WORKSHOP MANUAL

alfetta

ALFA ROMEO

TRANSMISSION • SUSPENSION
VEHICLE HEIGHT AND GEOMETRY
STEERING GEAR • BRAKES

This publication is intended
for the use by the ALFA ROMEO Service Organisation
and contains instructions for adjusting, repairing and
overhauling the transmission, suspension, brakes and steering.

The operations are fully illustrated in order
to facilitate the identification of the parts or units in question,
of the tool or jig to use, and the correct way to proceed.

The replacement of separate units or parts must be carried
out using only genuine ALFA ROMEO components. Only by this means
can the complete interchangeability and perfect performance
of the various parts be ensured.

When ordering please specify not only
the type of car and the part number from the Spare Parts Catalogue,
but also the chassis and engine serial numbers.

When repairing and overhauling we also recommend strongly the
use of special tools. Finally, this Manual should always be kept
up-to-date with the data and information received through the
'Service Information Sheets' and the 'Up-dating Instructions'
which are issued periodically by the Technical Service Department.

Alfa Romeo Service Department

CONTENTS

WORKSHOP STANDARDS

When dismantling and reassemblying, always use appropriate spanners, extractors and tools (both general and special tools) and not improvised devices, so as to prevent damaging the parts.

To release tight components, tap lightly using only a copper or aluminium hammer, if the parts concerned are made of ferrous materials, or a wood or plastic head mallet, if the parts are made of light alloy (covers, housings, etc.).

Neatly separate the parts belonging to the various units and partially screw the nuts on their corresponding studs or screws.

When dismantling, check that the parts that are to be aligned have a reference number or a distinctive mark on them. If it is discovered that a previously replaced part has not been aligned with such a mark, one should be applied.

Before washing the parts, remove all dirt with a brush and rags (to avoid excessive contamination of the cleaning fluid). Then wash the parts with paraffin or a suitable fluid. Remove any surplus with a compressed air jet. Dry the parts immediately after washing, to avoid corrosion.

After sandblasting or grinding with abrasive discs, etc., wash the parts thoroughly and blow off with compressed air to remove completely all traces of abrasive material. When reassembling, use compressed air or a dry clean brush to clean the parts (especially those that have been machined or ground).

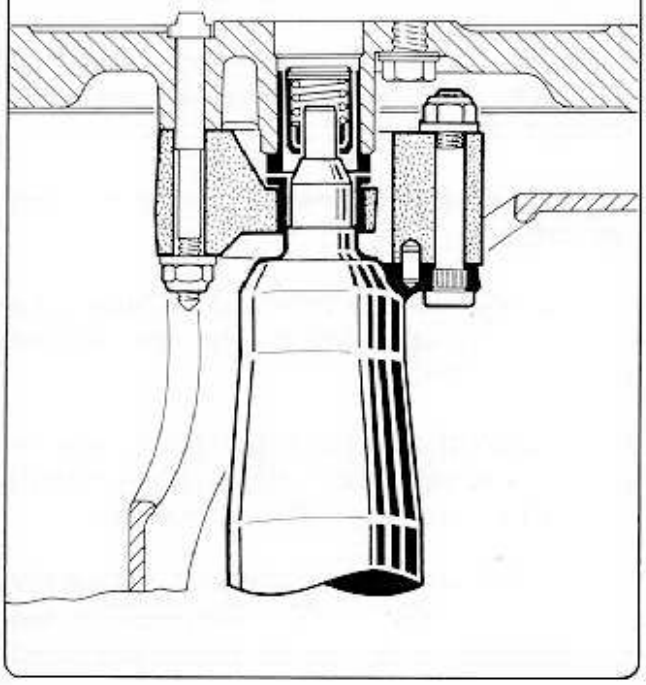
When re-assembling, lubricate the parts adequately (except graphited bushes) to avoid seizure during the initial running period.

When coating parts with a lubricant use specially clean brushes and oil. Protect the containers from dust and use them exclusively for this purpose.

When re-assembling, replace seals, oil seals, gaskets, flexible washers, lockwashers and lock plates, "Palmutter" locknuts and any other parts that appear to be in a doubtful condition.

Use exclusively genuine ALFA ROMEO spare parts

A



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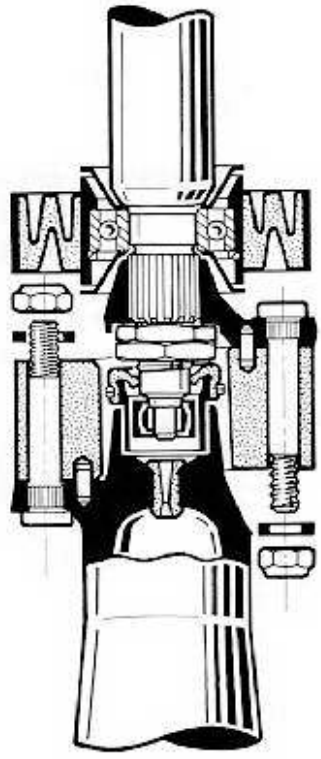

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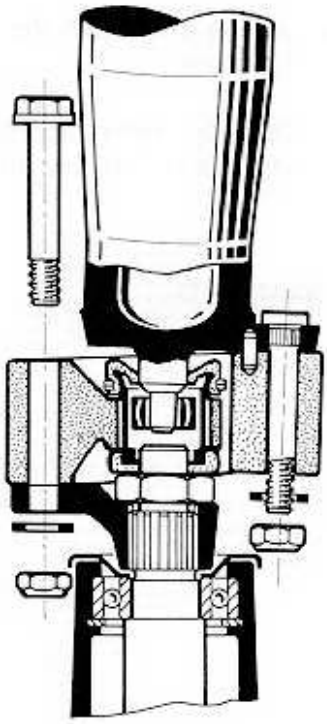

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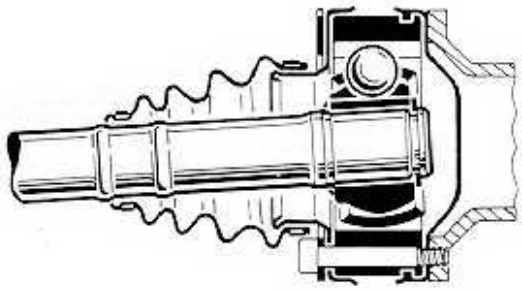
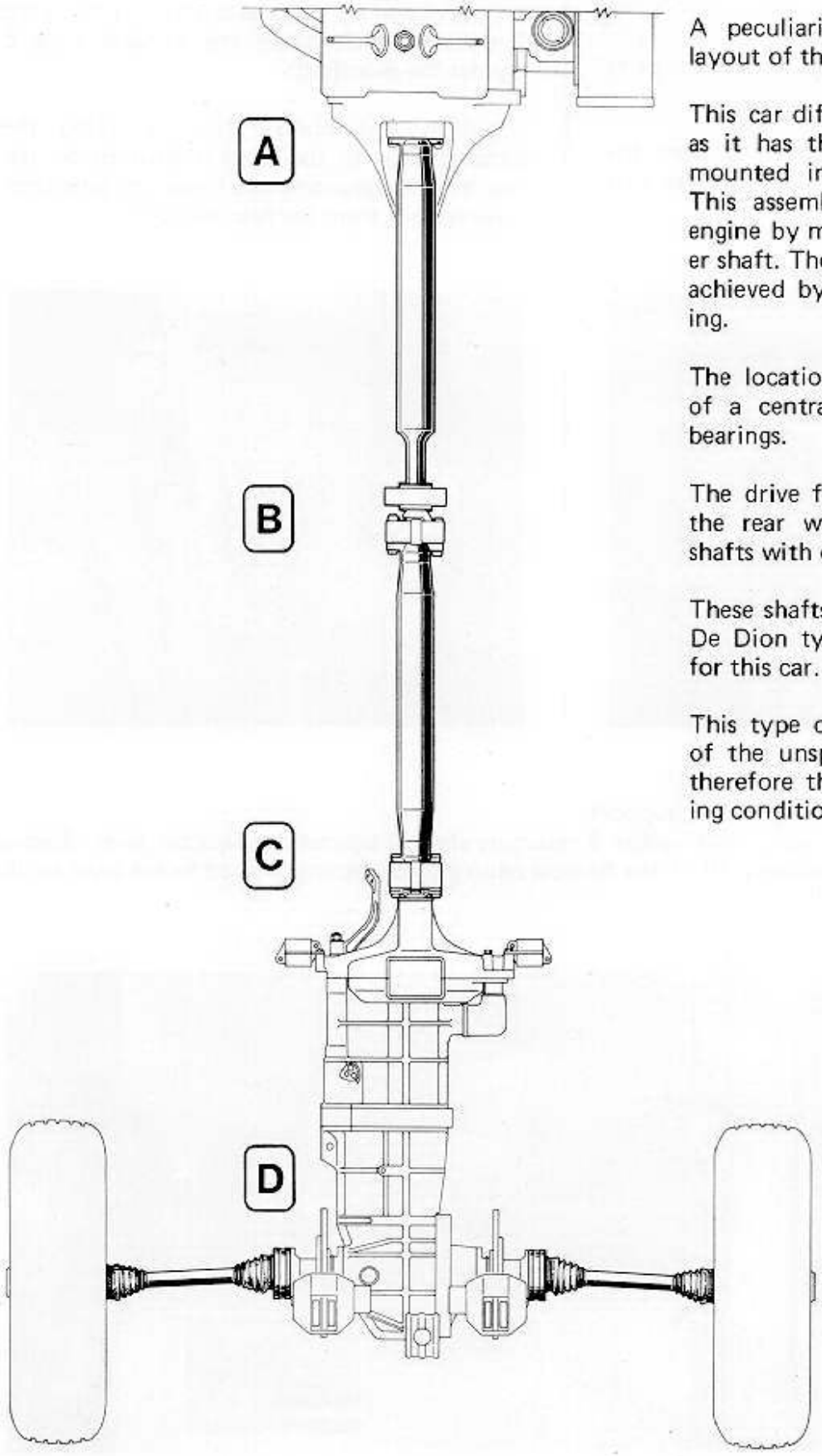


TRANSMISSION



A peculiarity of the Alfetta is the layout of the transmission.

This car differs from conventional cars as it has the clutch and gearbox unit mounted in unit with the rear axle. This assembly is connected with the engine by means of a two-piece propeller shaft. The connection at either end is achieved by means of a flexible coupling.

The location on the body is by means of a central support fitted with ball bearings.

The drive from the differential unit to the rear wheels is by means of half shafts with constant velocity joints.

These shafts are necessary owing to the De Dion type rear axle layout chosen for this car.

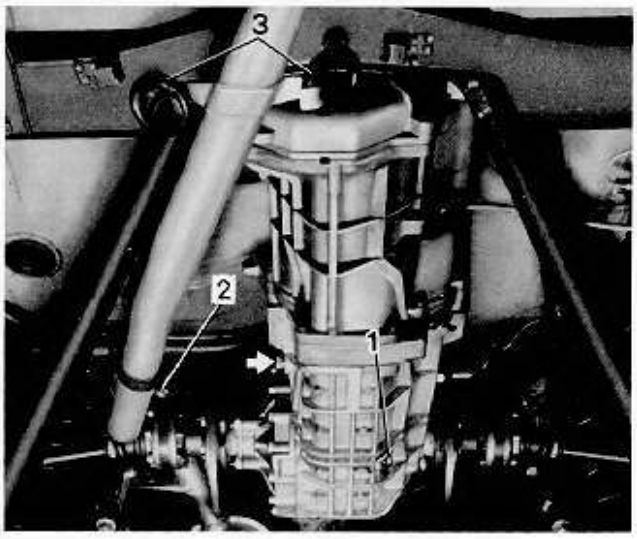
This type of axle achieves a reduction of the unsprung weight and improves therefore the stability under any driving condition.

TO REMOVE PROPELLER SHAFT FROM THE CAR

Place the car on a ramp.

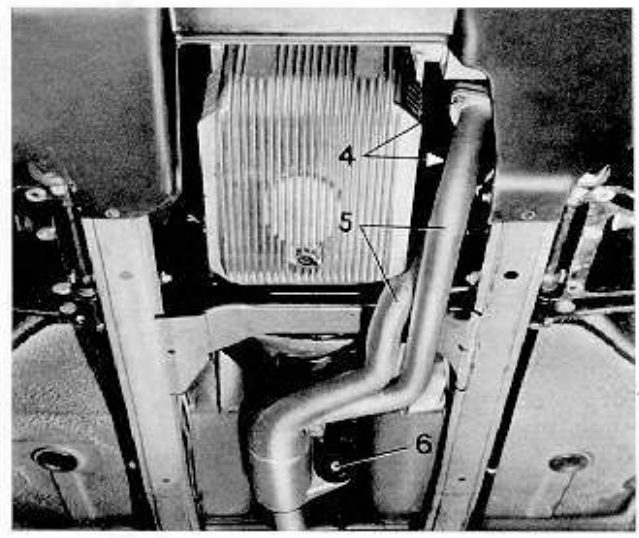
- Slacken clip 2 connecting the front pipe to the rear pipe;

- unhook the flexible supports 3 from the front crossmember supporting the rear axle assembly;

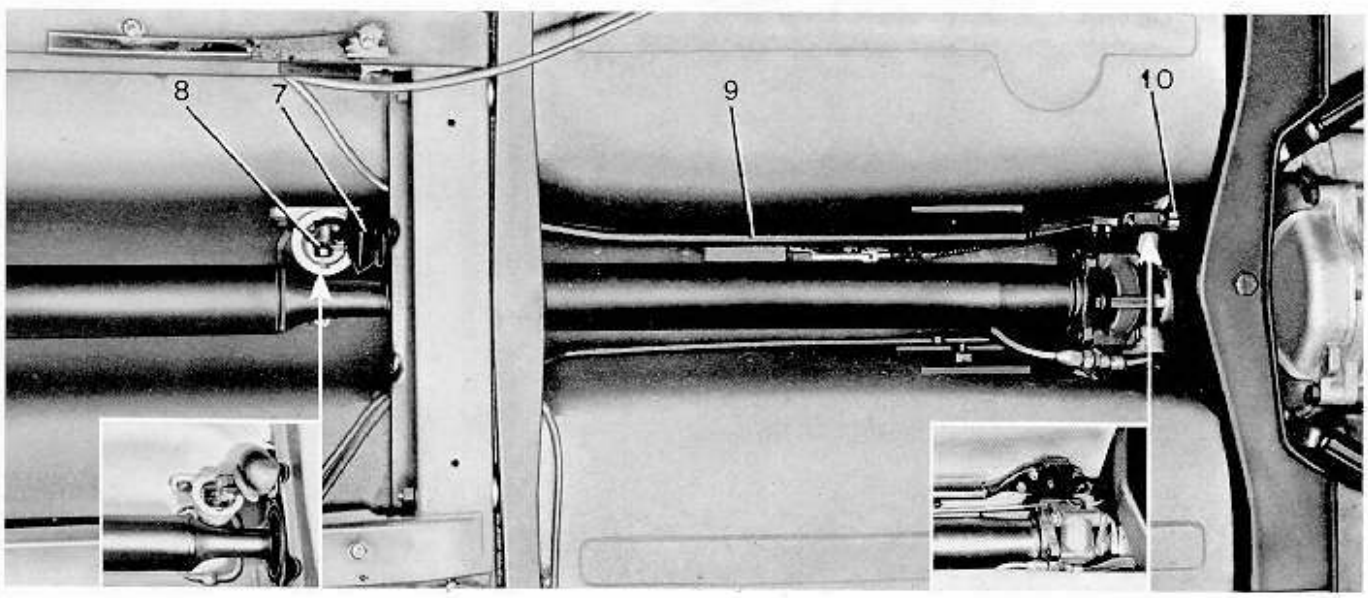


- slacken and remove the bolts connecting the flanges 4 which retain the exhaust pipe 5 against the manifold;

- slacken and remove bolt 6 fixing the exhaust pipe to the bracket situated on the rear engine mounting and lower the pipe after separating it from the rear section.



- Remove gaiters 7 from the gearlever support.
- Slacken and remove the screw and washer 8 retaining shaft 9 against the selector lever. Slacken and remove the nuts and washers 10 of the flexible coupling connecting the rod to the lever on the clutch housing. Lower shaft.

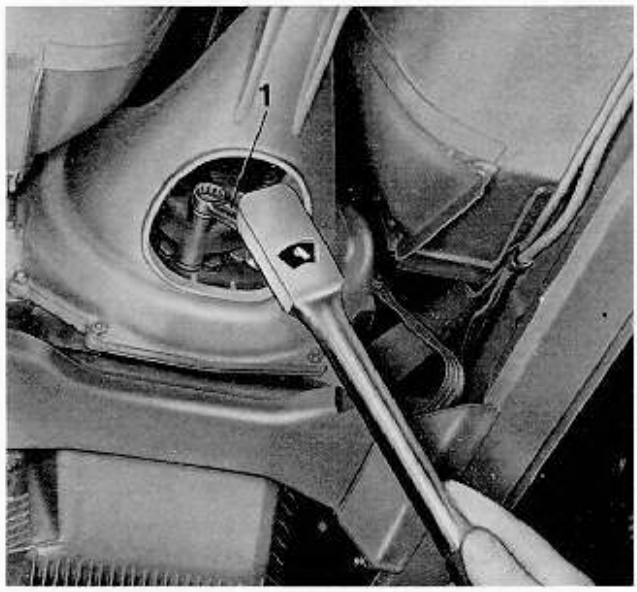


Rotate propeller shaft in order to be able to unscrew both one of the set bolts fixing the shaft to the flywheel and one of the set bolts fixing shaft to the clutch.

Remove the small flywheel cover from the rear engine housing.

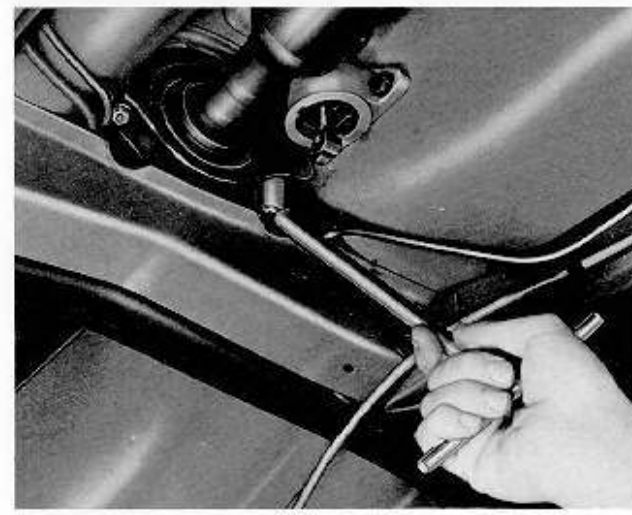
Lock the flywheel by means of tool no. A.2.0290 which is fitted in place of the cover.

Release and remove the above mentioned fixing bolts using spanner no A.5.0192 (1).



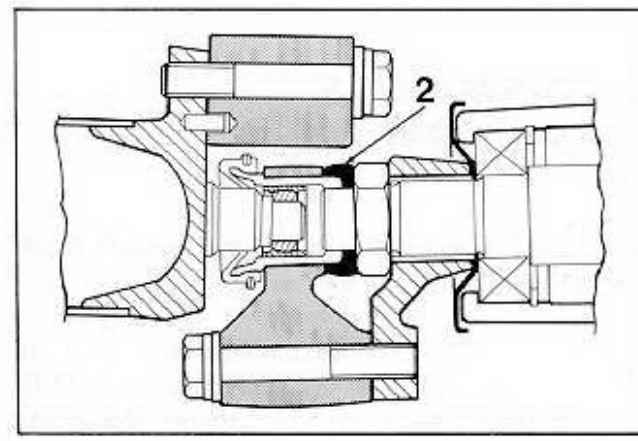
Remove the flywheel locking tool and unscrew the remaining fixing bolts on the propeller shaft, using the same procedure.

Unlock and remove the nuts and washers fixing the propeller shaft centre support to the studs.

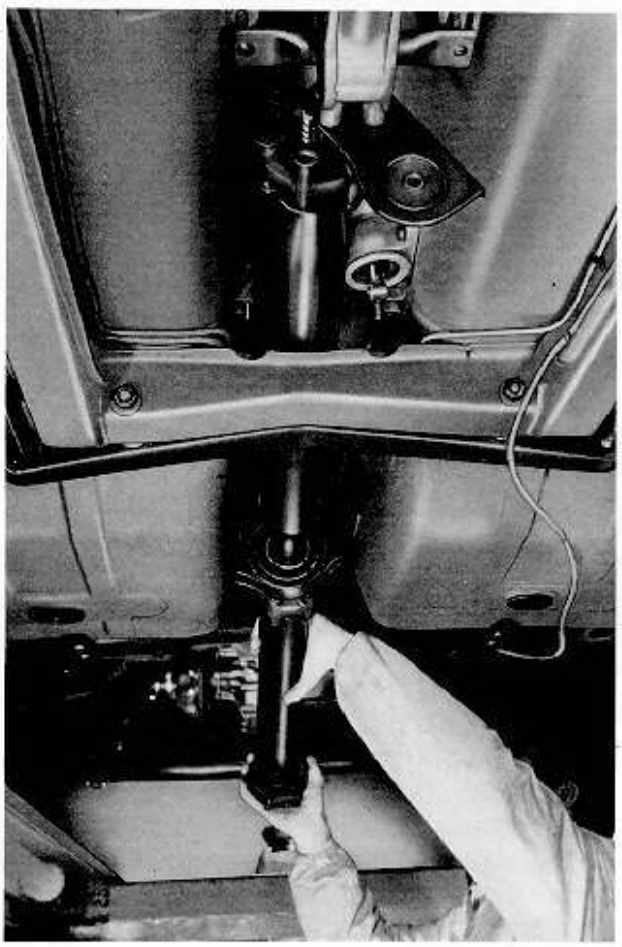


Disconnect the rear engine mounting from the body by unscrewing the retaining nuts. The washers should be retained as they are used on assembly to determine the distance of 7 ± 1 mm between the propeller shaft and the top of the support. This clearance is required to prevent any fouling. Withdraw the propeller shaft from the clutch.

Proceed with care in order not to damage the grease-retaining rubber cup 2 between the flexible coupling and the clutch fork.



Withdraw the propeller shaft from the tunnel, working from the rear of the car, disconnecting the centre support from the studs and the front bush from the flywheel spigot simultaneously with the front flexible coupling.



TO DISMANTLE PROPELLER SHAFT

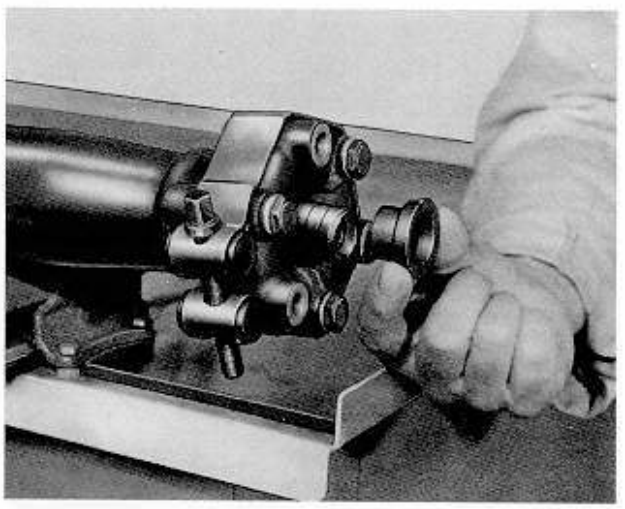
Disconnect the front section of the shaft from the rear portion. Proceed as follows:

- Suitably mark the respective positions of the front and rear shaft. Fit tool no. A.2.0263 to the flexible coupling. Release the bolts between shaft and flexible coupling and remove them with their washers.

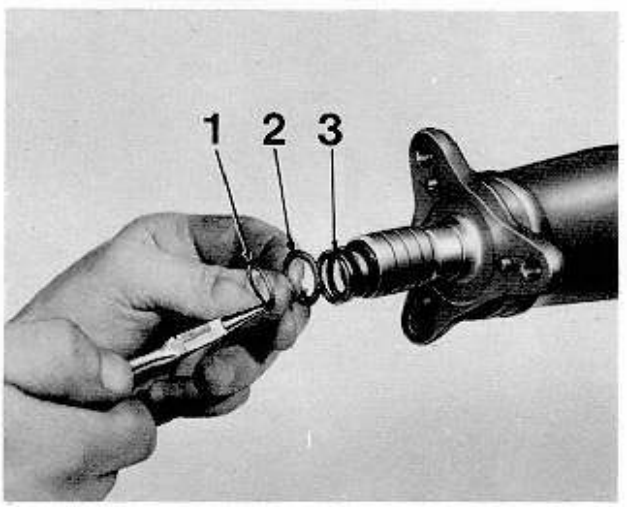
- Separate the two shaft halves.

Front flexible coupling

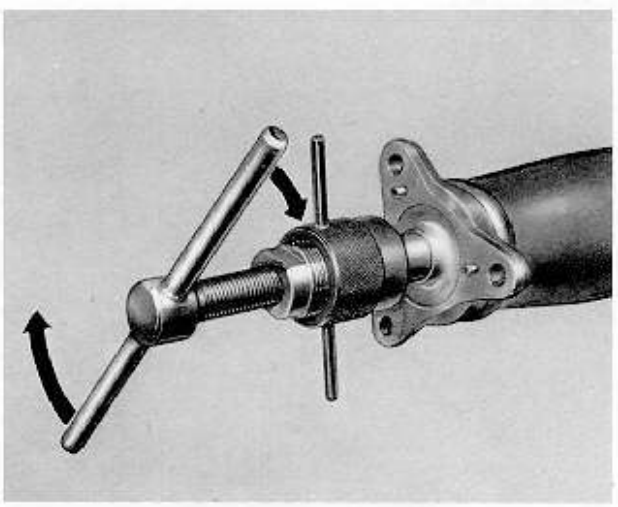
- Clamp the front shaft in a vice. Fit tool no. A.2.0263 to the flexible coupling and remove the protective rubber cap. Disconnect the coupling from the flange unscrewing and removing the fixing screws and washers.



- Remove the circlip **1** using the special pliers. Extract the washer **2** and the spring **3**.



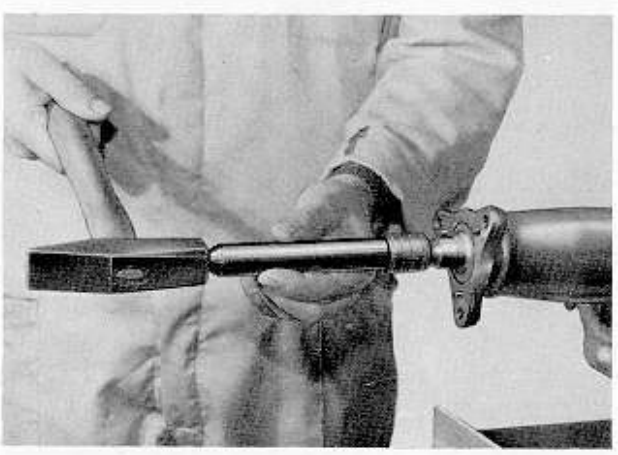
- Extract the spherical seat and the bush from the flange on the front propeller shaft, using extractor no. A.3.0361.



Replace the spherical seat and front bush, proceeding as follows:

Using Molykote paste G Rapid, lubricate the working surfaces of the new spherical seat and the new bush.

Place the spherical seat inside the bush and insert them together in the flange, using special tool no. A.3.0246.



Locate in the front bush: spring, spring seating washer and circlip.

Re-assemble the flexible coupling to the front propeller shaft. Ensure that the holes align with the centering pivots. Tighten the fixing bolts to 4.9 to 5.3 kgm; if the transmission is of the type with interference mounted bolts, fixing nuts must be tightened to 4.4 to 4.9 kg.m.
Remove tool no. A.2.0263.

Fit protective cap and fill the front bush with approx. 5 cm^3 of Molykote BR 2 grease, lubricating also its external surface.

Warning: The front bush may also be dismantled when the flexible coupling is mounted on the shaft flange. It is sufficient to remove the protective rubber cap.

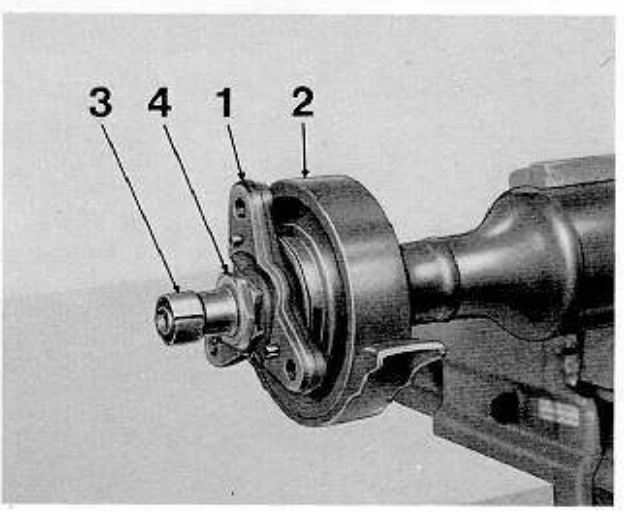
Centre support

Remove flange 1 and centre support 2 from the shaft, using a press. Proceed as follows:

- Mark flange and front shaft in order to facilitate the assembly.

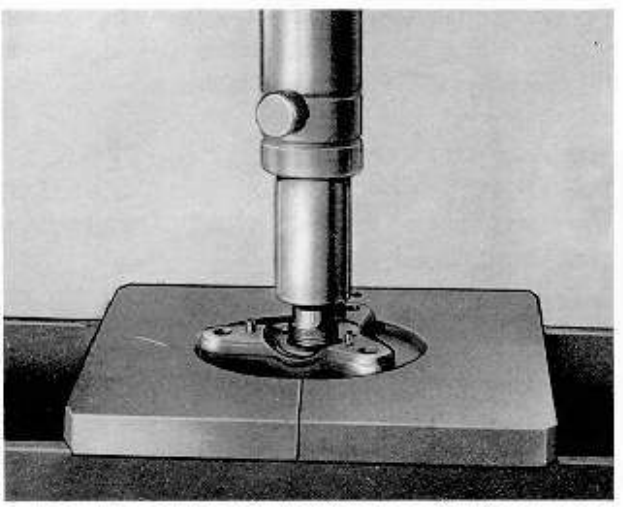
- Remove spherical seat 3. This is provided with a slot for the use of general tools. Proceed with care. If there is no slot, use tool no. A.3.0261.

- Unlock and remove fixing nuts 4 on the flange and support, using a ratchet and hexagon socket spanner.



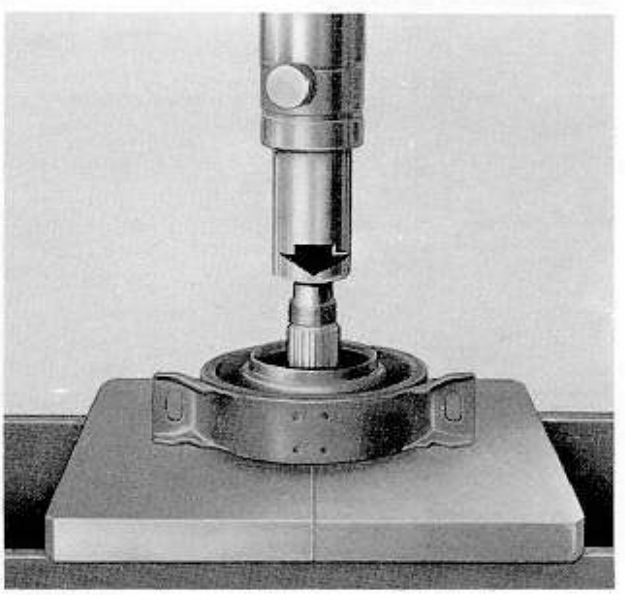
- Remove the flange from the shaft, using a press and semi-circular plates no. A.2.0248.

NOTE: Great care should be taken, in order to prevent any damage to the flange which cannot be replaced without affecting the balance of the complete shaft.



- Remove centrifugal cap.

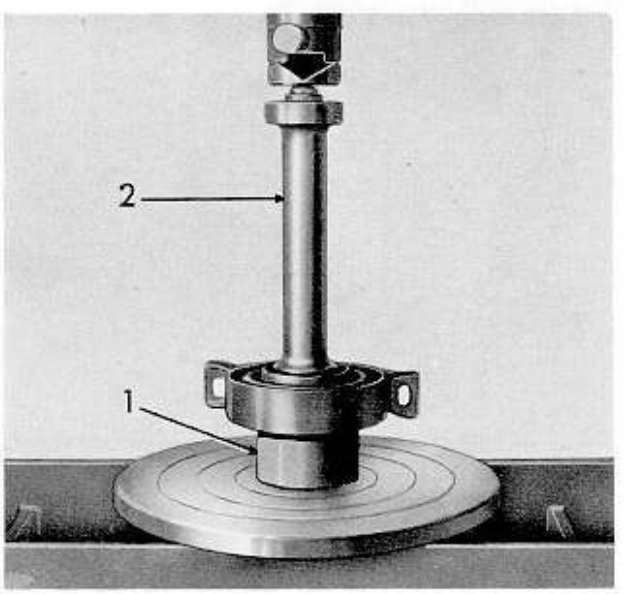
- Remove the centre support, using a press and the semi-circular plates, no. A.2.0247 at this stage the other centrifugal cap is damaged and must be replaced when re-assembling.



Replace the centre support bearing as follows:

- Remove bearing retaining circlip, using special pliers.

- Extract the ball bearing, using a press, and special base, tool no. A.3.0265/2 (1) and tool A.3.0401 (2).



- Fit the bearing in the centre support, using fitting tool no. A.3.0401. Retain with circlip.

Apply sealant Loctite 242 to the seat of the centre support and the seat of the flange.

WARNING: *Before applying the sealant, all traces of old sealant should be removed by scraping and blowing the surfaces clean. Degrease the surfaces using trichloroethylene or chlorothene.*

Fit a centrifugal cap on the front shaft and insert the centre support with the other centrifugal cap.

Refit the flange ensuring that the previously applied alignment marks are correctly positioned.

Fit the nut retaining the flange on the shaft. Tighten to 9.5 to 10.5 kg.m and fit locknut.

Check that the spherical seat on the rear flange is in good condition. If necessary, replace as follows:

- Remove circlip (where fitted), using special pliers, and extract the spherical seat from the flange.

- Fit a new spherical seat, using tool no. A.3.0244 and retain with circlip.

Complete the assembly of the front propeller shaft by refitting the spherical seat after lubrication of the working surfaces with Molykote paste G Rapid.

Centre coupling on rear shaft

Clamp the rear shaft in a vice.

Mark the position of the coupling in relation to the shaft.

Remove the protecting rubber cap from the front bush of the rear shaft, after having removed the retaining ring.

Fit tool no. A.2.0263 to the coupling.

Remove the centre flexible coupling from the rear shaft by unscrewing and removing the retaining bolts and washers.

Refit the centre flexible coupling, and ensure that the housing holes are aligned with the centering dowels on the flange of the rear shaft.

Fit the retaining screws and washers and tighten to 4.9 to 5.3 kg.m; stop nuts must be tightened to 4.4 to 4.9 kg.m.

Refit the rubber protection cap to the bush on the rear shaft and secure by means of the sealing ring. Lubricate the cap and the bush with approx. 7 cm^3 of Molykote BR 2 grease.

Remove tool no. A.2.0263.

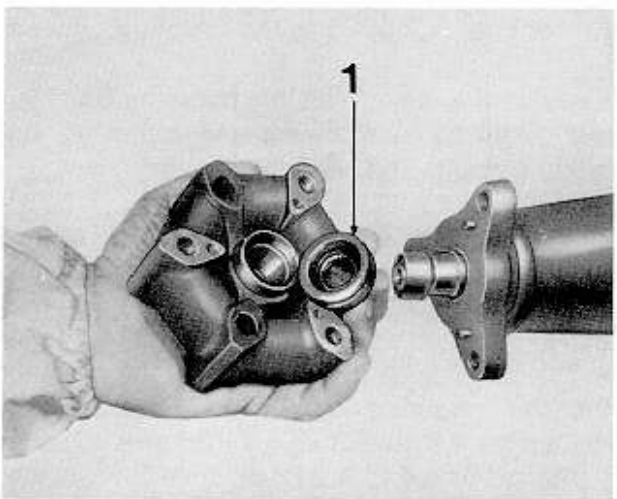
Rear coupling on rear propeller shaft

Check the condition of the flexible coupling and dismantle it as follows:

- Mark the position of the flexible coupling in relation to the flange on the rear shaft, in order to facilitate the re-assembly.

- Fit tool no. A.2.0263 as previously described and disconnect the coupling from the flange by removing the fixing bolts and washers.

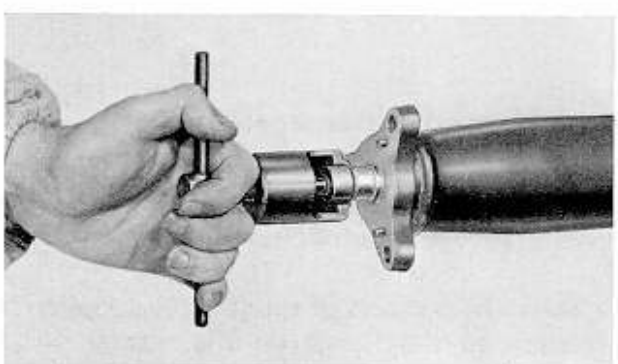
- Remove the rubber protection cap **1** from the flexible coupling, after having previously removed the retaining ring.



Check the condition of the spherical bearing and if necessary, replace it together with the corresponding spherical seat. Proceed as follows:

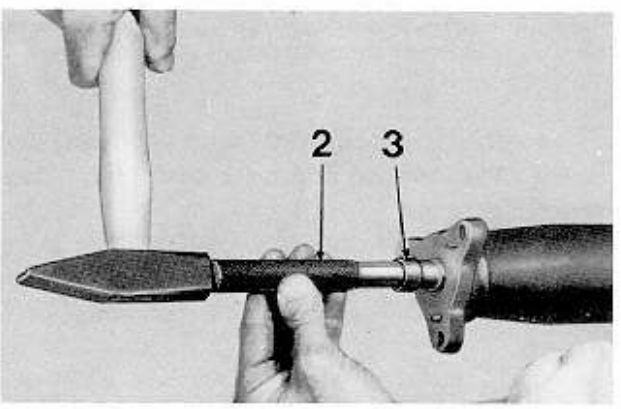
- Where fitted, remove the circlip that remains in the spherical bearing, using the special pliers.

- Extract the spherical bearing together with the spherical seat, using extractor no. **A.3.0261.** If the spherical seat is provided with a slot, use general tools.



