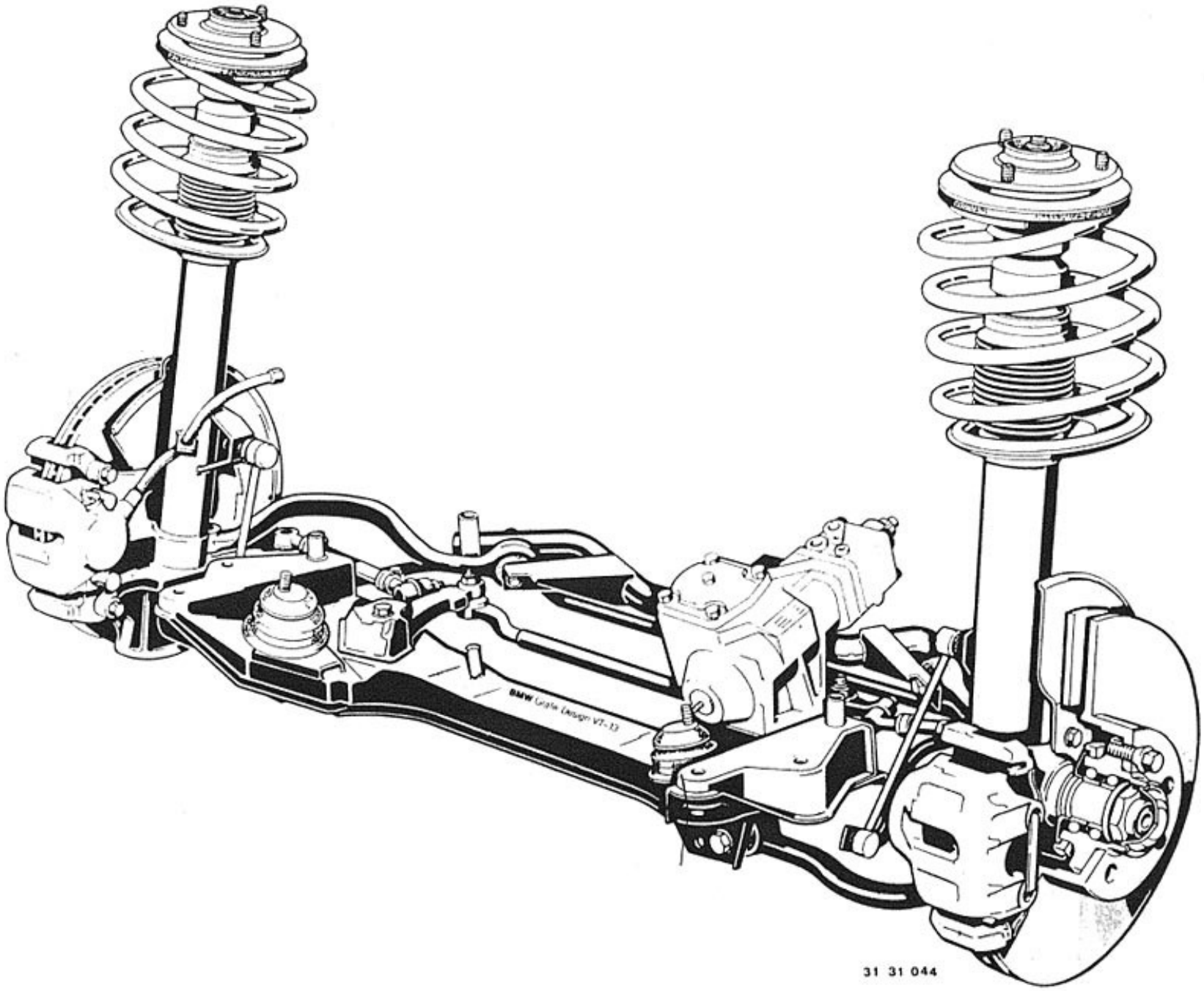
31 Front axle

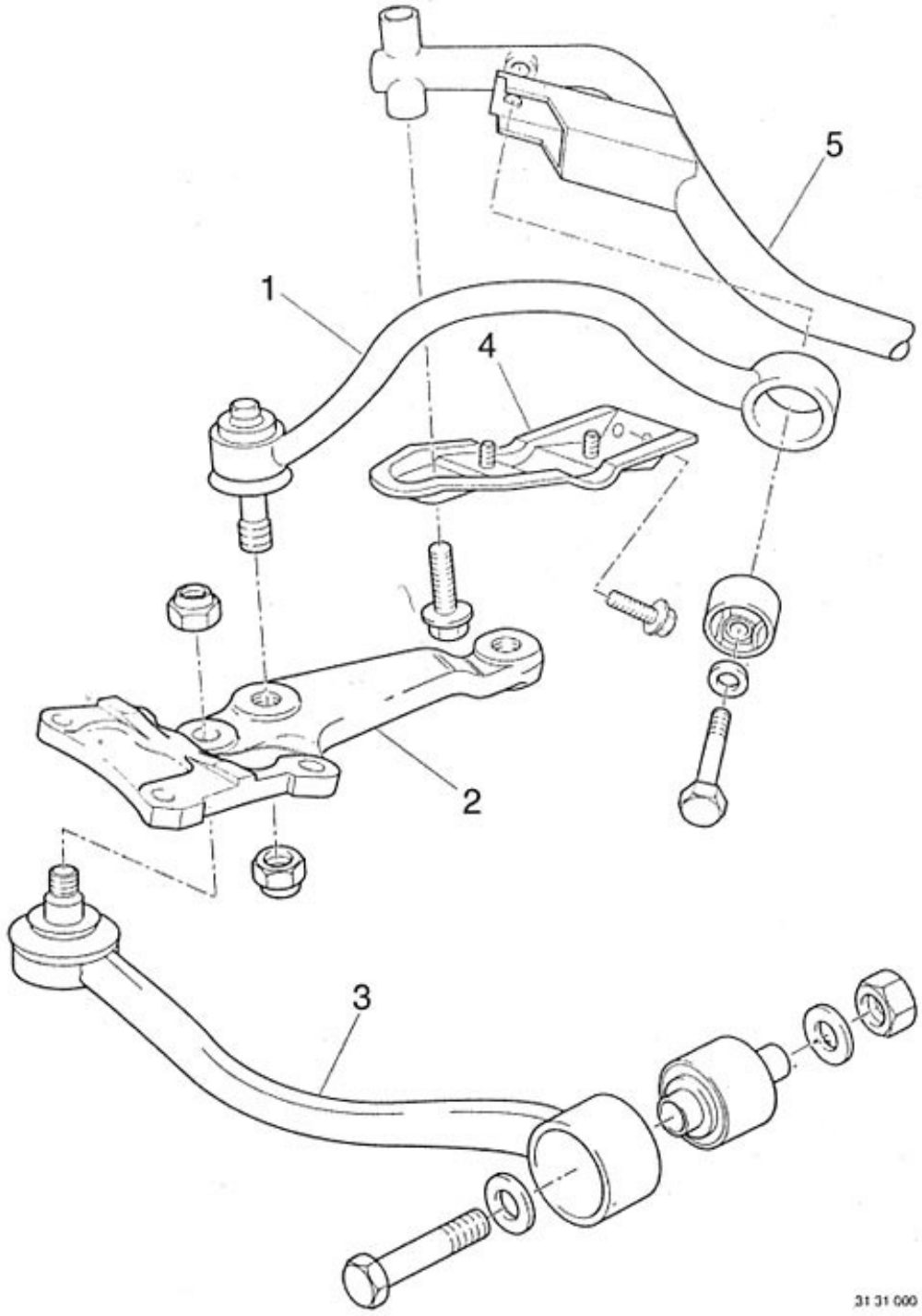
	Front axle suspension layout	31- 0/1
	Layout of struts and control arms	31- 0/2
	Layout of struts and control arms, version with reinforcement cross	31- 0/3
31 10 000	Front axle, complete – remove and install	31-10/1
31 11 001	Front axle carrier – replace	31-11/1
31 12 001	Control arm, left or right – replace	31-12/1
090	Traction strut, left or right – remove and install or replace	31-12/2
147	Rubber mount on traction strut – replace	31-12/3
31 21 180	Bearing (wheel hub) for front wheel – replace	31-21/1
	Layout of spring strut shock absorber	31-31/1
31 31 000	Spring strut shock absorber, front, left or right, complete – remove and install	31-31/2
031	Spring strut shock absorber, front, left or right – replace	31-31/3
31 33 001	Spring strut shock absorber, front thrust bearing, left or right – replace	31-33/1
100	Coil spring for spring strut shock absorber, front, left or right – remove and install or replace	31-33/1
31 35 000	Stabilizer, front – remove and install or replace	31-35/1
	Front axle – troubleshoot	31-90/1
	Shock absorber – troubleshoot	31-90/3

FRONT AXLE LAYOUT DRAWING



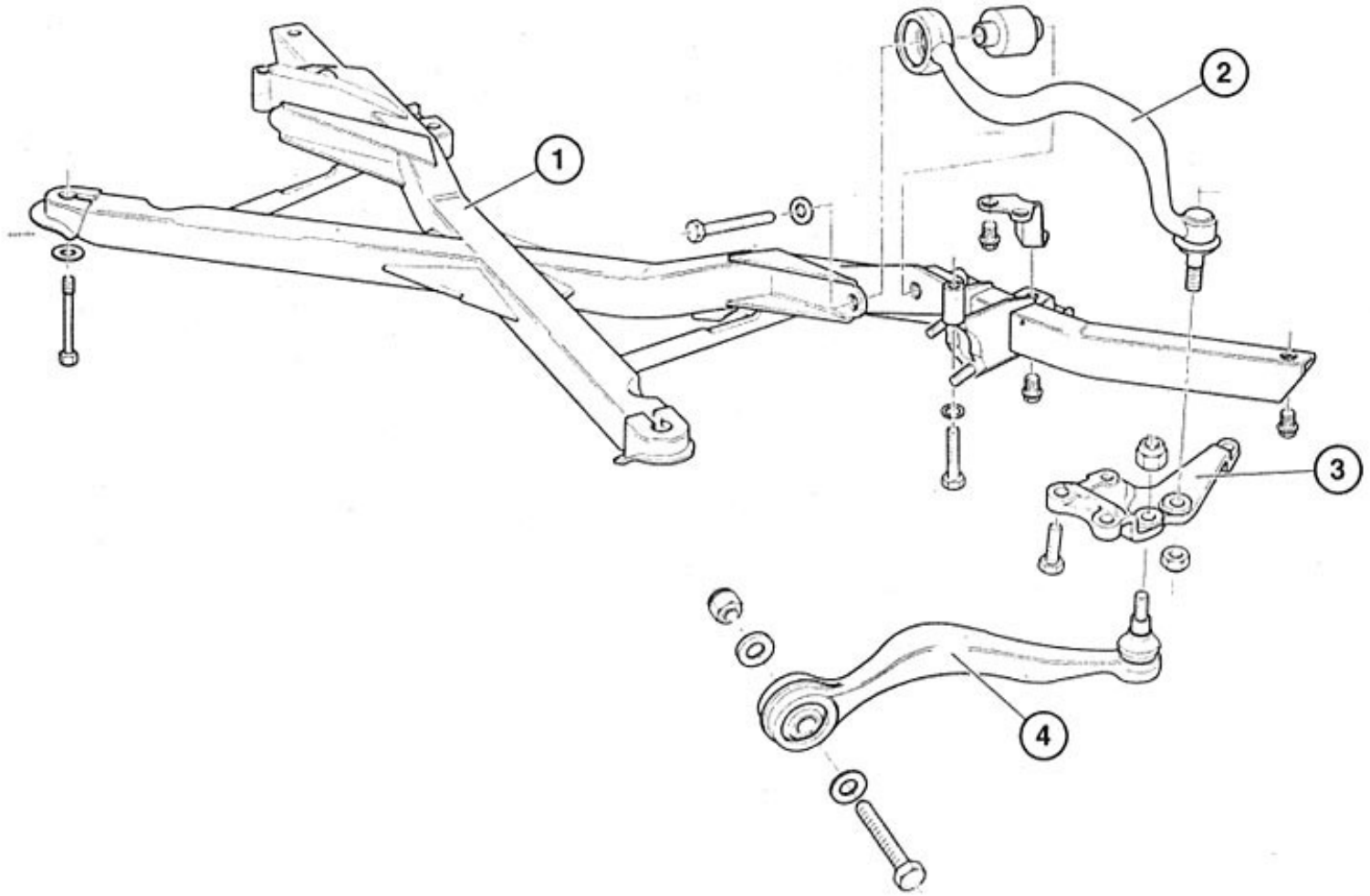
LAYOUT DRAWING OF STRUTS AND ARMS

1 Thrust strut
2 Tie rod arm
3 Control arm
4 Support
5 Connecting pipe



LAYOUT DRAWING OF STRUTS AND ARMS (Version with Reinforcement Cross)

1 Reinforcement cross
2 Thrust strut
3 Tie rod arm
4 Control arm

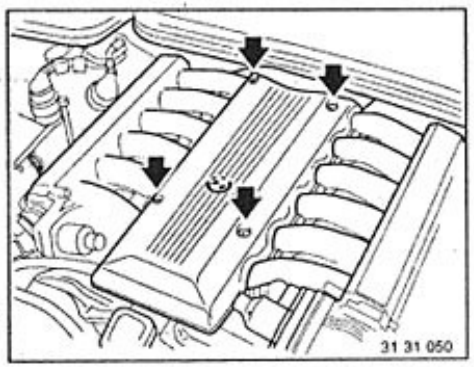


31 31 054

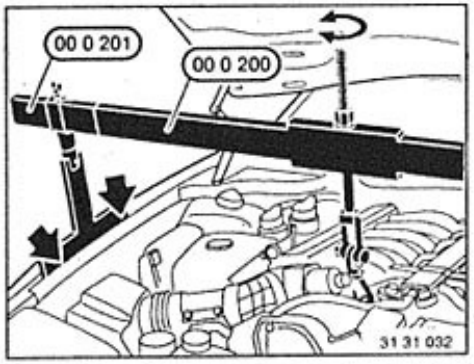
31 10 000 REMOVING AND INSTALLING FRONT AXLE ASSEMBLY

Unscrew brake calipers (pipes remain connected) - refer to Group 34.
Unscrew ABS pulse senders - refer to Group 34.
Disconnect EDC wire - refer to Group 37.

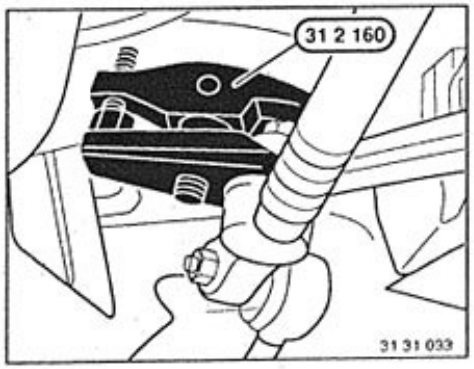
Note:
Check and adjust wheel alignment after installation of the front axle - refer to Group 32.



Unscrew cover.



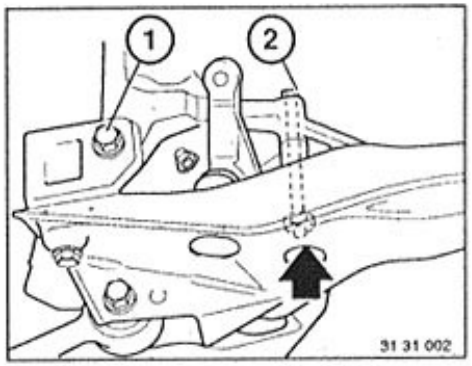
Suspend engine from Special Tools 00 0 200 and 00 0 201.
Supports must bear on the bolts of both side panels.



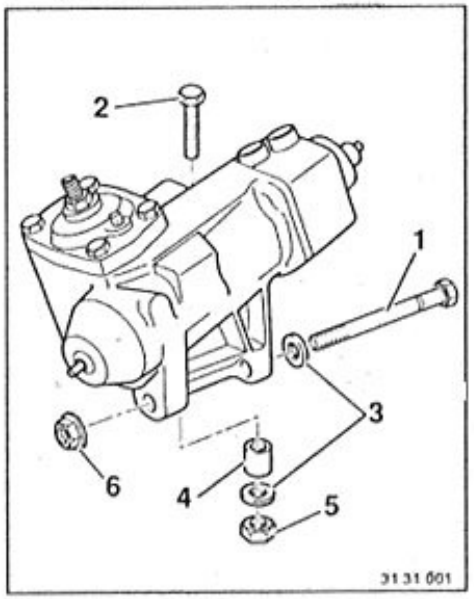
Unscrew nut.
Press tie rod off of the steering drop arm using Special Tool 31 2 160.

Installation:
Replace self-locking nut.
Tightening torque*.

* Refer to Specifications

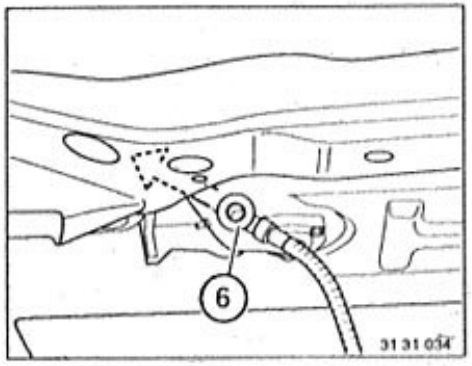


Unscrew bolts (1 and 2).
Suspend steering gear from car — pipes remain connected.



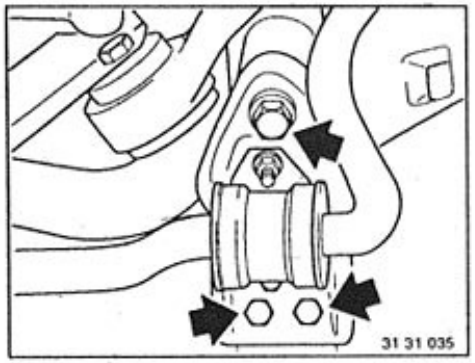
Installation:
1 Bolt
2 Bolt (only use 10.9 strength class)
3 Washer
4 Sleeve
5 Nut (replace)
6 Nut with washer (replace)

Tightening torque*.



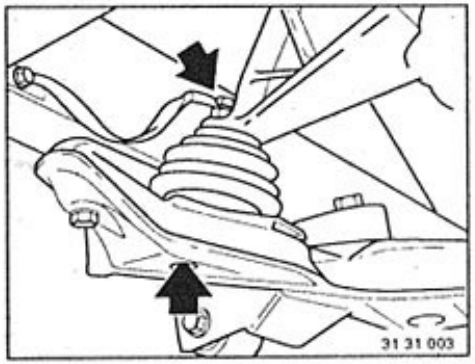
Installation:
Install nut (6) using a flexible magnetic lifter.

* Refer to Specifications



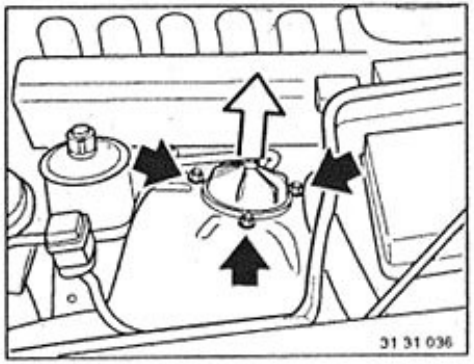
Unscrew left and right bolts.

Installation:
Tightening torque*.



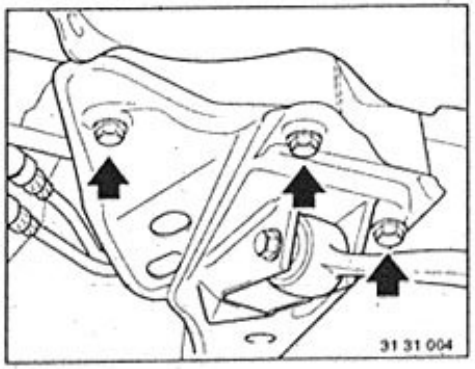
Unscrew left and right engine mounts on front axle.
Also unscrew right engine mount at top.

Installation:
Tightening torque*.



Take off cap.
Unscrew left and right nuts.

Installation:
Replace self-locking nuts.
Tightening torque*.

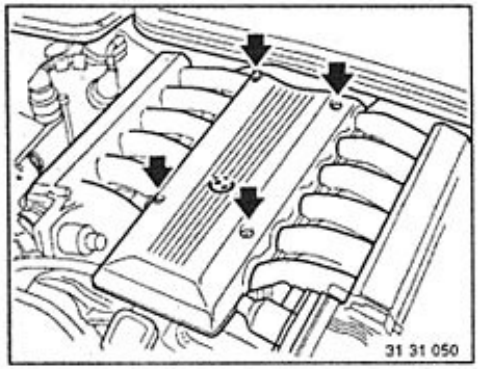


Place garage jack underneath front axle carrier.
Unscrew left and right bolts and lower the front axle slowly.

Important!
Spring struts must not fall out or down – this would damage the ball joints.

Installation:
Tightening torque*.

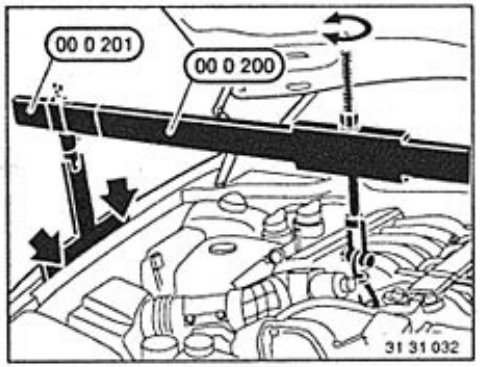
* See Specifications



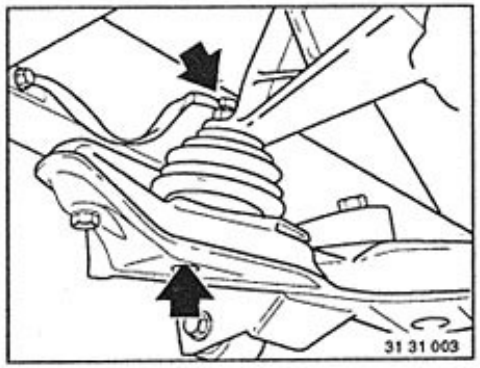
31 11 001 REPLACING FRONT AXLE CARRIER

Note:
The steering drop arm must be adjusted (refer to Group 32) after installation of a new front axle carrier.
Check and adjust wheel alignment after installation of the front axle - refer to Group 32.

Unscrew cover.

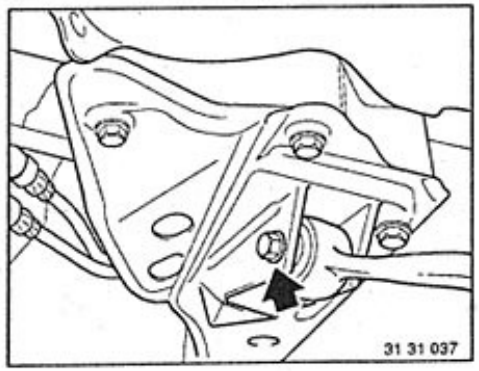


Suspend engine from Special Tools 00 0 200 and 00 0 201.
Supports must bear on the bolts of both side panels.



Unscrew left and right engine mounts at the front axle carrier.
Also unscrew right engine mount at top.

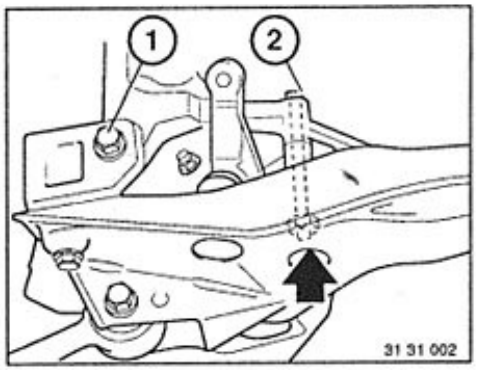
Installation:
Tightening torque*.



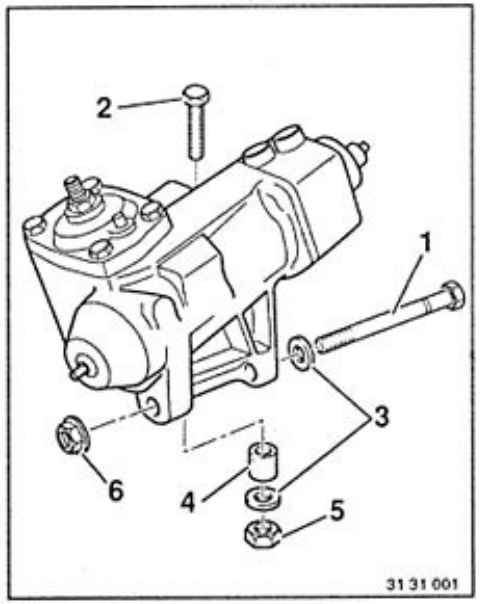
Unscrew left and right control arms.

Installation:
Replace self-locking nuts.
Use washers on both sides.
Tightening torque*.

* **Refer to Specifications**

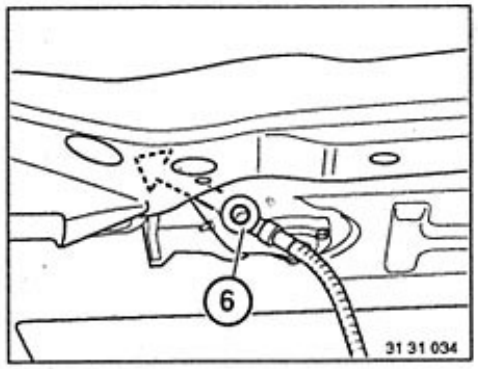


Unscrew bolts (1 and 2).
Suspend steering gear from car — pipes remain connected.



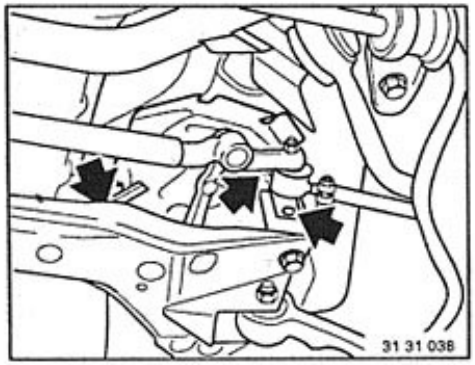
Installation:
1 **Bolt**
2 **Bolt (only use 10.9 strength class)**
3 **Washer**
4 **Sleeve**
5 **Nut (replace)**
6 **Nut with washer (replace)**

Tightening torque*.

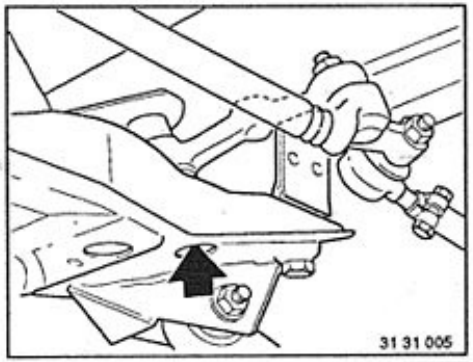


Installation:
Install nut (6) using a flexible magnetic lifter.

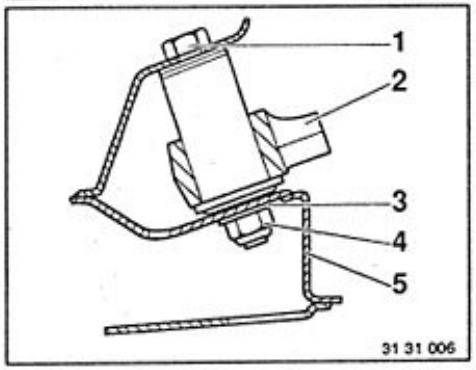
* **Refer to Specifications**



Unscrew heat shield.

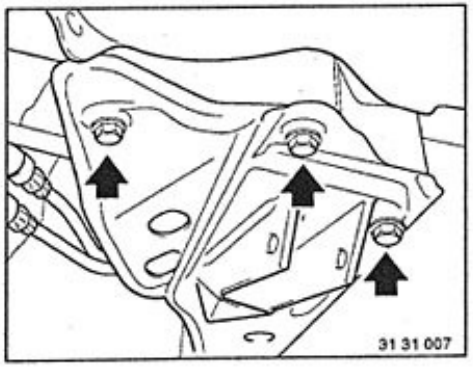


Unscrew steering guide arm.



Installation:
1 Bolt
2 Steering guide arm
3 Washer
4 Self-locking nut
5 Front axle carrier

Replace self-locking nut.
Tightening torque*.



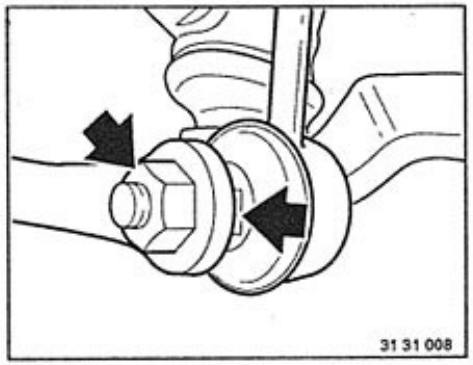
Unscrew left and right bolts and take off front axle carrier.

Installation:
Tightening torque*.

* See Specifications

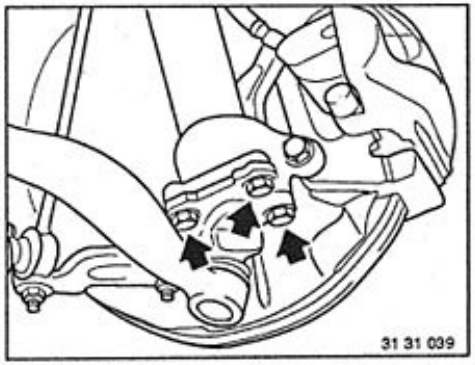
31 12 001 REPLACING LEFT OR RIGHT CONTROL ARM

Remove front wheel - refer to Group 36.



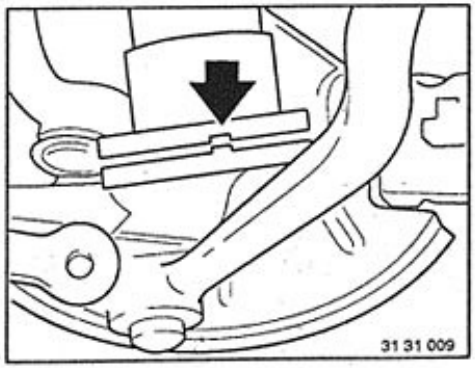
Unscrew thrust rod at stabilizer, while counterholding with a fork wrench.

Installation:
Wrench surface on ball head must be parallel to the absorber axis.
Tightening torque*.



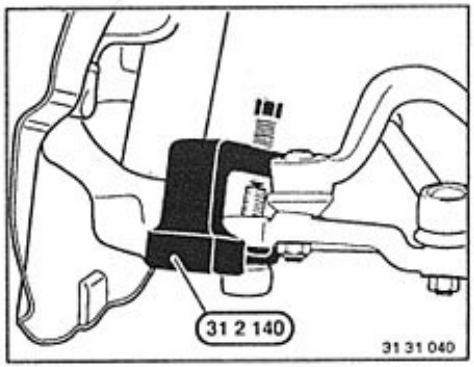
Unscrew bolts.

Installation:
Clean threads of bores and bolts.
Install bolts with bolt cement**.
Tightening torque*.



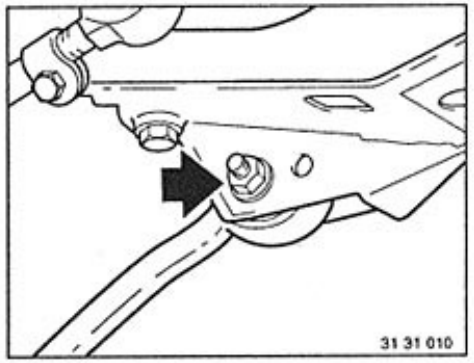
Check for correct installed position.

* Refer to Specifications
** Source of Supply: BMW Parts



Unscrew nut.
Pry off ball joint using Special Tool 31 2 140.

Installation:
Remove grease from ball pin and bore.
Replace self-locking nut.
Tightening torque*.



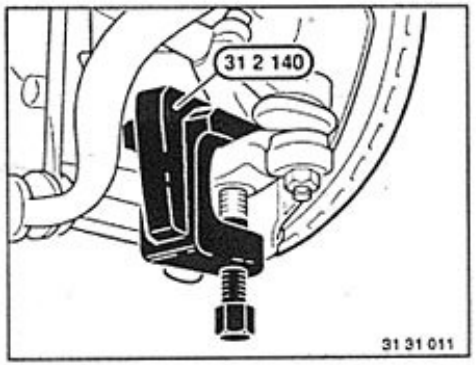
Unscrew bolt.

Installation:
Use washers on both sides.
Replace self-locking nut.
Tightening torque*.

* Refer to Specifications

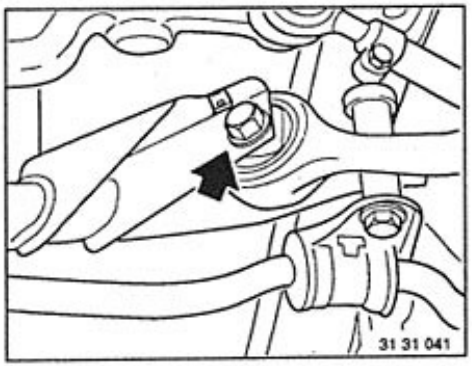
31 12 090 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT THRUST STRUT

Remove front wheel – see Group 36.



Unscrew nut.
Pry off ball joint with Special Tool 31 2 140.

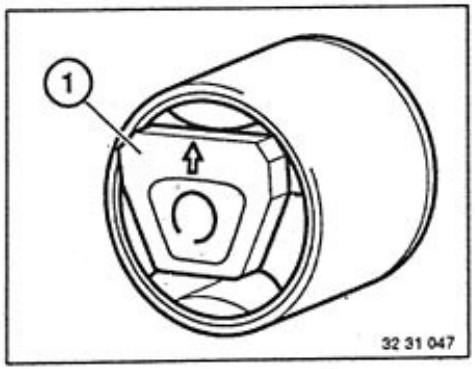
Installation:
Remove grease from ball pin and bore.
Replace self-locking nut.
Tightening torque*.



Unscrew heat shield if necessary.
Unscrew thrust strut.

Installation:
Use washer.
Replace self-locking nut.
Tightening torque* for car in normal position*.

Important!
Thrust strut mounts must always be installed or replaced in pairs.



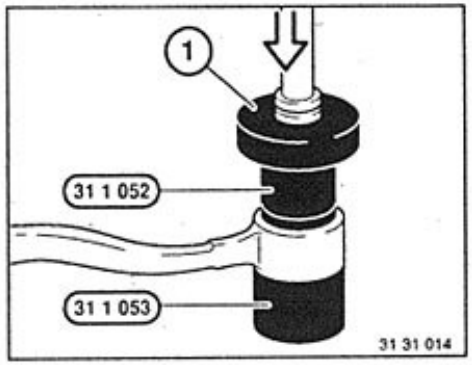
Note:
Hydraulic thrust strut mounts – recognized on plastic clip (1) – cannot be checked.
Both mounts must be replaced is fluid is running out of a hydraulic mount.

* See Specifications

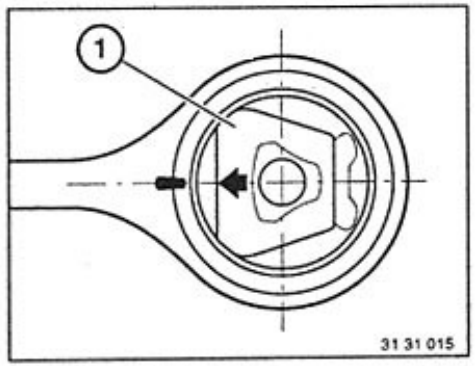
31 12 147 REPLACING THRUST STRUT RUBBER MOUNTS

Always replace both mounts!

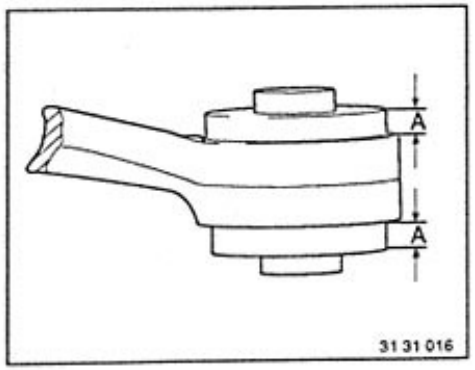
Remove thrust strut – see 31 12 090.



Press rubber mounts out (and in) on a press with Special Tools 31 1 052 / 053 and thrust pad (1).



Installation:
Remove grease from rubber mounts and thrust strut bore.
Arrow on plastic clip (1) faces mark on thrust strut.
Special tool must bear on the mount outer sleeve while pressing in.

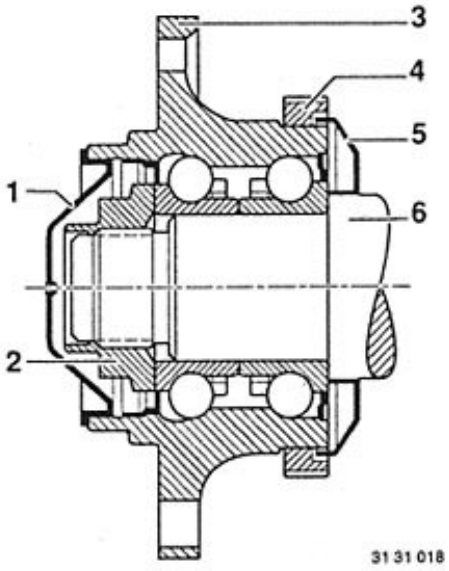


Installation:
Protrusion (A) equal on both sides.

31 21 180 REPLACING BEARINGS (WHEEL HUB) FOR FRONT WHEEL

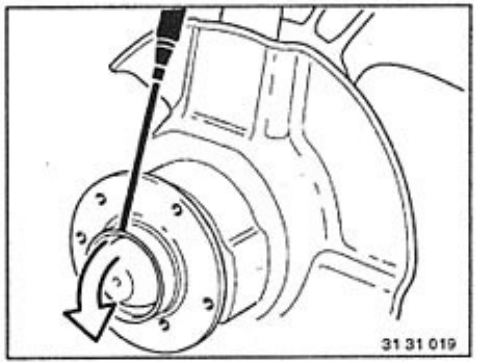
Important!
Never reuse bearing unit after removal.

Unscrew brake disc (line remains connected) – see Group 34.

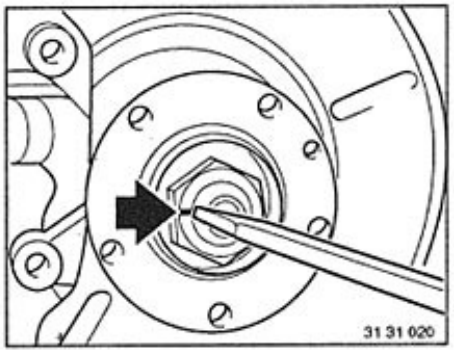


Wheel Bearings:

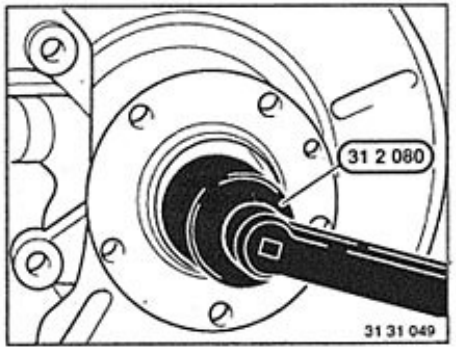
1 Grease cap
2 Collar nut
3 Bearing unit
4 Pulse gear
5 Dust cover
6 Stub axle



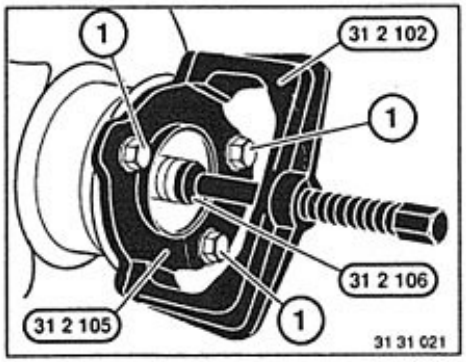
Pry off grease cap with a screwdriver. Never reuse cap!



Chisel off lock of collar nut.

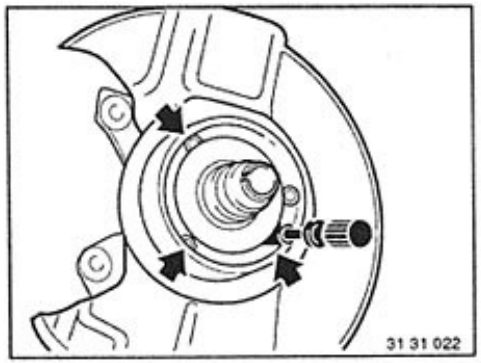


Unscrew nut with Special Tool 31 2 080. Never reuse nut!

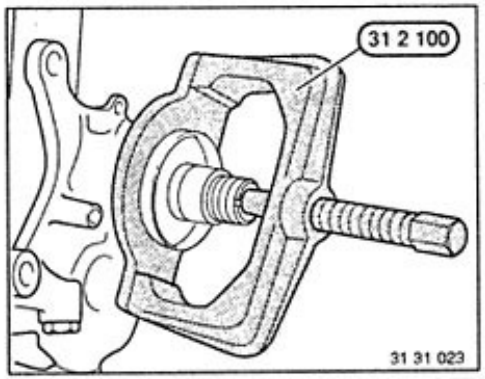


Pull off bearing unit with Special Tools 31 2 102 / 105 / 106 and wheel bolts (1).

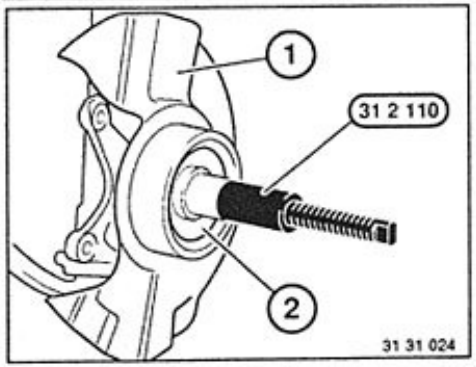
Never reuse bearing unit!



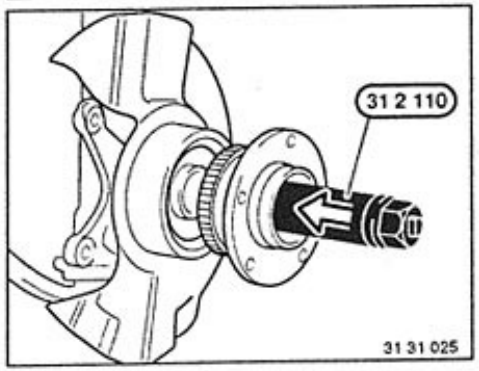
If bearing inner race remains on the stub axle, bend dust cover, insert wrench key and unscrew guard.



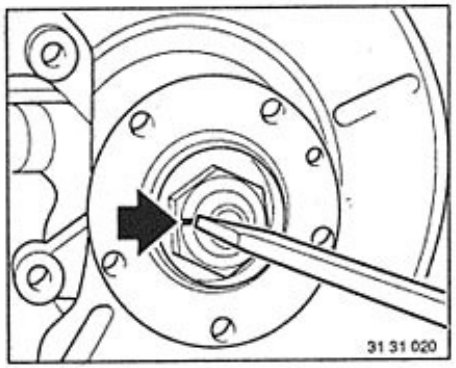
Pull off bearing inner race and dust cover using Special Tool 31 2 100.



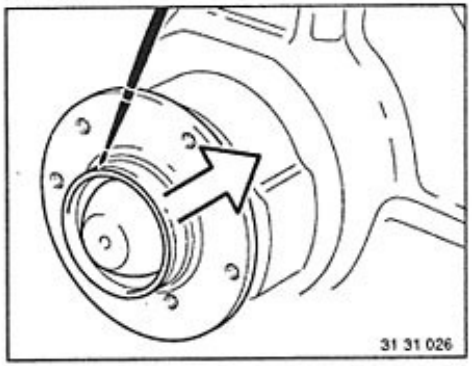
Screw on guard (1).
Install new dust cover (2).
Screw on Special Tool 31 2 110 whole length of threads.



Slide and pull on new bearing unit using Special Tool 31 2 110.



Screw on new collar nut to correct tightening torque* and lock by punching.

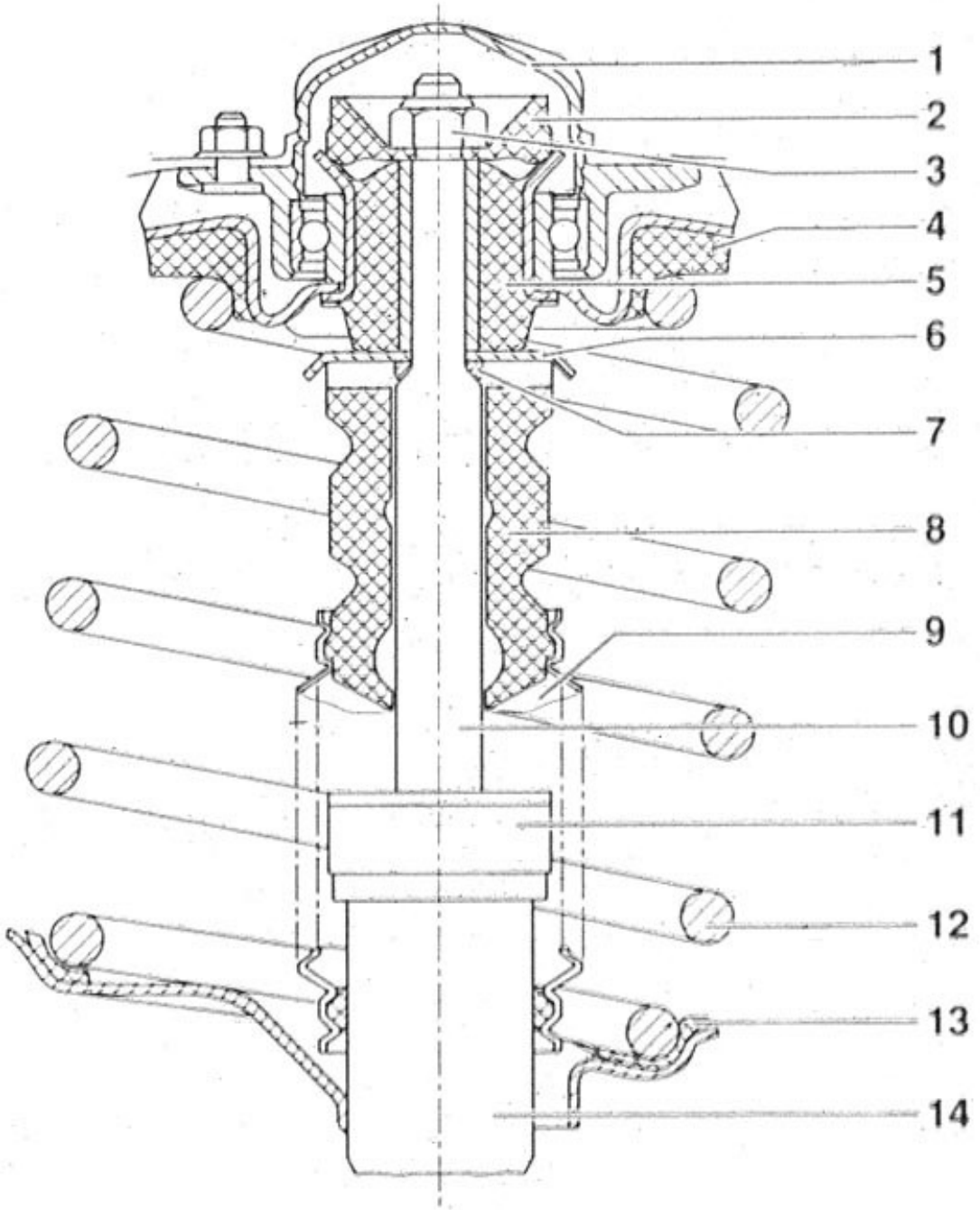


Install new cap with sealing compound**.

* Refer to Specifications
** Source of Supply: BMW Parts

SPRING STRUT ASSEMBLY DRAWING

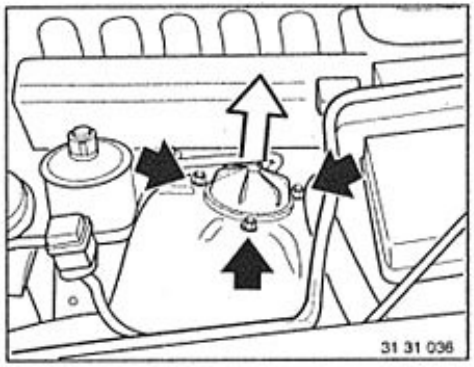
1 Cap
2 Stop washer
3 Nut
4 Upper spring ring
5 Mount
6 Support
7 Ring for hollow piston rod
8 Rubber damper
9 Dust cover
10 Shock absorber
11 Screw-on ring
12 Coil spring
13 Lower spring ring
14 Spring strut



31 31 028

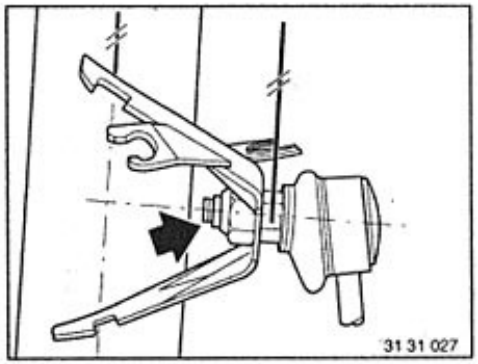
31 31 000 Removing and installing complete front left or right spring strut shock absorber

Remove brake caliper (line remains connected), refer to Gr. 34.
Remove ABS impulse sensor, refer to Gr. 34.
EDC – disconnect line, refer to Gr. 37.



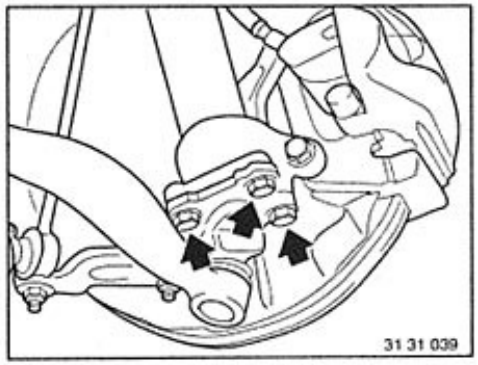
Lift off cap.
Support spring strut shock absorber.
Remove spring strut shock absorber support bearing from wheel arch.

Installation:
Replace self-locking nut.
Tightening torque*.



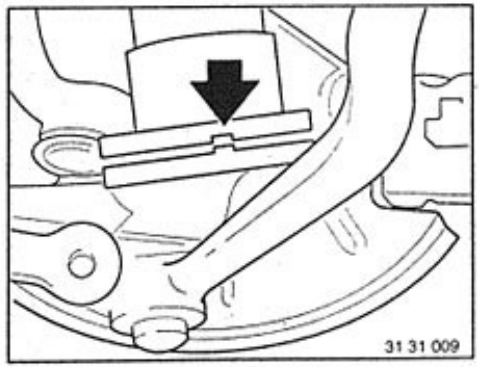
Unfasten stabilizer pressure rod – brace with open-end wrench.

Installation:
Wrench face on ball pin parallel to damper shaft.
Replace self-locking nut.
Tightening torque*.



Unfasten screws.

Installation:
Clean thread in bore and on screws.
Secure screws with screw cement**.
Tightening torque*.



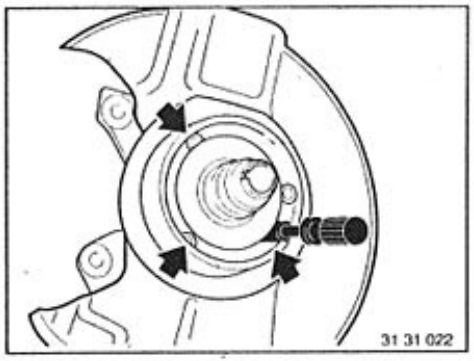
Ensure unit is correctly installed.

* Refer to Technical Data
** Source of Supply: BMW Parts Service

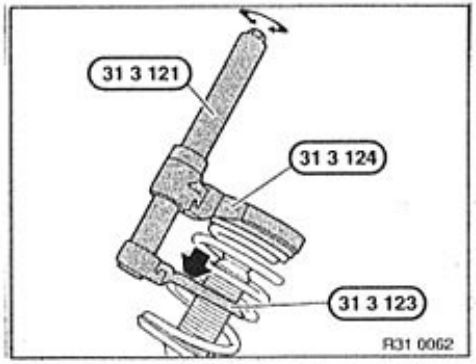
31 31 031 Replacing left or right front spring strut shock absorber

Note:
The shock absorber and spring strut form one unit and cannot be replaced separately.

To know whether a spring strut shock absorber has to be replaced, it must either be checked installed with a Shock Tester or removed and checked in a shock absorber testing machine.
Also refer to Service Information bulletin 37 01 92 (502).

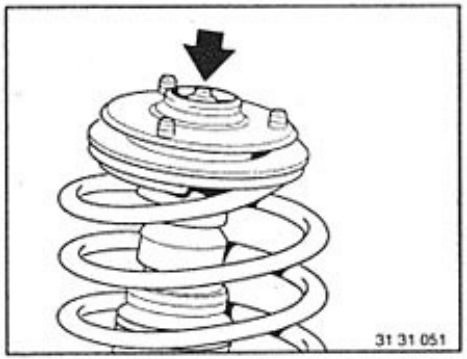


Only remove bearing (wheel hub) from front wheel 31 21 180 if dust shield is to be reused.

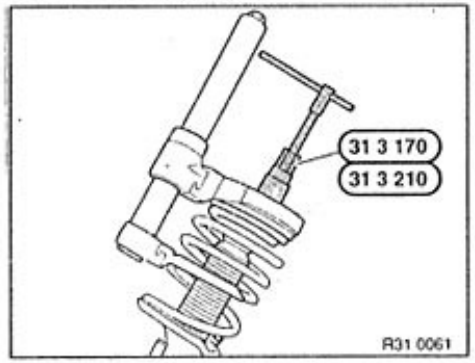


Coil spring with special tool 31 3 121/ 123/ 124.

Caution!
Lowest coil of spring must be securely mounted in tool and thrust bearing should be flush.

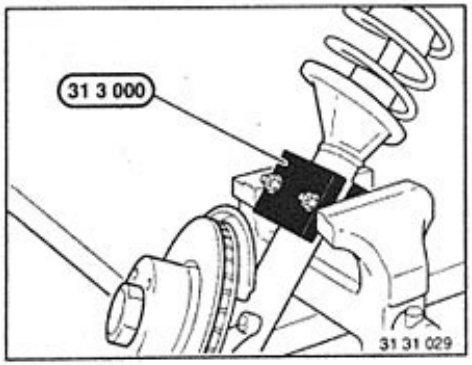


When replacing a spring strut, always fit a new spring strut with the same designation (K) (color spot).



