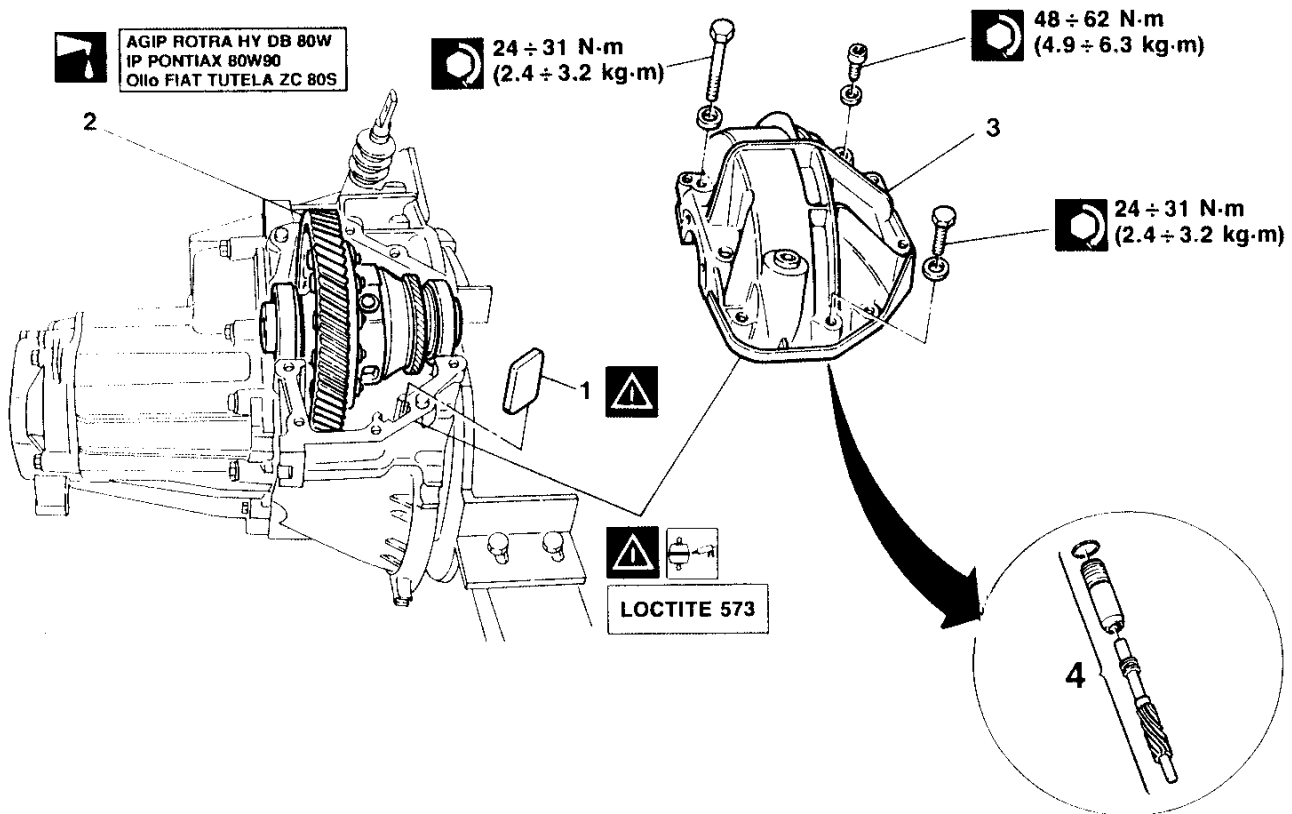




INSTALLATION

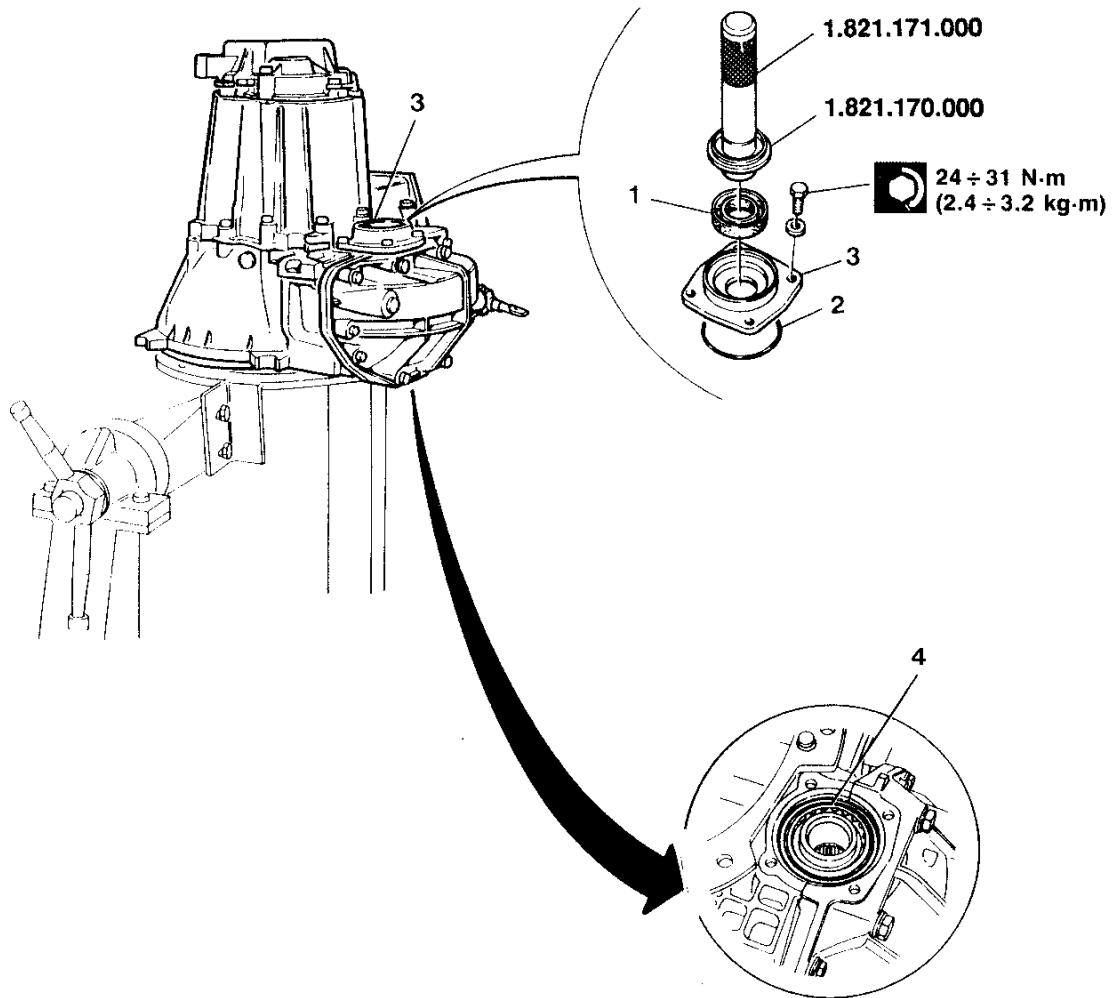
1. Insert magnet into its seating.
2. Insert differential assembly into gearbox.

3. Install cover (wipe contact surfaces with sealant).
4. Install odometer idle gear into differential cover.



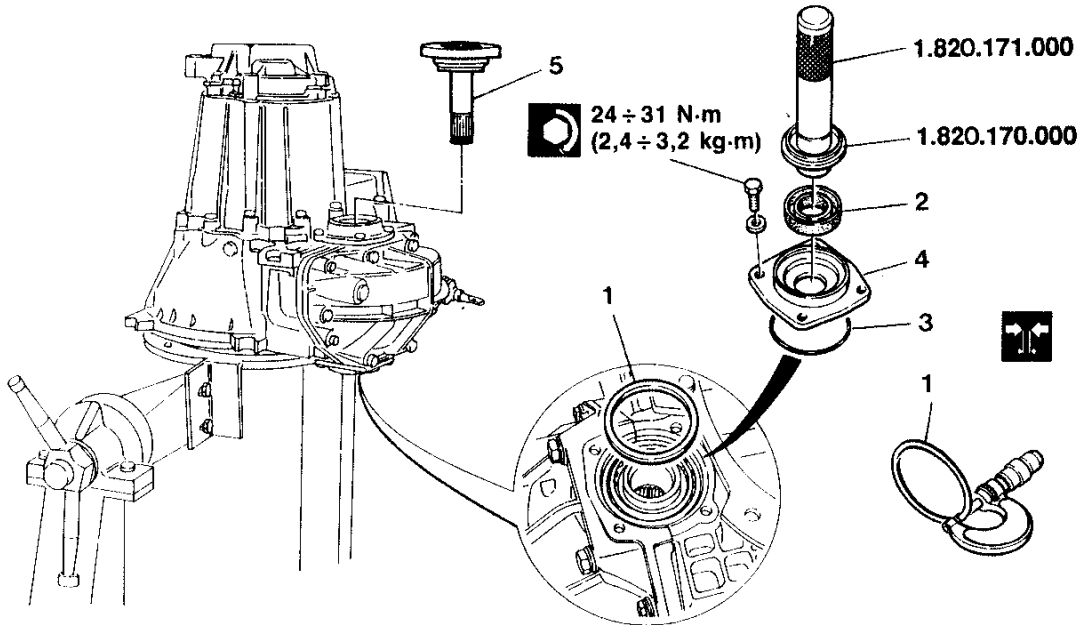


1. Install oil seal into seal cover using specified tool.
2. Install O-ring on cover.
3. Install seal cover - gearbox side.
4. Settle outer race of roller bearing into seating - (engine side).





1. Install shim ring of suitable thickness (refer to DIFFERENTIAL ADJUSTMENT).
2. Install oil seal into cover using suitable tool.
3. Install O-ring on cover.
4. Install seal cover - engine side.
5. Install left axle securing flange.





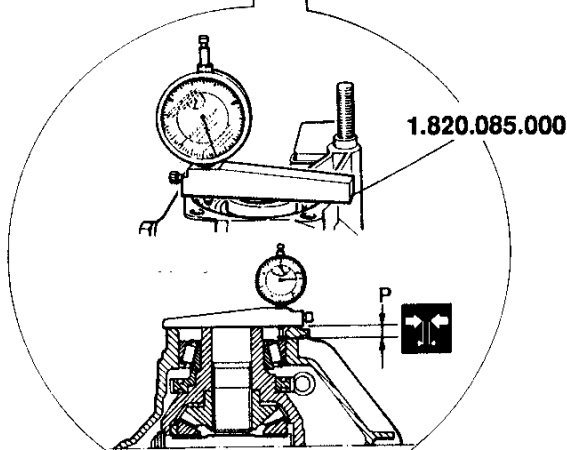
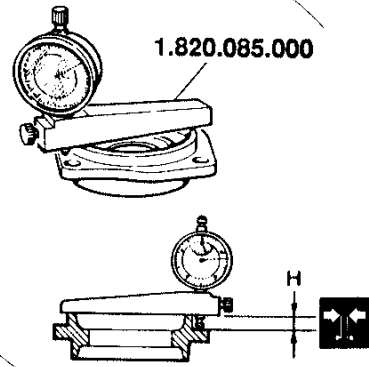
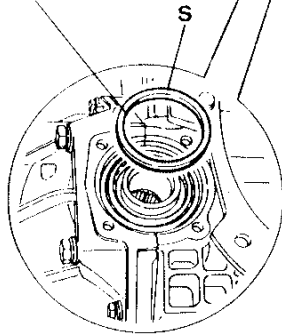
DIFFERENTIAL ADJUSTMENT

1. After the exact thickness of the shim ring has been determined, select thickness closest to determined value among spare shim rings.