- Insert the spherical bearing in the spherical seat, after having previously lubricated the working surfaces with Molykote G Rapid compound.

- Fit the spherical bearing complete with seat **3** on the spider, using special tool no. **A.3.0244,** (2) and secure with circlip.



- Fit the rubber sealing cap to the bush of the rear flexible coupling and secure by means of the special ring.

- Re-assemble the flexible coupling; align the marks previously made and ensure that the locating holes are aligned with the centering pins on the flange.

- Fit the bolts, flexible coupling to flange, and tighten to 4.9 to 5.3 kgm (for stop nuts, 4.4 to 4.9 kgm).

- Lubricate the bush and the grease cap of the flexible coupling, using approx. 7 cm^3 of Molykote BR 2 grease, and fit the grease retaining cap (which will remain interposed between the gearbox spider and the rear coupling), locating its lip over the bush of the coupling itself.

TO REASSEMBLE PROPELLER SHAFT

Re-assemble propeller shaft by aligning the marks on the flexible coupling and the centre spider. Connect the front propeller shaft to the rear shaft and tighten the bolts, using spanner no. **A.5.0192** and a torque wrench (300 to 400 mm) to 4.1 to 4.5 kg.m.
The lock nuts on the propeller shafts and the fitted bolts must be replaced and tightened, using the above spanner, to 3.8 to 4.2 kg.m.

REFITTING PROPELLER SHAFT TO CAR

To refit the propeller shaft, proceed in the reverse order, noting the following:

Lubricate, if this was not carried out during the overhaul, front bush and spherical seat of the rear coupling provided with grommet, by applying 5 and 7 cm^3 respectively of Molykote BR 2 grease; if necessary, add 2 cm^3 of the above mentioned grease to the bush of the engine flywheel.

Lock the engine flywheel, using tool no. **A.2.0290**, as for the dismantling, and insert the bolts fixing the propeller shaft to the flywheel and the spider on the clutch end. Tighten the bolts, using spanner no. **A.5.0192** and a 3000 mm. torque wrench, to 4.1 to 4.5 kg.m.

Clean the thread of the studs fixing the coupling to the gear control rod and fit the nuts and tighten to 2 to 3.25 kg.m.

The above operation applies to flexible couplings. For solid couplings, proceed as follows: fit loosely the gear control rod and the fixing nuts of the coupling. Engage 5th gear and tighten the nuts to the above mentioned torque.

Remove tool no. **A.2.0290** and fit in its place the small cover plate on the flywheel housing. Reconnect the rear engine mounting, using the displaced washers to ensure the correct distance between shaft and top of support, i.e. 7 ± 1 mm.

Refit the exhaust pipe by reversing the removal operation.

To check tightness of flexible couplings

This is the only operation required to be carried out when servicing the car, with no need to disconnect the propeller shaft. This check is not required on propeller shafts using safety locking nuts.

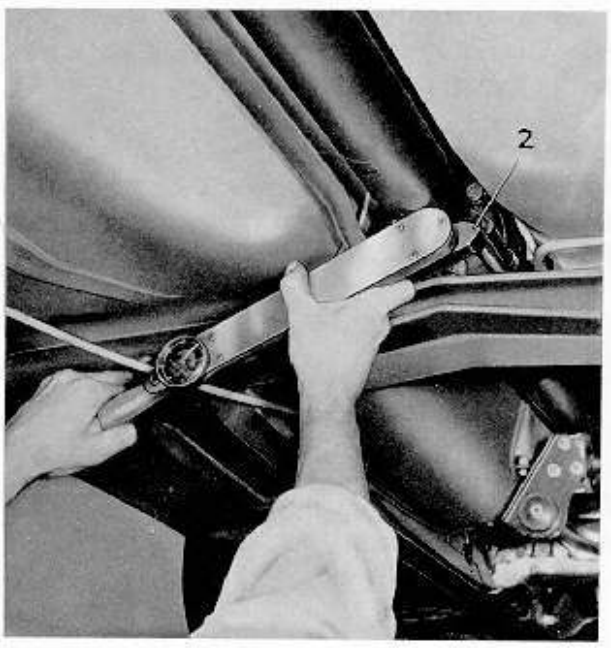
Check tightening torque of all coupling securing bolts, which must be within 4.1 to 4.5 kg.m using the appropriate special tool. Proceed as follows:

Disconnect the exhaust pipe, as described on Page 6.

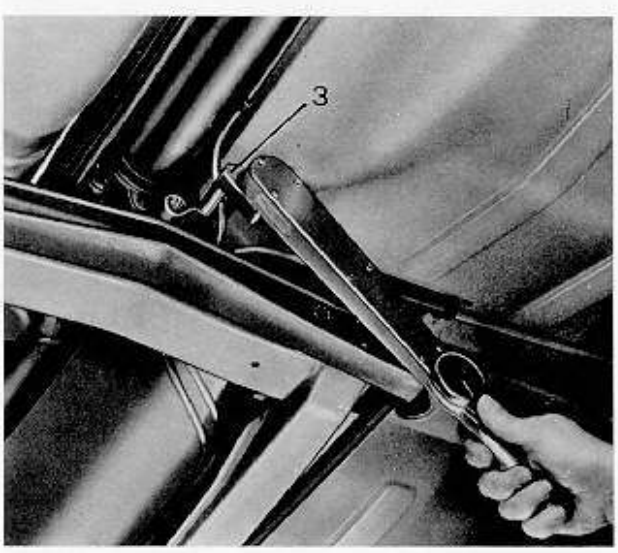
Remove the small cover plate from the flywheel housing and fit in its place tool no. **A.2.0290** which locks the flywheel. Secure the tool with small bolts.

- Check the tightening torque of the rear and front bolts on the rear coupling, using spanner no. **A.5.0192** (1) and a torque wrench.

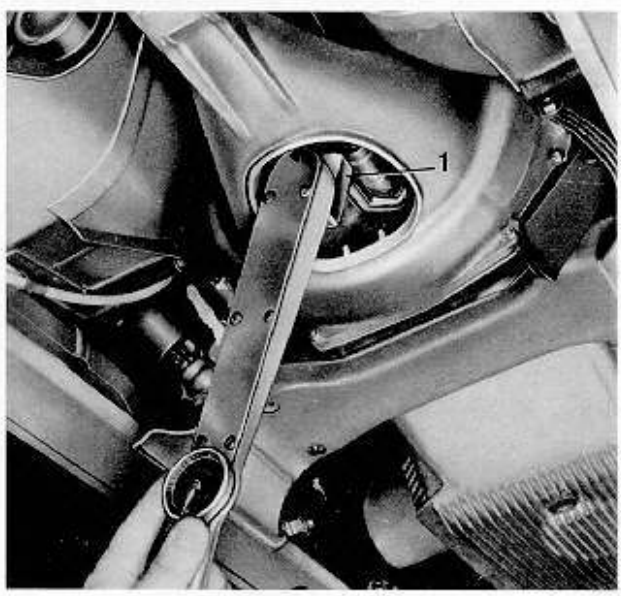
- Check tightening torque of bolts on central coupling.
- Front bolts, use special tool no. **2 (A.5.0190)** and torque wrench.



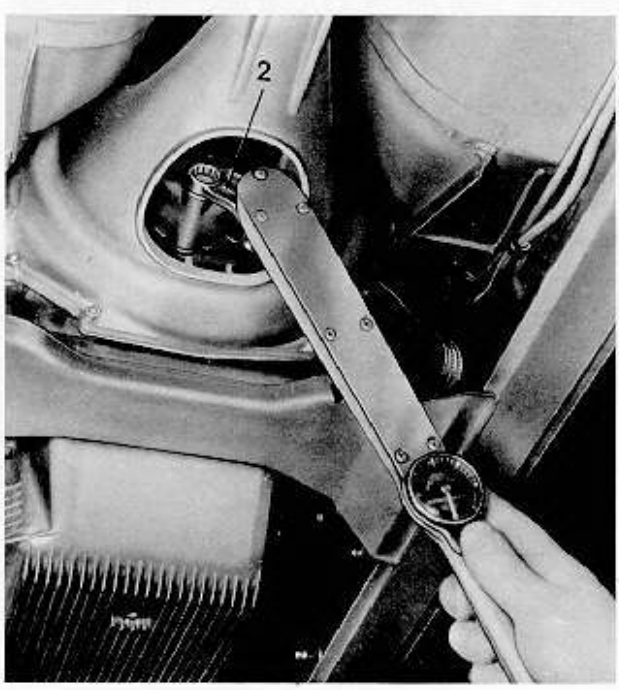
- Rear bolts, use special tool no. **3 (A.5.0191)** and torque wrench.



- To check tightening torque of bolts on front coupling.
- Front bolts, use special tool no. **1 (A.5.0191)** and torque wrench.



- Rear bolts, use special tool no. **2 (A.5.0192)** and torque wrench.



TO OVERHAUL THE HALF SHAFTS

INTRODUCTION

It should be noted that any damage to the rubber boots means the loss of the lubricant and ingress of foreign matter, which will prevent the constant velocity joints from working correctly.

To replace constant velocity joint boots

Place the car on a ramp and raise the rear wheels by means of a suitable jack.

Slacken the bolts securing the half shaft to the brake disc spacer and to the hub shaft. Remove the half shaft, retaining the fixing bolts, washers and plates.

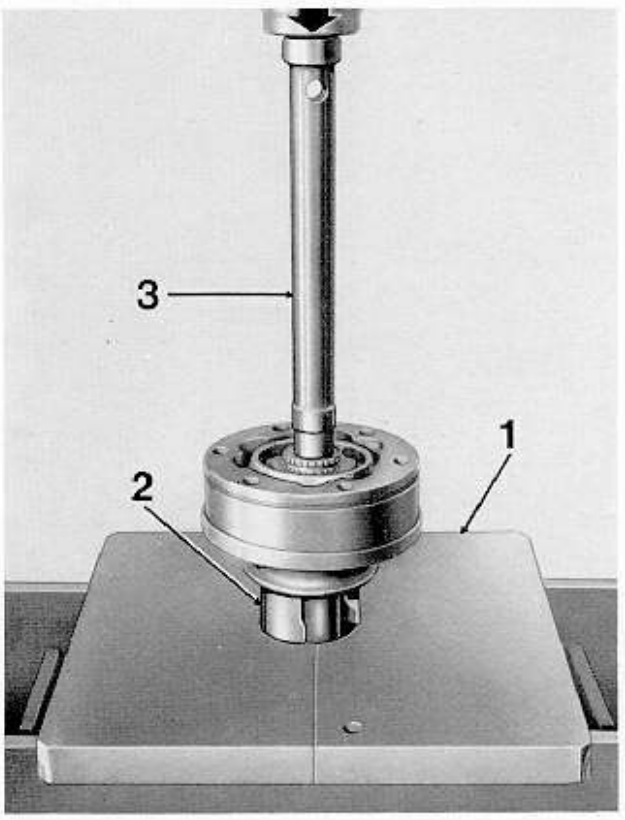
Clamp the half shaft in a vice, remove the boot by separating it from the retaining clips and pushing it back along the shaft, to enable the constant velocity joint to be dismantled.

Remove the outer cover from the joint and carefully clean the external part of the joint with rags. Do not use solvents.

Remove the circlip retaining the constant velocity joint, using suitable pliers.

Mark the joint in respect of the shaft.

Remove the joint from the shaft, using a press and semi-circular plates **A.2.0247** (1), the base, tool no. **A.3.0487** (2) and tool no. **A.3.0479** (3).



Finally, remove the cup spring and the boot.

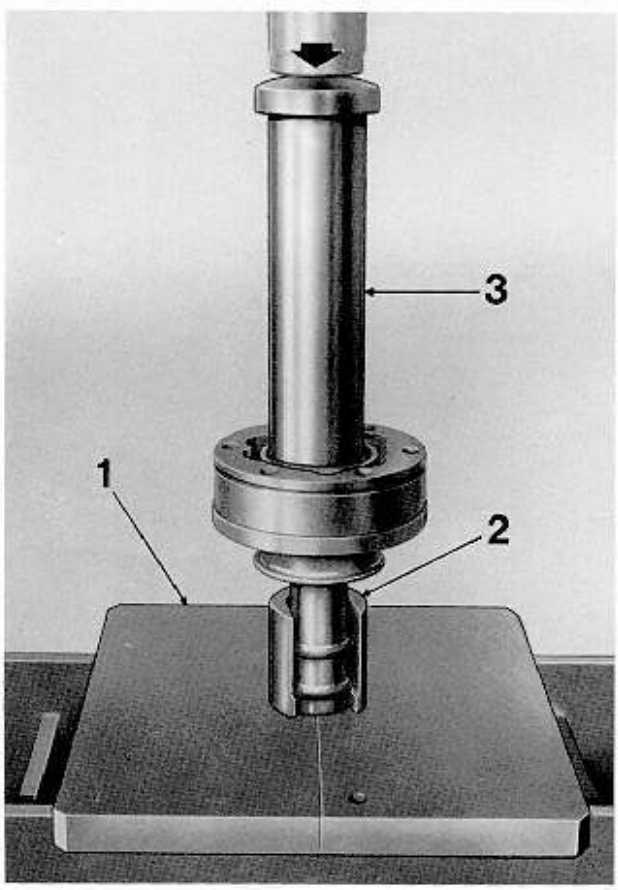
Replace the boot, taking care not to damage it when pushing it over the splines of the half shaft. Tape the splines to provide the necessary protection.

Fit the cup spring to the half shaft.

Fill the inner and outer chambers of the joint with 70 g. of Molykote VN 2461 C grease or Optimol Olistamoly 2 LN 584.

Refit the joint to the half shaft, aligning the marks made prior to dismantling it. Place the assembly under a press, and using the semi-

circular plates, No. **A.2.0247** (1), the base, tool no. **A.3.0487** (2) and the inserter, no. **A.3.0386** (3) as illustrated.



Refit the circlip, ensuring that it is seating correctly in its seat on the shaft.

Ensure that the grease-retaining rubber seal is on the outer ring of the joint; apply Curil K2 sealant and fit the outer cover.

Apply some Bostik 475 or U.S.M. 475 to the surface between the boot and the inner cover of the constant velocity joint.

WARNING: *It is recommended to apply the boot sealant uniformly and in sufficient quantity, to prevent, in time, loss of grease. It is also recommended that only the clamping clips of the type supplied by our Part Department be used, in order to prevent any out-of-balance condition of the half shafts.*

Place the boot on the joint and in the seat provided on the inner cover and on the shaft in the space between the ribs. Position the retaining clips and tighten with special pliers no. **A.2.0288/0035** and **A.2.0288/0062**, taking care not to damage the boot.

Reconnect the half shaft and lubricate the thread of the retaining bolts with Molykote BR 2 grease. Tighten bolts to 2.8 to 3 kg.m.

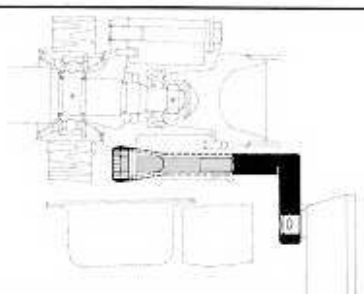
The half shafts are symmetrical and therefore interchangeable. The above operation thus applies to all the constant velocity joints of both half shafts.

TOOLS

TIGHTENING TORQUES

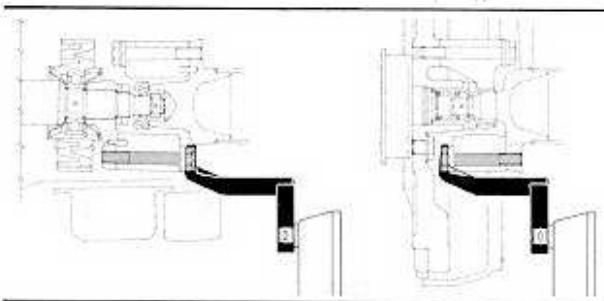
LUBRICANTS AND SEALANTS

TOOLS



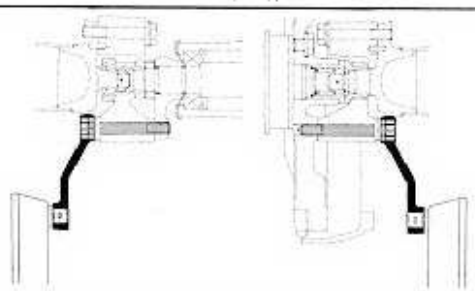
A.5.0190

SPANNER
17 mm Bi-hexagon spanner, L-shaped, for front bolts of centre coupling



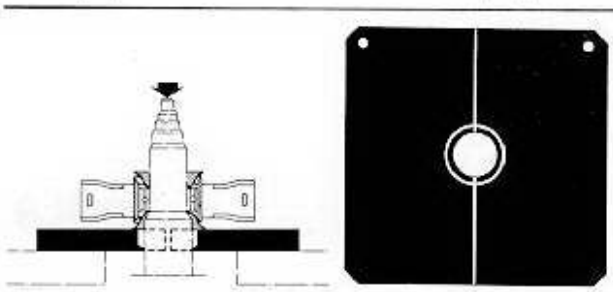
A.5.0191

SPANNER
17 mm Bi-hexagon spanner, L-shaped, for front bolts of front coupling and rear bolts of centre coupling.



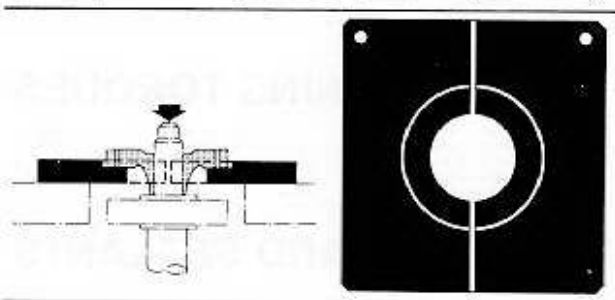
A.5.0192

SPANNER
17 mm Bi-hexagon spanner, L-shaped, for front bolts of rear coupling and rear bolts of front coupling



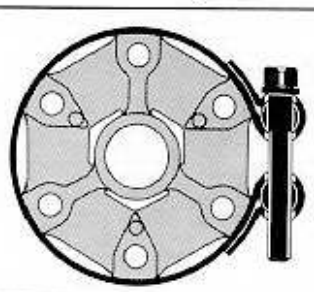
A.2.0247 *

SEMI-CIRCULAR PLATES
for removing the centre support of the front propeller shaft and for extracting and inserting constant velocity joints on the half shafts.



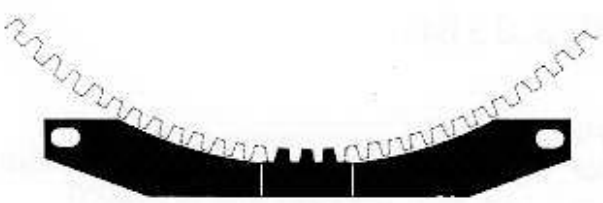
A.2.0248 *

SEMI-CIRCULAR PLATES
for removing spider from front propeller shaft.



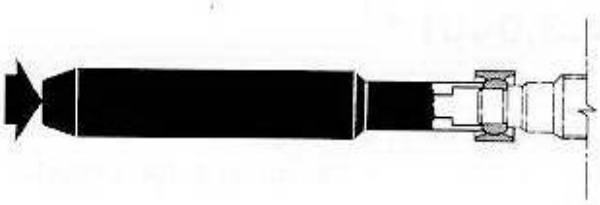
A.2.0315 *

CLAMP
For fitting front, centre and rear couplings



A.2.0290

TOOL
for locking flywheel (on the car)

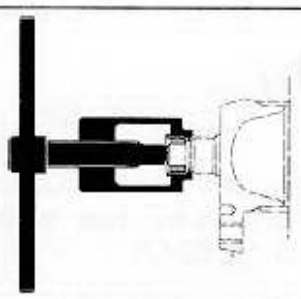


A.3.0244 *

TOOL
for inserting rear spherical bearing of front shaft and rear spherical bearing of rear propeller shaft.

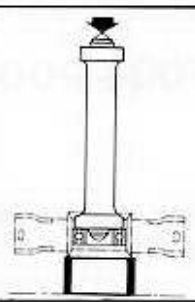
A.3.0246

FITTING TOOL
for the front spherical bearing of the front propeller shaft.



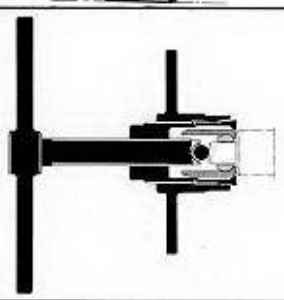
A.3.0261 *

EXTRACTOR
for rear spherical bearing and spherical seat of the front propeller shaft and spherical bearing of the rear propeller shaft



A.3.0265/2 *

BASE
for extracting the bearing of the centre support of the propeller shaft (use with A.3.0401)

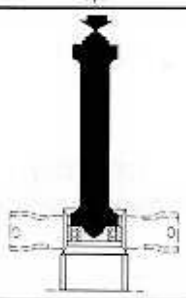


A.3.0361

EXTRACTOR
for the front spherical bearing and bush of the front propeller shaft

A.3.0386 *

FITTING TOOL
for fitting constant velocity joint into half shaft (use with A.3.0487 and A.2.0247)

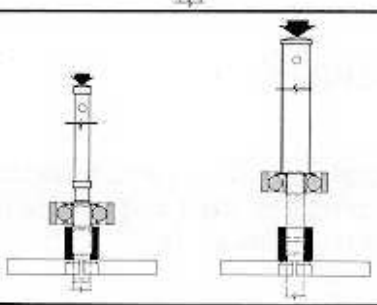


A.3.0401 *

EXTRACTOR-FITTING TOOL
for bearing of centre support for propeller shaft

A.3.0479

EXTRACTOR
for extracting half shaft from constant velocity joint (use with A.3.0487 and A.2.0247)



A.3.0487

BASE
for extracting and fitting constant velocity joints on half shafts (use with A.3.0479, A.3.0386 and A.2.0247)

A.2.0288/0035-0062

PLIERS
for fitting retaining clips for constant velocity joint boots on half shafts

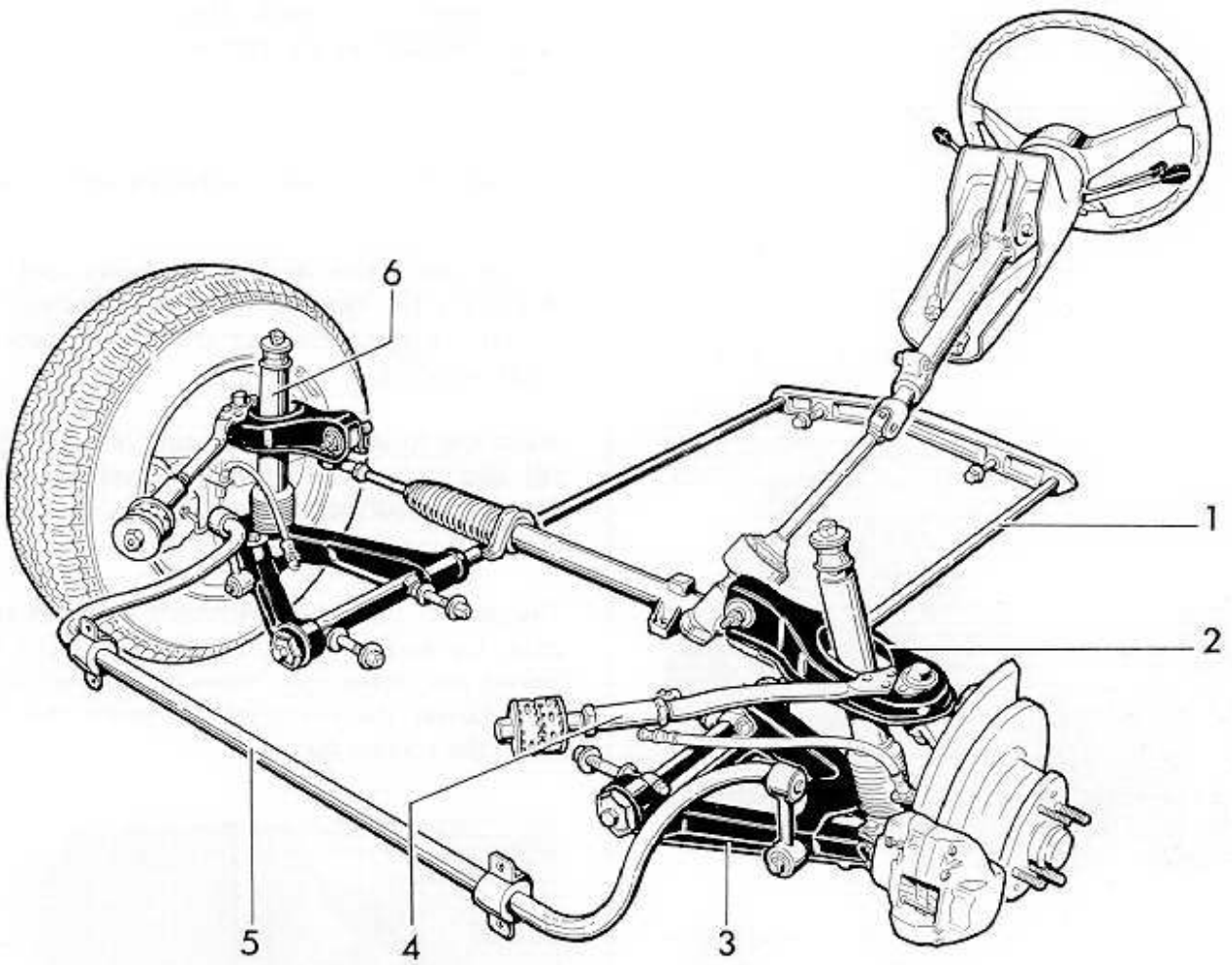
Tools marked thus * are also used on other types of cars.

TIGHTENING TORQUES

DESCRIPTION	Kg.m.	METHOD OF TIGHTENING
Nuts, fixing selector rod to flexible joint	2 - 3.25	Sealant
Nut on propeller shaft spider	9.5 - 10.5	Dry
Bolts securing half shafts to brake disc spacer and hub shaft	2.8 - 3	With grease
Fixing bolts for propeller shaft (with torque wrench directly applied)	4.9 - 5.3	Dry
Fixing nuts for propeller shaft, with use of special spanner and 300 or 400 mm torque wrench	4.1 - 4.5	Dry
Locking nuts for fitted bolts (with use of special spanner and 300 or 400 mm torque wrench)	3.8 - 4.2	Dry
Locking nuts for fitted bolts (with torque wrench directly applied)	4.4 - 4.9	Dry

LUBRICANTS AND SEALANTS

DESCRIPTION	COMMERCIAL EQUIVALENT
Grease for: - Bolt threads securing half shafts to brake disc spacers and to hub shaft - Bush and grease cap on rear coupling of propeller shaft - Inner and outer surfaces of front bush (5 cm^3) - Bush of propeller shaft and rubber cap on centre coupling - Bush of engine flywheel.	ISECO MOLYKOTE BR 2
Grease for: - Working surfaces of spherical bearing and bush for taking up front clearance of propeller shaft - Working surfaces of spherical bearing and centre and rear spherical seat of propeller shaft.	ISECO MOLYKOTE COMPOUND G RAPID
Sealant liquid for: - Splines of spider and centre propeller shaft support and seat on shaft for centre support bearing	LOCTITE 242
Grease for: - Constant velocity joint on half shafts (70 g)	ISECO MOLYKOTE VN 2461 C OPTIMOL OLISTAMOLY 2 LN 584
Compound for: - Surface connecting outer cover of constant velocity joint on half shaft	CURIL K2
Compound for: - Surface connecting boots to inner cover of constant velocity joint on half shaft	BOSTIK 475 U.S.M. 475



1 - Torsion bar
2 - Upper wishbone
3 - Lower wishbone
4 - Caster rod
5 - Anti-roll bar
6 - Shock absorber

FRONT SUSPENSION

The front suspension is independent, by means of wishbones. The flexible element is provided by two longitudinal torsion bars in place of coil springs. The torsion bars are attached at the front to the lower wishbones and at the rear to the body.

The suspension also comprises hydraulic double-acting shock-absorbers, passing through the upper wishbone and located between the body and the lower wishbone. Cornering is improved by an anti-roll bar. The upward and downward movement of the wishbones is restricted by the rebound stop secured to the chassis cross-member.

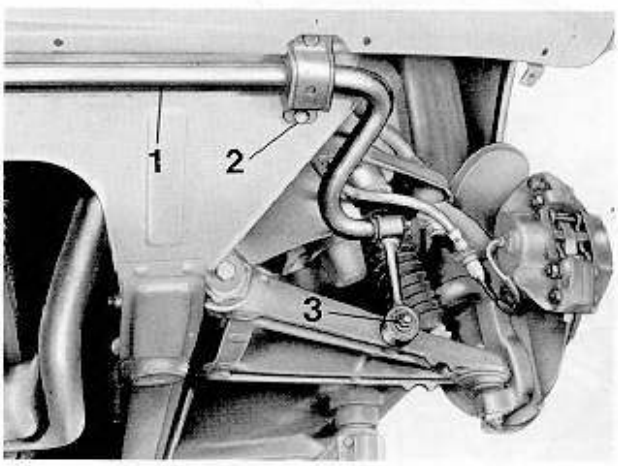
This new front suspension design, together with an even distribution of the weight, results in an exceptionally light steering.

TO REMOVE THE FRONT SUSPENSION

Place the car on a ramp. Load the car statically and slacken the road wheel nuts.

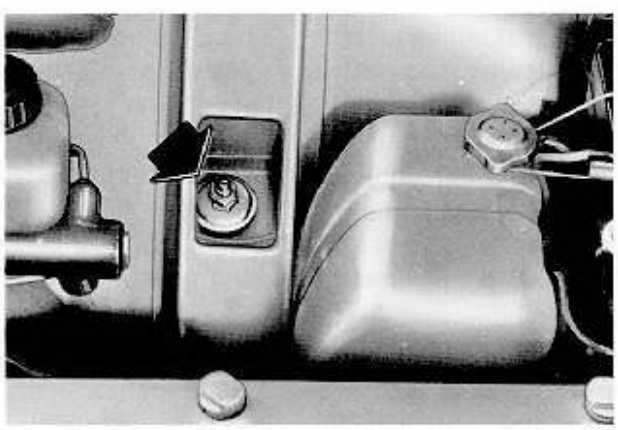
Raise the car and support it on stands. Remove the road wheels. Remove the front valance by removing the securing screws.

Remove anti-roll bar **1**, complete with links, separating it from its fixing points on the body and from the pivot points of the lower wishbones by removing bolts **2** and nuts **3**.



From the engine compartment, disconnect the shock absorbers from the body anchorage points, by removing the locknuts, retaining nuts, washer, and the appropriate rubber buffer.

For the latter operation, and when working on the LH side of the car, it is necessary to disconnect the expansion tank.



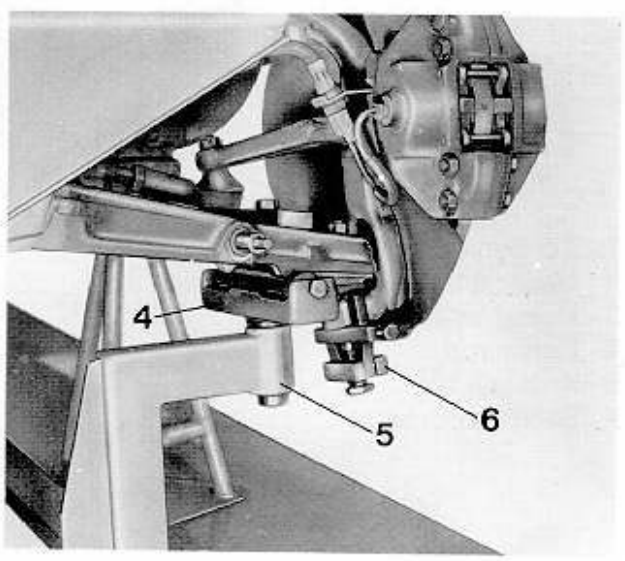
Disconnect the shock absorbers from the lower wishbones by removing the retaining bolts.

To remove the lower wishbone and torsion bar

Fit to the lower wishbone special tool no. **A.2.0265 (4)** locating it in the two registers which are provided near the shock absorber locating point.

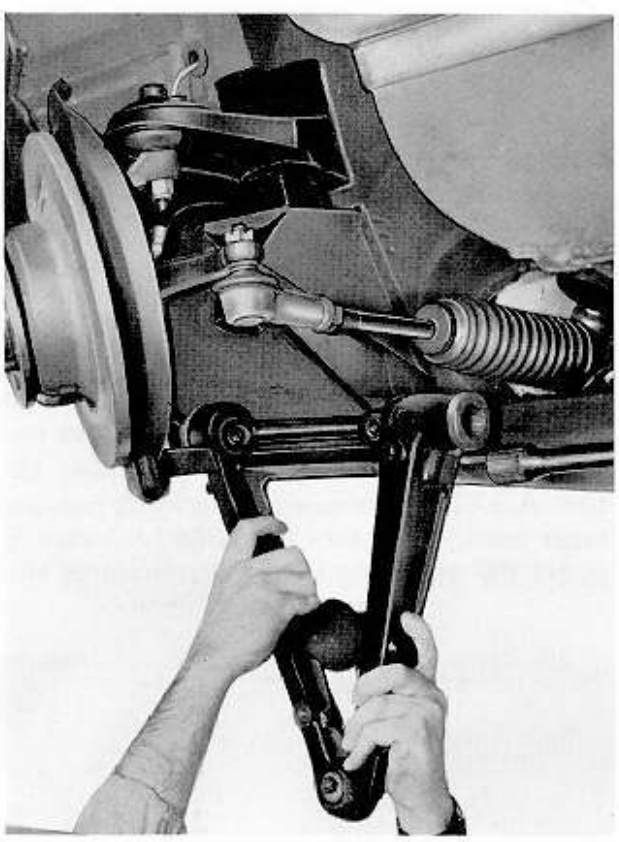
Raise the lower joint, using tool no. **A.2.0069 (5)** and jack no. **R.7.0010**, in order to move the upper wishbone away from the rebound stop.

Disconnect the lower wishbone from the stub axle, by tool no. **A.3.0377 (6)** freeing the swivel pin, after first removing the retaining nut. Lower the wishbone to release the load from the torsion bar.



Remove the small cover over the torsion bar on the rear crossmember. Mark the alignment components if not already marked. Fit extractor no. **A.3.0374** and extract the torsion bar from its seat.

Remove the lower wishbone by withdrawing the bolts, associated spacers and washers which secure the wishbone mounting bracket to the body.



Remove the torsion bar from the rear crossmember by extracting it from the front.

Proceed as detailed above for the other side of the car.

To remove the stub axle from the upper link

Remove the brake pads, extracting the retaining pins and cross-shaped spring.

Remove the brake caliper from the brake disc by unscrewing the retaining bolts, and attach it to the bracket for the brake fluid pipe connection, using a wire or string.

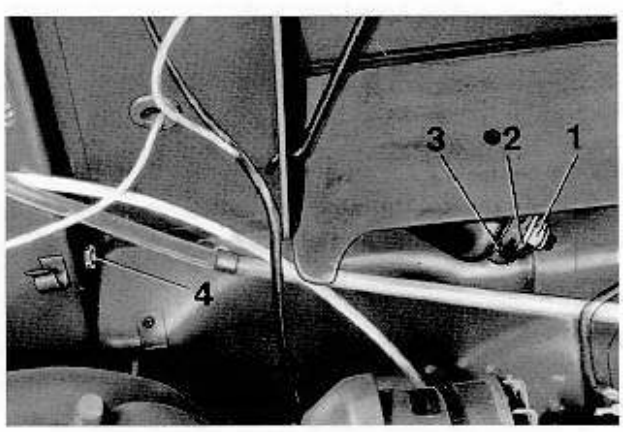
Disconnect the steering linkage from the stub axle by using tool no. A.3.0376 after removing the castellated nut and split pin.

Disconnect the stub axle from the upper wishbone after removal of the retaining nut by freeing the swivel pin using tool no. A.3.0377.

To remove upper link

From inside the engine compartment, remove lock nut 1 securing the caster adjustment rod to the body and remove it together with washer 2 and rubber pad 3.

Remove the upper wishbone by disconnecting the appropriate securing bolt 4.



Proceed as detailed above for the opposite side. When working on the LH side of the car, remove the battery, and where fitted, the alternator air intake shield.

Finally, disconnect the rear crossmember supporting the torsion bars, by removing the securing bolts, thus completing the dismantling operation of the front suspension.

DISMANTLING

To dismantle the wheel hub and stub axle assembly on the bench

Dismantle the assembly as follows:

- Remove hub cover cap. Withdraw split pin and remove hub securing nut.

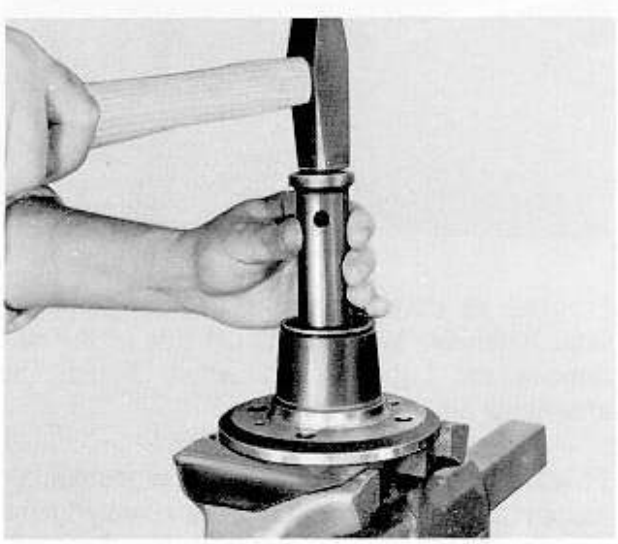
- Extract wheel hub from the stub axle, together with brake disc, retaining the inner race of the outer bearing.

- Remove the splash shield by removing the three retaining nuts.

- Remove wheel hub from the brake disc by removing the two retaining screws.

To remove the hub bearings

Extract the outer bearing outer race from the hub, using tool A.3.0378 and a press or a vice, as illustrated.



Extract the oil seal with outer race of inner bearing from the hub, using tool no. A.3.0379 and a press or vice, as illustrated.

Check bearings for signs of wear or seizure.