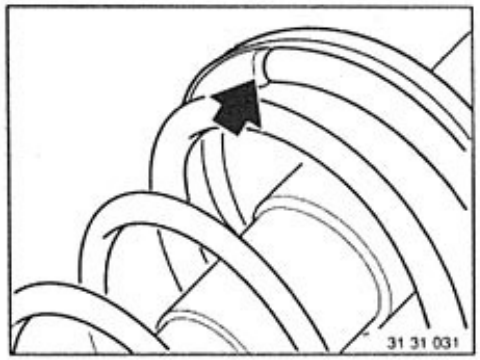
Unscrew and remove self-locking nut with special tool 31 3 170/210 and brace piston rod.

Installation:
Replace self-locking nut.
Tightening torque*.



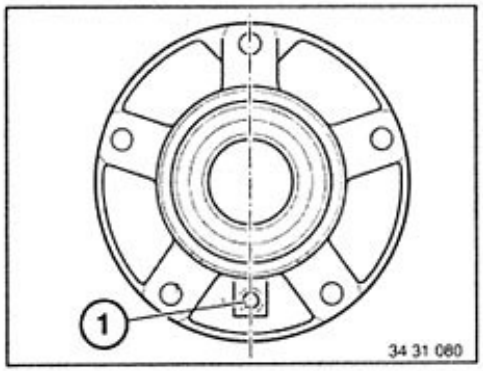
Removing and installing a spring strut 31 31 000.
Grip spring strut shock absorber in vise with special tool 31 3 000.

* Refer to Technical Data



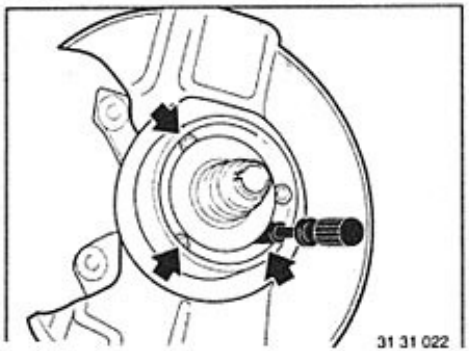
Remove coil spring and additional spring from spring strut shock absorber.
Fit the parts removed to the new spring strut shock absorber.

Installation:
Note configuration, see Page 31 - 31/1.
Check spring mount at top and bottom, also collar and auxiliary spring, replacing if necessary.
The end of the coil spring must contact the stop in the lower plate spring.



Caution!
On vehicles constructed before introduction of the standard wheel bearing, not only the spring strut shock absorber has to be replaced: also replace parts indicated in Parts Microfilm.

The standard wheel bearing can be identified by the bore (1) in the center for securing the brake disks.



Fit protective plate and new bearing (wheel hub) to front wheel 31 21 180.

After assembly, align front axle if necessary.

* Refer to Technical Data

31 33 001 Replacing left or right front spring strut shock absorber thrust bearing

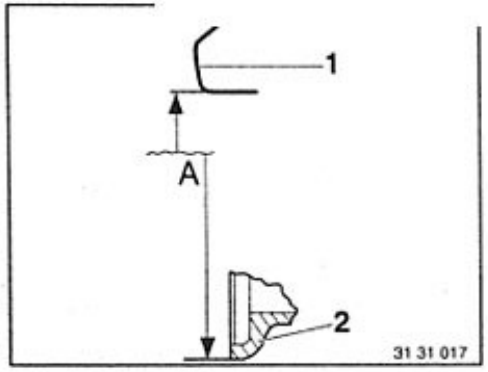
Operation identical to replacing spring strut shock absorber: 31 31 031.

31 33 100 Removing and installing or replacing coil spring for left or right front spring strut shock absorber

Operation identical to replacing spring strut shock absorber: 31 31 031.

Caution!
On one axle, only fit springs in pairs with the same BMW no. (1) (located on end of spring).

Allocation of springs by vehicle model and, if applicable, special equipment, e.g. air-conditioning, sports, ... and date of introduction - refer to Parts Microfilm.



- Move vehicle into normal position*.
- Determine actual ride level setting (A) – measurement from lower edge of wheel arch (1) to rim flange (2) at height of wheel centre. Obtain mean value in each case after raising and lowering the vehicle body on each wheel and calculating a mean value for each axle.
- Determine any difference from nominal ride level setting .
- Identifying which spring is installed – refer to 31 33 100.
- Determine correction spring from table. Figures indicate the difference in ride level setting (nominal values mm) between each of the different springs.

Example:

The vehicle is equipped with coil spring BMW No. 1 137 954 and is 6 mm too low – possibly because of a high proportion of custom items. By installing spring with BMW No. 1 137 955, the nominal ride level setting is achieved.

Note:
It is no longer possible to perform an additional correction of ride level by inserting springs of different thicknesses.

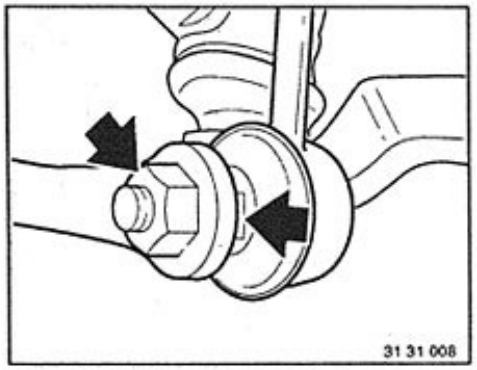
Table for Serie 840i, 850i, and EDC III ab 4/92:

A Equipment after correction
B Equipment when delivered
a Raised suspension
b Lowered suspension

*Refer to Technical Data

Table for EDC III
850i until 4/92:

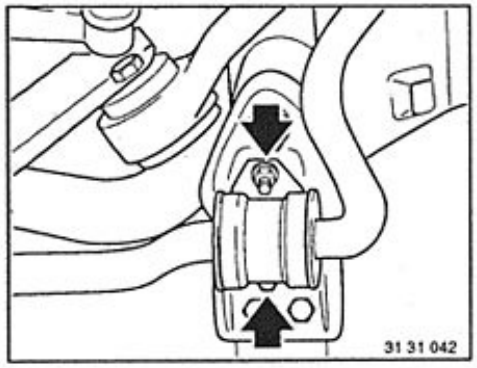
Explanation, refer to pages 31- 33/2



31 35 000 REMOVING AND INSTALLING FRONT STABILIZER

Unscrew left and right thrust struts.

Installation:
Wrench surface on ball pin must be parallel to the absorber axis.
Replace self-locking nut.
Tightening torque*.



Unscrew left and right nuts.
Take off stabilizer.

See Specifications

TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Grinding noise (louder in curves)	a) Wheel bearings faulty	a) Replace wheel bearings
Vibration	a) Imbalance of wheels b) Lateral and radial runout of rims c) Radial runout of tires	a) Balance wheels b) Replace rims, if necessary c) Match or replace tires
Steering wheel shake	a) Imbalance of wheels b) Radial and lateral runout of rims c) Shock absorbing effect insufficient d) Thrust strut mounts faulty e) Wrong thrust strut mounts installed f) Steering gear play excessive	a) Balance wheels b) Replace rims, if necessary c) Replace shock absorbers d) Replace thrust strut mounts e) Replace thrust strut mounts f) Adjust pressure point
Rattling noise	a) Shock absorber cartridge in spring strut loose b) Ball joint on control arm worn c) Ball joint on thrust strut worn d) Stabilizer rubber mounts worn e) Ball joints of thrust rod worn f) Front axle carrier mounted loose on body	a) Tighten screw-on ring (inspect threads) b) Replace control arm c) Replace thrust strut d) Replace rubber mounts e) Replace thrust rod f) Tighten (inspect threads)

TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Body swing long time after driving on rough road	Shock absorbing effect insufficient (see "Troubleshooting Shock Absorbers" on page 31-90/3)	Replace shock absorbers
Body wip when driving over successive rough road surfaces		
Body rise while accelerating		
Wheel jump even on normal road surfaces		
Car breaking out while braking		
Breaking out (skidding) in curves due to poor track holding		

TROUBLESHOOTING SHOCK ABSORBERS

The condition of shock absorbers can only be checked with a shock absorber tester in car or with a shock absorber testing machine after removal.

Condition	Cause	Correction
Shock absorbers knocking (bottoming)	a) Rubber dampers faulty b) Shock absorbing effect insufficient	a) Check or replace rubber dampers b) Replace shock absorbers
Shock absorber noise	a) Shock absorber cartridge loose b) Installed shock absorbers had been stored laying down with piston rods run in c) Shock absorbers faulty	a) Tighten screw-on ring; inspect threads b) Store shock absorbers standing upright with piston rods run out at room temperature for 24 hours c) Replace shock absorbers
Poor handling	a) Weak shock absorbers	a) Replace shock absorbers
Flat spots on tire treads	a) Shock absorbers faulty	a) Replace shock absorbers

32 Steering and wheel alignment

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620	Rear wheel alignment (with KDS)	32- 0/6
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	Rear wheel (alignment) – troubleshoot	32- 0/91
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	Airbag system	32- 34/1
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	Layout of power steering unit – parts and lines	32- 41/12
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	Layout of oil container with ASC + T	32- 41/14

GENERAL INFORMATION

Steering Gear:
The steering gear could be damaged from impact forces if a car is involved in an accident or operated under conditions similar to an accident. There must always be conformance with factory specifications in the interest of safety – refer to Service Information 32 01 88 (828).

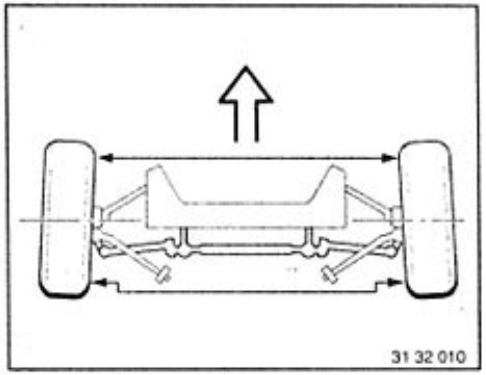
Tie Rod Joint:
Refer to Service Information 32 03 87 (733) for an evaluation of wear on ball joints.

Servotronic:
Troubleshoot with BMW DIAGNOSING SYSTEM - refer to Car Electric/Electronic Test Plan.

Airbag:
Troubleshoot with BMW DIAGNOSING SYSTEM - refer to Car Electric/Electronic Test Plan.

Electric Steering Wheel Adjustment:
Troubleshoot on electronic components - refer to Car Electric/Electronic Test Plan.

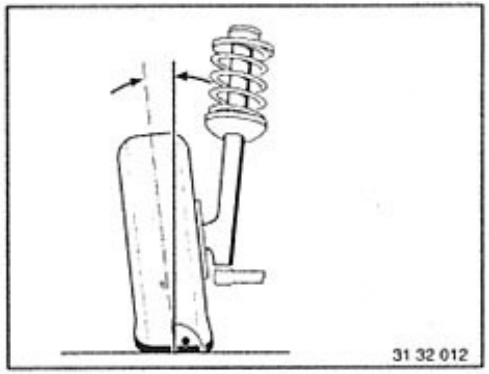
Car with Interlock System:
The function must be checked if a component of the interlock system had been removed and installed or the installed position of the interlock cable was changed - refer to 33 32 170.



GENERAL INFORMATION AND DEFINITIONS

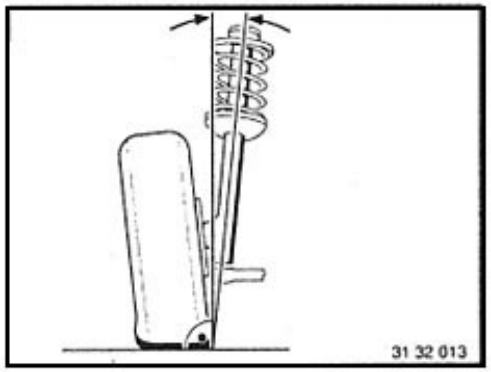
Toe

Is the reduction in distance of front of front wheels to rear of front wheels. Toe prevents the wheels from running apart while driving and consequently wheel shimmy and grinding, excessive tire wear, excessive loads on steering linkage and joints as well as hard steering of car. Toe is measured in "straight ahead position".



Camber

Is the inclination of a wheel from a perpendicular line.

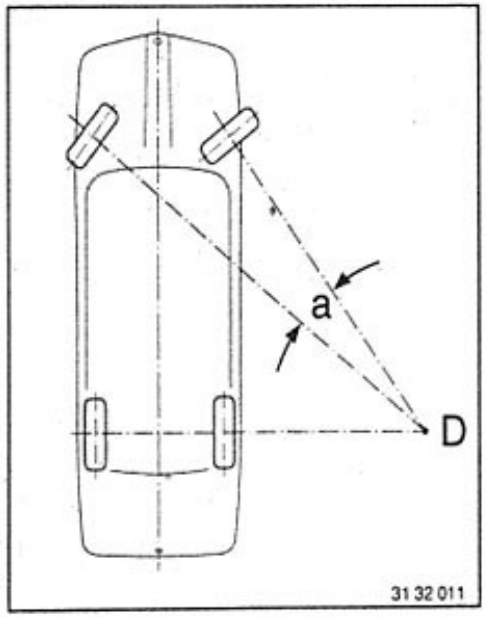


King Pin Inclination

Is the angle, by which the king pin* is inclined inward from a perpendicular line to the lateral axis of the car.
The king pin inclination produces returning forces, which return the road wheels and steering wheel to straight ahead after driving through a curve or around a corner.

Camber and king pin inclination determine the location of the wheel contact point with the road surface.
King pin inclination reduces the leverage, on which frictional forces are engaged, which makes it easier to turn the wheels to left or right lock. In addition, the jolts from rough road surfaces do not have as strong influence on the steering.

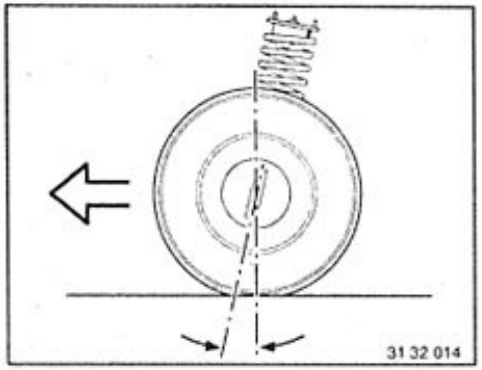
The "king pin" is equal to a line through the center point of the spring strut mount and control arm ball joint.



Toe Difference Angle

Is the angular position of the wheel on the inside of a curve to the wheel on the outside of a curve when driving in a curve. The steering is designed that the angular position of the wheels changes as steering lock progresses. The toe difference angle provides information on the pertinent operation of the steering trapezoid for left or right steering lock from the center position. A correctly adjusted toe difference angle produces equal values for left and right lock in due consideration for factory manufacturing tolerances.

a = Toe difference angle
D = Turning circle center point

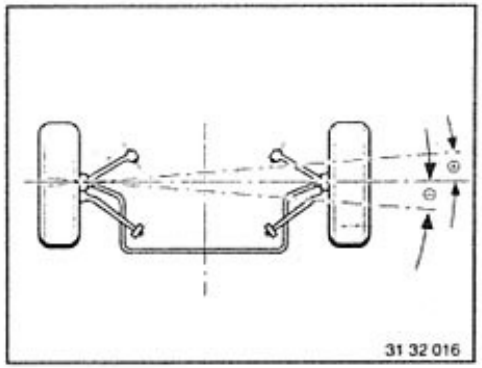


Caster

is the inclination of the king pin* in forward direction as seen from the side.

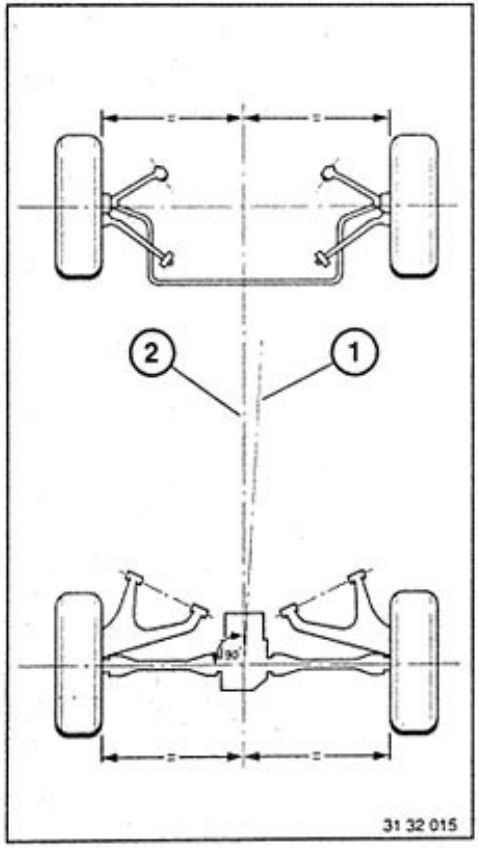
The wheels are pulled and not pushed because of caster. In a similar manner to king pin inclination, when driving in curves or around corners returning forces are produced to help return the wheels to straight ahead position.

The "king pin" is equal to a line through the center point of the spring strut mount and control arm ball joint.



Wheel Offset

is the angle, by which one front wheel is displaced more toward front or rear than the other front wheel.



Geometrical Axis 1

is the bisecting line of an angle from the total rear wheel toe.
Front wheel measurements are taken in reference to this axis.

Symmetrical Axis 2

is a center line running through the front and rear axles.

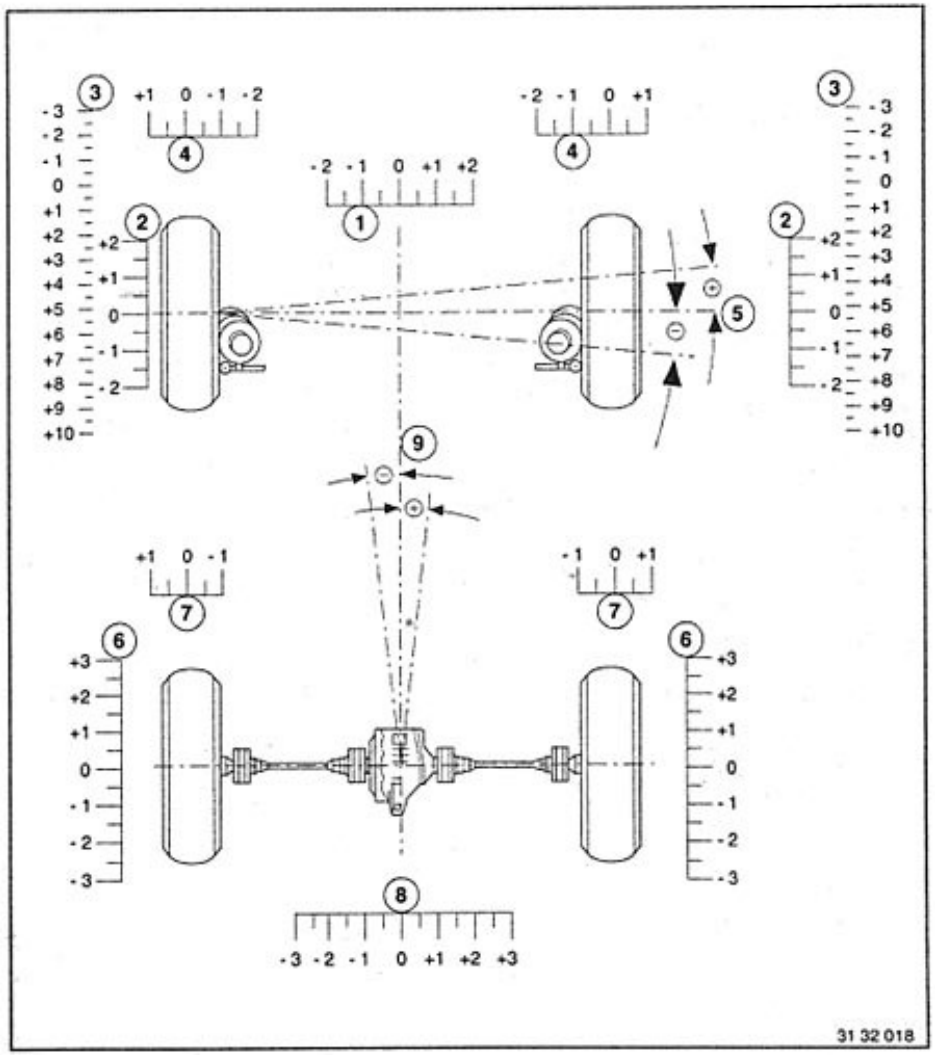
32 00 150 CHECKING WHEEL ALIGNMENT WITH ELECTRONIC TESTER (with KDS)

Requirements to be fulfilled prior to checking wheel alignment:

1. Good, uniform tire treads.
2. Specified tire pressure**.
3. Wheel rims in perfect condition*.
4. Specified wheel bearing play*.
5. Car loaded down to normal position*.
6. Specified ride level height*.

Always check wheel alignment only with a recommended electronic tester (see Workshop Equipment) and also use turntables on the rear wheels.

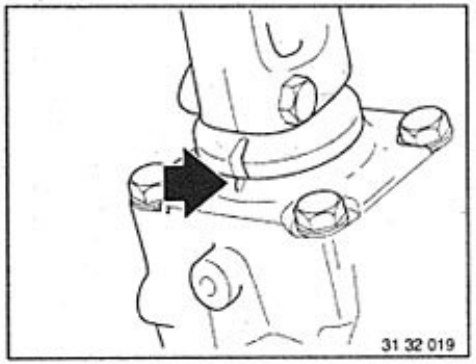
1 = Toe
2 = Camber
3 = Caster (with 10° or 20° wheel lock)
4 = Toe difference angle (with 20° wheel lock)
5 = Wheel offset
6 = Camber
7 = Rear wheel position
8 = Toe
9 = Geometrical axis



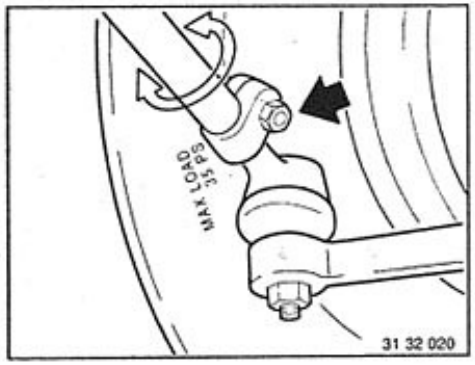
* Refer to Specifications of Gr. 31/32/33/36
** Refer to Service Information of Gr. 36

32 00 610 Adjusting front axle (with KDS)

Caution!
On vehicle with
Electronic Damper Control or
Active Rear Axle Kinematics or
Dynamic Stability Control, a "steering angle check" with the BMW Service Tester must be performed after each wheel adjustment check.



Adjust differential toe and camber angles.
Move steering gear into straight-ahead position (marking on housing and steering shaft).



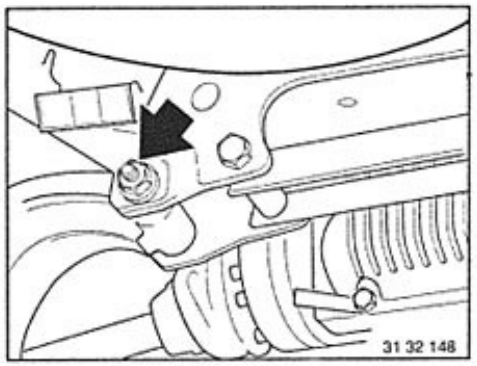
Loosen both clamping screws on track rod.
Check toe of left and right wheel against nominal value* by rotating the threaded sleeve

Installation:
Ensure that ball joints are not twisted.
Tightening torque*.

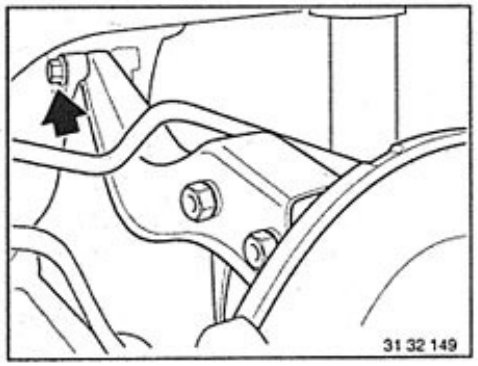
* See Technical Data

32 00 620 Adjusting rear axle (with KDS)

Caution!
On vehicles with Active Rear Axle Kinematics (AHK), an actuator member check must be performed wiht the BMW Service Tester before each wheel alignment check.

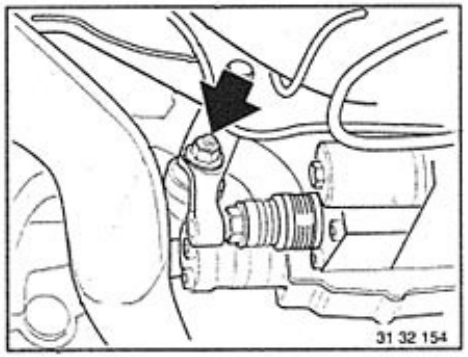


Adjusting toe-in.
Replace nut on support arm mount and tighten to tightening torque*.
Loosen nut one 1/2 turn and adjust toe-in to nominal value* by rotating the eccentric screw.
Tighten nut to tightening torque*.
If the nut has to be tightened down more than 5 times, it must be replaced – the self-locking characteristics become too impaired.



Adjusting camber always also involves a change in toe-in which is why camber must always be adjusted first.

Adjusting camber:
Replace nuts on trailing arm mount and tighten to tightening torque*.
Now loosen nut 1/2 a urn and adjust camber to nominal value* by rotating eccentric screw.
Tighten nut to tightening torque*.
If a nut is tightened down more than 5 times during the adjustment check, it must be replaced – the self-locking characteristics become too impaired.



Adjusting toe-in on vehicles with Active Rear Axle Kinematics:

Replace nut on support arm mount on idler arm and tighten down to tightening torque*.
Loosen nut one 1/2 turn and adjust toe-in to nominal value* by rotating the eccentric screw.
Tighten down nut to tightening torque*.
If the nut has to be tightened down more than 5 times, it must be replaced – the self-locking characteristics become too impaired.

* Refer to Technical Data

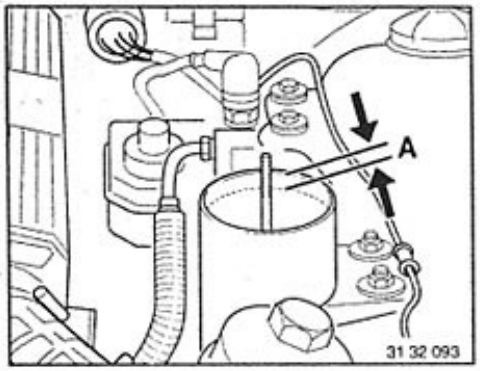
* Refer to Technical Data

TROUBLESHOOTING FRONT WHEEL ALIGNMENT

Condition	Cause	Correction
1 Toe deviation	a) Car not in normal position b) Tie rod(s) bent c) Track arm on spring strut bent d) Tie rod ball joints worn e) Rubber mount in control arm faulty	a) Ride level height, see Specifications of Group 31 b) Replace tie rod(s) c) Replace track arm d) Replace tie rod(s) or ball joints e) Replace rubber mount
2 Camber deviation Camber is given by design and cannot be adjusted.	a) Rubber mount in control arm faulty b) Control arm deformed c) Spring strut deformed d) Guide joint worn e) Spring force insufficient f) Front axle carrier deformed g) Spring strut mount holder deformed h) Distortion in floor assembly (engine carrier)	a) Replace rubber mount b) Replace control arm c) Replace spring strut d) Replace control arm e) Replace coil springs Ride level height, see Specifications of Group 31 f) Replace front axle carrier g) Repair front end h) Repair body
3 Caster deviation Caster is given by design and cannot be adjusted.	a) Rubber mount for thrust strut faulty b) Thrust strut deformed c) Control arm deformed d) Spring strut deformed e) Wheel house deformed (spring strut mount) f) Distortion in floor assembly (engine carrier)	a) Replace rubber mount b) Replace thrust strut c) Replace control arm d) Replace spring strut e) Repair front end f) Repair body
4 Toe difference angle deviation	Assuming camber and caster are correct: a) Tie rods not adjusted uniformly b) Track arm on spring strut bent	a) Adjust toe on left and right sides to same value b) Replace track arm
5 Wheel offset deviation	Assuming front wheels have equal single toe to geometrical axis: a) Front axle carrier deformed b) Engine carrier deformed c) Control arm deformed d) Thrust strut deformed	a) Replace front axle carrier b) Repair body c) Replace control arm d) Replace thrust strut

TROUBLESHOOTING REAR WHEEL ALIGNMENT

Condition	Cause	Correction
6 Camber deviation	a) Car not in normal position Spring force insufficient b) Rubber mounts on rear axle carrier faulty c) Rear axle carrier deformed d) Control arm deformed e) Guide arm deformed f) Distortion in floor assembly	a) Ride level height, see Specifications of Group 33 b) Replace rubber mounts c) Check or replace rear axle carrier d) Check or replace control arm e) Check or replace guide arm f) Repair body
7 Rear wheel position deviation	a) Rear axle carrier displaced laterally b) Distortion in floor assembly	a) Check / replace rubber mounts on rear axle carrier b) Repair body
8 Toe deviation	a) Car not in normal position or spring force insufficient b) Rubber mounts in rear axle carrier faulty c) Support arm deformed d) Fluid blocks in trailing arm faulty e) Rear axle carrier deformed f) Trailing arm deformed g) "Active rear axle kinematic" system not OK	a) Ride level height, see Specifications of Group 33 b) Replace rubber mounts c) Replace support arm d) Replace fluid blocks e) Check or replace rear axle carrier f) Check or replace trailing arm g) Repair "active rear axle kinematic" system
9 Deviation from geometrical axis	Assuming total rear wheel toe is correct: a) Distortion in floor assembly	a) Repair body



32 13 006 FILLING AND BLEEDING POWER STEERING

Filling and Checking Procedures:

1. **Filling with Engine Stopped:**

   Fill oil tank up to (A) = approx. 25 mm below edge.

2. **Filling and Bleeding with Engine Running:**

2.1 Filling:

Pour in the remaining amount* of oil uniformly while starting the engine.

2.2 Bleeding:

Turn steering wheel two times each against left and right locks, operate brake pedal five times, wait about 30 seconds and operate brake pedal five more times.

3. **Checking Oil Level with Engine Stopped:**

   Operate brake pedal until reservoir is empty (reservoir is empty when oil level no longer rises - visual check - or when suddenly more force is required to press down the pedal - force check).

   Lift rear axle until wheels have cleared ground. Reservoirs of ride level height control are empty after 2 minutes.

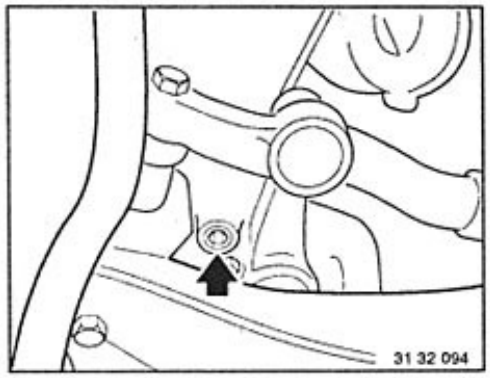
   If applicable, discharge the reservoir of "active rear axle kinematic" with help of the pressure discharging plug - refer to 33 34 . . ..

   Oil level must be about 10 mm below upper edge of tank.

   Correct deviation in oil level with the engine stopped by adding hydraulic fluid*.

   Cars with ASC+T - refer to 34 00 040.

* **Refer to Specifications**



32 13 ... ADJUSTING PRESSURE POINT

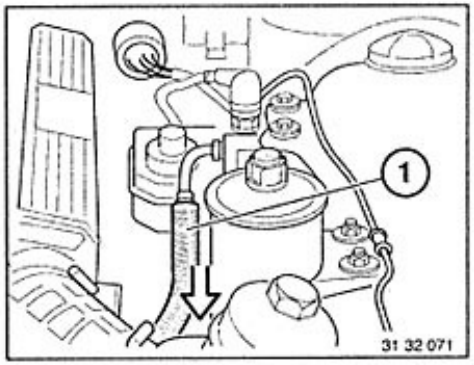
Important!
The pressure point of steering gears with automatic pressure point adjustment – recognized on punch-locked socket head bolt – should only be adjusted after a repair – see 32 13 631.

32 13 060 Removing and installing power steering gear

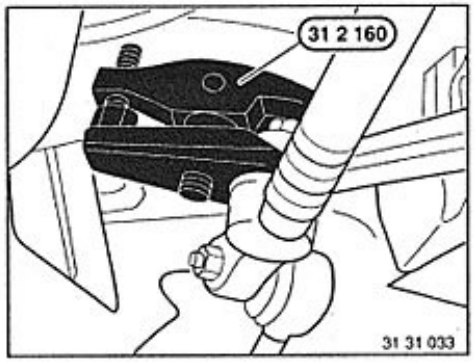
Airbag vehicle – remove steering wheel 32 33 000.

Bleed pressure accumulator = actuate brake pedal approx. 10 times.
Draw off hydraulic fluid from container – do not reuse.

Installation:
Topping up and bleeding hydraulic system 32 16 006.
Vehicle with:
Electronic Damper Control or
Active Rear Axle Kinematics or
Dynamic Stability Control
– perform steering angle check with BMW Service Tester.

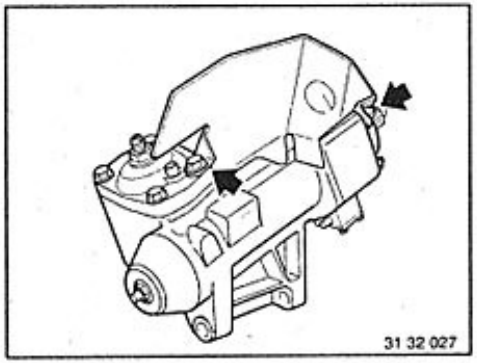


Installation:
Slide heat shield (1) downwards.

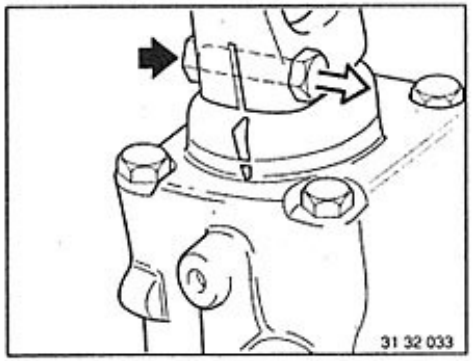


Unfasten nut.
Push track rod off pitman arm using special tool 31 2 160.

Installation:
Fit new self-locking nut. Taper and cone free of grease.
Tightening torque*.

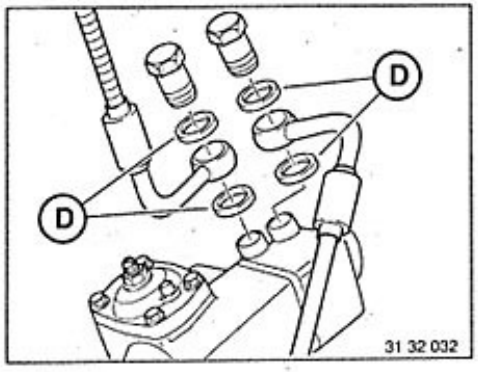


Remove heat shield from steering gear



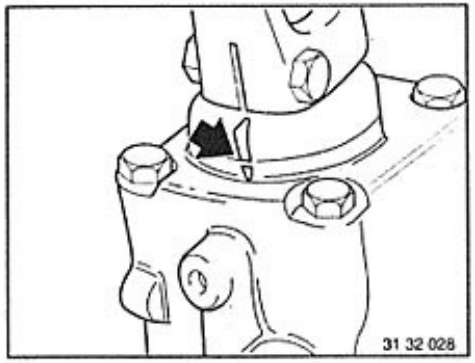
Unfasten screw.
Slide universal joint on steering gear.

Screw must locate in retaining groove in steering unit.
Tightening torque*.



Remove hydraulic leads.
Seal bores with dust caps.

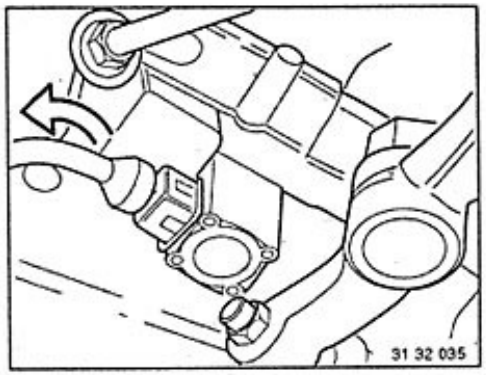
Installation:
Fit new sealing rings (D).
Tightening torque*.



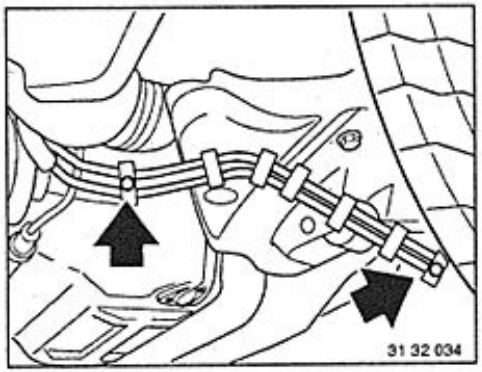
Installation:
Ensure that steering wheel and steering gear are in straight-ahead position.
Turn steering gear to left or right lock, then turn back approx. 1.7 turns until marks are aligned.

* Refer to Technical Data

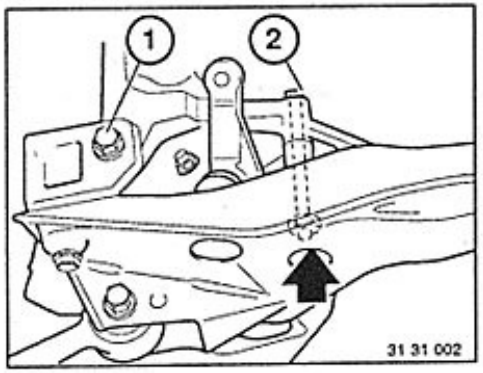
* Refer to Technical Data



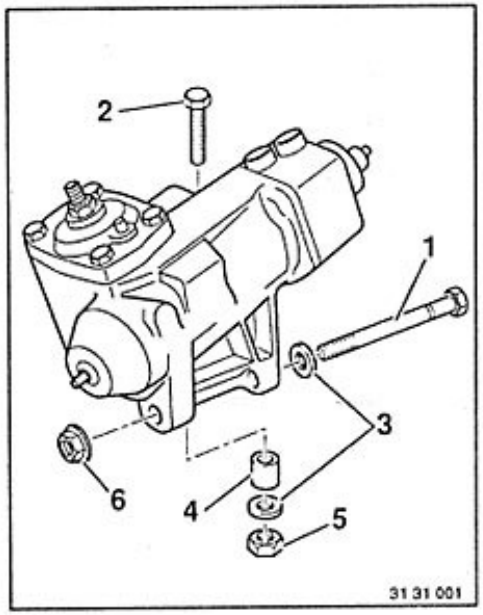
* If applicable, pull plug off of the Servotronic converter.



Loosen mounting clamps of oil cooler pipes.

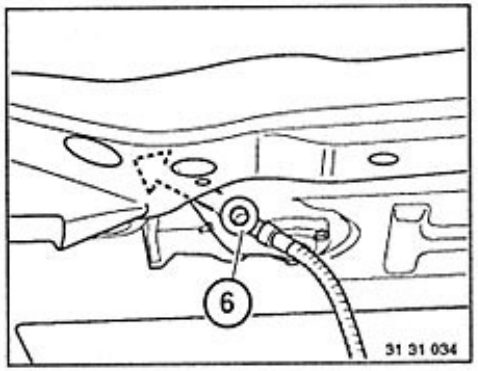


Unscrew bolts (1 and 2).
Pull back the disconnected tie rod — turn the left front wheel against lock if necessary.
Take out the steering gear downwards — if necessary, move the steering drop arm into a more favorable position by turning the steering stub.



Installation:
1 Bolt
2 Bolt (only use 10.9 strength class)
3 Washer
4 Sleeve
5 Nut (replace)
6 Nut with washer (replace)

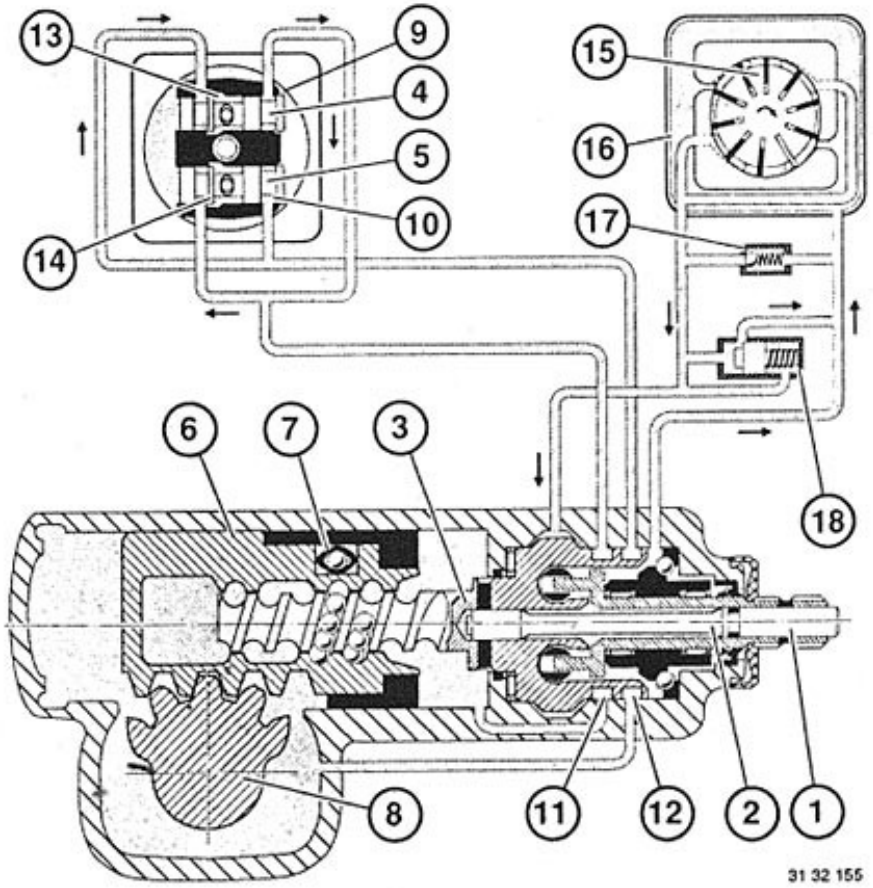
Tightening torque*.



Installation:
Install nut (6) using a flexible magnetic lifter.

* Refer to Specifications

DESIGN AND DESCRIPTION OF BALL AND NUT POWER STEERING



31 32 155

The housing contains a complete mechanical steering gear, the control valve and operating cylinder. Steering spindle (1) is connected elastically with worm (3) via torsion bar (2) and with valve pistons (4 and 5) without play. The valve pistons are installed transversely in the worm head. The connection between piston (6) and worm (3) is accomplished with an infinite line of balls. When turning the worm the balls are taken up at one end by circulating tube (7) and put out again at the other end of the balls. Piston (6) and sector shaft (8) are meshed. The special shape of teeth on the sector shaft permits zero-play adjustment with an adjusting screw.

In neutral position of valves (4 and 5) the oil flow delivered by the pump passes through the steering and can flow through the opened feed and return control edges to the cylinder chamber and return flow. Hydraulic support cuts in when force is transmitted from the steering wheel or from the steering drop arm via the sector shaft and pistons to the worm. Torsion bar (2) then serves as a link. It deforms itself in the elastic range and returns the valve pistons to neutral position after releasing the steering wheel. Moving valves (4 and 5) will let the oil flow into only one of the operating cylinder chambers and in this manner support the rotating motion of the steering spindle and/or counteract the jolt from rough roads.

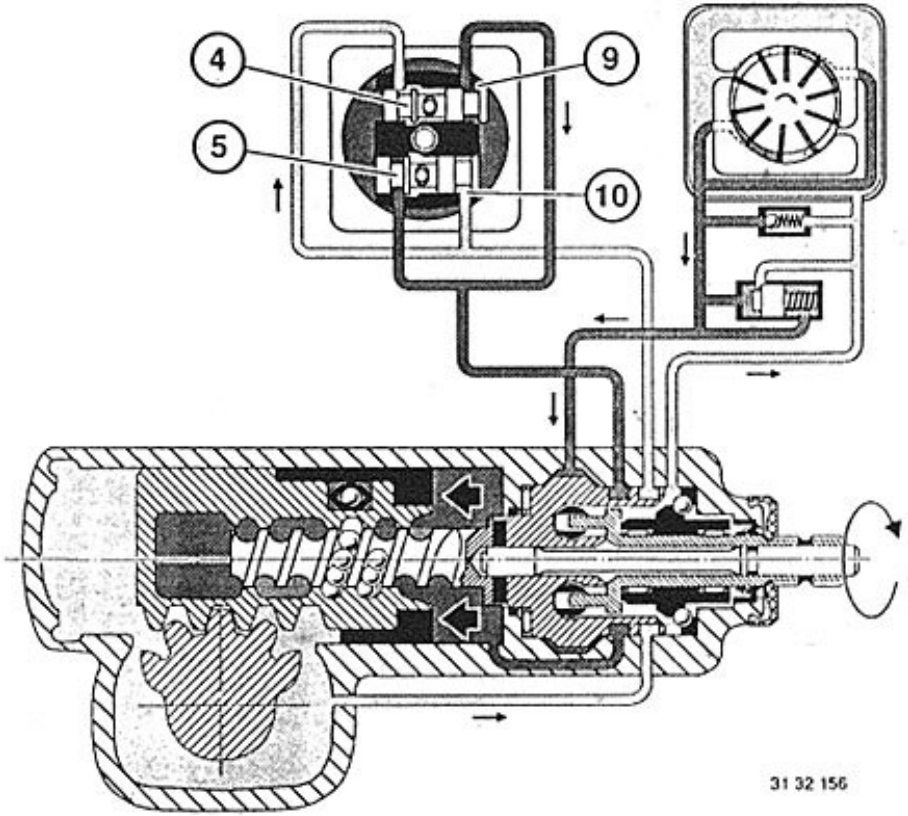
Steering Wheel in Neutral Position:

Oil flows from the impeller pump into the worm head, through feed grooves (9 and 10) to radial grooves (11 and 12). From here via connecting bores to the right and left cylinder chambers and via opened return flow grooves (13 and 14) back to the oil tank. The valve is also illustrated in cross section.

15 = Pump
16 = Oil tank
17 = Pressure relief valve
18 = Control valve

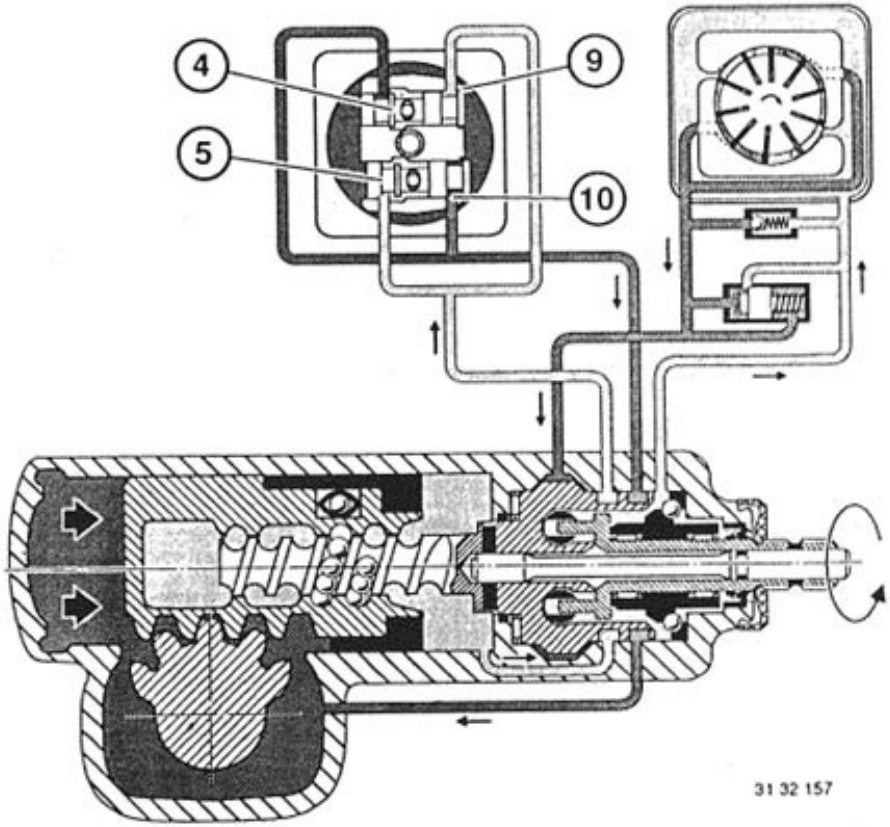
Steering Wheel Turned Clockwise:

Valve piston (4) is displaced to the right and feed groove (9) opened. Valve piston (5) is displaced to the left and feed groove (10) closed. This lets the oil flow into the right cylinder chamber. Oil in the left cylinder chamber is forced out and flows back into the oil tank.



Steering Wheel Turned Counterclockwise:

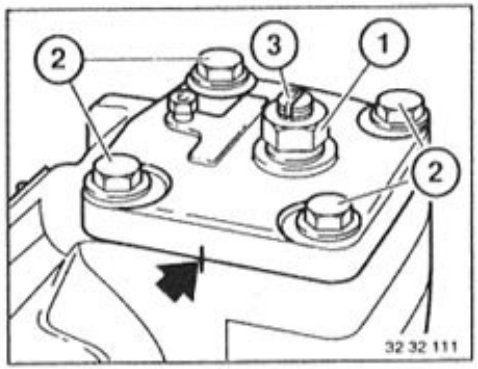
Valve piston (5) is displaced to the right and feed groove (10) opened. Valve piston (4) is displaced to the left and feed groove (9) closed. This lets the oil flow into the left cylinder chamber. Oil in the right cylinder chamber is forced out and flows back into the oil tank.



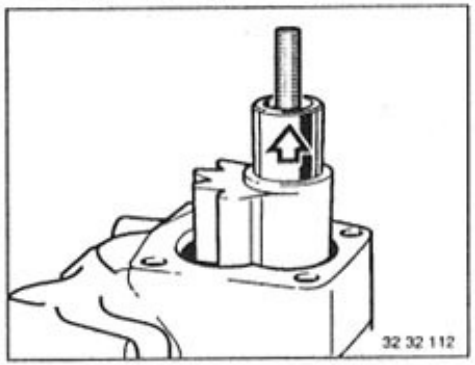
32 13 631 REPLACING RADIAL OIL SEAL FOR SECTOR SHAFT AND STEERING WORM AND SEALING INTERMEDIATE COVER – Power Steering Gear Removed –

Note:
Cleanliness is very important when working on steering gears.

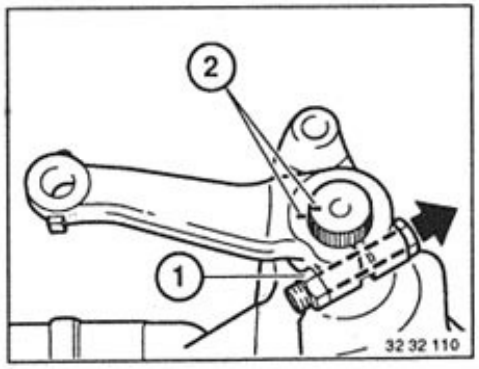
Drain hydraulic fluid in steering gear.



Mark position of cover to case.
Unscrew nut (1).
Unscrew bolts (2) and lift off cover by turning adjusting screw (3).

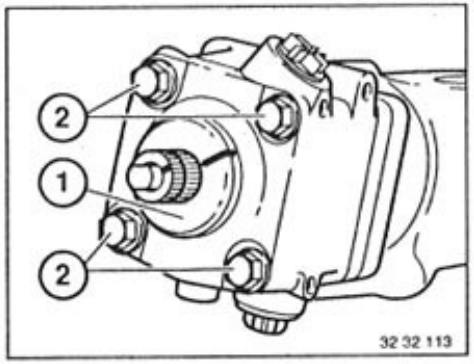


Pull sector shaft out of case.

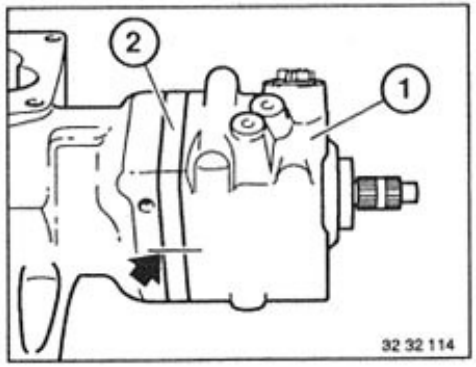


Mark position of sliding steering drop arm to sector shaft before unscrewing bolt (1) – if applicable, adjust steering drop arm – see 32 21 510.

Installation:
Slide on steering drop arm up to the mark – mark (2) must also be aligned.
Replace self-locking nut.
Tightening torque*.

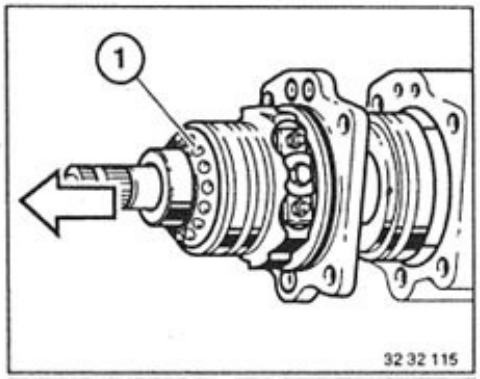


Pull off cap (1).
Unscrew bolts (2).

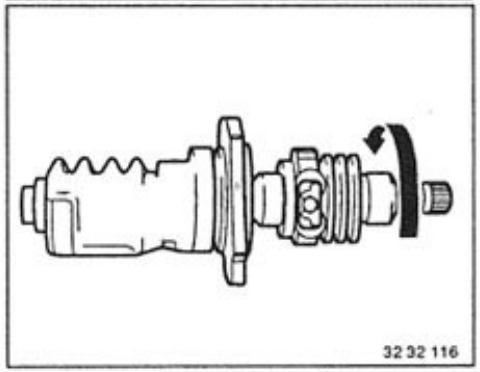


Mark position of valve housing (1) and intermediate cover (2) to case, and remove.

* See Specifications

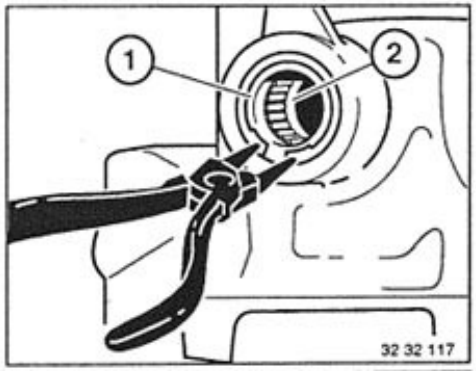


Take off ball bearing (1).
Pull out worm and piston.