2. If the determined thickness does not correspond to any of the available rings, or to the sum of thickness of two rings, install rings of next size up.

$$S = P - H + 0.12$$

mm
1,25
1,30
1,35
1,40
1,45
1,50
1,55
1,60





DIFFERENTIAL 1.8 - 2.0 T.S.

DESCRIPTION

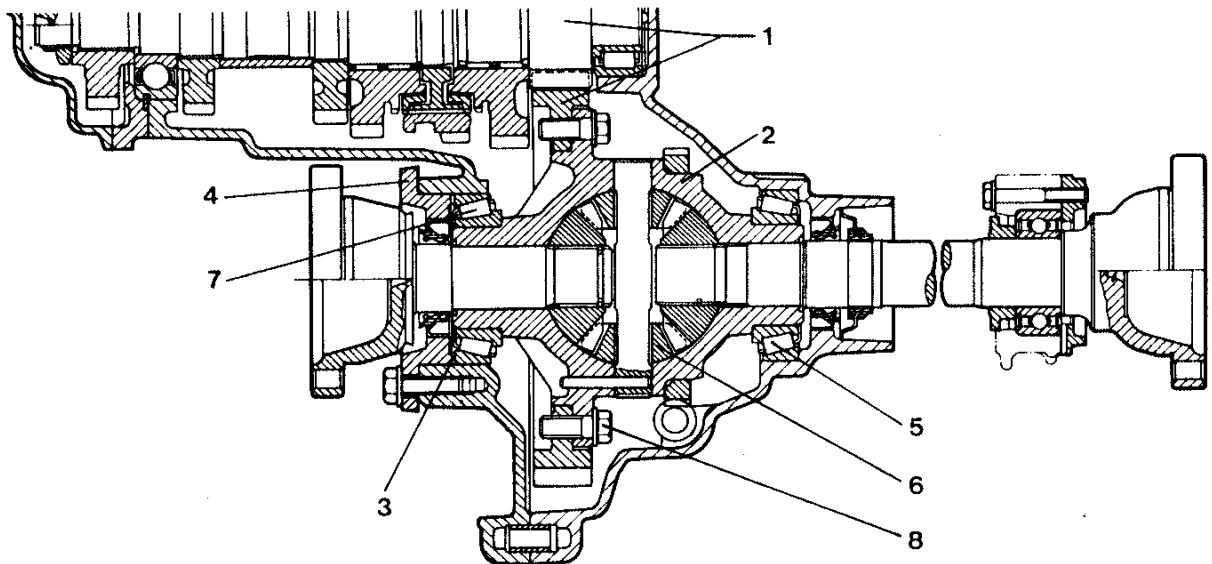
The differential, consisting of a reduction pair (1) and a differential casing (2) including crown wheels and side pinions, is different from that of the 2.4 V6 vehicle in that the differential casing is a single piece.

The differential casing is fixed to the cylindrical crown gear by screws (8) and is supported by two tapered bearings (5 and 3).

The odometer idling control gear is connected to the

outer surface of the casing.

The play between crown wheels and side pinions is pre-determined and cannot be adjusted as the crown wheels are installed in the casing without shims. Therefore the washers between the pinions and differential casing only serve to prevent slipping. On the other hand the pre-load adjustment system of the differential taper bearings is similar to that in use on other groups which are already known; in other words it employs variable thickness rings (3) which are placed below the relevant seal cover (4).



1. Reduction pair
2. Differential casing
3. Taper bearing
4. Seal cover

5. Taper bearing
6. Anti-slip washers
7. Taper bearing
8. Differential crown gear fixing screws.



REMOVAL AND INSTALLATION

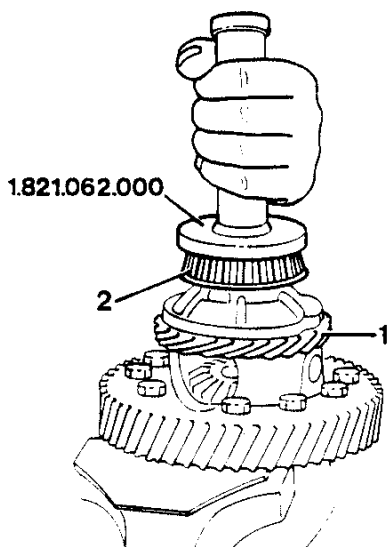
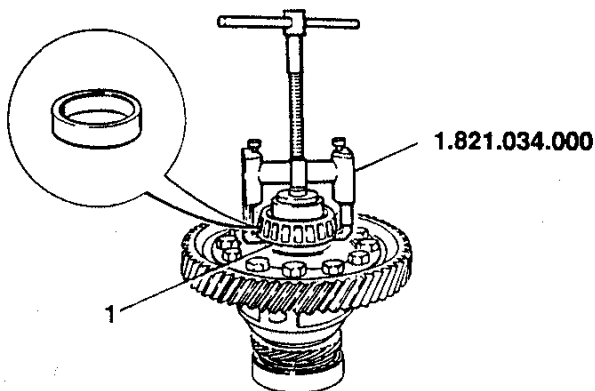
- Remove the gearbox and place it on a suitable stand. Disassemble up to the removal of the complete differential group (see: BENCH DISASSEMBLY 1.8 - 2.0 T.S.).

BENCH DISASSEMBLY

- Using tool No. 1.821.034.000, remove the roller bearings.



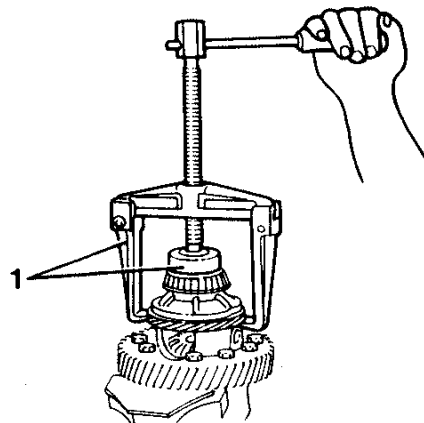
During installation insert the bearings using tool No. 1.821.062.000.



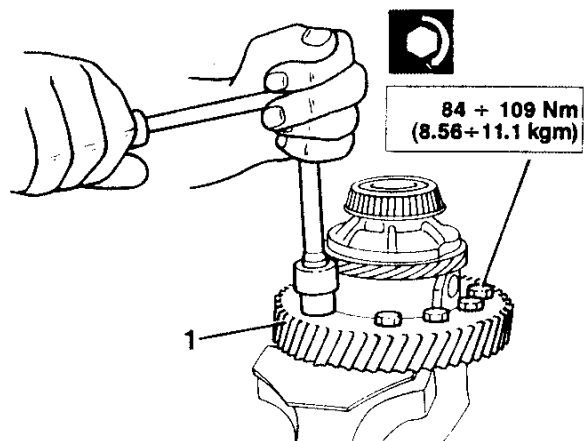
- Using a reaction washer and a universal puller, remove the odometer idle control gear.



On installation, heat the gear in an oven to between 100° and 120°C and then insert.



- Mark the relative positions of the cylindrical crown gear and differential casing in order to be able to correctly position them during installation. Unscrew the screws securing the crown gear to the casing and remove the crown gear.

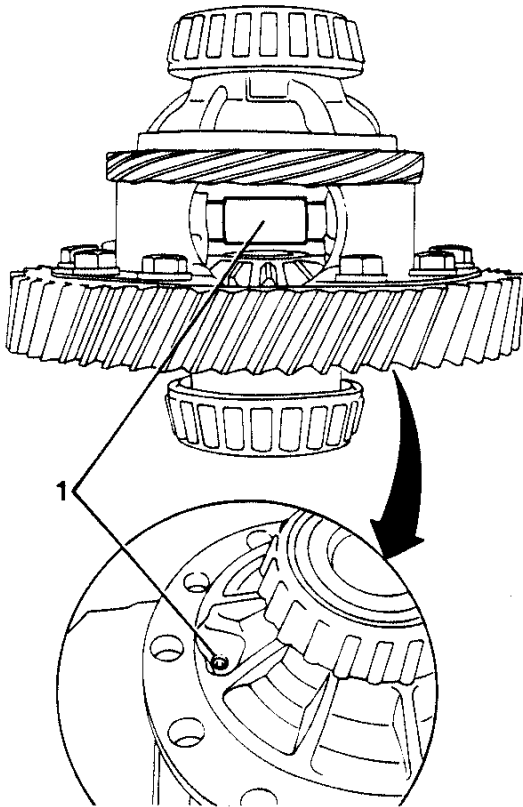




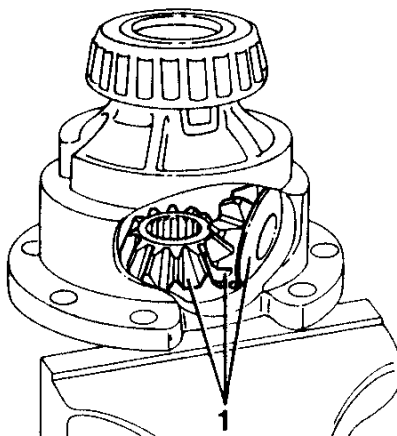
- 1. Using a suitable punch withdraw the side pinion shaft from the differential casing provoking the shearing of the flexible retaining pin.



During installation re-insert a suitable flexible retaining pin.



- 1. Withdraw the pinions, relative anti-slip washers and the crown wheels from the differential casing.



CHECKS AND INSPECTIONS

GEARING

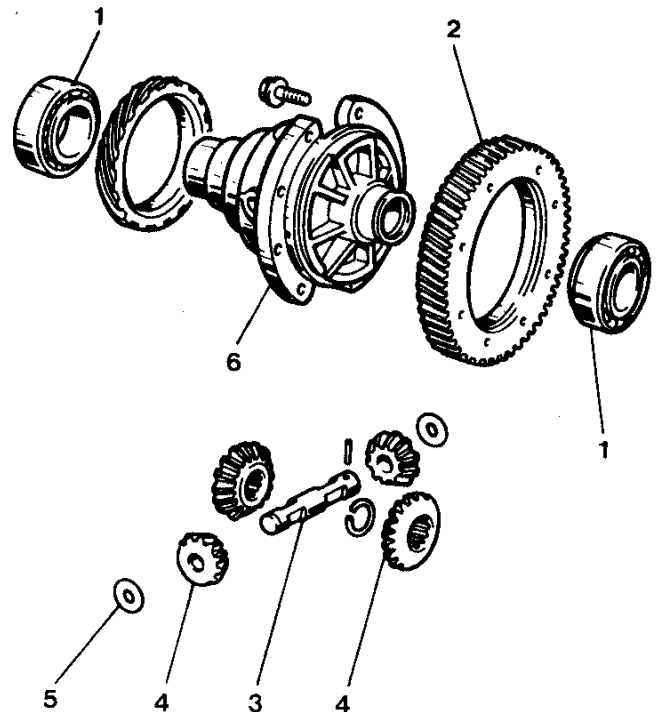
- 1. Check the bearings for scoring, traces of overheating or excessive wear.
- 2. Check the ring gear for nicks or excessive wear.