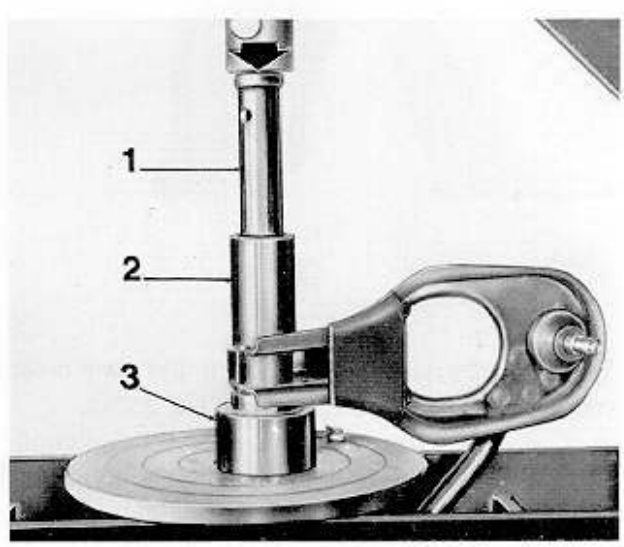
Check condition of hub and stub axle and replace these if necessary.

Upper link

Check that the upper link, caster adjustment rod and swivel pin are in good condition and not distorted. Replace these parts as required.

Check condition of caster adjustment rod mounting pads and upper link rubber mountings. Replace these as required.

When replacing rubber mountings, use tool no. A.3.0367 (1) (outer part only) and tool A.3.0368 (3) for extracting purposes. Use tool A.3.0367 (complete with inner part and taper bush 2) and tool A.3.0368 for inserting. Insert the mounting from the chamfered end.



Rear crossmember

Check condition of the rear crossmember rubber mountings, and replace these as required, using tools A.3.0422 and A.3.0423. It

should be noted that for extracting the rubber mounting the base of tool **A.3.0423** must be used. When fitting the mounting, use the same tool in the opposite way, in order to determine the fitted depth of the mounting.

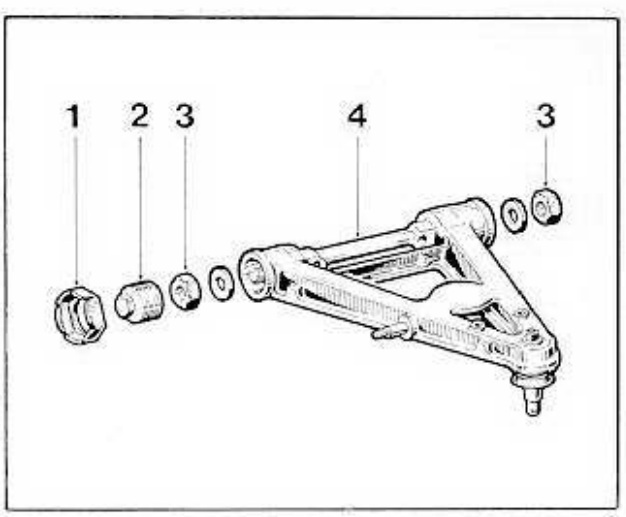
Lower wishbone

Check conditions of lower wishbones, swivel pins and bushes.

If necessary, replace the bushes as follows:

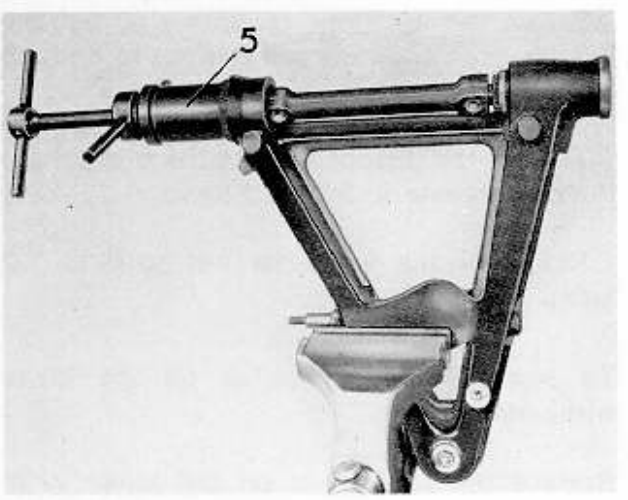
- Clamp the lower wishbone in a vice and remove the protruding washer from the torsion bar seat.

- Remove palmutter nut **1** and threaded cap **2** from the front end of the wishbone and remove nuts **3** with corresponding washers, securing the bushes to the wishbone mounting **4**.



Insert in the torsion bar seat the serrated ring tool no. **A.3.0373**, and secure to the threaded pin of the mounting bracket, by means of any type of nut, **except a thin one.**

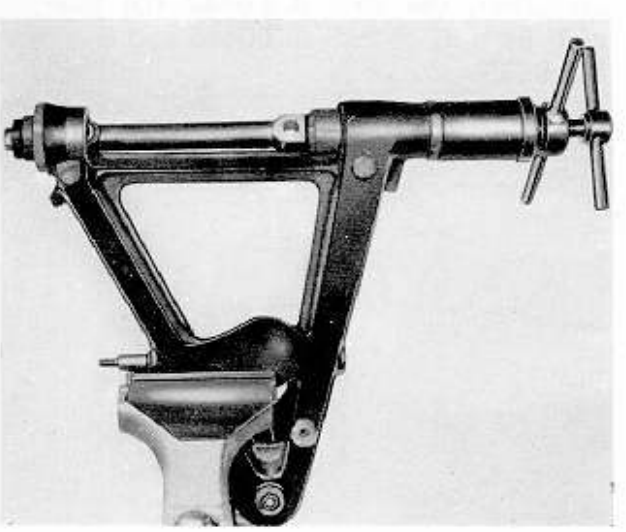
- Fit tool (5) **A.3.0372** to the front of the wishbone, using the threaded mounting bracket, and extract the bushes.



Remove tool **A.3.0373** and withdraw the rear bush; withdraw wishbone mounting and front bush by removing tool **A.3.0372.**

To reassemble, operate in the reverse order. Make sure that:

- the protected side of the bushes are turned towards the wishbone support;
- front bush is locked by means of tool **A.3.0373**; tool **A.3.0372** must be at torsion bar side.



- Lubricate the inner cavity between bushes and lower wishbone with Molykote LONG-TERM No. 2 grease (6 grs).

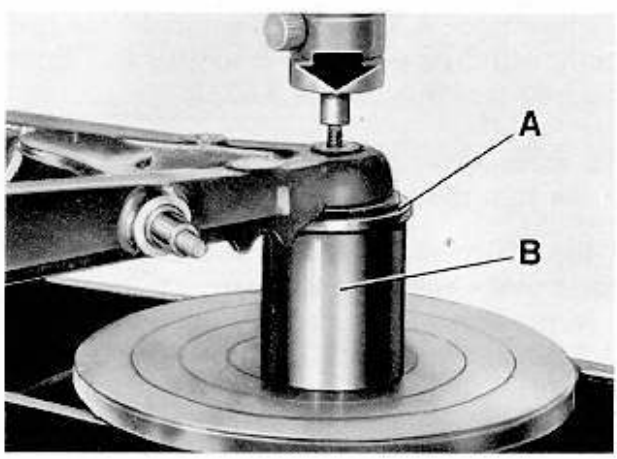
- Secure the wishbone mounting by tightening the respective nuts and washers to 3 to 3.5 kg.m.

- Tighten the threaded cap to the front of the lower wishbone to 2 to 3.5 kg.m.

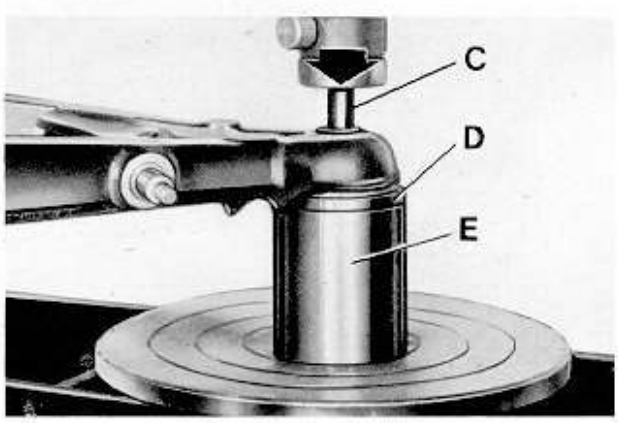
- Retighten the palmutter nut to 6 to 7.2 kg.m.

To replace the ball swivel on the lower wishbone

Replace the ball swivel on the lower wishbone. To extract it, use a press, tool **A.3.0441** (A) and part (B) of tool **A.3.0435.**



To insert, use tool **A.3.0442** (D) together with parts **C** of tool **A.3.0440** and **E** of tool **A.3.0435.**



At this stage ensure that the alignment mark on the ball joint coincides with that on the seat of the wishbone to prevent misalignment damage which would adversely affect the performance of the ball joint.

Fit the connecting nut to the wishbone without tightening it.

Shock absorbers

- Check the condition of the stem and cylindrical body of the damper and ensure that they have not been distorted.

- Check that the boots are intact and that they are no fluid leaks from the cylindrical body.

- Check the efficiency of the shock absorbers by measuring on a special test rig, their damping capacity at low and high speeds.

The readings should meet the data given on page 52.

- The front and rear shock absorbers of each car should be matched together as shown by the table con page 52.

RE-BUILDING

Anti-roll bar and links

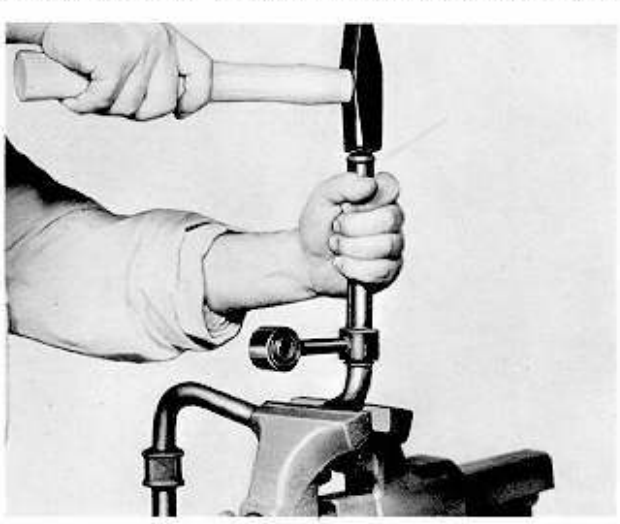
Check the condition of the rubber mountings, bushes, links and antiroll bar.

Should one or more of the above parts need replacing, proceed as follows:

- Apply markings on the bar and link.
- Separate the link from the anti-roll bar, using a press.
- Using a press remove the rubber bush and fit replacement.

- Before fitting the links, slide off the antiroll bar the worn rubber mountings and fit new ones. Prior to fitting them, lubricate their internal surfaces with:
  - ERGON RUBBER GREASE NO. 3 – ISECO
  - SFERUL B2 AR – REINACH OLEO-BLITZ.

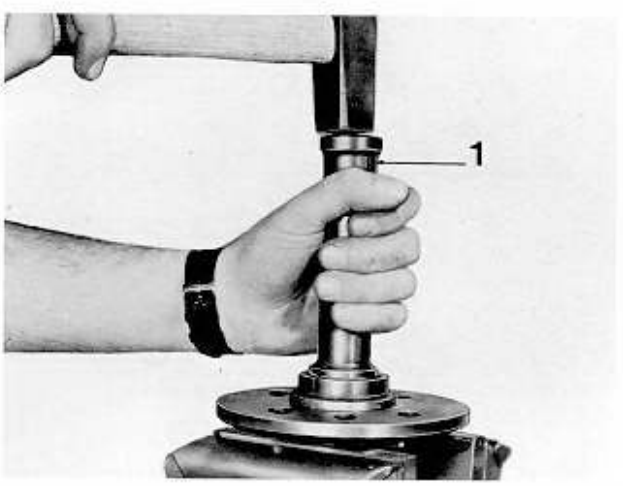
- Apply similar markings on the new components as on the discarded ones. Clamp the anti-roll bar in a vice and insert the link on the bar's pin, using tool **A.3.0346**. Ensure that the previously applied markings are aligned.



To re-assemble wheel hub

Fit the hub bearings as follows:

- Insert the outer bearing outer race in the hub, using tool **A.3.0328 (1)** and a press or a vice, as illustrated.

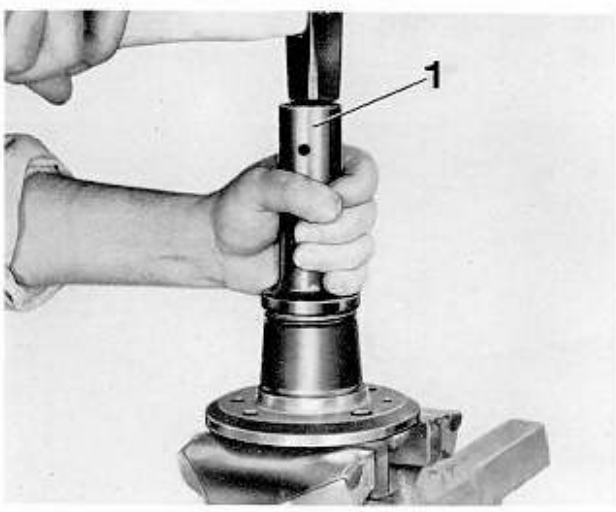


- Fit the inner bearing outer race by means of tool **A.3.0329 (2)**, using a press or vice, as illustrated.

At this stage of assembly, apply some grease at the rate of 55 grs. per hub, spreading it uniformly inside and on the sides of the bearings.

Do not exceed this quantity, to prevent the bearing from being overloaded, thus causing overheating, loss of grease etc.

- Fit the inner bearing inner race. Fit the oil seal after lubricating it with differential oil. Fit race by means of tool A.3.0459 (1) and a press or vice.



To fit the hub to the stub axle

Fit the splash shield to the stub axle, and secure it by means of the nuts. Carefully clean the brake disc and fit it to the hub.

Carefully clean the stub axle and lubricate it with Molykote BR2 grease, also the lip of the oil seal.

Fit the hub-disc assembly to the stub axle, noting the following:

- Tighten the hub retaining nut to 2 to 2.5 kgm. At the same time rotate the hub to assist the seating of the bearings in their seats, and to prevent the rollers causing damage to the races.

- Slacken the nut and tighten it again, using a torque wrench, to 0.5 to 1 kg.m.

- Slacken the nut by 90° and fit the split pin, if the hole on the shaft aligns. If it does not, turn the nut as little as possible, until the holes align.

- Improve the seating of the bearings by tapping with a mallet on the end of the stub axle.

- Check that the retaining washer of the bearing is not locked. This is done by inserting a screwdriver in one of the radial holes to check the clearance.

- Should the washer be locked, slacken the nut by one notch and tap again lightly with a mallet on the end of the stub axle.

RE-FITTING THE SUSPENSION

Reassemble the front suspension in the reverse order, noting the following:

Upper link

If previously removed, refit the caster adjustment rod. Position the rubber mounting and washer on the rod.

Position the upper link on the body and insert the securing bolt in its seat, having previously lubricated it with 'Never Seez' grease, manufactured by R. Gori.

Position the rubber mounting and the washer for the engine compartment and offer the retaining nut to the body panel.

Lift the upper link 1 to 2 mm. from the bump rubber, thus bringing it into its datum position. Tighten the link retaining bolt and the camber adjustment rod securing nut to 4 to 4.5 kg.m.

Rear crossmember and torsion bars

Fit the rear crossmember supporting the torsion bars and tighten the securing nuts to 8.2 to 9.2 kg.m.

Apply Never Seez compound, made by R. Gori, to the torsion bar seats. Fit the torsion bars. It should be noted that these have 35 splines at the front and 34 at the rear. The following identification marks are used:

RH bar	Blue mark and letter D or R at front of bar
LH bar	Yellow mark and letter S or L on front of bar.

Lower wishbone

Position the lower wishbone against the body, locating the respective spacers between the longitudinal member and the mounting pin of the wishbone, in line with the retaining bolt holes. Insert the bolts and tighten to 8.2 to 9.2 kg.m. Ensure that the protective plastic washer is located in the seat of the torsion bar, smear the splines with the anti-seizing compound used for the rear splines, and insert the torsion bar into its seat aligning the marks previously applied.

NOTE: On the lower wishbone, the anchoring points of the anti-roll bar links must be lubricated with Never Seez compound, manufactured by R. Gori.

Stub axle

Lay out the tools A.2.0265 and A.2.0069, as detailed on page 24 and load the torsion bar in such a way that both the lower wishbone and the upper link can be connected to the stub axle.

Tighten the nuts on the ball joints; torque to 8.2 to 9.2 kg.m. for the upper ball joint nut.

Separate the lower wishbone from the tools and tighten the nut securing the lower ball joint to the wishbone to 1.5 to 2 kg.m.

Proceed similarly on the opposite side of the car.

Complete the assembly, noting the following:

The brake caliper securing bolts should be tightened to 7.5 to 8.5 kg.m.

Ensure that the working surfaces of the brake discs are clean, before fitting the pads to the caliper.

Check vehicle suspension height.

Check the front suspension geometry.

PARTIAL OPERATIONS

To disconnect anti-roll bar

Proceed as detailed on page 24 noting the following:
- It is not necessary to load the car statically.
- It is not necessary to remove the road wheels.

To disconnect the shockabsorbers

Proceed as described on page 24 noting the following:

- It is not necessary to load the car statically.
- It is not necessary to remove the anti-roll bar.
- Road wheel removal is optional.

To disconnect the hub from the stub axle

Carry out the operations detailed on pages 25 and 26 noting the following:

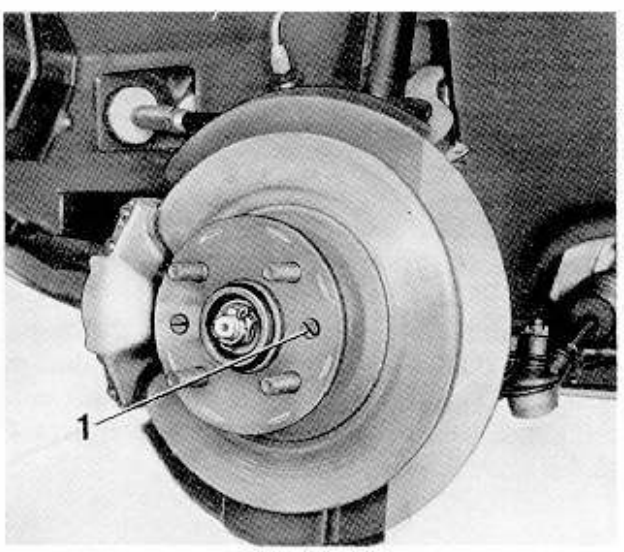
- It is necessary to remove the road wheel on the side of the car in question.

- It is not necessary to remove the brake caliper.

- It is not necessary to weight the car statically.

- It is sufficient to slacken and remove bolts 1 securing the brake disc to the hub.

- It is not necessary to remove the stub axle from the wishbone.



To remove the caster adjustment rod mountings

To remove and refit the mountings for the camber adjustment rod, proceed as follows:

- Jack up the car and remove the wheel.

- Slacken and remove the nut retaining the rod to the body. Remove the washer and corresponding mounting.

- Slacken the locknuts on the adjuster.

- Mark the position of the adjuster and screw it down completely to enable the inner mounting pad to be removed. If necessary, push the upper link backwards.

- Fit the new mounting pads. Bring the adjuster to its original position. Move the upper link 1 to 2 mm. away from the rebound pad thus bringing it to its nominal position and tighten the nut securing the rod to the body.

- Fit the road wheel and check the front suspension geometry. (see section on vehicle height).

- Tighten the locknuts on the adjuster.

To remove lower wishbone

Carry out the operations detailed on page 24 noting that it is not necessary to remove the shockabsorber from the body.

To remove the ball joint from the lower wishbone

The lower ball joint can be replaced without disconnecting the wishbone from the body and without removing the anti-roll bar.

Disconnect the lower wishbone from the stub axle. Replace the ball joint as follows:

- Extract ball joint using tools **A.3.0440** and **A.3.0441.**

- Fit a new ball joint, using tools **A.3.0440** and **A.3.0442.**

To remove upper link

To remove the upper link, carry out the removal operations as for the lower wishbone, noting the following:

- Disconnect the top ball joint from the stub axle.

- Release the bottom wishbone as detailed on page 24.

- Disconnect the shock absorber completely.

- Disconnect the brake caliper.

- Disconnect the steering linkage, and proceed as detailed on page 25.

- Finally, remove the upper link by withdrawing the bolt securing it to the body, and by removing the caster adjusting rod.

To remove stub axle

- Disconnect the stub axle from the wishbone and upper link. Proceed as for the disconnecting of the upper link.

- Remove the ball joints from the lower wishbone and upper link. Proceed as detailed on pages 24 and 25.

- Dismantle the stub axle as detailed on page 25.

To remove the crossmember and torsion bars

To remove the crossmember, carry out the operations for disconnecting the lower wishbone, noting the following:

- Do not detach the lower wishbone from the body.

- The same procedure applies to both sides of the car.

Remove the crossmember by withdrawing the torsion bars from their seats and by removing the crossmember retaining bolts from the body.

WARNING: *Check the front suspension geometry (see Chapter on suspension/vehicle height) after each partial operation, which includes the removal of the wishbones, torsion bars or the stub axle.*

To reconnect parts disconnected during the partial operations described above, proceed in the reverse order.

TOOLS

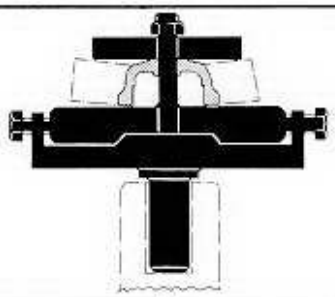
TIGHTENING TORQUES

LUBRICANTS
ANTI-SEIZING COMPOUNDS

TOOLS

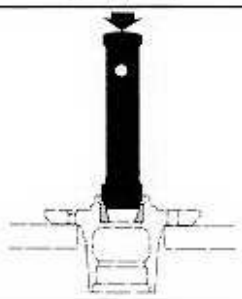
A.2.0069

SUPPORT TOOL
for A.2.0265 for tightening and releasing torsion bars.



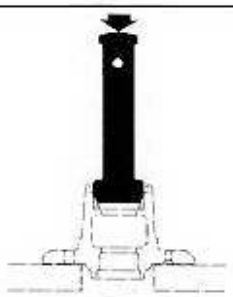
A.2.0265

TOOL
for tightening and releasing torsion bars (to be used together with A.2.0069)



A.3.0328 *

FITTING TOOL
for front hub outer taper bearing outer race

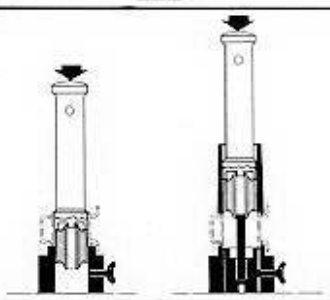


A.3.0329 *

FITTING TOOL
for front hub inner taper bearing outer race

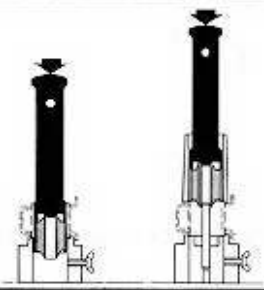
A.3.0346

FITTING TOOL
for link on anti-roll bar pivot



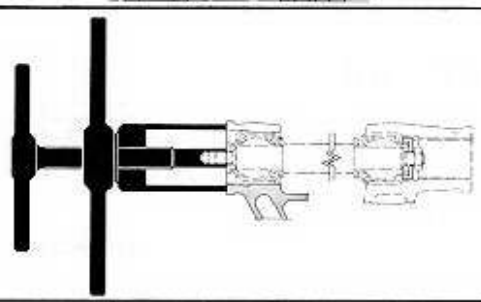
A.3.0367

BASE
for extracting and fitting rubber mountings for upper link. (To be used with A.3.0368)



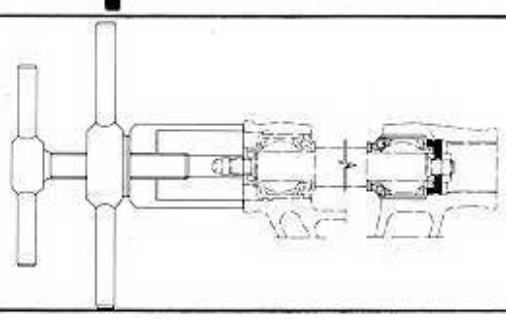
A.3.0368

EXTRACTOR-FITTING TOOL
for rubber mountings on upper link (to be used with A.3.0367)



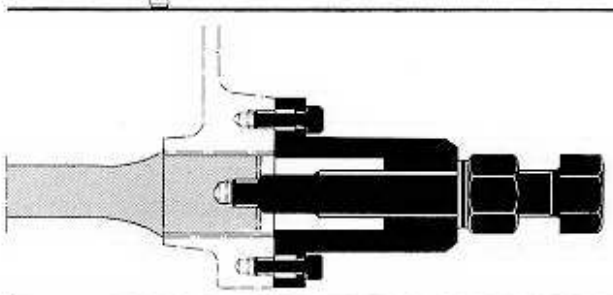
A.3.0372

EXTRACTOR-FITTING TOOL
for lower wishbone bush (to be used with A.3.0373)



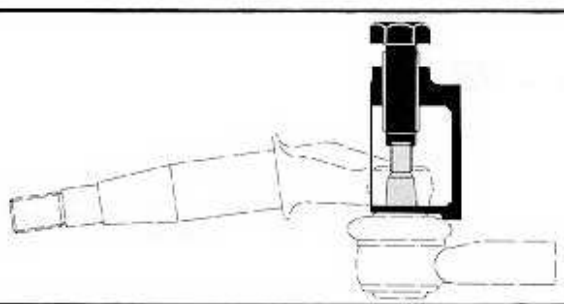
A.3.0373

RING
serrated ring for extracting the bushes from the lower wishbone (to be used with A.3.0372)



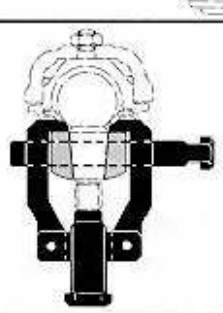
A.3.0374

EXTRACTOR
for torsion bar



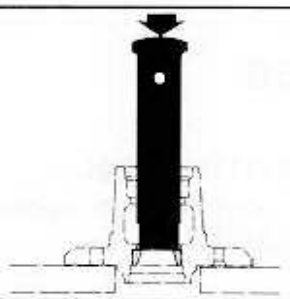
A.3.0376 *

EXTRACTOR
for ball joint on steering arm



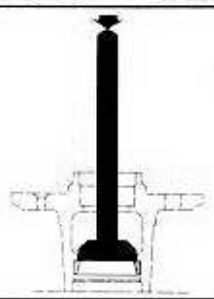
A.3.0377

EXTRACTOR
for upper and lower ball joints on stub axle



A.3.0378

EXTRACTOR
for front hub outer bearing outer race

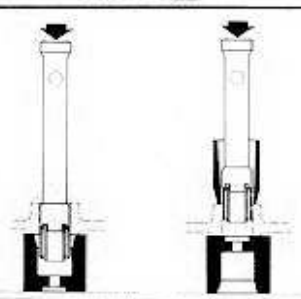


A.3.0568

EXTRACTOR
for front hub inner bearing outer race

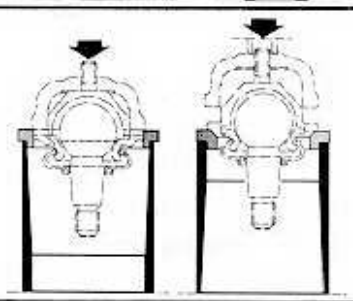
A.3.0422

PUNCH
for extracting rubber mountings for cross-member (to be used with A.3.0423)



A.3.0423

BASE
for extracting and fitting crossmember rubber mountings (to be used with A.3.0422)

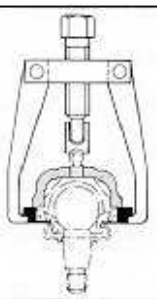


A.3.0435

FUNNEL
(Part of tool) for extracting/fitting ball joint on lower wishbone, on the bench

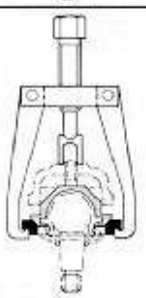
A.3.0440

EXTRACTOR-FITTING TOOL
for ball joint on lower wishbone on car



A.3.0441

RING
for extracting ball joint on lower wishbone



A.3.0442

RING
for extracting ball joint on lower wishbone

A.3.0459

FITTING TOOL
for front hub oil seal

R.7.0010 ※

JACK
column type for car hoisting

※ Tools marked with an asterisk are also used on other models.

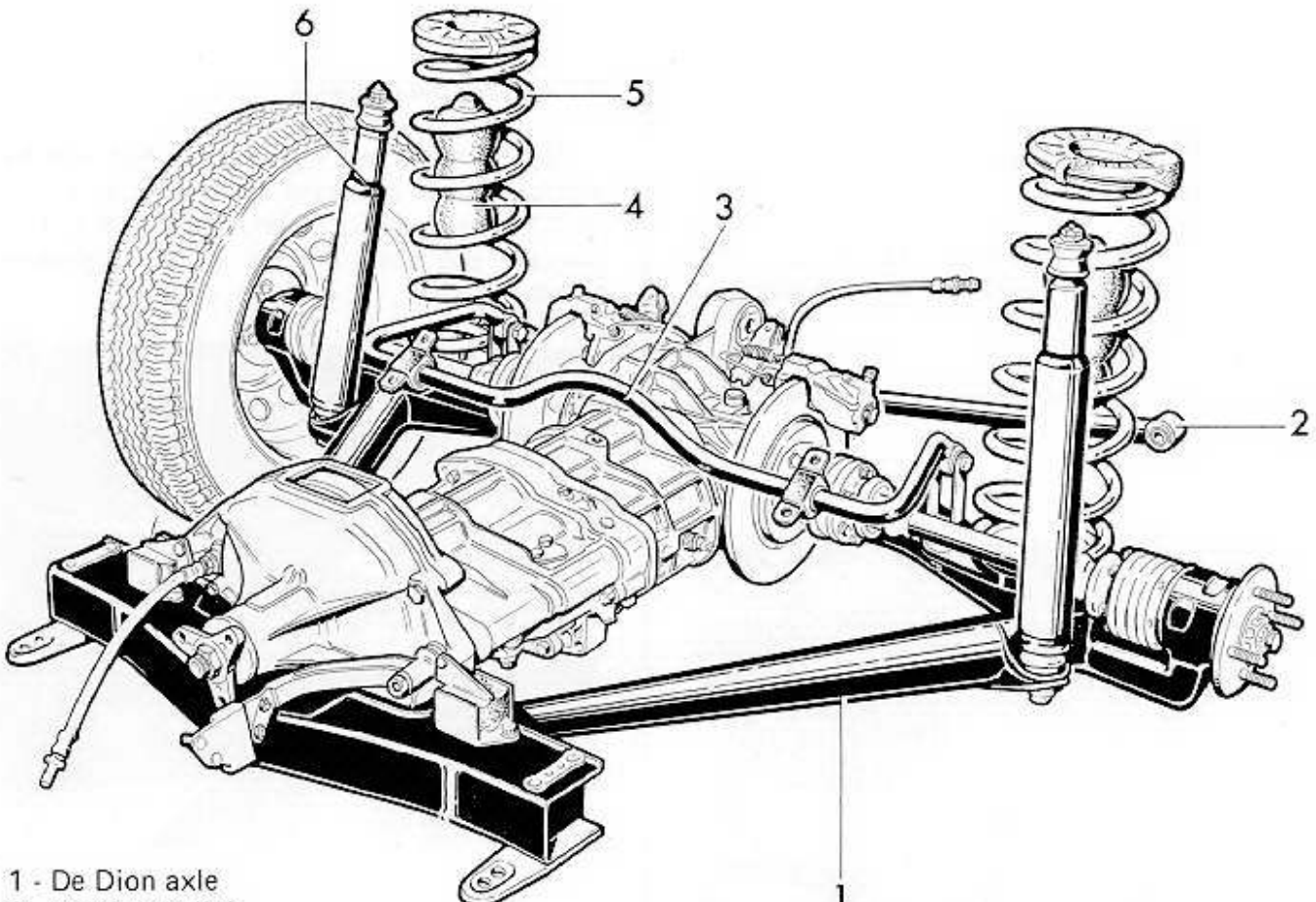
TIGHTENING TORQUES

DESCRIPTION	kgm	METHOD OF TIGHTENING
Nuts at end of lower wishbone mounting bracket	3 to 3.5	Dry
Threaded cap on lower wishbone	2 to 3.5	With sealant
Locknut for ring nut on lower wishbone	6 to 7.2	Dry
Securing nut for ball joint to lower wishbone	1.5 to 2	Dry
Nuts fixing lower wishbone mounting bracket to body	8.2 to 9.2	Dry
Nuts fixing upper link to stub axle	8.2 to 9.2	Dry
Nut fixing camber adjusting rod to body	4 to 4.5	Dry
Bolt fixing upper link to body	4 to 4.5	With anti-seizure compound
Bolts fixing crossmember to body	8.2 to 9.2	Dry
Bolts fixing brake calipers to stub axle	7.5 to 8.5	Dry

LUBRICANTS AND ANTI-SEIZING COMPOUNDS

DESCRIPTION	QUANTITY	COMMERCIAL EQUIVALENTS
Grease for: - Internal cavity of hub	50 g	AGIP FI GREASE 33 FD SHELL RETINAX AX IP AUTO GREASE FD
Grease for: - Lip of oil seal for hub and working area on stub axle. **NOTE:** Before fitting it to the hub, moisten the outer surface of the oil seal.	Sufficient quantity	ISECO MOLYKOTE BR 2 AGIP F1 ROTRA MP SAE 85 W/90 SHELL SPIRAX HD 90 IP PONTIAX HD 85 W 90
Grease for: - Internal surface of rubber bushes on anti-roll bar supports.	Sufficient quantity	ISECO ERGON RUBBER GREASE N. 3 REINACH OLEOBLITZ SFERUL B2 AR
Grease for: - Inner space between bush and lower wishbone	6 g	MOLYKOTE LONG TERM No. 2
Anti-seizure compound for: - Upper link securing bolts - Small mounting on lower wishbone for anti-roll bar link - Torsion bar splines	Sufficient quantity	R. GORI NEVER SEEZ

API - American Petroleum Institute NLGI - National Lubricating Grease Institute SAE - Society of Automotive Engineers



1 - De Dion axle
2 - Transverse link
3 - Anti-roll bar
4 - Bump rubber
5 - Spring
6 - Shock-absorber

REAR SUSPENSION

The rear suspension features a De Dion type axle.

This design which combines the advantages of the rigid rear axle with those of the independent axle, allows a reduction of unsprung weight together with an improved rear wheel geometry which ensures that the wheels always remain parallel to each other, providing thus excellent adhesion on corners and uneven surfaces.

The De Dion axle, which is of tubular construction and triangular shape, is connected at the front to a crossmember by means of rubber mountings. This crossmember in turn is bolted to the body.

The De Dion axle is controlled by a Watts linkage which is anchored on the body by a balance lever, which is in turn linked to the body by means of two crossmembers.

The bars of the Watt's linkage, by acting as struts or tie rods with forces equal to those transmitted by the wheels to the axle, prevent any lateral movement of the body.

The rear suspension comprises also variable rate coil spring, covered with a sound-absorbing plastic material, telescopic hydraulic shock absorbers, and an anti-roll bar.

TO REMOVE THE REAR SUSPENSION

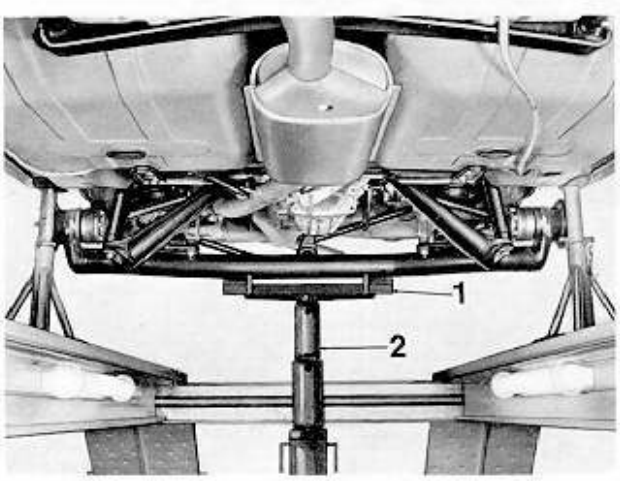
Preliminary operations

- Place the car on a ramp and slacken the rear road wheel nuts.

- Fit tool no. A.2.0075 (1) to jack no. R.7.0010 (2); then raise the car and place on stands approx 40 cm. high.

- Remove road wheels and retain wheel nuts.

- Lower the jack.

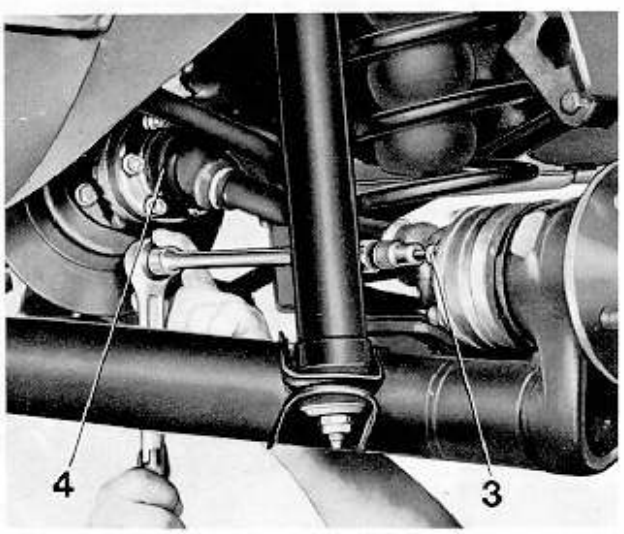


- Remove exhaust pipe as detailed on page 6.

- Disconnect gear selector rod from the selector lever and from the lever on the clutch cover, proceeding as detailed on page 6.

To remove the rear axle

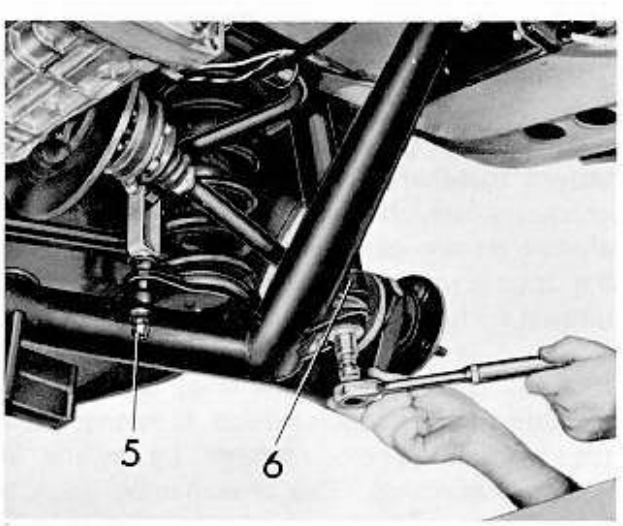
Disconnect the half shaft on the hub side by slackening and removing the bolts 3, also associated washers and plates. Take care not to damage the boot on the constant velocity joints 4.