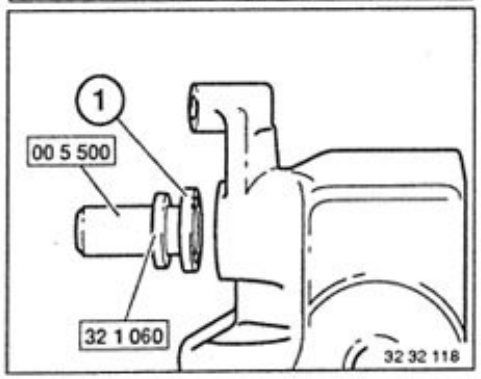


Unscrew worm clockwise.

Important!
23 loose balls.

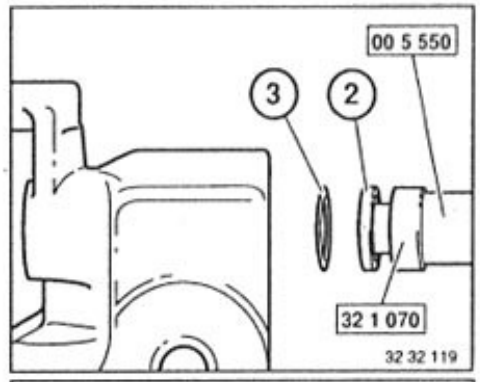


Lift out circlip.
Press out outer radial oil seal (1) and inner radial oil seal (2).

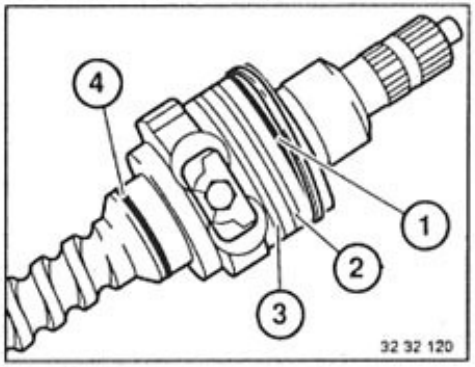


Lubricate sealing lips of radial oil seals with grease.
Drive in outer radial oil seal (1) that sealing lip faces inside of case with Special Tools 00 5 500 and 32 1 060.

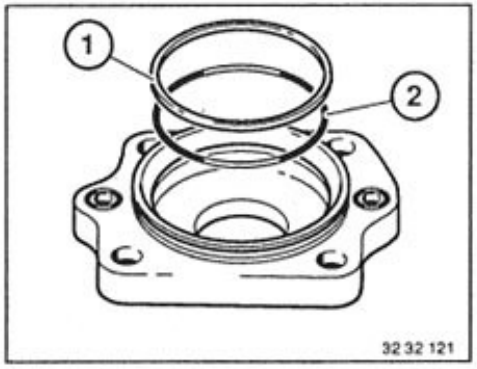
Important!
Install circlip.



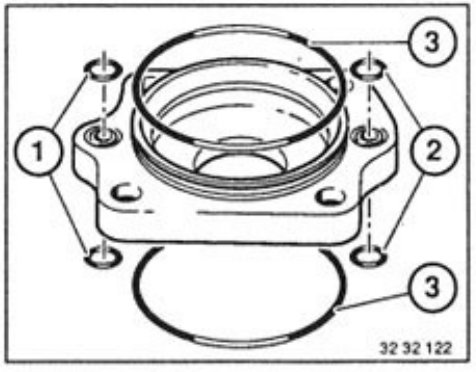
Insert support ring (3).
Drive in radial oil seal (2) that sealing lip faces inside of case with Special Tools 00 5 550 and 32 1 070.



Replace seals (1 ... 3) and O-rings located underneath.
Replace O-ring (4).
Coat seals with hydraulic fluid*.

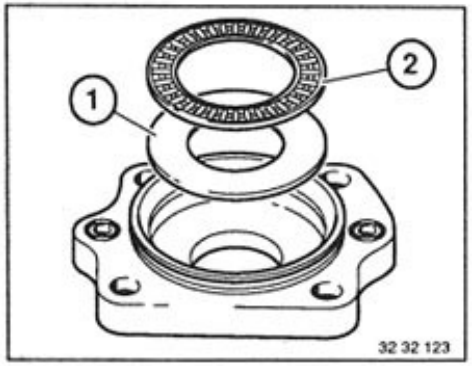


Replace seal (1) and O-ring (2) located underneath.
Coat seal with hydraulic fluid*.

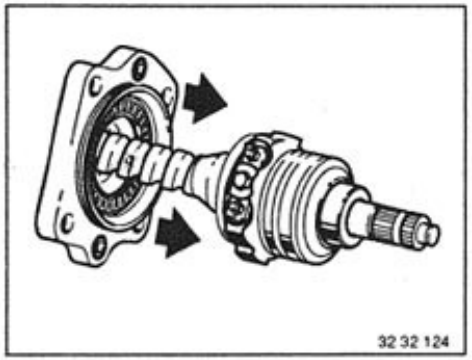


Replace O-rings (1 ... 3) on both sides.
Install O-rings (1 and 2) with grease.

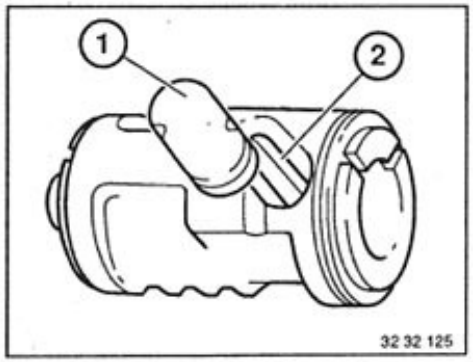
* See Operating Fluids



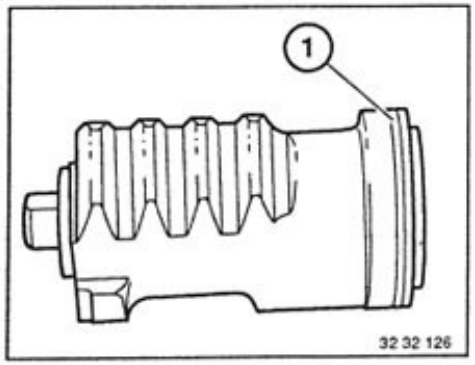
Place bearing ring (1) and axial bearing (2) in intermediate cover (with a small amount of grease).



Mount intermediate cover on the worm head (do not damage seal of worm).

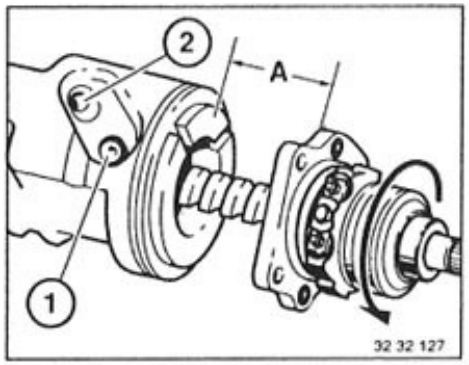


Pull off cap (1) and remove circulating pipe (2).

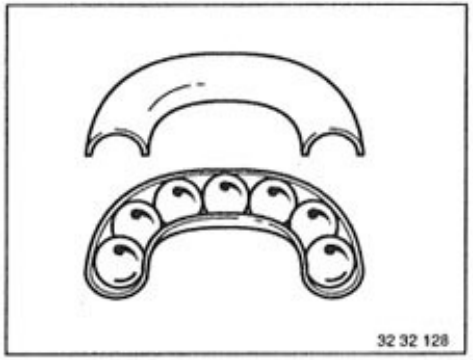


Replace seal (1) and O-ring located underneath.
Coat seal with hydraulic fluid*.

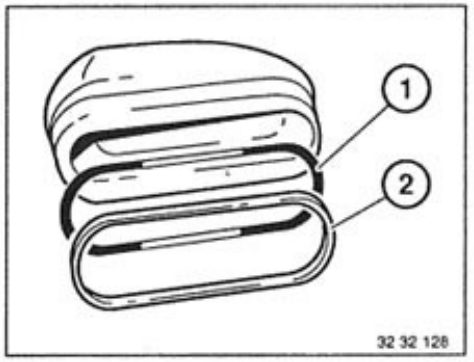
* See Operating Fluids



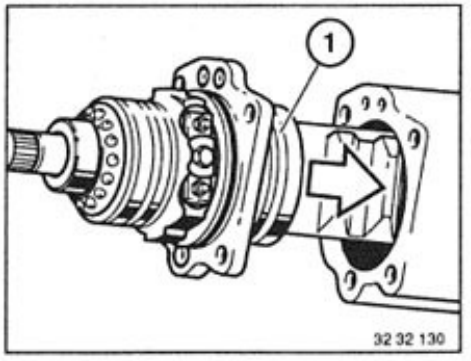
Slide worm head into piston.
A = about 6 cm (2.362").
Slide 16 balls into threads of worm through hole (1) and turn the worm until the balls are forwarded to hole (2).



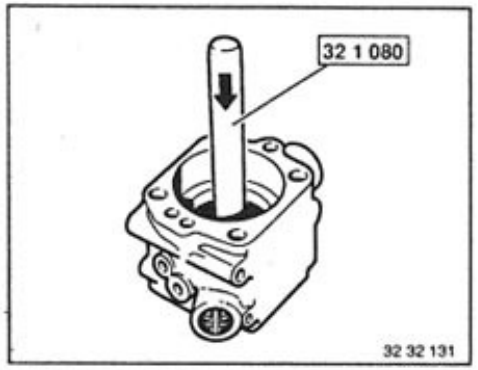
Install 7 balls in half of circulating pipe (grease both outer balls) and install circulating pipe in piston.



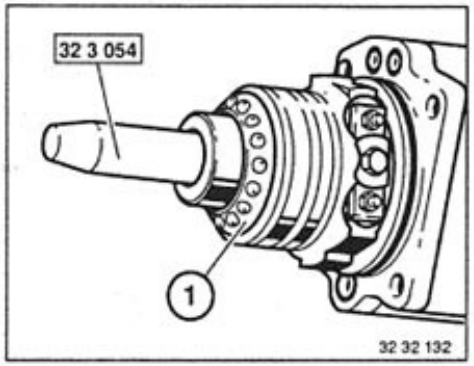
Place O-ring (1) and seal (2) in cap.
Press cap into piston.



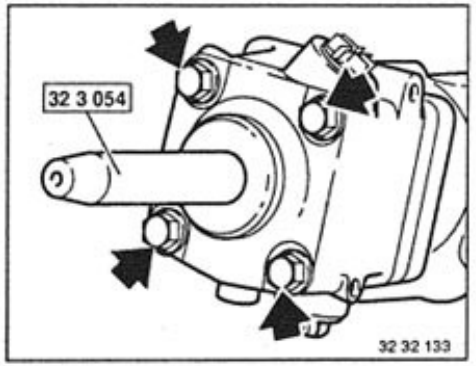
Slide piston into steering case, being careful not to damge seal (1).



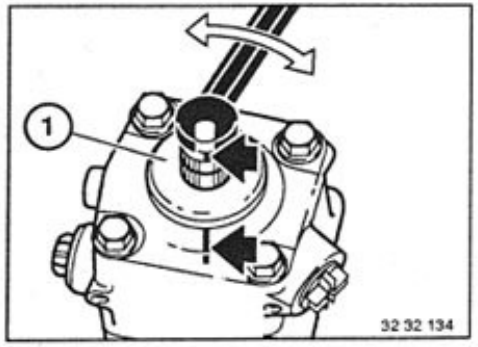
Replace radial oil seal (sealing lip greased) in valve housing with Special Tool 32 1 080.
Sealing lip faces inside of case.



Install ball bearing (1) and Special Tool 32 3 054.

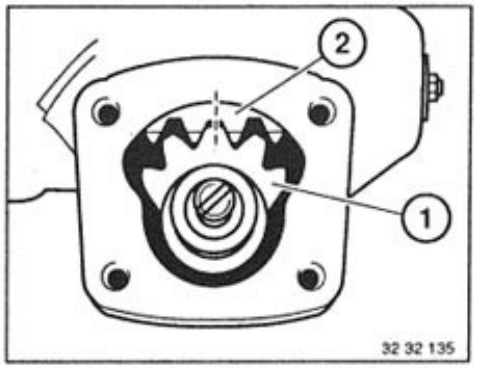


Slide valve housing over seals of worm head carefully and tighten bolts.
Tightening torque*.
S = washer
Remove Special Tool 32 3 054.

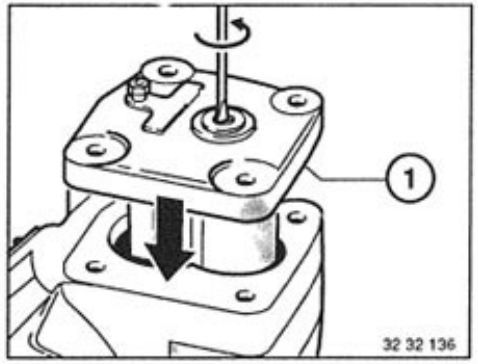


Turn steering to a final position.
Turn back about 2 turns until marks on spindle and case are aligned = straight ahead position.
Press grease-filled cap (1) on spindle.
Marks on spindle, cap and case must be aligned.

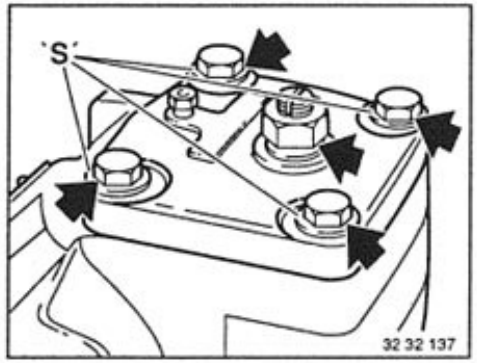
* See Specifications



Guide in sector shaft (1) carefully that radial oil seal is not damaged.
Center tooth of sector shaft (1) must be in middle of teeth of piston (2).

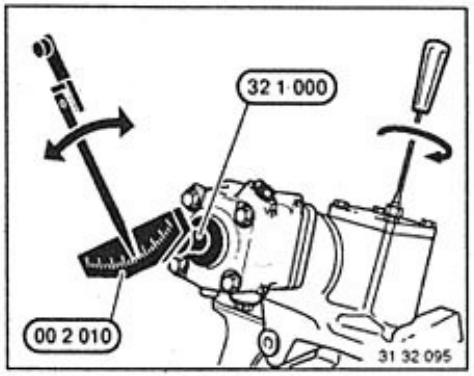


Replace O-ring (1) in cover.
Position cover by turning the adjusting screw on the case counterclockwise.



Tighten cover bolts.
Tightening torque*.
S = washer
Tighten lock nut – sealing surface facing cover – finger tight.

* See Specifications



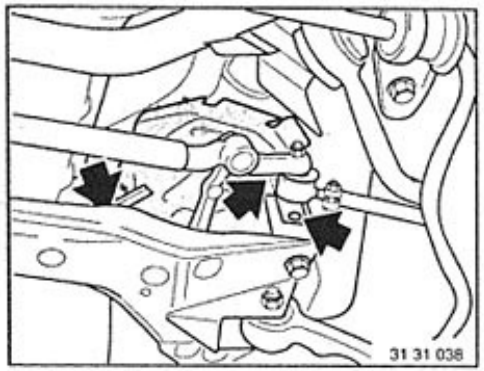
Adjusting Pressure Point:
Mount Special Tool 32 1 000 on the spindle and apply friction torque tester 00 2 010.
Measure friction torque about 1/2 turn before reaching final lock.
Move steering gear to straight ahead position.
Turn adjusting screw until a friction torque 0.4 to 0.6 Nm (0.3 to 0.4 ft. lbs.) higher than the previously measured friction torque is measured while "passing" the pressure point.
Total friction torque must not exceed 1.4 Nm (1 ft. lbs.).
Tighten locknut with a tightening torque of 25 Nm (18 ft. lbs.).
Recheck friction torque.

Install steering drop arm.
Check function after installation of the steering gear.

TROUBLESHOOTING POWER STEERING

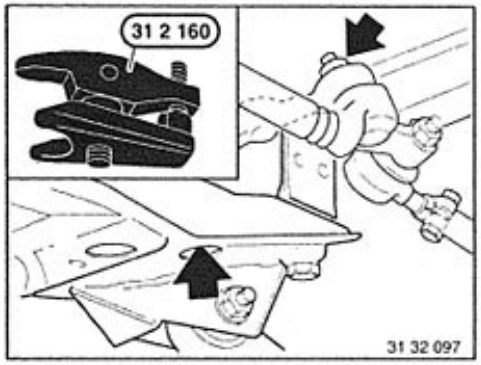
Condition	Cause	Correction
Steering is hard to turn left or right from center	Pressure point adjusted too tight	Adjust pressure point
Steering runs automatically to final position onesidedly	Valve setting for hydraulic center incorrect	Replace steering gear (adjustments can only be made in the factory)
Excessive steering wheel play	a) Steering gear loose on front axle carrier b) Universal joints have excessive play c) Joint disc loose d) Tie rod ends worn e) Play between worm and piston f) Worm has axial play g) Insufficient oil in system	a) Tighten steering gear b) Replace universal joints c) Tighten joint disc d) Replace tie rod ends e) Replace steering gear f) Replace steering gear g) Add oil*; bleed hydraulic system - see 32 13 006
Steering wheel shakes	a) Imbalance or radial runout of wheels b) Toe, camber, caster or king pin inclination incorrect c) Thrust strut bent d) Rubber mount for thrust strut faulty e) Control arm bent f) Weak shock absorbers g) Bearing sleeve in steering guide arm faulty	a) Balance wheels; replace rims and/or tires in case of radial runout b) Check/adjust front wheel alignment with optical tester c) Replace thrust strut d) Replace rubber mount e) Replace control arm f) Replace shock absorbers g) Replace bearing sleeve
Steering difficult to move against left or right lock	a) Pressure does not build up in lower chamber b) Pressure does not build up in upper chamber c) Insufficient oil in system d) Control valve in power pump seized e) Filter clogged f) Valve piston seized or leaks g) Piston seal damaged h) Teflon rings in worm head leak i) Teflon ring in intermediate cover leaks k) System filled with strong foaming, unsuitable oil	a) Replace steering gear b) Replace steering gear c) Add oil*; bleed hydraulic system - see 32 13 006 d) Replace power steering pump e) Replace filter and clean pipes f) Replace steering gear g) Replace steering gear h) Replace steering gear i) Replace steering gear k) Fill hydraulic system with specified oil*
Loss of hydraulic fluid	a) Hose connection leaks b) Oil tank seal leaks c) Radial oil seal for sector shaft faulty d) Radial oil seal for steering spindle leaks e) O-ring in cover leaks f) O-rings in intermediate cover leak	a) Tighten hose connections or replace hoses b) Replace seal c) Seal steering gear d) Seal steering gear e) Seal steering gear f) Seal steering gear
No straight ahead	Height of steering drop arm not correct	Adjust steering drop arm - see 32 21 520

* Refer to Specifications



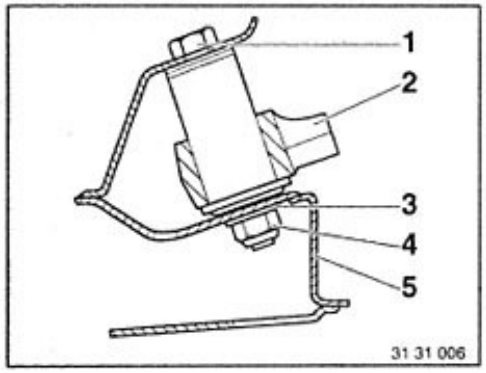
32 21 080 Removing and installing idler arm

Remove heat shield.



Unfasten nut and press off ball joint with special tool 31 2 160.
Remove idler arm.

Installation:
Bore and taper free of grease. Replace self-locking nut.
Tightening torque 32 21 3AZ*.

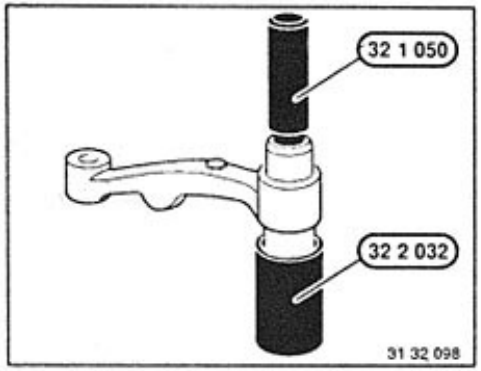


Installation:
Replace self-locking nut.
Tightening torque 32 21 7AZ*

1 Screw
2 Idler arm
3 Washer
4 Self-locking nut
5 Front axle carrier

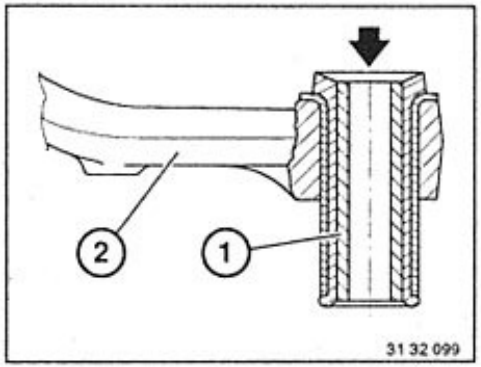
Caution!
If the idler arm is replaced, check/adjust alignment of the pitman arm 32 21 510.

* Refer to Technical Data

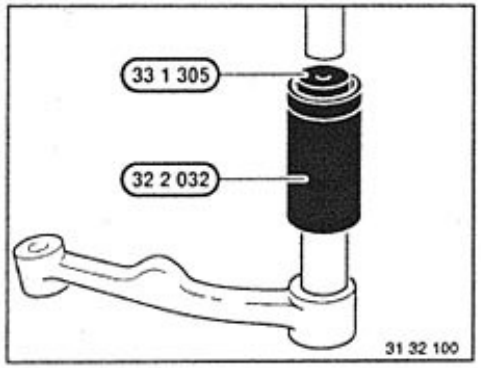


31 21 091 REPLACING DAMPER FOR STEERING GUIDE ARM

Remove steering guide arm – see 32 21 080.
Press out damper with Special Tools 32 1 050 and 32 2 032.

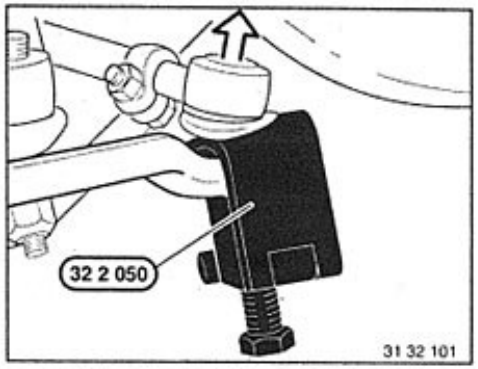


Note pressing-in direction.
1 = Damper
2 = Steering guide arm.



Press in new damper against the stop with Special Tools 33 1 305 and 32 2 032.

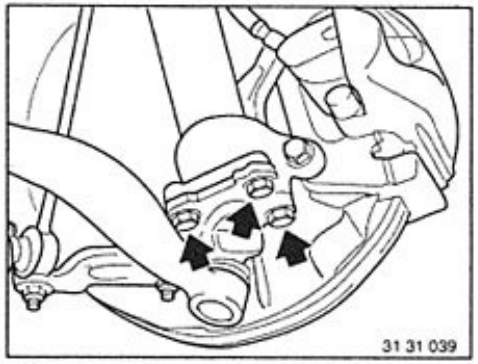
Important!
Adjust steering drop arm after installation – see 32 21 510.



32 21 101 Replacing left or right tie rod lever

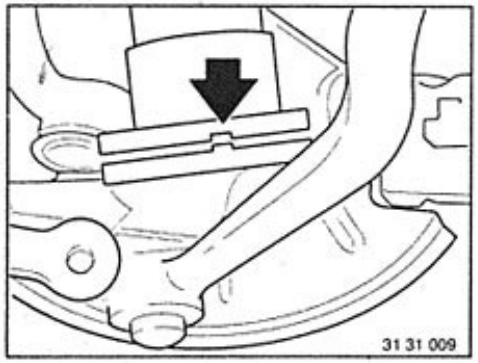
Remove front wheel, see Gr. 36.
Unfasten nut.
Press ball joint off tie rod lever with special tool 32 2 050.

Installation:
Bore and taper free of grease.
Tightening torque 32 21 3AZ*.
Replace self-locking nut.
Perform front wheel alignment check 32 00 . . .

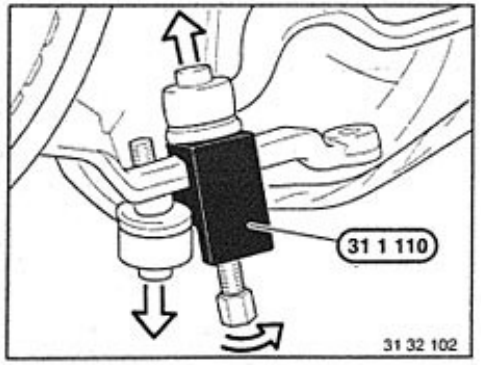


Unfasten screws.

Installation:
Clean thread of bores and screws.
Secure screws with screw cement**.
Tightening torque 32 21 9AZ*.



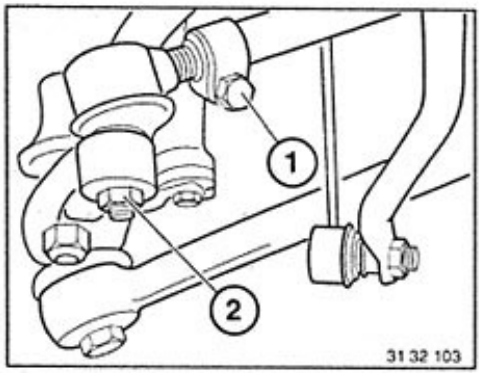
Ensure unit is correctly installed.



Unfasten nut from control arm and traction strut.
Press off ball joint with special tool 31 1 110.

Installation:
Remove grease from bore and taper.
Replace self-locking nut.
Tightening torque 32 21 9AZ/11AZ*

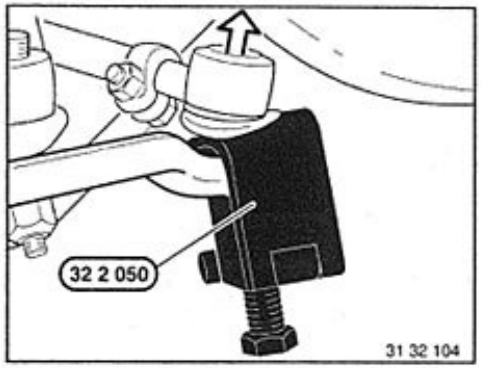
* Refer to Technical Data
** Source of Supply: BMW Parts Service



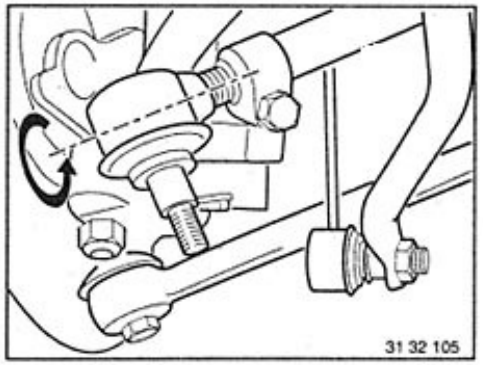
32 21 151 Replacing left or right track rod end

Remove front wheel, see Gr. 36.
Unfasten clamping screw (1).
Unfasten nut (2).

Installation:
Remove bore and taper. Replace self-locking nut.
Tightening torque 32 21 3AZ/4AZ*.
Perform front axle alignment check 32 00 . . . .

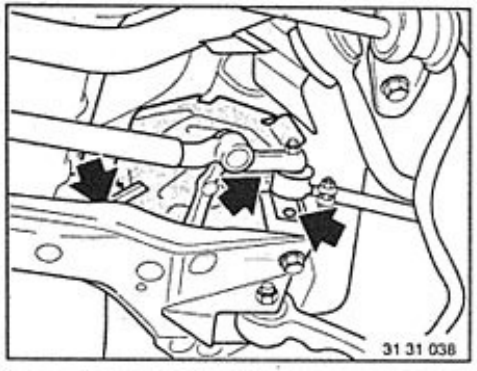


Press off ball joint using special tool 32 2 050.



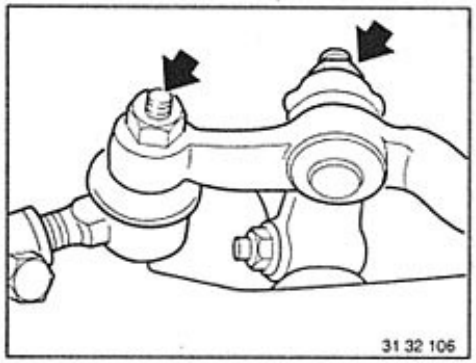
Unscrew and remove track rod end.

* Refer to Technical Data



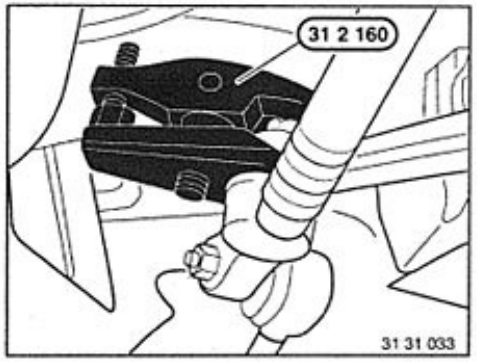
32 21 281 Replace center track rod

Remove heat shield from right side.

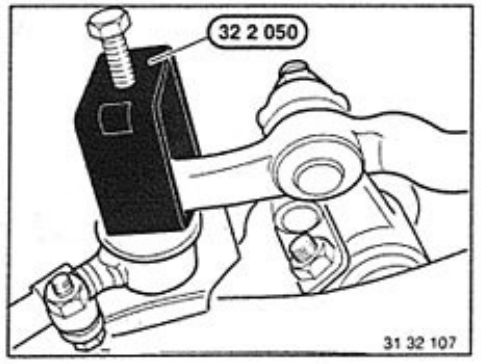


Unfasten nut on left and right sides.

Installation:
Remove grease from bore and taper.
Replace self-locking nut.
Tightening torque 32 21 3AZ*.
Adjust pitman arm 32 21 510.
Perform alignment check of front axle 32 00 . . . .

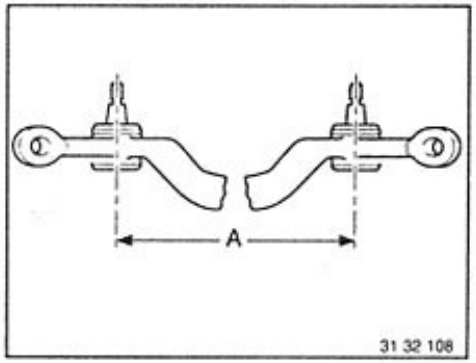


Press center track rod off pitman arm and idler arm using special tool 31 2 160.



Press off lateral track rods using special tool 32 2 050.

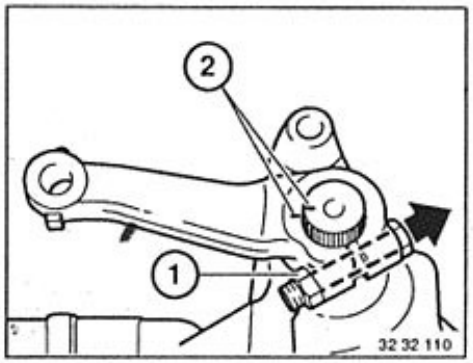
* Refer to Technical Data



Inspection dimension A = 534 ± 1 mm.

32 21 500 REMOVING AND INSTALLING STEERING DROP ARM
– Steering Gear Removed –

Mark position of sliding steering drop arm on the sector shaft prior to unscrewing bolt (1).
If necessary, adjust steering drop arm – see 32 21 510.

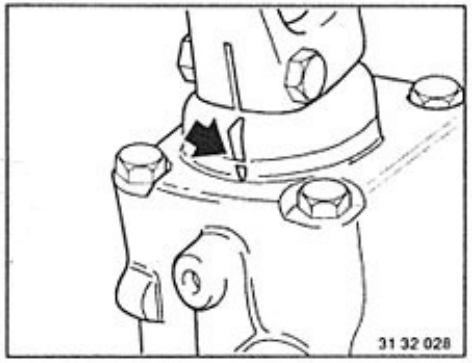


Installation:
Slide on steering drop arm up to the mark, whereby marks (2) must also be aligned.
Replace self-locking nut.
Tightening torque*.

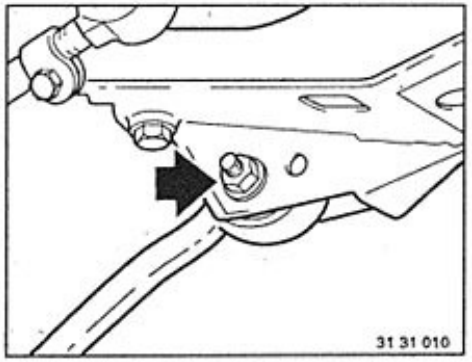
* **See Specifications**

32 21 510 ADJUSTING STEERING DROP ARM

Adjusting the steering drop arm moves the left and right tie rods to correct height. This guarantees the same amount of toe on left and right wheels when the car's suspension is bottomed.
It also optimizes directional stability on rough road surfaces.

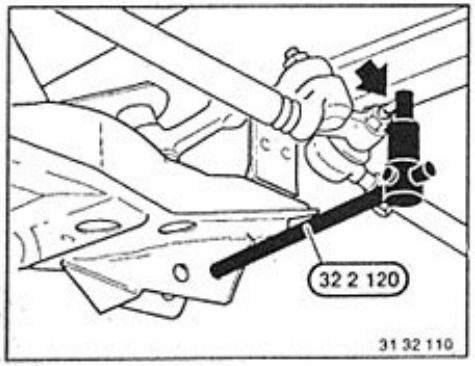


Set steering gear to straight ahead position (marks on spindle and case aligned).



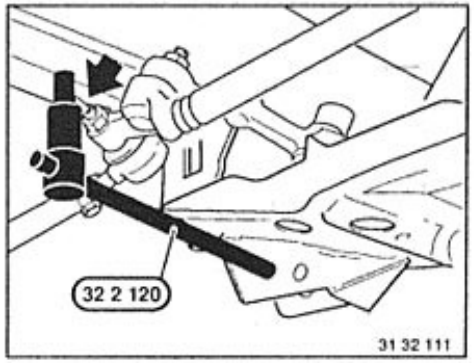
Unscrew left and right control arms on front axle carrier.

Installation:
Replace self-locking nuts.
Tightening torque*.

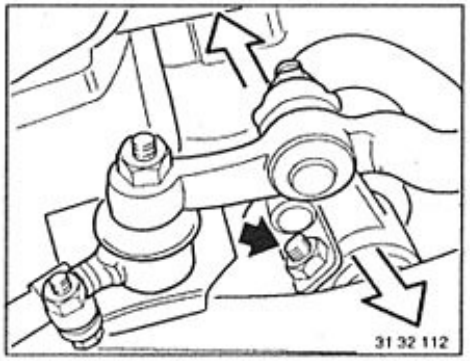


Mount Special Tool 32 2 120 on the side of the steering guide arm on the control arm mount.
Align the master mandrel with the centering bore in the pivot pin and clamp.

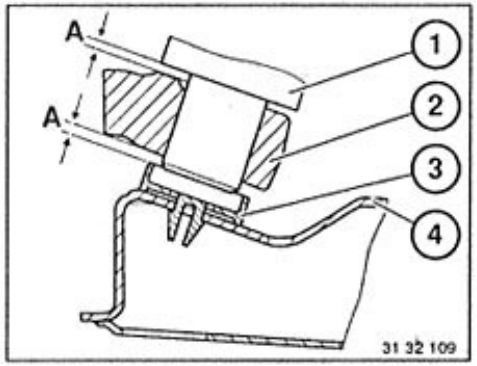
* Refer to Specifications



Mount the special tool on the other side — without changing the master mandrel.



Loosen bolt.
Move the steering drop arm until the centering bore is aligned with the master mandrel as precisely as possible; max. permissible deviation = ± 1.5 mm.
Tighten nut to correct tightening torque*.
Repeat the measurement, if necessary.



Important!
Turn steering gear from stop to stop — steering drop arm must move easily.

Distance A = 0.5 mm.

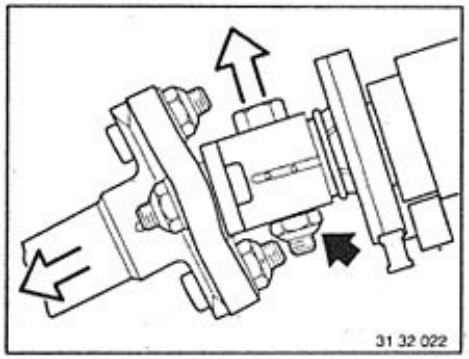
1 Steering gear
2 Steering drop arm
3 Spacer
4 Front axle carrier

* Refer to Specifications

32 31 082 Removing and installing or replacing steering angle sensor

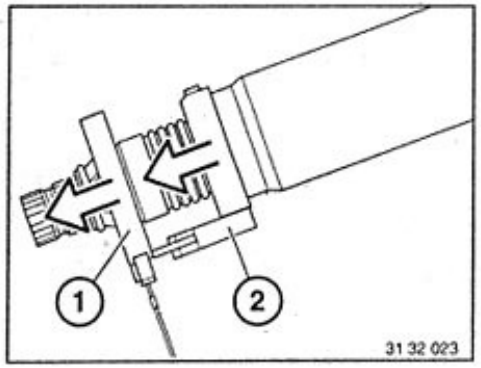
Disconnect battery, refer to Gr. 61
Remove lower trim from instrument panel, refer to Gr.51
Remove airbag steering wheel 32 33 000.

Caution!
On vehicles with
Electronic Damper Control or
Active Rear Axle Kinematics (AHK) or
Dynamic Stability Control,
a "steering angle adjustment "must be conducted after assembly using the BMW Sevice Tester.



Remove clamping screw.
Press steering spindle downwards.

Installation:
Clamping screw is located in retaining groove of steering spindle.
Replace self-locking nut.
Tightening torque 32 31 1AZ *.



Remove steering angle sensor (1) from steering spindle.

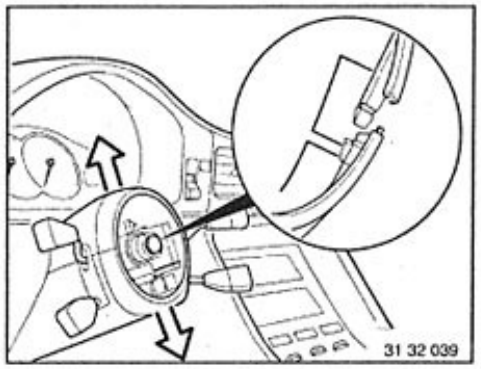
Installation:
The pin on the steering angle sensor (1) must locate in the rotary fixture (2).

*Refer to Technical Data

32 31 090 Removing and installing complete steering column

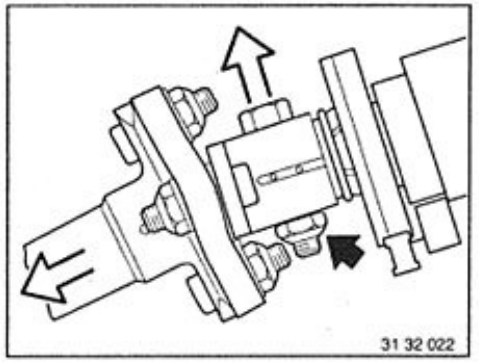
Disconnect ground lead from battery.
Remove steering wheel 32 33 000.
Remove lower trim from instrument panel, refer to Gr. 51.

Caution!
On vehicles with
Electronic Damper Control or
Active Rear Axle Kinematics (AHK) or
Dynamic Stability Control,
a "steering angle check" must be performed using the BMW Sevice Tester.



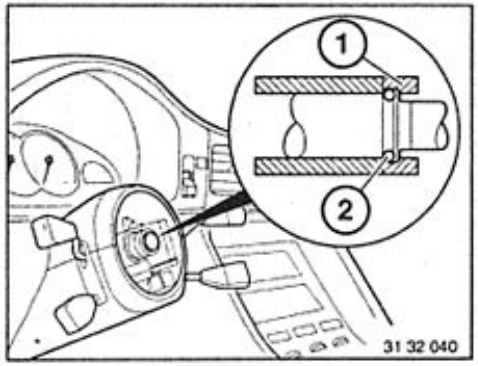
Remove lower section of steering column trim from upper section
If necessary, unscrew and remove cable from interlock.

Installation:
Check that locking fixture is correctly seated.



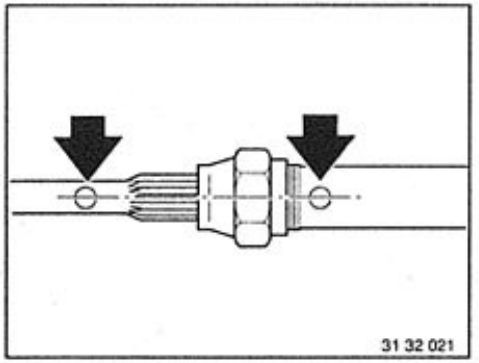
Remove clamping screw.
Press steering spindle downwards.

Installation:
Clamping screw is located in retaining groove of steering spindle.
Replace self-locking nut.
Tightening torque*.

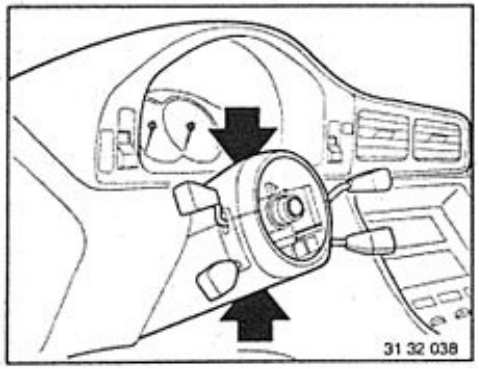


Remove end collar (1).

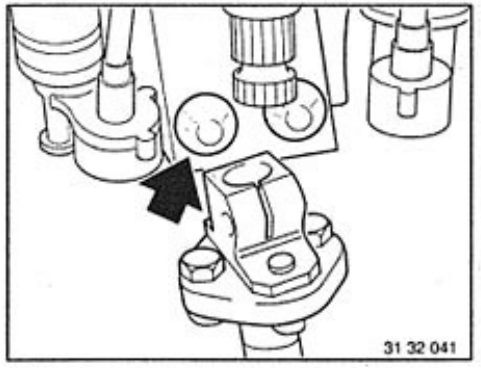
Installation:
Note position of end collar (1) relative to sna ring (2).



Note:
Allocation of gear teeth marked with spot of paint.
Adjusting nut tightened down to point that displacement force equals 40 ± 25 N.



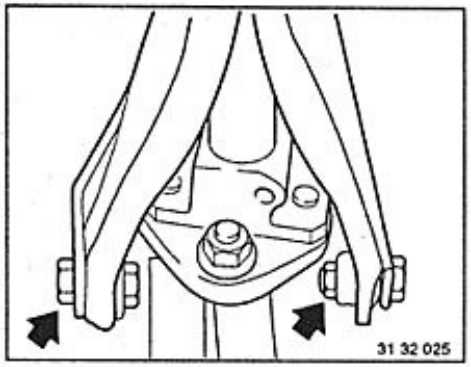
Unfasten screws.



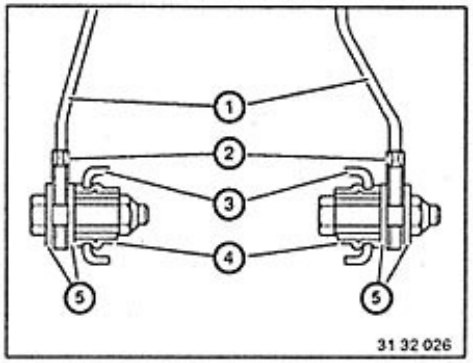
Unfasten tear-off screw with chisel or mill off screw head.

Installation:
Fit spacer tube.
Tighten down tear-of screws to tearing point.

* Refer to Technical Data

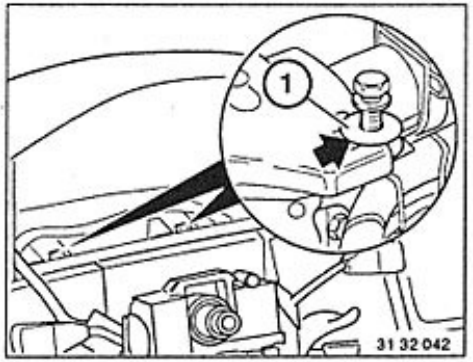


Installation:
1 Lever (left, right)
2 Sliding cover
3 Steering column slide
4 Rubber mount
5 Washer
Replace self-locking nuts.
Tightening torque*.

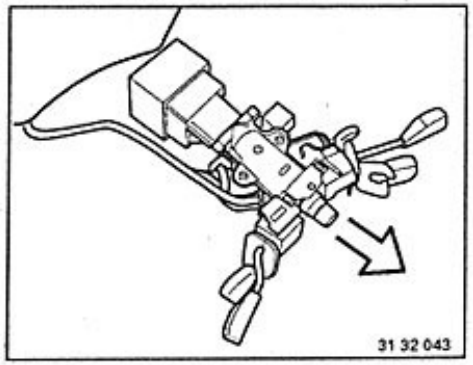


Remove instrument cluster – see Group 62.
Loosen bolts.

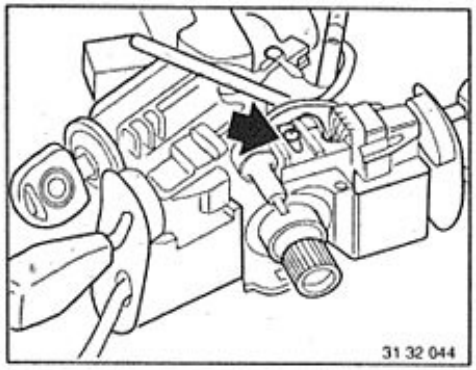
Installation:
Hooks of the steering column must be located in guide sleeves (1).
Pull steering column up and tighten the bolts.
Tightening torque*.



Pull off plugs on potentiometers.
Discoonect all wires leading to the steering column on the plugs.
Press down and remove steering column.



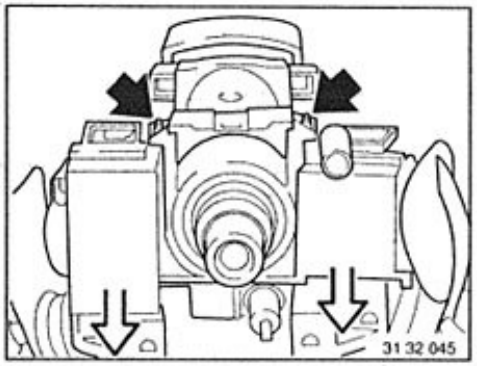
* See Specifications



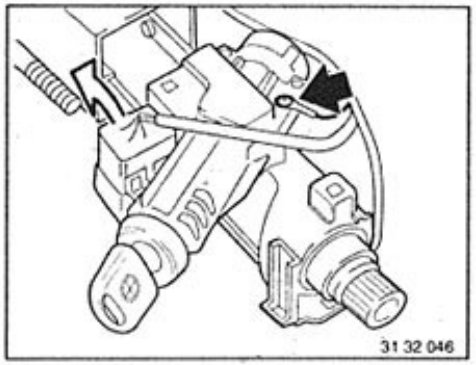
32 31 595 Dismantling and assembling complete steering column

Remove steering column 32 31 090.

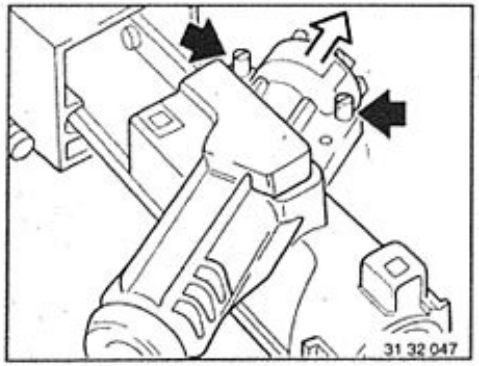
Unfasten screw.



Press locking hook and remove switch.

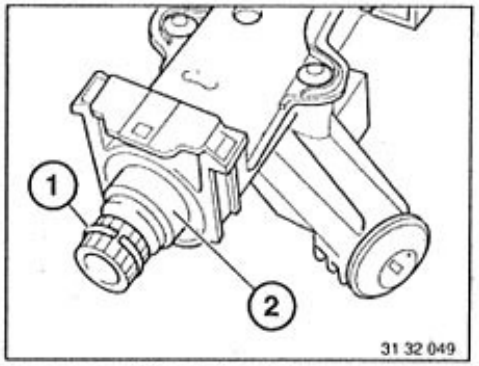


Remove ground cable.
Turn relay base and remove.

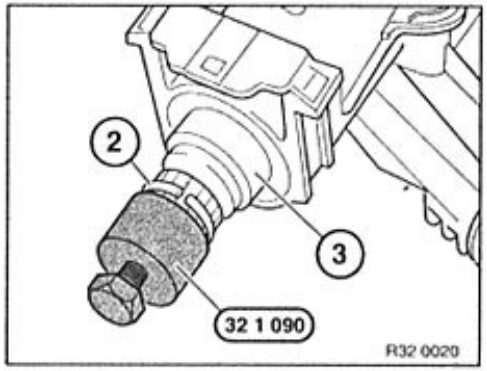


Unfasten both Maden screws.

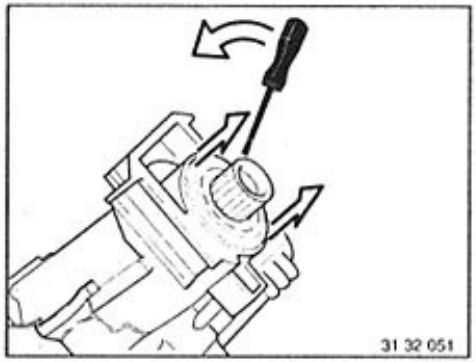
Installation:
Secure Maden screws with paint.



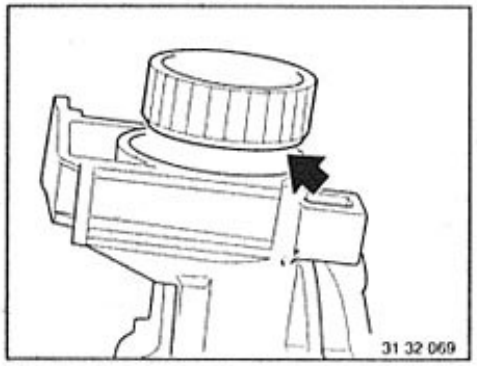
Lift out snap ring (1) and remove with bush (2).



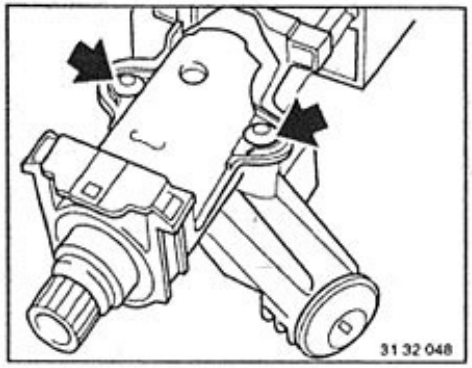
Installation:
Fit bush (3).
Tighten down snap ring (2) with special tool 32 1 090 and steering wheel retaining screw until they engage in groove.



Lift out and remove steering spindle bearing.
Remove inner steering sleeve.

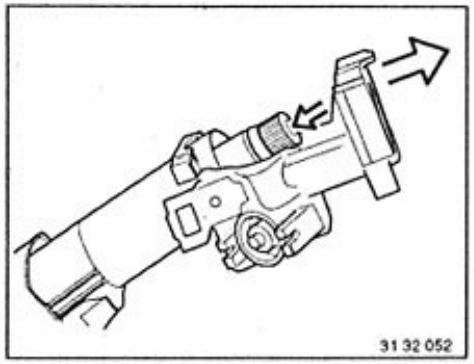


Installation:
Install bearing sleeves with the tapered side facing the steering lock.

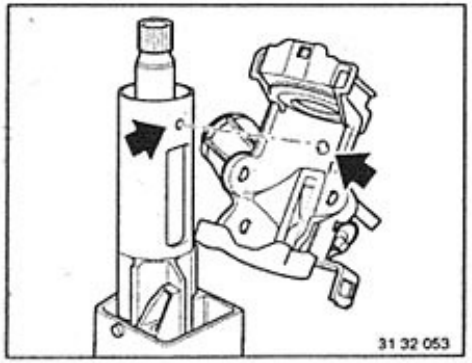


Remove shear-off bolts.

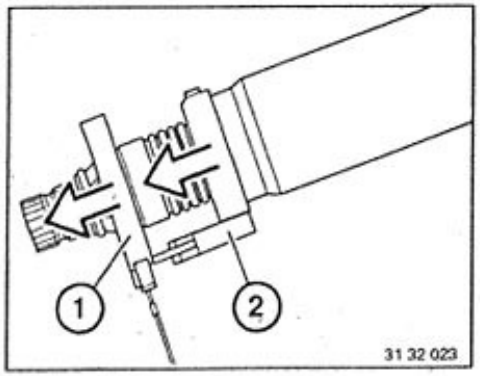
Installation:
Tighten Torx bolts until they shear off.



Turn steering lock to "R" position.
Press down on steering spindle and remove the steering lock.

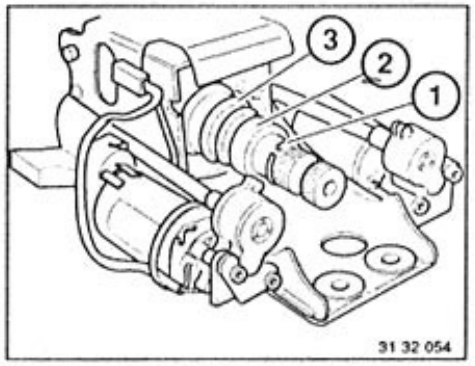


Installation:
Dowel pin must be in the bore.

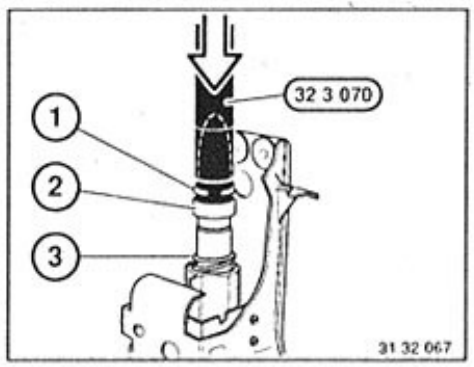


Pull steering angle sensor (1) off of the steering spindle.

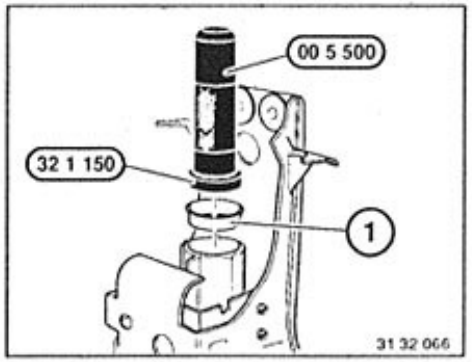
Installation:
Pin of steering angle sensor (1) must fit in turning lock (2).