CAUTION:

When replacing the ring gear (after high mileage), the gearbox layshaft should also be replaced.

- 3. Check the pinion shaft for seizing, wear or excessive play into casing half.
- 4. Check side pinions and crown wheels for nicks or excessive wearing of the working surfaces.
- 5. Check the anti-slip washers located under the side pinions for nicks or signs of wearing of the working surfaces.
- 6. Check the differential casing for cracks or wearing of the working surfaces.

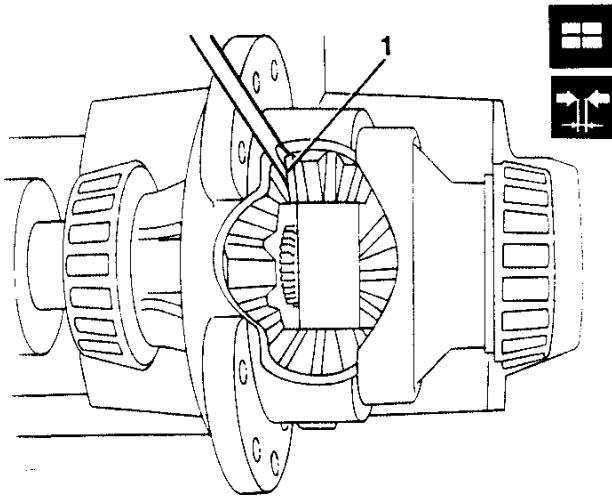




CHECKING PLAY BETWEEN SIDE PINIONS AND CROWN WHEELS

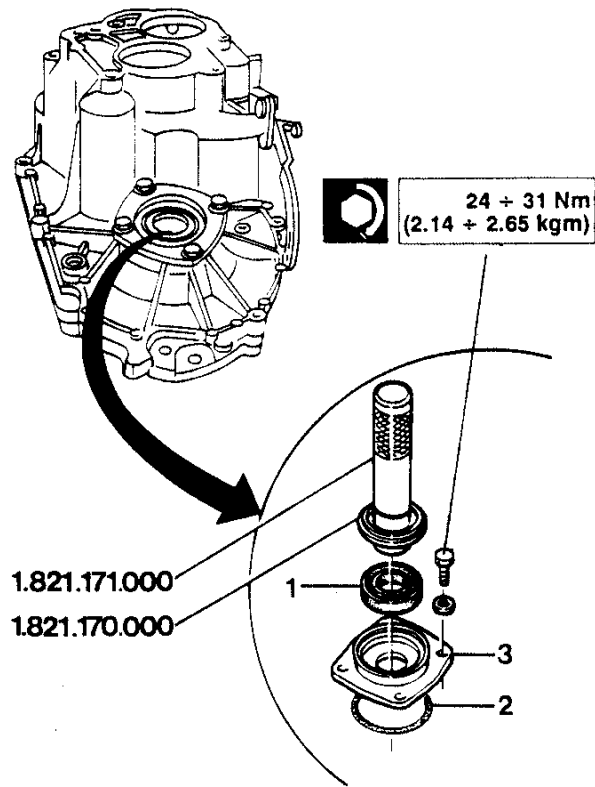
NOTE: As the crown wheels are installed in the differential casing without shim rings, it is not possible to adjust the play between side pinions and crown wheels.

1. After installing the differential casing, check the correct coupling of the crown wheels and side pinions with a screw-driver ensuring that during rotation of the assembly there is a slight resistance and no play.



REPLACING DIFFERENTIAL CASING OIL SEAL ON GEARBOX SIDE

- Remove the gearbox side differential casing seal cover with the seal ring and oil seal.
1. Using tools No. 1.821.171.000 and 1.821.170.000, install the new oil seal in the differential casing seal cover.
 2. Install a new gasket on the cover.
 3. Install the seal cover and tighten all the screws to the specified torque.

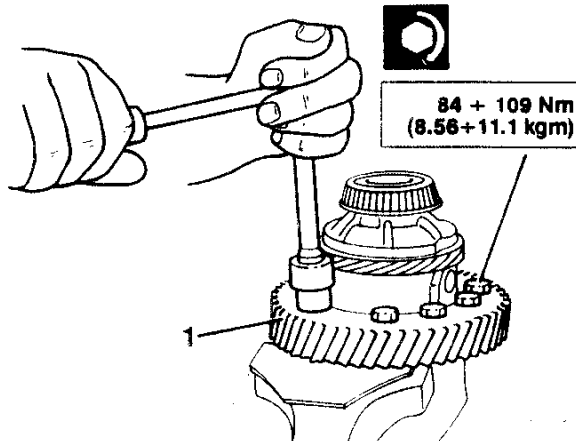


REPLACING DIFFERENTIAL CASING OIL SEAL ON ENGINE SIDE

The replacement of the engine side differential casing seal cover, due to the characteristics of the gearbox itself can be carried out in the workshop when overhauling the gearbox (see: REASSEMBLY 1.8 - 2.0).

**REASSEMBLY**

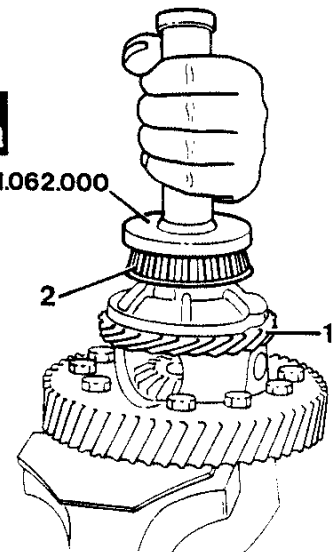
1. Install the ring gear and tighten the screws to the prescribed torque.



1. Install the odometer idle control gear after gradually heating it from ambient temperature to approximately 100° - 120°C in an oven.
2. Using tool No. 1.821.062.000 install the differential casing support roller bearings.



1.821.062.000



Install the differential assembly by reversing the procedures used for disassembly taking care to correctly determine the pre-load thickness of the bearings (see: DIFFERENTIAL ADJUSTMENT).

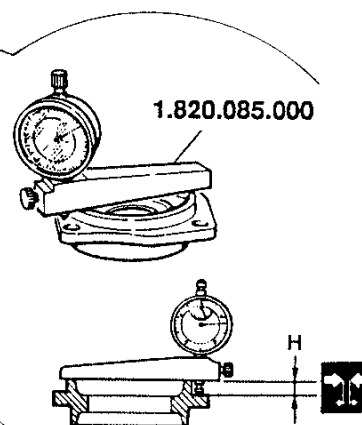
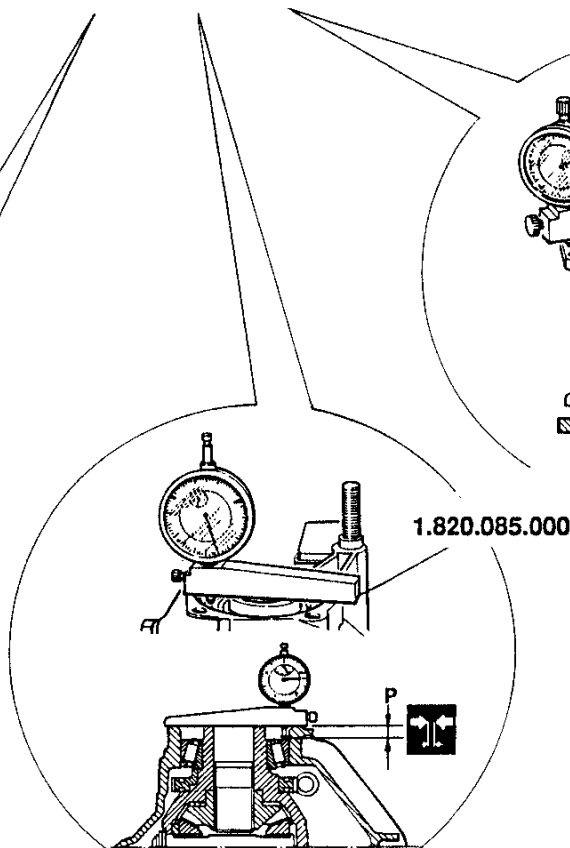
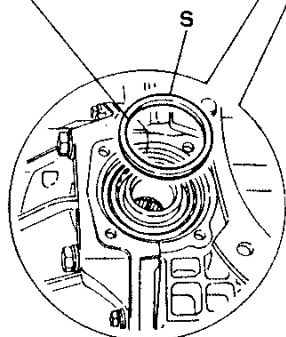
**DIFFERENTIAL ADJUSTMENT**

- Using a centesimal dial gauge and tool No. 1.820.085.000, measure the distance "P" between the resting plane of the seal cover and the outer ring of the roller bearing.

- Using a centesimal dial gauge and tool No. 1.820.085.000, measure height "H" of the seal cover.

$$S = P - H + 0.12$$

mm
1,25
1,30
1,35
1,40
1,45
1,50
1,55
1,60



- Given that the fixed number 0.12 corresponds to the negative allowance prescribed for the settling and pre-loading of the bearings for the differential casing, determine value "S" of the thickness of the shim rings by applying the following formula:

$$S = P - H + 0.12$$

NOTE: After the exact thickness of the shim ring has been obtained select a ring from among those supplied as spare parts which is as near as possible to this value.

If the value obtained in this way does not correspond to one of the shim rings available, or to the sum of two rings, install the next thickness up.

NOTE: Thicknesses "S" of the shim rings supplied as spare parts range from 1.70 to 2.60 mm increasing in steps of 0.05 mm.