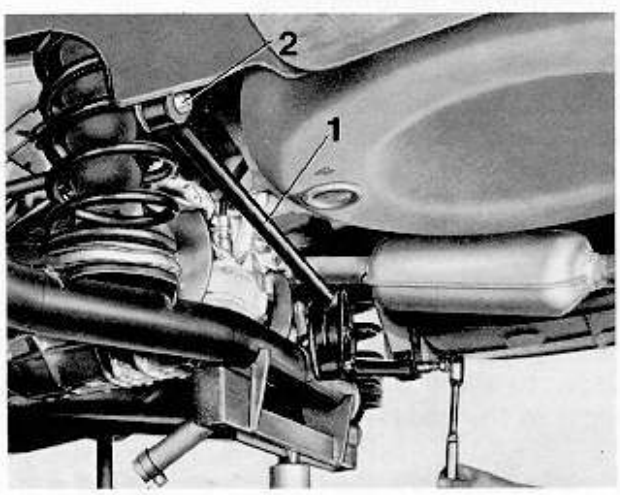
Support the axle.

Disconnect the anti-roll bar from the axle by slackening and removing the retaining nuts 5, together with the rubber bushes and washers.

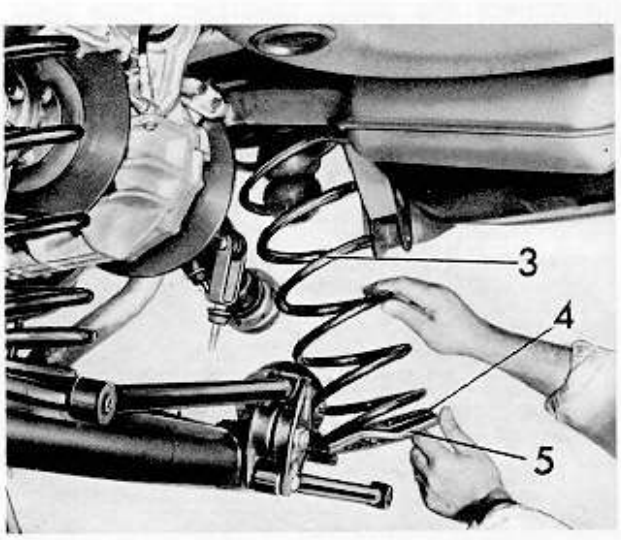
Disconnect shock absorbers 6 from the mounting brackets by removing the nuts, locknuts and rubber bushes.



Disconnect the transverse links of the Watt linkage **1** from the body by removing the fixing bolts **2**.



Lower the axle by means of the jack, until the springs **3** are completely free and remove them from their seats together with the rings **4** and rubber pads **5**.



Disconnect the speedometer drive cable from the drive shaft.

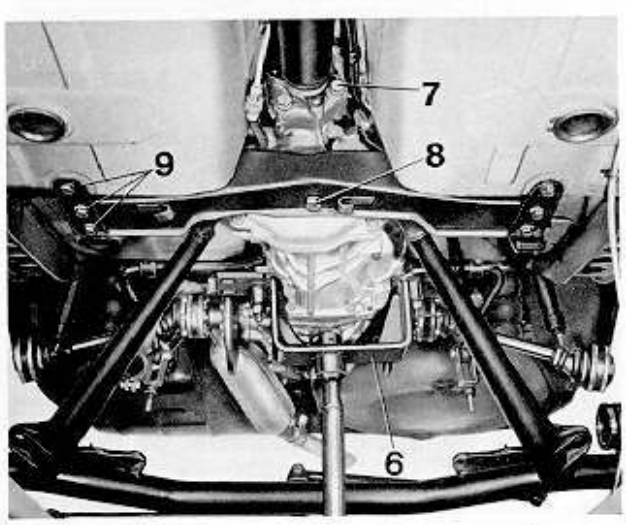
Disconnect the electric cables from the reverse light switch.

Fit tool **R.4.0150 (6)** to the gearbox/rear axle unit. Support the assembly by means of a column-type jack and proceed as follows:

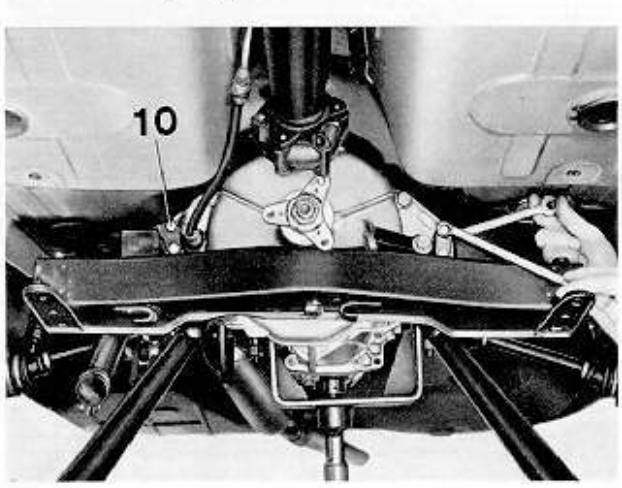
- Disconnect the propeller shaft from the clutch spider by slackening and removing the retaining bolts **7** from the flexible coupling.

- Slacken the securing bolts **8** between axle and front crossmember.

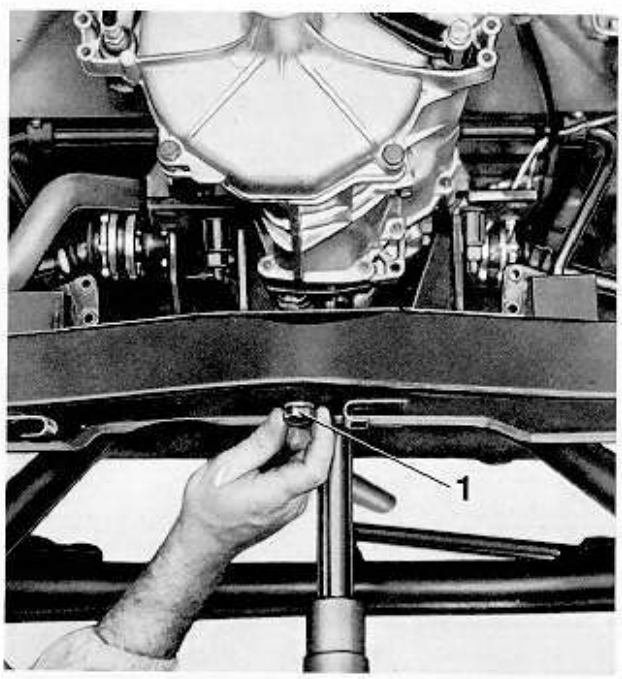
- Detach the front crossmember from the body by slackening and removing retaining bolts **9**.



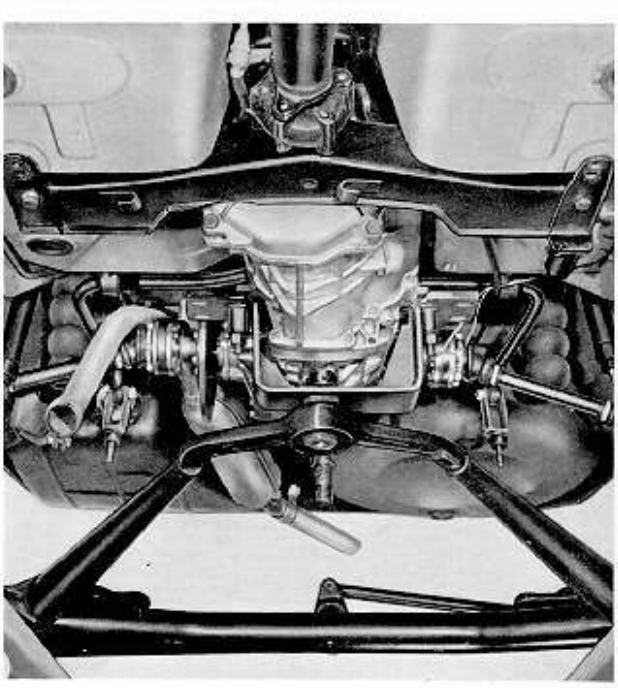
Detach the front crossmember from the gearbox/rear axle unit by slackening and removing the retaining bolts **10**. At this stage of the operation it becomes necessary to momentarily support the rear axle.



Place the removed items on the ramp. Separate the axle from the crossmember by removing the anchoring bolt 1.



Refit temporarily the front crossmember to the body, in order to support the gearbox/rear axle unit when removing the jack, to allow the complete withdrawal of the axle assembly.



To disconnect anti-roll bar

Disconnect the links from the anti-roll bar by removing the securing bolts.

Slacken and remove the bolt securing the anti-roll bar mountings to the body. Withdraw mountings.

Disconnect the handbrake cable from the brake caliper levers.

Fit the column-type jack to tool **R.4.0150** and raise the gearbox/differential unit, in order to allow the removal of the bolt securing it to the body.

Finally, lower the assembly to enable the anti-roll bar to be withdrawn.

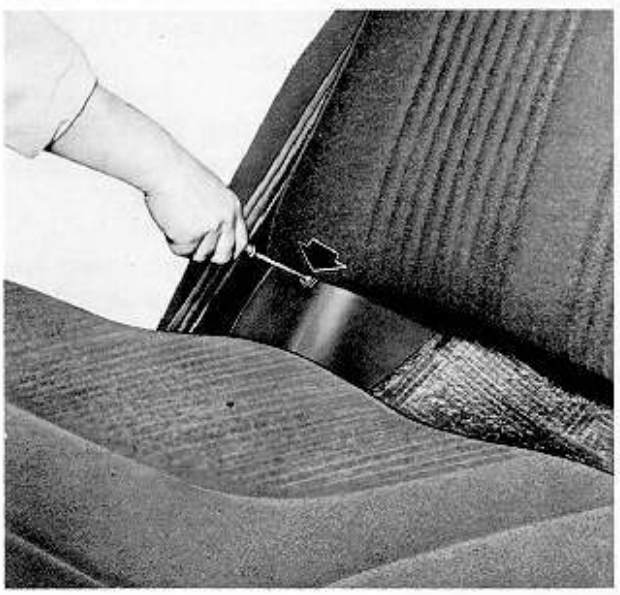
To disconnect the shock absorbers from the body

Disconnect the shock absorbers from their anchoring points on the body, proceeding as follows:

From inside the boot, remove the wing nuts retaining the rear squabs.

DISMANTLING

Move the rear seat and remove the squab by unscrewing the bolts which secure it to the wheel arch.



Disconnect the shock absorbers by removing the locknuts and securing nuts.
Remove the cups together with the rubber bushes **1**.

To dismantle rear axle

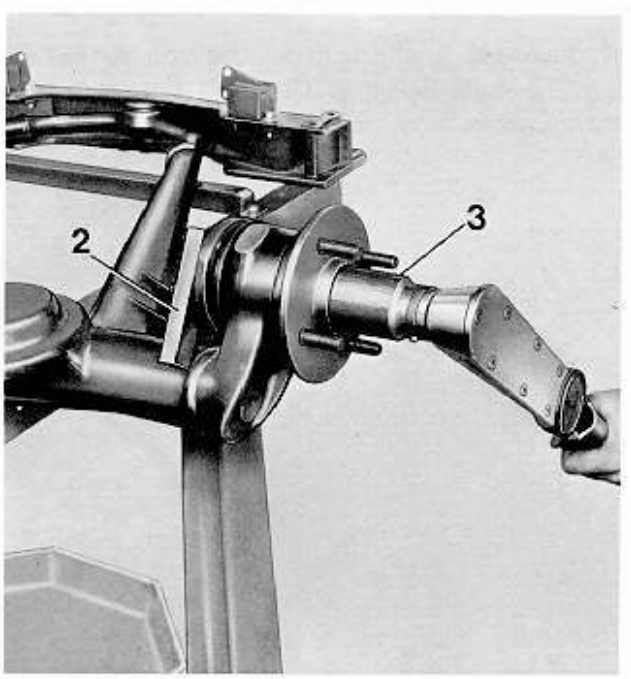
Secure the axle assembly to the bench and remove the Watts linkage from the pivot by removing the securing nut for the balance lever, after breaking the caulking. Where fitted, remove also the washer.

Disconnect the Watts linkage from the balance lever by removing the securing nuts.

Remove hub and half shaft from the axle. Proceed as follows:

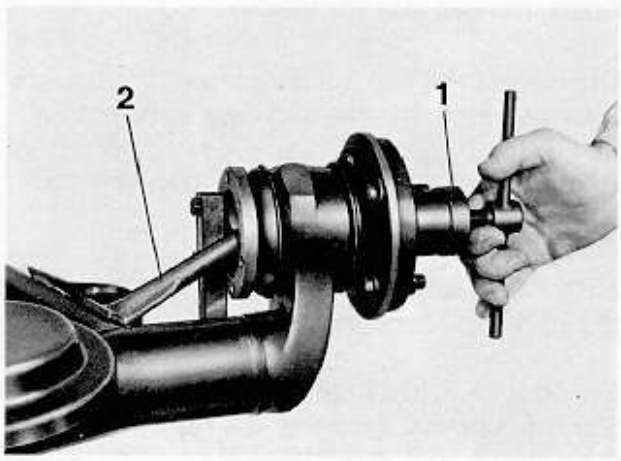
Withdraw split pin and remove locknut from the half shaft securing nut.

Fit tool **A.2.0131** (2) to half shaft flange. Slacken the nut securing the hub to the half shaft, using tool **A.5.0163** (3).



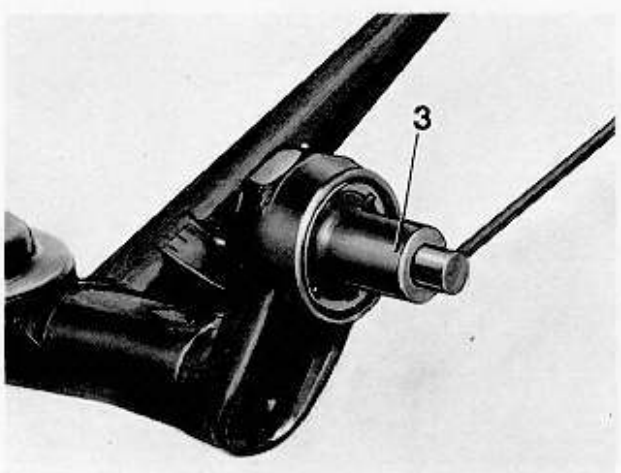
Extract the hub, using tools **A.3.0327**, **A.2.0281** and **A.2.0131** (the latter having been fitted previously), proceeding as follows:

Fit tool A.3.0327 (1) to the hub. Interpose tool A.2.0281 (2) between axle and half shaft flange. Rotate the hub until it is locked by tool A.2.0131. At this point, proceed to extract the hub by operating tool A.3.0327.



Remove the tools and half shaft.

Remove the caulking from the ring nut securing the hub bearing. Unscrew the ring nut, using spanner no. A.5.0187 (3).



It should be noted that the ring nut has a left-hand thread on the LH side and a RH thread on the RH side.

Extract the bearing from the hub by means of tool A.3.0432 operated by a spanner.

Check condition of De Dion axle, Watts linkage, balance lever and all rubber mountings.

If necessary, replace the rubber mountings at the anchoring points between axle and cross-member. Proceed as follows:

Extract the rubber mounting from its seat together with upper and lower washer, using tool A.3.0435 operated by a spanner.

Place the lower washer in its seat. Insert the new rubber mounting using tool A.3.0435 complete with guide tunnel.

Fit the upper washer. Caulk the edge of the seat of the rubber mounting, using tool A.2.0269.

To replace rubber bushes for Watts linkage and balance lever

Extract the bushes from the Watts linkage using tools A.3.0443 and A.4.0444 and a press. Replace bushes, using the identical tools, but inserting them from the chamfered side.

Extract the balance lever bush, using tools A.3.0445 and A.3.0446 and a press. Fit the bush, using the same tools, but inserted from the chamfered side.

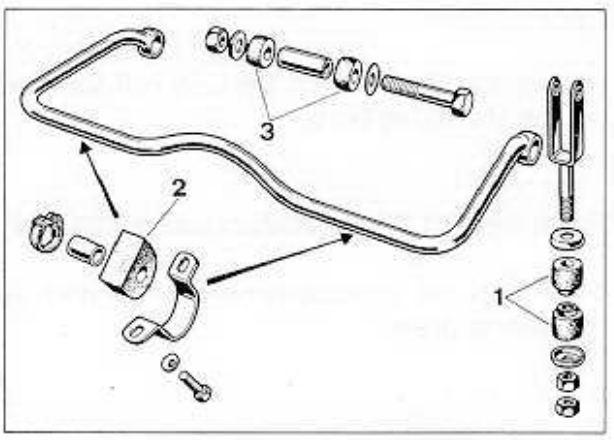
Anti-roll bar

Check the condition of the rubber pads 1 on the links connecting the anti-roll bar to the De-Dion axle; replace the pads, if damaged.

Check that the rubber mountings 2 securing the anti-roll bar to the body are in good condition. If necessary, replace the mountings. Before fitting new mountings these should be lubricated on their internal surface with:

- SPAGRAPH by RN RENAULT
- ERGON RUBBER GREASE NO. 3 by ISECO
- SFERUL B2 AR REINACH OLEOBLITZ

Check the condition of the rubber bushes **3** seated in the eye of the anti-roll bar. If necessary, replace them as follows:
- take away the stakings from the distance pieces and remove the worn parts;
- fit the new rubber bushes, the washers and the distance pieces; then, stake again the distance pieces in place with tool **A.2.0298.**



Check the shock absorbers by measuring their damping capacity at high and low speeds.

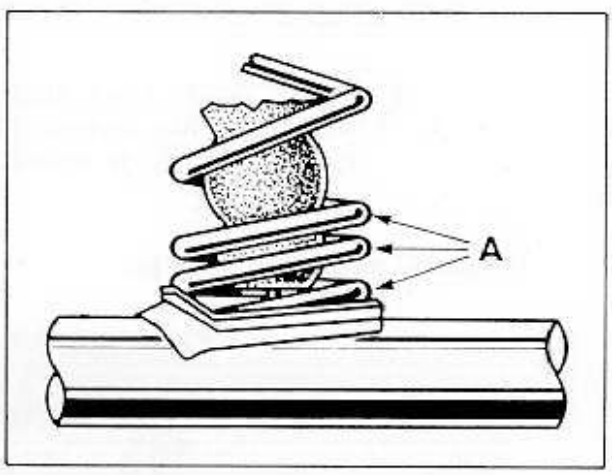
The readings should meet the data given on page 52.

- The front and rear shock absorbers of each car should be matched together as shown by the table on page 52.

Road springs

To check the efficiency of the springs, measure, under static load, the distance between the spring cup and the bump rubber pad (see page 59).

If spring replacement is necessary, fit springs of the same grade to each axle. Furthermore, the variable rating coil springs (A) must be fitted with the variable coils pointing toward the axle.



For tables stating spring grade, loads and part numbers, refer to the "Inspection Specs".

Wheel hub bearings

Check the hub bearings for signs of excessive wear and or seizure.

Rebound rubbers

Check the condition of the rubbers which determine the end of the compression stroke of the springs. Replace rubbers if required.

To facilitate the replacement, lubricate the spherical head of the rubber, and fit it under pressure in its locating hole on the body.

RE-ASSEMBLING

To fit wheel hub

Fit hub bearing, after previously cleaning and lubricating its seat. Use fitting tool A.3.0432.

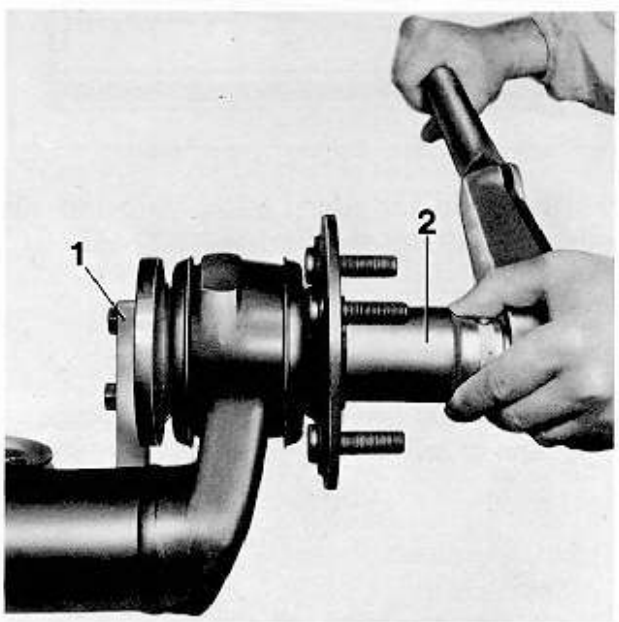
Fit ring nut to lock the bearing, using tool A.5.0187 and tighten to 23 to 27 kgm. Lock by caulking on diametrically opposed sides.

Fit hub, using tool no. A.3.0432.

Insert the drive flange and fit tool A.2.0131 (1) to flange. Fit the nut securing the hub to the drive flange, using tool A.5.0163 (2) and tighten to 27 to 33 kgm.

After tightening the hub securing nut, apply the RUST VETO 1064 greasy-film compound by HOUGHTON to the drive flange threads with a brusch.

Fit lock nut and secure with split pin.



To refit Watts linkage

Connect the Watts linkage to the balance lever. Fit the bolts without locking them. It should be noted that the lower bolt of the RH link must have its head turned towards the axle to prevent fouling.

TO RECONNECT THE SUSPENSION

To re-connect anti-roll bar

Place the anti-roll bar, complete with rubber mountings and bushes, in position, and secure to body.

Raise the gearbox/differential unit, using a column type jack in conjunction with tool R.4.0150, previously fitted, and secure to body. Tighten the fixing bolts to 4.5 to 5.5 kgm.

Reconnect the links to the anti-roll bar and tighten the fixing bolts.

To re-connect the shockabsorbers to the body

Reconnect the shockabsorbers to the body in the reverse order.

To reconnect the axle

Reconnect the axle in the reverse order, noting the following:

- Tighten the crossmember securing bolts to 4 to 4.5 kgm.

- Tighten the bolt securing the front axle mounting to the crossmember to 9 to 11 kgm.

- Tighten the bolt securing the flexible coupling to the clutch spider using tool A.5.0192 in conjunction with a 300 or 400 mm. torque wrench. Torque: 4.1 to 4.5 kgm. At this stage, and before proceeding with the tightening, lubricate the centralising seat and the retaining rubber cap, using approx. 7 cm^3 of MOLYKOTE BR 2 grease.

Position the road springs, complete with cups and rubber pads and raise the axle. Connect the shock absorbers after having previously coated the stems with NEVER SEEZ compound manufactured by R. GORI.

Also reconnect to the axle:

- Anti-roll bar links,

- Watts linkage, securing it to the pivot on the axle, using a retaining bolt and the abutment washer. Do not lock at this stage.

Connect the Watts linkage to the body. Fit the bolts which should also be coated with NEVER SEEZ compound, manufactured by R. GORI, but do not tighten at this stage.

Reconnect the half shafts to the stub shafts. Lubricate the retaining bolts with MOLY-KOTE BR 2 paste and tighten to 2.8 to 3 kgm.

Fit the road wheels. Establish the correct vehicle/suspension height and tighten:

- Nut securing balance lever to axle and caulk.

- Bolts securing the Watts linkage to the body and balance lever.

- Anti-roll bar bushes, near the rubber caps, to prevent any possible lateral movement of the bar.

Reconnect the speedometer drive cable, the electric wires and adjust the hand-brake cable.

Check the correct vehicle/suspension height.

Check rear wheels geometry.

PARTIAL OPERATIONS

For refitting the parts disconnected or removed during the partial operations, proceed in the reverse order.

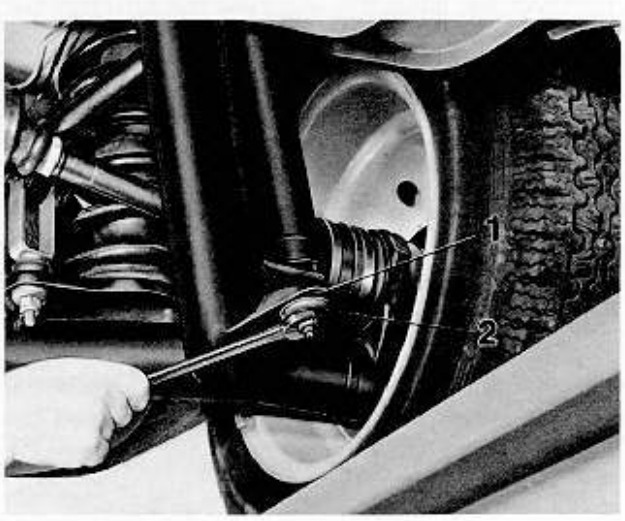
To disconnect the rear shock absorbers

Place the car on a ramp.

Remove rear seat. Release the squab by unscrewing the retaining bolts securing it to the wheel arch and releasing the wing nuts accessible through the boot.

Disconnect the shock absorbers from their anchoring points on the body by unscrewing the locknuts, retaining nuts and removing these together with the rubber bushes and cup washers.
(See illustrations on page 44 and 45).

Raise the car and disconnect the shock absorbers from the De Dion axle, by unscrewing the locknuts and retaining nuts and removing the rubber bushes 1 and cup washers 2.



To disconnect the anti-roll bar

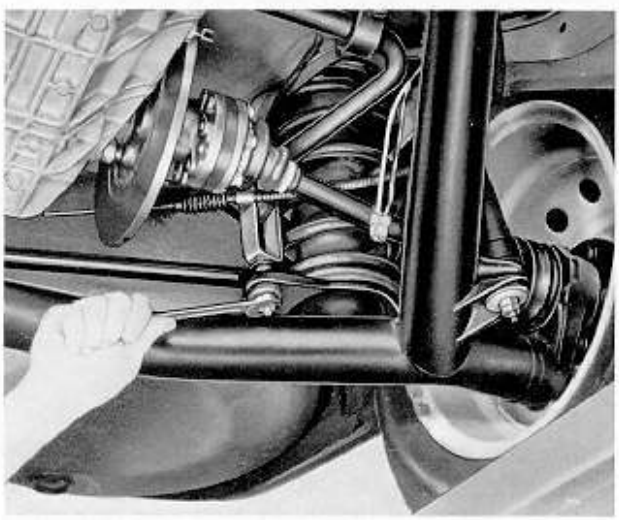
Raise the car on a ramp:

- Disconnect the speedometer drive cable from the drive spindle.

- Disconnect the handbrake cable.

- Disconnect the electric cables from the reverse light switch.

Disconnect the bar links, retaining the rubber mountings, cups and fixing nuts.



Remove the supports securing the anti-roll bar to the body.

Remove the anti-roll bar links from the bar by unscrewing the fixing bolt.

Support the gearbox/differential unit by means of a column type jack. Release this assembly from the body anchoring point by removing the fixing bolt.

Lower the jack and gearbox/differential assembly sufficiently to allow the anti-roll bar to be withdrawn.

To replace the Watts linkage rubber mountings

Raise the car on a ramp.

Disconnect the Watts linkage from the body by removing the relevant fixing bolts.

Disconnect the balance lever from the axle by removing the fixing bolt, after having previously removed the caulking, and where fitted, the washer.

Remove the bolts securing the Watts linkage to the balance lever and withdraw the linkage.

Replace the rubber bushes on the bench, as detailed on page 46.

Reassemble the Watts linkage by connecting the linkage to the balance lever and inserting the retaining bolts, but without tightening these. Fit the lower bolt securing the RH linkage with its head turned towards the axle, in order to avoid any fouling the axle.

Connect the Watts linkage to the axle by inserting the bolts securing the linkage to the body and fitting the nut securing the balance lever to the pivot bolt and all remaining bolts. Do not tighten fixings at this stage.

Place the car in its normal height position. Tighten the linkage securing bolts. Tighten the nut securing the balance lever to the axle and caulk.

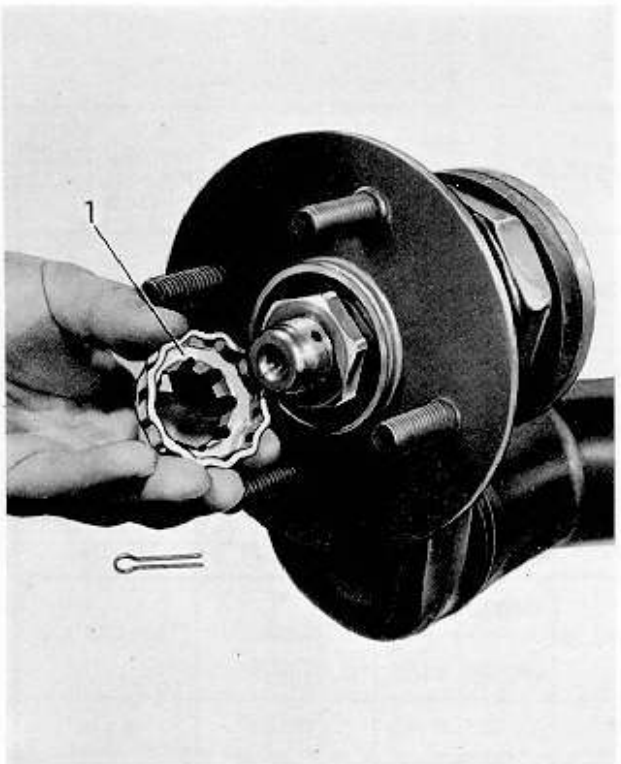
To replace a stub shaft, hub and bearing

Place the car on a ramp. Slacken the road wheel nuts on the wheel in question.

Support the car on a stand and remove the wheel.

Remove the bolts **3** retaining the half shaft to the stub shaft and to the brake disc spacer. Take care not to damage the boots **4** on the constant velocity joints and remove the half shaft. (see illustration on page 42).

Remove the split pin and remove the locknut 1 from the retaining nut fixing the half shaft to the hub.



Replace the parts affected as detailed on pages 45 and 46. It should be noted that for the removal of stub shaft and hub it is only necessary to carry out the first sequence of operations, whereas it is necessary to carry out the complete sequence of operations if the hub bearing is to be replaced.

The fitment of the hub to the axle is detailed on page 48.

To remove road springs and bump rubber

The operations for the removal of the road springs and bump rubbers are detailed on pages 42 and 43. This operation may be required for a possible correction of the vehicle height, which can be achieved by shimming the springs.

TING DATA FOR CALIBRATING AND MATCHING FRONT & REAR SHOCK ABSORBERS

front and rear shock absorbers of each car should be matched together as shown by the table w:

CAR'S MODEL			116.08 – 116.09 116.42	116.10 – 116.11 – 116.36 – 116.37 – 116.54				116.10 – 116.11 116.36 – 116.37 116.54 – 116.55 116.56
SHOCK ABSORBER			11600.21070.01 11600.21070.07	11600.21070.06	11600.21070.13		* 11604.21070.01	11655.21070.01
					GREEN	BLUE	BLACK	
RATING kg	LOW SPEED	COMPRESSION	6 - 15	5 - 16	7 - 17	9 - 19	10 - 21	14 - 26
		EXTENSION	28 - 50	12 - 33	37 - 64	24 - 43	35 - 59	43 - 70
	HIGH SPEED	COMPRESSION	32 - 45	19 - 35	20 - 32	47 - 65	53 - 72	47 - 66
		EXTENSION	157 - 205	84 - 127	83 - 118	98 - 135	94 - 130	145 - 190
SHOCK ABSORBER			11600.25070.06 11600.25070.11 11600.25070.22	11600.25070.10	11600.25070.17		* 11604.25070.01	11655.25070.01
					GREEN	BLUE	BLACK	
RATING kg	LOW SPEED	COMPRESSION	6 - 15	5 - 16	6 - 16	9 - 19	13 - 25	6 - 16
		EXTENSION	22 - 50	12 - 39	15 - 38	21 - 54	22 - 54	24 - 54
	HIGH SPEED	COMPRESSION	29 - 45	19 - 37	21 - 35	26 - 45	44 - 67	23 - 42
		EXTENSION	112 - 155	86 - 144	83 - 127	92 - 143	93 - 144	93 - 140

hock absorbers to be fitted at option to get stiffer suspensions.

se figures are to be achieved on a test rig and with the shock absorbers at a temperature of 20° ± . Prior to perform the tests, pump the shock absorbers through few complete cycles to settle n, particularly when they have been out of use for a long time.

TOOLS

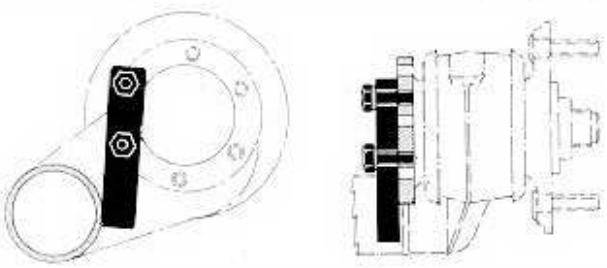
TIGHTENING TORQUES

LUBRICANTS AND ANTI-SEIZING COMPOUNDS

TOOLS

A.2.0075 *

SUPPORT
for raising car

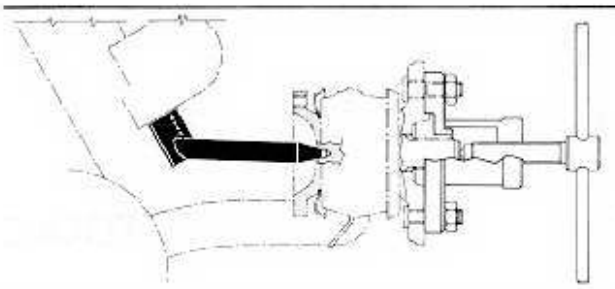


A.2.0131

STOP
Wheel hub tool

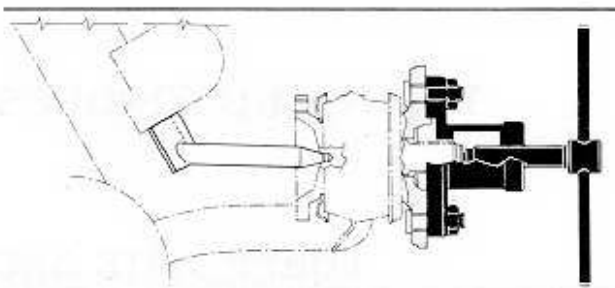
A.2.0269

CAULKING TOOL
for caulking upper washer on rear axle rubber mounting



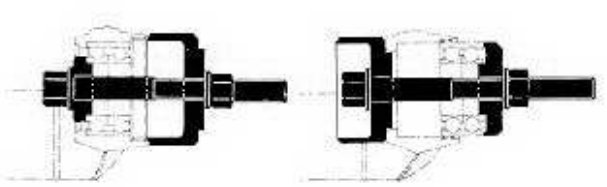
A.2.0281

SPACER
for extracting rear wheel hubs



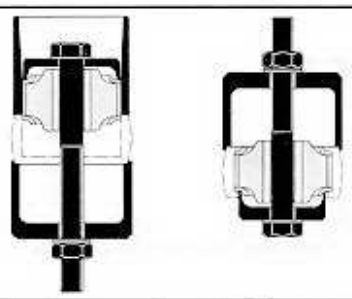
A.3.0327 *

EXTRACTOR
for rear hubs



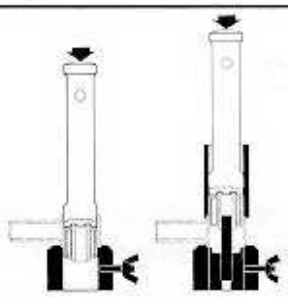
A.3.0432

EXTRACTOR-FITTING TOOL
for rear hub bearing



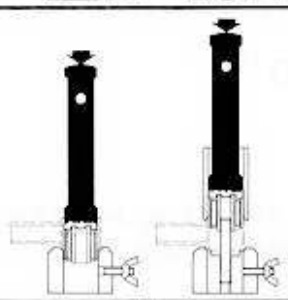
A.3.0435

EXTRACTOR-FITTING TOOL
for rear axle rubber bush



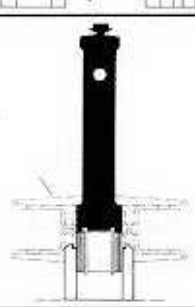
A.3.0443

BASE
for extracting and fitting rubber bush on transverse linkage for rear axle



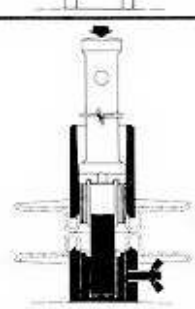
A.3.0444

EXTRACTOR-FITTING TOOL
for rubber bushes on transverse linkage for rear axle



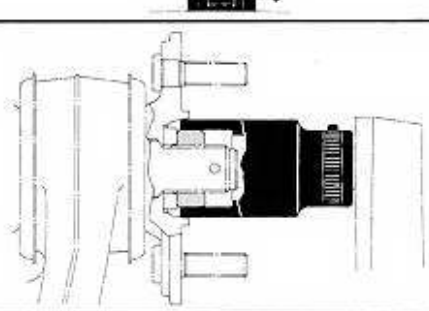
A.3.0445

EXTRACTOR-FITTING TOOL
for balance lever rubber bush, connecting Watts linkage to the axle



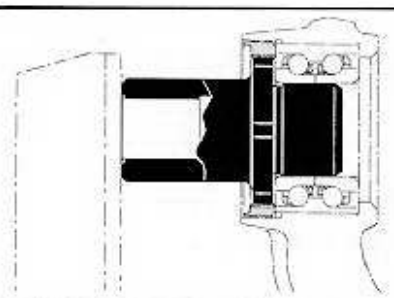
A.3.0446

BASE
for extracting and fitting rubber bushes on balance lever



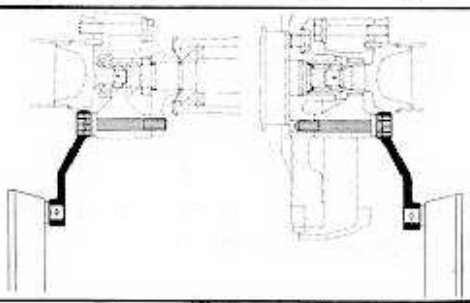
A.5.0163

SPANNER
36 mm. spanner for rear hub nut



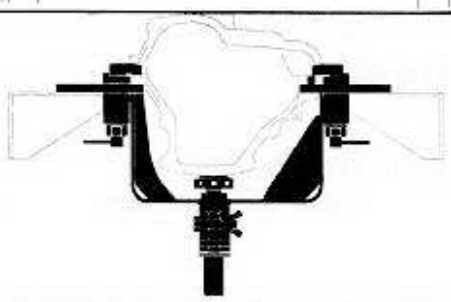
A.5.0187

TOOTHED SPANNER
for ring nut on rear wheel bearings



A.5.0192

SPANNER
17 mm. hexagon spanner for propeller shaft flexible coupling retaining bolts



R.4.0150

SUPPORT
for fitting and removing clutch unit to gearbox/differential unit

R.7.0010 *

ELEVATOR
column type for fitting and removing gearbox/differential unit

A.2.0298

CAULKING TOOL
for caulking antiroll bar mountings

Tools marked thus * are also used on other models.