Lower Steering Spindle Bearing:
Lift out circlip (1) and remove collar (2) and spring (3).
Take off steering spindle.



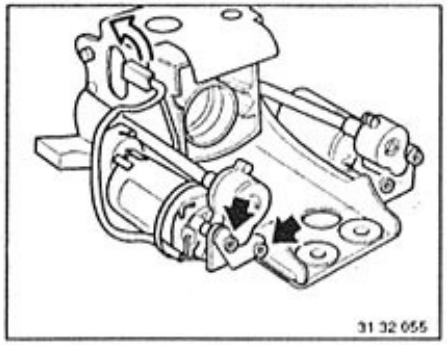
Installation:
Mount spring (3) and collar (2).
Recess in the collar must face the circlip.
Install circlip (1) with Special Tool 32 3 070.



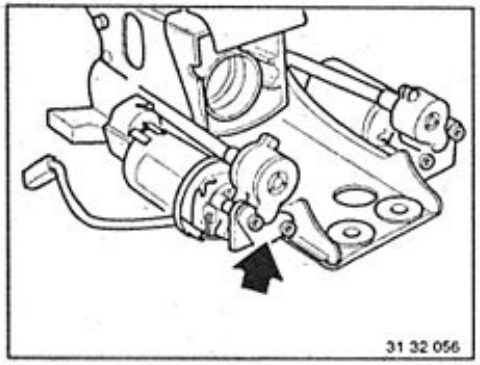
Knock lower steering spindle bearing out of the outer sleeve.

Installation:
Press contact ring out of the new bearing.
Drive in new bearing (1) with Special Tools 32 1 150 and 00 5 500.

Important!
Press contact ring – for horn ground – into the bearing again.

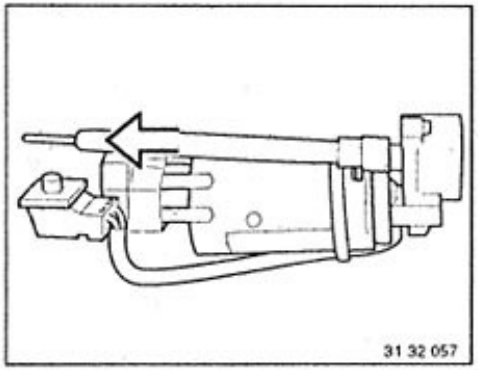


Unscrew screws.
Turn plug out of the holder.
Take off gearbox motor.

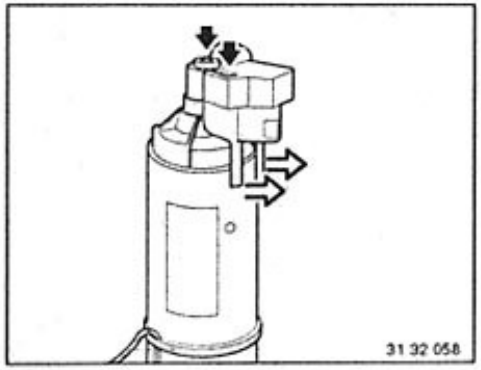


Installation:
If applicable, use washer.

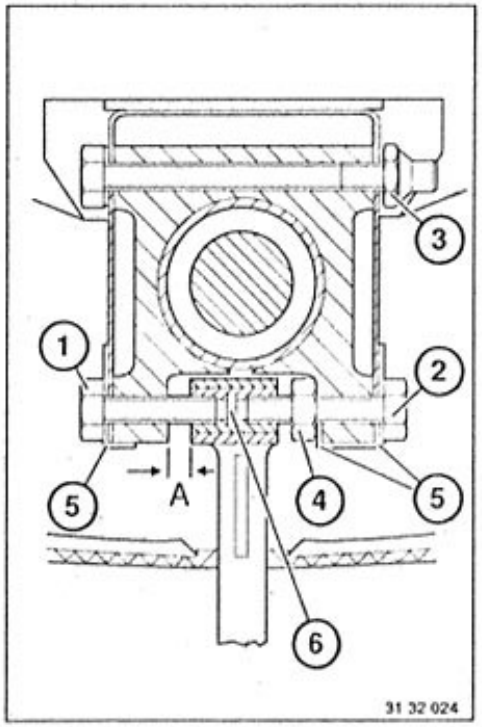
Mechanical Steering Column Adjustment:
Unbend lockplates (5).
Unscrew bolts (1 ... 3).
Bolt (1) = left-hand threads.



Pull off shaft.



Unscrew screws, press hooks towards outside and take off potentiometer.

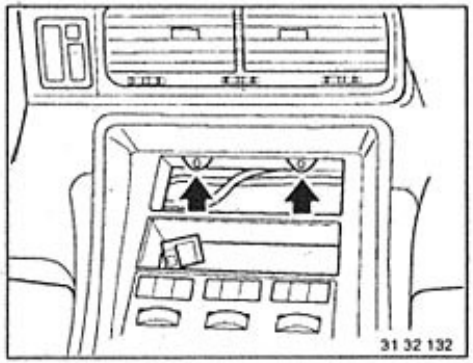


Assembling Procedures (Note Order):

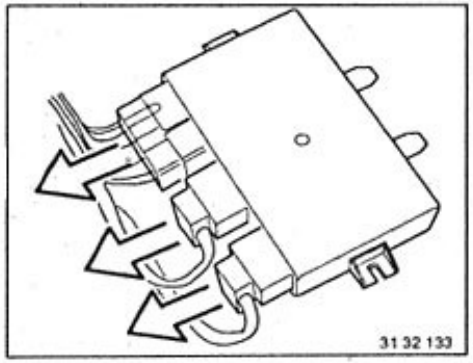
1. **Screw in left M 8 x 32 bolt (1) together with lockplate (5) – tightening torque = 15 Nm.**
   Distance A between lever and clamp = 6 ± 1 mm.
2. **Screw in M 8 x 40 bolt (2) together with lockplate (5) and nut (4) – tightening torque = 7 Nm.**
3. **Tighten nut (4) – tightening torque = 15 Nm.**
4. **Tighten hexagon nut (3) – lever (6) in "CLOSED" position.**
   Tightening torque = 15 Nm.
5. **Bend lockplate (5).**

32 31 800 REPLACING CONTROL UNIT FOR ELECTRIC STEERING COLUMN CONTROL

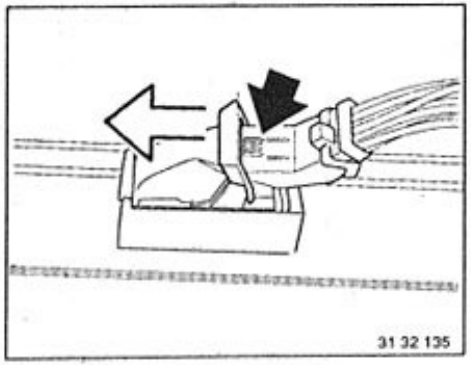
Remove multi-information display – see Group 65.



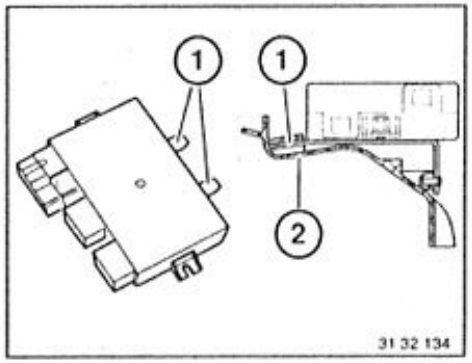
Unscrew screws.



Pull out control unit and pull off plugs.
Transfer holder.



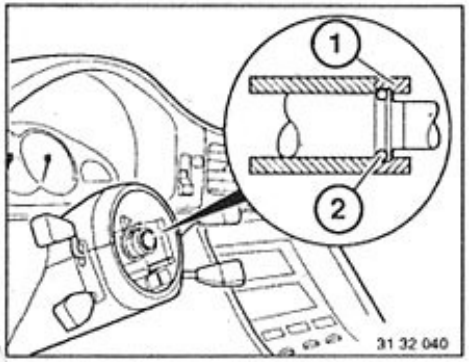
Important!
Press down on retainer and lift lever.



Installation:
Tabs (1) must be located in slots (2) of the heater housing.

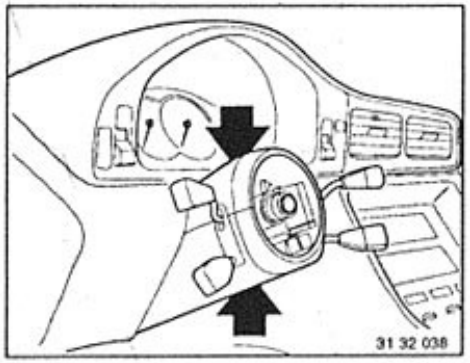
32 32 001 REPLACING COMPLETE STEERING LOCK

Set steering column to "lowered" and "run out" position.
Disconnect battery ground lead.
Remove steering wheel – see 32 33 000.
Remove bottom dashboard trim panel – see Group 51.

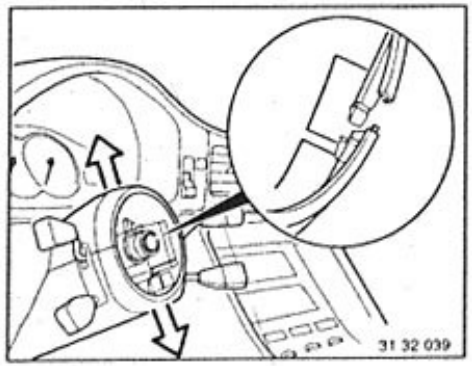


Take off collar (1).

Installation:
Recess in collar (1) must be above circlip (2).

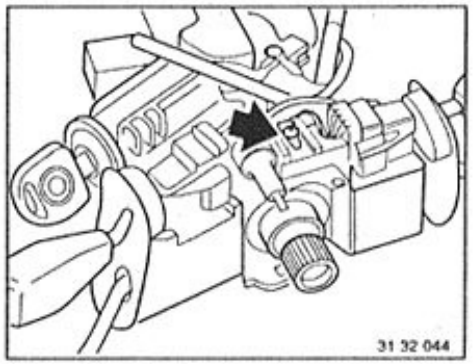


Unscrew screws.



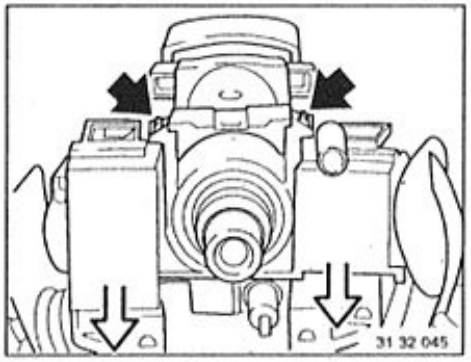
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of the lock.

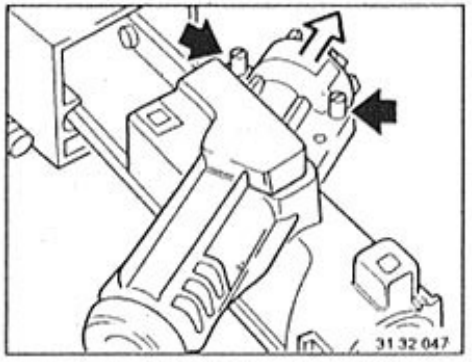


Remaining procedures are shown on a removed steering column for better understanding.

Unscrew screw.

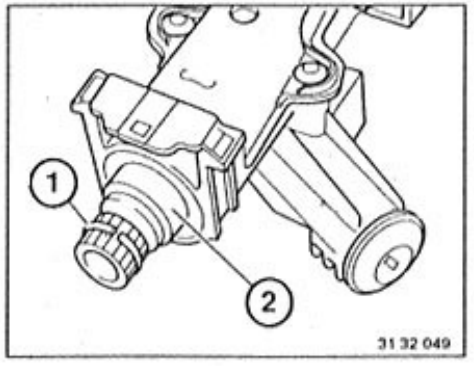


Compress retainers and pull off switch.

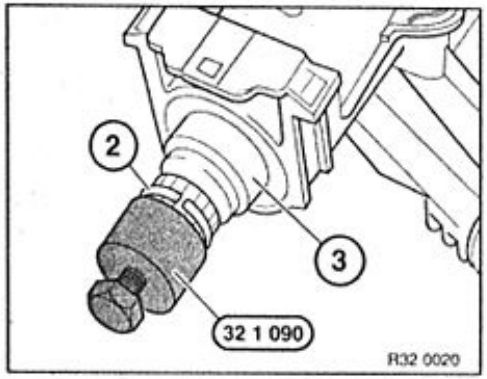


Unscrew both setscrews.

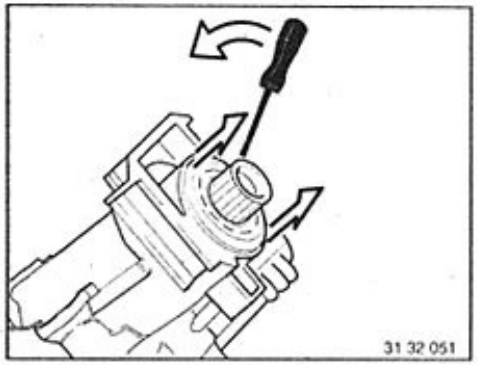
Installation:
Lock setscrews with paint.



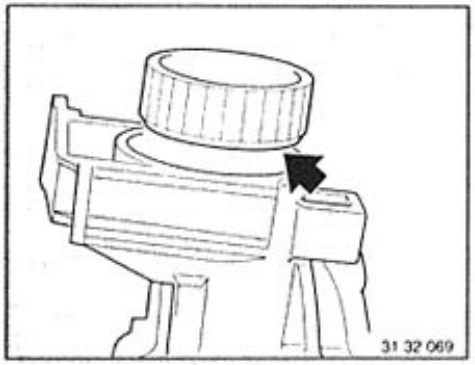
Lift out and remove circlip (1) with sleeve (2).



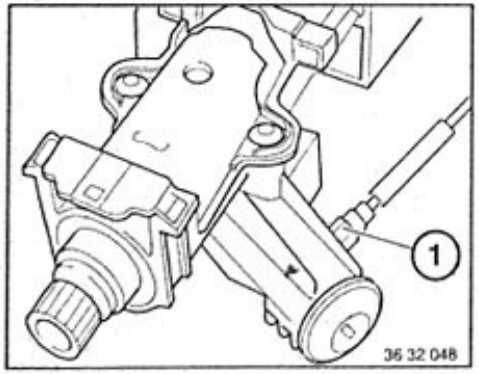
Installation:
fit bush (3).
Draw snap ring (2) with special tool 32 1 090 and steering wheel retaining screw firmly home in groove.



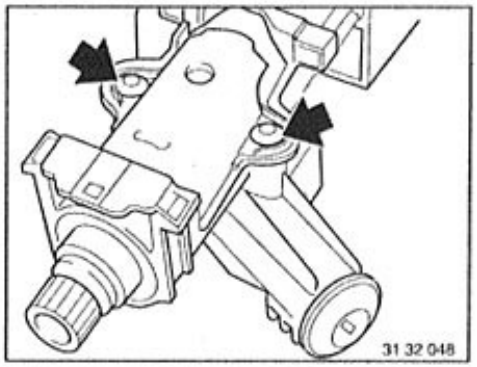
Lift out and remove steering spindle bearing.
Remove inner steering sleeve.



Installation:
Install bearing sleeves with the tapered side facing the steering lock.

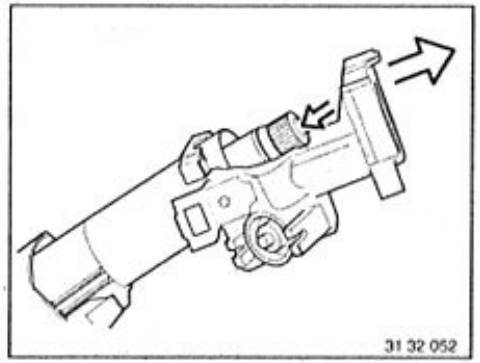


If necessary, unscrew and remove cable (1) from interlock.

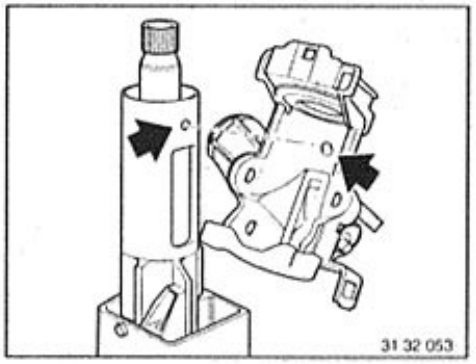


Unfasten tear-off screws.

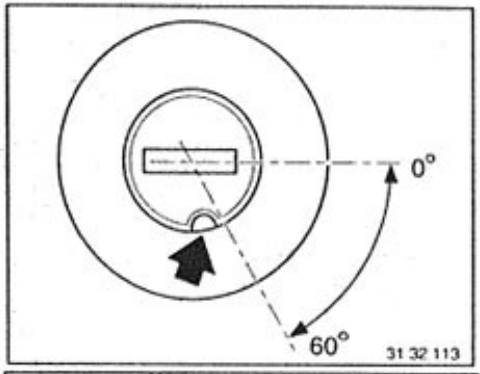
Installation:
Tighten down Torx threaded dowels until they tear off.



Rotate steering lock into position "R".
Press steering spindle downwards and remove steering lock.

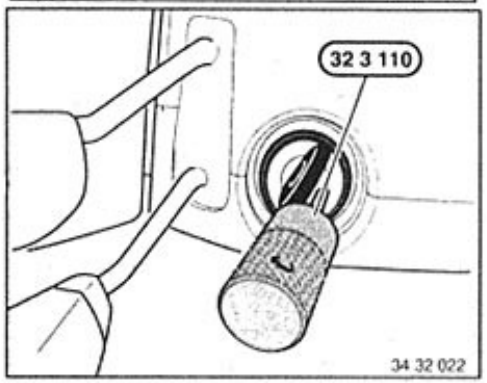


Installation:
Reamed bolt must locate in bore.



32 32 050 Removing and installing or replacing steering lock cylinder

Using ignition key, move lock cylinder into position "R" = 60°.



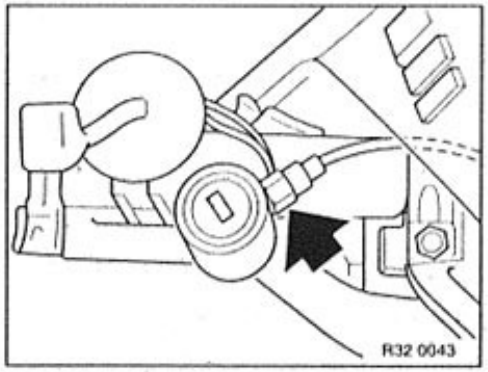
Press special tool 32 3 110 or a piece of Ø 1.2 mm wire into bore of lock cylinder and pull out lock cylinder.

32 32 170 Removing and installing or replacing interlock cable

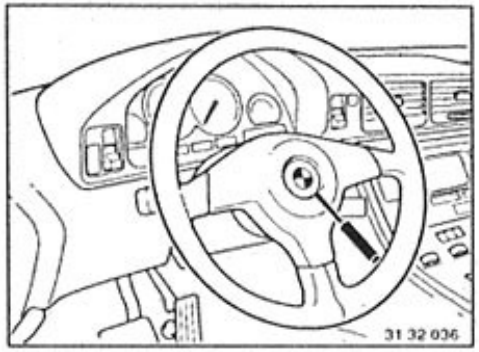
Caution!
After fitting interlock, check function, refer to 25 16 ... Repair Instructions for 3 Series E36.

Remove shift lever cover and unfasten interlock cable from shift tower
Secure new interlock cable to existing cable with wire or similar material

Installation:
Adjusting interlock cable, refer to 25 16 ... Repair Instructions 3 Series E36.
Tightening torque 8 Nm.



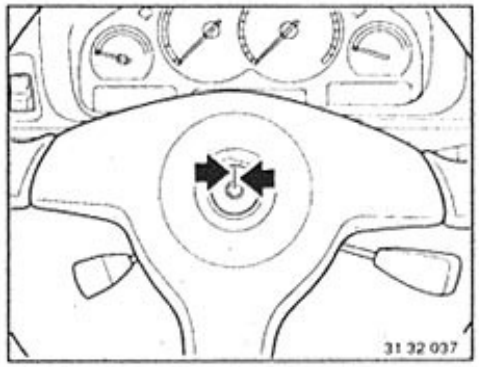
Remove lower section of steering column trim
Unfasten interlock cable on steering lock and remove, inserting new interlock cable at the same time.



32 33 000 REMOVING AND INSTALLING STEERING WHEEL

Without Airbag (SRS):

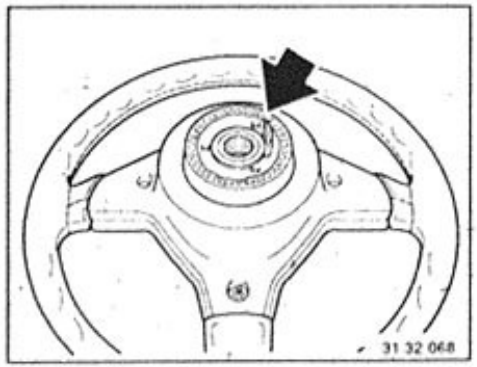
Lift out BMW emblem.



Unscrew screw.
Mark position of steering wheel to steering spindle.
Pull off steering wheel.

Installation:
Tightening torque*.

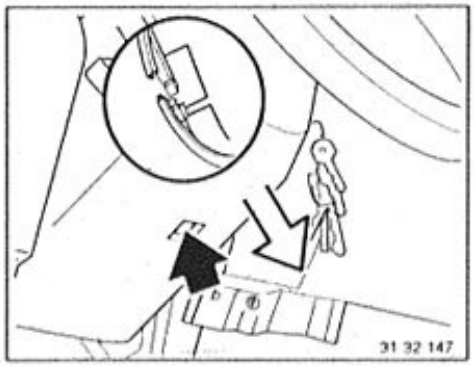
Important!
Don't damage the turn signal self-cancelling cams – set turn signals to center position.



Installation:
Coat slip ring with grease**.

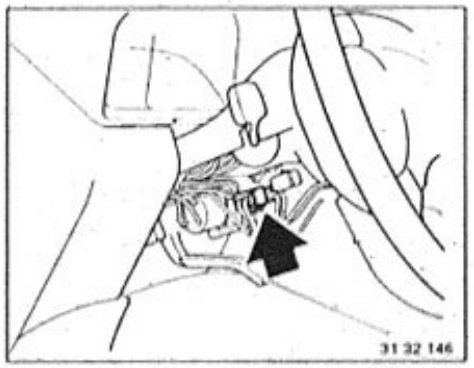
With Airbag (SRS):

Caution!
Conform with safety precautions! Incorrect handling could cause activation of the airbag and lead to injuries. Disconnect battery and cover ground pole or terminal.



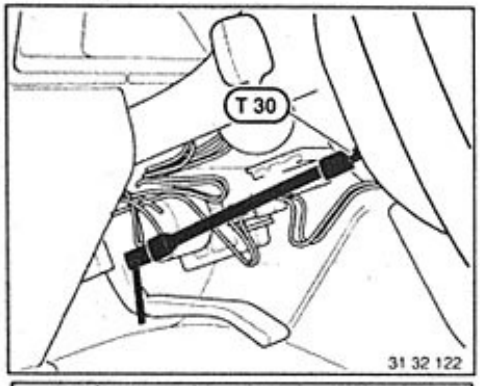
Unscrew screw.
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of the lock.



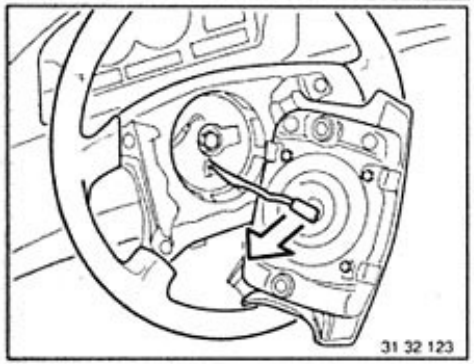
Turn plug (orange) out of the holder and disconnect.

See Specifications
See Operating Fluids



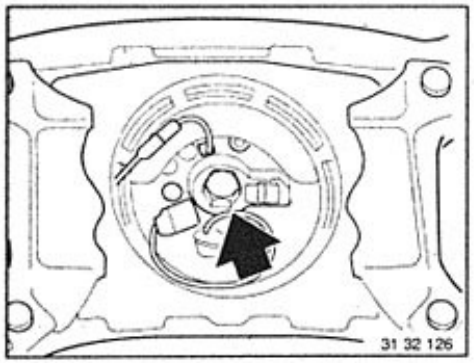
Until mod.95
Loose screws (Innentorx T 30).

Installation:
First tighten the right screw, viewed in direction of travel.
Do not jam cable. Tightening torque*.



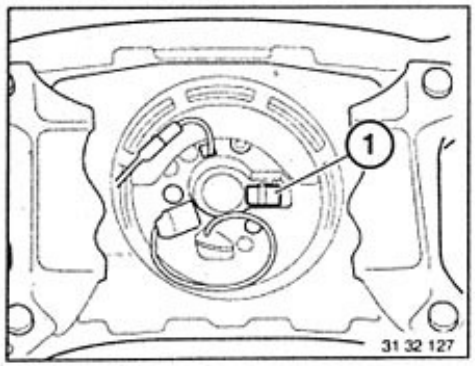
Unfasten connector and remove airbag unit.

Caution!
Airbag must always be placed with padded side facing upwards (trunk).



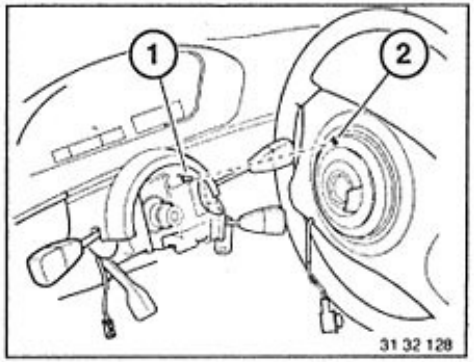
Move steering wheel into straight-ahead setting (marking on steering gear and on steering spindle).
Unfasten screw, mark relative position of steering gear to steering spindle

Installation:
Tightening torque 32 33 1AZ*.

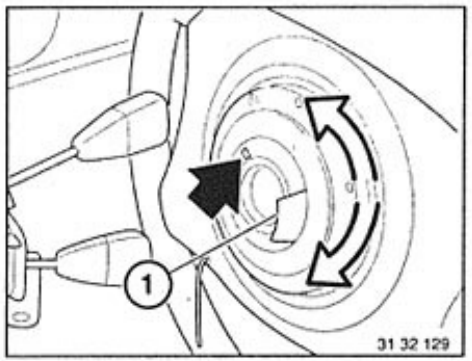


Note:
When the screw is loosened, the torsion spring (1) becomes effective, securing the contact ring in its center position.

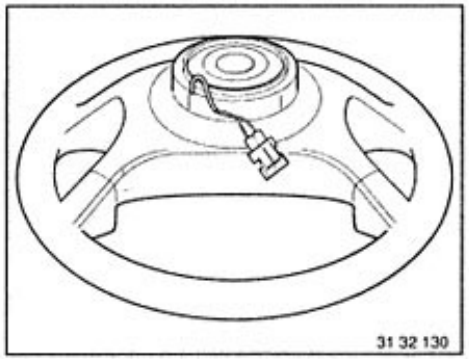
* Refer to Technical Data



Installation:
Locating pin (1) must engage in recess (2).
Tightening torque*.

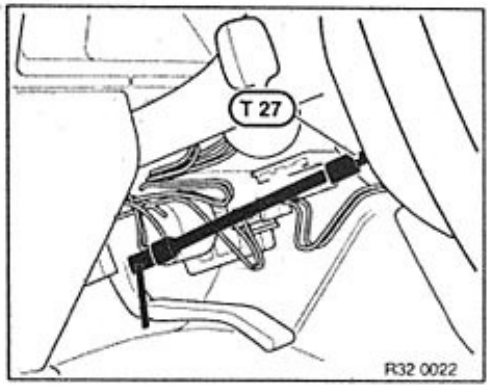


If necessary, adjust contact ring:
Press down spring (1) – turn contact ring to left or right stop, turn back approx. 3 complete turns until marker arrows for center position are aligned, then release spring (1).



Installation:
Coat slip ring with grease**.

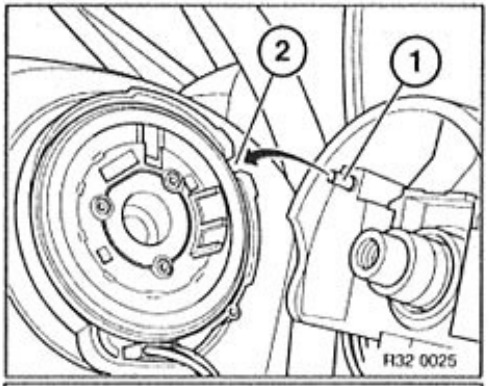
* Refer to Technical Data
** Refer to Operating Fluids Specifications



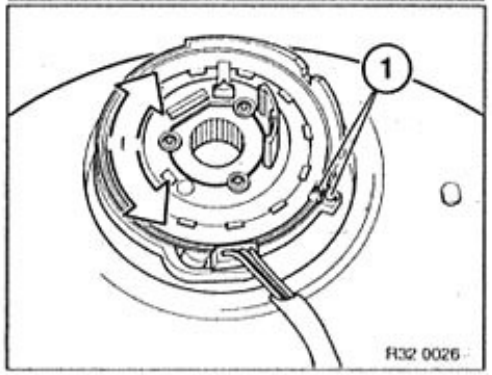
From mod. 95
Unfasten both screws (internal Torx T 27).
Remove connector from squib, pull off horn contact and remove airbag unit.

Caution!
Airbag unit must be stored with pad facing upwards (trunk).

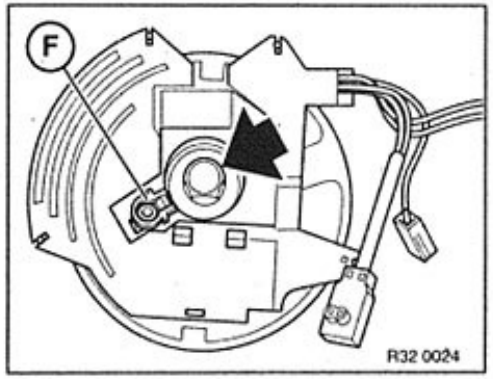
Installation:
Do not jam cable. Tightening torque, refer to Technical Data 32 34 1AZ.



Installation:
Detent pin (1) must engage in recess (2).



Installation:
If necessary, adjust contact ring:
Press down on spring (F).
Determine centre position of contact ring by halving total number of turns. Ensure all marks (1) are accurately aligned.
Release spring (F).



Move steering wheel into straight-ahead position (marks on steering gear and steering spindle must be aligned).

Unfasten screw, mark position of steering wheel relative to steering spindle and remove.

Note:
When screw is unfastened, torsion spring (F) becomes active, securing the contact ring in centre position.

Installation:
Tightening torque, refer to Technical Data 32 33 1AZ.

- with Airbag II

Refer to Repair Instructions for 3 Series E36.

AIRBAG SYSTEM (SRS)

Components:

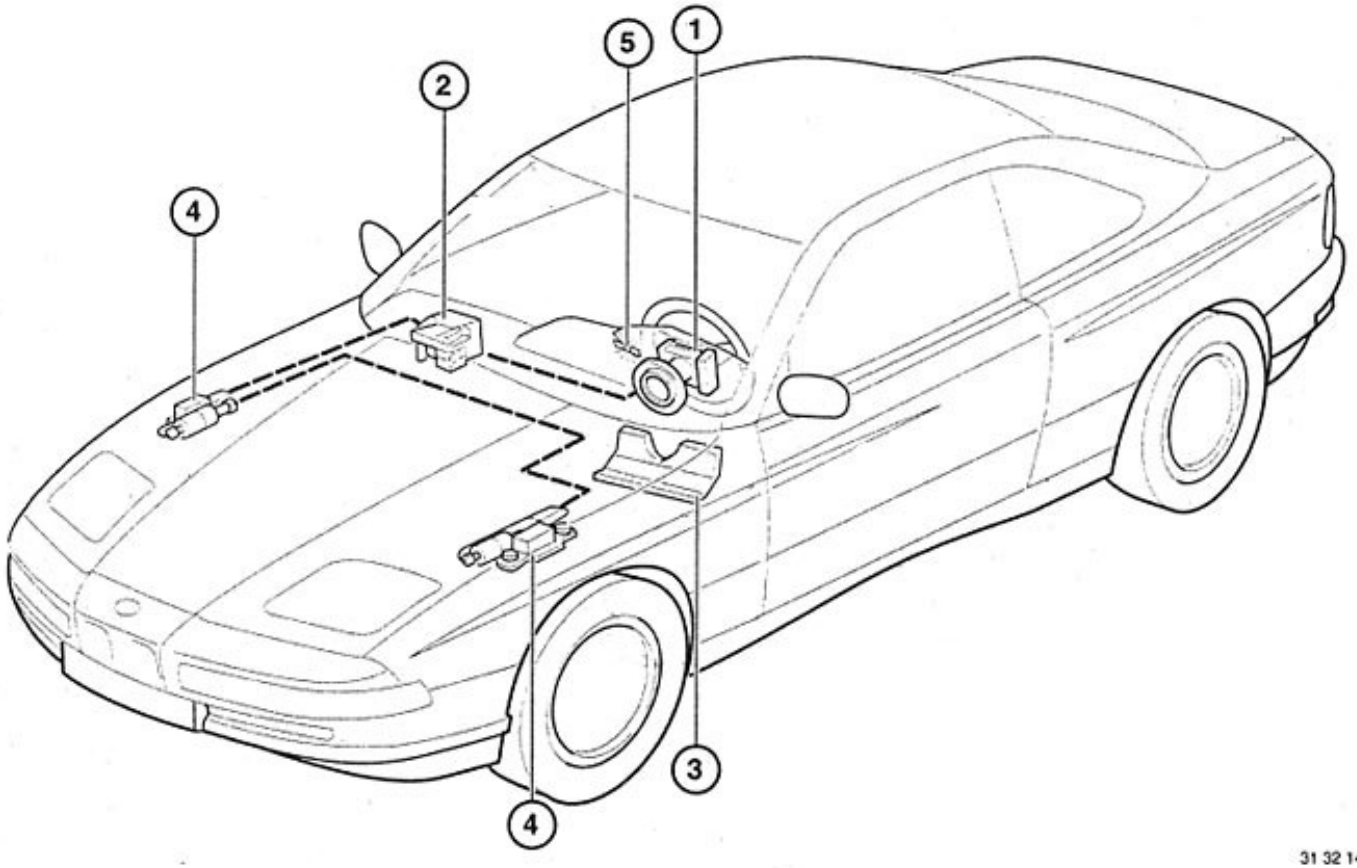
1 Steering wheel with airbag unit (airbag, gas generator, ignition pill and contact ring)

2 Diagnosis unit

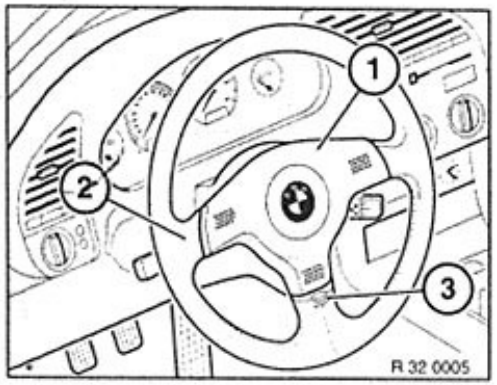
3 Knee guard (US model)

4 Two crash sensors (left and right on wheel house)

5 Airbag control lamp (in instrument cluster)



31 32 144



Airbag II

Components:

1 Airbag unit (airbag, gas generator, ignition squib)
2 Steering wheel (contact rings or coil springs, electronics)
3 Indicator lamp

Basic / central airbag unit

Components:

Basic airbag unit, EEC / Central airbag unit US (under the oddments tray beside the handbrake lever)

Steering wheel with airbag unit (airbag, gas generator, ignition squib and contact ring).

Airbag indicator lamp (in the instrument cluster)

Passenger airbag unit (airbag, gas generator, ignition squib)

Knee guard (US model)

Function

The system is triggered by sensors when vehicle retardation is equivalent to a direct head-on collision at no less than 18 km/h with a solid obstacle (i.e. one which does not yield).

This closes the circuit, igniting the gas generators. This sudden combustion causes non-toxic gases to be released by the solid fuel mixture. These completely inflate the folded airbag in the steering wheel and instrument panel within the space of approx. 30 ms.
When fully inflated, the airbag minimizes injuries to head and upper torso in head-on collisions. Discharging takes place through two holes on the side of the airbag facing away from the driver / passenger.

Monitoring:

The airbag system is monitored continuously by a diagnosing unit from ignition lock position "1". The control lamp comes on and goes out again after about 6 seconds to indicate that the system is ready for use.

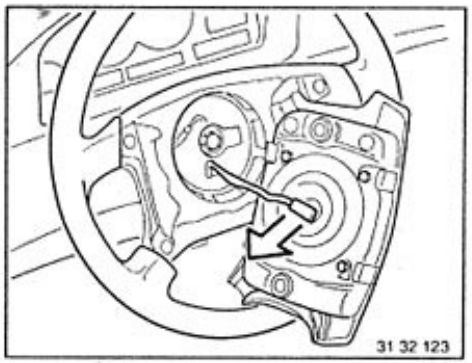
If this lamp comes on again, there is a detected fault in the system.
Self – diagnosis – interrogate the fault memory with the BMW DIAGNOSING SYSTEM.
Airbag II troubleshooting, refer to Repair Instructions for 3 Series E36.

Safety rules for handling airbag gas generators

Refer to Repair Instructions for 3 Series E36.

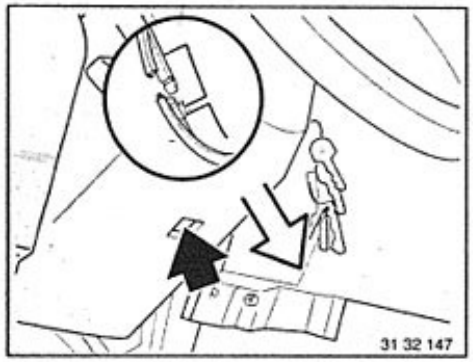
32 34 020 Removing and installing or replacing airbag

Caution!
Note safety regulations!
Incorrect handling can trigger the airbag and may cause injury.
Disconnect battery and cover ground terminal.



Unfasten connector and remove airbag unit.

Caution!
Airbag must always be laid aside (in trunk) with impact pad facing up.

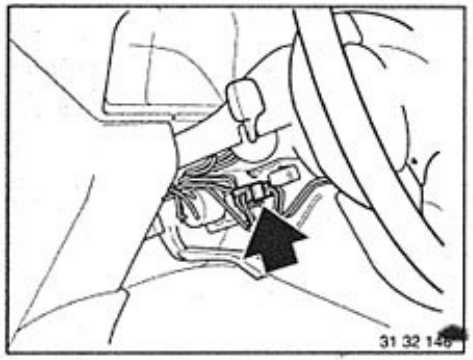


Unfasten screw.
Remove lower section of steering column trim from upper section.

Installation:
Check that locking fixture is correctly seated.

Airbag II:

Refer to Repair Instructions for 3 Series E36.



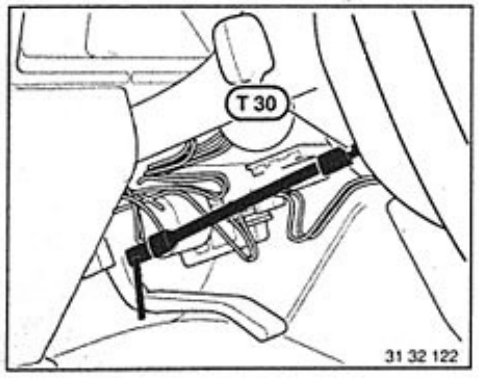
Twist plug connection (orange) out of bracket and disconnect.

32 34 504 Additional work with passenger airbag
– Steering wheel removed –

Caution!
Note safety regulations!
Incorrect handling can trigger the airbag and may cause injury.

Lift cover off airbag.
Unfasten screws, lift off passenger airbag and remove connector.

Caution!
Only place passenger airbag to one side (in trunk) with impact pad facing up.



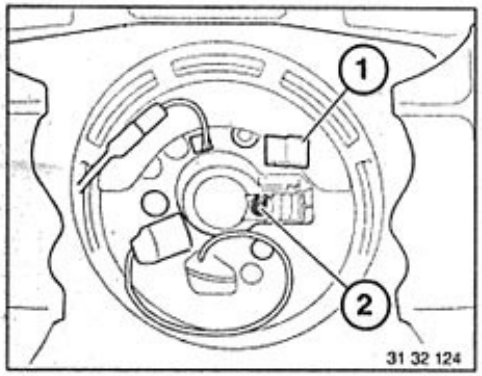
Loose screws (Innentorx T 30, from mod. 95 T 27).

Installation:
First tighten right screw in direction of travel.
Do not jam cable.
Tightening torque*.

* Refer to Technical Data

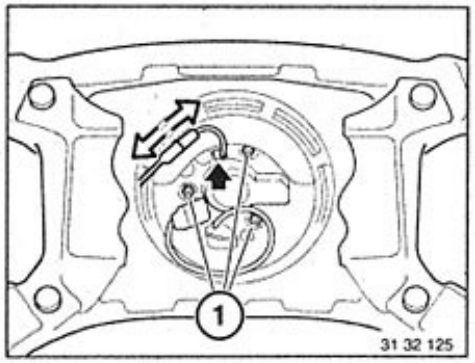
32 34 510 Replacing contact ring (Air-bag)

Caution!
Note safety regulations!
Incorrect handling can trigger the airbag and may cause injury.
Remove steering wheel 32 33 000.



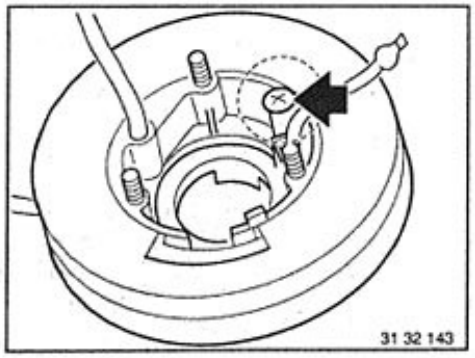
Lift out interlock (1) with screwdriver.

Installation:
Install spring (2) in bore and fit interlock.
Press interlock down until it engages.

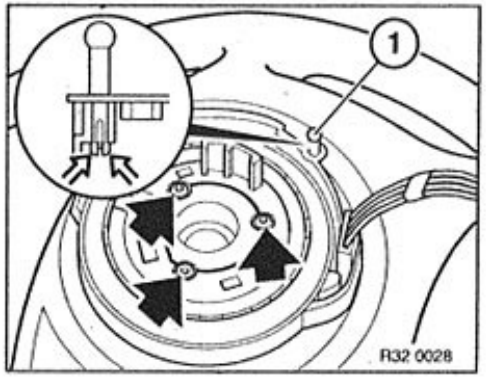


Disconnect plug connection.
Unfasten nuts (1) and remove contact ring.

Installation:
Insert horn cable through rectangular aperture.
Secure nuts with paint.



Caution!
A new contact ring is secured in centre position with a screw. This screen must be removed once the contact ring has been screwed to the steering wheel.

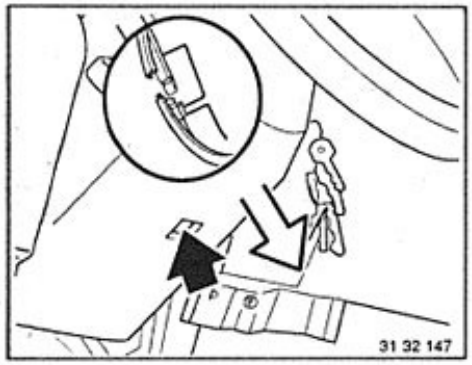


from mod. 95
Unfasten screws and remove contact ring.
Caution!
Do not remove anti-twist retainer (1) until contact ring is screwed to steering wheel.

Press together both ends and remove anti-twist retainer (1).

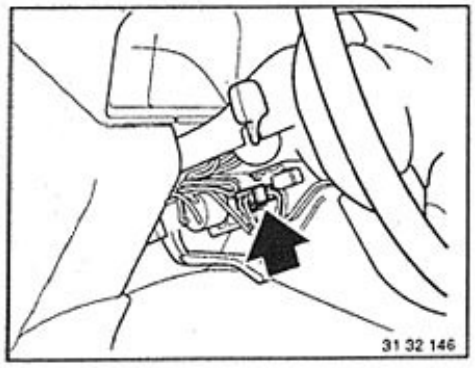
65 77 010 REMOVING AND INSTALLING OR REPLACING AIRBAG DIAGNOSIS UNIT

Caution!
Conform with safety precautions! Improper handling could cause activation of the airbag and lead to injuries. Disconnect battery and cover negative pole or terminal.

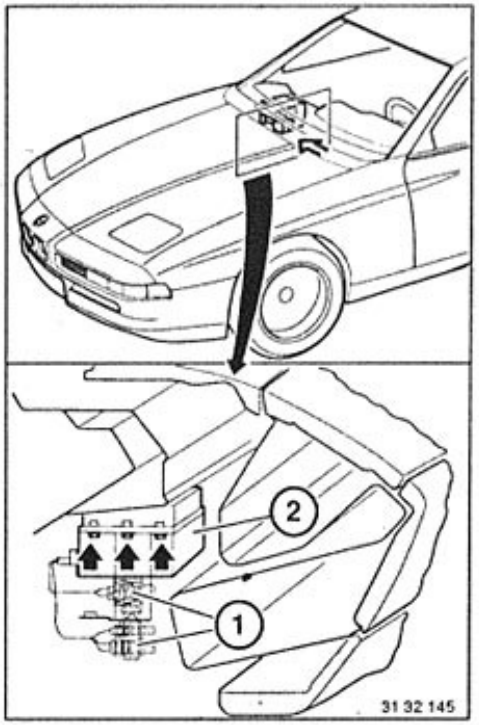


Unscrew screw.
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of the lock.



Twist plug (orange) out of the holder and disconnect.



Remove trim panel for dashboard at bottom right.

Disconnect (orange) plugs (1).
Unscrew screws.
Remove diagnosis unit (2).

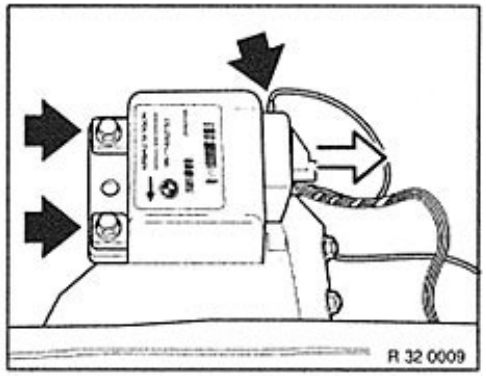
Installation:
Arrow on unit faces forward.

65 77 012 Removing and installing or replacing control unit for airbag II

see Repair Instructions for 3 Series E36.

65 77 016 Removing and installing basic / central airbag

Caution!
Observe safety regulations!
Incorrect handling can trigger the airbag, possibly causing injury.
Disconnect battery and cover ground terminal.
After assembly, perform function check.



Remove oddments tray, see 51 16 200.
Unfasten screws, disconnect cable connector and remove basic / central airbag unit.

Installation:
Arrow on unit points in direction of travel.

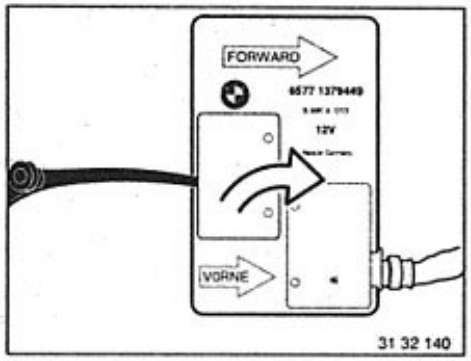
65 77 018 Replacing basic / central airbag unit

Remove and install basic / central airbag unit, see 65 77 016.

Code new unit wity MoDiC.

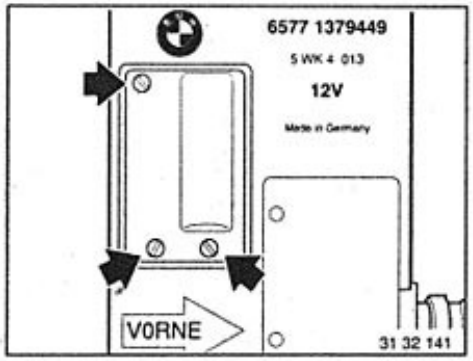
65 77 015 REPLACING CAPACITOR OF AIRBAG DIAGNOSIS UNIT

Remove diagnosis unit – see 65 77 010.

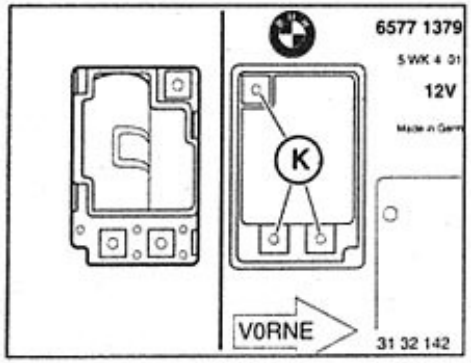


Open cover with a feeler gage blade (0.20 mm) or small screwdriver.

Installation:
Install new cover.



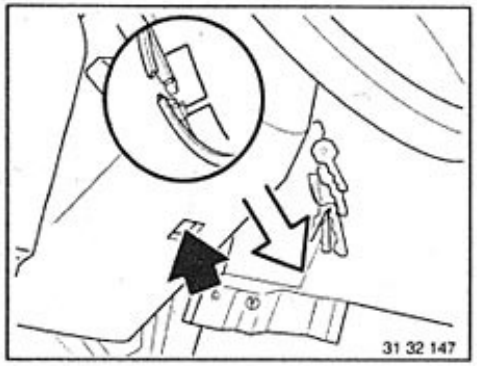
Unscrew screws and take off capacitor.



Installation:
Clean contact surfaces (K).

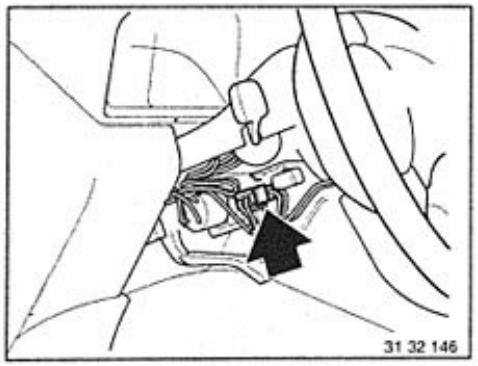
65 77 020 Removing and installing or replacing one front airbag sensor

Caution!
Observe safety instructions!
Incorrect handling can trigger the airbag, possibly causing injury.
Disconnect battery and cover ground terminal.

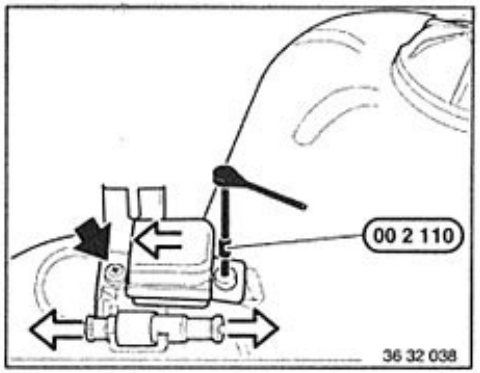


Unfasten screw.
Remove lower section of steering column trim from upper section.

Installation:
Ensure that locking fixture is correctly located.



Twist connection (orange) out of bracket and unfasten.



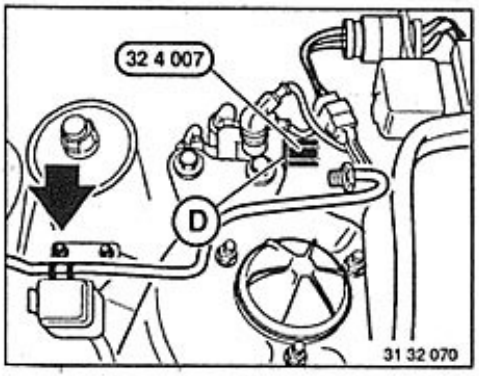
Unfasten connector and unscrew screws using tool 00 2 110.

Installation:
Arrow on sensor points in direction of travel.
Tightening torque*.

* Refer to Technical Data

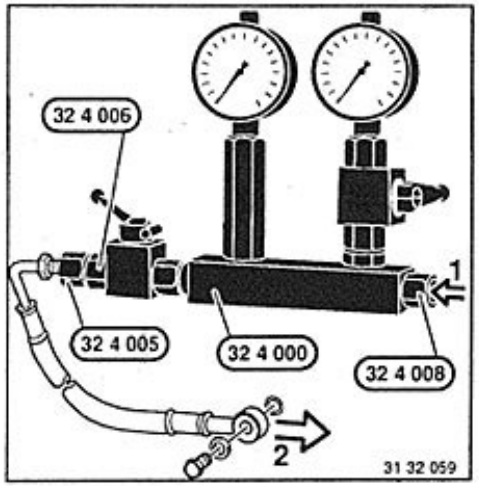
32 41 005 CHECKING OPERATION OF POWER STEERING (H-31 System)

– Engine at Operating Temperature –
Check hydraulic fluid level in tank.
Check all hose connections and equipment (pump, brake booster, power flow regulator and steering gear) for leaks before checking operation.



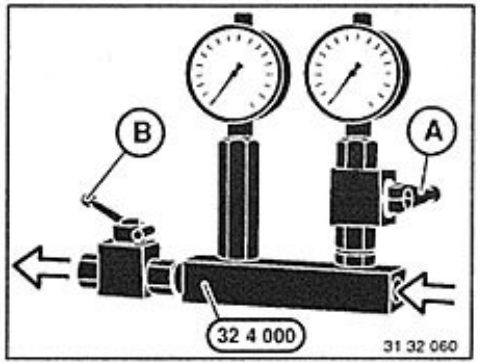
Discharging Pressure:
Stop engine and operate brake pedal about 20 times.
Unscrew pipe on power flow regulator and connect Special Tool 32 4 007.

D = Gasket



Install Special Tools 32 4 000 / 005 / 006 / 008 between pump (1) and power flow regulator (2).

Note:
Special Tool 54 3 100 could also be used instead of Special Tool 32 4 000.



A = Shutoff valve (low pressure from 0 to 15 bar / 0 to 213 psi)
B = Shutoff valve (high pressure from 0 to 150 bar / 0 to 2133 psi)

Caution!
Shutoff valve (A) must always be closed for high pressure tests to avoid damaging the pressure tester.

Open valve (B).
Close valve (A).
Start engine and fill tank with hydraulic fluid*.

Bleeding System:
Turn steering wheel twice each against left and right locks.
Operate brake pedal 5 times, wait 30 seconds and operate pedal another 5 times.