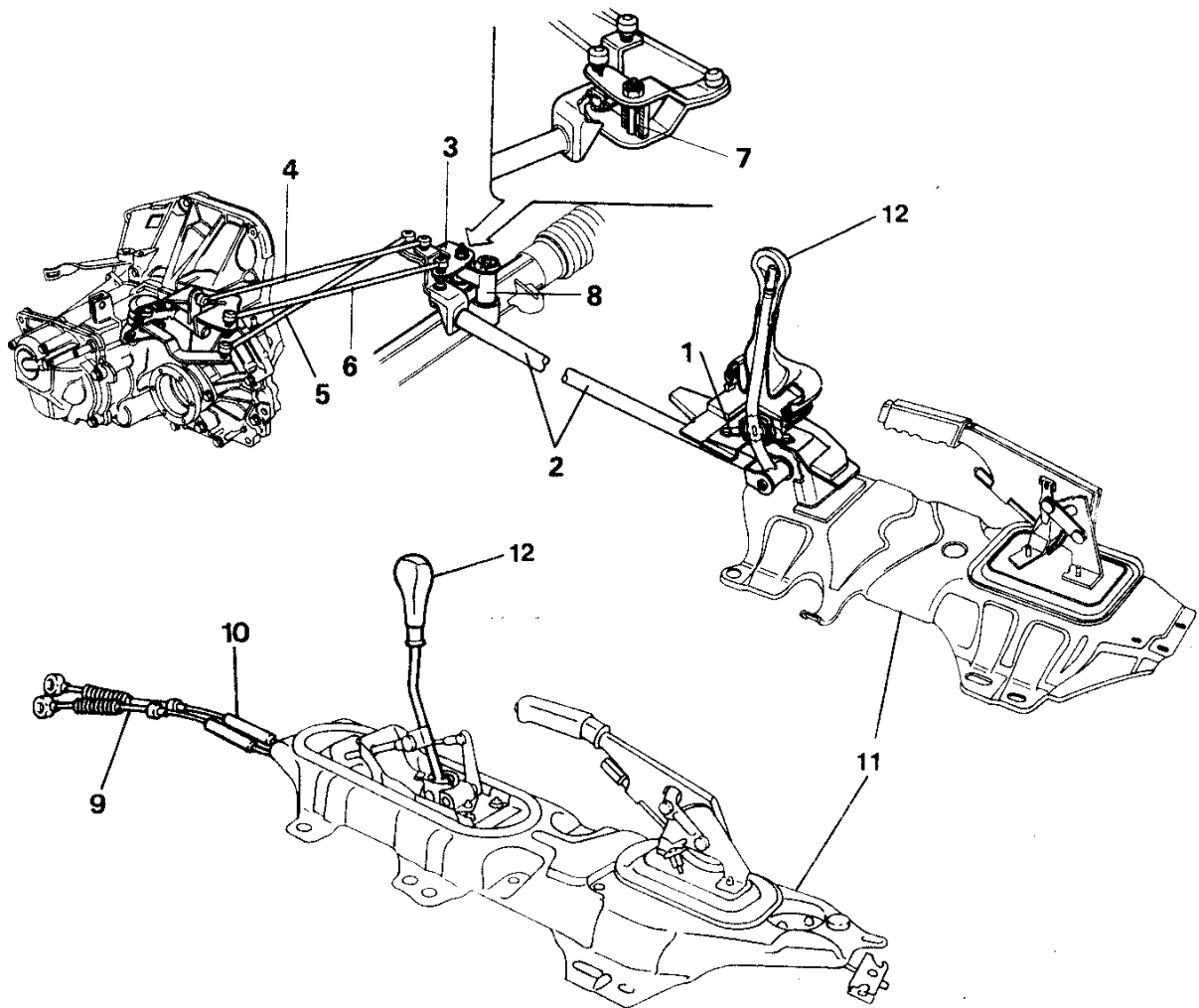
GEARBOX OUTER LINKAGE

DESCRIPTION

The gearbox outer linkage assembly can be divided into two types depending on the type of gearbox.

For gearboxes with a medium-low pick-up torque for 1.8 - 2.0 T.S. engines, the traditional system of shafts and

rods is adopted. For gearboxes with high a pick-up torque for 2.4 V6 engines, a system of control cables has been introduced which, in addition to improving system maintenance, permits a notable reduction in vibration, and a consequent lowering of the noise level when compared to the traditional system. It also improves the characteristics of docility and precision of engagement.



1. Speed selection lever support stand
2. Control rod
3. Speed selection and engagement rod return and support stand
4. Speed selection lever control rod
5. Speed engagement lever control rod
6. Reaction rod

7. Bearings
8. Pin retaining relay support and gear engagement and selection rod support
9. Speed selector cable
10. Speed engagement cable
11. Central support
12. Gear control lever

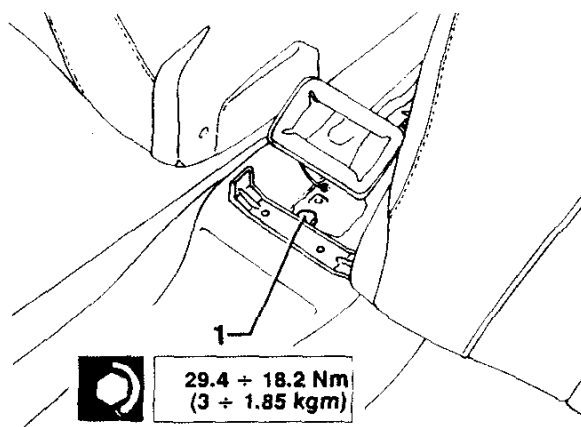
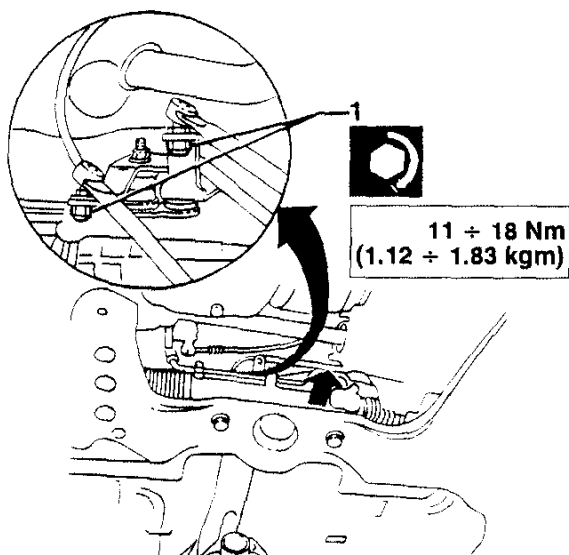


REMOVAL AND INSTALLATION (versions with shafts and rods)

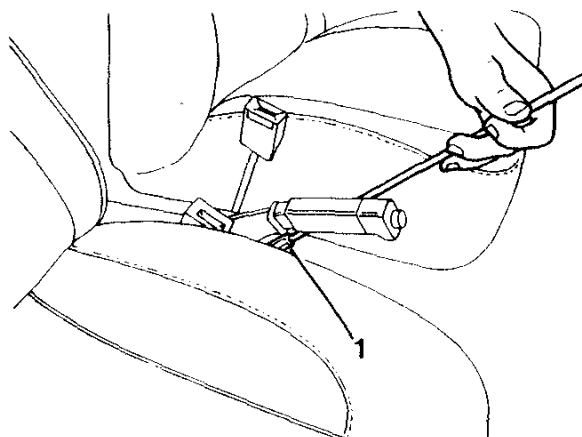
- Operating underneath the vehicle, remove the front and central sections of the exhaust system (see: REPAIR MANUAL - ENGINES - GR. 04 - EXHAUST SYSTEM).

SPEED SELECTION AND CONTROL RODS

1. If necessary remove the speed selection and control rods by unscrewing the nuts securing the spherical joints at the ends of the rods and disconnect them from the relay support and from the gearbox speed selection and engagement devices.



1. Unscrew the handbrake cable adjustment nut located under the lever.

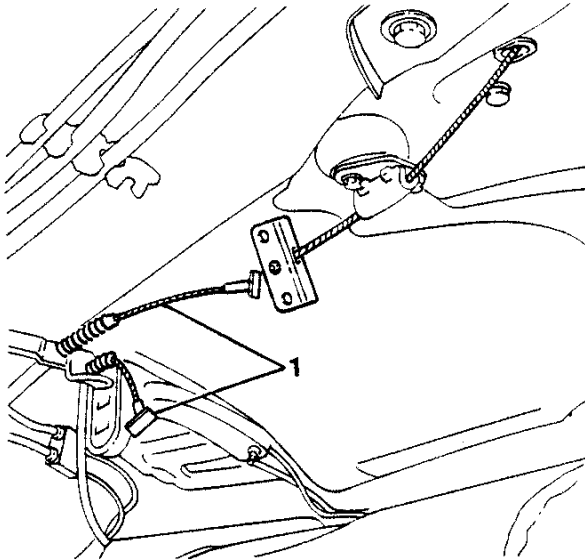


SPEED CONTROL LEVER - CENTRAL SUPPORT

- Operate as follows only if it is necessary to remove the central support together with the speed control lever.
 - Working inside the vehicle remove the central console (see: REPAIR MANUAL - BODY - GR. 75 - CENTRAL CONSOLE).
1. Unscrew the screw securing the central support to the body located near the rear air vent.



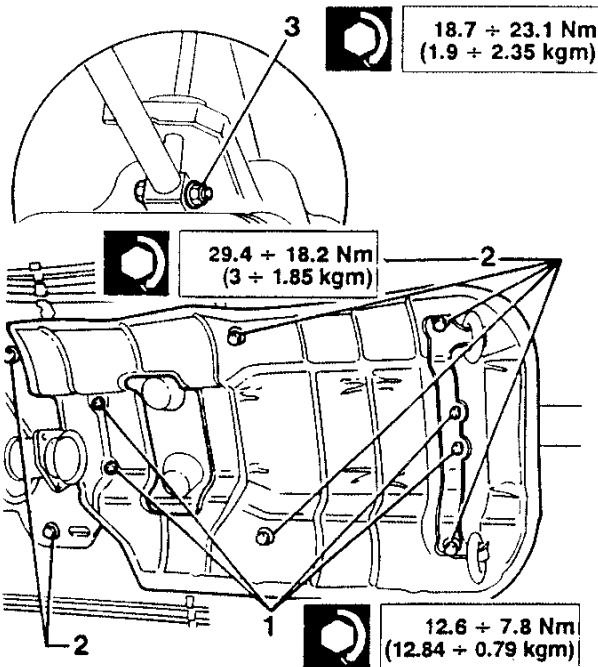
1. Operating under the vehicle, disconnect the hand-brake drive tie-rods from the control bracket.



1. (only for vehicles with catalyzed exhaust system):
 - remove the heat shielding.
2. Unscrew the screws securing the central support to the body and lower the support.
3. Unscrew the bolt securing the lever to the speed control shaft and withdraw the central support together with the control lever.



Install by reversing the process employed for disassembly.

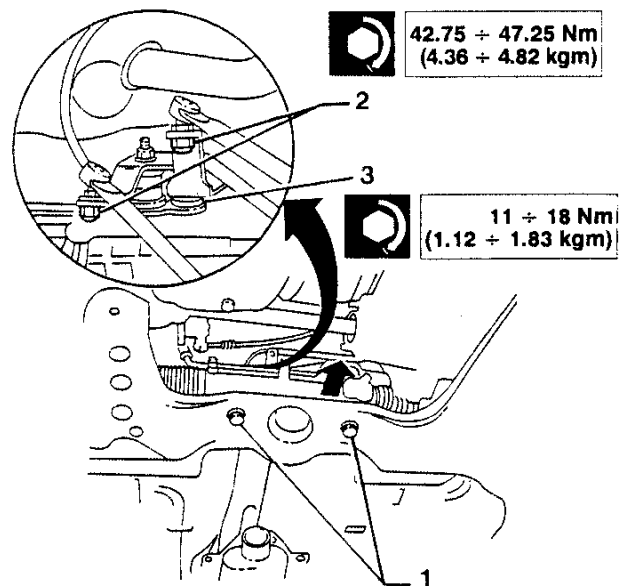


SPEED RODS RELAY SUPPORT

- If it is necessary to remove the speed selection and engagement rods relay, proceed as follows:
 1. Unscrew the screws securing the steering box to the front cross member and move the box forwards.
 2. Unscrew the nuts securing the spherical joints of the speed selection rods from the relay support.
 3. Remove the rubber protection and the underlying clamp and withdraw the relay from the steering box pin.