TIGHTENING TORQUES

DESCRIPTION	kgm	METHOD OF TIGHTENING
Bolt, axle to crossmember	9 to 11	Dry
Bolt, gearbox crossmember to body	4.5 to 5.5	Dry
Nut, shaft to hub	27 to 33	Dry
Ring nut on hub bearing	23 to 27	Dry
Bolts, half shaft to stub shaft	2.8 to 3	With grease
Bolts, differential drive shaft to spacer	2.8 to 3	With grease
Bolts, retaining propeller shaft (with 200 to 400 mm torque spanner and tool spanner)	4.1 to 4.5	Dry
Bolts, retaining axle crossmember	4 to 4.5	Dry

LUBRICANTS AND ANTI-SEIZING COMPOUNDS

DESCRIPTION	RECOMMENDED COMMERCIAL EQUIVALENTS
Grease for: - Internal surface of rubber mountings for anti-roll bar	ISECO – ERGON RUBBER GREASE N. 3 REINACH-OLEOBLITZ – SFERUL B2 AR
Grease for: Bolts, half shaft to stub shaft	ISECO MOLYKOTE BR 2
Anti-seizure compound for: - Lower shockabsorber pin - Bolts, Watts linkage to body	R. GORI – NEVER SEEZ
Protective compound for: - Drive flange threaded end	HOUGHTON RUST VETO 1064

TO CHECK VEHICLE HEIGHT

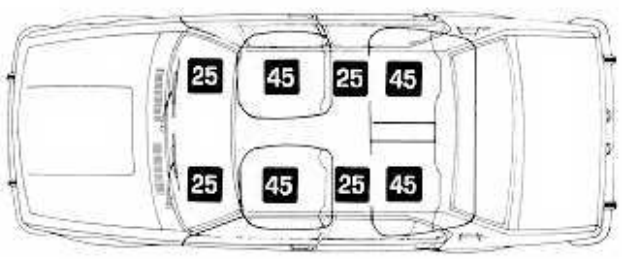
Preliminary operations

Place the car on a 4 column lift or over a suitable, level pit.

Ensure that the tyre pressure is a recommended and check, using the appropriate gauge, that the tyre tread depth is the same on all four wheels.

Put the car in running order, filling up the tank completely.

Weigh the car statically as shown below.

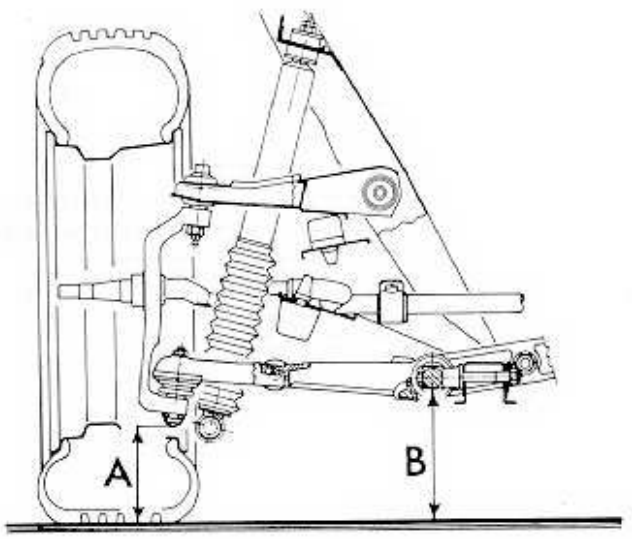


Raise the car, disconnect the anti-roll bars, front and rear; disconnect front and rear shock absorbers and slacken the bolts securing the Watts linkage to the body.

Bounce the car a few times to settle the suspension.

To check front vehicle height

Measure dimension A from the lower wishbone mounting and distance B from the end of the ball joint on the stub axle to the ground.



Calculate the difference of the two dimensions. This should be between 39 and 49 mm. and the values should be the same on each side of the car.

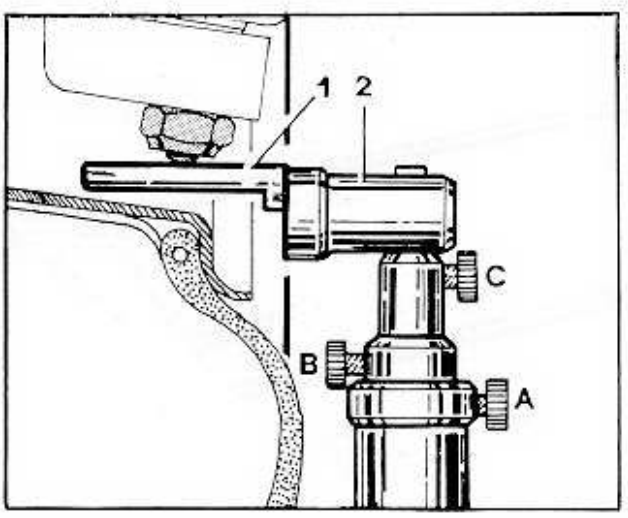
If the torsion bars have been replaced, the above value should be 44 to 54 mm., but still the same on both sides of the car.

Measure dimensions A and B using the following tools:

- Ruler A.4.0146
- Bar, graduated in mm., and base A.4.0149
- Pointer A.4.0151.

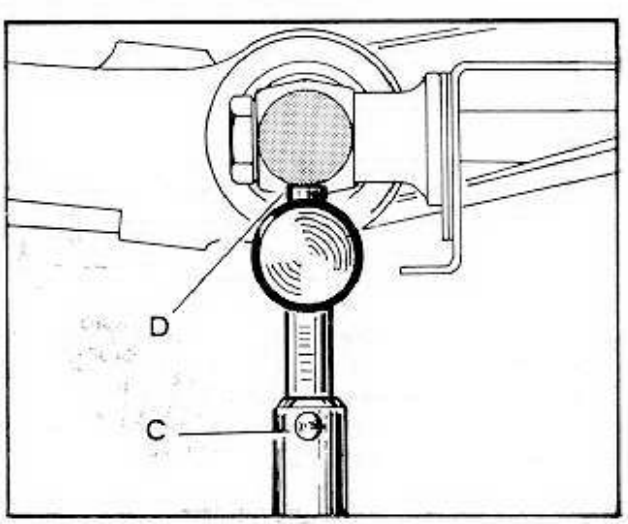
Place ruler against the lower joint.

Fit pointer **1** to the upper hole on head **2** of tool **A.4.0149**.
Slacken bolts A and B and tighten Bolt **C**.
Place tool on the outer face of the ruler and bring the upper part of the pointer lightly in contact with the end of the ball joint, as illustrated.

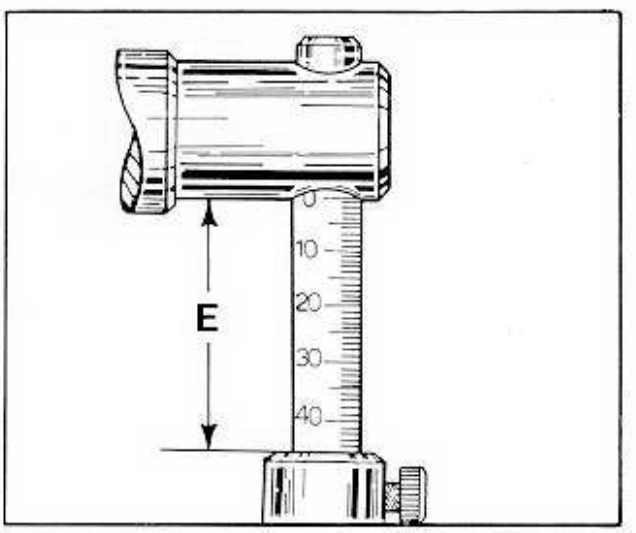


Tighten bolts A and B. The tool is now zeroed.

Move tool **A.4.0149** along the inner surface of the ruler and, after removing the pointer and slackening bolt **C**, withdraw graduated rod until the head of screw **D** lightly touches the lower part of the wishbone mounting, as illustrated, and tighten setscrew **C**.



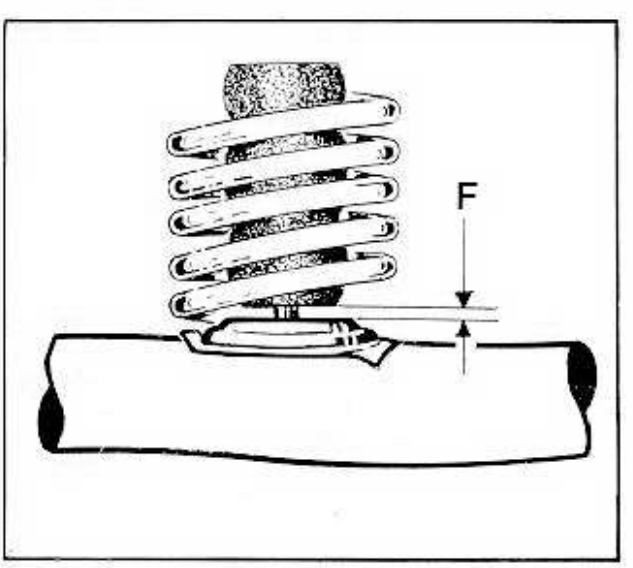
Read the áctual value of the front suspension height **E** off the calibrated rod, at points as shown below.



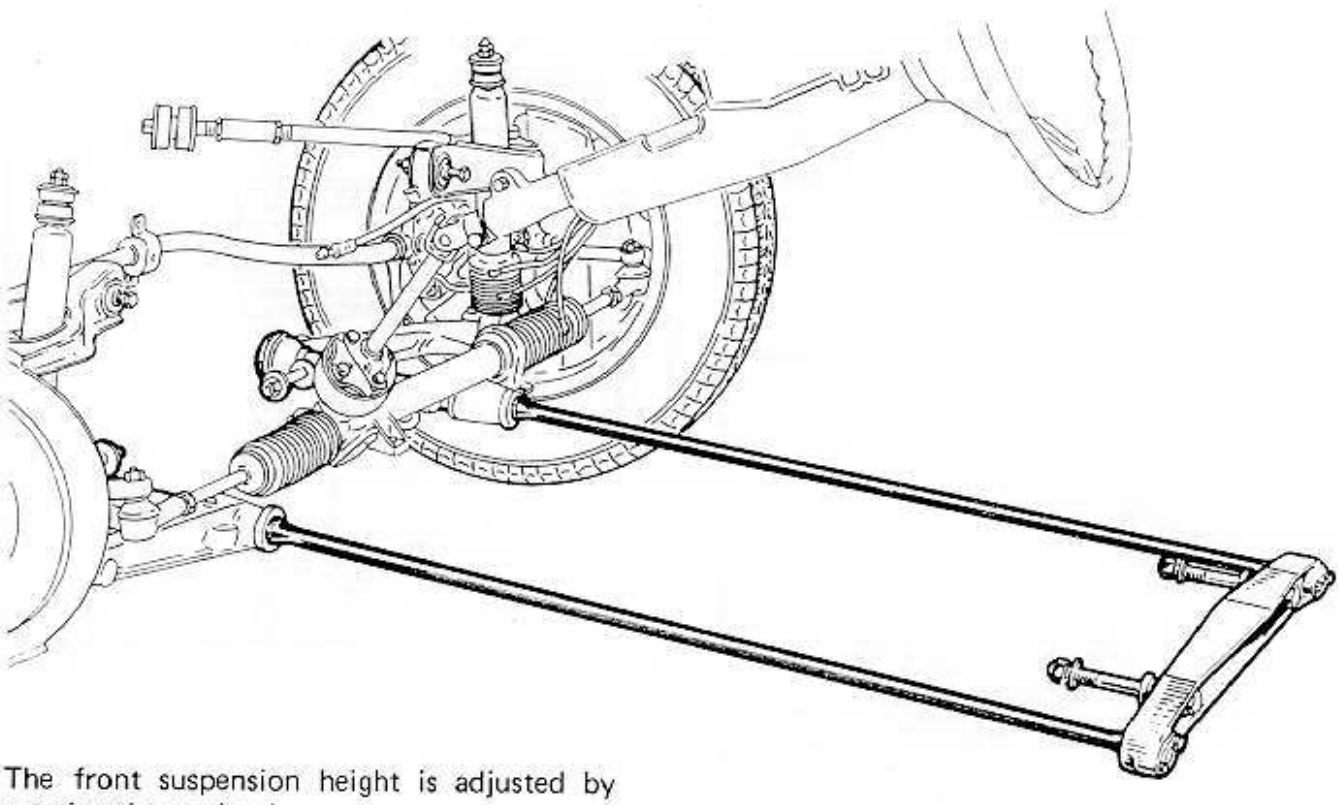
To check rear vehicle height

With the car laden statically, measure the distance between the spring locating cup and the bump rubber pad.

The value **F** thus obtained must be between 39 and 49 mm., and must be identical on both sides.



TO ADJUST VEHICLE HEIGHT



The front suspension height is adjusted by rotating the torsion bars.

The different number of splines at the ends of the torsion bars, i.e. 35 at the front and 34 at the rear, allows a minimum correction of 1.5 mm., which corresponds to the rotation by one spline.

Correct the suspension height as shown in the illustration, and detailed in the chart listing the relevant corrective values. It should be noted that the instructions refer to the suspension when this is viewed from the rear.

DIRECTION OF ROTATION OF TORSION BARS FOR SUSPENSION HEIGHT ADJUSTMENT		
Suspension height low (The car is raised)	Anti-clockwise	Clockwise
Suspension height high (Car is lowered)	Clockwise	Anti-clockwise

VALUES FOR CORRECTING SUSPENSION HEIGHT				
Error of suspension height mm	Suspension height low		Suspension height high	
	Torsion bar		Torsion bar	
	left-hand	right-hand	left-hand	right-hand
	↺	↻	↻	↺
1.5	Z = 1	Z = 1	Z = 1	Z = 1
3.0	Z = 2	Z = 2	Z = 2	Z = 2
4.5	Z = 3	Z = 3	Z = 3	Z = 3
6.0	Z = 4	Z = 4	Z = 4	Z = 4
7.5	Z = 5	Z = 5	Z = 5	Z = 5
9.0	Z = 6	Z = 6	Z = 6	Z = 6

Z = Number of splines by which the torsion bars must be rotated, either clock-or anti-clockwise, with reference to the front and rear markings on the seats, in order to correct the suspension height of the car.

In the case of replacements or completely dismantling the torsion bars, care should be taken, not to transpose them and not to overlook the following marks when refitting the bars.

LH torsion bar	Yellow mark and letter S (or L) on front face
RH torsion bar	Blue mark and letter D (or R) on front face.

Example of adjustment

Assuming the suspension height is 8 mm. too low on the RH side.

The height is adjusted by rotating the torsion bar. In this particular case reference to the CHART showing the VALUES FOR CORRECTING THE SUSPENSION HEIGHT shows that the rotation must amount to 5 splines (the difference of 0.5 mm. cannot be accommodated) in a **clockwise** direction.

Proceed as follows:

Raise the car and place on stands. Remove the road wheel.

Disconnect the lower wishbone as described in the front suspension section.

Remove the torsion bar cover from the rear crossmember.

Starting from the assembly notch, and moving in an ANTI-CLOCKWISE DIRECTION, mark off the 5th spline on the rear face of the torsion bar. Repeat the same operation for the front end.

Using tool **A.3.0374,** remove the torsion bar from its seat, rotate it in a CLOCKWISE direction, and locate it again in its rear seat. Ensure that the marked spline lines up with the assembly notch.

Rotate the lower wishbone and insert it on the torsion bar. Ensure that the assembly notch lines up with the new mark.

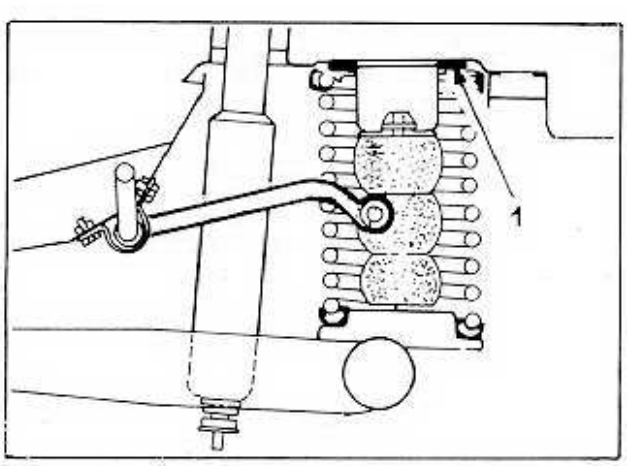
Refit all parts previously removed.

The rear suspension height is adjusted by shimming the springs. Proceed as follows:

Disconnect the half shafts on the outer end. Disconnect the Watts linkage from the body. Raise the car, using jack **R.7.0010** fitted with tool **A.2.0075** and support the car on stands. Remove road wheels.

Lower the jack and the axle until the springs are free.

Restore vehicle height values inserting the necessary spacers **1** between the bump rubber and body. The spacers are obtainable from our Parts Department in the following sizes: 7, 14 and 21 mm.



If the required correction exceeds 21 mm., the replacement of the springs is recommended. Ensure that the new springs are of the same type (see page 47).

Refit all parts previously disconnected by proceeding in the reverse order. At this stage the bolts securing the Watts linkage to the body should be tightened with the suspension height adjusted to the correct value.

TO CHECK GEOMETRY

Check for possible damage to the wheel rims and replace these if the distortion exceeds 3 to 4 mm.

Turn the steering wheel to its central position so that it is symmetrical in the vertical plane. Check that the front wheels are in the straight ahead position.

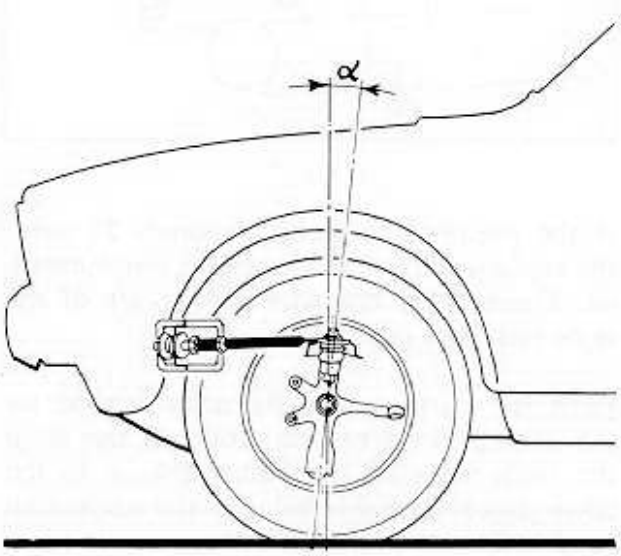
Lock the brake pedal in the depressed position to prevent the wheels from turning when turning them from lock to lock on rotating plates.

To check and adjust caster angle

Check the caster angle on both front wheels, which should be:

$$\alpha = 4^\circ\ 30' \pm 30'$$

The maximum difference between the two sides is 0° 20'.



Where the caster angle is outside the specified value, slacken nuts and rotate adjuster on the rod.

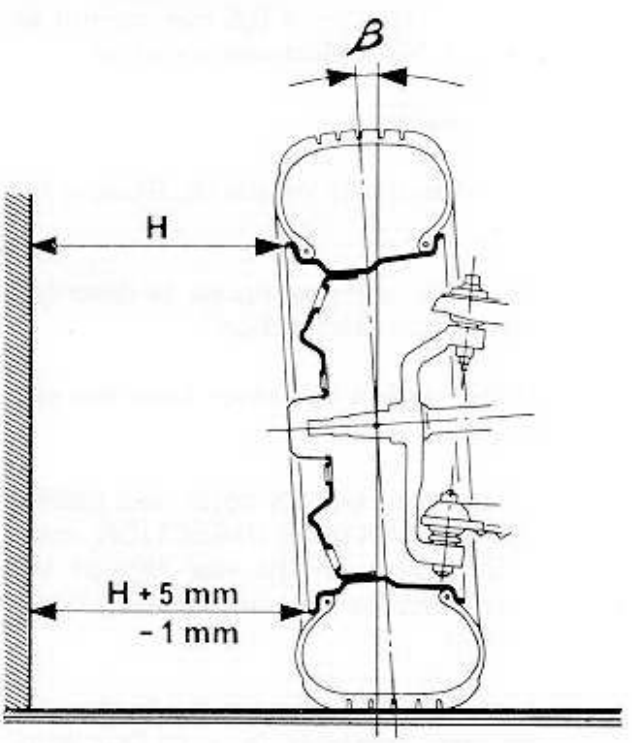
NOTE: Small variations of the caster angle within the previously mentioned tolerance are permitted to accommodate small corrections to the car's stability.

To check and adjust front camber angle

Check camber angle on both sides, which should be:

$$\beta = 0^\circ\ 20' \pm 30'$$

whilst the maximum difference allowed between the two sides is 0° 40'.



If camber value is taken in linear measure, follow dimensions as illustrated.

If the camber angle exceeds the specified values, adjust by fitting shims between the spacer and the longitudinal side member to which the lower wishbone is secured (each shim allows a variation of 15' approx.).

NOTE: Adjustments can only be carried out in a negative direction.

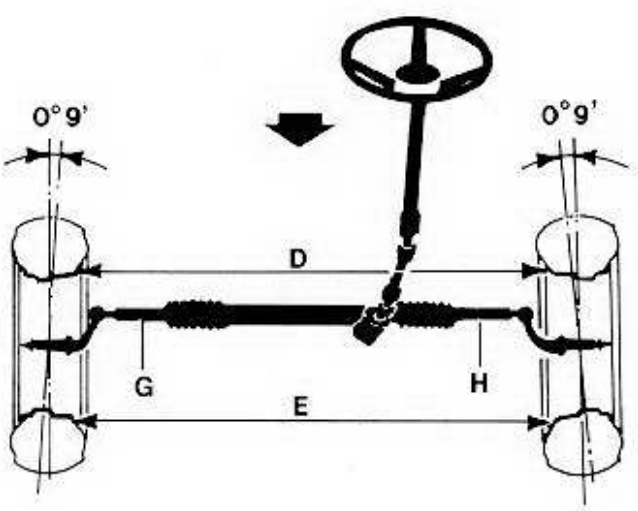
To check and adjust front wheel toe-out

Check front wheel toe-out, which should be:

$$\gamma = 0° 9'$$

The toe-out is adjusted by equalizing the length of the tie-rods **G** and **H** until for each wheel a toe-out of 1 mm is obtained.

Toe-out varies by 35' approx. on one wheel (3.5 mm. on dimension D-E) rotating one steering tie-rod by 1 rev.



If the steering wheel is not central, reposition it on the steering column splines.

Before refitting it, check that the notch controlling the cancellation of the direction indicator lever is in line with the pawl of this lever. If this condition is not correct, disconnect the steering column from the universal joint and rotate it sufficiently to restore the alignment.

Refit the steering wheel in the central position.

To check steering lock

With the front wheel on full LH or RH lock, the maximum angle, measured at the outer wheel, must be 30°.

To check toe-in on rear wheels

Check the chassis serial number, as there are two different values, according to the type of car.

VALUE A, Applicable to cars up to chassis serial number 2034000

VALUE B, Applicable to cars from chassis serial number 2034001 onwards.

The latter cars are also identified by a white paint mark on the axle.

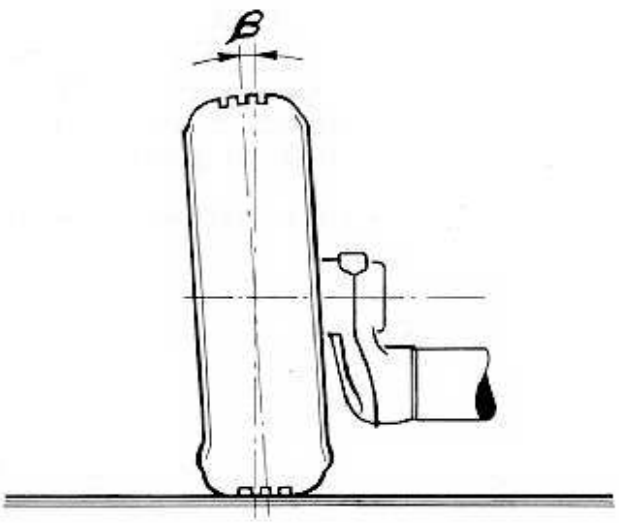
Check toe-in on both sides, noting that the value δ for each wheel must be as follows:

For type A $\delta = 0° 30' \pm 15'$

For type B $\delta = 0° \pm 10'$.

The maximum difference in toe-in between LH and RH side must not exceed 0° 10'.

To check rear wheel camber angle



Check the camber angle on the LH and RH rear wheel. This angle, which is not adjustable, should be:

$$\beta = 0° \pm 30'$$

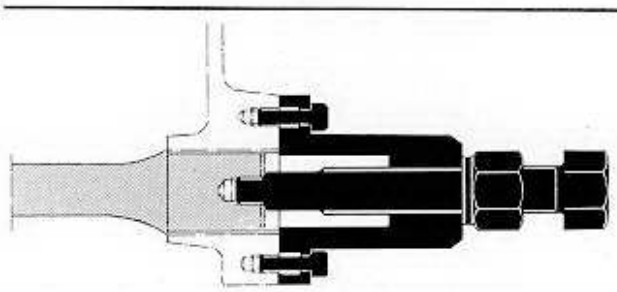
whilst the maximum difference between the two sides should not exceed 0° 20'.

TOOLS

TOOLS

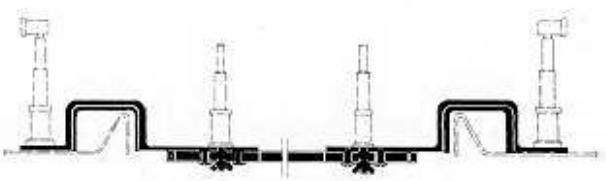
A.2.0075 *

SUPPORT
for raising car



A.3.0374

EXTRACTOR
for torsion bar

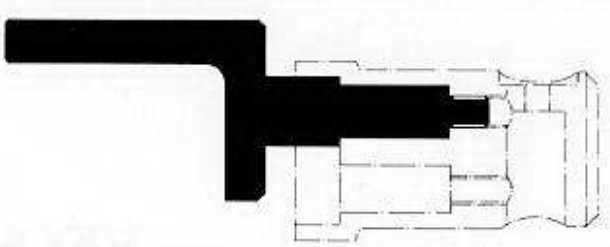


A.4.0146 *

RULER
for checking car suspension height

A.4.0149 *

TOOL
for checking car suspension height



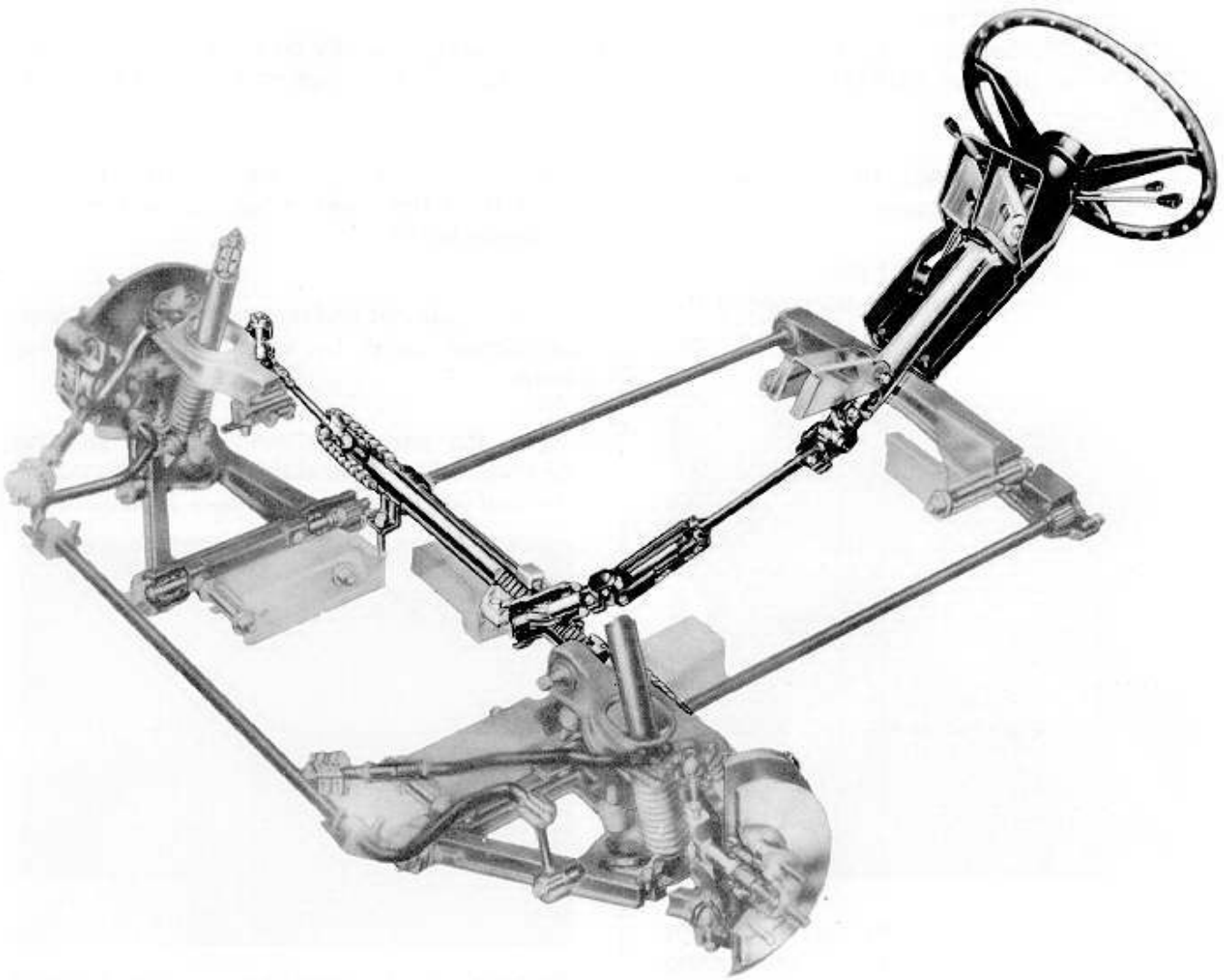
A.4.0151 *

POINTER
for checking car suspension height

R.7.0010 *

ELEVATOR
column type for car hoisting

Tools marked thus * are also common to other models.



STEERING GEAR

The steering is of the rack and pinion type.

Neither the ZF type steering rack, nor the ball joints require any lubrication.

In order to afford the driver increased protection in the event of a frontal impact, the steering rack has been mounted in a rearward position.

For the same reason a two-piece steering column is used, which is connected by a universal joint.

The steering wheel is dished and provision is made for adjusting it in the vertical plane using a lever which makes the adjustment easy and rapid.

TO REMOVE THE ZF STEERING RACK FROM CAR

IMPORTANT WARNING

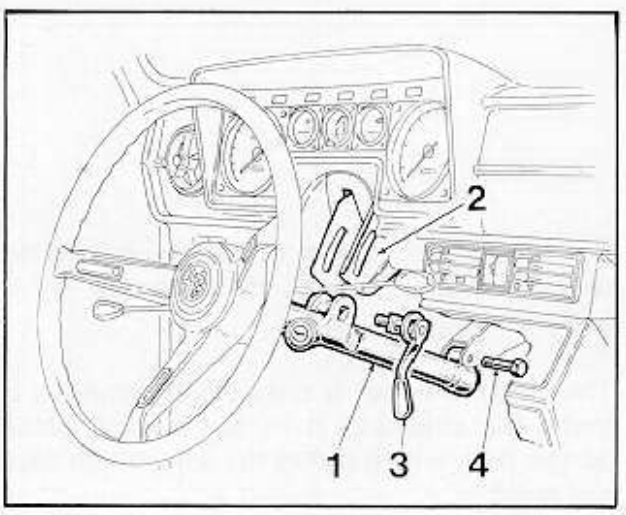
The overhauling operations outlined below are to be carried out exclusively on the ZF steering box. Never perform them on BURMAN (SPICA) steering box. Use only exchange scheme units available from SPICA.

Place the car on a ramp. Before raising it, carry out the following operations:

- Remove the lower half of the shroud from the steering column tube by unscrewing the retaining bolts.

- Disconnect the steering column tube 1 from the top mounting 2 by removing the adjusting lever 3 after unscrewing the retaining nut and washer.

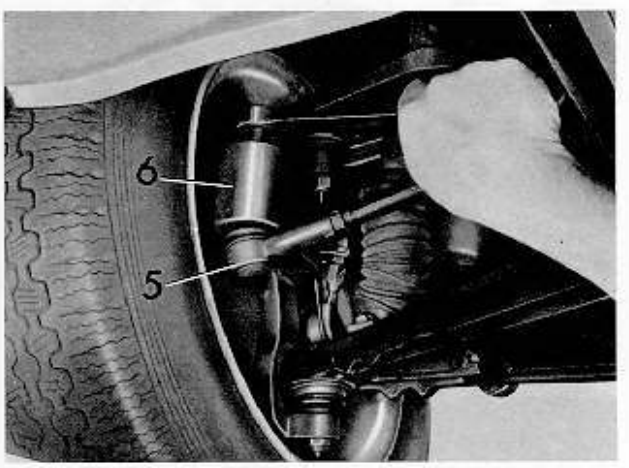
- Extract the upper half of the shroud from its location on the scuttle.



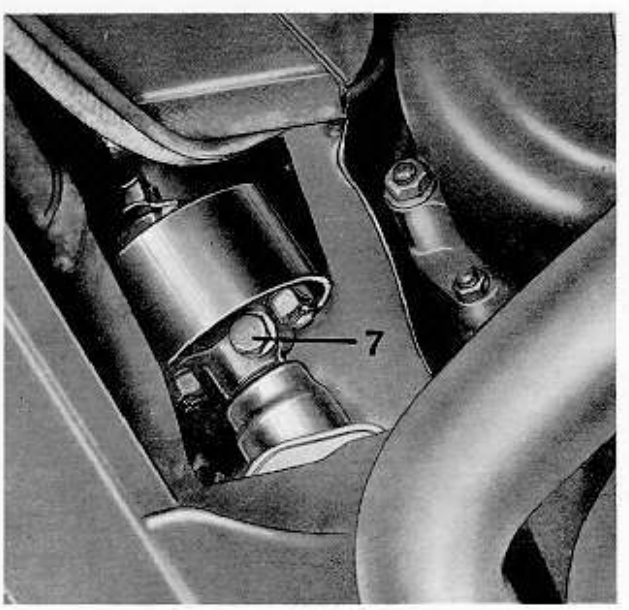
- Finally, disconnect the steering column tube from the lower mounting by removing retaining bolt 4.

Open the bonnet and remove the steering rack protection panel by unscrewing the fixing bolts.

Raise the car and disconnect the steering tie-rods 5 from the stub axles and withdraw the ball joints by means of tool A.3.0376 (6).



Remove bolt 7 connecting the lower steering column to the pinion.



Disconnect the steering rack from the body crossmember by removing the securing bolts from the mounting strips.

Pull the steering wheel upwards and disconnect the steering column from the steering rack.

Turn the LH road wheel to a suitable position. Withdraw the steering rack through the hole on the valance panel, manoeuvring the rack to facilitate its removal.

TO DISMANTLE THE STEERING RACK

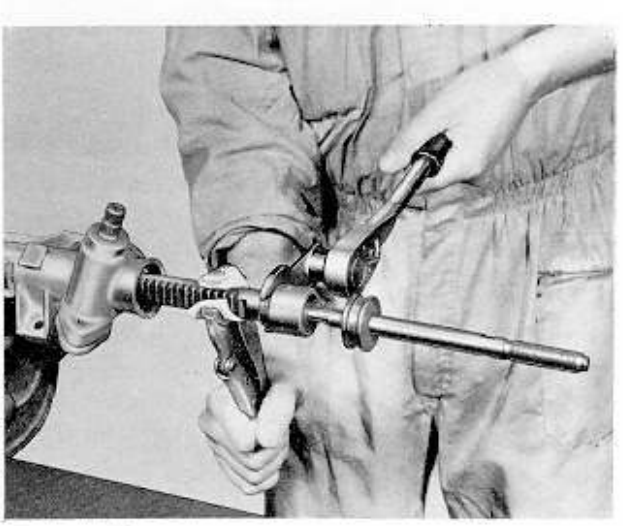
Clamp the steering rack in a vice. Remove the ball joints from the steering tie rods as follows:

- Slacken the locknut fixing the ball joints. If necessary, hold the tie rods, using a spanner applied on the flats provided on the rods.

- Extract the ball joints and remove the boots by removing the securing clips.

- Withdraw the rack sufficiently to hold it with suitable pliers. Protect the rack to prevent any damage being caused.

- Disconnect the steering tie rods, using tool A.5.0202 in conjunction with a ratchet spanner.



- Remove the cover over the rack pressure bush by removing the retaining bolts. Remove the shim and withdraw the spring and the bush itself.

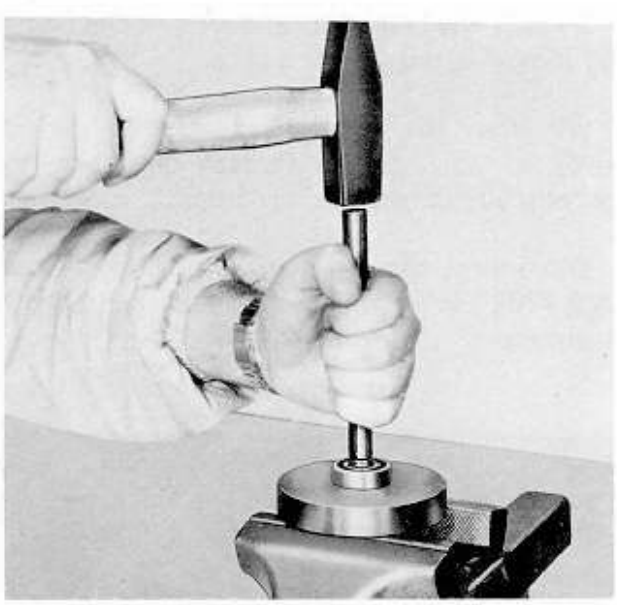
- Remove the pinion cover by unscrewing the retaining bolts. Remove the shim and drive out the pinion, using a plastic or lead hammer.