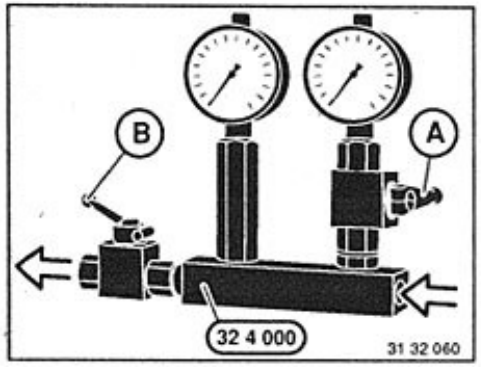
Hydraulic fluid temperature should be approx. 50° C (122° F) for all tests.
If necessary, increase the temperature by turning the steering wheel against locks with the engine running.

1. Checking Flow Pressure:
Open valve (B).
Close valve (A) and run engine.
Open valve (A) and read pressure when pressure is less than 15 bar (213 psi). Max. permissible flow pressure of 8 bar (114 psi) must not be exceeded. Pressure greater than 8 bar (114 psi): check power flow regulator and steering gear.

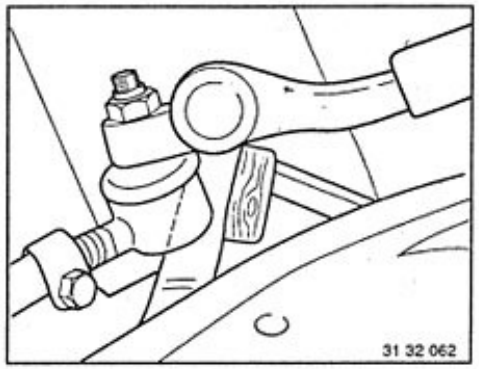
32 41 505 CHECKING POWER FLOW REGULATOR AND STEERING GEAR

Discharge pressure. Install pressure tester between power flow regulator and steering gear. Bleed system. Carry out test as described above. With pressure less than 8 bar (114 psi), replace power flow regulator – see 34 33 100. With pressure more than 8 bar (114 psi), replace steering gear – see 32 13 060. Recheck flow pressure between pump and power flow regulator.

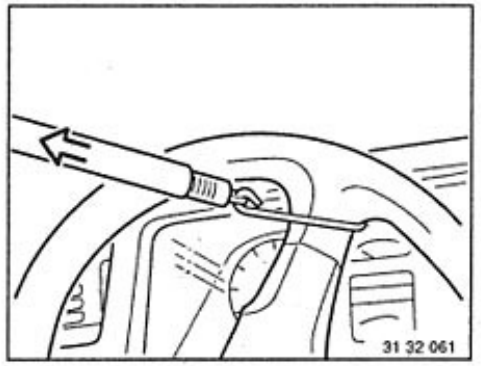
* See Operating Fluids



2. Checking Pump:
Install pressure tester between pump and power flow regulator.
Close valve (A).
Start engine.
Close valve (B) max. 10 seconds and read pressure.
Rated pump pressure* æ 10 % should be reached.
Rated pressure* exceeded, replace pump – see 32 41 061.
Rated pressure* not reached, check drive belt tightness – see 32 41 109.
Repeat test.
Rated pressure* still not reached, replace pump – see 32 41 061.



4. Power Steering:
Pressure tester between pump and power flow regulator – system bled – valve (B) open – valve (A) closed – engine not started.
Lift car.
Stop steering from reaching final left lock by 1/2 to 3/4 steering wheel turn with a piece of wood or something similar.



Start engine.
Pull steering wheel against final left lock with a force of 100 N (22 lbs.) (force meter) about 5 seconds and read pressure.
If pressure values are lower than pump pressure determined in point 2, replace steering gear – see 32 13 060.

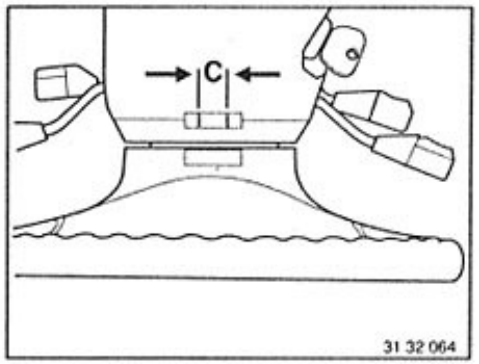
3. Checking Reservoir Charge Pressure:
Pressure tester between pump and power flow regulator.
System bled.
Engine not started.
Vlave (B) open.
Valve (A) closed.
Start engine and observe pressure tester.
Pressure must rise to max. 57 bar (811 psi) and then drop immediately to less than 8 bar (114 psi).
If max. permissible pressure of 57 bar (811 psi) is exceeded or there is no immediate pressure drop after reaching the maximum permissible pressure, replace power flow regulator – see 34 33 100.

* See Specifications

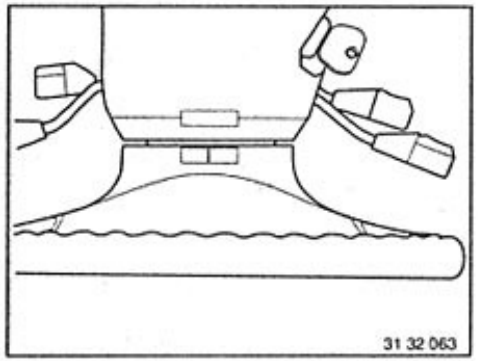
5. Check mechanical backlash in the steering unit:

- Pressure point is set 32 13 014
- No backlash in steering column

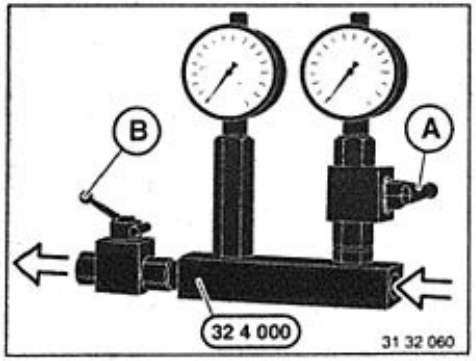
Pressure measuring device between pump and 3-phase controller– System vents – Valve (B) open – Valve (A) closed – Engine not switched on.
Ensure that pitman arm is in straight-ahead position.



Turn steering wheel to left until pressure measuring device indicates 1 bar rise in pressure over throughput pressure.
Mark position of steering wheel hub.
Repeat procedure with steering wheel on right-hand lock.
If max. perm. travel (C) = 7 mm is exceeded, the steering gear must be replaced – 32 13 060.
Remove retaining fixture and pressure measuring device.
Vent hydraulic system and, if necessary, top up hydraulic fluid.



Attach paper strip to steering wheel hub and upper section of trim.
Fit marker to steering wheel hub (center).



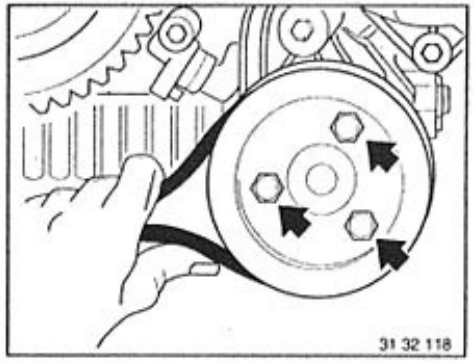
Switch on engine and open valve (A).
Read off throughput pressure.

* Refer to Operating Fluids Specifications

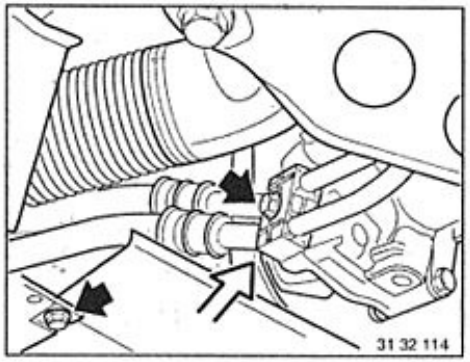
32 41 060 Removing and installing vane pump (tandem pump) for power steering unit

Drain pressure accumulator – Depress brake pedal approx. 20 times.
Draw hydraulic fluid out of container – and do not reuse.
After assembly of power steering unit, bleed: refer to 32 13 006.

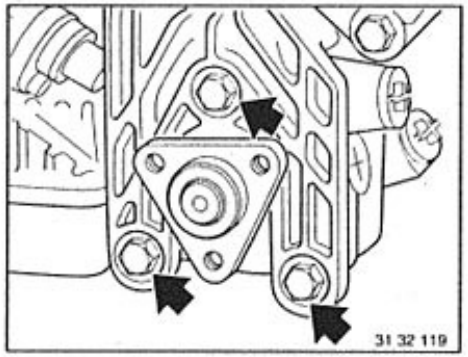
Remove ribbed vee belt.



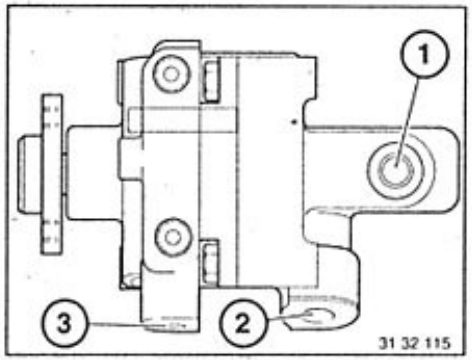
Grip pulley with help of ribbed vee belt.
Unfasten screws.



Remove splash guard.
Unfasten oil cooler line.



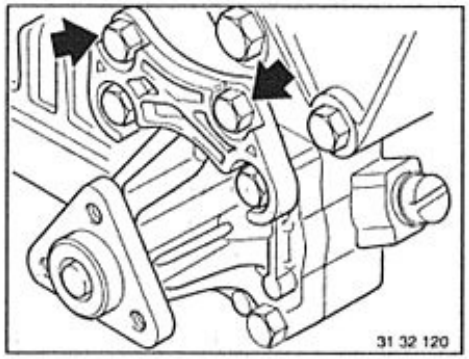
Tandem pump:
Unfasten screws.



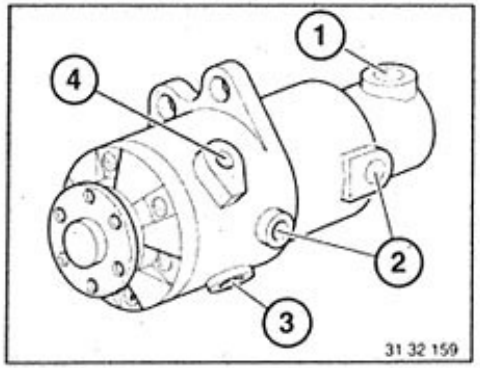
Remove lines.

Installation:
Replace gaskets.
Tightening torque*.
Bleed hydraulic system 32 13 006.

1 to steering unit
2 to container
3 to ASC +T plunger unit

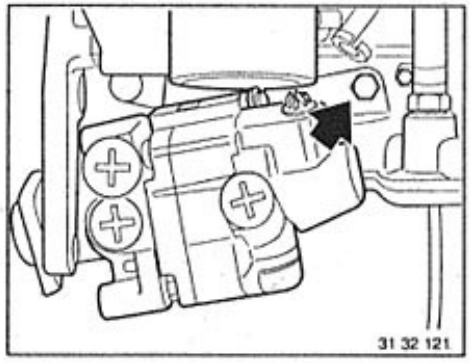


Vane pump:
Unfasten screws.



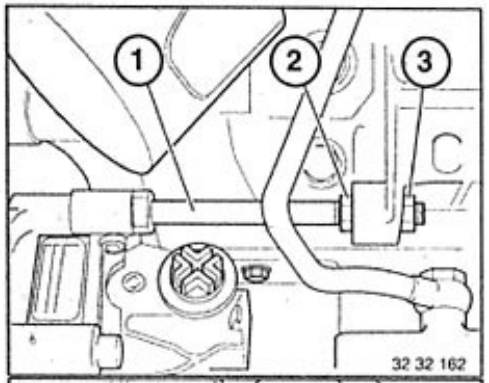
Three-circuit pump:

1 to steering unit
2 to container
3 to ASC +T plunger unit
4 to accumulator charging unit for Active Rear Axle Kinematics (AHK)



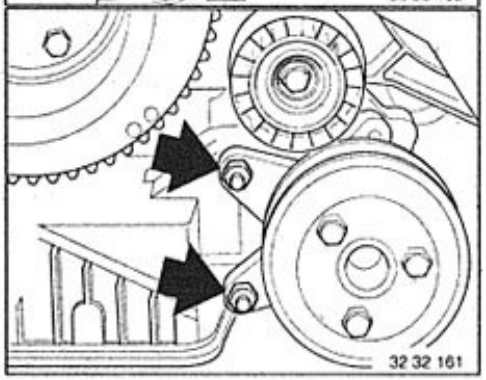
Unfasten screw.
Remove vane pump or tandem pump.

* Refer to Technical Data



from mod. 94:
Loose nut (3).

Installation:
Secure support (1) to pump.
Tightening torque, refer to Technical Data 32 41 2AZ.
Tighten nut (2) hand-tight against engine support screws.
Tighten down nut (3). Tightening torque, refer to Technical Data 32 41 2 AZ.

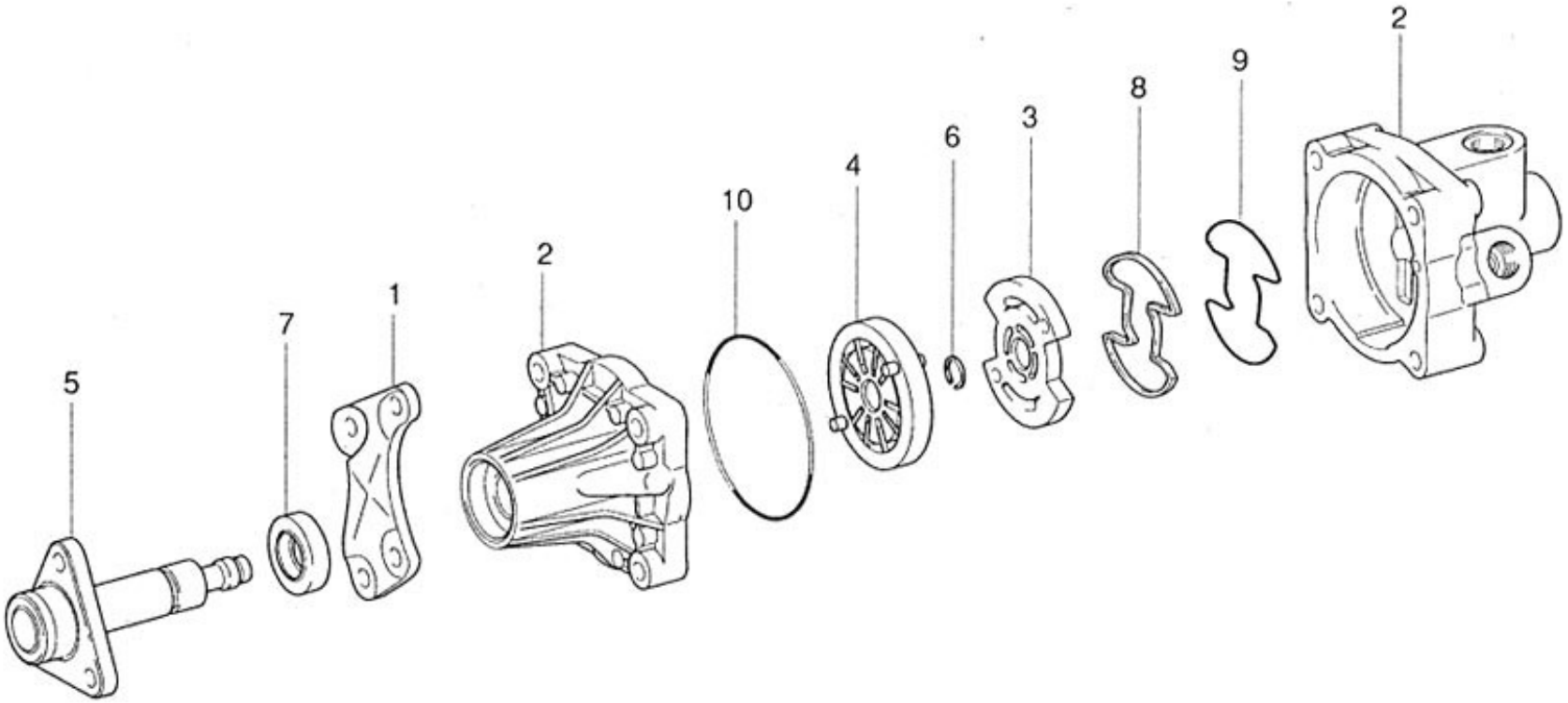


Unfasten retainer on oil pan and remove pump.

Installation:
Tightening torque, refer to Technical Data 32 41 2AZ.

POWER STEERING IMPELLER PUMP

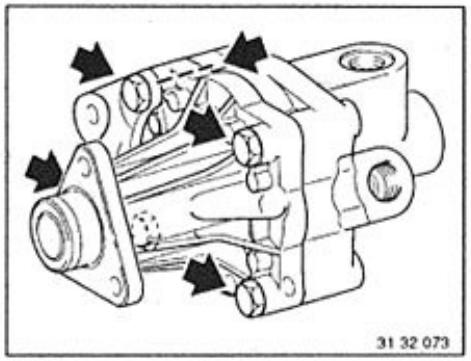
1 Holder
2 Body
3 Face plate
4 Rotor
5 Shaft
6 Circlip
7 Radial oil seal
8 Seal
9 Guide
10 O-ring



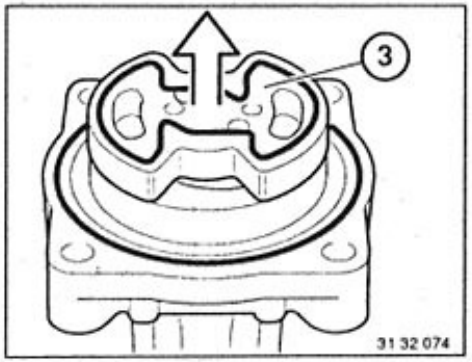
31 32 072

32 41 553 DISASSEMBLING AND ASSEMBLING POWER STEERING IMPELLER PUMP
– Pump Removed –

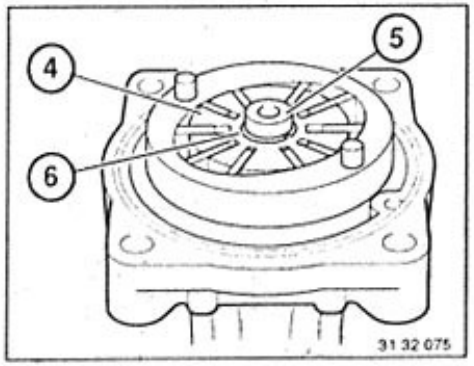
Absolute cleanliness is essential when working on pumps.



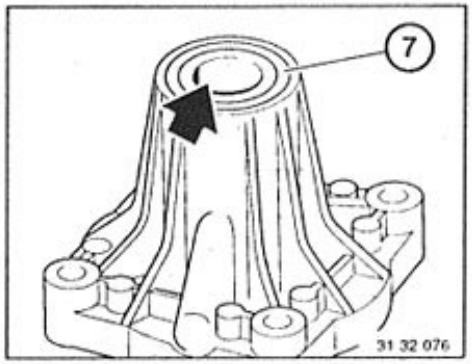
Mark position of holder (1) to pump body (2).
Unscrew bolts and separate housing.



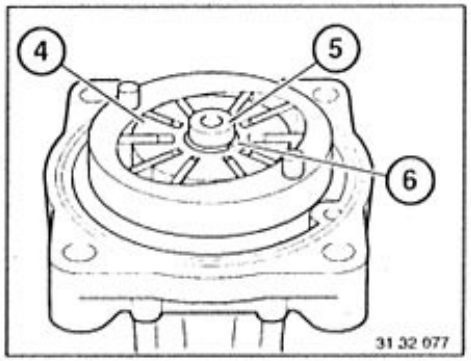
Take off face plate (3).



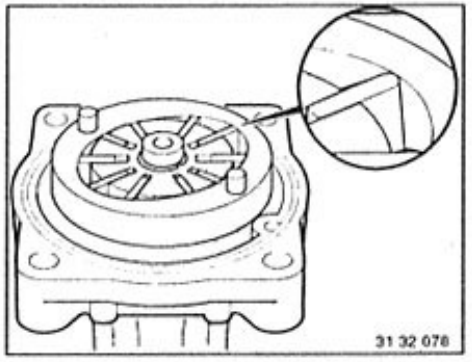
Press down rotor (4) on shaft (5).
Remove circlip (6) and pull shaft out of body.
Remove rotor (4).



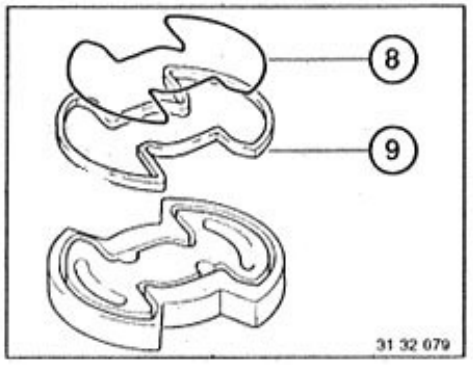
Assembling:
Clean and lubricate all parts with hydraulic fluid.
Replace radial oil seal (7) – sealing lip faces in – and pack space between sealing and dust lips with grease.



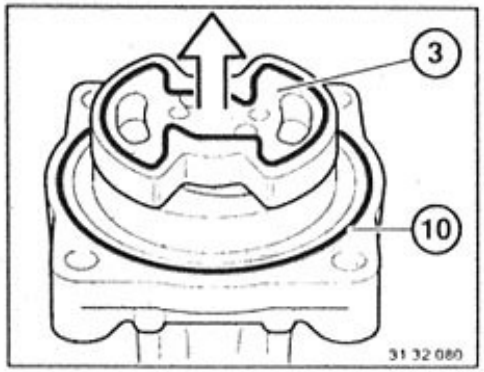
Insert shaft (5) in body.
Mount rotor (4) with recess for circlip facing up and install circlip (6) in radial groove of the shaft.



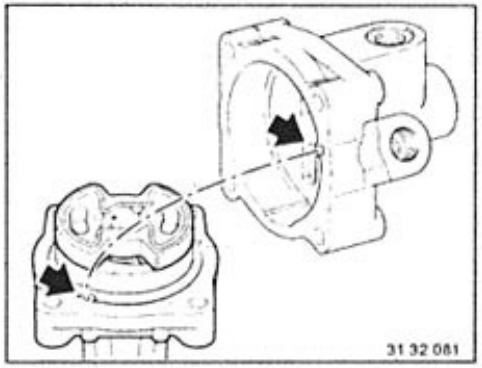
Install the impeller with the polished, rounded outside surfaces facing the cam ring.
Check that impeller moves easily.



Install seal (8) with wide end facing down and guide (9) in face plate (3).



Install face plate (3) on dowel pins.
Replace O-ring (10).

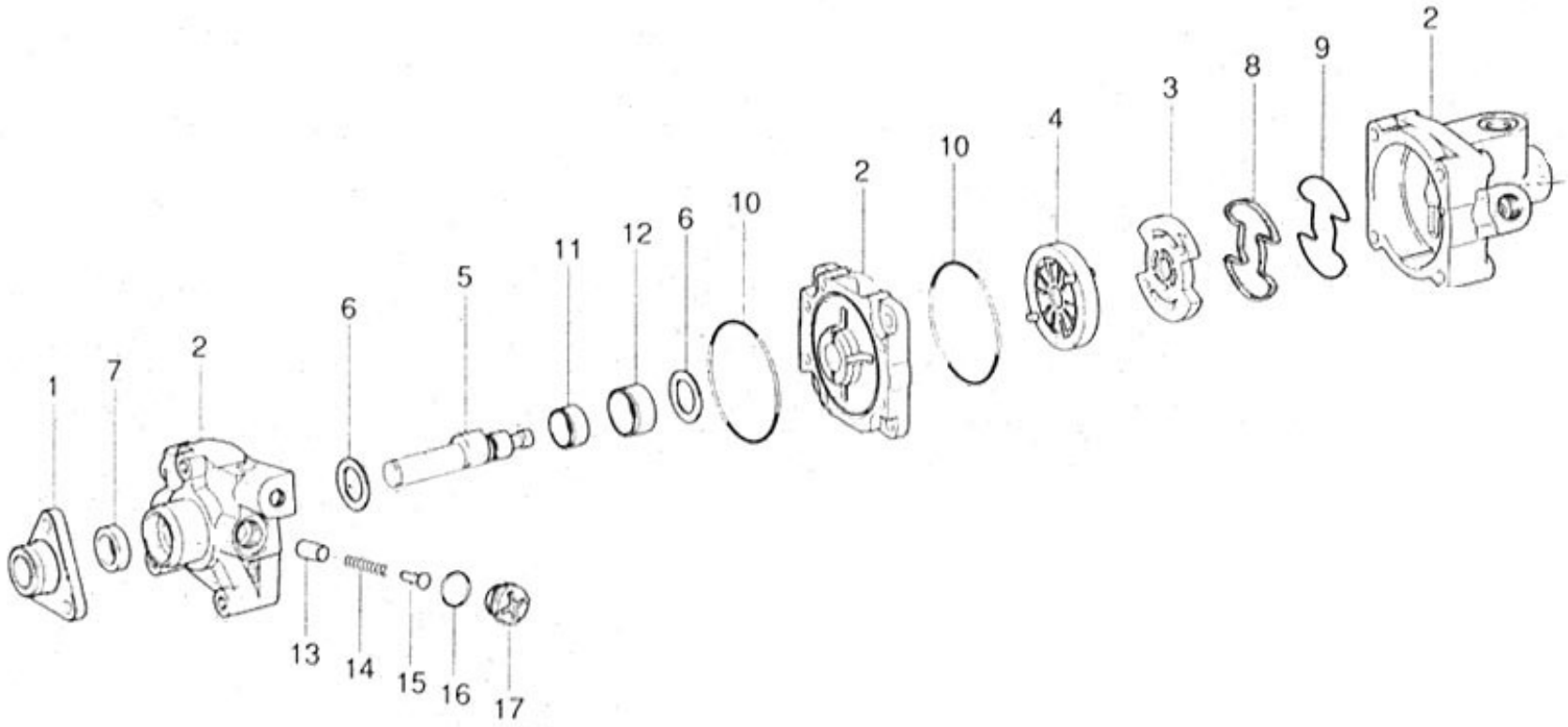


Mount body (checking that bores are aligned) and bolt down with the holder. Tightening torque = 16 ... 19 Nm (12 ... 14 ft. lbs.).

Check function after installation of the power steering impeller pump.

TANDEM PUMP

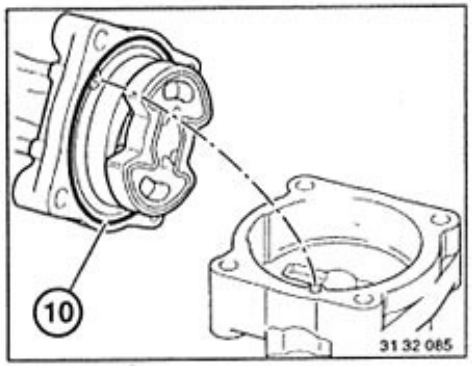
1 Flange
2 Body
3 Face plate
4 Rotor
5 Shaft
6 Axial washer
7 Radial oil seal
8 Seal
9 Guide
10 O-ring
11 Sleeve
12 Slide
13 Piston
14 Spring
15 Shaft
16 O-ring
17 Plug



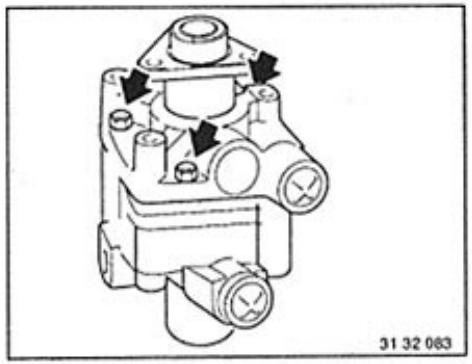
51 32 062

32 41 555 DISASSEMBLING AND ASSEMBLING TANDEM PUMP
– Pump Removed –

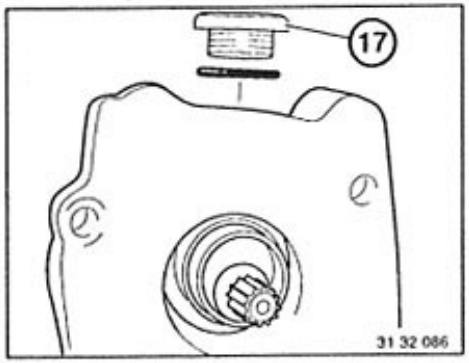
Absolute cleanliness is required when assembling the pump.
Lubricate all parts with hydraulic fluid.



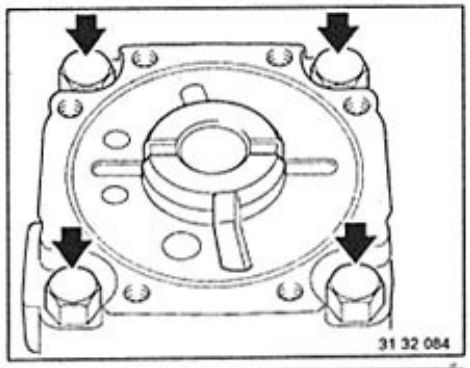
Replace O-ring (10).
Bolt body – bore to bore.
Tightening torque = 14 $^{+5}$ Nm (10 $^{+4}$ ft. lbs.).



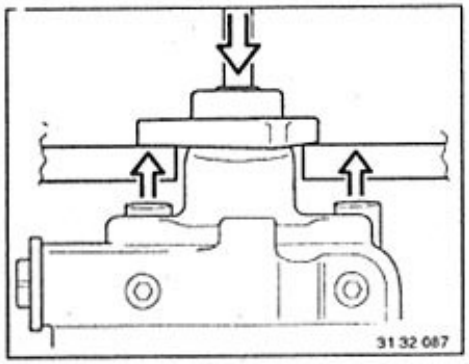
Mark position of the flange to the shaft and body sections to each other.
Unscrew bolts.
Take off body.



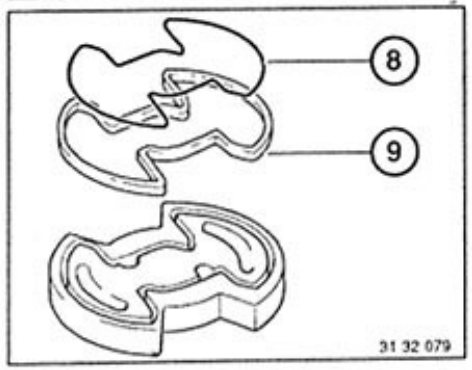
Unscrew both plugs (17).
Take off piston and sliding ring with sleeve.



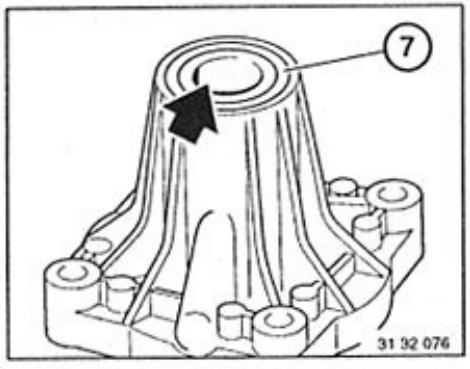
Unscrew bolts.
Take off body (4).



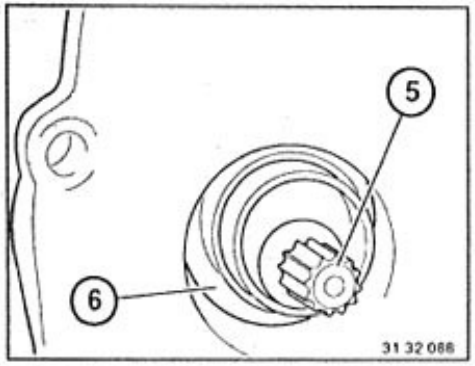
Press triangular flange off of the shaft with a press, while supporting on the flange.



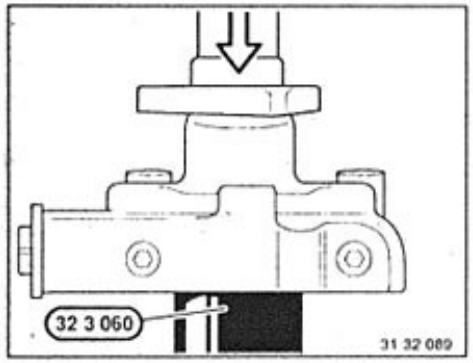
Replace seal (8) (wide end facing plate) and guide (9).



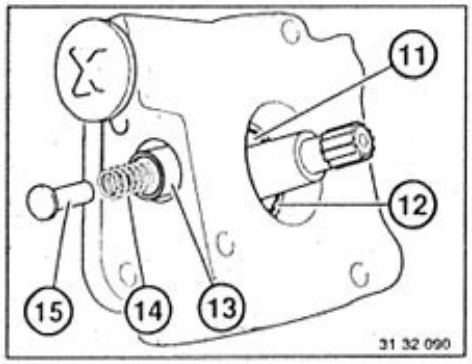
Replace radial oil seal (7) – sealing lip facing in and filled with grease.



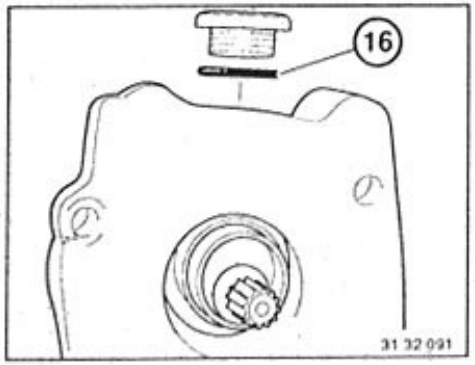
Install axial washer (6) and run in shaft (5).



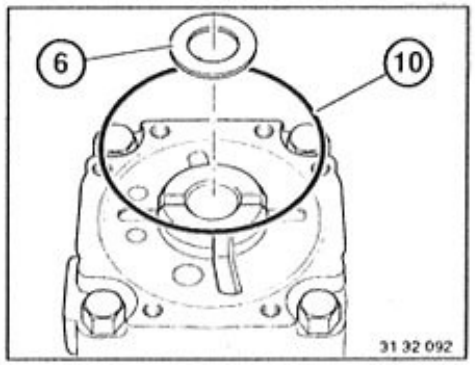
Press on flange with Special Tool 32 3 060.
Shaft protrusion = approx. 1 mm (0.039").
Check marks.



Insert sleeve (11) and sliding ring (12).
Slide in both pistons (13), spring (14) and shaft (15).

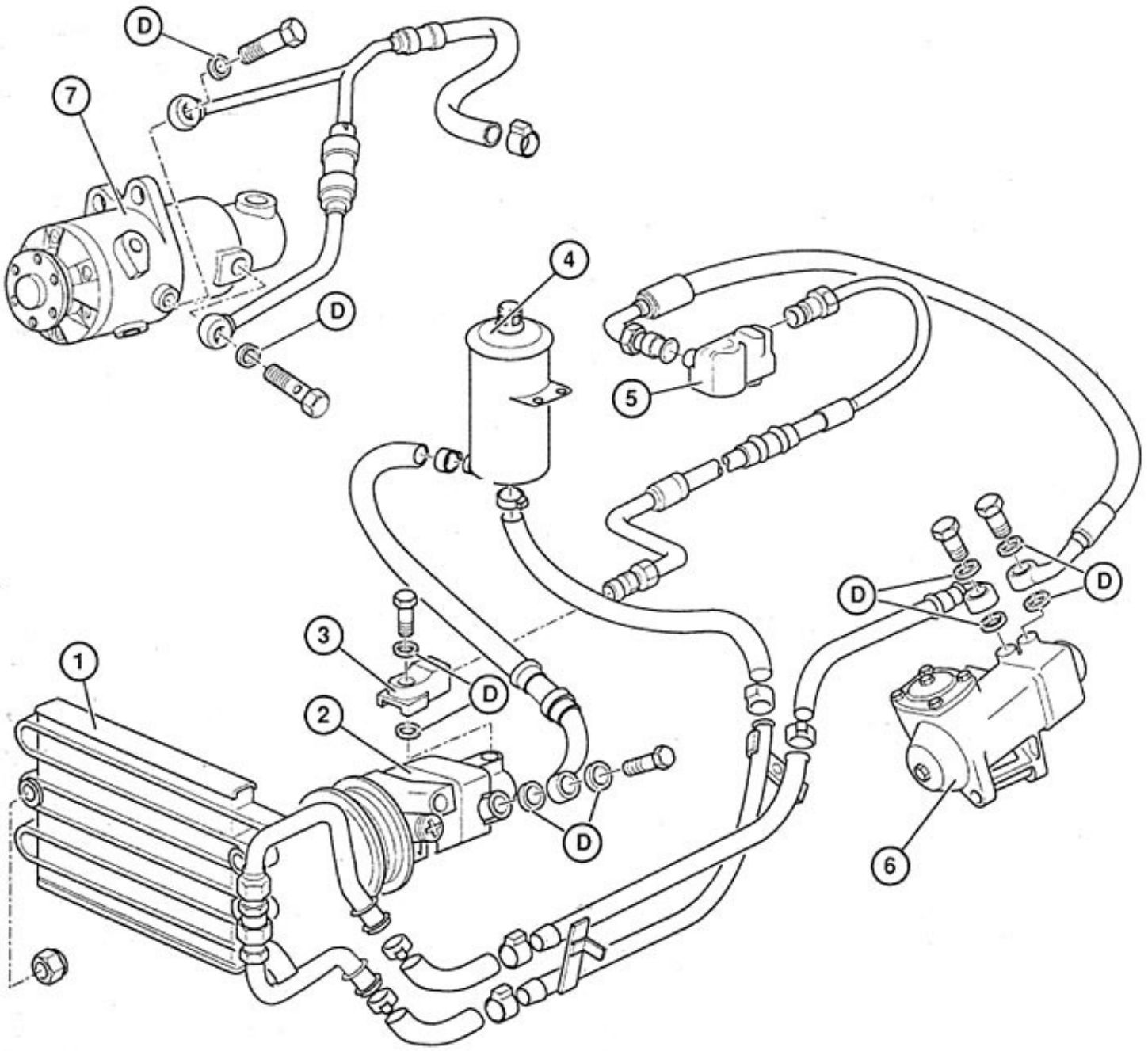


Replace O-ring (16).
Tighten plugs (17) with a torque of 50 Nm (36 ft. lbs.).



Replace O-ring (10).
Insert axial washer (6).
Mount and bolt body.
Tightening torque = 8 Nm (6 ft. lbs.).
Other jobs – see 32 41 553.

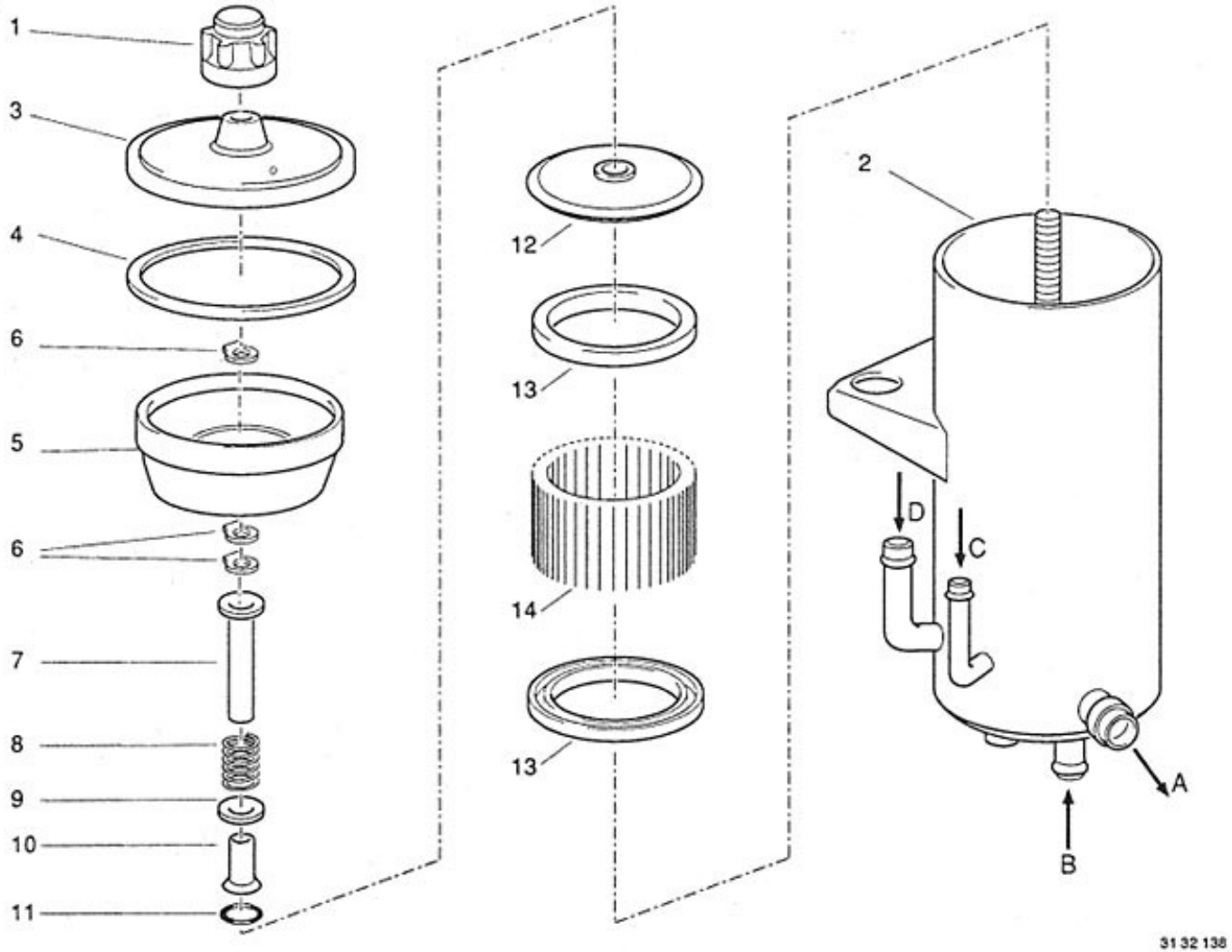
POWER STEERING COMPONENTS AND PIPES



1 Oil cooler
2 Power pump/tandem pump
3 Adapter
4 Oil supply tank
5 Power flow regulator
6 Steering gear
7 Triple-circuit pump for version with AHK (active rear axle kinematic)
D Seals

31 32 158

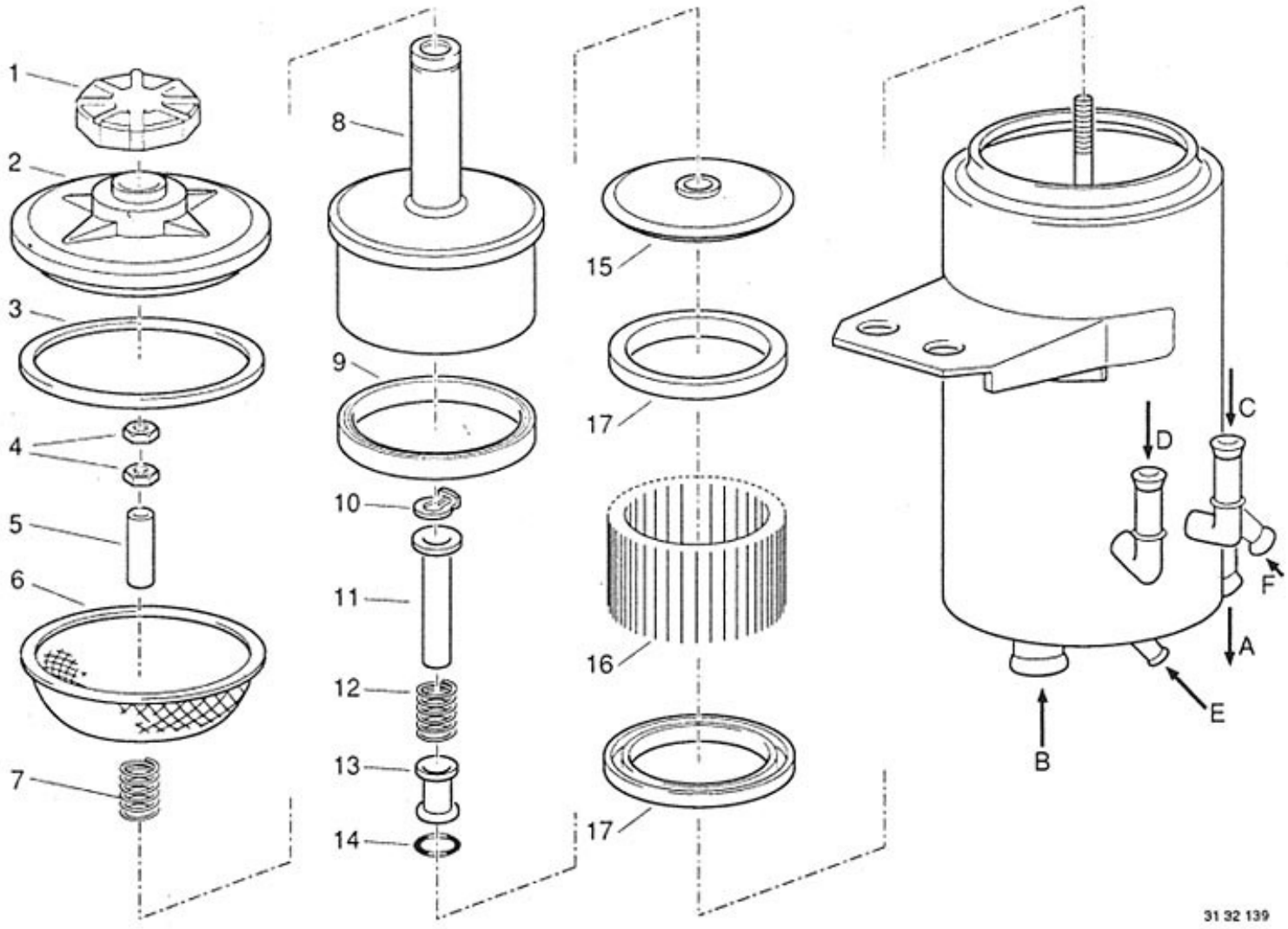
OIL SUPPLY TANK



1 Cap
2 Tank
3 Cover
4 Seal
5 Oil strainer
6 Retainer
7 Guide pipe
8 Spring
9 Washer
10 Sleeve
11 O-ring
12 Pressure relief valve
13 Seal
14 Filter element

A To pump
B From steering gear
C From charging valve (power flow regulator)
D From brake booster

OIL SUPPLY TANK (with ASC + T)



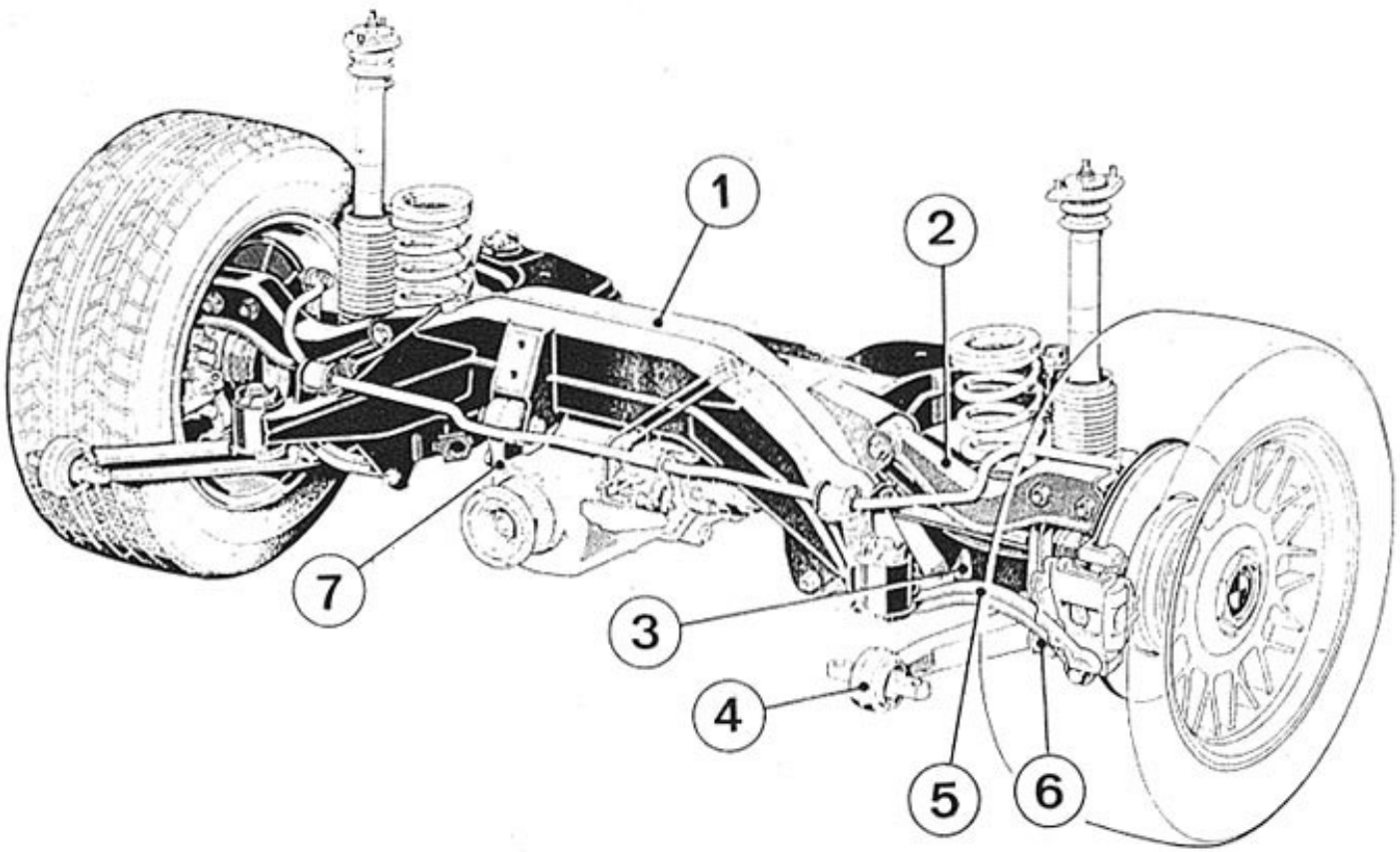
1	Cap
2	Cover
3	Seal
4	Nut
5	Pipe
6	Oil strainer
7	Spring
8	Oil strainer
9	Seal
10	Retainer
11	Guide pipe
12	Spring
13	Spacer
14	O-ring
15	Pressure relief valve
16	Filter element
17	Seal

A	To pump
B	From steering gear
C	From charging valve (power flow regulator)
D	From brake booster
E	From ASC+T (recirculation)
F	From ASC+T (return)

33 Rear axle

	Rear axle layout	33- 0/1
	Layout – rear axle – components	33- 0/2
	Running-in specifications when exchanging / repairing final drive	33- 10/1
33 10 010	Final drive – remove and install or replace	33- 10/2
33 11 151	Shaft seal for driver flange – replace	33- 11/1
33 15 005	Cooling circuit for final drive oil cooling – remove and install or replace	33- 15/1
33 17 006	All rubber mounts on final drive mounting (front and back) – replace	33- 17/1
503	All rubber mounts on final drive rear mounting – replace	33- 17/2
010	Final drive bracket – replace	33- 17/3
510	Final drive bracket rubber mounts – replace	33- 17/3
33 21 000	Output shaft – remove and install or replace	33- 21/1
031	Dust cover – replace	33- 21/2
33 31 000	Rear axle carrier, complete (with final drive and control arms) – remove and install	33- 31/1
33 32 021	Semi-trailing arm – replace	33- 32/1
551	Rubber mount for semi-trailing arm – replace	33- 32/2
051	Traction strut – integral link – remove and install or replace	33- 32/3
651	Rubber mount in the traction strut of integral link – replace	33- 32/3
071	One upper control arm – replace	33- 32/4
671	One rubber mount in upper control arm – replace	33- 32/4
091	Traction strut – remove and install or replace	33- 32/5
691	Rubber mount on traction strut – replace	33- 32/5
111	Supporting arm – remove and install or replace	33- 32/6
711	Ball joint in supporting arm – replace	33- 32/6
131	Wheel carrier – remove and install or replace	33- 32/7
719	Ball joint in lower wheel carrier – replace	33- 32/7
725	Ball joint in upper wheel carrier – replace	33- 32/8
33 33 101	Two rubber mounts for rear axle carrier – replace	33- 33/1
	Active Rear axle Kinematics (AHK)	33- 34/1
	General instructions on AHK	33- 34/1
	Layout of AHK	33- 34/2
	Layout: actuator unit with supporting arm	33- 34/3
	Layout: hydraulic lines	33- 34/4
	Hydraulic circuit diagram – AHK	33- 34/5
33 34 000	AHK hydraulic system – function check	33- 34/6
005	AHK hydraulic system – bleed	33- 34/7
015	Double joint, left or right – remove and install or replace	33- 34/8
020	Intermediate lever, left or right – remove and install or replace	33- 34/9
520	Accumulator charge unit – remove and install or replace	33- 34/10
530	Actuator unit – remove and install or replace	33- 34/11
540	Pressure sensor – remove and install or replace	33- 34/12
545	Filter in accumulator charge unit – replace	33- 34/13
547	Filter in actuator unit – replace	33- 34/13
550	Control unit (AHK) – remove and install or replace	33- 34/14
33 41 151	Wheel bearing in rear axle shaft, left or right – replace	33- 41/1
33 52 000	Shock absorber, rear – remove and install or replace	33- 52/1
33 53 000	Coil spring, left or right – remove and install	33- 53/1
	Rear axle – troubleshoot	33- 90/1

REAR AXLE ASSEMBLY DRAWING



330301

1 = Rear axle carrier

2 = Upper control arm / camber adjustment

3 = Lower support arm / toe adjustment

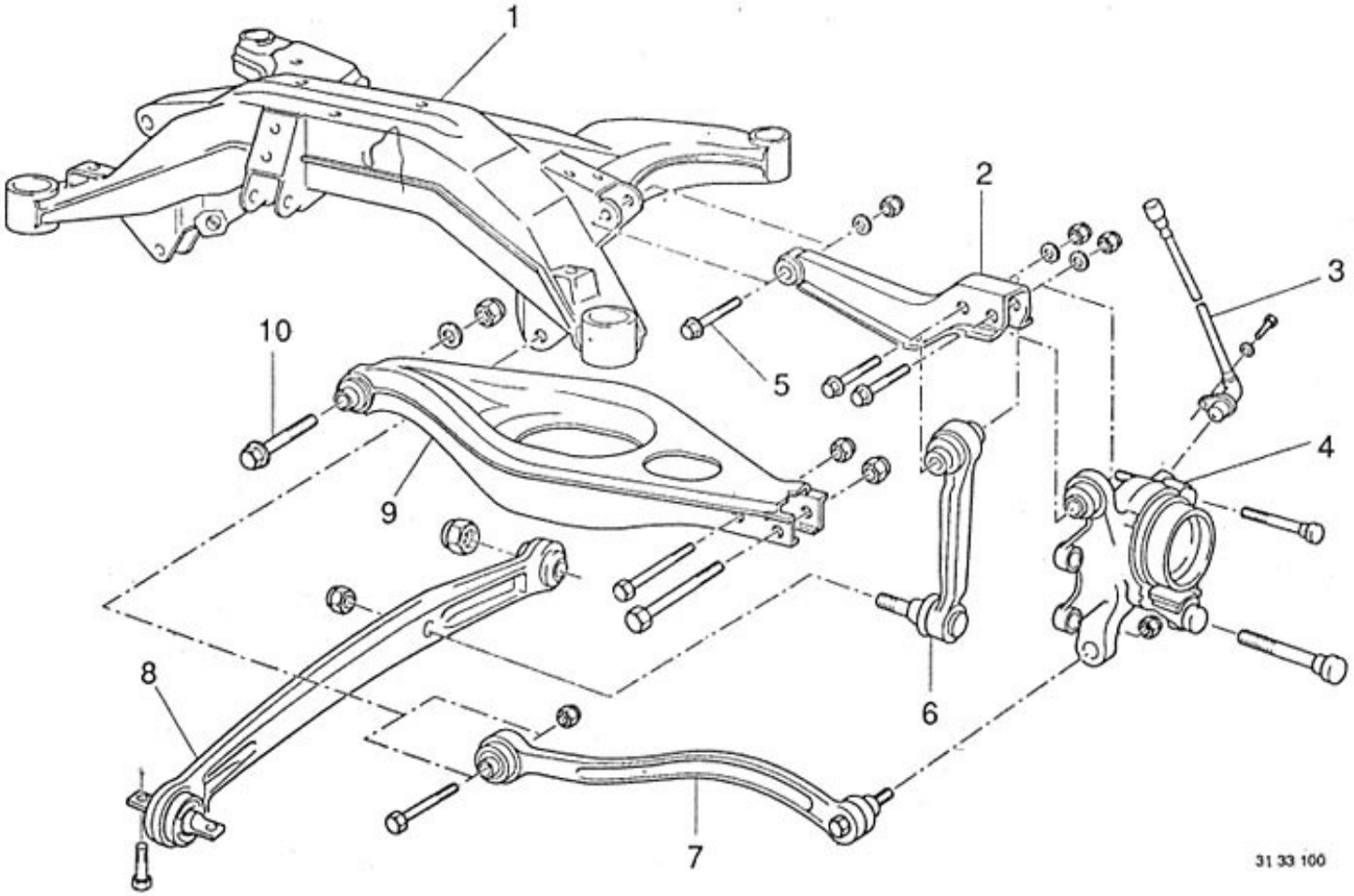
4 = Trailing arm

5 = Front control arm / guide arm

6 = Push rod / integral arm

7 = Final drive holder

REAR AXLE COMPONENTS



1 = Rear axle carrier

2 = Upper control arm

3 = ABS sensor

4 = Wheel carrier

5 = Camber adjusting bolt

6 = Push rod / integral

7 = Guide arm

8 = Trailing arm

9 = Lower support arm

10 = Toe adjusting bolt

BREAKING-IN PROCEDURES AFTER REPLACING/REPAIRING FINAL DRIVE

Strict conformance with these breaking-in procedures is required for preloading the tapered roller bearing.