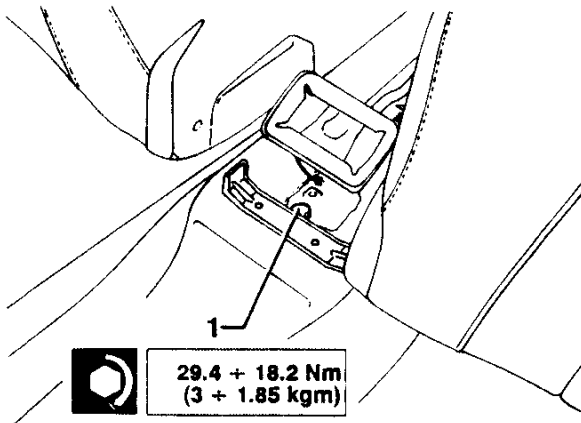
Install by reversing the process employed for disassembly.



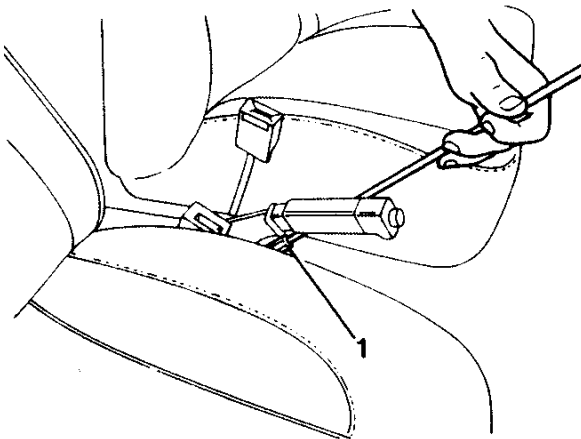


REMOVAL AND INSTALLATION (cable version)

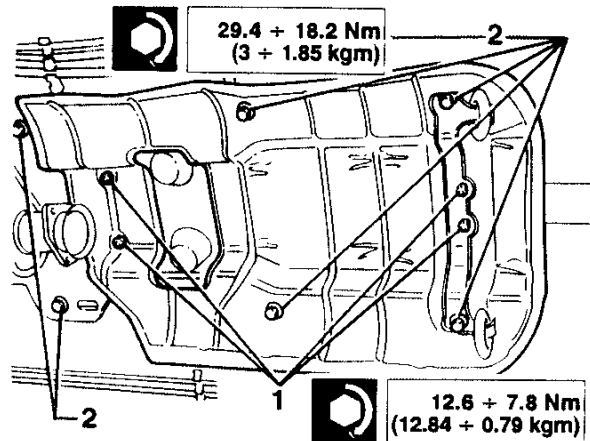
- Operating inside the vehicle remove the central console (see: REPAIR MANUAL - BODY - GR. 75 - CENTRAL CONSOLE).
- Unscrew the screws securing the central support to the body located near the rear air vent.



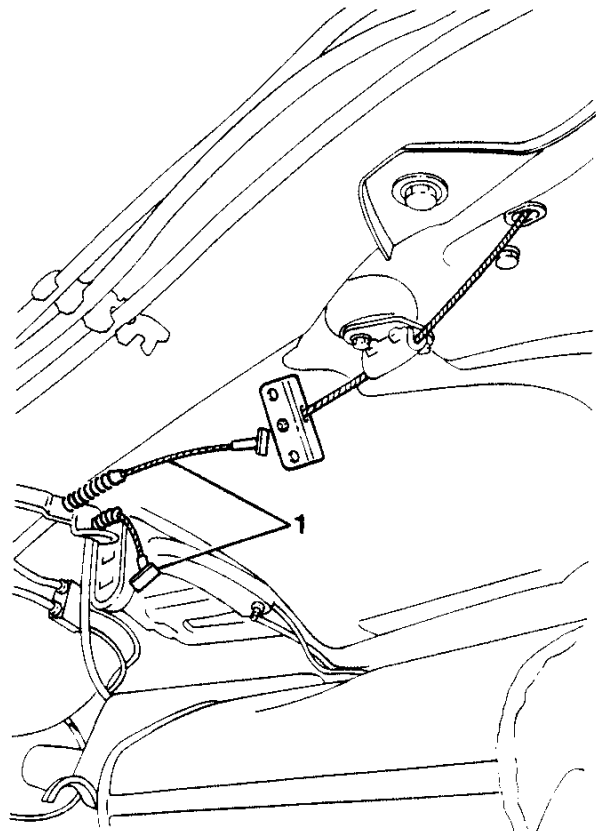
- Unscrew the handbrake control cable adjustment nut located under the lever.



- Operating under the vehicle, remove the front and central sections of the exhaust system (see: REPAIR MANUAL - ENGINES - GR. 04 - EXHAUST SYSTEM).
- (only for versions with catalyzed exhaust system):
 - remove the heat shielding.



- Disconnect the handbrake relay tie-rods from the control bracket.

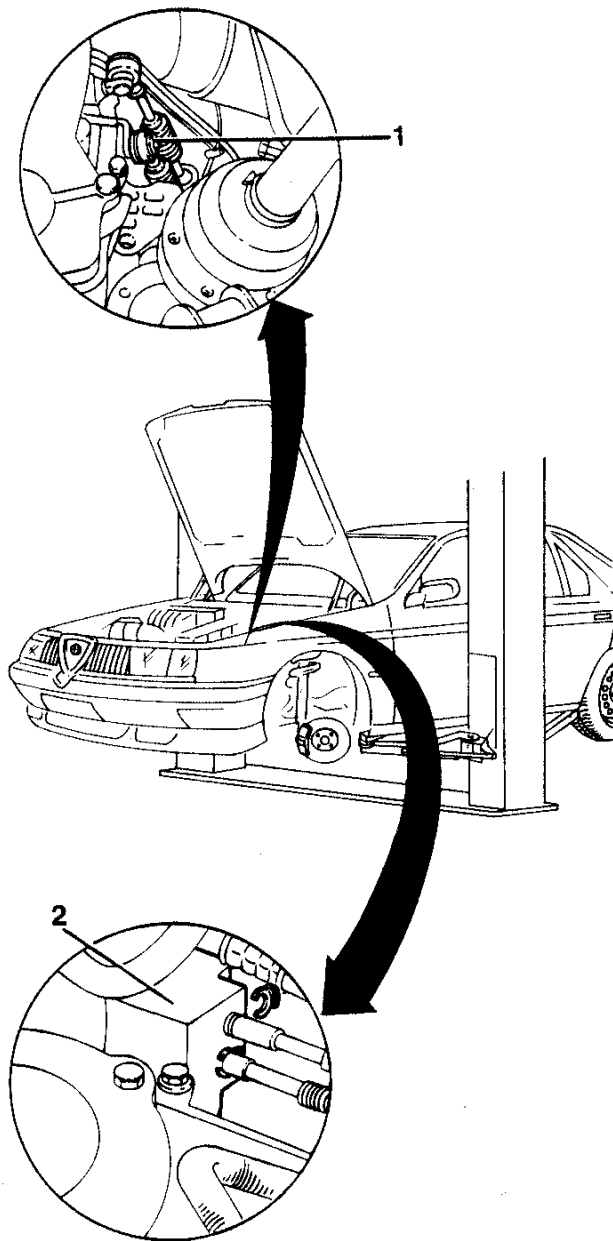




- Operating in the engine compartment, remove the cover-air flow meter assembly (see: REMOVAL AND INSTALLATION).
- 1. Disconnect the clamps securing the gear control cables to the speed engagement device.
- 2. Remove the checking points securing the speed selection and engagement cables to the supporting bracket and withdraw the cables from the bracket and pulling them through from the underside of the vehicle.
- 3. Unscrew the screws securing the the central support to the body and remove them together with the cables.



Install by reversing the procedure followed for disassembly taking care that the speed engagement and selection cables are correctly positioned on their relative devices.

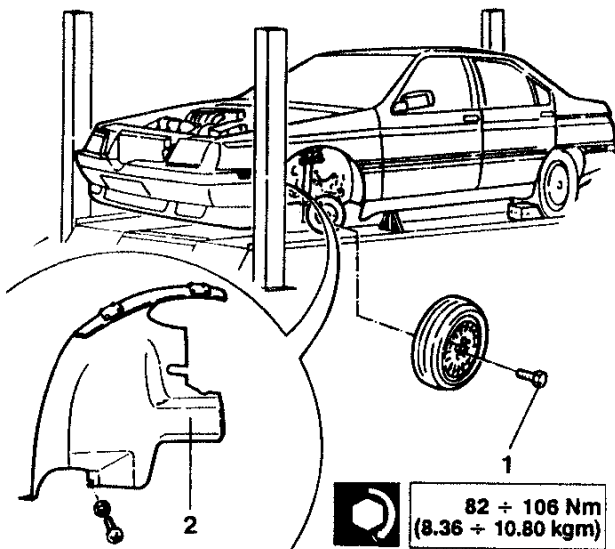




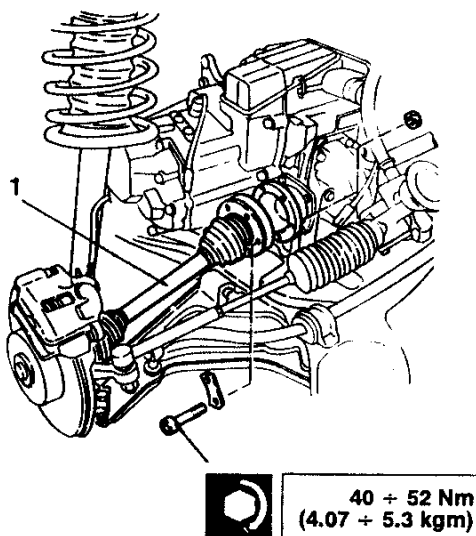
INTERVENTIONS CARRIED OUT ON THE VEHICLE

REPLACING DIFFERENTIAL CASING OIL SEAL ON GEARBOX SIDE (2.4 V6 - 1.8 - 2.0 T.S.)

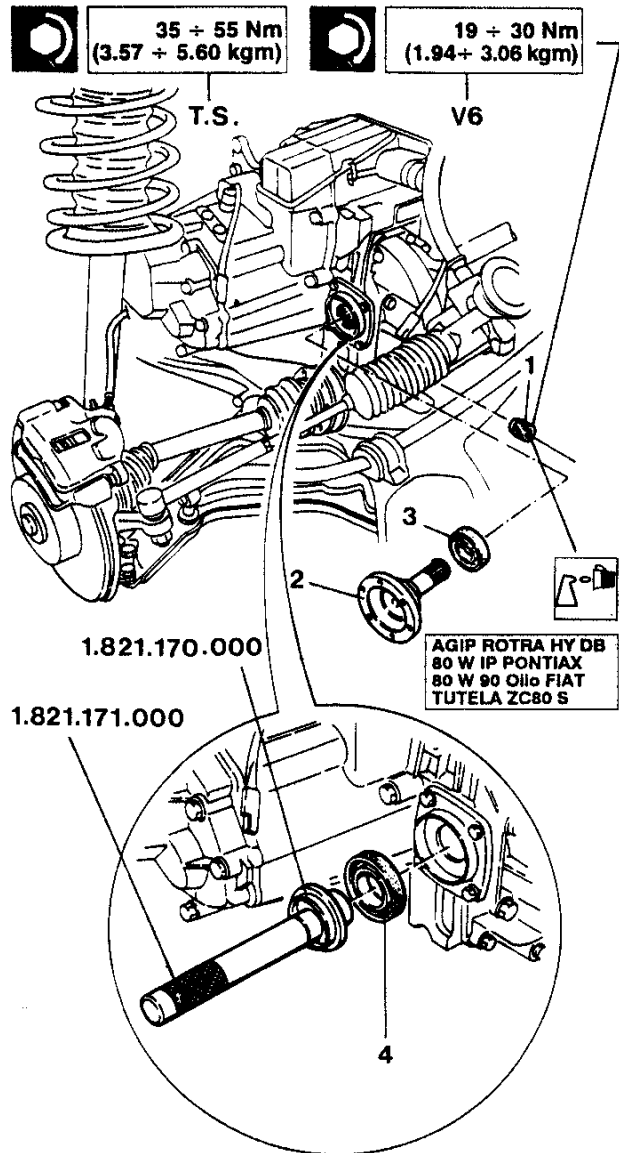
1. Unscrew the bolts and remove the front wheels.
2. Remove the gearbox side wheel housing.