- Withdraw the steering rack.

To dismantle the pinion, proceed as follows:

- Remove the circlip securing the bearing, using suitable pliers, and retain the shim.

- Extract the ball bearing, using tool no. A.2.0239 in conjunction with A.3.0353.



Extract the needle bearing from the housing, using tool A.3.0455 after having removed the sealing ring.

Extract the guide bush from the rack from the far end of the housing, using tool A.3.0291.

Inspection and checks

Carefully clean all dismantled parts, checking that:

- The pinion, the rack and bearings do not show any signs of excessive wear or seizure.

- The boots on the tie rods and the dust covers on the ball joints are intact.

- The ball joints have not seized.

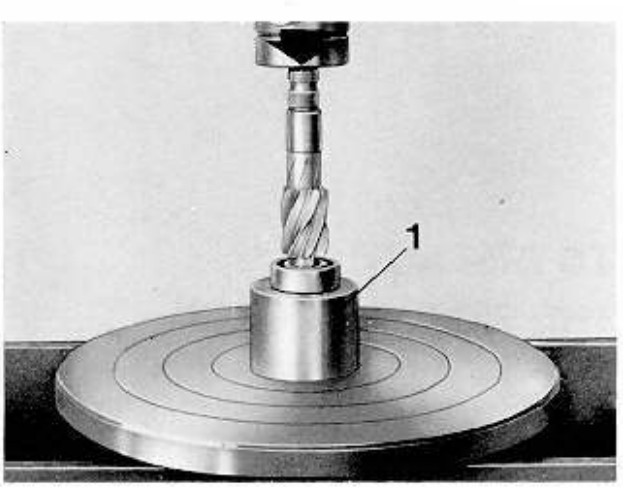
- The pressure bush and rack guide bush do not show any signs of excessive wear or seizure on their working surfaces.

TO REASSEMBLE THE STEERING RACK

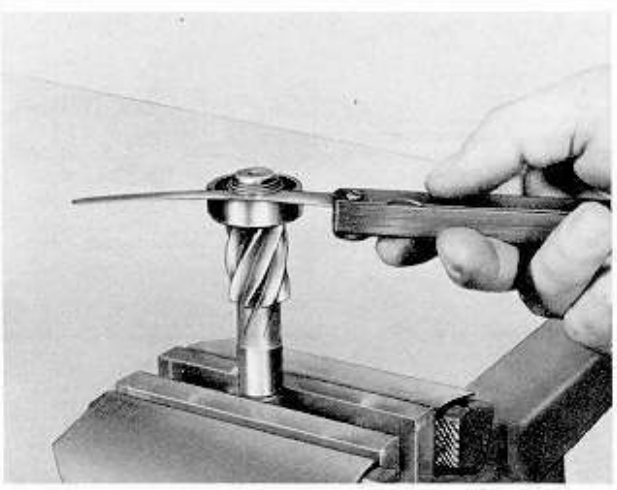
Carefully clean the seat of the rack guide bush and the outer surface of the guide bush. Apply Loctite 601, manufactured by R. Gori on the outer surface of the bush.

Insert the guide bush on its seat, using tool A.3.0346.

Fit the ball bearing on the rack pinion, using a press and the base tool A.3.0397 (1).

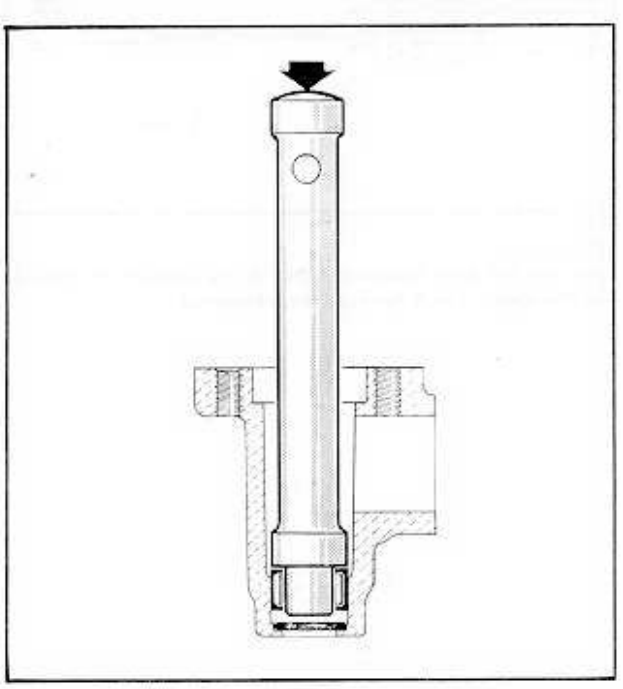


Fit to the rack pinion the shim previously removed and secure with the circlip, placing it squarely in its seat. Check with a feeler gauge the clearance between the circlip and the spacer. The clearance must not exceed 0.05 mm.



If this condition is not fulfilled, alter the shim. These are available from our Spares Department in various thicknesses.

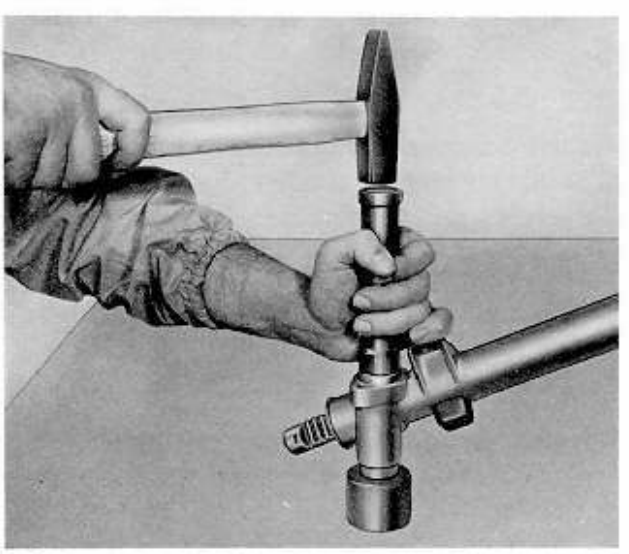
Fit the needle roller bearing to the housing, using tool A.3.0456. Fit the rubber ring in its seat.



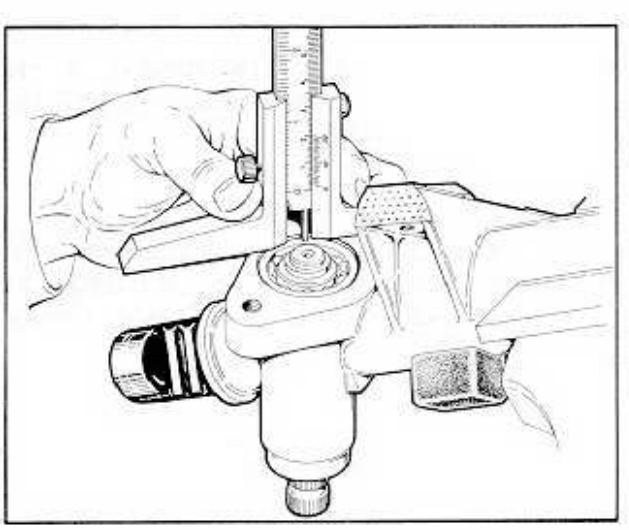
Prepare approx. 90 g. of BP Energrease HT-EP-OO grease and lubricate the rack, the rack pinion, bearings and all working surfaces.

Insert the rack in the housing and turn it so that its teeth are towards the pinion seat.

Fit the rack pinion, locating it correctly, by means of tool A.3.0397 and A.3.0393.



Using a suitable gauge, measure the distance from the edge of the bearing to the bearing surface of the cover.



Check that the previously removed shim is sufficient to cancel the distance measured. Fit the shim.

Where this condition is not met, replace the shim, which is available in various thicknesses from our Spare Division.

Fit the cover after previously applying CURIL K 2 sealant to the bearing surface. Tighten the securing bolts to 1.5 kgm.

Fit the rack pressure bush without sealing ring, after having previously lubricated it.

Fit the previously removed shim between the pressure bush and the cover. Fit the cover and tighten the securing bolts to 1.5 kgm.

Check manually that the rack can slide freely without endfloat or binding.

Where this condition is not met, rectify by replacing the shim, which are available from our Spare Division in various thicknesses.

Remove again the cover, spacers and the bush. Fit sealing ring to the bush.

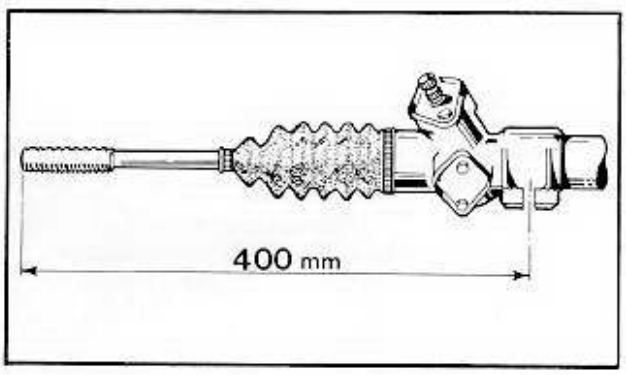
Refit the bush, spring and spacers. Apply CURIL K 2 to the cover and fit. Tighten the securing bolts to 1.5 kgm.

Fit the steering tie rods and tighten these to 4,2 kgm. using spanner no. **A.5.0202** in conjunction with a 300 to 400 mm. torque wrench.

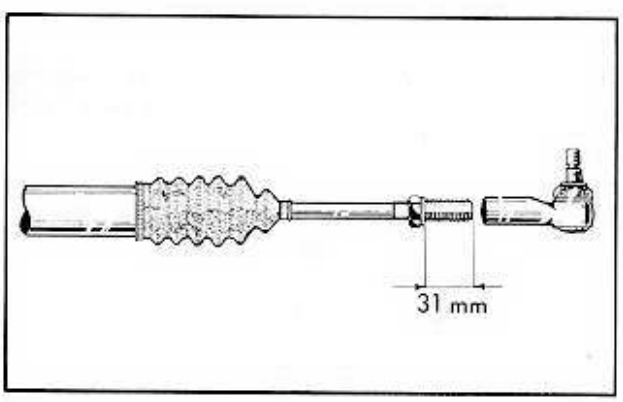
Secure with lock plate.

Fit the boots to the steering rack and secure with a clip. Ensure that the boots are not twisted.

Position the steering rack as shown below.



Fit the ball joints. Position the lock nuts to the dimension shown at the illustration below.



WARNING
Lock the ball joint locknuts, after having checked the toe-out and the steering rack having been assembled.

TO REFIT STEERING RACK TO THE CAR

Refit the steering rack in the reverse order, noting the following:

- The steering wheel spokes should be arranged symmetrically in the vertical plane before refitting the rack pinion to the steering rack.

- Coat the upper steering column retaining bracket with Molykote G compound.

- Adjust front wheel toe-out as detailed in the appropriate Section, after refitting the steering rack.

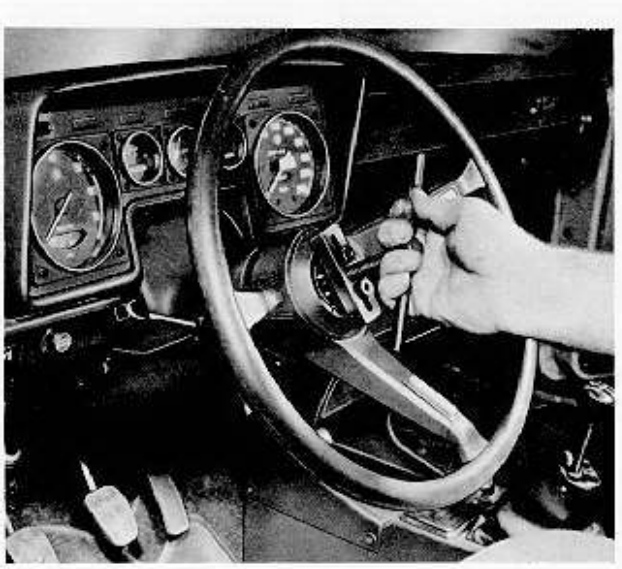
- Fit the flexible joint to the facia side of the scuttle, after having previously applied SIGIFLEX FR sealant, manufactured by ICIR.

TO REMOVE THE STEERING COLUMN FROM THE CAR

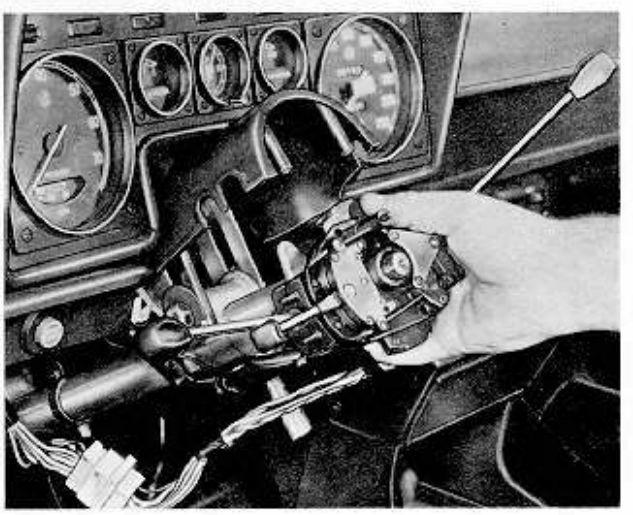
Disconnect the battery earth cable.

Remove the steering wheel hub trim cover. Unlock and unscrew nut retaining steering wheel to column.

Extract the steering wheel from the splines, using tool A.3.0451.



Disconnect from the steering column tube the lower shroud and steering assembly by removing the retaining screws.



Disconnect the steering column tube from the upper retaining bracket, removing the steering wheel adjusting lever after withdrawing the securing nut and washer.

Separate the upper shroud from the dash.

Disconnect ignition steering column lock cables.

Disconnect the steering column tube from the lower mounting by removing the retaining bolt.

Finally disconnect the steering column from the universal joint connecting the steering column to the intermediate steering column.

Remove the vulcollan washer between the universal joint and the steering column tube.

To disconnect the lower steering column

Remove the cover from the steering rack from the engine compartment, by removing the relevant bolts.

TO DISMANTLE AND REASSEMBLE THE STEERING COLUMN TUBE

Disconnect the lower steering column from the steering column tube and rack pinion by uncrewing the universal joint bolts.

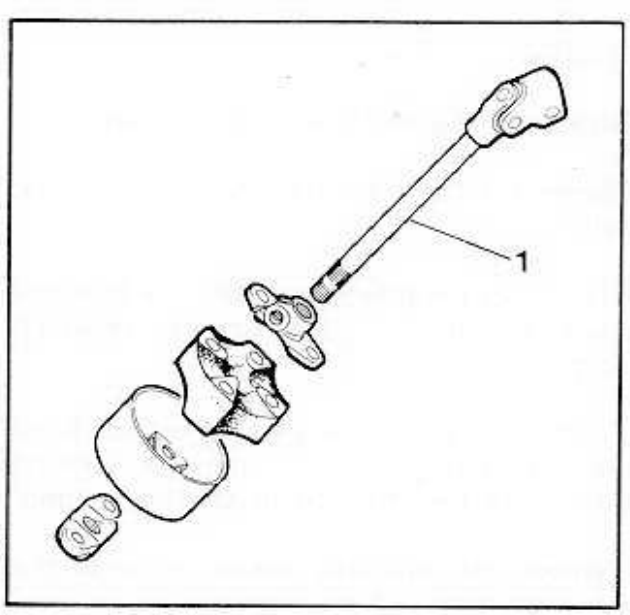
Withdraw the steering column from the boots, working under the car. If necessary, remove the boots.

Early cars were fitted with a type of lower steering column illustrated below.

To disconnect this type of steering column, proceed as follows:

Remove the steering rack cover.

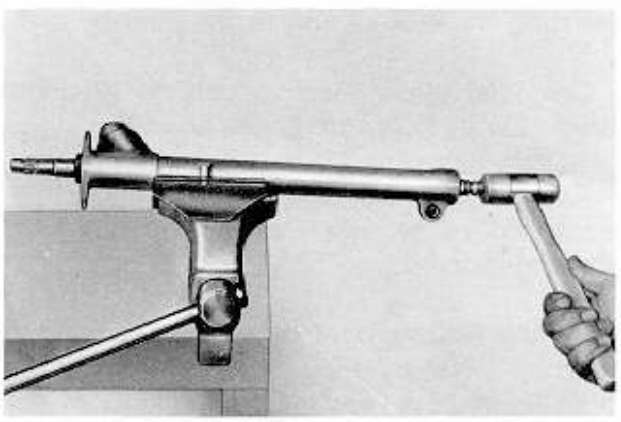
Disconnect the lower steering column **1** from the upper flange of the flexible coupling.



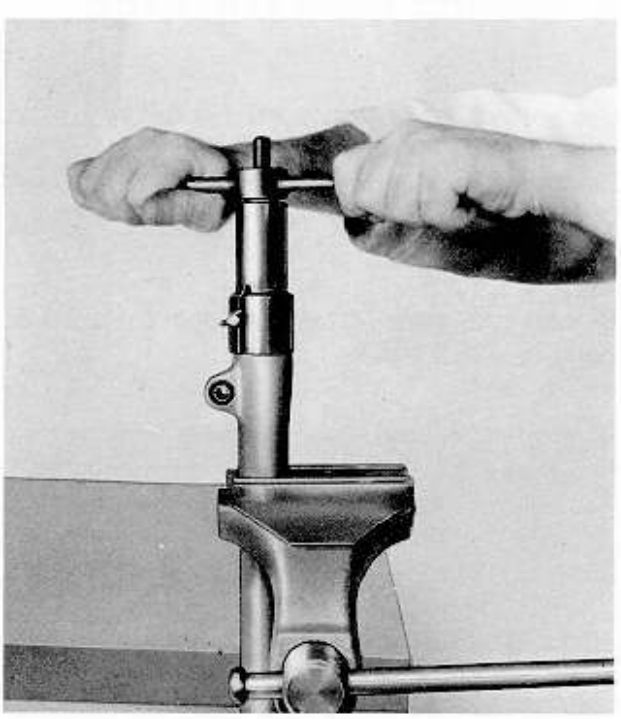
Withdraw the column from this flange, working from the passenger compartment of the car. Extract the flange from the boots. If necessary, remove boots.

Raise the car and disconnect the flexible coupling by unscrewing the retaining bolts.

Clamp the steering column tube in a vice. Drive out the steering column, as illustrated, using a lead or plastic hammer.



Extract the bushes and the cover from the ends of the tube, using tool **A.3.0402.**



Extract the rubber bush from the lower lug, using tool **A.3.0501**, base **A.3.0492** and a press.

Check that the steering column bushes working surfaces do not show any signs of seizure. Replace elastic type bushes with roller bushes obtainable from our Spares Department.

Check that the universal joints have no excessive play nor signs of roughness.

Check that the steering column and tube are in good condition. Ensure that their working surfaces show no signs of scoring or seizure.

Check operation of steering column lock. If necessary, replace as follows:

- Clamp the steering column tube in a vice. Drill out the steering column lock securing bolt.

- Remove the steering column lock from its housing. Take care not to damage the switch leads.

- Fit a new steering column lock. Tighten the shear bolt until the head shears.

Fit the rubber bush to the lower lug, using a press, tool **A.3.0501** and base **A.3.0492.**

Prior to fit the roller cages to the steering column, lubricate their seats in column tube with grease:

- ERGON RUBBER GREASE NO. 3 by ISECO
- SFERUL B2 AR by REINACH

Clamp the steering column tube in a vice and fit one of the cages in the lower seat of the tube, using tool **A.3.0383.**

Insert the steering column in the tube and fit the second bush in the upper seat of the tube, using tool **A.3.0493** minus lower cup.

TO REFIT STEERING COLUMN TO CAR

Refit the steering column in the reverse order, noting the following:

- Place the front wheels in the straight ahead position.

- Insert the Vulcollan washers, previously removed, between the universal joint and the steering column tube.

- Position the steering column and check that the notch that operates the direction indicator lever is aligned with the pawl of the self-effacing device.

- Fit the steering wheel, arranging the spokes symmetrically.

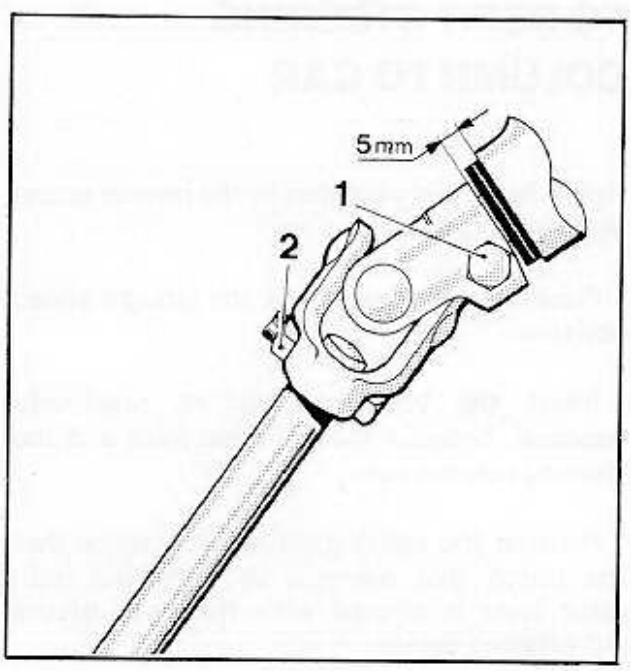
- Refit the steering rack cover, after applying SIGIFLEX FR sealant, manufactured by ICIR.

- When carrying out work on the flexible coupling, turn the lower steering column until the clamping bolt can be fitted.

Should the Vulcollan washers be missing between universal joint and steering column tube, check, after the assembly has been completed, that the endfloat of the steering column does not exceed 5 mm. The dimension is measured between the lower face of the tube and the upper edge of the universal joint.

If this condition is not fulfilled, take up the endfloat by unscrewing the fixing bolts 1 and 2 and moving the universal joint upwards. Take care not to move the steering column.

If this operation is not sufficient, it is necessary to remove the steering column tube, in order to fit suitable Vulcollan washers, obtainable from our Parts Department, to overcome the excessive endfloat.



PARTIAL OPERATIONS

In the event of repairs being required, it is possible to work on the steering rack and the steering, without completely removing and dismantling the units concerned.

Partial operations that can be carried out, are:

- Removal of steering wheel. Details on page 73.

- Removal of steering column assembly, as detailed on page 73. It is also necessary to disconnect the electric leads.

- Removal of steering column lock, as detailed and illustrated on page 75.

- Removal of steering column tube, as detailed on page 73.

- Removal of lower steering column, as detailed and illustrated on page 73, after having previously removed the steering column tube.

- Removal of gaiters on lower steering column shaft, after removal of shaft.

The fitment of the parts removed during the above operations is usually effected in the reverse order.

To remove and replace the flexible coupling on the lower steering column

On cars fitted with a lower steering column comprising a flexible coupling, this coupling can be removed as follows:

- Place the car on a lift.

- Raise bonnet and remove steering rack cover by removing the appropriate fixing bolts.

- Raise the lift. Unscrew the 4 bolts securing the coupling to the steering rack flange and the lower steering column flange.

- Remove flexible coupling together with metal housing.

- Remove the earth cable from the centre hole of the coupling and extract the coupling from its housing.

- Refit flexible coupling to its housing. Insert the earth cable in the centre hole. Refit the assembly between the two flanges. Insert the terminals of the earth cable. One terminal in one of the lower retaining screw and the other in one of the upper retaining screws.

- Tighten the bolts securing the flanges to the flexible coupling.

- Refit the steering rack cover, after previously applying SIGIFLEX FR sealant, manufactured by ICIR.

To replace steering tie rod ball joints

Disconnect the ball joints from the stub axle, as detailed on page 68.

Unscrew the locknuts. If necessary, use a spanner on the flats of the tie rods.

To replace the boots on the steering tie rods

In order to replace the boots on the tie rods it is necessary to remove the ball joints from the stub axle.

The boots can then be withdrawn after removal of the retaining clips.

To disconnect steering tie rods

Disconnect the steering tie rods as follows:

- Disconnect the ball joint from the stub axle as detailed on page 68.

- Remove the retaining clips and move the boots.

- Unlock the steering tie rods, using tool **A.5.0202 (1)** in conjunction with a ratchet spanner, and locking the rack rod with a grip spanner **2**, to avoid transmitting the load to the rack pinion.

Assemble in the reverse order, using the same tools as for the removal.

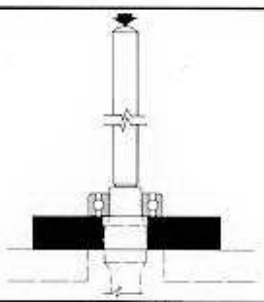
WARNING: After every operation that involves the removal of parts from the steering rack and the remaining steering units, the toe-out of the front wheels should be checked.

TOOLS

TIGHTENING TORQUES

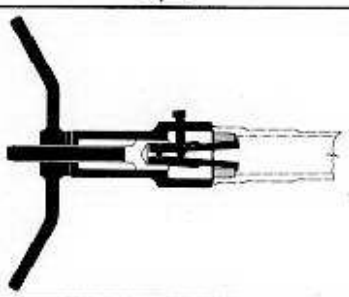
LUBRICANTS AND SEALANTS

TOOLS



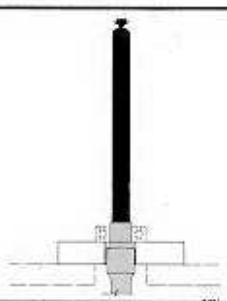
A.2.0239 *

PLATE
for extracting ball bearing from steering rack pinion. (use with tool A.3.0353)



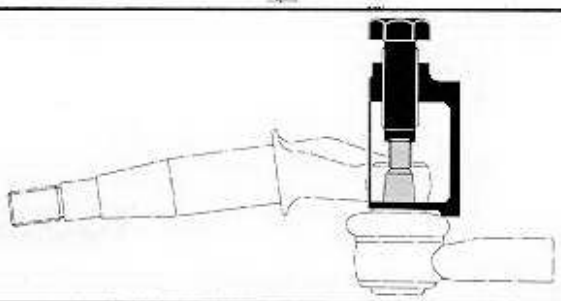
A.3.0291

EXTRACTOR
for rack bush



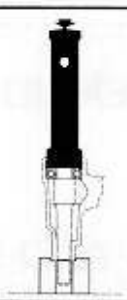
A.3.0353 *

EXTRACTOR
for ball bearing on steering rack pinion (use with tool no. A.2.0239)



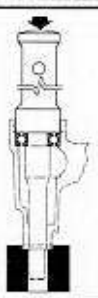
A.3.0376 *

EXTRACTOR
for ball joint on steering lever



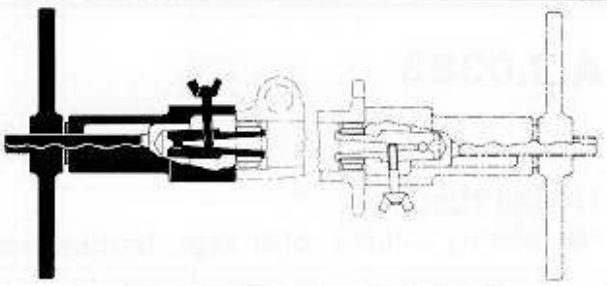
A.3.0393

FITTING TOOL
for pinion complete, with bearing (use with tool A.3.0397)



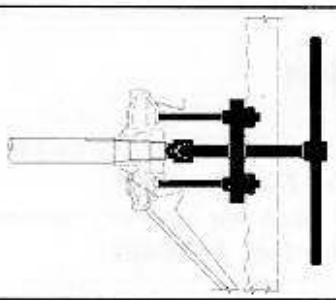
A.3.0397

BASE
for fitting steering rack pinion complete with bearing (use with tool A.3.0393)



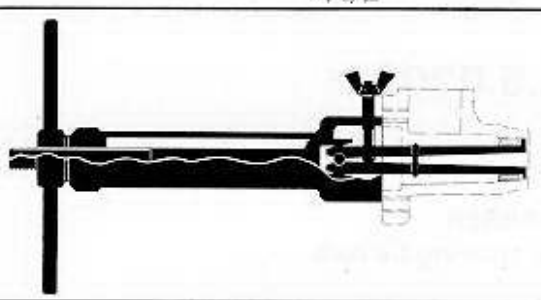
A.3.0402 *

EXTRACTOR
for bushes from ends of steering column tube



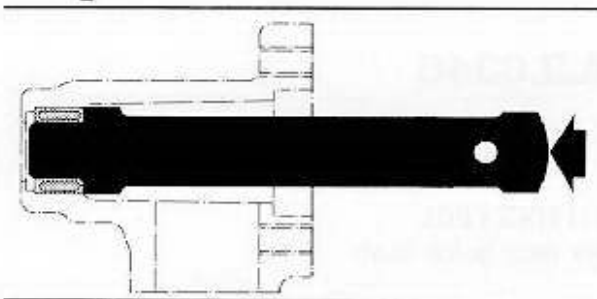
A.3.0451 *

EXTRACTOR
for steering wheel



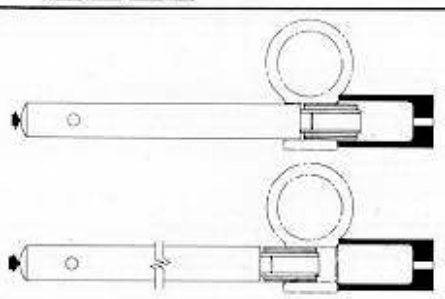
A.3.0455

EXTRACTOR
for needle roller bearing on steering rack pinion



A.3.0456

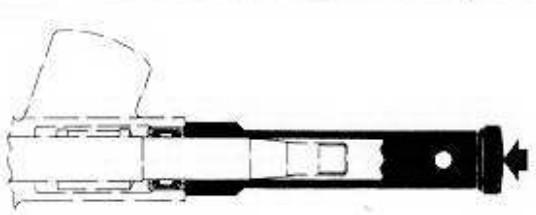
FITTING TOOL
for needle roller bearing on steering rack pinion



A.3.0492

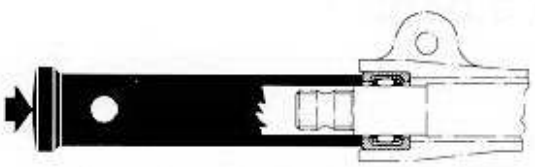
BASE

for fitting and extracting steering column bush



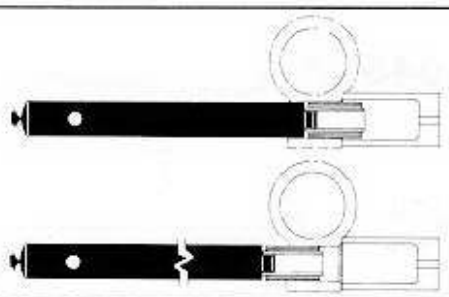
A.3.0342

FITTING TOOL
for steering column roller cage, top side



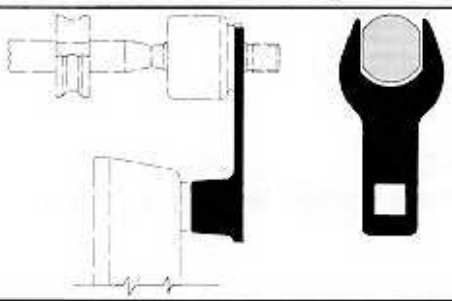
A.3.0383

FITTING TOOL
for steering column roller cage, bottom side



A.3.0501

EXTRACTOR-FITTING TOOL
for rubber bush for steering column tube. (to be used with tool A.3.0492)



A.5.0202

SPANNER
for steering tie rods

A.3.0346

FITTING TOOL
for rack guide bush

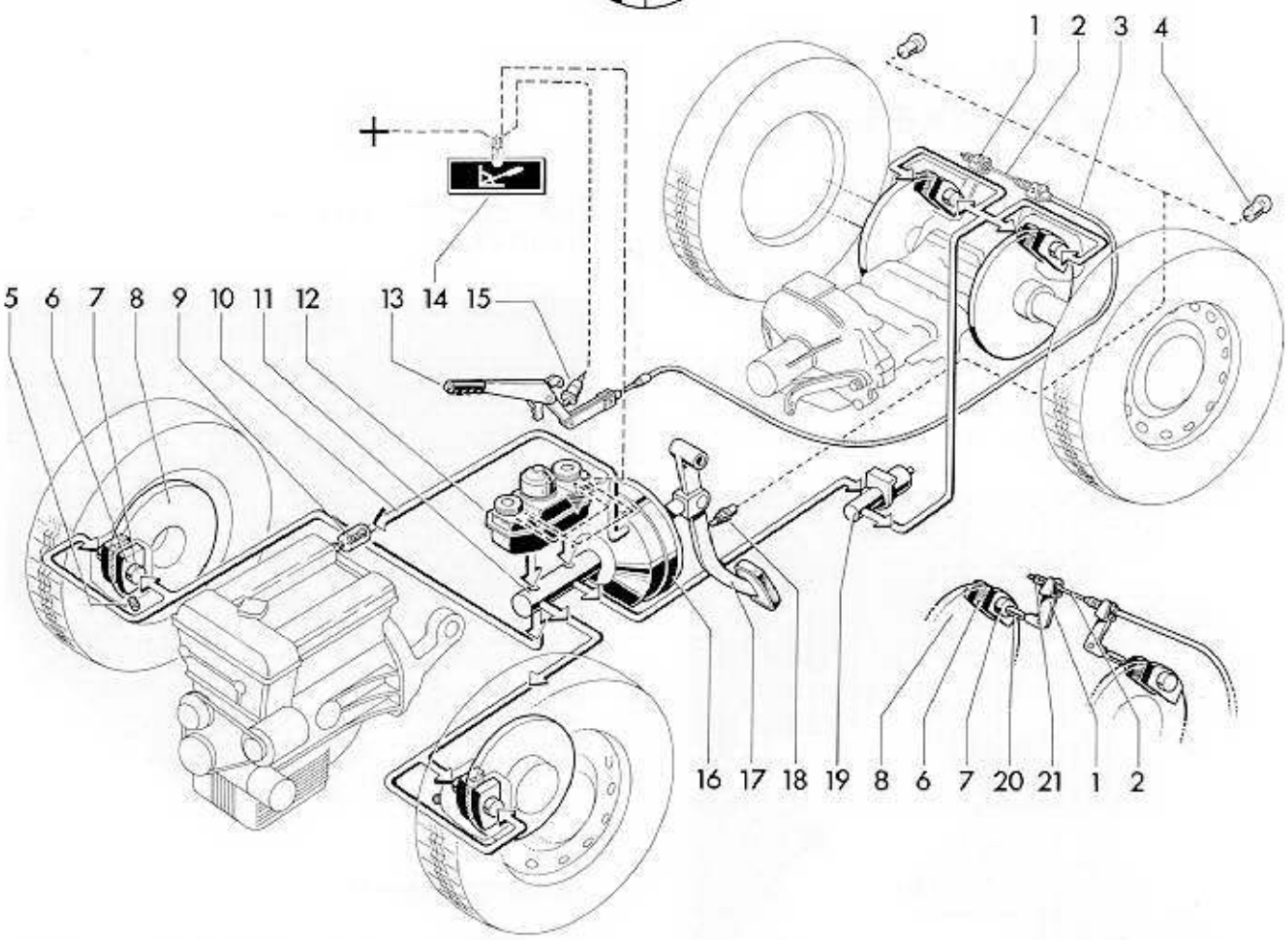
Tools marked thus * are also common to other models

TIGHTENING TORQUES

DESCRIPTION	kgm	METHOD OF TIGHTENING
Fixing bolt for steering rack end float adjustment plate, ZF steering	1.5	Dry
Fixing bolt for rack pinion end float, ZF steering	1.5	Dry
Nut, fixing steering tie rod to rack, ZF steering (with spanner A.5.0202)	4.2	Dry

LUBRICANTS AND SEALANTS

DESCRIPTION	COMMERCIAL PRODUCTS
Grease for - ZF steering box: 90 g	BP ENERGREASE HT-EP-00
Oil for: - Steering column roller cages	ERGON RUBBER GREASE N. 3 - ISECO SFERUL B2 AR-REINACH
Lubricant for: - Top support brackets fixing the pivot and steering column adjustment lever	ISECO MOLYKOTE COMPOUND G
Sealant for: - Outer surfaces of steering rack support bush	LOCTITE 601
- Contact faces of top cover and dash	ICIR SIGIFLEX FR
- Pinion adjusting covers - Steering rack adjusting cover	CURIL K2



1 - Hand brake pads control levers
2 - Hand brake cable
3 - Hand brake cable sheath
4 - Stop lights
5 - Air bleed screws
6 - Pads
7 - Pistons
8 - Discs
9 - Vacuum port and check valve
10 - Pipe connecting vacuum port to servobrake
11 - Brake master cylinder
12 - Brake fluid reservoir with switches for minimum level warning light
13 - Hand brake lever
14 - Warning light for hand brake and brake fluid minimun level
15 - Switch for hand brake warning light
16 - Servo brake unit
17 - Pedal
18 - Switch for stop lights
19 - Braking effort valve on rear wheels
20 - Hand brake pads push rods
21 - Hand brake adjusting screws.

BRAKING SYSTEM

The brakes are hydraulic and servo assisted. Disc brakes are fitted to all four wheels.

The hydraulic circuit is fed by a tandem brake master cylinder, mounted co-axially on the vacuum brake servo unit.

The circuit is of the dual line tipe, i.e. it consists of two independent circuits, one front and one rear, which feed the four brake calipers.

The front brake circuit consists of two pipes which are connected to the front body of the master cylinder and feed independently the front brake calipers.

The rear brake circuit consists of a single pipe which comprises a pressure limiting valve to provide increased stability under braking. From this pressure limiting valve the circuit continues to a three-way union which distributes the brake fluid to the rear brake calipers.