During the first 1,000 km the car must be driven at different engine speeds and road speeds, but never faster than 2/3rds of the max. permissible speed.

If there is no conformance with these breaking-in procedures there could be seizure between the tapered rollers and inner race guide band, which in turn will continuously cause noise, overheating and oil leakage.

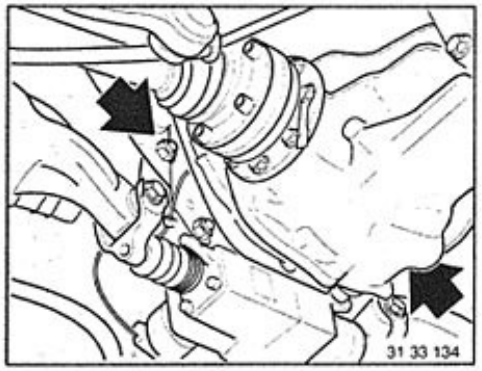
Install a label or tag to remind the driver of the breaking-in specifications and next oil change.

33 10 010 Removing and installing or replacing final drive

Note:
When replacing unit, carefully note ratio embossed on type plate.

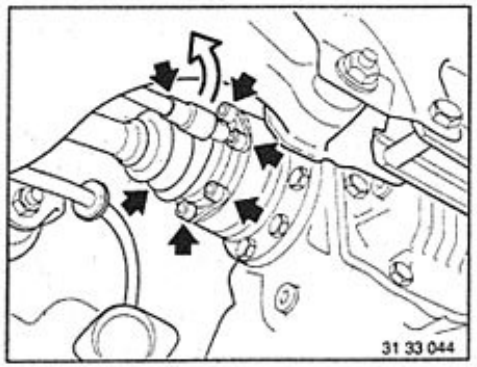
When work is complete:
Check oil level and, if necessary, top up oil in final drive **.

Disconnect propeller shaft from final drive, see 26 11 000.



Vehicles with AHK (Active Rear Axle Kinematics) up to 9.92:
Unfasten screw connection (intermediate lever with rear axle carrier).
Partially remove screws.

Installation:
Replace self-locking nut.
Tightening torque 33 34 11AZ*



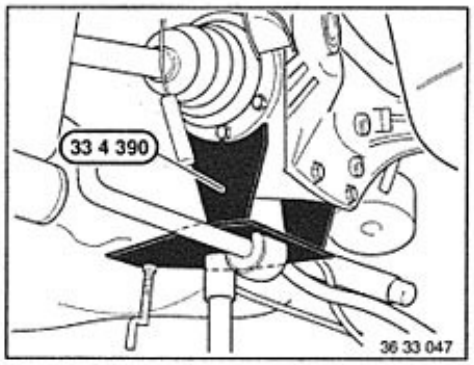
Unfasten screws.
Lift wheel carrier with hydraulic lifter 00 2 030 until the output shaft can be removed from the driver flange.

Installation:
Fit washers.
Tightening torque 33 21 1AZ*

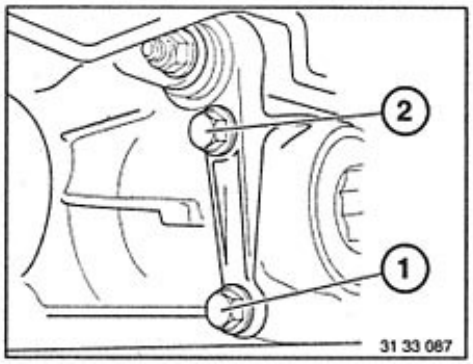
* Refer to Technical Data
** Refer to BMW Parts Service

If transmission oil cooler is fitted:
drain off oil in final drive.
Disconnect oil lines (to cooling circuit) on final drive.

Installation:
Screw-in plug: tightening torque 33 11 6AZ*
Replace O-rings.
Oil lines: tightening torque 33 11 7AZ*

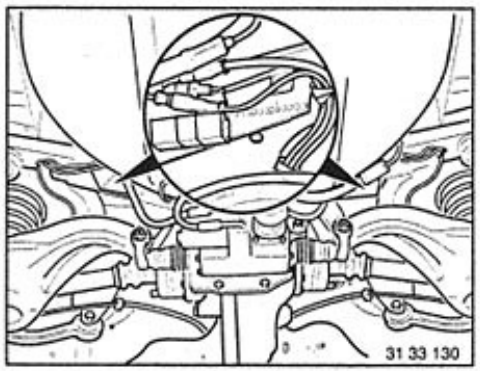


Support final drive with hydraulic lifter 00 2 030 in conjunction with special tool 33 4 390.



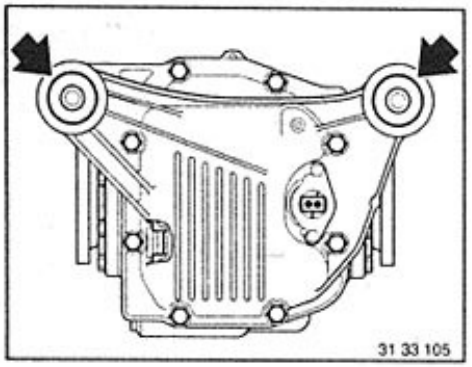
Unfasten screws (1...2).

Installation:
Tightening torque 33 17 7AZ*



Remove plug connector (EDC/ABS/brake lining wear indicator) from the housings on the rear axle carrier.
Remove expanding rivets from case mounting and remove final drive case.

* Refer to Technical Data



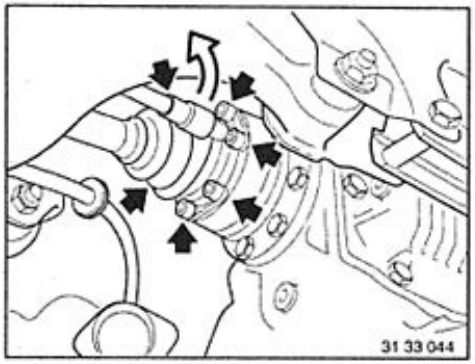
Unfasten screw connection on rear axle carrier and remove screws as far as possible.
Lower final drive until propeller shaft can be removed from the output flange.
Remove cable connector from speedo impulse sensor.
Continue lowering final drive and remove completely.

Installation:
Tightening torque 33 17 1AZ*

* Refer to Technical Data

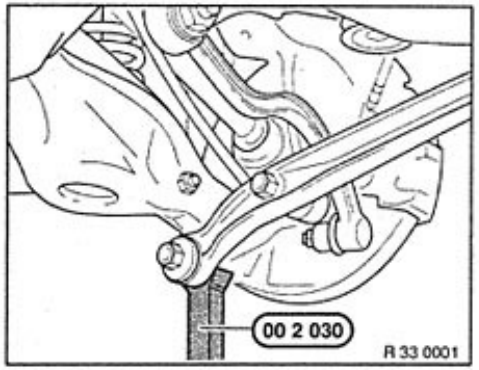
33 11 151 Replacing shaft seal for drive flange

Remove rear section of exhaust unit, see 18 00 020.

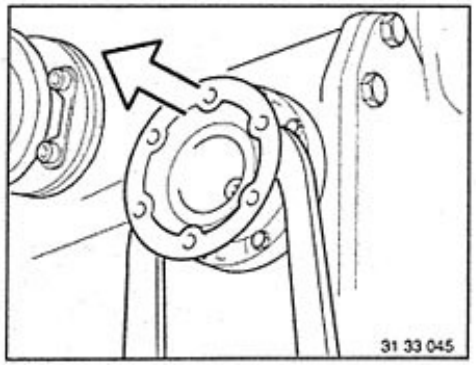


Unfasten screws.

Installation:
Fit washers.
Tightening torque 33 21 1AZ*

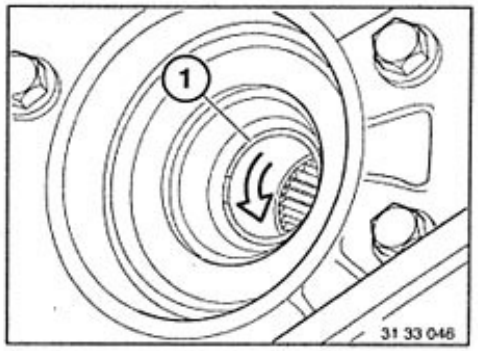


Lift wheel carrier with hydraulic lifter 00 2 030 until the output shaft can be removed from the driver flange.



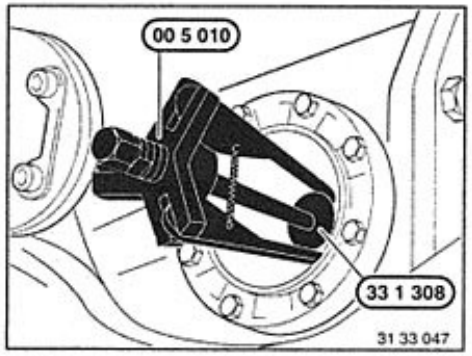
Press off drive flange using pry bar.

* Refer to Technical Data

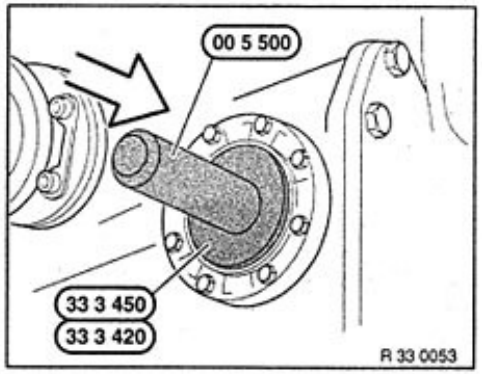


Installation:
Place round wire snap ring (1) in groove of final drive case prior to installation and in such a manner that both ends of ring are recessed in groove.
This prevents lateral bending of the ring. Turn in drive flange by hand with light pressure until the round wire snap ring is heard to engage.

Caution!
Replace stretched snap rings.



Pull out shaft seal with special tool 00 5 010 and special tool 33 1 308.



Installation:
Coat plate housing flange and sealing lips of shaft seal with final drive oil.
Drive shaft seal firmly home with special tool 00 5 500 /
33 3 450 (cover with 8 screws) or
33 3 420 (cover with 6 screws).
Replace drive flange if the bearing surface is seriously scored.

* Refer to Technical Data

33 15 005 Removing and installing or replacing cooling circuit for cooling oil in final drive

Note:
When work is complete, test drive the vehicle, then check final drive oil level and top up if necessary.

Unfasten heat shield on the spare wheel recess.
Disconnect cooling circuit at joints.

Installation:
If necessary, replace O-rings.
Tightening torque 33 11 7AZ*.

Unfasten retaining points of cooling circuit on spare wheel recess and towing console.

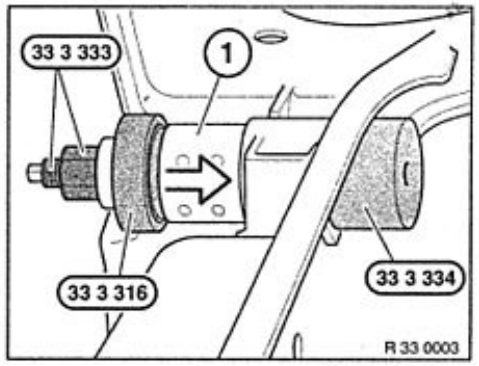
Installation:
Fill cooling circuit with final drive oil prior to installation.**

* Refer to Technical Data
** Refer to BMW Operating Fluids

33 17 006 Replacing all rubber mounts for final drive suspension (front and rear)

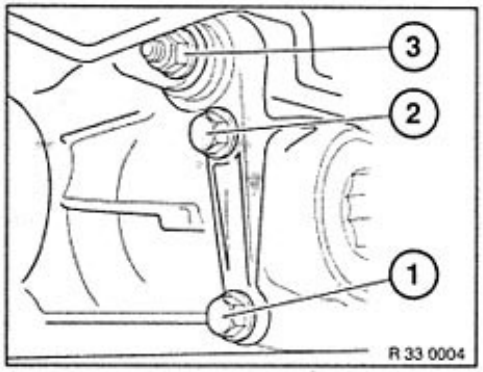
(rubber mount in rear axle carrier)

Remove rear axle, see 33 31 000.



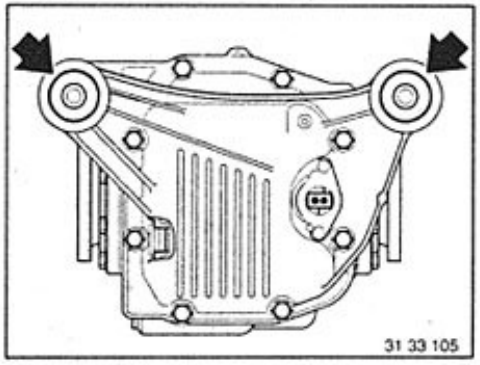
Note:
The stepped side of the rubber mount must point towards the final drive.

Coat new rubber mount (1) with Circolight** and pull in flush with special tool 33 3 316/ 333/ 334.



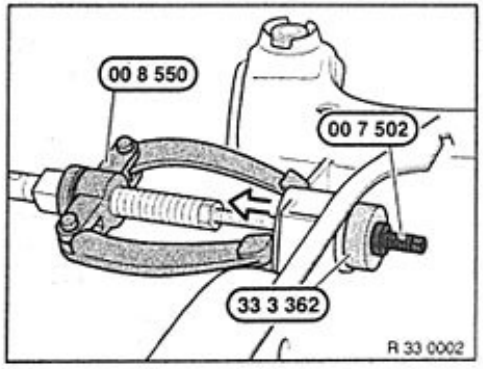
Unfasten screws (1...3).
Pull rubber mounts in and out, see 33 17 510.

Installation:
(1...2) Tightening torque 33 17 7AZ*
(3) Tightening torque 33 17 8AZ*



Unfasten screws.
Lower final drive until there is enough room for the special tool.

Installation:
Tightening torque 33 17 1AZ*



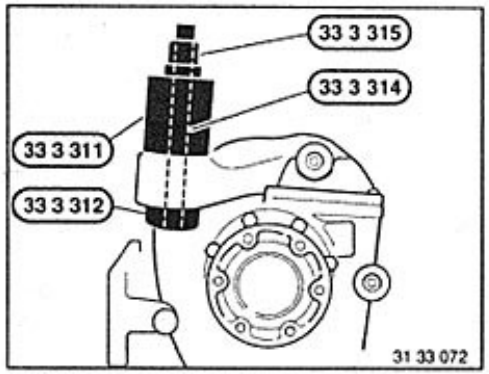
Remove rubber mount using special tool 00 7 502/00 8 550/ 33 3 362.

* Refer to Technical Data

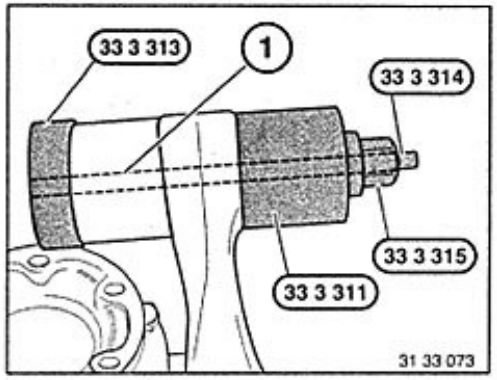
** Refer to BMW Parts Service

33 17 503 Replacing all rear rubber mounts for final drive suspension
(final drive removed)

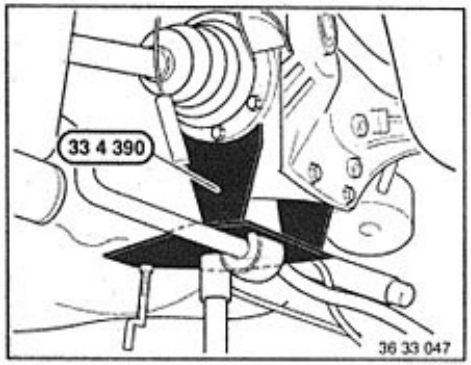
(rubber mount in final drive cover)



Pull out rubber mount with special tool 33 3 311/ 312 / 314 / 315.

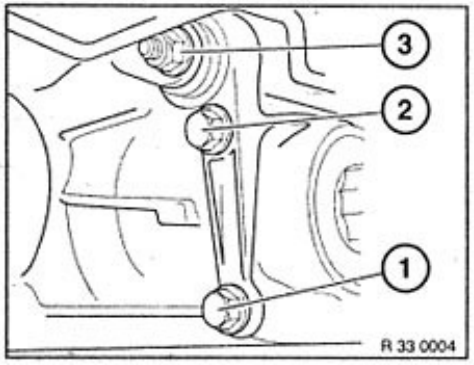


Pull in rubber mount (1) mit special tool 33 3 311/ 313 / 314 / 315.



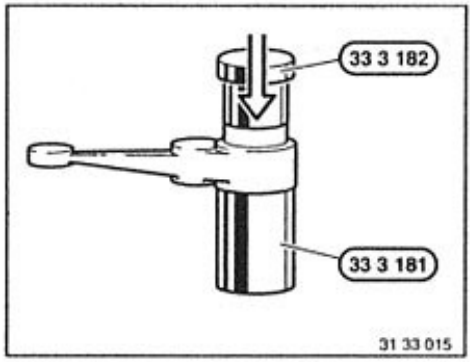
33 17 010 Replacing final drive bracket

Brace final drive with hydraulic lifter 00 2 030 and special tool 33 4 390.



Unfasten retaining screws (1 ...3).

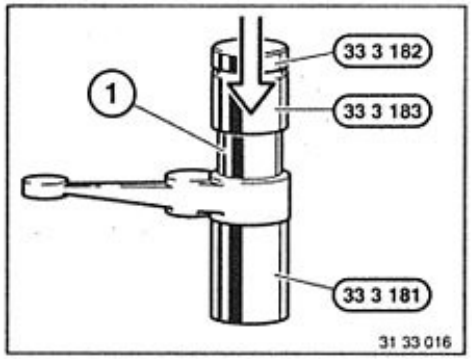
Installation:
(1...2) Tightening torque 33 17 7AZ*
(3) Tightening torque 33 17 8AZ*



33 17 510 Replacing rubber mount on final drive bracket

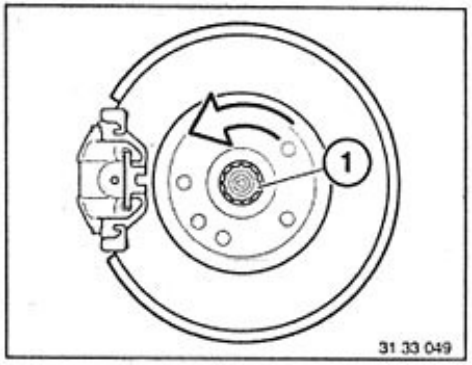
(final drive bracket removed)

Press out rubber mount with special tool 33 3 181 /182.



Press in new rubber mount (1) with special tool 33 3 181 / 182 / 183 from the tapered side of the final drive bracket.

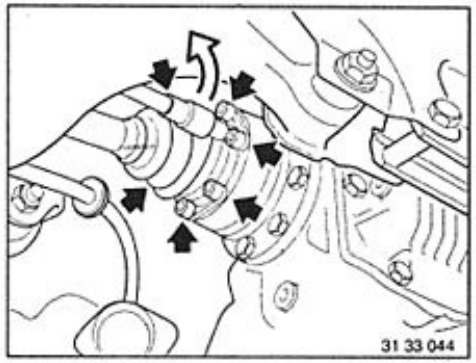
* Refer to Technical Data



33 21 000 Removing and installing or replacing output shaft

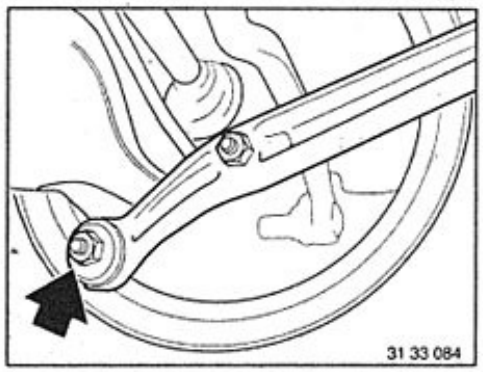
Unfasten collar nut (1).
Remove back wheel, see Gr. 36.

Installation:
Replace collar nut
Tightening torque *
Secure collar nut



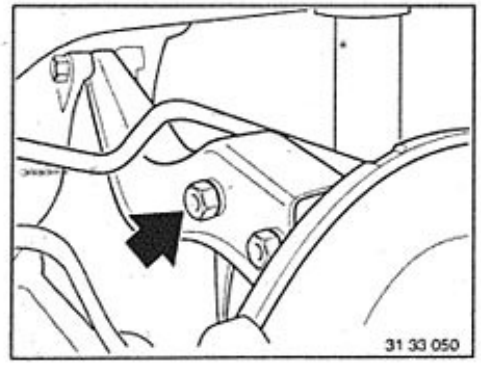
Remove output shaft from final drive output flange.

Installation:
Tightening torque *



Automatic transmission
Unfasten semi-trailing arm and push inwards to provide sufficient space for pressing out the output shaft.
Brace wheel carrier with special tool 00 2 020.

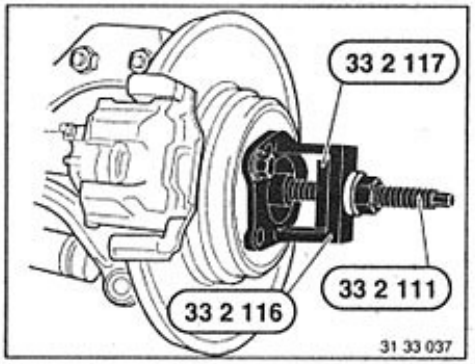
Installation:
Tightening torque *
Replace self-locking nut



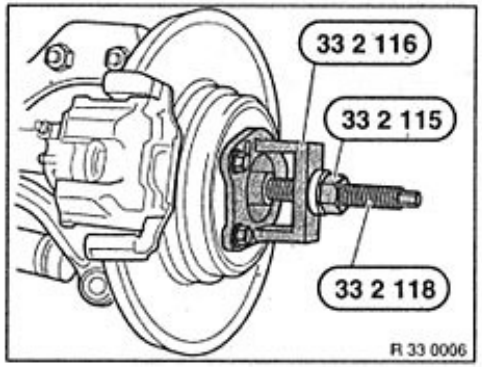
Manual transmission:
Unfasten top of integral link and slide to make sufficient room for pressing out the output shaft.
Brace wheel carrier with special tool 00 2 020.

Installation:
Tightening torque*
Replace self-locking nut.

* Refer to Technical Data



Press output shaft out of drive flange hub with special tool 33 2 111, 116, 117.



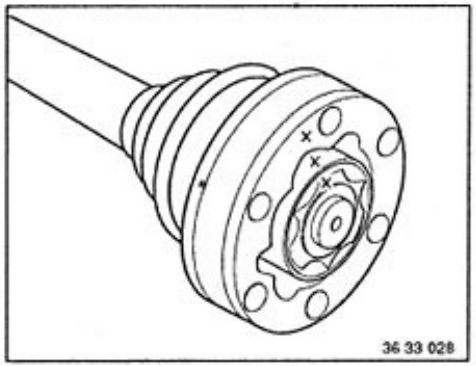
Pull in output shaft with special tool 33 2 115, 116 , 118.

Installation:
Tightening torque* .

* Refer to Technical Data

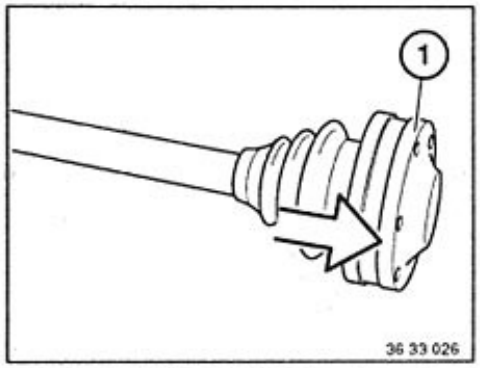
33 21 031 REPLACING DUST COVER

Remove output shaft - refer to 33 21 000.
Clean output shaft.
Use dust cover from repair kit.

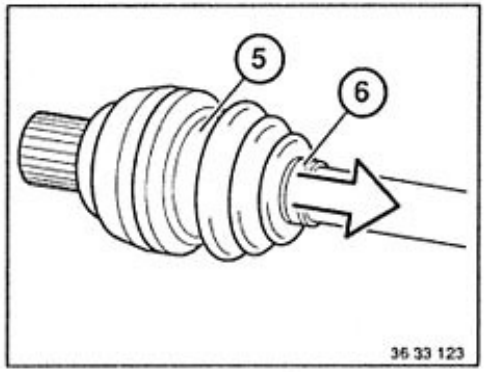


Note:
If the joint has to be disassembled (dirt), mark the position of the ball hub, ball cage and joint to each other on the face with an electric scriber.

Important!
Ensure cleanliness when assembling.

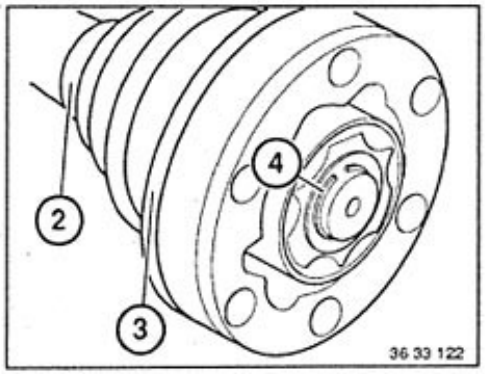


Pry off sealing cover (1).



Loosem hose clamps (5 and 6).
Pull off dust cover over splined shaft.

Note:
Clean constant velocity joint in assembled state thoroughly.
Fill joint with new grease*.

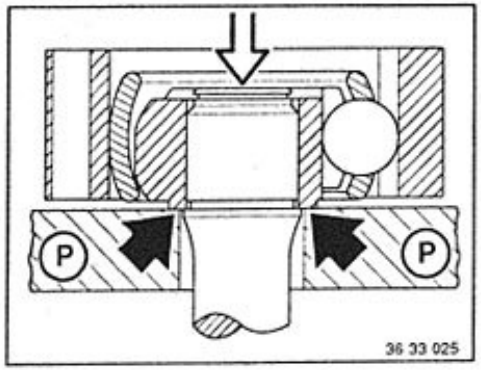


Loosen hose clamps (2).
Press off cap (3) together with dust cover.
Remove circlip (4).

Pull on new dust cover.

Note:
Wrap adhesive tape around splines of the splined shaft for protection of new dust covers.
Lubricate the splined shaft lightly with grease to make installation easier.

Install new hose clamps (5 and 6).



Press splined shaft out of constant velocity joint.

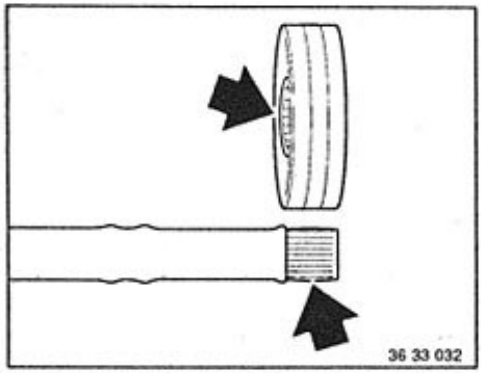
Important!
Bearing inner race must bear on the counterpressure plate (P).
Don't disassemble the joint.
Check joint for dirt or damage.

Pull off dust cover.

Install the transmission-end dust cover.
Remove adhesive tape.

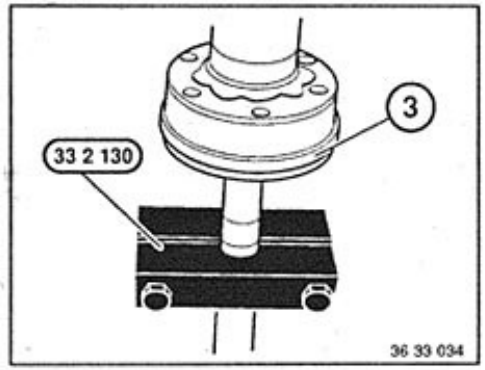
Coat sealing surface of cap (3) with sealant** and press it onto the constant velocity joint using a pressure ring.

* Refer to Specifications
** Source of Supply: BMW Parts

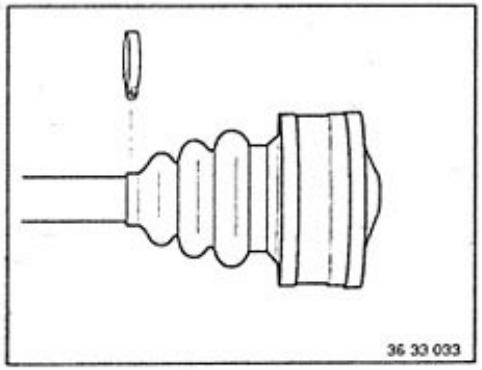


Remove grease from splines of the splined shaft and constant velocity joint.
Coat splines with Loctite No. 270**.

Important!
Keep Loctite out of ball grooves.



Apply Special Tool 33 2 130.
Press constant velocity joint and cap (3) onto the splined shaft.
Install a new circlip.



Fill joint with grease*.
Pull dust cover onto cap (3).
Install new hose clamps (large and small).

Note:
The lock of the large diameter hose clamp must be located between two bores of the constant velocity joint.

Coat sealing surfaces of sealing cover (1) with sealant** and press on cover using a pressure ring.

* Refer to Specifications
** Source of Supply: BMW Parts

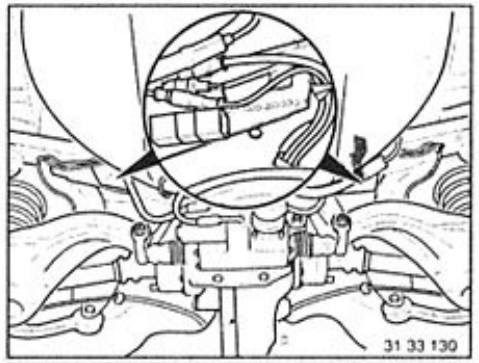
33 31 000 Removing and installing complete rear axle carrier (with final drive and trailing arms) (without chassis alignment check)

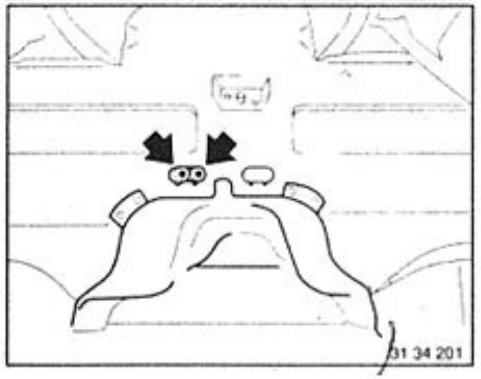
Note:
When operation is complete, perform a chassis alignment check, see 32 00 150.

Unfasten Bowden cables on handbrake lever, see 34 41 000.
Remove wheels, see 36 10 300.
Unfasten brake calipers and tie up, (do not disconnect brake line), see 34 21 745.
Remove both rear mufflers, see 18 00 020.
Unfasten propeller shaft on final drive, see 26 11 000.

Active Rear Axle Kinematics (AHK):
Relieve accumulator pressure, disconnect hydraulic lines to the actuator unit and remove cable connector, see 33 34 530 .

Installation:
When operation complete, bleed the hydraulic system, see 33 34 005 .





850CSi:
Drain off oil in final drive.
Disconnect oil lines (to cooling circuit) on final drive.

Installation:
Tightening torque of screw-in plug 33 11 6AZ*
Replace O-rings.
Tightening torque of oil lines 33 11 7AZ*

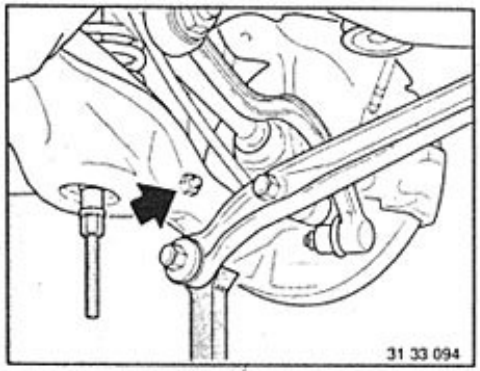
Caution!
After test driving the 850CSi, always check the final drive oil level and top up if necessary.

Remove plug connector (EDC/ ABS/ brake lining wear indicator) from the protective housings on the rear axle carrier and disconnect.

Unfasten connector to speedo sensor.

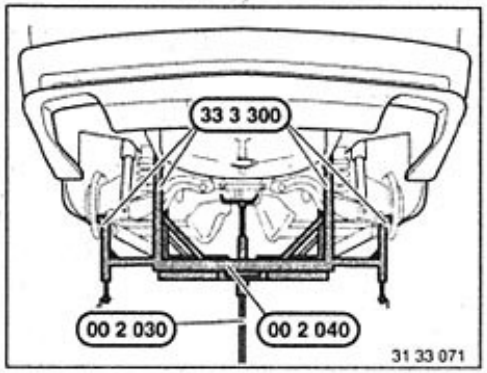
Unfasten heat shield and pull handbrake Bowden cables out of guide tubes.

* Refer to Technical Data



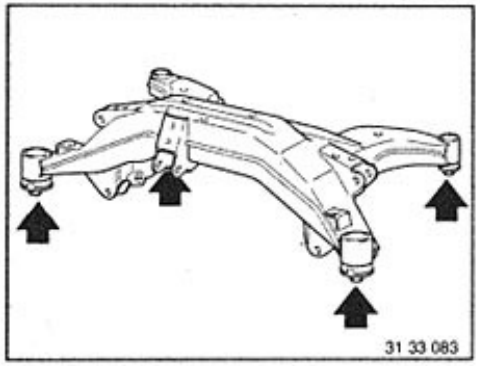
Disconnect shock absorbers:
Brace wheel carrier with workshop hoist 00 2 030.
Unfasten screw connection from shock absorber.
Lower workshop hoist.

Installation:
Replace self-locking nut.
Tightening torque 33 52 1AZ*



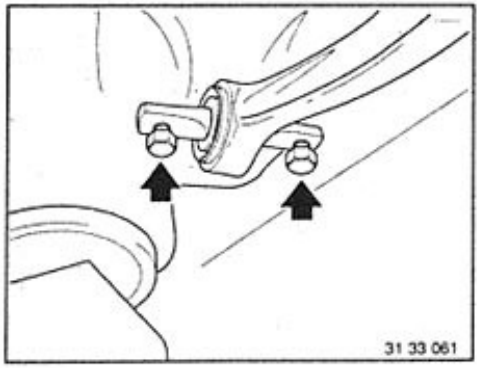
Brace rear axle with special tool 00 2 030/040 33 3 300.

Note:
If necessary, remove power cable and retaining clips located beside the support points.



Unfasten screws.

Installation:
Thrust washers, rear 70 mm dia.
Thrust washers, front 75 mm dia.
Tightening torque 33 33 3AZ*



Unfasten screws.

Installation:
Tightening torque 33 32 2AZ*

* Refer to Technical Data

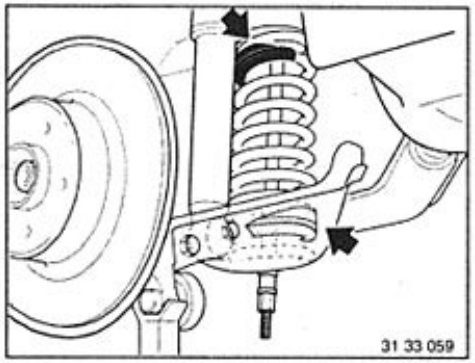
Slowly lower rear axle, ensuring that oil lines and power cables have unrestricted movement.
Remove propeller shaft from input flange.

Installation:
Place gasket in the constant velocity joint and fit propeller shaft on input shaft when raising the rear axle.
Secure constant velocity joint with two nuts.

When installing the springs, ensure that the springs are mounted flush on the spring pads.

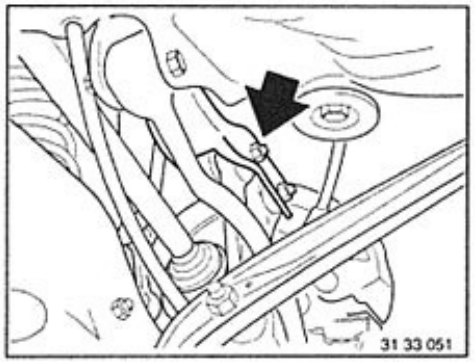
33 32 021 REPLACING TRAILING ARM

Remove rear wheel – see Group 36.



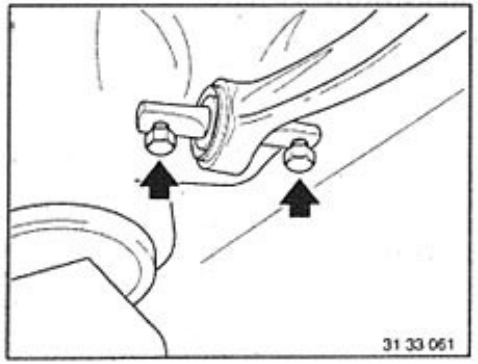
Tension rear spring with Special Tool 33 2 300.
Support wheel carrier with Special Tool 00 2 020 to take tension off of the trailing arm.

Installation:
Check wheel alignment after installation – see Group 32.



Unscrew integral arm at top.

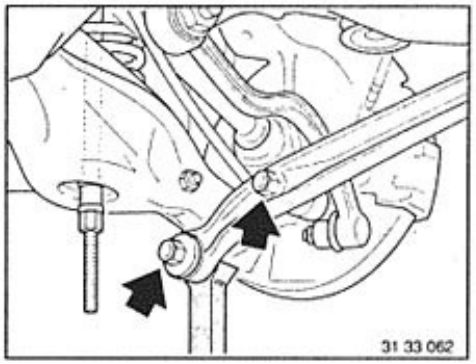
Installation:
Tightening torque* with car loaded down to normal position*.



Unscrew front bolts.

Installation:
Tightening torque*.

* See Specifications

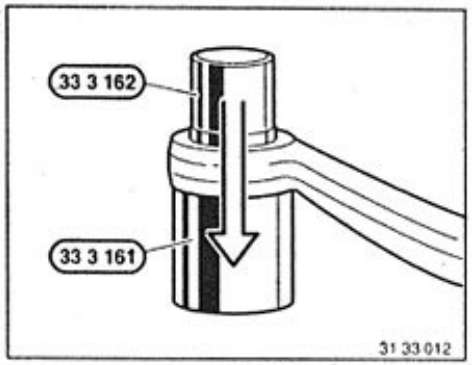


Unscrew rear nuts.

Installation:
Tightening torque* with car loaded down to normal position*.

Press integral arm out of trailing arm in a press.

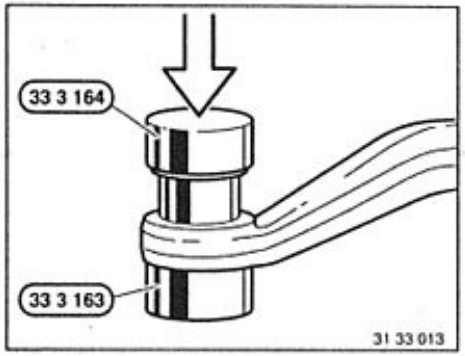
* See Specifications



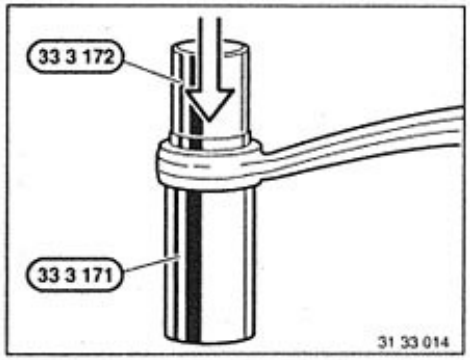
33 32 551 Replacing rubber mount for semi-trailing arm

- Semi-trailing arm removed-

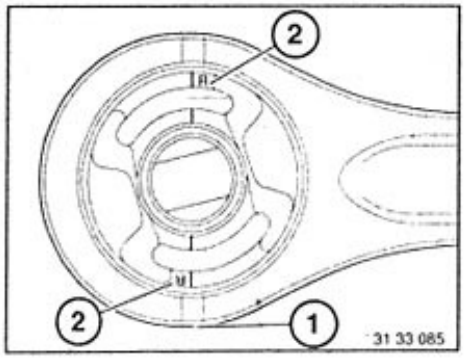
Press out rear rubber mount with special tool 33 3 161, 162.



Press in new rear rubber mount with special tool 33 3 164 ,163, starting from chamfered end.



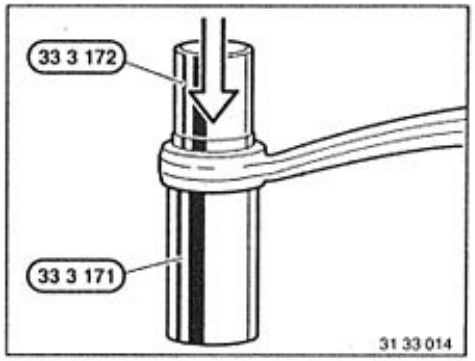
Press out front rubber mount with special tool 33 3 172, 171 without guide sleeve.



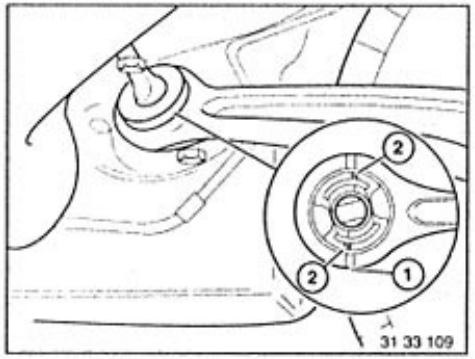
Installation:

Align marker dash (2) on rubber mount, designated with "R" for right semi-trailing arm with notch (1).

Align marker dash (2) on rubber mount, desingated with "L" for left semi-trailing arm, with notch (1)



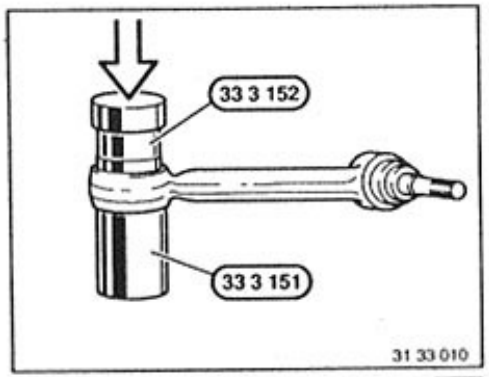
Press in front rubber mount with special tool 33 3 171, 172 and 173 with guide sleeve.



Correct installation location of right semi-trailing arm mount in direction of travel, (viewed from inside to outside).

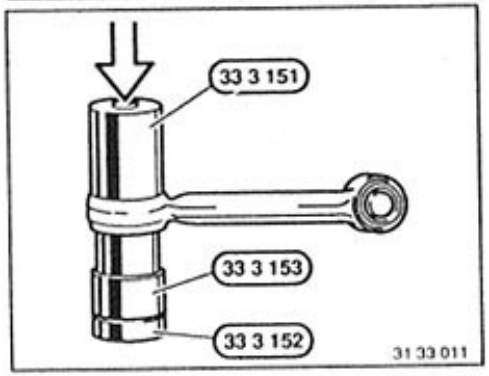
33 32 051 REMOVING AND INSTALLING OR REPLACING INTEGRAL ARM THRUST STRUT

Remove trailing arm – see 33 32 021. Procedures are identical with those for "Replacing Trailing Arm" in 33 32 021.



33 32 651 REPLACING RUBBER MOUNT IN INTEGRAL ARM THRUST STRUT
– Trailing Arm Removed –

Remove trailing arm – see 33 32 021. Press out rubber mount with Special Tools 33 3 152 and 151.

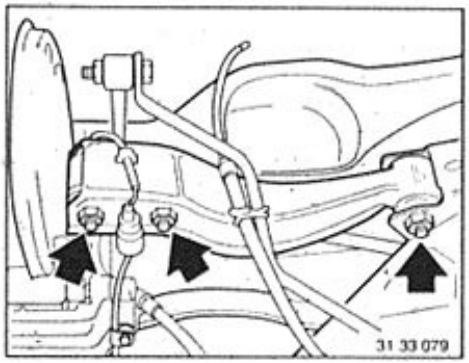


Press in new rubber mount with Special Tools 33 3 153, 152 and 151.

33 32 071 Replacing one upper control arm
(without chassis alignment check)

Note:
When operation complete, perform chassis alignment check, see 32 00 150.

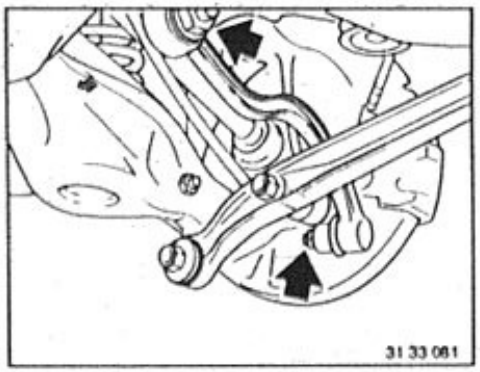
Remove wheel, see 36 10 300



Unfasten screws.
Unclip ABS sensor lead.
If necessary, unfasten stabilizer link on stabilizer.
Remove control arm.

Installation
Tightening torque 33 32 8AZ / 10AZ / 14AZ*

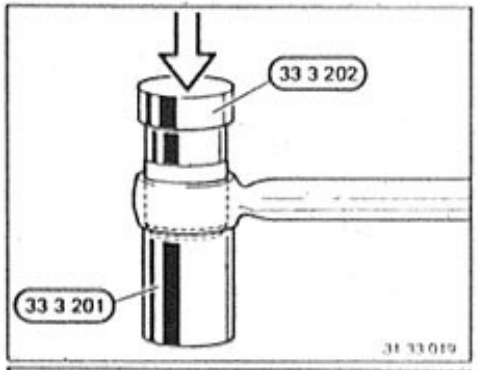
* Refer to Technical Data



33 32 091 REMOVING AND INSTALLING OR REPLACING GUIDE ARM

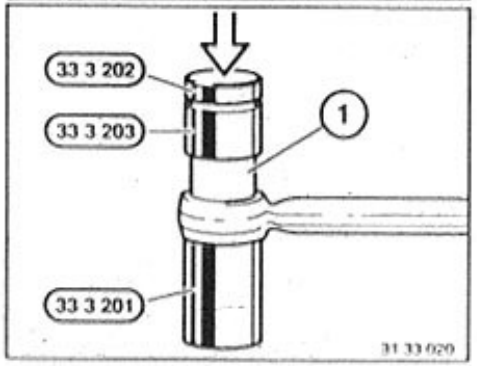
Unscrew bolts.
Remove guide arm.

Installation:
Tightening torque* with car loaded down to normal position*.
Check wheel alignment after installation – see Group 32.



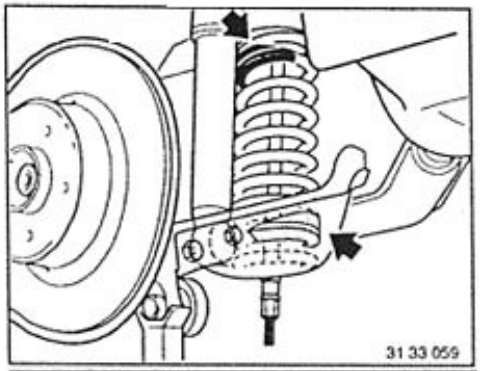
33 32 691 REPLACING GUIDE ARM RUBBER MOUNT
– Guide Arm Removed –

Remove guide arm – see 33 32 091.
Press out rubber mount with Special Tools 33 3 202 and 201.



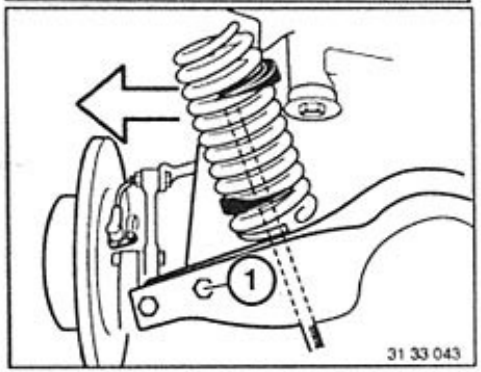
Press in new rubber mount (1) with Special Tools 33 3 202, 203 and 201.

* See Specifications



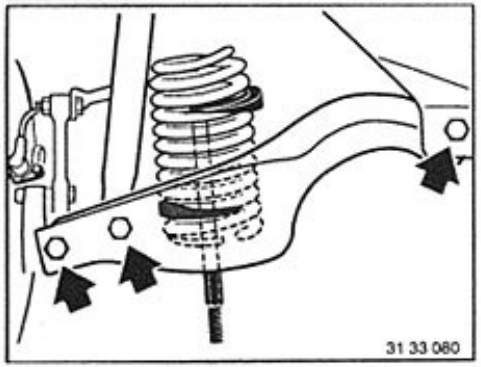
33 32 111 REMOVING AND INSTALLING OR REPLACING SUPPORT ARM

Compress and remove coil spring – see 33 53 000.



Unscrew bottom shock absorber bolts.

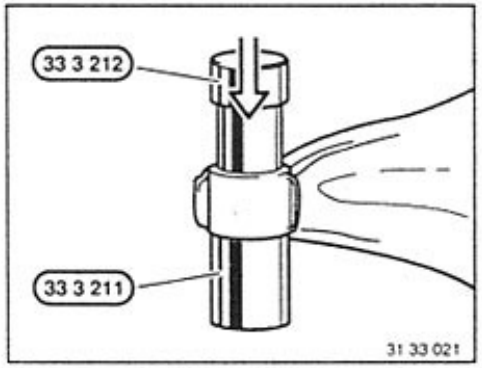
Installation:
Tightening torque*.



Unscrew bottom support arm bolts.

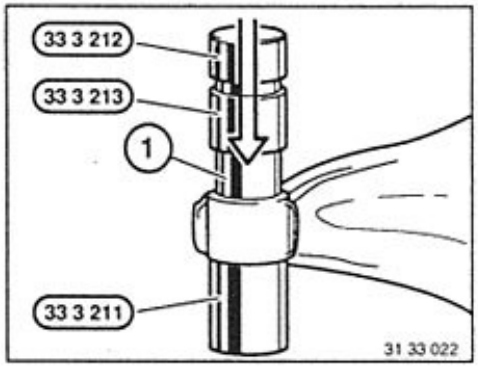
Installation:
Tightening torque*.

Important!
Check wheel alignment after installation – see Group 32.



33 32 711 REPLACING BALL JOINT IN SUPPORT ARM – Support Arm Removed –

Remove support arm – see 33 32 111.
Press out ball joint with Special Tools 33 3 212 and 211.



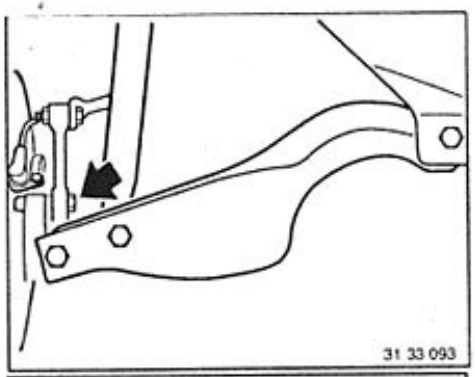
Press in new ball joint (1) with Special Tools 33 3 211, 212 and 213.

* See Specifications

33 32 131 REMOVING AND INSTALLING OR REPLACING WHEEL CARRIER

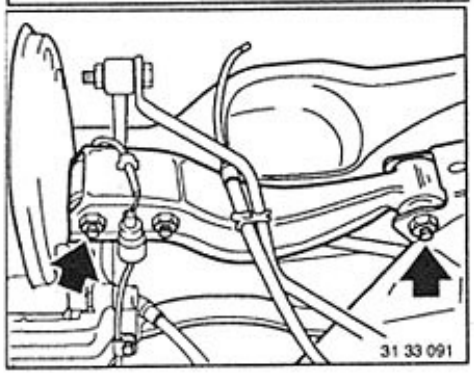
Important!
Check wheel alignment after installation – see Group 32.

Remove rear wheel – see Group 36.
Remove output shaft – see 33 21 000.
Remove brake caliper – see 34 21 745.
Remove ABS sensor – see 61 12 522.
Loosen parking brake cables – see Group 34.
Remove brake disc – see Group 34.
Remove expander lock – see 34 41 220.
Remove guide arm – see 33 32 091.