1. Disconnect the left-hand halfshaft from the differential flange.



1. Unscrew the cap and drain off the oil.
2. Using tools No. 1.821.161.000 and 1.820.229.000, remove the flange from the differential.
3. Pull off the old oil seal.
4. Using tools No. 1.821.171.000 and 1.821.170.000, insert the new oil seal.

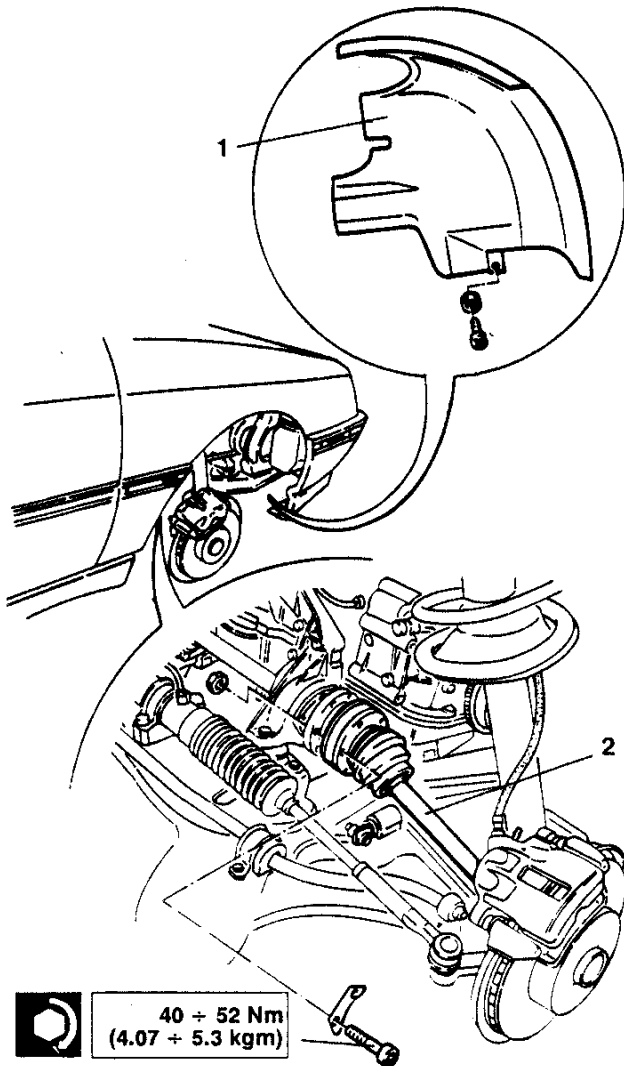


Refit by reversing the procedure followed for removal and tightening the screws to the specified torque.

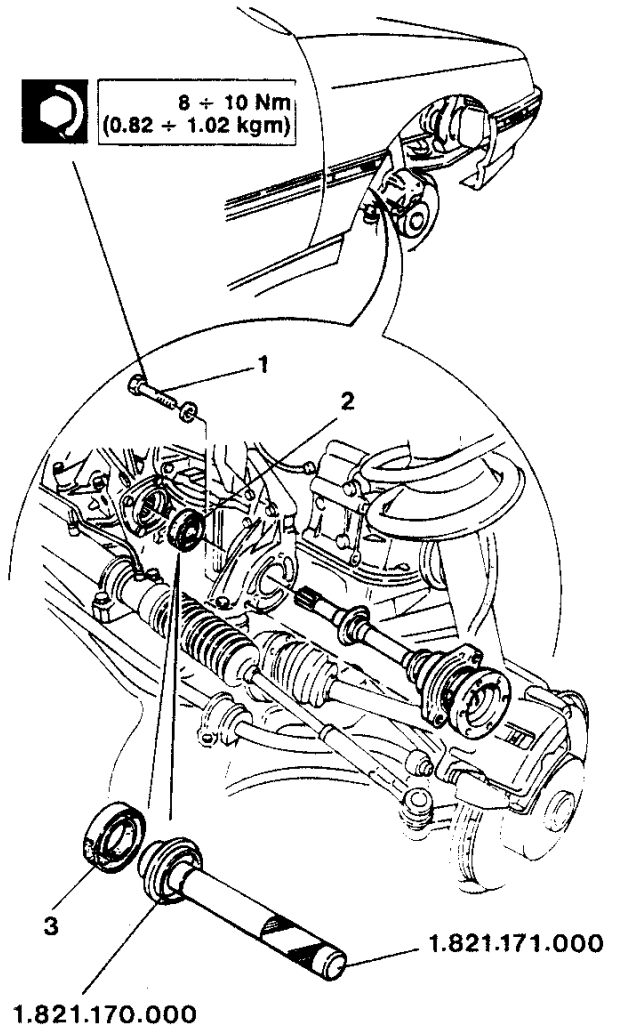


REPLACING DIFFERENTIAL CASING OIL SEAL ON ENGINE SIDE (2.4 V6 model)

1. Remove the front wheel housing.
2. Disconnect the right-hand halfshaft from the intermediate shaft.



1. Remove the bolts securing the intermediate shaft flange and withdraw the shaft from the differential.
2. Pull off the old oil seal.
3. Using tools No. 1.821.170.000 and 1.821.171.000, insert the new oil seal.



Refit by reversing the procedure followed for removal and tightening the screws to the specified torque.



REPLACING DIFFERENTIAL CASING OIL SEAL ON ENGINE SIDE (1.8 - 2.0 T.S. model)

Replacing the engine side differential casing oil seal, due to the construction characteristics of the gearbox itself can only be carried out with the gearbox on the a bench in the overhaul workshp. (See: REASSEMBLY 1.8 - 2.0 T.S.).



TECHNICAL DATA AND SPECIFICATIONS

TECHNICAL DATA

GEARBOX RATIOS

Model	Axle ratio	Gear engaged	Gearbox ratio	Total ratio
1.8.T.S. (167A4C)	16/57 1 : 3.562	1	1 : 3.545	1 : 12.627
		2	1 : 2.267 ◆ 1 : 2.238	1 : 8.075 ◆ 1 : 7.972
		3	1 : 1.542	1 : 5.493
		4	1 : 1.156	1 : 4.118
		5	1 : 0.943	1 : 3.359
		RM	1 : 3.909	1 : 13.924
		1.8.T.S. (167A4B) 2.0.T.S. (167A2A)	17/57 1 : 3.353	1
2	1 : 2.267 ◆ 1 : 2.238			1 : 7.601 ◆ 1 : 7.504
3	1 : 1.542			1 : 5.170
4	1 : 1.156			1 : 3.876
5	1 : 0.943			1 : 3.162
RM	1 : 3.909			1 : 13.107
2.4 V6 (167A1)	17/58 1 : 3.412			1
		2	1 : 2.173	1 : 7.425
		3	1 : 1.519	1 : 5.183
		4	1 : 1.156	1 : 3.944
		5	1 : 0.817	1 : 3.129
		RM	1 : 3.545	1 : 12.096

◆ Starting from random chassis no. 9700



Model	Axle ratio	Gear engaged	Gearbox ratio	Total ratio
T.SPARK 1.7 (167A4H)	16/57 1 : 3.563	1	1 : 3.545	1 : 12.631
		2	1 : 2.238	1 : 7.974
		3	1 : 1.541	1 : 5.491
		4	1 : 1.156	1 : 4.119
		5	1 : 0.942	1 : 3.356
		RM	1 : 3.909	1 : 13.928
T.SPARK 1.7 (167A4L)	18/57 1 : 3.167	1	1 : 3.909	1 : 12.380
		2	1 : 2.238	1 : 7.088
		3	1 : 1.440	1 : 4.560
		4	1 : 1.156	1 : 3.661
		5	1 : 0.875	1 : 2.771
		RM	1 : 3.909	1 : 12.380
T.SPARK 1.8 (167A4G)	16/57 1 : 3.563	1	1 : 3.545	1 : 12.631
		2	1 : 2.267	1 : 8.077
		3	1 : 1.541	1 : 5.491
		4	1 : 1.156	1 : 4.119
		5	1 : 0.942	1 : 3.356
		RM	1 : 3.909	1 : 13.928
T.SPARK 2.0 (167A2D)	17/57 1 : 3.353	1	1 : 3.545	1 : 11.886
		2	1 : 2.267	1 : 7.601
		3	1 : 1.541	1 : 5.170
		4	1 : 1.156	1 : 3.876
		5	1 : 0.942	1 : 3.159
		RM	1 : 3.909	1 : 13.107
2.5V6 (167A1C)	17/58 1 : 3.412	1	1 : 3.500	1 : 11.932
		2	1 : 2.176	1 : 7.425
		3	1 : 1.524	1 : 5.200
		4	1 : 1.156	1 : 3.944
		5	1 : 0.917	1 : 3.129
		RM	1 : 3.545	1 : 12.096



VERSIONS '95

Model	Axle ratio	Gear engaged	Gearbox ratio	Total ratio
T.SPARK 1.7 (167A4H) (167A4G) T.SPARK 1.8 (167A4E)	16/57 1 : 3.562	1	1 : 3.545	1 : 12.627
		2	1 : 2.238	1 : 7.792
		3	1 : 1.520	1 : 5.414
		4	1 : 1.156	1 : 4.118
		5	1 : 0.946	1 : 3.370
		RM	1 : 3.909	1 : 13.924
T.SPARK 1.7 (167A4L) T.SPARK 1.8 (167A4M)	18/57 1 : 3.167	1	1 : 3.909	1 : 12.380
		2	1 : 2.238	1 : 7.088
		3	1 : 1.444	1 : 4.573
		4	1 : 1.156	1 : 3.661
		5	1 : 0.872	1 : 2.762
		RM	1 : 3.909	1 : 12.380
2.5V6 (167A1E)	17/54 1 : 3.176	1	1 : 3.500	1 : 11.118
		2	1 : 2.235	1 : 7.099
		3	1 : 1.522	1 : 4.834
		4	1 : 1.156	1 : 3.672
		5	1 : 0.914	1 : 2.903
		RM	1 : 3.545	1 : 11.260


**GENERAL INDICATIONS****FLUIDS AND LUBRICANTS**

APPLICATION	TYPE	NAME
Gearbox/differential unit oil filling	OIL	AGIP ROTRA HY DB 80W IP PONTIAX 80W90 FIAT TUTELA ZC 80S oil
Clutch control fork bearing and thrust bearing seat	GREASE	AGIP GREASE 33 FD IP AUTOGREASE FD
Speed engagement control rod bushings and gear lever ball joint	GREASE	ISECO MOLIKOTE LONGTERM No. 2 FIAT GREASES/IX

SEALANTS AND SURFACE FIXING AGENTS

APPLICATION	TYPE	NAME
Rear cover and gearbox casing	HERMETIC	LOCTITE 573

CHECKS AND ADJUSTMENTS**DIFFERENTIAL - CROWN WHEEL/SIDE PINION BACKLASH**

	2.4 V6
	0.07 - 0.20 mm

NOTE: Backlash between crown wheel and idle pinion is adjusted by using spare rings with a thickness ranging from 1.80 mm to 2.20 mm.