Parking (hand) brake

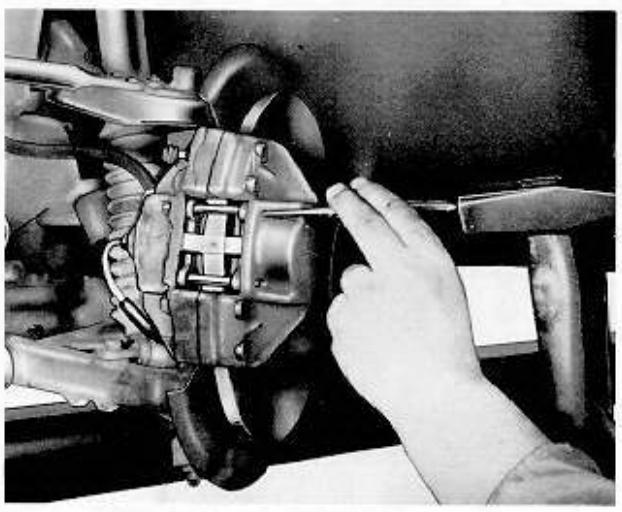
The hand brake acts on the rear brake calipers, which are of the mixed type, i.e. they comprise a hydraulic and a mechanical control. The hand brake lever is connected to the mechanical control by means of a flexible cable.

TO DISMANTLE THE FRONT BRAKES

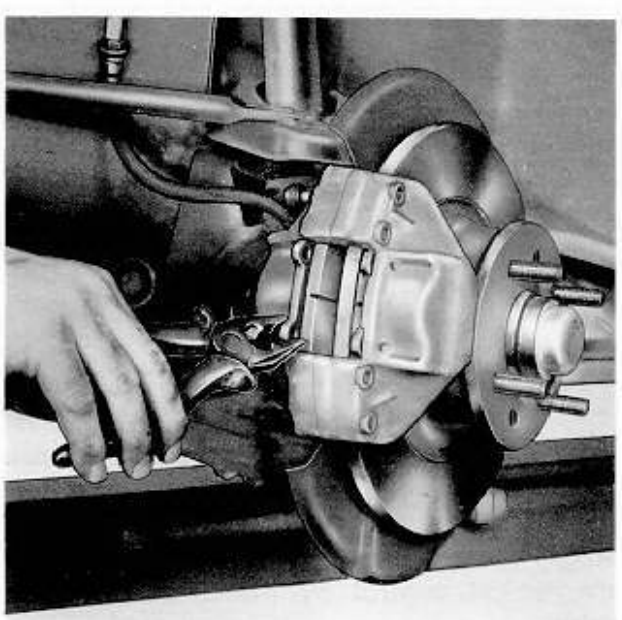
To remove brake pads

Raise the front of the car and place it on stands. Remove the road wheels.

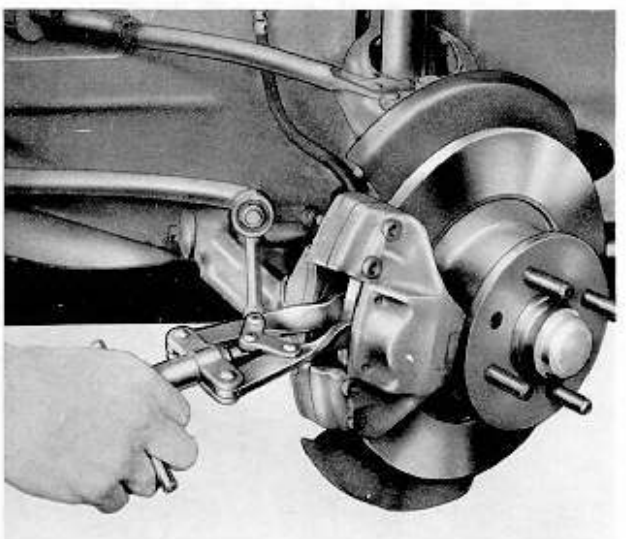
Extract the cross-shaped spring from the brake caliper, removing the retaining pins by means of a centre punch.



Withdraw the brake pads. If necessary, use pliers. Mark the assembly position of the pads.



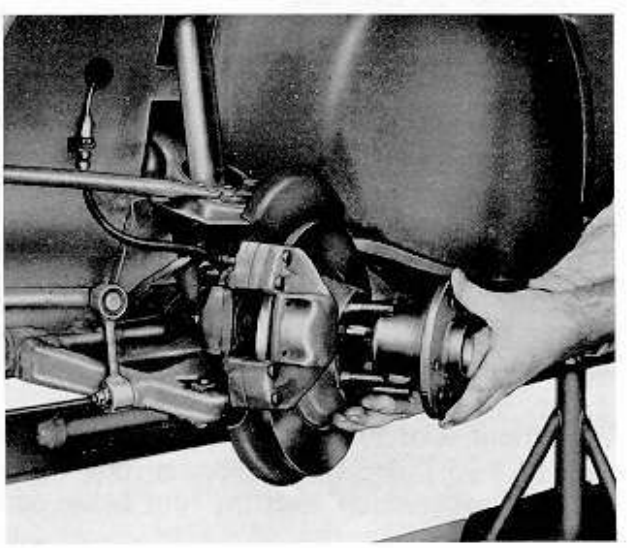
Push back the brake cylinders, using tool A.2.0147.



To remove brake disc

Remove the hub cover. Withdraw the split pin and unscrew the wheel hub castellated nut.

Disconnect and remove the wheel hub after removal of the bolts securing it to the brake disc.



Withdraw the brake disc from the stub axle, withdrawing it from the caliper.

TESTS AND CHECKS

Brake pads

Check brake pads for wear. The pad thickness, including the metal backing, should be as follows:

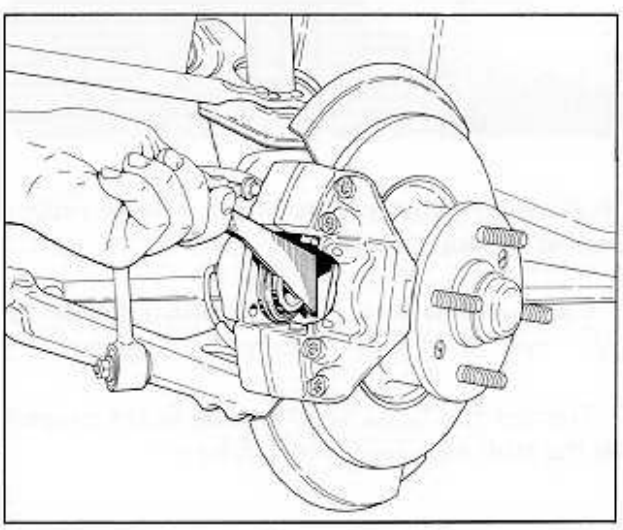
New = 15 mm.
Worn = 7 mm. (minimum thickness)

Front brake calipers

The front brake calipers are of the type with automatic adjustment to compensate for pad wear. Therefore no provision is made for adjustments.

Check that the position of the cylinders is as required, using tool A.2.0149.

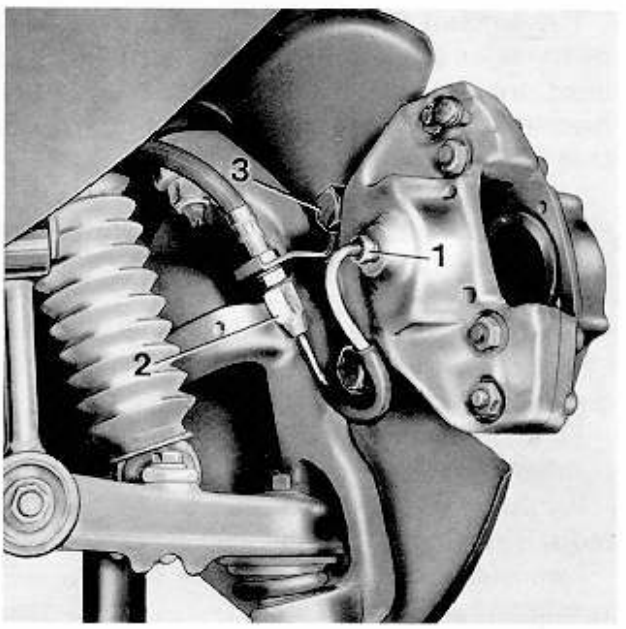
If necessary, re-set, using tool A.2.0355.



To replace brake calipers

Test operation of brake caliper. Replace it if necessary. Proceed as follows:

- Unscrew the adaptor 1 of the metal pipe connecting it to the caliper. Unscrew the adaptor 2 and remove the connecting pipe.
- Disconnect the caliper from the stub axle by removing the retaining bolts 3.



- Refit the brake caliper to the stub axle by reversing the removal operations, noting the following:

- Tighten the bolts securing the caliper to the stub axle to 7.5 to 8.5 kg.m.

- Tighten the caliper feed pipe adaptor to an indicated torque of 0.8 to 1.0 kg.m.

On completion of the operation, bleed the system as detailed on page 100.

Front brake discs

Carefully clean the front brake discs and ensure that the working surfaces are not scored or porous.

Should the working surfaces require machining, the following instructions should be noted:

- Always machine the complete working surface on both front brake discs.

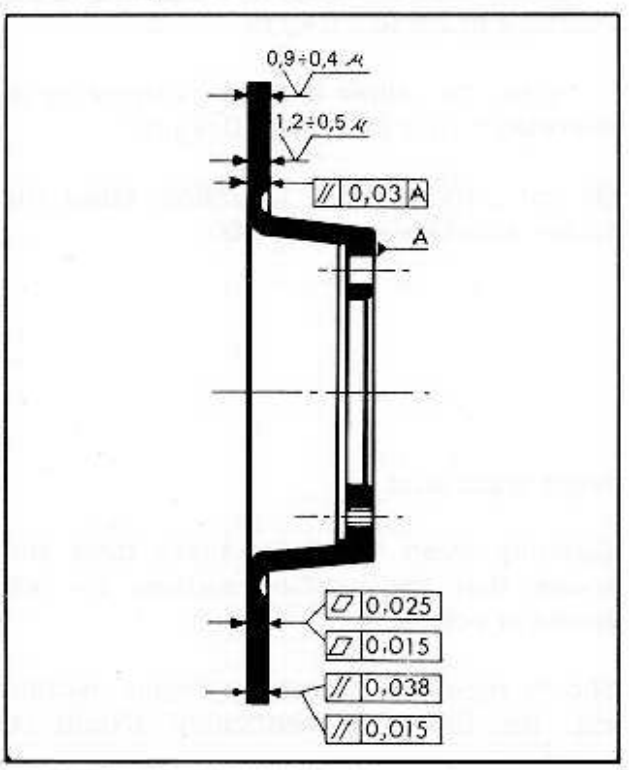
- The amount of metal removed must always be the same on both surfaces of each disc, and must not exceed 0.5 mm. on each side. After machining, the disc thickness must not be less that 10 mm.

- The machining must be carried out within the following tolerances:

- Parallelism in respect of plane A	0.030 mm.
- Flatness, measured in a radial direction	0.025 mm.
- Flatness, measured in a circumferential direction	0.015 mm.
- Parallelism, measured in a radial direction	0.038 mm.
- Parallelism, measured in a circumferential direction	0.015 mm.

The surface finish of the disc must be as follows:

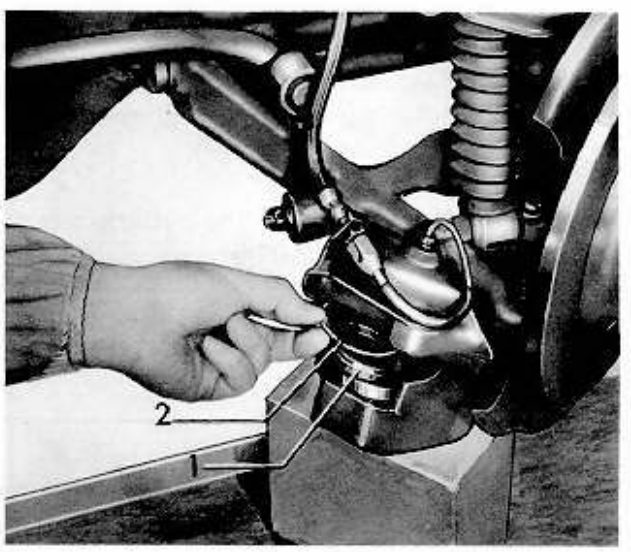
0.4 to 0.9 μ measured in a circumferential direction
0.5 to 1.2 μ measured in a radial direction.



To replace brake caliper dust covers

Disconnect the brake caliper from the stub axle by removing the appropriate retaining screws.

With the caliper connected to the brake pipes, remove the dust covers 1 from their respective seats, together with their flexible retaining rings 2.



Replace the dust covers in the reverse order, noting the following:

- The dust covers must be lubricated prior to assembly, using ATE Bremszylinder grease.

- Tighten the bolts securing the brake caliper to the stub axle to 7.5 to 8.5 kg.m.

TO REFIT THE FRONT BRAKES

Refit the front brakes in the reverse order, noting the following:

- Clean the brake discs carefully and check as previously described.

TO DISMANTLE REAR BRAKES

- Lubricate the stub axle and the working lip of the hub oil seals with Molykote BR 2 grease.

- The amount of grease required for the correct functioning of the hub bearings must, if necessary, be replenished as described in the Section dealing with the front suspension.

- Before fixing the hub to the brake disc, secure it to the stub axle as detailed in the Section dealing with the front suspension.

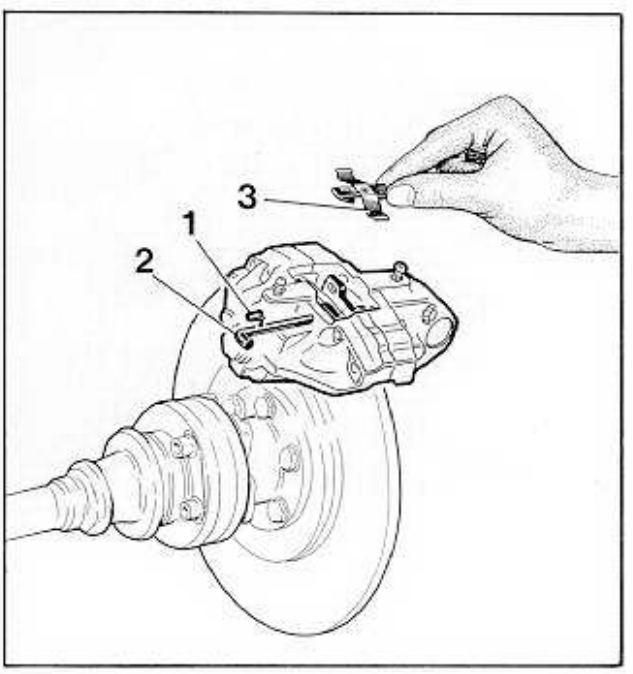
- Refit the brake pads in accordance with the marks previously applied, providing they are not replaced and no rectification work is required on the brake disc.

- On completion of the assembly, pump the brake pedal repeatedly, in order to re-establish the correct braking conditions.

To remove the rear brake pads

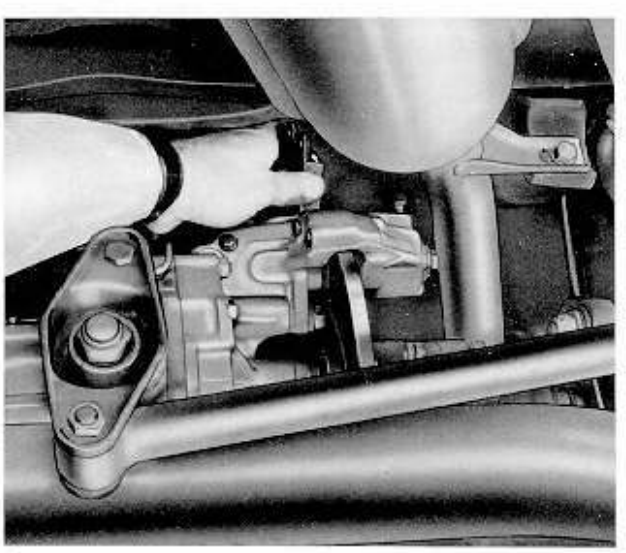
Raise car on a lift sufficiently to be able to work comfortably on the rear brakes.

Remove the retaining springs **1**, the pad retaining pins **2** and the cross-shaped spring **3**.



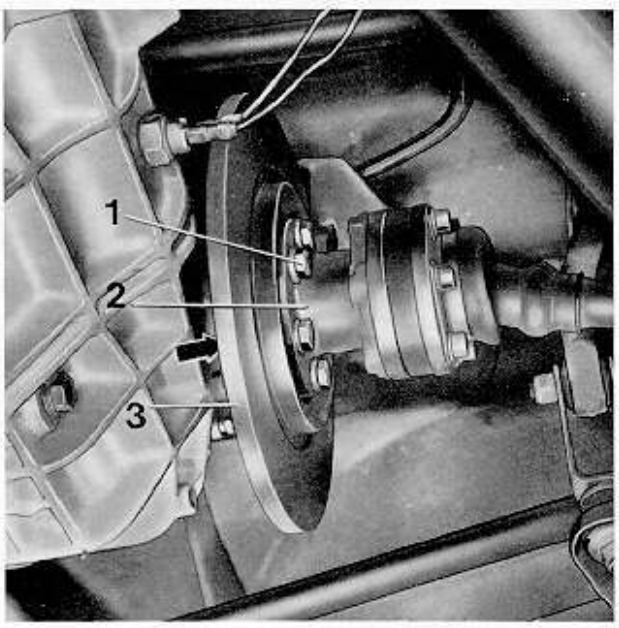
Push back the cylinders, using adjustment screw.

Withdraw the brake pads upwards.



To remove rear brake discs

Remove the bolts **1** securing the spacer **2** and brake disc **3** to the differential drive shaft and remove the brake disc.



TESTS AND CHECKS

Brake pads

Check brake pads for wear. The pad thickness, including the metal backing, should be as follows:

New = 15 mm.
Worn = 7 mm. (minimum thickness)

Rear brake discs

Carefully clean the rear brake discs and ensure that the working surfaces are not scored or porous.

Where these surfaces are to be machined, note the following:

- Always machine the working surfaces of both brake discs.

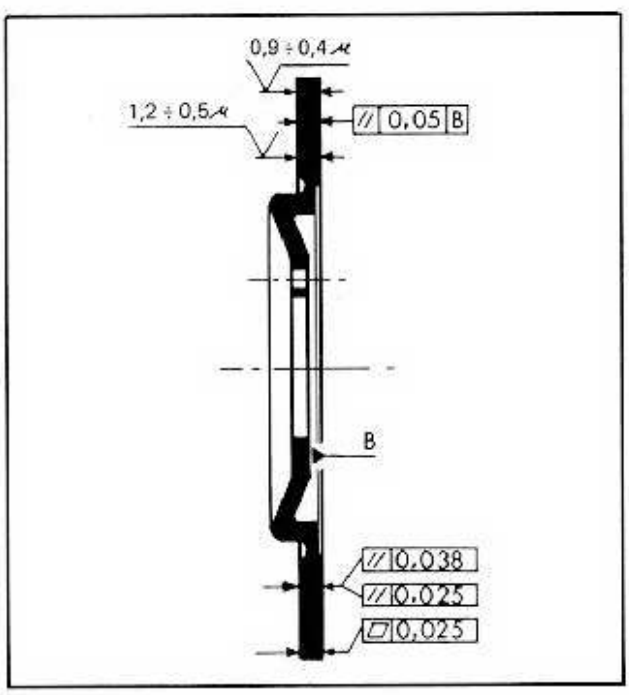
- The amount of metal removed, which must be the same on both surfaces of each disc, must not exceed 0.5 mm. on each side. After machining, the thickness of the rear discs must not be less than 9 mm.

- The machining must always be carried out within the following tolerances:

- Parallelism in respect of plane B	0.050 mm.
- Parallelism measured in a radial direction	0.038 mm.
- Parallelism measured in a circumferential direction	0.025 mm.
- Flatness, measured in both a radial and circumferential direction	0.025 mm.

The finish of the brake disc surface must be as follows:

0.4 to 0.9 μ when measured in a circumferential direction
0.5 to 1.2 μ when measured in a radial direction.



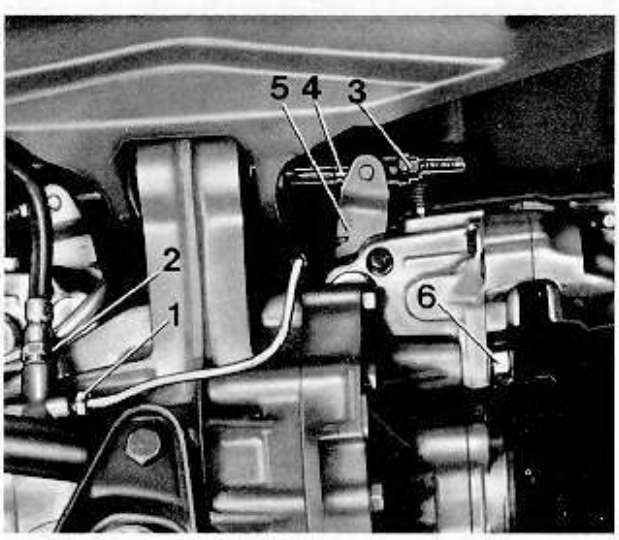
Rear brake calipers

Test the operation of the rear brake calipers and, if necessary, replace them. Remove the brake calipers as follows:

- Disconnect the feed pipe adaptor **1** from the three-way adaptor **2**.

- Remove the retaining nuts **3** and the hand brake adjustment. Disconnect the cable **4** from the caliper levers **5**.

- Remove the caliper, unscrewing the nut **6** securing it to the differential/rear axle casing.



Refit the brake caliper in the reverse order, noting the following:

- Tighten the bolts securing the caliper to the differential/rear axle casing to 4.7 to 5.4 kgm.

- Fit the caliper feed pipe adaptor to the three-way adaptor and tighten to 0.8 to 1 kg.m.

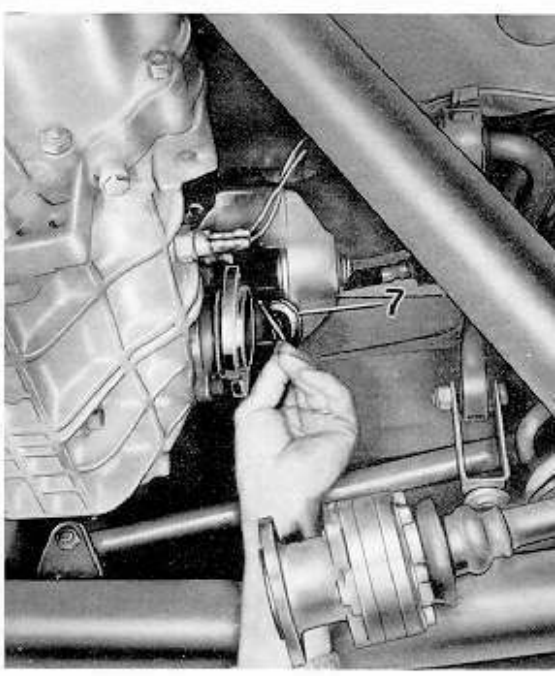
- Bleed the brakes as detailed on page 100 on completion of the assembly.

To replace the dirt excluders

The dirt excluders for the rear caliper ders can be replaced as follows:

- Remove the brake pads and discs. Pu the cylinders by acting on the caliper a ing screws.

- Remove the dirt excluders **7** and assoc retaining rings from the caliper pistons.



Re-assemble the dirt excluders in the re order and lubricate them, using ATE B zylinder grease before fitting.

Braking effort limiting valve

The braking effort limiting valve canno serviced and must be replaced in the eve malfunctioning. Disconnect the feed and remove the screw securing the valv the body.

TO REFIT REAR BRAKES

Refit the rear brake in reverse order, noting the following:

- Tighten the bolts securing the spacer and brake disc to the differential drive shaft to 5.2 to 5.7 kg.m. Use tool **A.5.0201.**

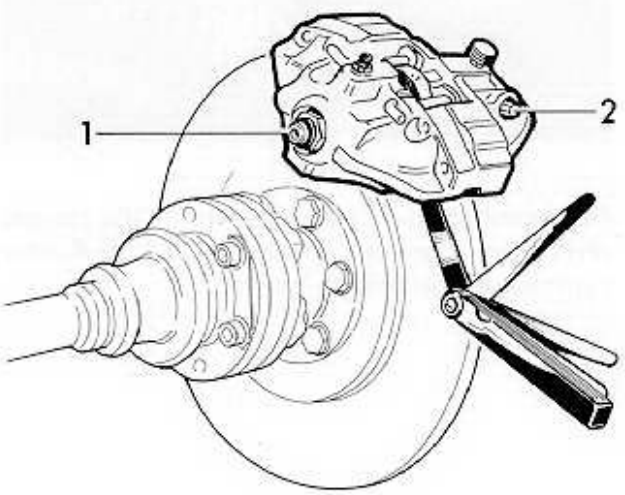
- The brake pads, either the original ones or new ones, must be fitted with the reference marks pointing in the direction of the movement of the car.

- Adjust the brake pad end-float as follows:

Outer pads

Remove dirt excluders.

Unscrew the locknut **1** using tool **A.5.0194.** Turn the adjusting pin clockwise or anticlockwise, until the required endfloat of 0.1-0.15 mm. between brake disc and pad, measured with a feeler gauge, is obtained.



Tighten the locknut to a nominal torque of 0.7 to 1 kg.m. using tool **A.5.0194.**

Inner brake pads

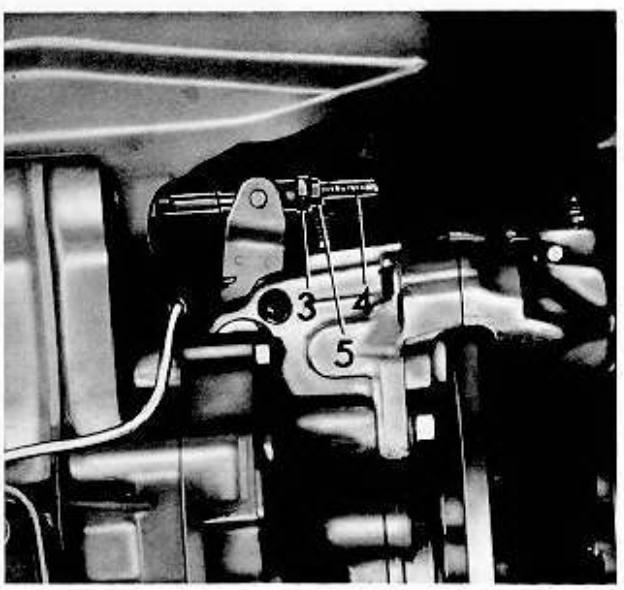
Turn the adjusting screw 2 until the required end-float of 0.1-0.15 mm. between disc and pad (measured with a feeler gauge) is obtained.

Refit dirt excluders previously removed.

Pump the brake pedal repeatedly to restore the normal braking action.

To re-connect and adjust the handbrake cable

Check that the handbrake lever is in its inoperative position.
Re-connect the handbrake cable to the levers on the calipers, screwing the retaining nut **3** on the threaded terminal **4** until the end-float of the cable is completely taken up **without loading the caliper levers.** Failure to observe this condition will reduce the end-float between the inner pad and the disc, which has previously been adjusted, thus causing friction with the handbrake lever in the inoperative position.
Finally tighten the locknut **5.**



When the adjustment is completed, check that the rear wheels are locked when the hand-brake lever is pulled up to between the 4th and 6th notch.

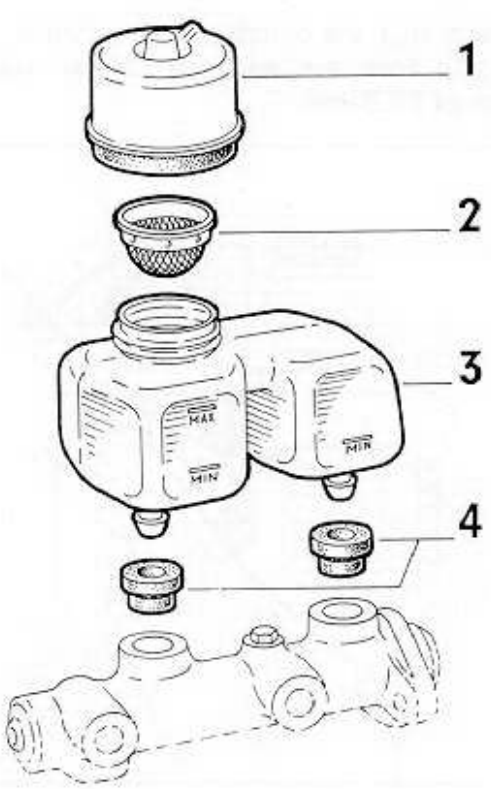
Check that the level in the brake fluid reservoir is as required. If not, replenish it, using exclusively one of the following products:

- ALFA ROMEO Standard 3881-69905
- AGIP F1 BRAKE FLUID SUPER HD
- ATE "S"

To disconnect and reconnect the brake master cylinder and reservoir

Remove cover **1**. Remove gauze **2** and, using a syringe, remove the fluid from the two chambers of the reservoir **3**.

Separate the reservoir from its connections on the master cylinder and collect the seals **4**.



Disconnect the brake master cylinder from the brake servo by removing the associated retaining nuts.

Refit in the reserve order, noting the following:

Check the seals **4** for wear. Replace the seals if necessary.

Ensure that the sealing ring is fitted between the brake master cylinder and the brake servo unit.

Tighten the nuts to 0.8 to 1.0 kg.m.

Fill the braking system and bleed. Use only one of the recommended products. Bleed as described on page 100.

TO REMOVE AND REFIT THE SERVO ASSEMBLY

To remove and dismantle the brake master cylinder-servo-pedal assembly

Empty the chamber of the braking system and the reservoir of the clutch system, withdrawing the fluid by means of a syringe.

Disconnect the flexible vacuum pipe from the adaptor on the brake servo by slackening the securing clip.

Disconnect the adaptors for the feed pipes from the brake and clutch master cylinders.

Working as described and illustrated in the "STEERING' Section".

Remove the lower half of the shroud from the steering column tube. Disconnect the steering column tube from the top mounting bracket. Remove the lever for the steering wheel adjustment and remove the upper half of the shroud from the facia.

Lift the carpets and unscrew the five nuts fixing the pedal box to the scuttle.

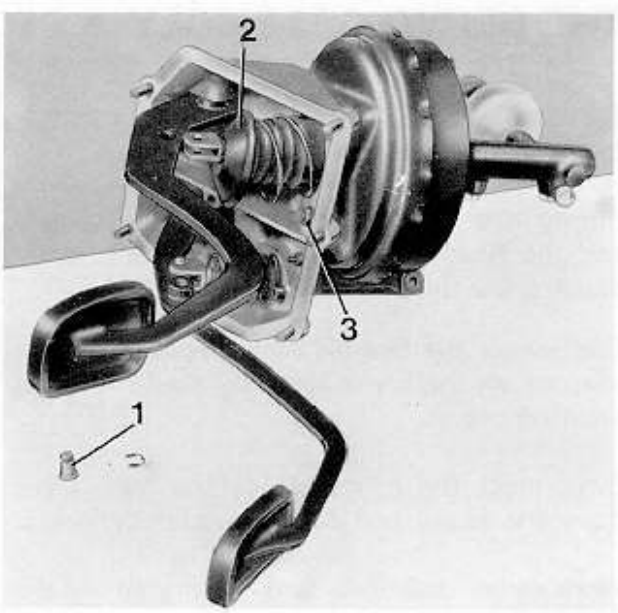
At this stage, collect the plates secured by the two lower nuts corresponding to the clutch pedal. These determine the stroke of the clutch pedal.

Remove the brake master cylinder and brake servo unit complete with mounting and pedals.

Remove the gasket from the pedal support bracket or from the dash.

Disconnect the servo rod from the brake pedal, removing the flexible ring and the pivot **1**. Remove the spring anchorage plate **2** and the spring itself.

Disconnect the master cylinder-brake servo assembly from the pedal bracket by removing the fixing nuts **3**.



Dismantle the pedal assembly as follows:

- Remove the pivot pin securing the fork of the clutch master cylinder to the pedal.

- Remove the anchorage plate for the pedal return spring and remove the spring.

- Remove the clutch master cylinder from the pedal bracket by unscrewing the fixing nuts.

- Withdraw the pedal shaft from the bracket, after having removed the retaining pin. Remove the pedals.

- Remove the bushes from the pedals.

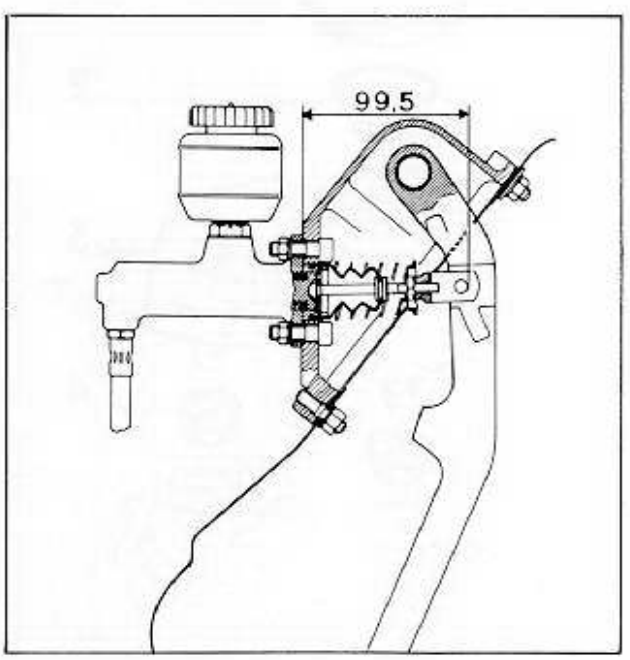
When the dismantling is completed, check the pedal bushes and shafts for excessive wear.

To assemble and refit pedal-master cylinder and servo assembly

Refit the assembly in the reverse order, noting the following:

- Lubricate the pedal shaft with LONGTERM MOLYKOTE No. 2.

- Check that the clutch master cylinder push rod and fork are adjusted to the required length of 99.5 mm.



- Apply LOWAC Perfect Seal to the contact faces of the pedal assembly and the brake servo. Tighten the retaining screw to 1.2 to 1.5 kg.m.

- Replace the gasket between the seating face of the pedal assembly and the dash, after having thoroughly cleaned the contact areas.

- Tighten the feed pipe adaptors for the brake and clutch master cylinders to 0.8 to 1 kg.m.

- Replenish the brake and clutch fluid reservoirs with the recommended fluid and bleed the systems as detailed on page 100.

- Fit the previously removed plates for the clutch pedal adjustment. Check that the stroke of the slave cylinder operating the fork is 10.6 to 12.2 mm. If necessary, the stroke can be adjusted by varying the number of adjustment plates.

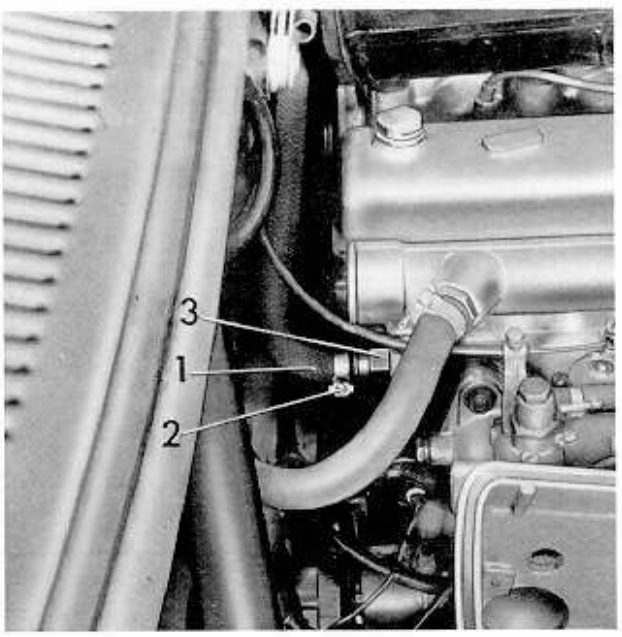
Vacuum system

The vacuum system consists of a non-return valve fitted to the inlet manifold and connected to the brake servo by means of a flexible pipe.

Dismantle the non-return valve as follows:

- Remove the air cleaner by releasing the retaining clips.

- Disconnect the flexible pipe **1**, slackening its retaining clip **2**.



- Unscrew the non-return valve **3** and remove the gasket.

- Check the non-return valve for correct operation and replace it, if necessary, proceeding in the reverse order. Fit new gasket to the valve.

- Check the condition of the flexible pipe connecting the non-return valve with the brake servo unit, and replace it, if necessary.

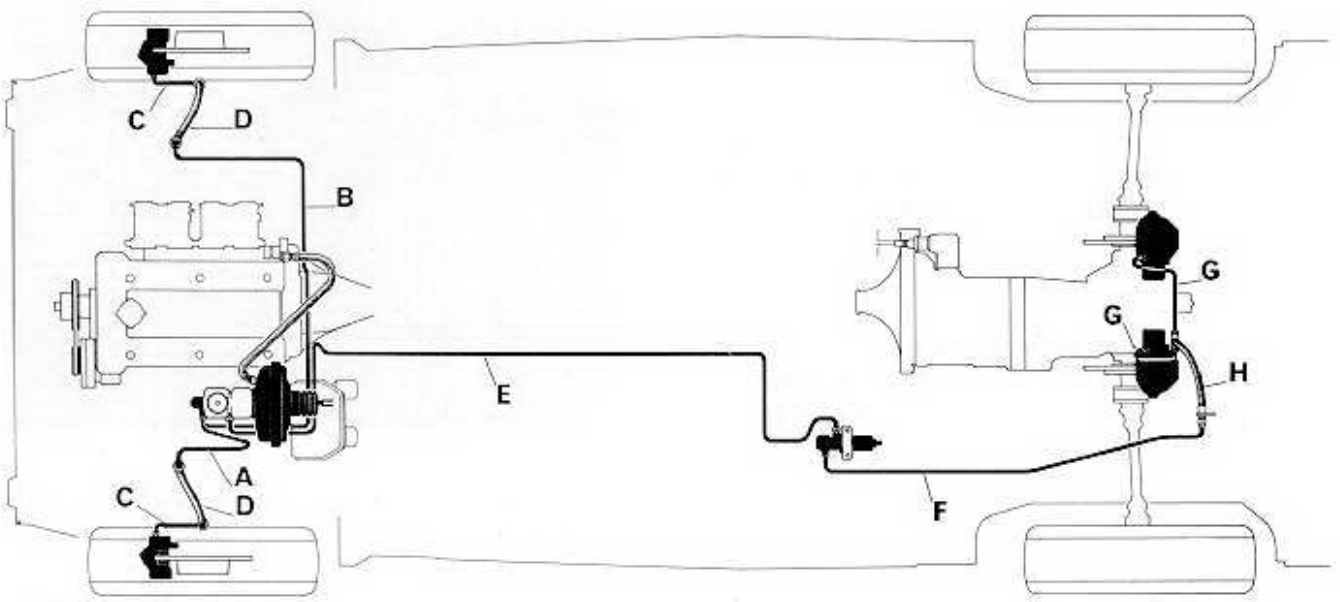
- Refit the air cleaner.