Unscrew stabilizer.

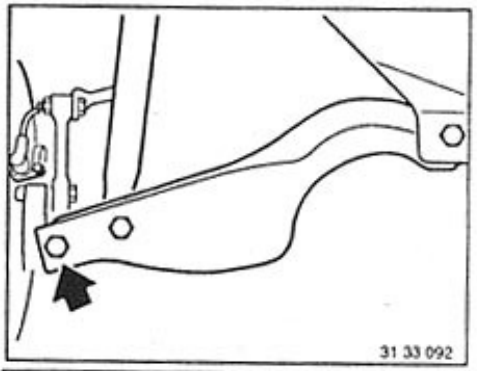
Installation:
Tightening torque* with car loaded down to normal position*.



Unscrew upper control arm bolts.

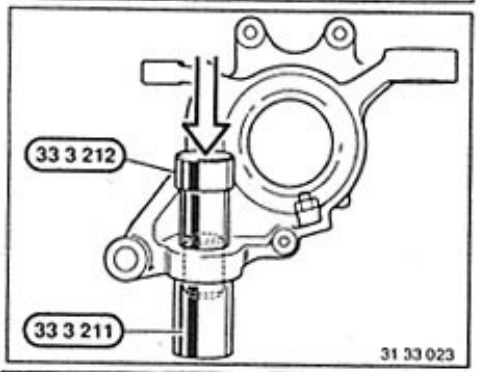
Installation:
Tightening torque* with car loaded down to normal position*.

* See Specifications



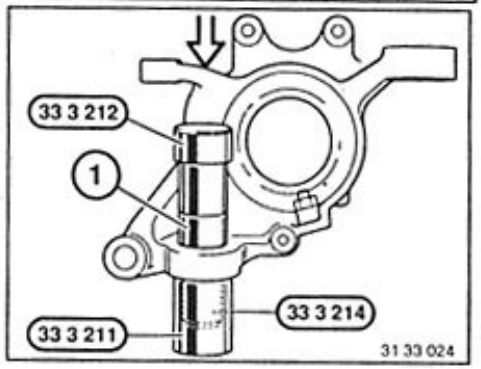
Unscrew lower control arm bolts on outside.
Unscrew guide arm bolt on outside.

Installation:
Tightening torque* with car loaded down to normal position.



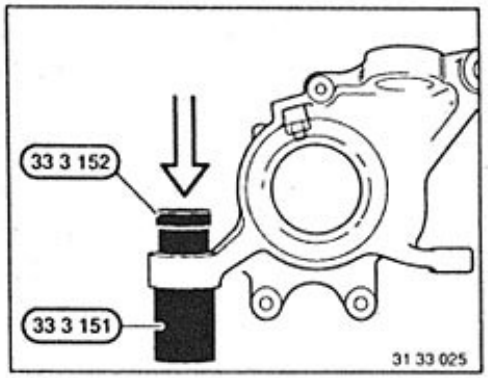
33 32 719 REPLACING LOWER BALL JOINT IN WHEEL CARRIER – Wheel Carrier Removed –

Remove wheel carrier – see 33 32 131.
Press out lower ball joint with Special Tools 33 3 212 and 211.



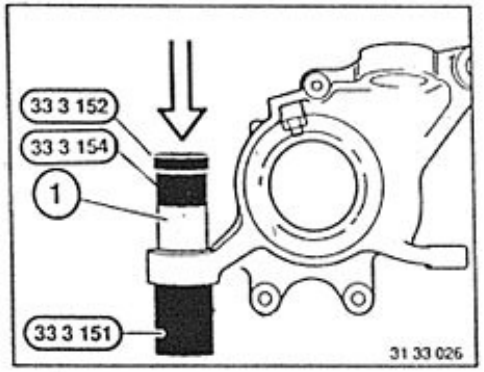
Press in new ball joint with Special Tools 33 3 212, 211 and 214.

* See Specifications



33 32 725 REPLACING UPPER BALL JOINT IN WHEEL CARRIER
– Wheel Carrier Removed –

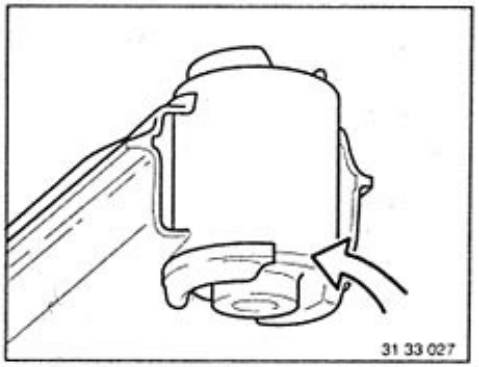
Press out upper ball joint bearing with Special Tools 33 3 152 and 151.



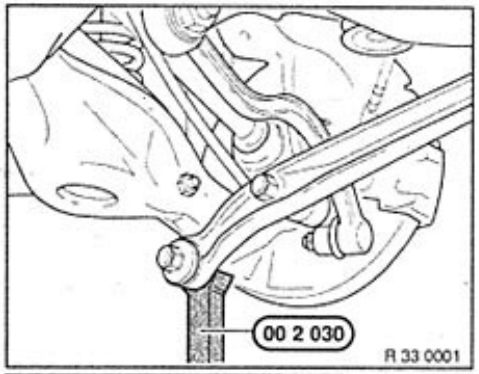
Press new ball joint bearing (1) into wheel carrier with Special Tools 33 3 151, 152 and 154.

33 33 101 Replacing two rubber mounts for rear axle carrier

Remove both rear mufflers,
see 18 00 020.
Unfasten propeller shaft from final drive,
see Gr.26.
If necessary, unfasten hydraulic lines from actuator unit, see 33 34 530.
If necessary, unfasten cooling circuit at joints,
see 33 15 005.

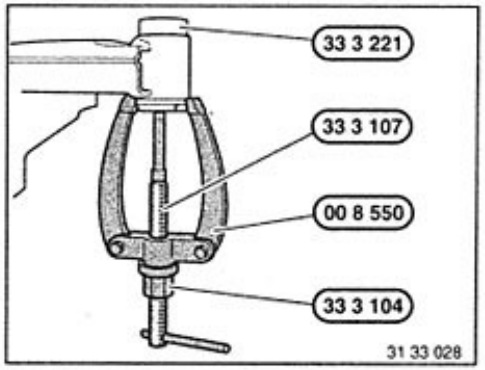


Note:
To enable the special tool 00 8 500 to be fitted better, the recesses of the metal bush on the rubber mount must be driven inwards.



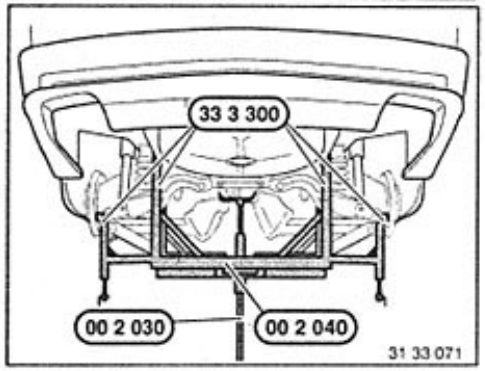
Disconnect shock absorber:
Brace wheel carrier with workshop hoist 00 2 030.
Unfasten screw connection on shock absorber.
Lower workshop hoist.

Installation:
Replace self-locking nut.
Tightening torque 33 52 1AZ*

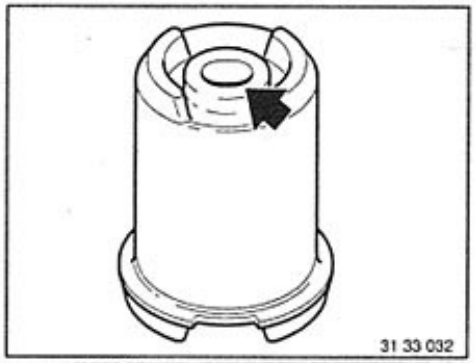


Lower rear axle until the extractor tool can be fitted.

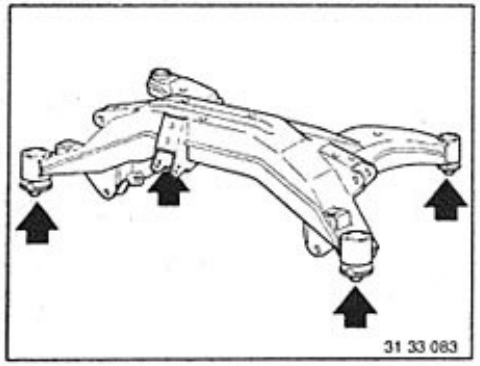
Front rubber mount:
Fit special tool 33 3 221/ 00 8 550 / 33 3 107 / 104.
Heat bush using standard hot air blower.
Pull out rubber mount.



Support rear axle with workshop hoist 00 2 030 and special tool 00 2 040 / 33 3 300.

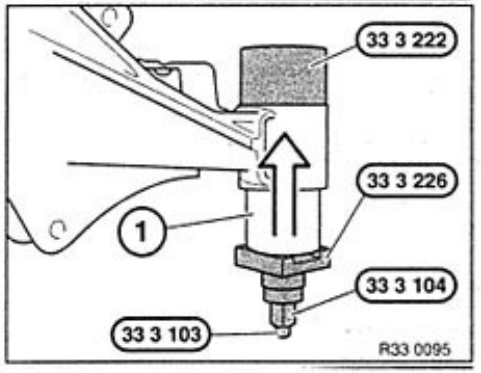


Installation:
Note installation position:
slot at right angles to direction of travel.



Unfasten screws.

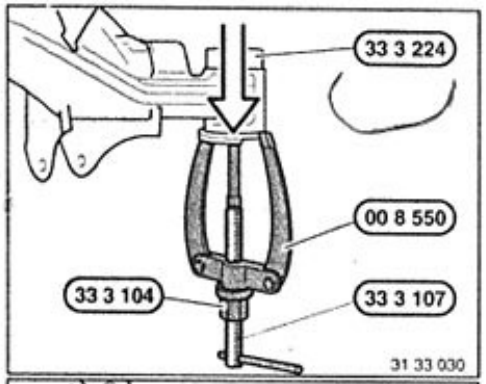
Installation:
Thrust washers, rear 70 mm dia.
Thrust washers, front 75 mm dia.
Tightening torque 33 32 2AZ*



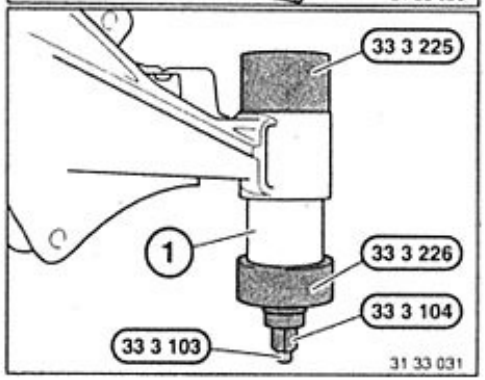
Coat new rubber mount (1) with Circolight* and pull in using special tool 33 3 222 / 223 / 103 / 104.

* Refer to Technical Data

* Refer to BMW Parts Service



Rear rubber mount:
Fit special tool 33 3 224 / 00 8 550 / 33 3 107 / 104.
Heat bush using standard hot air blower.
Pull out rubber mount.



Coat new rubber mount (1) with Circolight* and pull in with special tool 33 3 225 / 226 / 103 / 104.

* Refer to BMW Parts Service.

ACTIVE REAR AXLE KINEMATIC (AHK)

In comparison with conventional rear axles, active rear axle kinematic makes it possible to actively control the build-up of lateral force on the rear axle by way of selective steering.. This considerably reduces the hazard of swerving.

Example:
In case of a sudden obstacle avoidance maneuver (panic steering) normally steered vehicles will react with swerving motion under certain conditions, which can even be amplified by "correcting on the steering wheel".
The occurring tendency to swerving is reduced considerably under certain conditions in vehicles with AHK.

Design:
Input variables of the system are steering wheel angle and road speed. They are measured twice (redundant) in the interest of driving safety. An electronic control unit also fitted with redundant microprocessors calculates an optimal steering angle for the rear wheels depending on the pertinent driving condition.
Corrections are carried out by an electric/hydraulic drive unit. The drive unit is immediately arrested by hydraulic/mechanical clamps in case of serious system disturbance.
Rear wheels are brought to and arrested in straight ahead position in case of less serious disturbance.
In other words, driving safety is never impaired.
The disturbance is always reported to the driver by a warning lamp in the instrument cluster.

Self-test:
The AHK system activates a self-test after each engine start to check the operation of electric, hydraulic and mechanical components.
The mechanical clamp of the setting cylinder, among others, is briefly activated on the drive unit.
Switching the mechanical clamp on and off produces a "pounding sound" which might be heard in the passenger compartment.
After conclusion of the self-test the AHK system is active; but the AHK system remains inactive if a fault is recognized.

General information About AHK (Active Rear Axle Kinematic)

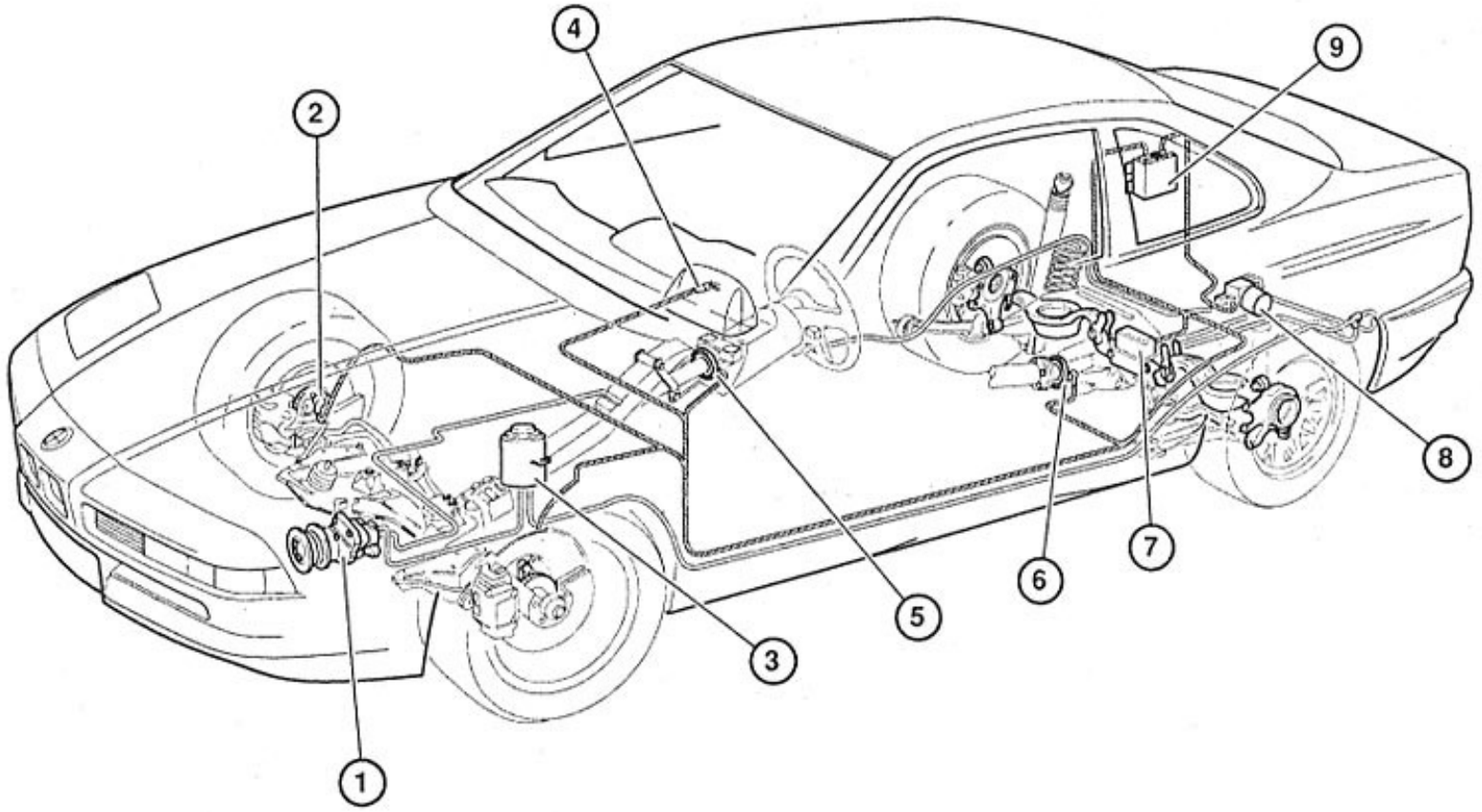
There must be conformance with the following points when carrying out repairs as the AHK system must fulfill very strict safety specifications.

- Read fault memory, investigate and eliminate stored faults before working on AHK.
  Erase fault memory.
- Discharge pressure reservoir by loosening the pressure discharging plug about one half turn before working on the reservoir charging unit and drive unit.
- Ensure absolute cleanliness and only use rags which do not lose lint.
- Filter elements of the reservoir charging unit and drive unit must be replaced after a mechanical defect on the hydraulic pump.
- Plug removed hydraulic pipes and equipment immediately with suitable rubber or plastic caps.
- Always use a torque wrench to tighten bolts and nuts to specified torque values.
- Switch off the ignition before working on the electrical system.

A fault could be stored in the fault memory by carrying out the following jobs:
Performance test on dynamometer
Electronic balancing of rear wheels on vehicle (finish balancing).

Read and, if applicable, erase the fault memory after carrying out this work.

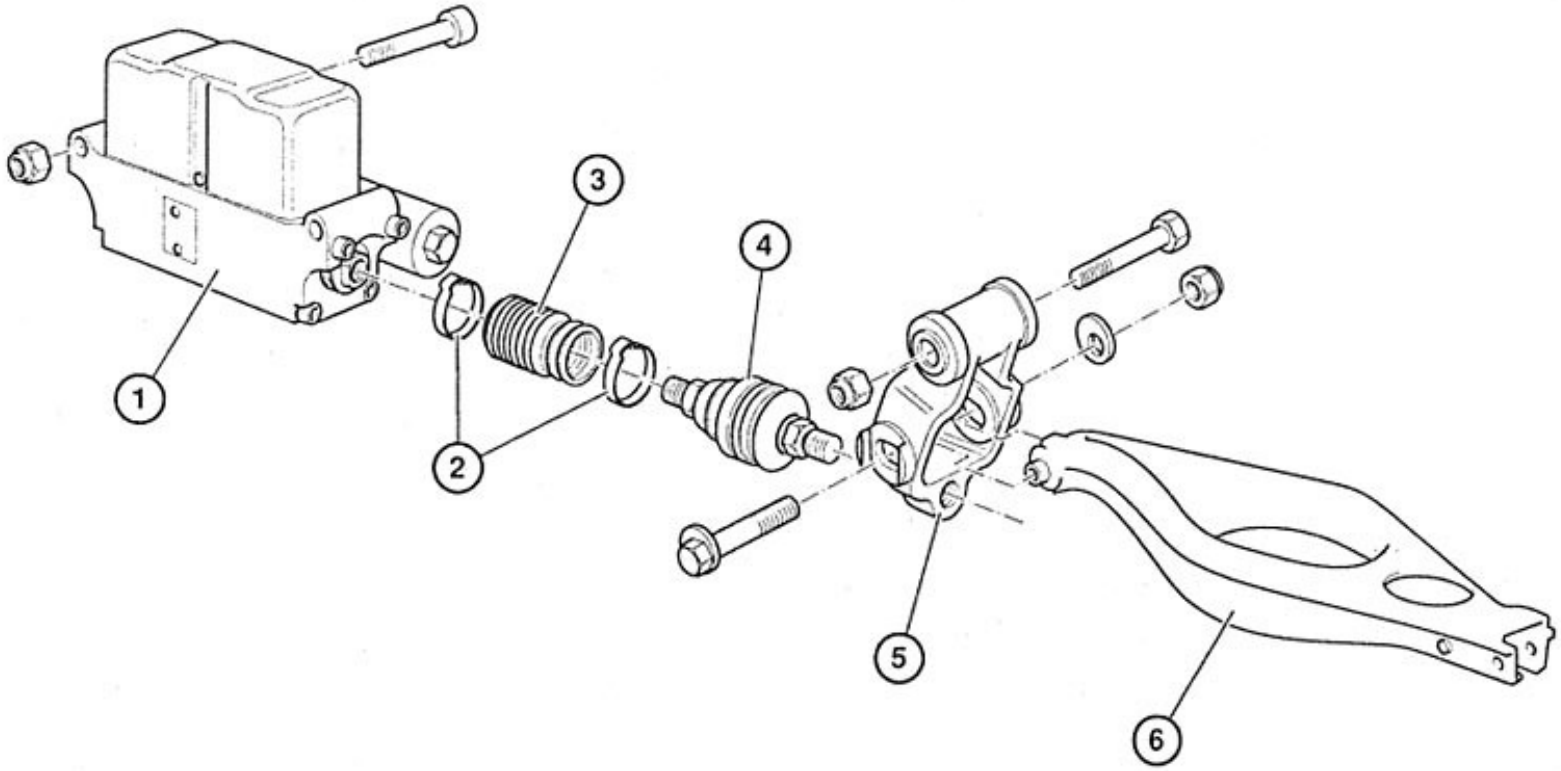
LAYOUT DRAWING OF AHK (Active Rear Axle Kinematic)



31 33 122

1 Triple-circuit pump
2 Wheel speed sensor (from ABS)
3 Supply tank
4 Warning lamp
5 Steering wheel angle sensor
6 Speedometer sender
7 Drive unit
8 Reservoir charging unit
9 AHK control unit

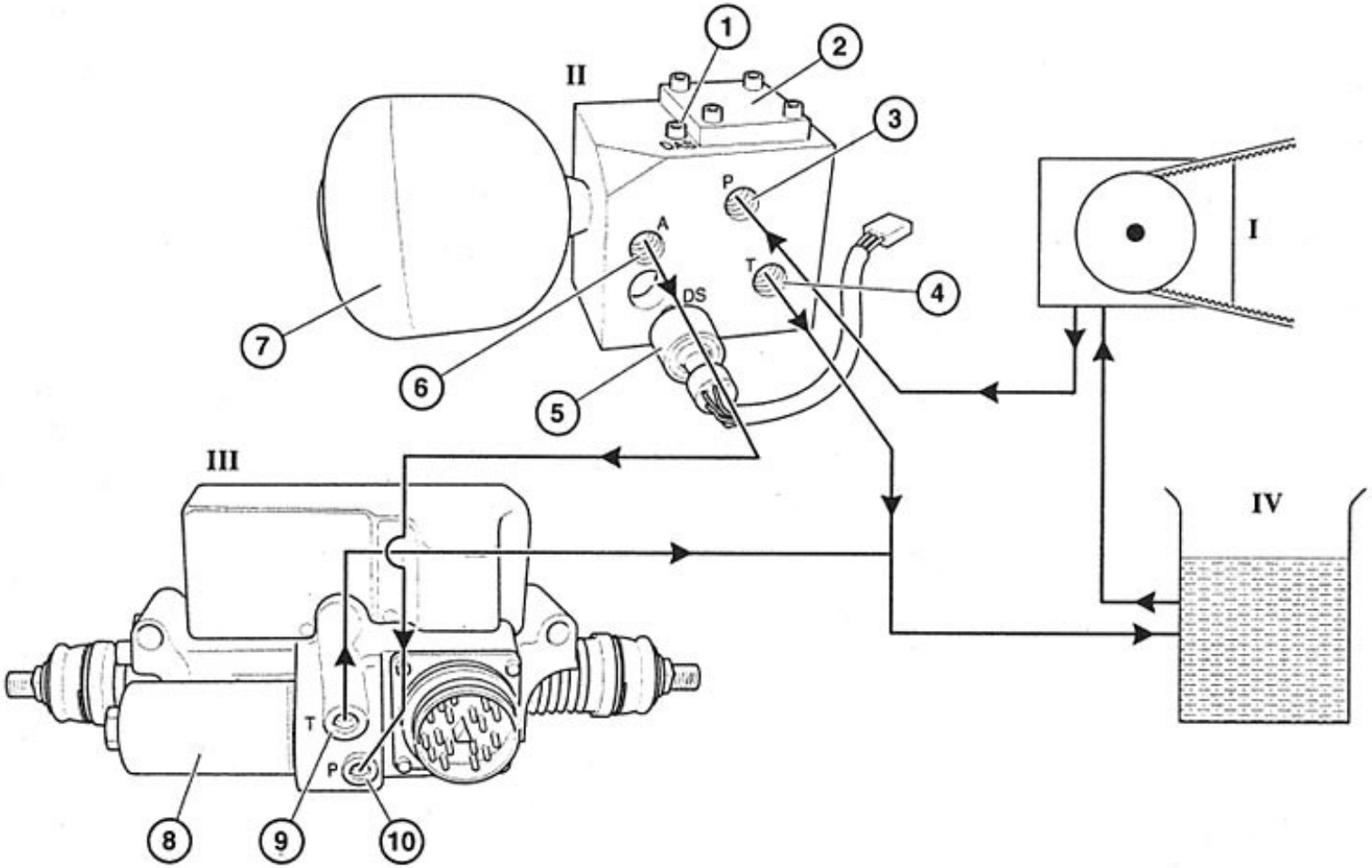
LAYOUT DRAWING OF DRIVE UNIT AND SUPPORT ARM



31 33 124

1 Drive unit
2 Clamp
3 Dust cover
4 Double joint
5 Intermediate arm
6 Lower support arm

LAYOUT DRAWING OF HYDRAULIC PIPES



31 33 125

I Triple Circuit Pump

II Reservoir Charging Unit

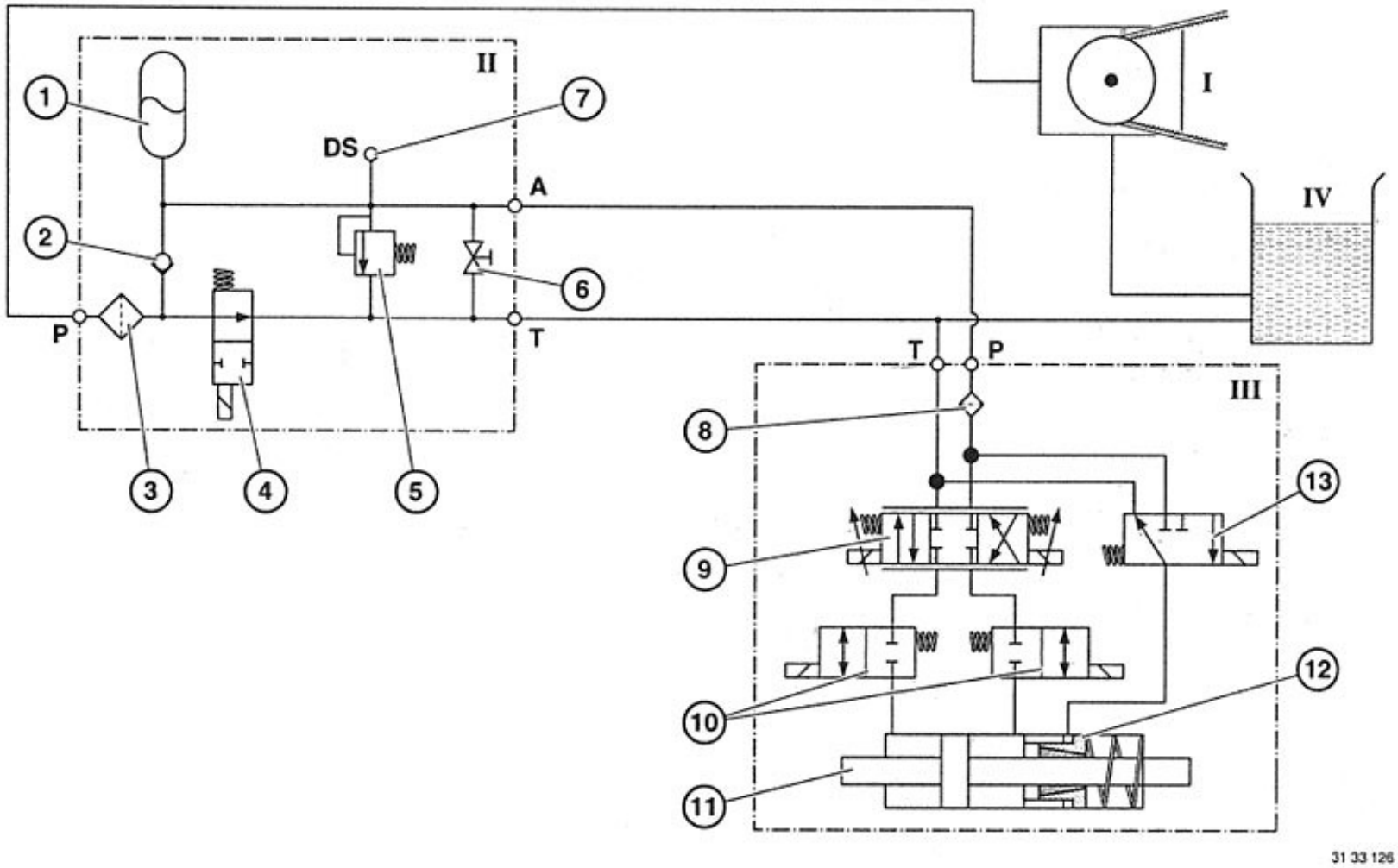
1 (DAS) pressure discharging plug
2 Filter element
3 (P) pressure inlet from pump
4 (T) tank connection to hydr. fluid tank
5 (DS) pressure sensor
6 (A) pressure outlet to drive unit
7 Pressure reservoir

III Drive Unit

8 Filter element
9 (T) tank connection to hydr. fluid tank
10 (P) pressure inlet from reservoir charging unit

IV Hydraulic Fluid Tank

AHK (Active Rear Axle Kinematic) HYDRAULIC DIAGRAM



I Triple Circuit Pump

II Reservoir Charging Unit

1 Pressure reservoir
2 Non-return valve
3 Filter
4 Reservoir charging valve
5 Pressure relief valve
6 Pressure discharging plug
7 Pressure sensor connection

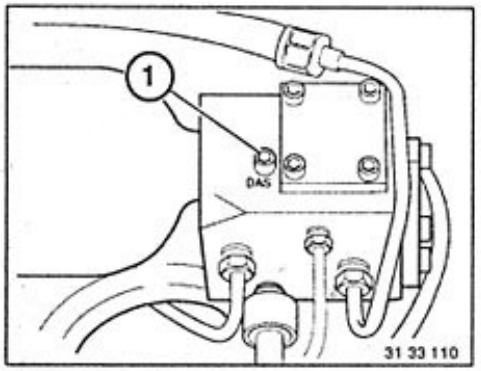
III Drive Unit

8 Filter
9 Proportioning valve
10 Hydraulic shutoff valves
11 Setting cylinder
12 Mechanical clamp
13 Mechanical clamping valve

IV Hydraulic Fluid Tank

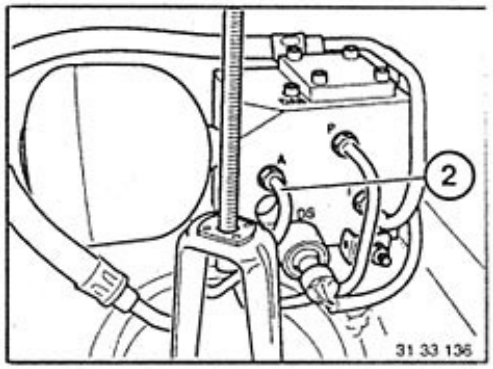
33 34 000 CHECK FUNCTION OF AHK HYDRAULIC SYSTEM (with BMW Service Tester)

Note:
This job is required to troubleshoot the AHK hydraulic system — refer to BMW Diagnosing System.



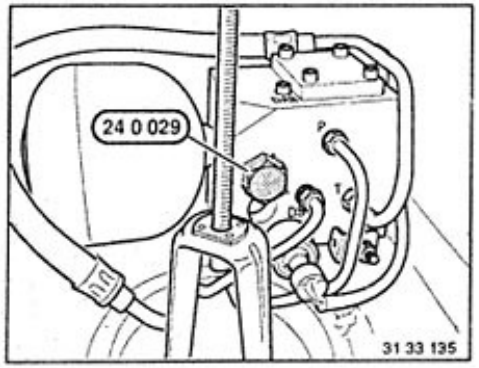
Loosen pressure discharging plug (1) one half turn – pressure is discharged from the reservoir.

Installation:
Tightening torque*.



Unscrew hydraulic pipe (2) from the reservoir charging unit.

Installation:
Tightening torque*.



Plug pressure connection (A) using Special Tool 24 0 029.

Caution!
Discharge pressure from the reservoir before unscrewing the special tool.

* **Refer to Specifications**

33 34 005 Bleeding AHK hydraulic system

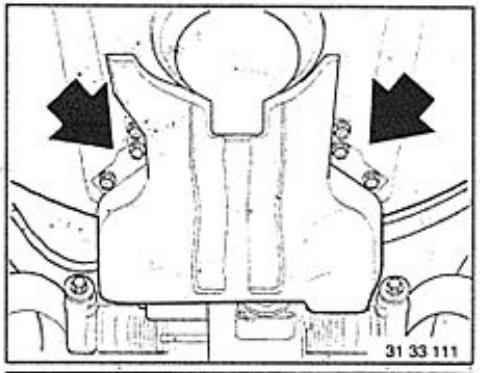
Perform hydraulic load test, refer to BMW diagnosis system, menu item "Special Functions".

Note:
The air inclusions are carried along by the increased flow rate in the load test and are transported to the expansion tank.

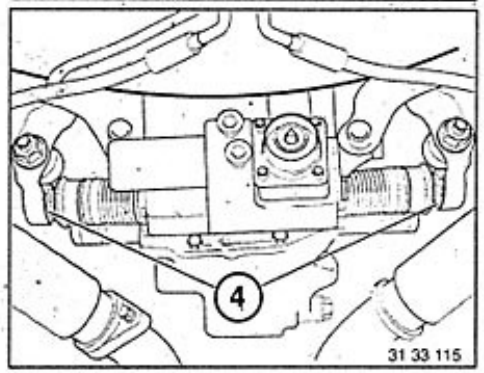
Check the hydraulic fluid level, see 32 13 006.

33 34 015 Removing and installing or replacing left or right double joint
(without chassis alignment check)

When operation is complete, perform a chassis alignment check, see 32 00 150.



Unfasten nut and remove protective plate.

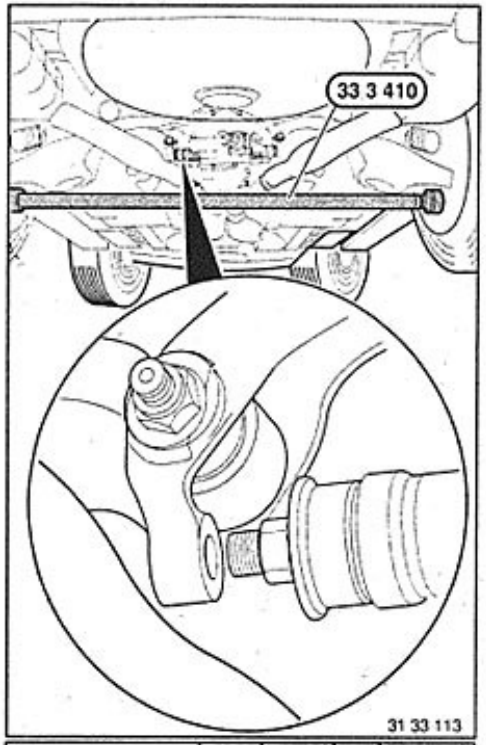


Unfasten ball joint (4).

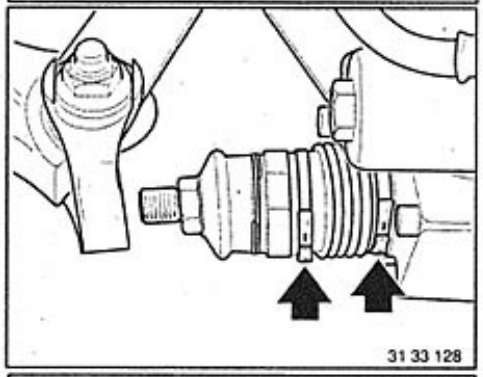
Caution!
Do not damage thread.

Installation:
Grip center section of double joint while screwing in the ball joint (4) to avoid damaging the thread.
Tightening torque 33 34 9A 7*

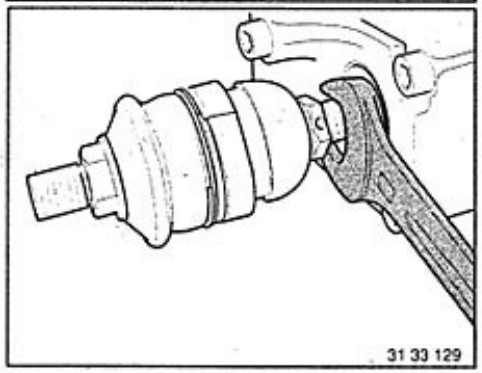
* Refer to Technical Data.



Force rear wheels apart by pressing on trailing arm with special tool 33 3 410 until the thread for the left or right double joint is exposed.



Open tightening straps and remove.



Slide gaiter to one side, brace piston rod with open-end wrench and unfasten double joint.

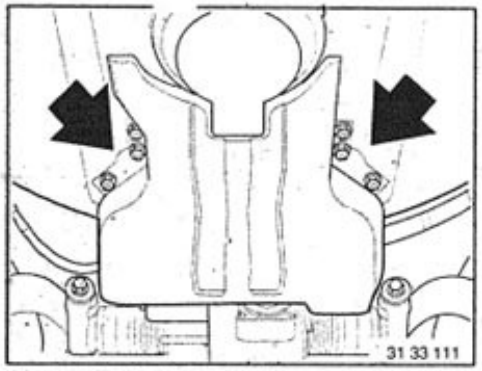
Installation:
Tightening torque 33 34 8 AZ*

* Refer to Technical Data.

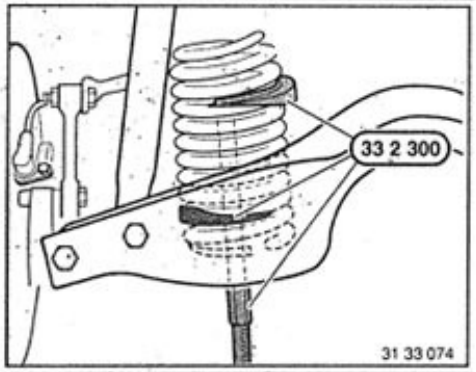
33 34 020 Removing and installing or replacing left or right intermediate lever
(without chassis alignment check)

When operation is complete, perform chassis alignment check, see 32 00 150.

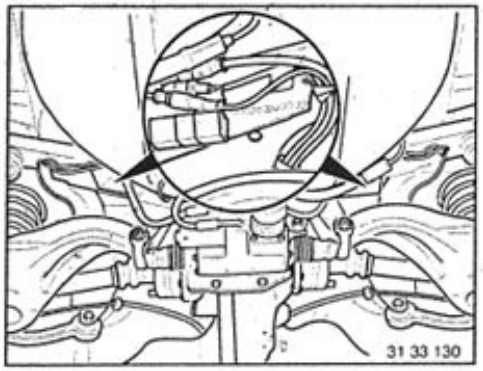
Remove both rear mufflers, see 18 00 020.



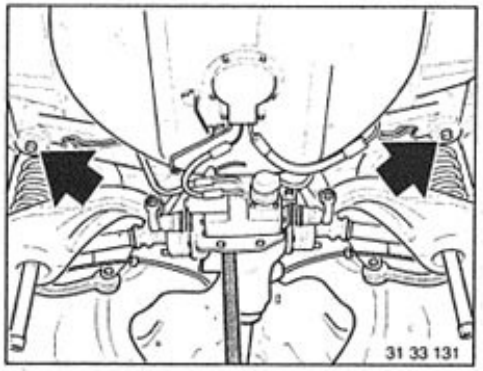
Unfasten nuts and remove protective plate.



Preload left and right springs with special tool 33 2 300, see 33 53 000 .



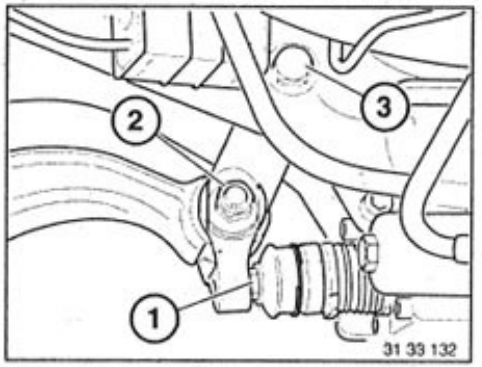
Remove plug connector (EDC /ABS /brake lining wear indicator) from the protective housings on the rear axle carrier.



Support rear axle carrier on a workshop hoist. Unfasten screws and lower rear axle carrier.

Caution!
Cables and hydraulic lines must not be subjected to traction load.

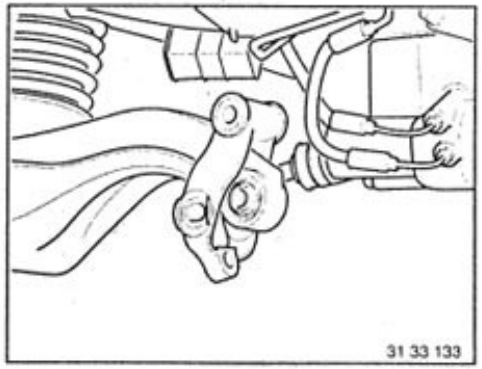
Installation:
Tightening torque 33 33 3AZ



Unfasten screws (1. . . 3).

Note:
Pull rear axle carrier down slightly to enable screw (3) to be unscrewed and removed.

Installation:
Replace self-locking nut.
Grip center section of double joint while screwing in the ball joint (1) to avoid damage to the thread.
(1) Tightening torque 33 34 9AZ*
(2) Tightening torque 33 34 10AZ*
(3) Tightening torque 33 34 11AZ*



Swivel lower support arm to one side and remove intermediate lever.

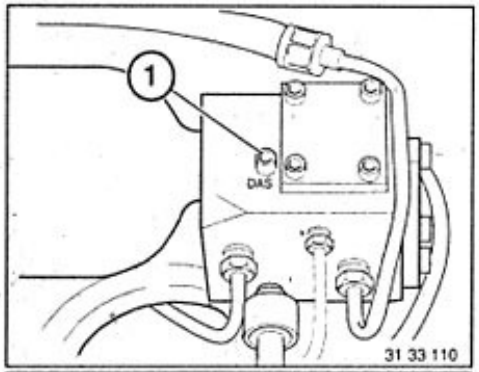
* Refer to Technical Data.

33 34 520 Removing and installing or replacing spring accumulator unit

When operation is complete:
bleed hydraulic system, see 33 34 005.
Perform leak test, see BMW diagnosis system, menu item "Special Functions".

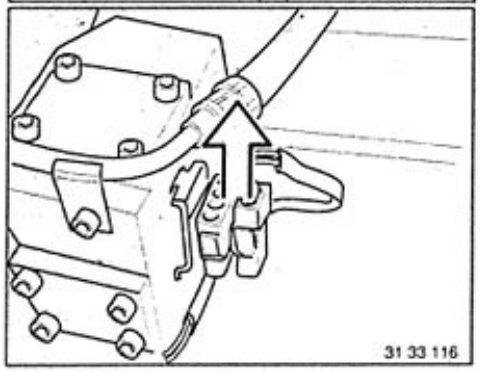
Visual inspection for leaks:
- Hydraulic lines and screw connections
- Filter cover
- Pressure sensor
- Spring accumulator spring connection

Remove spare wheel.
Remove cover from the spring accumulator unit.

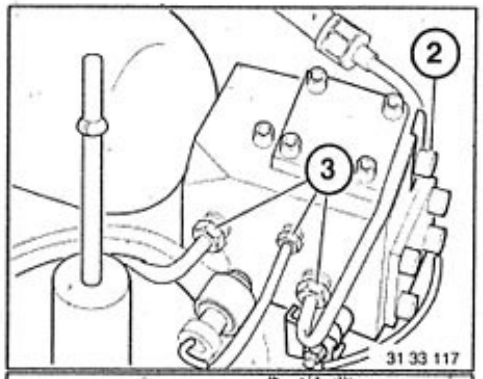


Loosen pressure relief screw (1) half a turn to relieve spring accumulator pressure.

Installation:
Tightening torque 33 34 1AZ*



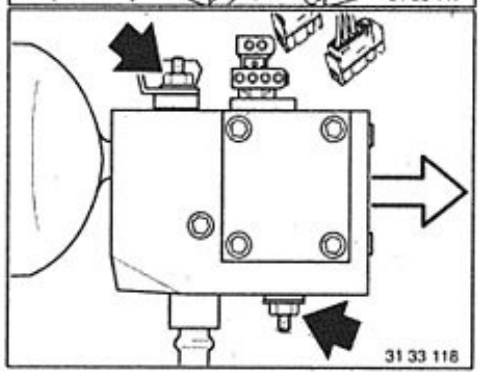
Disconnect plug connections.



Unfasten screw (2).
Unfasten hydraulic lines (3).

Note:
Seal hydraulic lines with a rubber cap.

Installation:
(3) Tightening torque 33 34 3AZ*
Hydraulic lines must not contact any body components and should be laid without any torsional stresses.



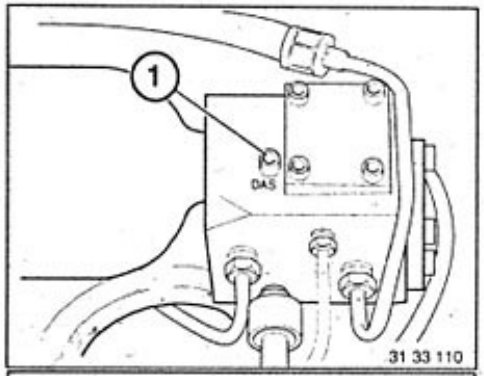
Unfasten screws and slide spring accumulator unit out to the right.

* Refer to Technical Data

* Refer to Technical Data

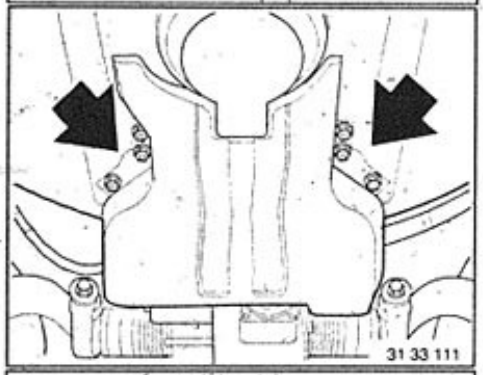
33 34 530 Removing and installing or replacing actuator unit
(without chassis alignment check)

When operation is complete:
perform chassis alignment check,
see 32 00 150.
Perform leak check, see BMW diagnosis system.
Visual inspection for leakage:
- Hydraulic lines and screw connections
- Filter bell/ actuator cylinder

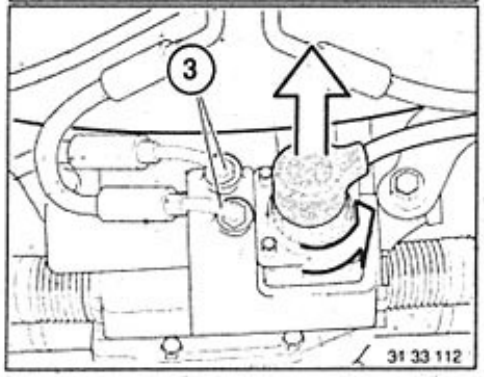


Remove spare wheel.
Remove cover from spring accumulator unit.
Loosen pressure relief screw (1) one half turn to relieve spring accumulator pressure.

Installation:
Tightening torque 33 34 1AZ*



Unfasten nuts and remove protective plate.

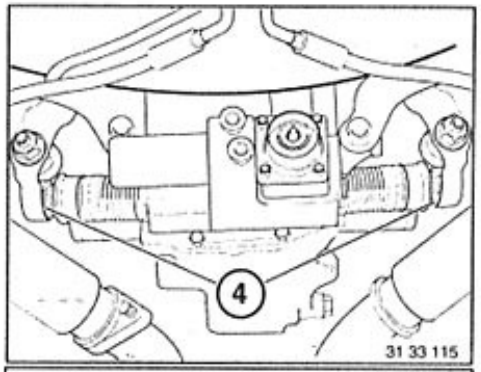


Unlock connector and remove.
Unfasten hydraulic lines (3).

Note:
Seal hydraulic lines with a rubber cap.

Installation:
Tightening torque 33 34 3AZ*

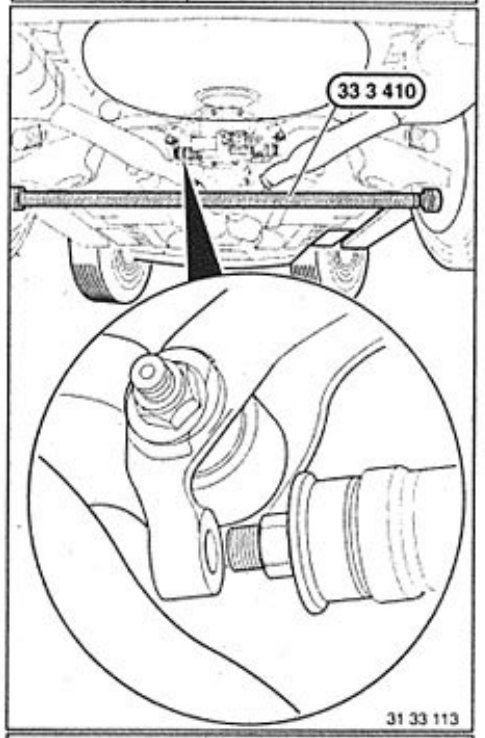
* Refer to Technical Data



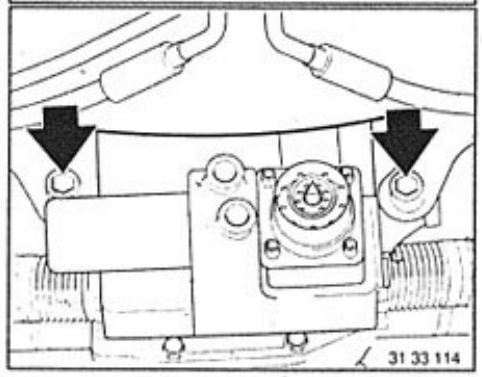
Unfasten ball joint (4).

Caution!
Do not damage the thread.

Installation:
Grip center section of double joint while screwing in the ball joint (4) to avoid damaging the thread.
Tightening torque 33 34 9AZ*



Force apart rear wheels by pressing on semi-trailing arm with special tool 33 3 410 until the threads for the left and right double joints are exposed.



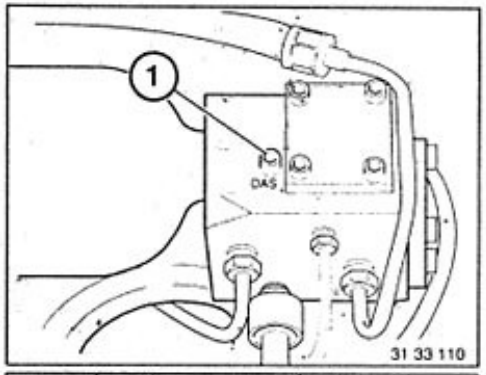
Unfasten retaining screws and remove actuator unit.

Installation:
Tightening torque 33 34 6AZ*

* Refer to Technical Data

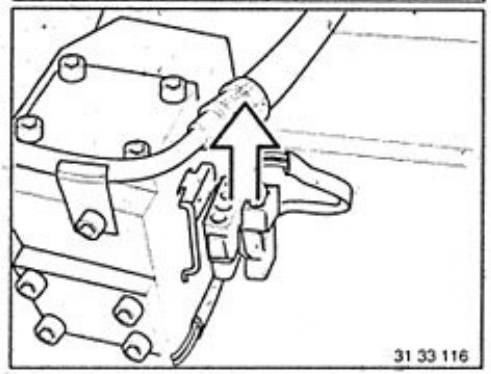
33 34 540 Removing and installing or replacing pressure sensor

Switch off ignition.
Remove spare wheel.
Remove cover from spring accumulator unit.

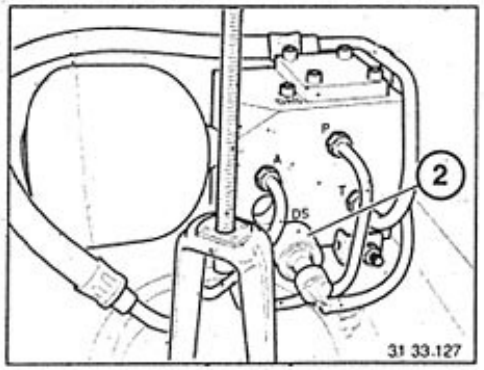


Loosen pressure relief screw (1) half a turn to relieve pressure in the spring accumulator unit.

Installation:
Tightening torque*



Remove connector from pressure sensor.



Unfasten pressure sensor (2).

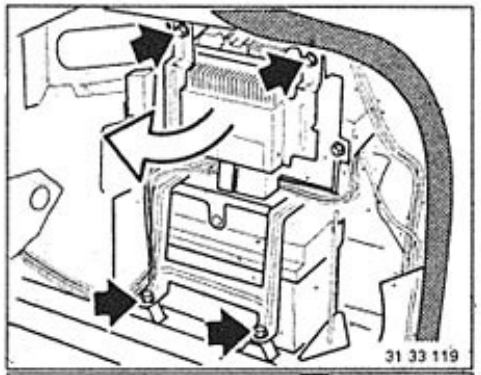
Installation:
Tightening torque*

* Refer to Technical Data.

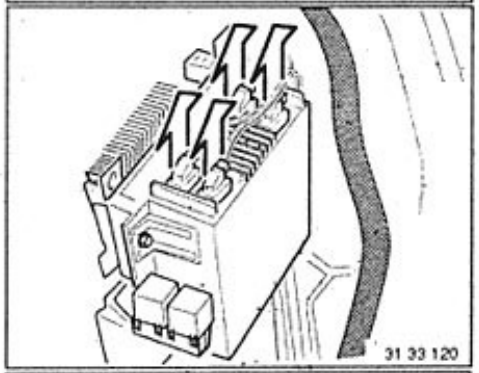
33 34 550 REMOVING AND INSTALLING OR REPLACING AHK CONTROL UNIT

Remove right trim panel in trunk - refer to Group 51.

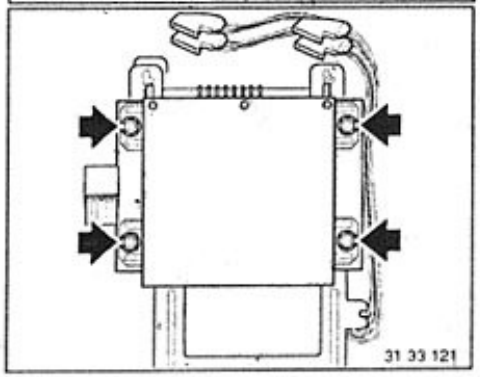
Important!
Switch off ignition before removing or installing control unit.
After conclusion of work, trim drive element and steering angle - refer to BMW Diagnosing System.