**TIGHTENING TORQUES - 2.4 V6****GEARBOX - DIFFERENTIAL**

Description	N·m	kg·m
Screw securing clutch disengagement sleeve support cover	7 - 9	0.71 - 0.92
Screw securing left and right side covers to casing	24 - 31	2.45 - 3.16
Screws securing gearbox casing to support	24 - 31	2.45 - 3.16
Screws securing rear cover to gearbox casing	24 - 31	2.45 - 3.16
Threaded plug for gearbox oil drainage	19 - 30	1.94 - 3.06
Screw securing differential cover to engine-gearbox support (length 55 mm)	24 - 31	2.45 - 3.16
Screw securing differential cover to engine-gearbox support (length 20 mm)	48 - 62	4.89 - 6.32
Screw retaining gearbox control rod spring	19 - 30	1.94 - 3.06
Ring nut locking main shaft gears	143 - 185	14.57 - 18.86
Ring nut locking drive shaft gears	143 - 185	14.57 - 18.86
Screw securing main shaft rear bearing retaining plate	24 - 31	2.45 - 3.16
Screw securing transmission shaft rear bearing retaining plate	24 - 31	2.45 - 3.16
Self-locking screw securing 1st and 2nd speed fork	24 - 31	2.45 - 3.16
Self locking screw securing 3rd and 4th speed prong	24 - 31	2.45 - 3.16
Self locking screw securing 3rd and 4th speed fork	24 - 31	2.45 - 3.16
Self locking screw securing reverse and 5th speed prong	24 - 31	2.45 - 3.16
Screw fixing complete reverse lever	24 - 31	2.45 - 3.16
Self locking screw securing 5th speed fork	24 - 31	2.45 - 3.16
Screw securing gearbox control shaft bushing to casing	7 - 9	0.71 - 0.92
Self-locking nut securing gear lever to internal shaft	24 - 31	2.45 - 3.16
Screw securing gear lever to outer shaft	24 - 31	2.45 - 3.16
Screw securing odometer support	8 - 12	0.82 - 1.22
Self-locking screw securing crown gear	81 - 90	8.26 - 9.17



Reversing light switch screw	20 - 40	2.04 - 4.08
Screws securing differential side coupling to flange	40 - 52	4.07 - 5.3
Screw securing axle shaft intermediate flange	8 - 10	0.82 - 1.02

ENGINE-GEARBOX SECURING DEVICES

Description	N-m	kg-m
Screw securing gearbox assembly support to engine	41 - 53	4.18 - 5.41
Screw securing flywheel cover to gearbox assembly support	6 - 10	0.61 - 1.02
Screw securing starter motor to gearbox assembly support	20 - 25	2.04 - 2.55
Nut securing supply cable to starter motor	10 - 12	1.01 - 1.22

GEARBOX OUTER LINKAGE

(Version with rods)

Description	N-m	kg-m
Screw securing rear flexible block to speed engagement reaction rod	4.5 - 7.1	0.45 - 0.72
Screw securing speed engagement lever ball-joint to complete support	5.6 - 7.3	0.57 - 0.74
Self-locking nut securing end of rod support to bracket on gearbox	5.6 - 7.3	0.57 - 0.74
Screw securing speed engagement reaction rod bracket to gearbox	10 - 12	1.01 - 1.22
Self-locking nut securing speed engagement tie-rod fork to gear lever	8.7 - 11.2	0.88 - 1.14
Screw securing speed engagement tie-rod to coupling	16 - 21	1.63 - 2.14
Screw securing coupling to gearbox output rod	19 - 25	1.93 - 2.54
Self-locking nut securing rod cover to body	4.6 - 7.2	0.46 - 0.73
Self-locking nut securing anti-vibration weight on gearbox reaction rod	12 - 16	1.22 - 1.63



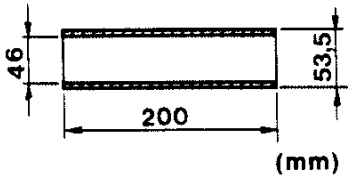
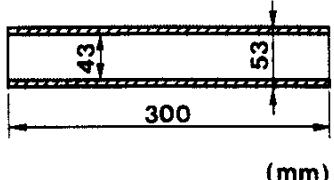
(Version with cables)

Description	N·m	kg·m
Nut with self-locking flange securing gearbox reaction cables bracket to tunnel	7.1 - 9	0.72 - 0.92
Screw securing gearbox reaction cables to gearbox	14 - 18	1.43 - 1.83

**SPECIAL TOOLS 2.4 V6**

TOOL NUMBER	DESCRIPTION
1.820.018.000	half rings for: – extracting main shaft rear bearing – extracting main shaft 4th speed drive gear
1.820.023.000	Half plate for: – extracting layshaft front bearing
1.820.024.000	Half ring support plate (Use with 1.820.018.000)
1.820.043.000	Half rings for: – extracting layshaft 4th speed driven gear – extracting layshaft rear bearing
1.820.046.000	Half rings for: – extracting layshaft 2nd and 3rd speed driven gears – extracting layshaft 2nd speed synchronizer – extracting layshaft 1st speed driven gear sliding hub-sleeve
1.820.047.001	Half ring support plate (Use with 1.820.043.000)
1.820.047.003	Half ring support plate (Use with 1.820.046.000)
1.820.085.000	Tool for measuring thickness of differential casing bearing shim rings
1.820.125.000	Mandrel for checking differential axial play
1.820.146.000	Plate for supporting gearbox on rotary stand
1.820.208.000	Support for gearbox removal/installation (Use with 1.820.230.000)
1.820.226.000	Engine support (Use with 1.820.239.000 and 1.820.581.000)
1.820.229.000	Flange (Use with 1.821.161.000)
1.820.230.000	Bracket for gearbox removal/installation (Use with 1.820.208.000)
1.820.239.000	Supports for gearbox-engine stand (Use with 1.820.581.000 and 1.820.226.000)
1.820.581.000	Engine support horizontal cross member (Use with 1.820.239.000 and 1.820.226.000)
1.820.034.000	Differential bearing puller
1.821.047.000	Tool for inserting 1st, 3rd and 5th speed control rod safety pawls
1.821.049.000	Half plate for extracting/inserting main shaft rear and front bearings



TOOL NUMBER	DESCRIPTION
1.821.092.000	Inserting tool for: – main shaft rear and front bearings – layshaft rear bearing – layshaft 4th speed driven gear
1.821.161.000	Mallet for extracting differential flange (Use with 1.820.229.000)
1.821.169.000	Puller for steering lateral tie-rod pin
1.821.170.000	Key for inserting differential cover oil seal (Use with 1.821.171.000)
1.821.171.000	Hand grip (Use with 1.821.170.000)
 <p>(mm)</p>	Inserting tool for: – layshaft front bearing – layshaft 1st and 2nd speed engagement sliding sleeve-hub – layshaft 3rd speed driven gear
 <p>(mm)</p>	Inserting tool for differential bearings

**TIGHTENING TORQUES - 1.8 T.S. - 2.0 T.S.****GEARBOX - DIFFERENTIAL**

Description	N·m	kg·m
Nut securing spring inserting speed control rod	20 - 40	2.03 - 4.07
Screw securing gearbox plate and cover	24 - 31	2.45 - 3.16
Screw securing cover on gearbox coupling support to engine	10 - 12	1.01 - 1.22
Screw securing gearbox to engine junction support	24 - 31	2.45 - 3.16
Screw securing reverse speed shaft	32 - 42	3.26 - 4.28
Ring nut for main and lay shafts securing 5th speed gear	113 - 145	11.51 - 14.78
Screw securing speed control forks	17 - 22	1.71 - 2.21
Screw securing lever to speed selection and engagement control shaft	24 - 31	2.44 - 3.16
Screw securing support for reverse speed control lever	10 - 12	1.01 - 1.22
Screw securing speed control shaft bushing	10 - 12	1.01 - 1.22
Screw securing differential cylindrical crown gear	84 - 109	8.56 - 11.1
Screw securing differential casing retaining flange to gearbox	24 - 31	2.45 - 3.16
Screw securing speedometer support	9 - 14	0.91 - 1.42
Threaded magnetic tapered cap for gearbox oil drainage	35 - 55	3.56 - 5.6
Threaded tapered cap for introduction of gearbox oil	35 - 55	3.56 - 5.6
Screw securing right differential shaft support	7.8 - 12	0.79 - 1.22
Threaded tapered cap for 1st and 2nd speed rod seat on gearbox	15 - 24	1.52 - 2.45
Screw securing speed selection lever support	11 - 18	1.12 - 1.83
Screw securing differential side coupling to flange	40 - 52	4.07 - 5.3
Screw securing damping counterweight to axle shaft	5.6 - 8.8	0.57 - 0.89
Screw securing intermediate axle shaft	8 - 10	0.82 - 1.02
Reversing light switch screw	20 - 40	2.04 - 4.08

**ENGINE - GEARBOX SECURING DEVICES**

Description	N·m	kg·m
Nut for stud on gearbox support for gearbox-engine coupling	21 - 27	2.14 - 2.76
Screw with unlosable washer securing flywheel cover to gearbox junction support	6 - 10	0.61 - 1.01
Screw securing starter motor to gearbox coupling support	20 - 25	2.04 - 2.55
Screw securing gearbox coupling support to engine	20 - 25	2.04 - 2.55
Nut securing starter motor supply cable	10 - 12	1.01 - 1.22

GEARBOX OUTER LINKAGE

Description	N·m	kg·m
Screw securing gear lever support to floor	5.6 - 8.8	2.03 - 4.07
Screw securing lower speed selection and engagement rod to gear lever	21 - 26	2.14 - 2.65
Self-locking nut for intermediate control retaining pin	11 - 18	1.12 - 1.83
Self-locking nut securing engagement tie-rod head to intermediate lever	11 - 18	1.12 - 1.83
Self-locking nut for screws securing selection intermediate control to gearbox	14 - 18	1.42 - 1.83

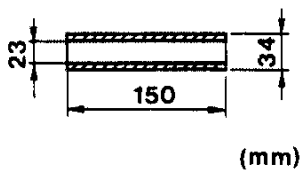
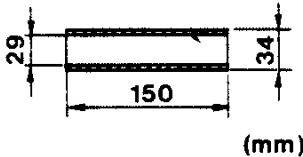
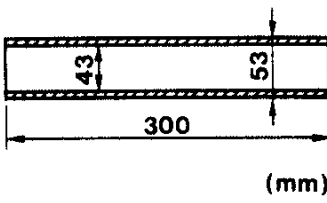


SPECIFIC TOOLS - 1.8 T.S. - 2.0 T.S.