BRAKE PIPES

When removing brakes pipes, either rigid or flexible, take care to prevent the loss of fluid by suitably plugging the ends.

Refit the pipes in the reverse order and tighten the unions to 0.8 to 1 kg.m.

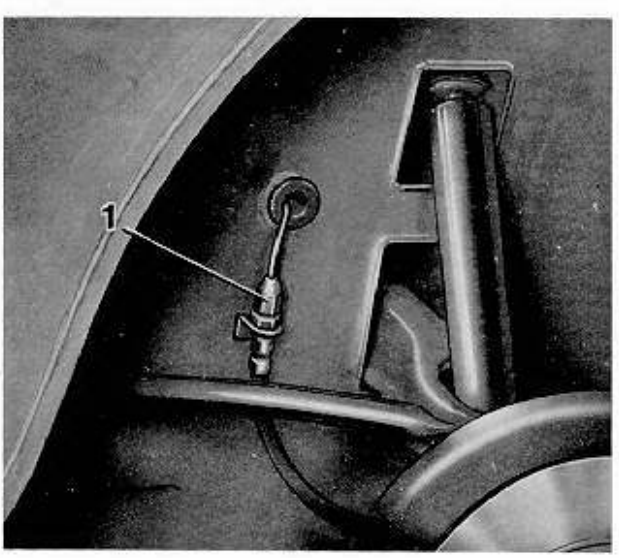
It is necessary to bleed the brakes as detailed on page 100, even in the case of a partial removal of the brake pipes.



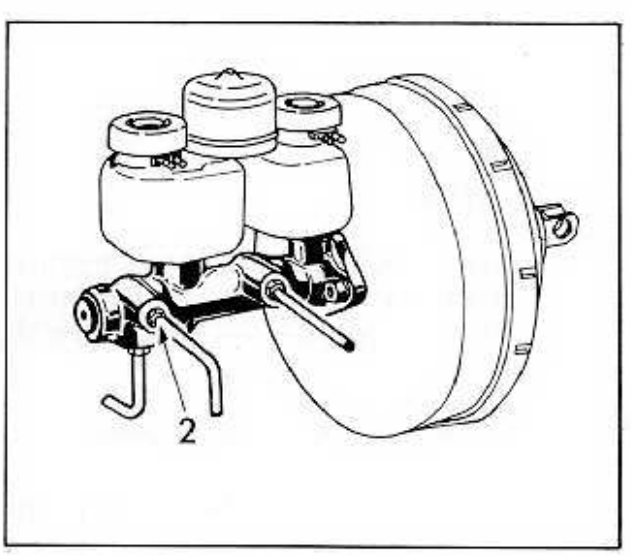
Front circuit

To remove brake pipe A

Raise the car. Remove the front LH road wheel and unscrew the union **1.**



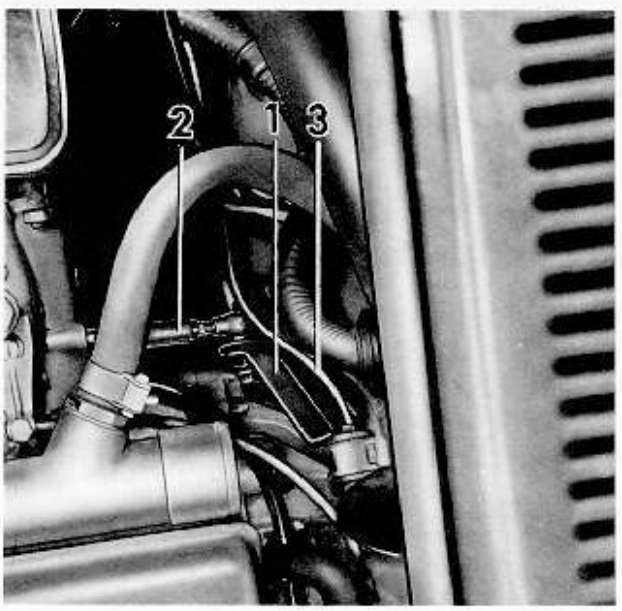
Disconnect the union 2 on the brake master cylinder. Remove the brake pipe from its retaining clip and remove it from the engine compartment by passing its lower end through the aperture in the valance and retaining the rubber grommet.



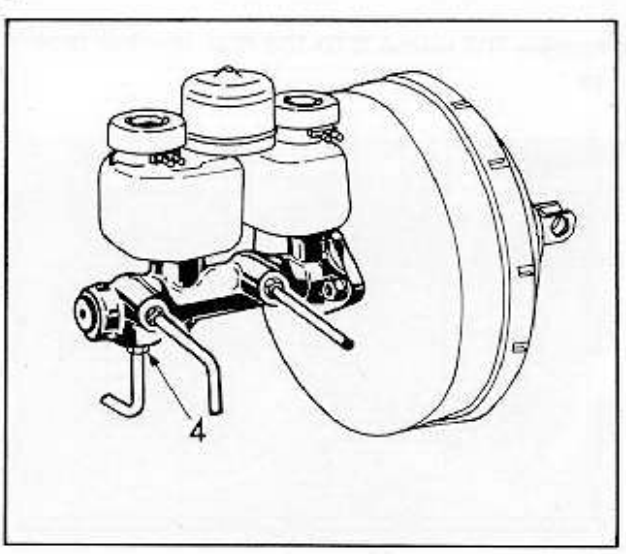
To remove brake pipe B

Working in the engine compartment, remove air cleaner from its seat by releasing it from its retaining clips.

Disconnect link **1** of the accelerator control linkage by unhooking the socket **2** from the ball joint. Remove the brake pipe **3** from the retaining clips.



Unscrew the union **4** from the brake master cylinder.



Raise the car. Remove the front RH road wheel and disconnect the union between brake pipe B and the flexible pipe **D**.

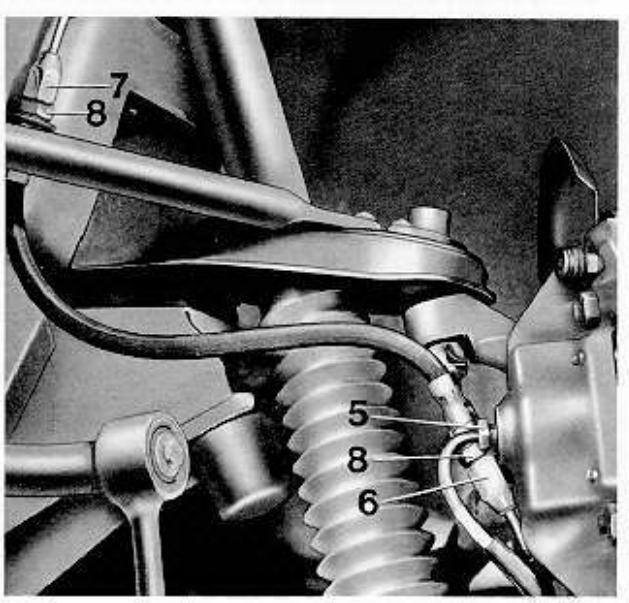
Feed again into the engine compartment the end of the pipe that has just been disconnected. Retain the rubber bush and finally remove the pipe complete by withdrawing it from the RH side of the car.

To remove brake pipes C and flexible pipes D

Raise the car and remove the front wheels.

Unscrew the union **5** from the brake caliper. Disconnect the union **6** for the flexible pipe and remove the pipe.

Remove flexible pipe by disconnecting union **7** and locknuts **8**.

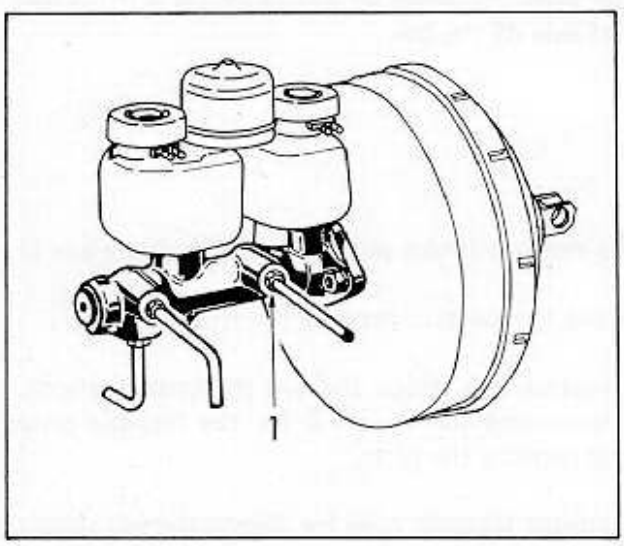


Operate in a similar manner on the opposite side of the car.

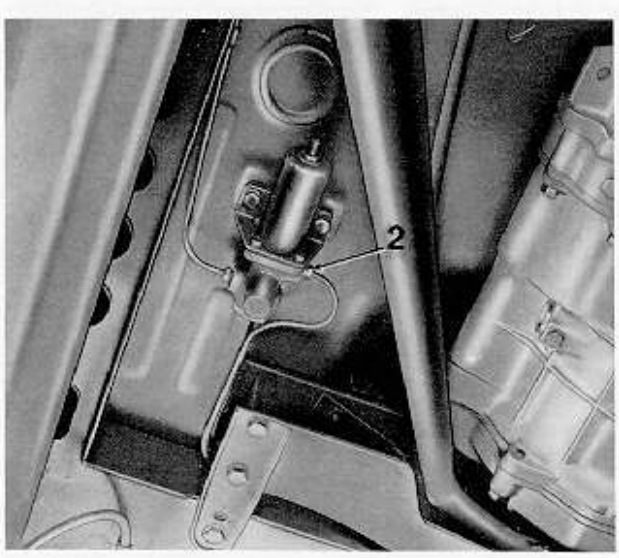
Rear braking circuit

To remove pipe E

Place the car on a lift. Disconnect the union **1** at the brake master cylinder.

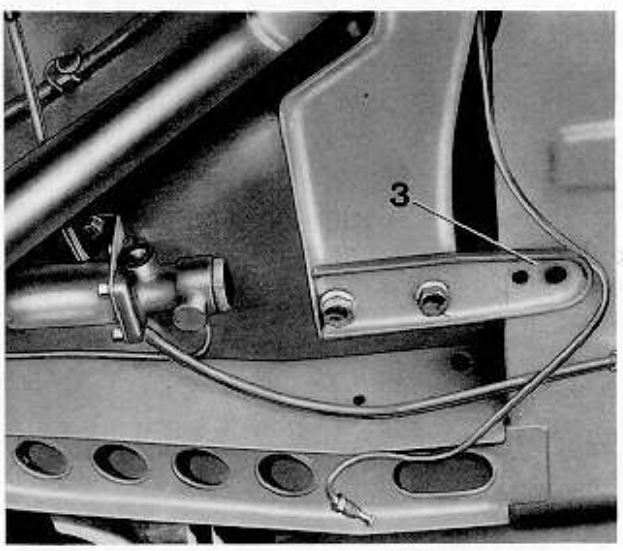


Raise the car and unscrew the union **2** on the braking effort limiting valve.



Free the brake pipe from the retaining clips.

Partially unscrew the bolts fixing the De Dion axle crossmember to the body, with the exception of bolt **3** which must be removed completely. This allows the crossmember to be lowered sufficiently for the pipe to pass through.



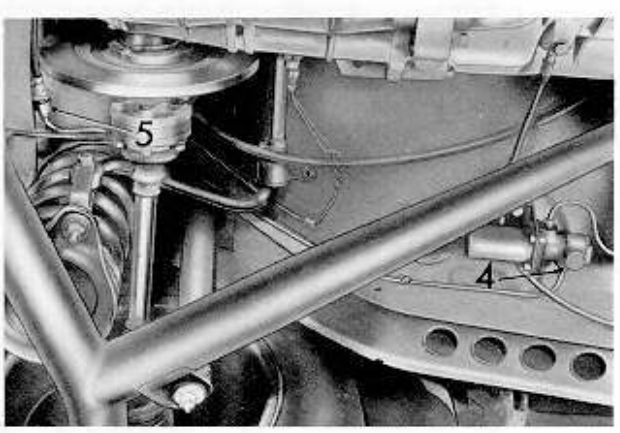
From underneath the car, remove the metal brake pipe E, withdrawing it towards the rear and simultaneously guiding it from the side of the engine compartment, to avoid it becoming entangled, thus causing possible damage.

When refitting, tighten the securing bolts of the crossmember to 4 to 4.5 kg.m.

To remove brake pipe F

Raise the car by means of a lift. Disconnect the brake pipe F from the braking effort limiting valve by unscrewing the union **4**.

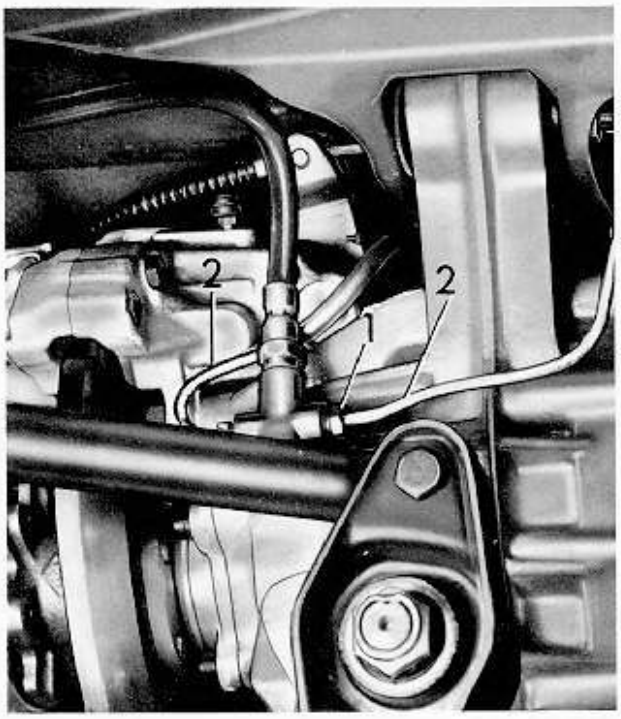
Unscrew the union 5 to the rear flexible brake pipe.



Separate the pipe from the support clip and remove it.

To remove brake pipes G

Unscrew union **1** connecting brake pipe **2** to the three-way connector.



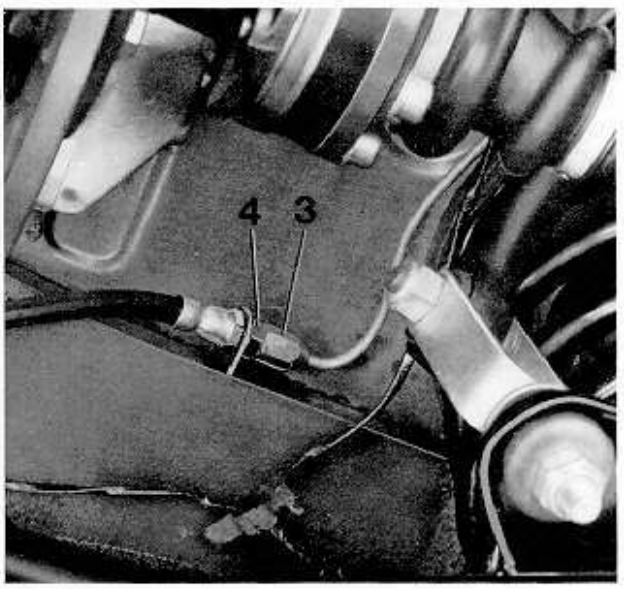
Remove the rear brake caliper as detailed on page 91.

Remove the brake pipe by unscrewing the adaptor, connecting it to the brake caliper.

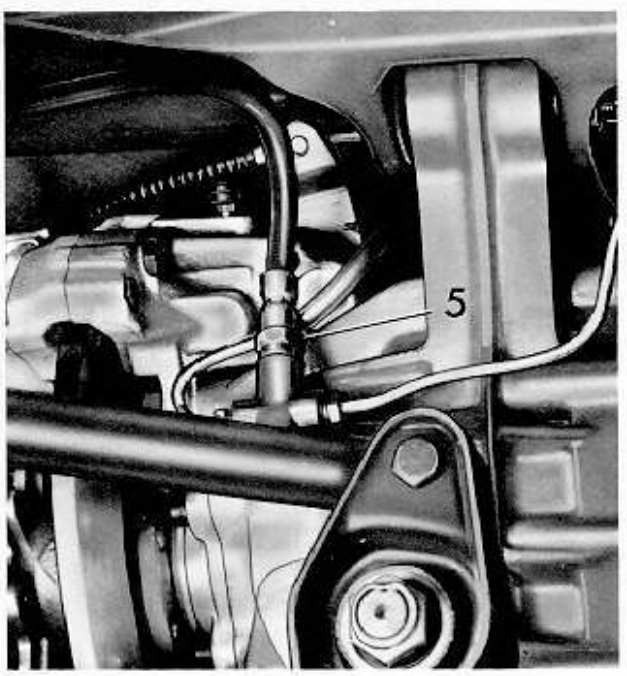
Proceed in a similar manner for the opposite side of the car.

To remove flexible pipe H

Raise the car. Disconnect the union **3** between the brake pipe **F** and the flexible pipe. Unscrew locknut **4** and withdraw the flexible pipe union from the mounting bracket.



Unscrew union **5** from the three-way connector on the differential housing and remove the flexible pipe, retaining the gasket.



TO BLEED BRAKE SYSTEM

The brakes can be bled in two different ways: conventional method, and the method involving the use of tool R.2.0105.

Conventional method

Place the car on a lift.

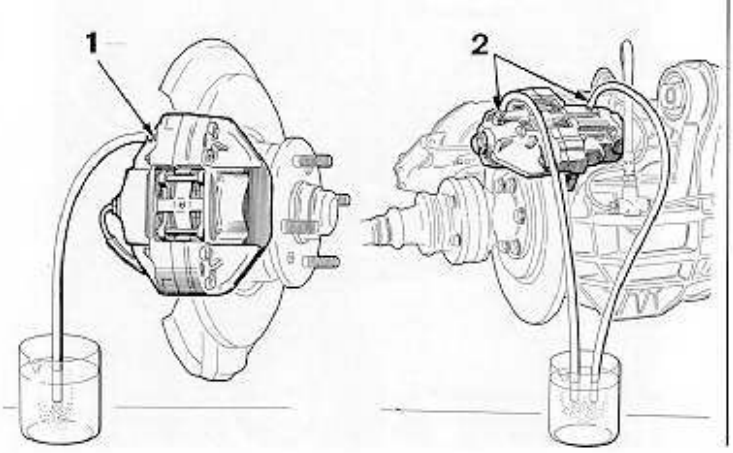
If necessary, replenish the reservoirs with the recommended fluid from sealed tins. These should be opened only immediately before use.

Raise car and remove the dust caps from the bleed screws on the calipers.

Bleed brakes, adhering strictly to the following instructions. It should be noted that the front and rear calipers must be bled simultaneously, first on one side of the car, then or the other.

- Attach flexible tubings to the bleed screws 1 and 2 on the calipers in question and put the other end in transparent containers containing brake fluid of the recommended type.

- Slacken the bleed screws and operate repeatedly the brake pedal; allow the brake pedal to return slowly and pause a few seconds between each stroke. Continue with this operation until the fluid emerging is free from air bubbles. Depress the brake pedal fully. Tighten the bleed screws and remove the tubings.



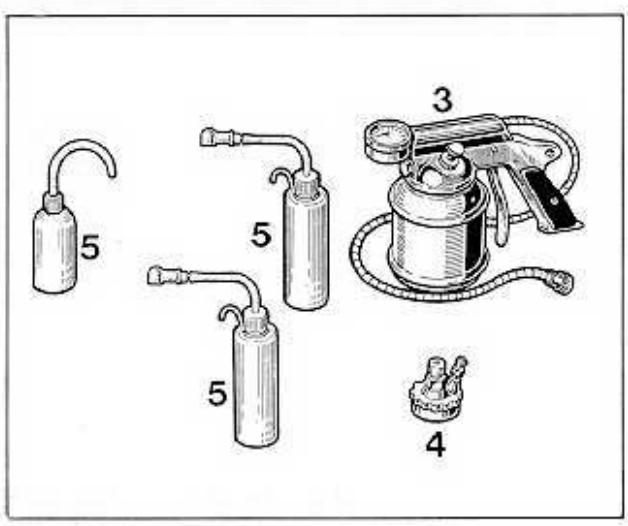
- On completion of this operation on the one pair of calipers, refit the dust caps. If necessary, restore the level of brake fluid in the reservoir.

If the bleeding has been carried out carefully, after an initial empty stroke the pedal operation should be without any trace of sponginess. If not, continue with the bleeding.

Method involving the use of tool R. 2.0105

The set, which is supplied complete with all accessories, comprises:

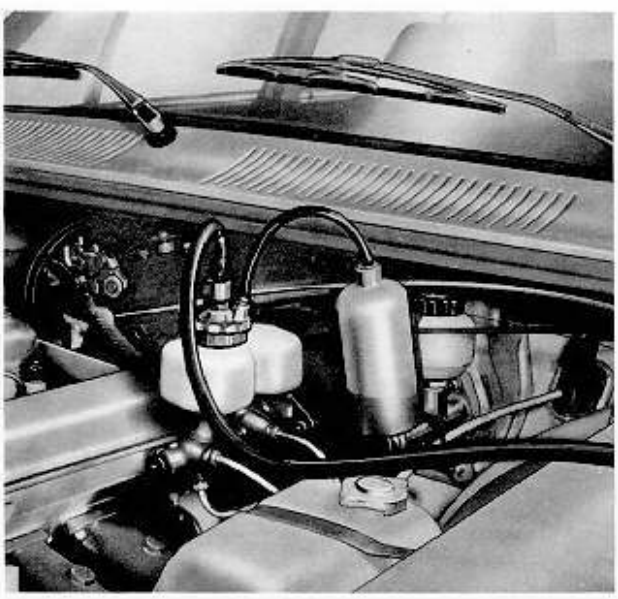
Pump complete 3, connecting plug 4, flexible tubing and two transparent bottles 5 for collecting the fluid.



Place the car on a lift and fit the equipment as follows:

- Replenish the master cylinder reservoir by abt. three quarters, using the recommended fluid from sealed tins.

- Fit the plug contained in the kit in place of the reservoir cap. Connect the pump's flexible pipe and fit a collecting bottle to the bleed valve.



Bleed the air from the reservoirs, operating as follows:

- Pressurize the circuit by operating the pump lever. Do not exceed a pressure of 3 kg/cm², as indicated on the pressure gauge.

- Open the valve on the adaptor plug and allow the fluid to flow until all air bubbles have disappeared.

- Maintaining the pressure, close the bleed valve. Release the pressure by means of the valve on the pump reservoir.

At this stage bleed the system as detailed below, taking into account that the front and rear calipers must be bled simultaneously, first on one side, (we recommend the RH side), then on the other.

- Raise the car and remove the dust caps from the bleed screws on the calipers.

- Attach the transparent collecting bottles, which should be partially filled with fluid, to the bleed screws or the calipers in question. Ensure that the flexible tubes are immersed in the fluid.

- Raise the pressure to the level previously indicated.

- Open the bleed screws. Maintain the system's pressure at 2.8 kg/cm² and allow the fluid to escape until all air bubbles have disappeared completely. Close the bleed screws in the sequence illustrated, whilst still maintaining the pressure at a constant level.

- front caliper
- rear caliper inner screw
- rear caliper outer screw

- Repeat the above operation on the opposite side of the car and, when the bleeding is completed, and prior to releasing the pressure, ensure that there are no fluid losses from the tubings.

- Release the pressure.

- Check that the brakes have been bled carefully by operating the brake pedal. This should show no sign of sponginess, otherwise the above operation should be repeated.

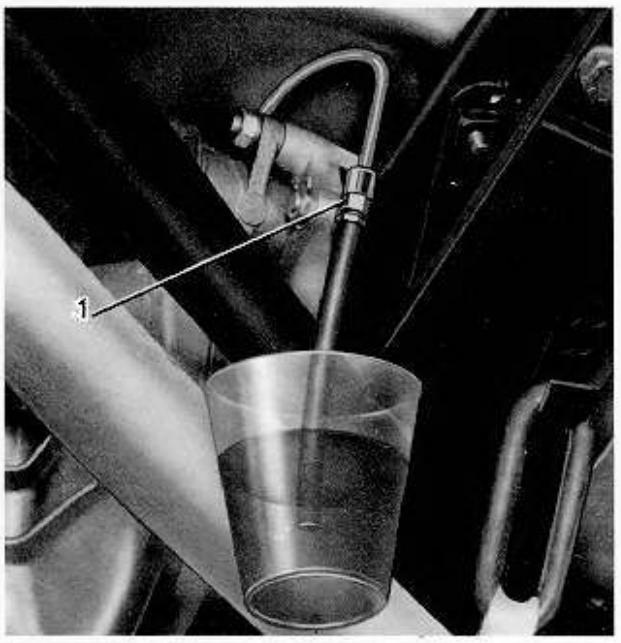
- Disconnect the pump from the adaptor plug and from the valve on the pump. Remove any excess fluid from the reservoirs, until the maximum permissible level is restored.

Remove the adaptor plug and fit the reservoir caps.

To bleed clutch system

Proceed in a similar manner as for the conventional bleeding of the brakes.

Attach the tubing to the only bleed nipple 1 of the system located on the clutch slave cylinder.

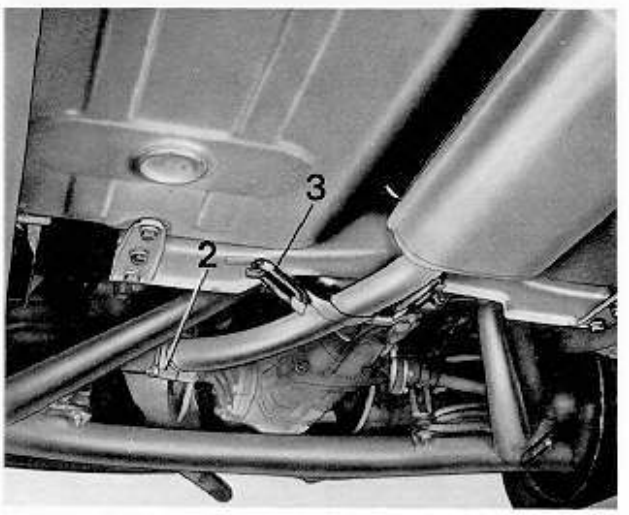


TO OVERHAUL THE HANDBRAKE ASSEMBLY

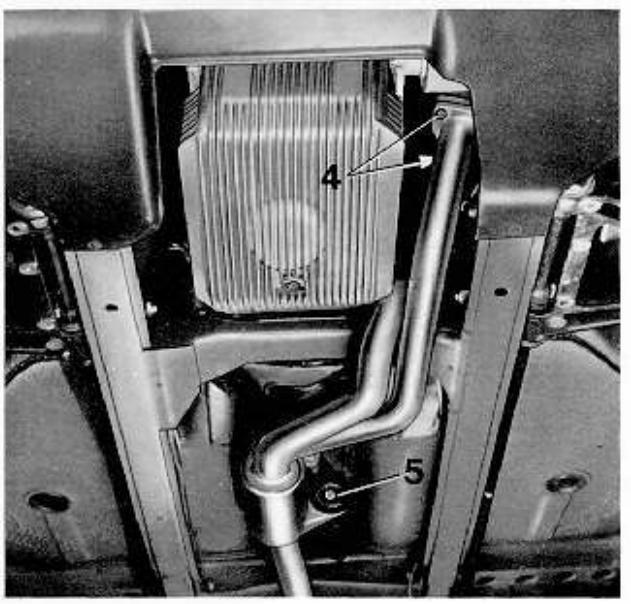
To remove the handbrake cable

Raise the car and, working below it, disconnect the front part of the exhaust pipe as detailed below:

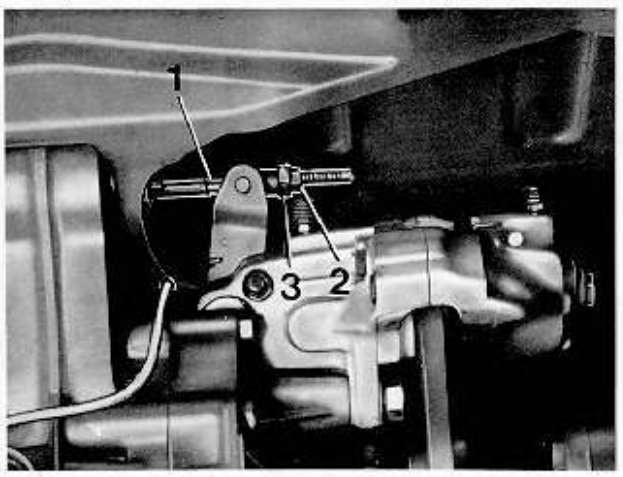
Slacken the clamp 2 securing the front pipe to the tail pipe and disconnect the flexible mountings 3 from the crossmember.



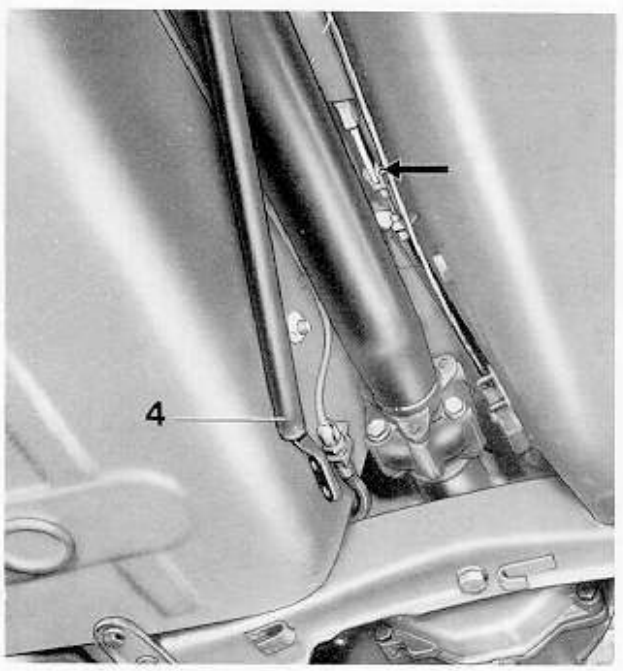
Remove the front exhaust pipe by unscrewing the nuts 4 and the bolt 5 which secures it to the exhaust manifold and the mounting bracket respectively, and withdrawing it from the rear tail pipe adaptor.



Disconnect the handbrake cable **1** from the rear brake calipers by unscrewing locknut **2** and adjusting nut **3**. Withdraw handbrake cable from the levers, complete with outer cable.



Disconnect the gear selector linkage **4** from the studs by removing the securing nuts and move it sufficiently to provide access to the connection between cable and handbrake control lever as illustrated.



Disconnect the cable from the lever by removing the split pin and washer from the pin.

Separate the cable from the anchoring plates. Withdraw the handbrake outer cable from the mounting plate near the rear flexible propeller shaft coupling.

To remove handbrake lever

Remove the console from the tunnel as follows:

- Remove gear lever knob.

- Remove ashtray by unscrewing retaining screws.

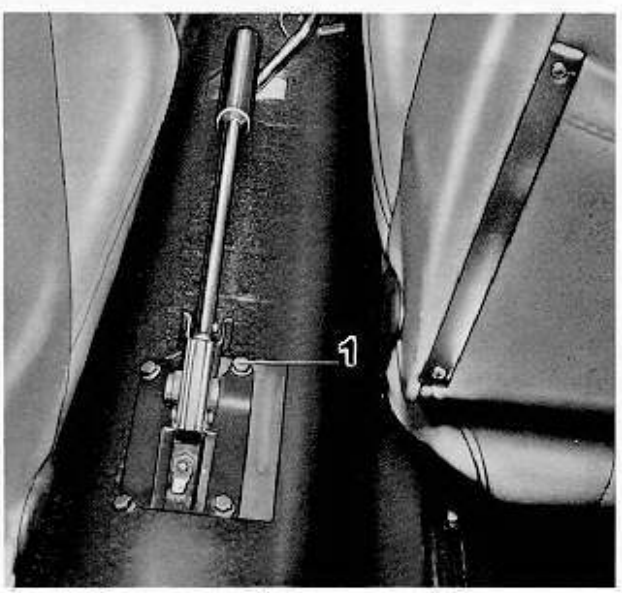
- From the aperture of the rear ashtray, remove the screw fixing the console to the tunnel.

- Remove the securing nut for the console, located at the front.

- Unscrew the lateral fixing screws.

Raise the back of the console. Disconnect the electric wiring of the cigar lighter, and remove the console.

Remove the screws **1** fixing the handbrake mounting bracket to the console.



Raise the lever and disconnect the electric cables from the handbrake warning light switch.

Disconnect the handbrake lever from its mounting bracket by removing the split pin and retaining washer from the pivot pin.

Remove handbrake warning light switch, using pliers, withdrawing it from its seat located at the rear of the handbrake lever mounting bracket.

Check the components removed and replace them as required. Assemble the lever in the reverse order, noting the following:

Adjust the handbrake lever travel by reconnecting the flexible cable to the rear calipers, as detailed on page 92.

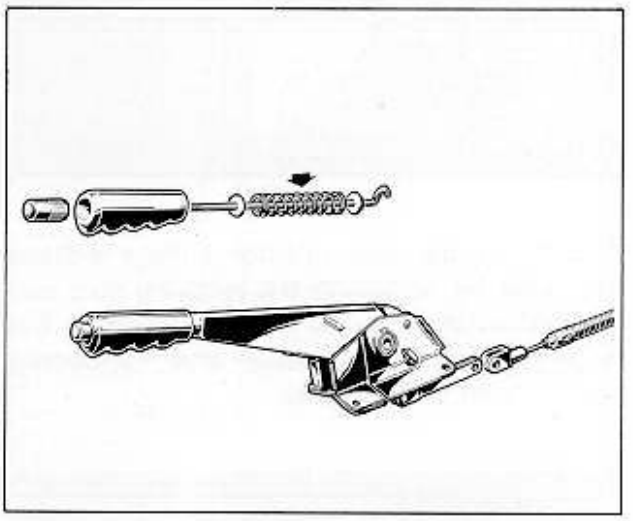
Reconnect the gear selector linkage to the joint, noting the following:

- Select 5th gear, by means of the rear selector lever on the gearbox.
- Tighten the securing nuts, selector linkage to joint, to 2 to 3.25 kg.m.

To replace spring for handbrake release button

Unscrew the push button from the control rod. Remove the washer and remove the spring.

Replace the spring, proceeding in the reverse order.

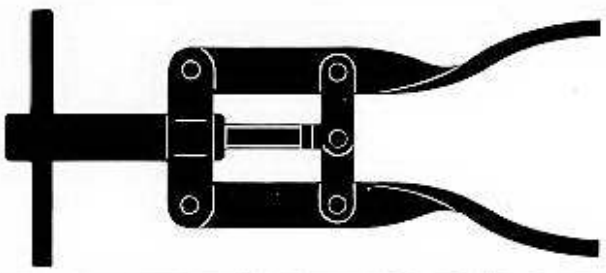


TOOLS

TIGHTENING TORQUES

LUBRICANTS FLUIDS AND SEALANTS

TOOLS



A.2.0147 *

EXPANDER
for brake caliper pistons

A.2.0355 *

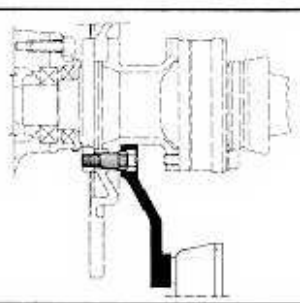
PLIERS
for extracting front caliper pistons

A.2.0149 *

GAUGE
for checking front caliper piston position

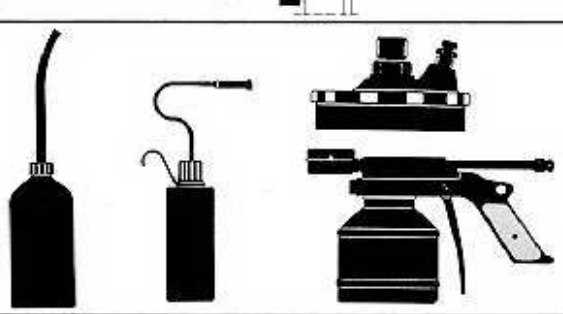
A.5.0194 *

SPANNER
for rear caliper endfloat adjustment



A.5.0201

SPANNER
for rear brake disc retaining bolts



R.2.0105 *

PUMP AND ACCESSORIES
foor bleeding brake system

Tools marked thus * are also used for other models.

TIGHTENING TORQUES

DESCRIPTION	kgm	TIGHTE METH
Bolt, fising front brake calipers to stub axle	7.5 to 8.5	Dry
Fixing bolt for rear brake calipers	4.7 to 5.4	Dry
Fixing bolts for rear brake disc (with spanner A.5.0201 and a 300/400 mm long torque spanner)	5.2 to 5.7 4.1 to 4.5	Dry
Fixing nuts, brake servo to pedal assembly	1.2 to 1.5	Dry
Unions for flexible and rigid brake pipes, approximate value	0.8 to 1.0	Dry
Fixing bolts for rear axle crossmember	4.0 to 4.5	Dry
Locknut for pad adjusting bolt	0.7 to 1.0	Dry
Nuts, fixing gear selector linkage to joint	2.0 to 3.25	Dry

LUBRICANTS, FLUIDS AND SEALANTS

DESCRIPTION	QUANTITY	COMMERCIAL EQUIVALENT
Grease for: - Working lip of oil seal and working surfaces of oil seal on stub axles	Sufficient quantity	ISECO MOLUKOTE BR 2
Grease for: - Wheel hub bearings	55 g	AGIP F1 GREASE 33 FD SHELL RETINAX AX IP AUTOGREASE FD
Grease for: - Glutch and brake pedal shafts	Sufficient quantity	ISECO MOLUKOTE LONGTERM N. 2
Lubricant for: - Dirt excluders for brake caliper pistons	Sufficient quantity	ATE BREMSZYLINDER PASTA
- Clutch and brake fluid	Sufficient quantity	ALFA ROMEO STANDARD 3681-69905 AGIP F1 BRAKE FLUID SUPER HD ATE "S"
Oil for: - External surfaces of oil seal on front hubs	Sufficient quantity	AGIP F1 ROTRA MP SAE 85 W/90 SHELL SPIRAX HD 90 IP PONTIAX HD 85 W 90
Sealant for: - Contact faces between brake servo and pedal unit	Sufficient quantity	LOWAC PERFECT SEAL

Alfa Romeo

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