GEARBOX - DIFFERENTIAL

TOOL NUMBER	DESCRIPTION
1.820.017.000	Half rings for: - extracting layshaft 4th speed driven gear - main shaft disassembly
1.820.019.000	Plate for extracting layshaft 2nd and 3rd speed driven gears
1.820.022.000	Half plates for inserting inner race of main shaft front bearing
1.820.024.000	- Half ring support plate (Use with 1.820.017.000) - Plate for extracting layshaft 1st speed driven gear
1.820.146.000	Plate supporting gearbox on rotary stand
1.820.208.000	Support for gearbox removal/installation (Use with 1.820.227.000)
1.820.226.000	Engine support (Use with 1.820.239.000 and 1.820.581.000)
1.820.227.000	Brackets for gearbox removal/installation (Use with 1.820.208.000)
1.820.229.000	Flange (Use with 1.821.161.000)
1.820.239.000	Supports for gearbox-engine stand (Use with 1.820.581.000 and 1.820.226.000)
1.820.581.000	Engine support horizontal cross member (use with 1.820.239.000 and 1.820.226.000)
1.821.003.000	Beater for withdrawing outer race of differential support bearing
1.821.028.000	Inserting tool for outer race of differential support bearing
1.821.034.000	Puller for differential bearings
1.821.047.000	Inserting tool for safety pawl 1st, 3rd and 5th speed control rods
1.821.049.000	Half plates for: inserting main shaft rear bearing
1.821.050.000	Inserting tool for 4th speed driven gear
1.821.062.000	Inserting tool for differential bearings
1.821.092.000	Inserting tool for 1st speed driven gear
1.821.117.000	Puller for dismantling inner race of main and layshaft front bearing



TOOL NUMBER	DESCRIPTION
1.821.161.000	Mallet for extracting differential flange (Use with 1.820.229.000)
1.821.169.000	Puller for side tie-rod pin of steering wheel
1.821.170.000	Inserting tool for gearbox side differential casing oil seal (Use with 1.821.171.000)
1.821.171.000	Grip (Use with 1.821.225.000)
1.821.225.000	Inserting tool for engine side differential casing oil seal (Use with 1.821.171.000)
 <p>(mm)</p>	Inserting tool for: inner race of main shaft front bearing (Use with 1.820.022.000)
 <p>(mm)</p>	Inserting tool for: main and layshaft rear bearing (Use with 1.821.049.000)
 <p>(mm)</p>	Inserting tool for: layshaft 2nd and 3rd speed gears and synchronizer hub

**FAULT DIAGNOSIS AND CORRECTIVE ACTION**

SYMPTOMS AND ANOMALIES	FAULT ISOLATION	TEST
	<p>When the origin of the noise has been identified and does not therefore originate from the engine, locate the anomalous group as indicated below:</p> <ul style="list-style-type: none">- Start the engine- The gearbox should be idling; in this state noises can be noted- Within reason vary the speed of the vehicle and engage different gears in order to locate the anomaly with precision- During these operations it may be difficult to engage the gears, or there may be excessive play in the gear control or a fault in the reverse gear electrical circuit	
NOISY GEARBOX/DIFFERENTIAL GROUP		A
NOISY GEARBOX WHEN IN NEUTRAL (STATIONARY VEHICLE)		B
CONSTANT NOISE DURING TRAVEL AND WITH GEARBOX IN NEUTRAL		C
SPECIFIC GEAR NOISE DURING ACCELERATION AND/OR DECELERATION		D
NOISE DURING ACCELERATION AND DECELERATION MOSTLY EXPERIENCED IN 4th OR 5th GEAR		E

**FAULT DIAGNOSIS AND CORRECTIVE ACTION**

SYMPTOMS AND ANOMALIES	FAULT ISOLATION	TEST
KNOCKS DURING PICK UP OR GEAR SPEED CHANGE		F
NOISE IN CURVES BOTH AT NORMAL GEAR SPEED AND IN NEUTRAL		G
NOISY REVERSE GEAR		H
BINDING OF GEARBOX CONTROL AND POSSIBLE NON-RETURN OF GEAR LEVER TO NEUTRAL		I
EXCESSIVE PLAY DURING GEAR SPEED CHANGE AND NOISE/VIBRATION OF GEAR LEVER		L
DIFFICULT OR NOISY (GRATING) ENGAGEMENT/DISENGAGEMENT OF GEAR SPEEDS		M
LOW SENSIBILITY DURING GEAR ENGAGEMENT		N



NOISY GEARBOX/DIFFERENTIAL

TEST A

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
A1	ENGINE OIL LEVEL CHECK		
- Check the oil level		<input checked="" type="checkbox"/> OK ▶	Carry out step A2
		<input type="checkbox"/> OK ▶	Top-up oil to proper level
A2	OIL CHECK		
- Check that gearbox oil has the prescribed characteristics		<input checked="" type="checkbox"/> OK ▶	Carry out step A3
		<input type="checkbox"/> OK ▶	Replace with prescribed oil
A3	CHECK FOR OIL LEAKS		
- Check that oil is not leaking from the oil seals of the differential support, top-up cap or drainage cap		<input type="checkbox"/> OK ▶	Replace the oil seal rings or caps




NOISE DURING ENGINE IDLE (STATIONARY VEHICLE)

TEST B

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
B1	CONTROL IDLE SPEED		
-	Check the engine idle rpm setting	<input checked="" type="checkbox"/> OK ▶ <input checked="" type="checkbox"/> OK ▶	Carry out step B2 Top-up oil to correct level
B2	CHECK OIL LEVEL		
-	Check oil level	<input checked="" type="checkbox"/> OK ▶	Top-up oil to correct level




CONTINUOUS NOISE DURING TRAVEL AND WHEN IDLING	TEST C
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TEST PROCEDURE		RESULT	CORRECTIVE ACTION
C1	CHECK BEARINGS	 ►	Replace bearings and check seatings
-	Check that the main and lay shaft bearings are not worn or damaged		




SPECIFIC GEAR NOISE DURING ACCELERATION AND/OR DECELERATION

TEST D

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
D1	CHECK GEARS		Replace gears
	- Check that the gear teeth mating surfaces are not worn and are free from traces of meshing		



NOISE DURING ACCELERATION AND DECELERATION EXPERIENCED MAINLY IN 4th OR 5th GEAR	TEST E
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TEST PROCEDURE		RESULT	CORRECTIVE ACTION
E1	CHECK SPUR GEAR PAIR		Restore correct play or re-place the spur gear pair
-	Check that the spur gear pair is not worn or damaged and that play is not excessive		




KNOCKING DURING PICKUP OR GEAR SPEED CHANGE

TEST F

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
F1	CHECK SPUR GEAR PAIR		
	- Check the spur gear pair for wear, damage or excessive play	<input type="radio"/> OK ▶ <input checked="" type="radio"/> OK ▶	Carry out step F2 Restore correct play or replace spur gear pair if necessary
F2	CHECK CROWN GEAR ATTACHMENTS		
	- Check that the crown gear attachments are are not loose	<input type="radio"/> OK ▶ <input checked="" type="radio"/> OK ▶	Carry out step F3 Tighten screws
F3	CHECK SPIDER PIN		
	- Check that the spider pin and reltive seating on the differential casing are not worn	<input type="radio"/> OK ▶ <input checked="" type="radio"/> OK ▶	Carry out step F4 Replace differential unit
F4	CHECK PINION SHAFT		
	- Check that the pinion shaft retaining nut is not loose	<input type="radio"/> OK ▶ <input checked="" type="radio"/> OK ▶	Carry out step F5 Tighten or replace nut



NOISE IN CURVES BOTH AT NORMAL GEAR SPEED AND IN NEUTRAL	TEST G
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TEST PROCEDURE		RESULT	CORRECTIVE ACTION
G1	CHECK GEAR TEETH	 ►	Replace differential unit
-	Check that the idle pinion and crown gear teeth are not worn or damaged and are free from traces of meshing		



NOISY REVERSE GEAR	TEST H
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TEST PROCEDURE		RESULT	CORRECTIVE ACTION
H1	CHECK GEARS	OK ►	Replace defective parts
- Check that the reverse gears are not worn or damaged			



BINDING OF GEARBOX CONTROLS AND POSSIBLE NON-RETURN OF GEAR LEVER TO NEUTRAL	TEST I
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TEST PROCEDURE		RESULT	CORRECTIVE ACTION
I1	CHECK GEARBOX LINKAGE		
- Check the gearbox linkage for binding or looseness		<input type="radio"/> OK ▶ <input checked="" type="radio"/> OK ▶	Carry out step I2 Tighten or replace the damaged parts
I2	CHECK LINKAGE LUBRICATION		
- Check that the gearbox linkage parts are sufficiently lubricated		<input checked="" type="radio"/> OK ▶	Lubricate the parts as required

**EXCESSIVE PLAY DURING GEAR SPEED CHANGE AND NOISE/VIBRATION OF GEAR LEVER****TEST L**

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
L1	CHECK LINKAGE PARTS		Check for proper torque and replace parts if necessary
-	Check for wear of selector lever spherical unit, flexible joint bushings and the gear selection rod knuckle bushings		

**DIFFICULT OR NOISY (GRATING) ENGAGEMENT/DISENGAGEMENT OF GEAR SPEEDS****TEST M**

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
M1	CHECK GEARS		
	– Check gear teeth for nicks and excessive wear and inner surfaces for signs of meshing	<input type="radio"/> OK ▶ <input checked="" type="radio"/> OK ▶	Carry out step M2 Replace defective gears
M2	CHECK HUBS AND SLIDING SLEEVES		
	– Check hubs and sliding sleeves for nicks, excessive wear or play and freedom of movement	<input type="radio"/> OK ▶ <input checked="" type="radio"/> OK ▶	Carry out step M3 Replace the sliding sleeves
M3	CHECK SYNCHRONIZER RINGS		
	– Check synchronizer rings for ovalization and inner surface wear	<input type="radio"/> OK ▶ <input checked="" type="radio"/> OK ▶	Carry out step M4 Substitute the synchronizer rings
M4	CHECK PAWL SPRINGS		
	– Check sleeve hub pawl for damage	<input checked="" type="radio"/> OK ▶	Replace the sliding sleeves



LOW SENSIBILITY DURING GEAR ENGAGEMENT

TEST N

TEST PROCEDURE		RESULT	CORRECTIVE ACTION
N1	CHECK FORK CONTROL RODS		
- Check bushings of fork control rods for wear or seizure		<input checked="" type="checkbox"/> OK ▶	Carry out step N2
		<input type="checkbox"/> OK ▶	Replace worn parts
N2	CHECK PAWLS		
- Check pawls and relevant springs for damage		<input checked="" type="checkbox"/> OK ▶	Carry out step N3
		<input type="checkbox"/> OK ▶	Replace defective parts
N3	CHECK RODS		
- Check rods for wear, distortion and freedom of movement		<input checked="" type="checkbox"/> OK ▶	Carry out step N4
		<input type="checkbox"/> OK ▶	Replace rods
N4	CHECK SELECTOR FORK		
- Check selector fork for wear or damage		<input type="checkbox"/> OK ▶	Replace selector