Unscrew mounting bolts and remove control unit holder.



Disconnect plugs.

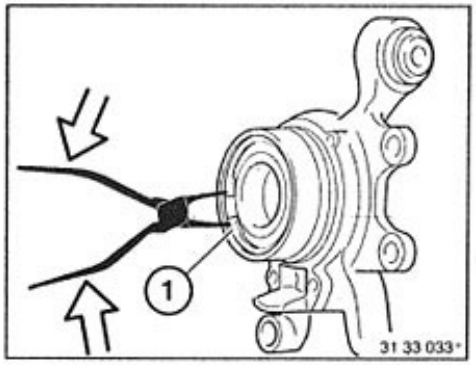


Unscrew bolts and remove control unit.

33 41 151 Replacing wheel bearing on left or right rear axle shaft

Remove output shaft, see 33 21 000.
Remove brake disc, see 34 21 320.
Remove ABS sensor, see 61 12 522.

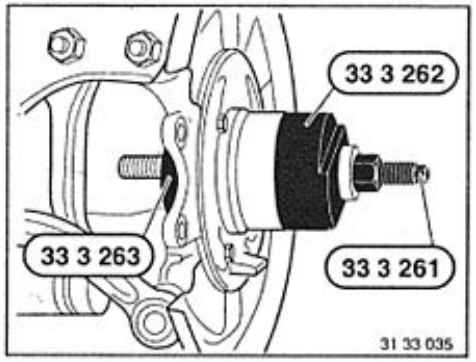
Note:
If necessary, when operation is complete, adjust the handbrake, see 34 10 014.



Lift out retaining ring (1).

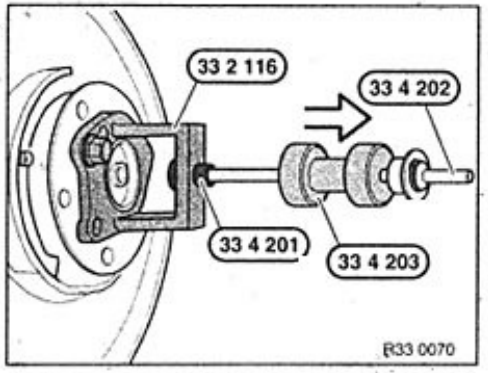
Unfasten stabilizer arm on stabilizer of wheel carrier.

Installation:
Tightening torque 33 55 1AZ*

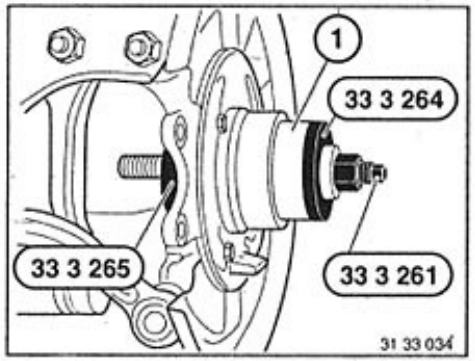


Remove taper ball bearing with special tool 33 3 261 / 262 / 263.

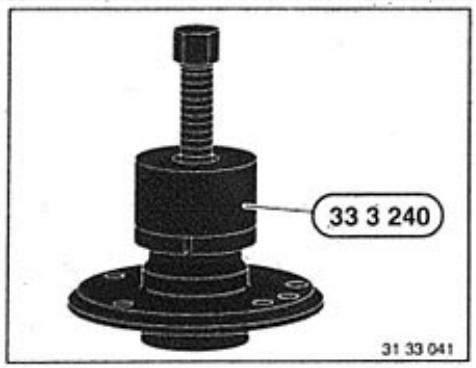
Caution!
Do not reuse taper ball bearing.



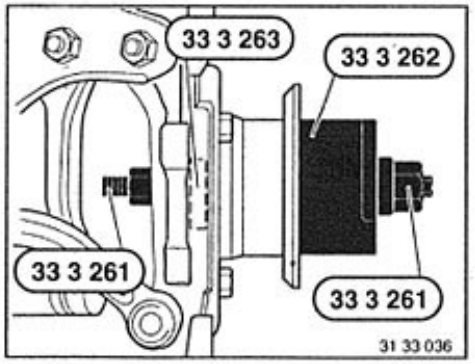
Secure special tool 33 2 116 with wheel studs to drive flange.
Drive out hub of driver flange with special tool 33 4 201 / 202 / 203.



New pull in taper ball bearing (1) with special tool 33 3 261 / 264 / 265.
Fit retaining ring.

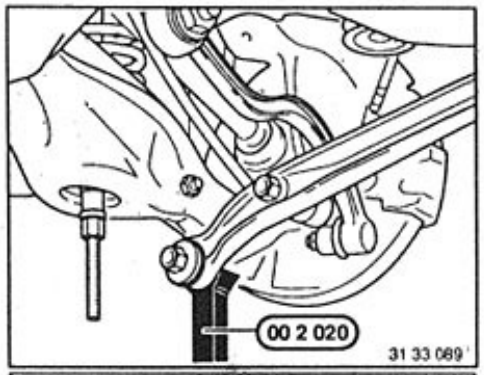


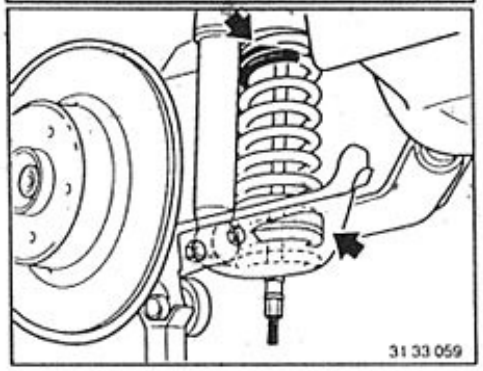
Remove inner bearing race from the drive flange hub with special tool 33 3 240.



Pull in drive flange hub with special tool 33 3 261/ 262 / 263 / 264.

* Refer to Technical Data





33 52 000 REMOVING AND INSTALLING OR REPLACING REAR SHOCK ABSORBERS

Wheel suspension must be unloaded for removal and installation.

Note:
Rear springs do not have to be compressed when wheel suspension is loaded for removal and installation.

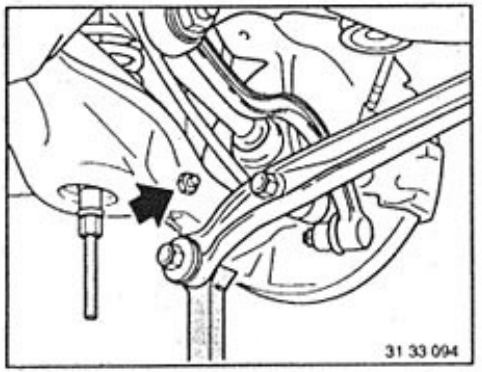
Lift car and support trailing arms with Special Tool 00 2 020.

Compress rear springs with Special Tool 33 2 300.

Caution!
Shock absorbers have the same effect as elastic straps.

Take mats out of trunk.
Unscrew shock absorber bolt at top.

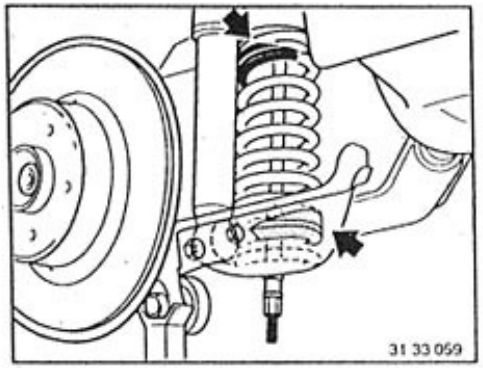
Installation:
Tightening torque*.



Unscrew shock absorber bolt at bottom.

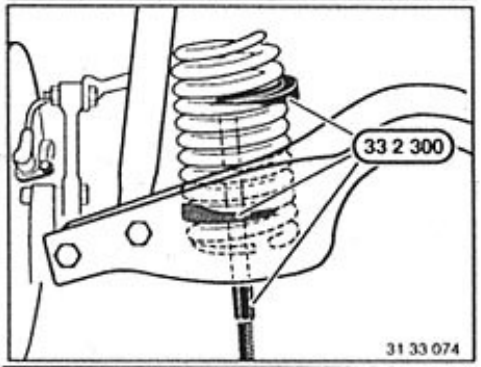
Installation:
Replace self-locking nuts.
Tightening torque* with car loaded down to normal position.

* **See Specifications**

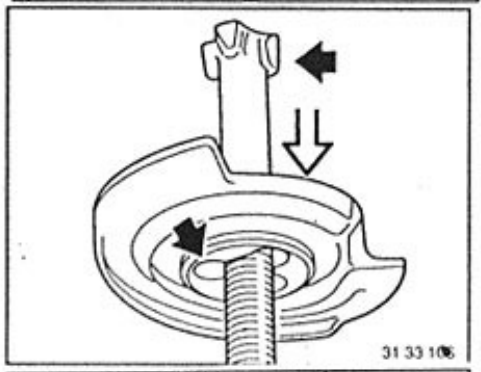


33 53 000 REMOVING AND INSTALLING LEFT OR RIGHT COIL SPRING

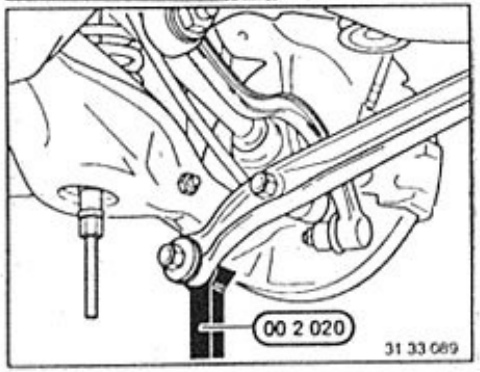
Compress rear spring with Special Tool 33 2 300.



Place spring tensioning plate in the middle of the coil spring.
Turn up upper spring tensioning plate completely; turn down lower spring tensioning plate completely.

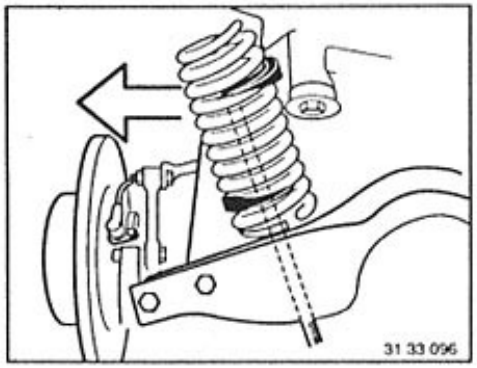


Slide in and turn the tensioning shaft until crosshead (1) is inserted perfectly in the openings of the upper spring retainer.
Compress spring.



Support trailing arm with Special Tool 00 2 020, lifting slightly if the coil spring is turned while compressing.

Installation:
Check for correct position of the rubber liners.



Lift out rear spring.

Important!
Only replace coil springs in pairs.
Check code*.

Note:
Always store shock absorbers standing upright. If shock absorbers have been stored laying down and with the piston rod run in, this could lead to a knocking noise when used in car again.

TROUBLESHOOTING REAR AXLE

Condition	Cause	Correction
Load change knock	Backlash excessive Output shaft faulty Play in propeller shaft slide	Adjust backlash – see 33 12 551 Replace output shaft – see 33 21 000
Traction or compression noise	Backlash excessive or insufficient	Adjust backlash – see 33 12 551
Drumming	Propeller shaft Rubber mounts on rear axle carrier faulty	See "Troubleshooting Propeller Shaft" Replace rubber mounts – see 33 33 ...
Oil loss	Radial oil seals leak Vent clogged Wrong oil grade*	Replace radial oil seals Clean vent Replace final drive oil
Vibration	Imbalance of wheels Ouput shaft faulty Propeller shaft	Balance wheels or replace rims Replace output shaft – 33 21 000 See "Troubleshooting Propeller Shaft"
Rattling noise	Shock absorbers installed loose Upper shock absorber rubber ring faulty Lower shock absorber rubber ring faulty Rubber mounts on rear axle carrier faulty	Tighten shock absorbers Replace rubber ring Replace shock absorber – see 33 52 ... Replace rubber mounts – see 33 33 ...
Grinding noise only when driving in curves	Wheel bearings faulty	Replace wheel bearings – see 33 41 ...

* See Operating Fluids

TROUBLESHOOTING REAR AXLE WITH AHK

If faults are reported in the instrument cluster, the fault memory must always be read. Troubleshoot with BMW Service Tester.

Condition	Cause	Correction
Loud droning noise from rear end of car	Air in drive unit	Bleed hydraulic system - refer to 33 34 005.
Knocking noise from rear end of car at intervals of about 30 seconds	Reservoir charging unit touches body Hydraulic pipes touch body	Loosen spare wheel bolt slightly. Route hydraulic pipes correctly and without tension.
Slurping or whining noise from engine compartment	a) Leak in hydraulic system b) Low hydraulic fluid level in tank	Eliminate leak. Correct hydraulic fluid level - refer to Group 32. Bleed hydraulic system - refer to 33 34 005.

34 Brakes

	General information	34- 0/1
	General information , ABS	34- 0/2
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	Function check – 3-phase alternator	34- 0/4
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048	Bleeding brake system with ABS/ASC + T	34- 0/8
34 10 014	Parking brake – adjust	34- 10/1
34 11 000	Brake pads of both front disc brakes – remove and install or replace	34- 11/1
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519	Brake caliper, front, left or right – remove and install or replace	34- 11/3
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667	Both front brake discs – fine-grind both sides	34- 11/5
34 21 200	Brake pads of both rear disc brakes – remove and install or replace	34- 21/1
320	Both rear brake discs – remove and install or replace	34- 21/2
745	Brake caliper, rear, left or right – remove and install or replace	34- 21/2
812	Brake caliper, rear, left or right – overhaul	34- 21/3
879	Both rear brake discs – check for runout and thickness deviation	34- 21/3
947	Both rear brake discs – fine-grind both sides	34- 21/3
	The operating principle of the master brake cylinder	34- 31/1
34 31 000	Master brake cylinder – remove and install	34- 31/2
34 32 362	Brake pipes – replace	34- 32/1
941	All front brake hoses – replace	34- 32/2
983	Both rear brake hoses – replace	34- 32/3
	Function of complete system H 31	34- 33/1
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34 33 505	Brake unit (brake booster) with master cylinder – remove and install	34- 33/2
100	3-phase alternator – remove and install	34- 33/3
110	Hydraulic accumulator – remove and install	34- 33/3
34 41 000	Handbrake lever – remove and install	34- 41/1
100	Handbrake Bowden cable, left or right – remove and install or replace	34- 41/2
220	All handbrake shoes – remove and install or replace	34- 41/3
	Brake system – troubleshoot	34- 41/4
	1. Antilock braking system (ABS) – operating method and design	34- 50/1
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	Automatic Stability Control (ASC)	34- 50/4
	Automatic Stability Control plus Traction (ASC + T)	34- 50/5
34 50 511	ASC + T brake intervention – check	34- 50/6
34 51 520	Hydraulic unit, complete – remove and install or replace (for ABS)	34- 51/1
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525	Hydraulic unit, ASC + T – remove and install or replace	34- 51/3
525	Hydraulic unit – remove and install or replace (for ASC + T)	34- 51/5
540	ASC + T filter – remove and install/replace	34- 51/6
	Oil circuit / ASC + T	34- 52/1
34 52 510	Control unit – remove and install/ replace (for ABS / ASC)	34- 52/2
515	Control unit – remove and install/replace (ASC + T)	34- 52/3
525	One front impulse sensor – replace	34-52/3.1
61 12 535	One rear impulse sensor – replace	34-52/3.1
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61 31 570	Relay on hydraulic unit (for ABS) – replace	34- 52/5
	Layout of ABS / ASC + T	34- 52/6
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General information

The brake system is one of the most important safety systems on a motor vehicle.
For this reason, particular care must be taken with all work on the brake system and account should be taken of the following points:

- The brake fluid must be replaced at least every two years.
  Caution: never reuse drained brake fluid.
  Brake fluid must not be poured down drains, onto open ground or into systems not suited to this substance. There is an inherent risk of contaminating ground water because brake fluid is listed as a water source contaminant.

- Brake disks must not be scored or cracked and, in addition, minimum disk thickness, disk runout, parallelism and surface roughness of friction faces must not fall above or below specified values. Brake drums must not be out of roundness, scored or cracked. Brake lining thickness must not fall below the specified minimum level*. Always replace brake disks, brake drums and brake linings in pairs (i.e. either side of same axle).

- Only loosen or tighten screw connections on brake pipes with a special brake pipe wrench (this avoids damage to the pipes).

- When dismantling the brake system, seal all brake pipes and individual components to prevent particles of dirt from entering the brake system. Ensure unit is kept clean and always use non-fluffing cloths.

- All moving parts in the brake system must move easily (adjustment fixtures, brake caliper guides, handbrake cables and actuation).

- After every operation on the brake system, it must be bled. This should be followed by a low pressure and a high pressure test.
  On vehicles with ASC+T, also perform a "brake application" function test.
  Check all connecting parts for leakage.

- Oils or grease must not enter the brake system under any circumstances since these destroy all rubber components and can cause the brake system to fail.

- When cleaning brake components (with brake cleaning fluid)**, brake cleaning fluid must never be allowed to enter the brake system.
  The chlorinated hydrocarbons frequently contained in brake cleaning fluids lead to corrosion of brake components.

- When repairing brake calipers, only use approved, glycol-based assembly compounds.

- Brake pipes and hoses must be routed correctly and must not make contact with other parts or chafe at any point.

- If the system is bled using a bleeding device, always follow the manufacturer's operating instructions.

- Do not allow brake fluid to make contact with the paint on the vehicle. Brake fluid damages the paintwork.

- Wash off brake dust or remove with suction: do not blow away with compressed air.
  Brake linig dust is a health hazard!

- If brake fluid enters the eyes, flush immediately with large quantities of fresh water. If eyes are irritated, seek appropriate medical attention without delay.

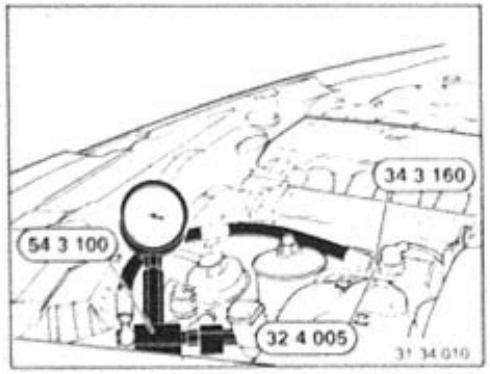
- To avoid damage to the skin, keep contact time of brake fluid on the skin as short as possible. Use soap and water to clean skin coated with brake fluid.

* Refer to Technical Data
** Source of supply: BMW Parts Service

General information on ABS

Basically, ABS does not require servicing but there must be conformance with the following points when working on cars equipped with ABS:

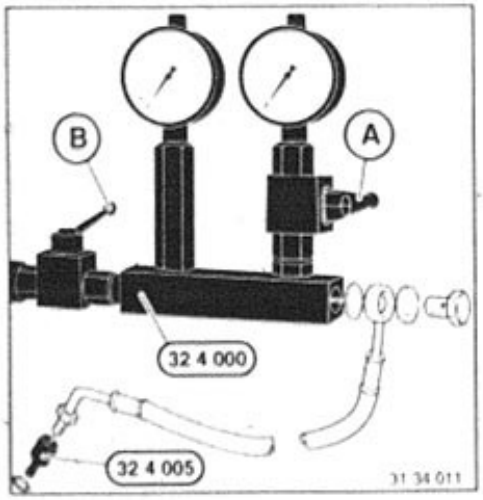
- Plug must be pulled off the electronic control unit (ignition switched off) when welding with an electric welder.
- Electronic control unit may be subjected to max. 95°C briefly or to max. 85°C for about 2 hours when painting car.
- If battery was removed, ensure that terminals are firmly seated after installation.
- The brake lines on the hydraulic unit must not be confused: to avoid this, mark them prior to disassembly.
- Entire ABS system must be checked in accordance with the "Electrical Troubleshooting Manual" if one of the following ABS components was removed or replaced:
  - Hydraulic unit
  - ABS control unit
  - Wheel speed sensor
  - ABS wiring harness
  - Valve control relay
  - Electric motor relay



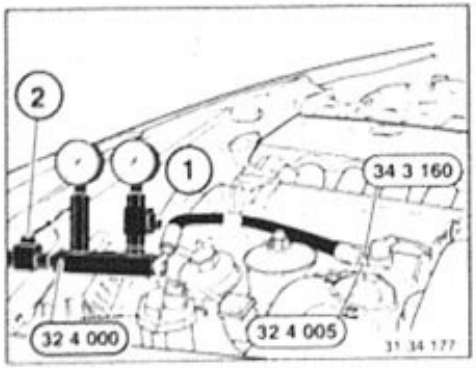
34 00 015 CHECKING BRAKE BOOSTING SYSTEM

Discharge the hydraulic reservoir by operating the brake pedal about 20 times with the engine stopped and a force equal to full stop braking.
Pull off wires and unscrew hydraulic pressure switch.
Mount Special Tools 34 3 160 and 32 4 005.

Installation:
Tightening torque*.



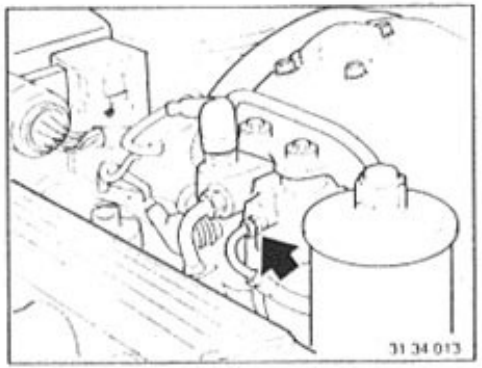
Connect pressure tester (Special Tool 32 4 000 or alternatively 54 3 100) to Special Tools 34 3 160 and 32 4 005.



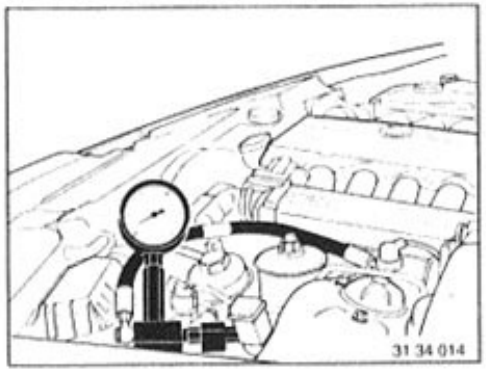
Close both valves (1 and 2).

Checking Power Flow Regulator and Brake Booster for Leaks:
Start engine and observe the pressure gage.
Stop engine after reaching the upper switching-off pressure*.

* Refer to Specifications

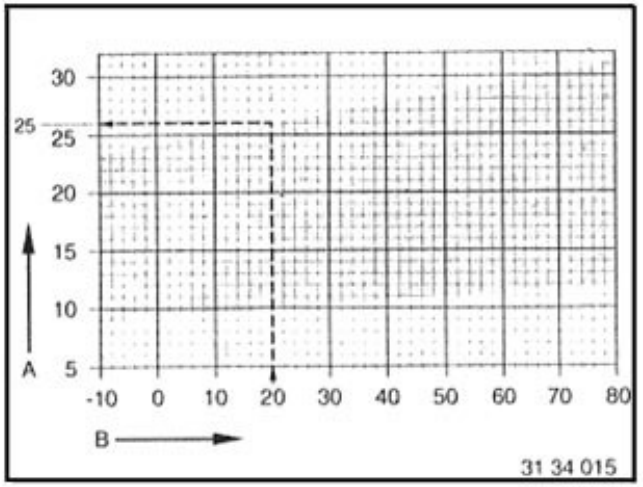


If the reservoir pressure (pressure gage) drops by more than 5 bar within 5 minutes, disconnect the return pipe at the power flow regulator.
If leak oil runs out of the return pipe bore in the power flow regulator, the power flow regulator leaks and must be replaced.
If no leak oil runs out and the reservoir pressure still drops, the brake booster has an internal leak and must be replaced.

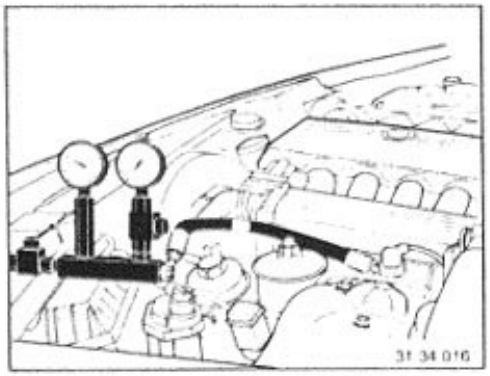


Hydraulic Reservoir Function Test:
Operate the brake pedal about 20 times to drop the reservoir pressure (pressure gage) to zero.
Start engine and observe the pressure gage. Pressure gage should immediately display a value shown in the diagram.
If this value is not reached or exceeded, replace the hydraulic reservoir.

Gas Charging Pressure/Hydraulic Reservoir Temperature Diagram

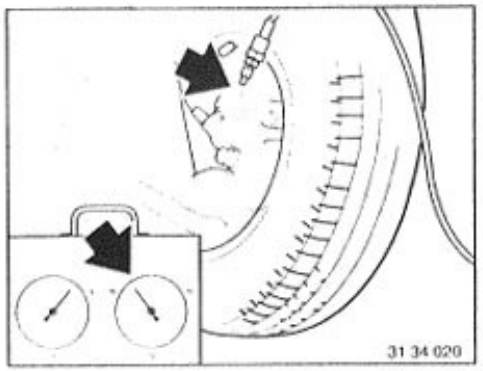


A Gas charging pressure in bar
B Hydraulic reservoir temperature in °C
Permissible gas charging pressure of hydraulic reservoir depending on pertinent temperature conditions.



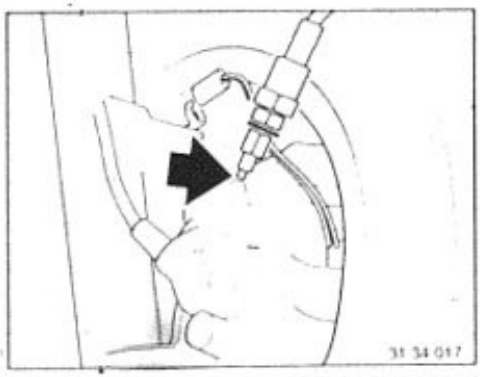
Checking Function of Power Flow Regulator:

Start engine. Pressure continues rising up to the upper switching-off pressure*. Drop the reservoir pressure (pressure gage) to switching-on pressure* by operating the brake pedal with the engine running. Afterwards the power flow regulator switches again to "charging reservoir" (pressure rises again). Replace the power flow regulator, if test values are not reached. Drop the reservoir pressure (pressure gage) to zero by operating the brake pedal about 20 times.
Remove pressure tester and check oil level in supply tank.



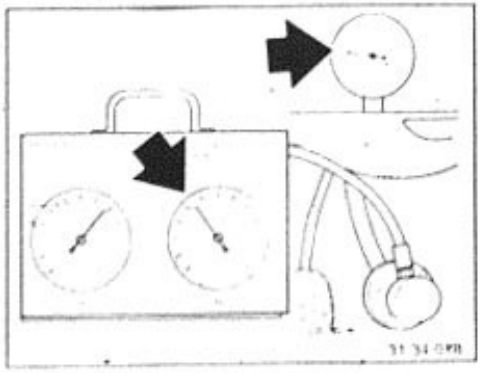
34 00 019 CHECKING SERVICE BRAKE (HIGH AND LOW PRESSURE TESTS)

High Pressure Leak Test:
Discharge the hydraulic reservoir by operating the brake pedal 20 times with the engine stopped and a force equal to full stop braking.
Test both brake circuits.
1st circuit = front right and rear left
2nd circuit= front left and rear right
Unscrew bleeder screw of the 2nd brake circuit. Connect and bleed a pressure tester.



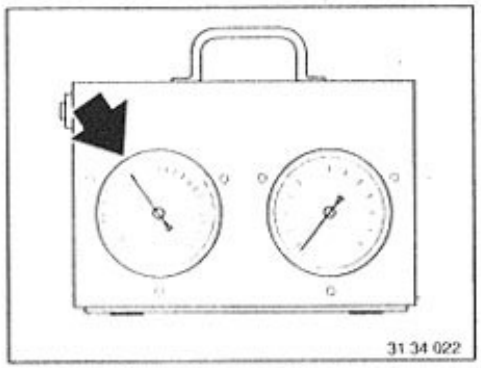
Checking Function of Brake Booster with Tandem Brake Master Cylinder:

Unscrew bleeder screw on caliper.
Connect and bleed a pressure tester.



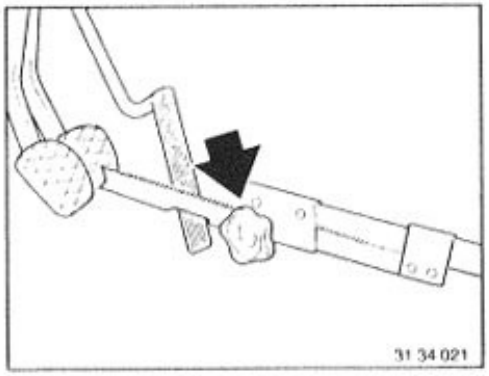
Mount a pedal force meter on brake pedal. Apply a force* on brake pedal with the engine running (full hydraulic reservoir). In so doing the hydraulic line pressure of the service brakes must reach the specified value*. The brake booster must be replaced, if thee values are not reached with the service brakes in perfect operating condition.
Note:
This test does not include the service brake leak test.

* See Specifications



Apply a force* on the brake pedal. In so doing the hydraulic line pressure of the service brakes must show specified pressure*. Pressure may drop by max. 8 % after 2 minutes. Perform same test on the 1st brake circuit.

Caution!
Engine must be stopped for the high pressure leak test.



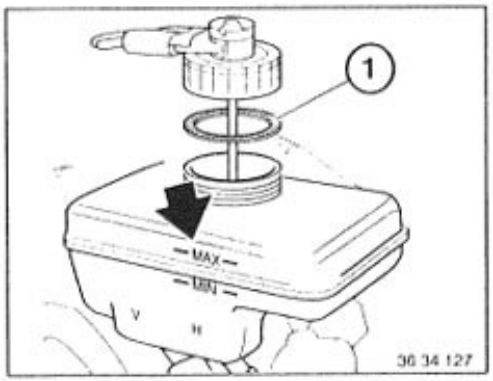
Low Pressure Test:
Test both brake circuits. Take back the pedal prop until testing pressure in the brake system is 2 to 5 bar (28 to 71 psi). Car and tester must remain still, since any motion would produce wrong readings. Pressure must remain constant during the 5 minute test. Check rubber parts, if the pressure drop is considerable. Bleed calipers after finishing the test.

* See Specifications

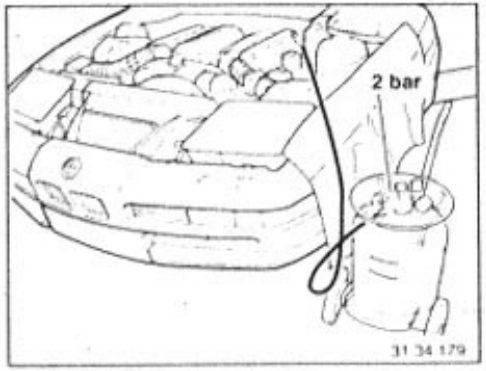
34 00 047 Bleeding ABS brake system

Note:
Only use approved brake fluid*.
Observe correct brake fluid change intervals *

Caution!
Note general instructions

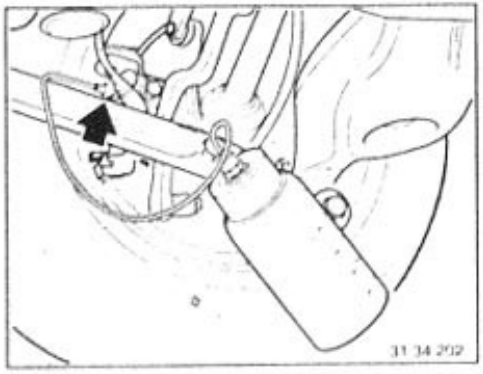


Switch off bleeder unit and remove from expansion tank.
Check brake fluid level.
Close expansion tank (note rubber seal (1) in cover).



Connect bleeder unit ** to expansion tank.

Note:
Follow relevant manufacturer's operating instructions.
Fill pressure must not exceed 2 bar.



Connect bleeder hose and receptacle to rear right brake caliper.
Open bleed valve and fully depress brake pedal at least 12 times (brake fluid must emerge without bubbles).
Hold brake pedal down (fully depressed).
Close bleeder valve.
Release brake pedal.
Follow same procedure on rear left, front right and front left wheel brakes.

* Refer to BMW Operating Fluids
** Refer to BMW Workshop Equipment Planning documentation

AUTOMATIC STABILITY CONTROL AND TRACTION (ASC + T)

Purpose of ASC + T:
- Easier moving off for driver
- Guarantee of directional stability and steerability
- Improvement of traction (+ T)
- Information for driver

Description of Operation:
The system has the task of regulating the slip of driven wheels to the lowest possible value regardless of the road surface condition.

Engine torque is reduced via DME (ignition timing correction) and EML (throttle valve correction) during regulation. If this is not sufficient, the drive wheel rotating too fast will be slowed down by the wheel brake via a hydraulic element of the plunger hydraulic unit.

The system is switched on automatically after starting the engine and can be switched off manually. The ASC lamp is off with the system switched on.

The ASC lamp in the instrument cluster flashes to inform the driver when regulation has been activated.
If the ASC lamp is on continuously, the system was switched off automatically because of a fault or was switched off manually.

Note:
Troubleshooting – see Car Electric/Electronic Test Plan.

Important!
Pull off the ASC + T control unit plug before starting the engine for the first time after working on the oil supply tank, tandem pump, high pressure filter, ASC + T hydraulic control unit and corresponding connection lines.
Reconnect control unit plug with the ignition turned off after the engine has run 1 minute.

Switch off ASC+T when testing on a brake roller test stand pr dynamometer test stand!

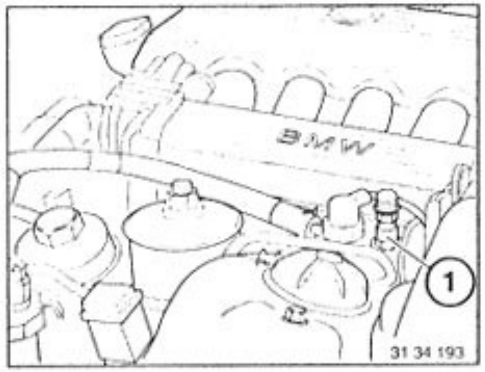
34 00 040 Bleeding ASC + T mineral oil circuit

1. Fill mineral oil circuit

Caution!
Before the mineral oil circuit is filled with hydraulic oil*, ensure that the brake system is filled with brake fluid.
Filling brake system, refer to 34 00 048, section 1.

Disconnecting control unit ABS/ASC+T, refer to 34 52 510.

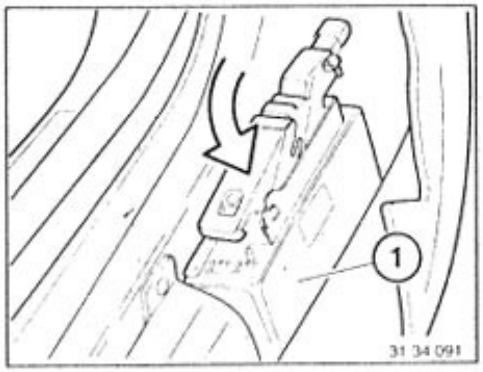
Topping up with hydraulic fluid*, refer to 32 13 006.



Fit special tool 34 3 110 to the bleeder screw on the hydraulic plunger unit and insert end of hose in hydraulic oil tank.
Open bleeder screw and flush plunger hydraulic unit until hydraulic oil emerges without bubbles (at least 15 seconds).
Close bleeder screw.

Note:
Tightening torque 34 32 1AZ*

Check hydraulic fluid level and top up if necessary, refer to 32 13 006.



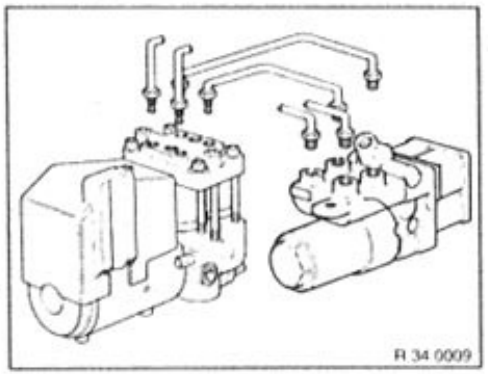
Bleed 2nd mineral oil circuit

Switch off ignition.
Attach control unit connector to (1) ABS/ASC+T control unit.

Switch on engine and run at idle speed for at least 60 seconds (automatic charging of the ASC +T plunger accumulator).

* Refer to BMW Service Operating Fluids

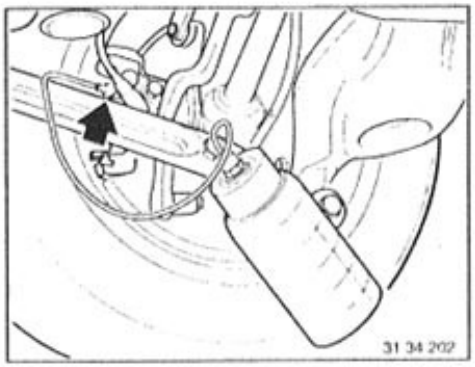
* Refer to Technical Data



34 00 048 Bleeding brake system with ABS/ASC+T

ABS/ASC+T with plunger hydraulic unit

Note:
Apply the relevant filling and bleeding specification when exchanging or repairing parts in the tandem master brake cylinder and ASC+T plunger hydraulic unit (both included in each case).
For other operations on the brake system (e.g. exchange of brake calipers), the specification used until now - "Bleeding ABS brake system" (see 34 00 047) should also be applied to ASC+T vehicles.



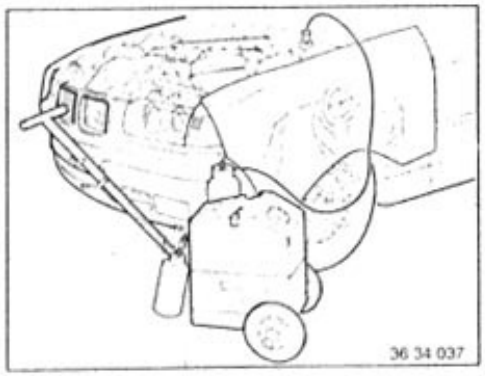
1. Fill brake system with brake fluid *

Connect bleeder hose and receptacle to rear right brake caliper.
Open bleeder valve and flush until brake fluid emerges without bubbles, for at least 4 minutes, then close the vent screw.
Follow same procedure on rear left, front right and front left wheel brakes (minimum flush time per front wheel brake: 1 minute)

2. Bleed brake system

Caution!
Before bleeding the system, ensure that the mineral oil side of the ASC+T plunger hydraulic unit was bled. This applies especially after exchange or repair work on mineral oil assemblies and lines from the expansion tank and up to and including the plunger hydraulic unit.
If necessary, bleed the ASC+T mineral oil circuit before bleeding the brake system, see 34 00 040.

Correct bleeding of the ASC+T hydraulic unit is only possible using the ABS/ASC tester 34 5 110.



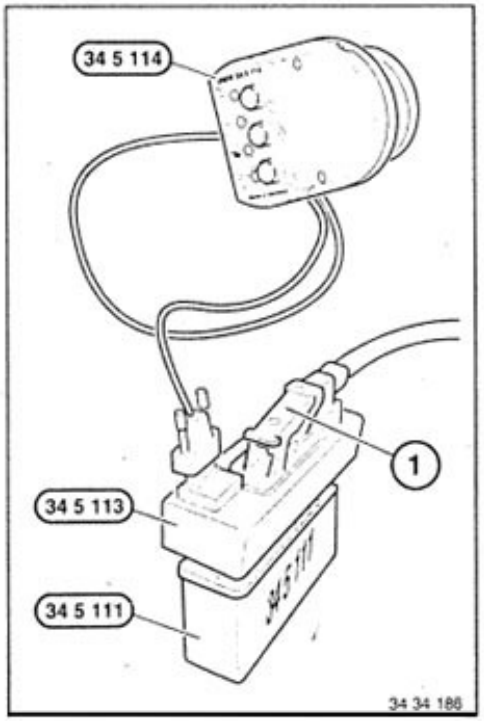
Connect bleeder unit to expansion tank.

Note:
Follow relevant manufacturer's operating instructions.
Set charge pressure to 2.5 - 3 bar.

* Refer to BMW Operating Fluids

2.1 Bleed rear axle brake circuit:

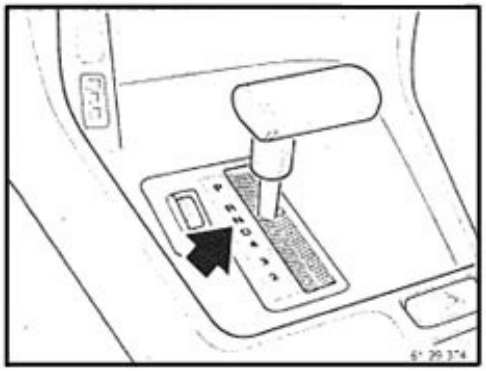
Disconnect ABS/ASC+T control unit, see 34 52 510.



Connect test adapter 34 5 113 to tester 34 5 111.

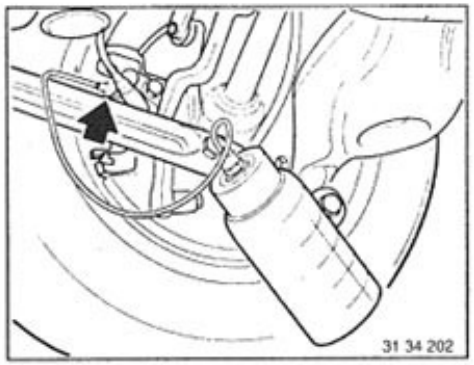
Connect diagnosis connection cable 34 5 114 to test adapter 34 5 113.

Connect control unit connector (1) to test adapter 34 5 113.



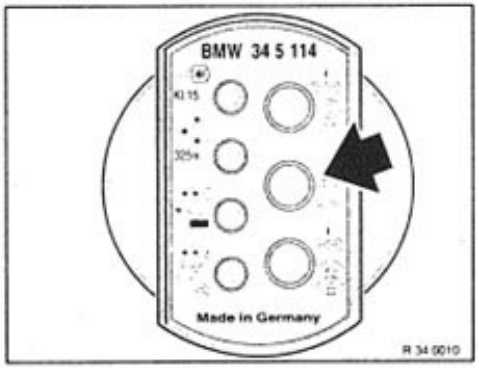
Move shift lever into neutral or selector lever into setting "P" or "N".

Switch on engine.



Connect bleeder hose and receptacle to rear right brake caliper.
Open bleeder valve and fully depress brake pedal at least 20 times (brake fluid must emerge without bubbles).

Release brake pedal



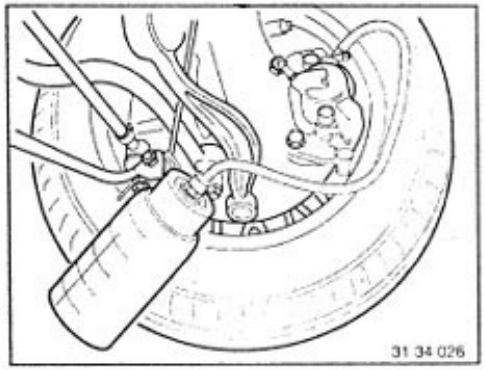
Press red button to start bleeding operation (duration approx. 60 seconds).

Caution!
Brake fluid must emerge without bubbles: if necessary, repeat bleeding operation.

Close bleeder valve.

Follow same procedure on rear left wheel brake.

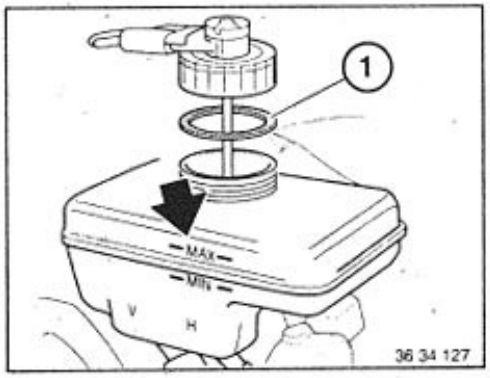
Switch off engine.



2.2 Bleed front axle brake circuit:

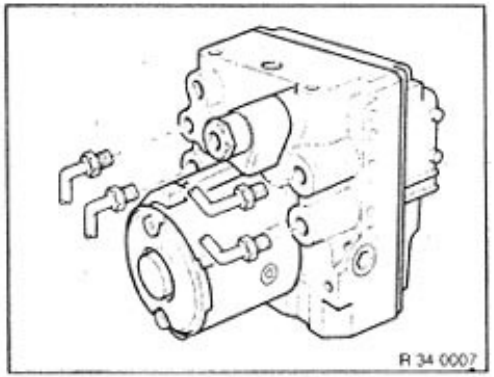
Connect bleeder hose and receptacle to front right brake caliper.
Open bleeder valve and fully depress brake pedal at least 12 times (brake fluid must emerge without bubbles).
Hold down brake pedal (fully depressed), close bleeder valve and release brake.

Bleed front left wheel brake using same procedure.



Remove bleeder unit.
Check brake fluid level and correct if necessary.
Close expansion tank (note rubber seal (1) in cover).

Switch off ignition.
Remove control unit connector from test adapter and attach to ABS/ASC+T control unit, see 34 52 5100.



34 00 048 Bleeding brake system with ABS/ASC+T

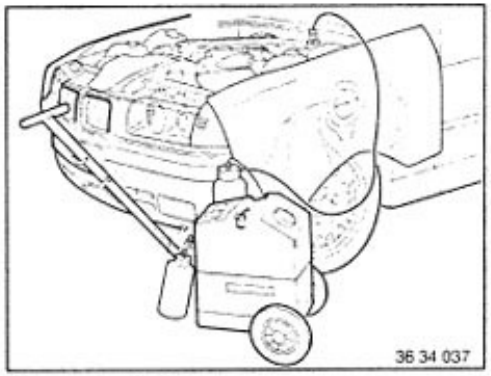
ABS/ASC+T from model year '94

Note:
Follow the filling and bleeding specification when exchanging or repairing:
- tandem master brake cylinder
- ABS/ASC+T hydraulic unit
- and components installed between these assemblies.

For other operations on brake system (e.g. exchange of brake calipers), follow specification "Bleeding ABS brake system", see 34 00 047.

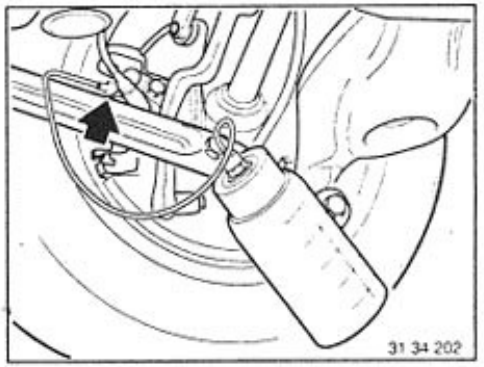
Caution!
Follow general instructions.

Attach BMW Service Test/MoDIC to diagnosis connector.
Call up diagnosis program (ABS/ASC/ABD).

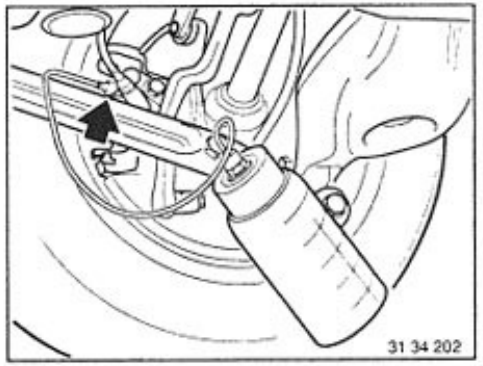


Connect bleeder unit to expansion tank and switch on.

Note:
Follow relevant manufacturer's operating instructions.
The charge pressure must not exceed 2 bar.

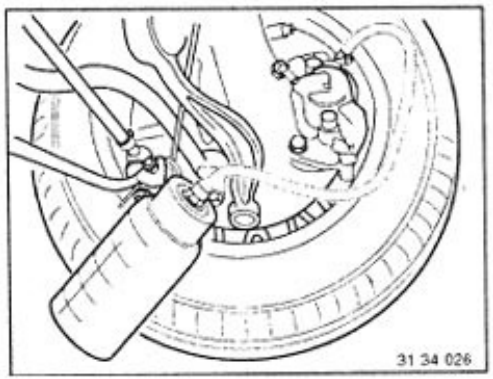


Connect bleeder hose and receptacle to bleeder valve on the rear right brake caliper.
Open bleeder valve and flush until clear brake fluid emerges without any air bubbles.
Close bleeder valve.
Repeat same procedure on rear left, front right and front left wheel brakes.



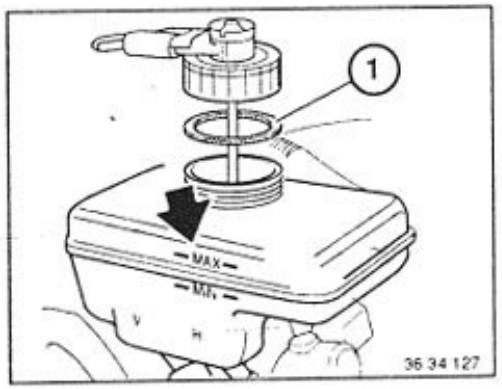
Bleed rear axle brake circuit:

Attach bleeder hose and receptacle to the bleeder valve on the rear right brake caliper.
Open bleeder valve.
Perform bleeding routine on BMW diagnosis system.
Close bleeder valve.
Follow same procedure on rear left wheel brake.



Bleed front axle brake circuit:

Attach bleeder hose and receptacle to the bleeder valve on the front right brake caliper.
Open bleeder valve.
Fully depress brake pedal at least 12 times.
Brake fluid must emerge clear and without air bubbles.
Hold down brake pedal (fully depressed).
Close bleeder valve.
Release brake pedal.
Follow same procedure on front left wheel brake.



Switch off bleeder unit and disconnect from expansion tank.
Check brake fluid level.
Close expansion tank (note rubber seal (1) in cover).

Remove BMW Service Test/MoDIC and replace cover on diagnosis connector.

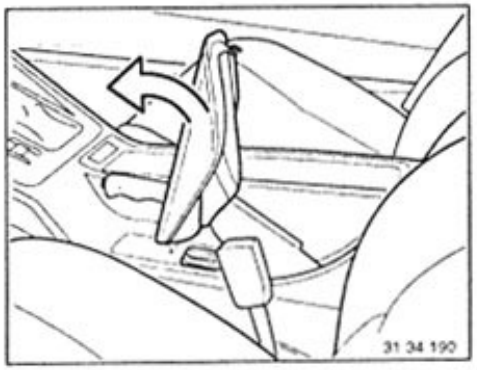
34 10 014 ADJUSTING PARKING BRAKE

Test Specifications

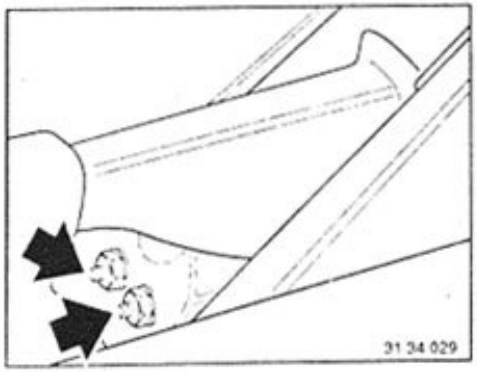
- There should not be braking effect when parking brake lever is pulled up one tooth.
- The wheel peripheral force may deviate from the larger value by max. 30 % in comparison with the opposite wheel (measured on dynamometer).
  Adjustment is necessary in case of greater brake force difference.
- It should be possible to hold the car with the parking brake.
- The parking brake must be adjusted if the parking brake lever travel is greater than ten teeth.

Note:
The parking brake can only be adjusted correctly if the parking brake cables and all moving parts of the parking brake move easily and function correctly.

Basic parking brake adjustment is necessary:
- After replacing brake shoes
- After replacing brake drums
- After resetting slack control device
- In case of excessive parking brake lever travel (ten teeth).



Lift dust cover off.

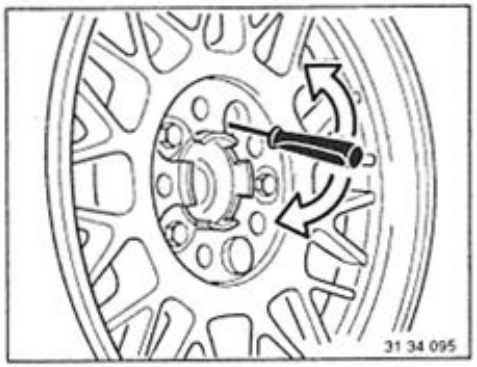


Unscrew the adjusting nuts and loosen the cable completely.



Unscrew and remove one wheel bolt from each rear wheel.
Turn wheel until the tapped bore is positioned at top.

Installation:
Install and tighten wheel bolt.
Tightening torque*.



Turn adjusting screw using a screwdriver until the wheel or brake disc can no longer be turned.

Loosen the adjusting screw 8 catches afterwards.

* Refer to Specifications

2. Adjusting Cables

2.1 By Hand

Pull parking brake lever up four teeth and turn the adjusting nuts until it is just possible to still turn the rear wheels.

Release the parking brake lever; it must be possible to turn the wheels easily.

Switch ignition on; the control lamp must not be on with a released parking brake lever.

1 tooth: No braking effect.
Control lamp could be on.

2 teeth: Control lamp must be on; if necessary, adjust the switch contact on the parking brake lever – refer to Group 61.

2.2 On Dynamometer

0 teeth: (parking brake lever released) wheel peripheral force at idling speed in cars
a) without limited slip differential < 150 N
b) with limited slip differential < 200 N

1 tooth: No braking effect.
Control lamp could be on.

2 teeth: Control lamp must be on; if necessary, adjust the switch contact on the parking brake lever – refer to Group 61.

Checking of braking force difference with
duo-servo parking brake in 3rd tooth

The left/right brake force display must be 600 + 50 N.

3. Breaking In Specifications for Duo-Servo Parking Brake

The following breaking in procedures are applicable in case of insufficient braking effect or after replacing brake discs and/or brake shoes.

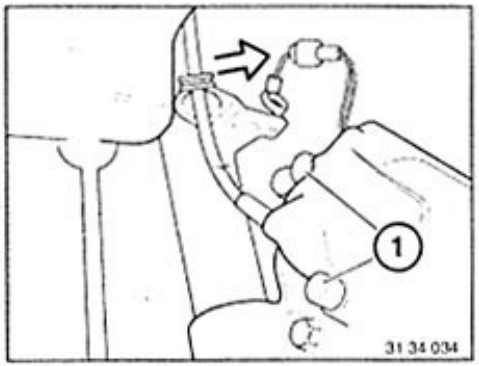
With car moving approx. 40 km/h pull up the parking brake lever until braking of the car is noticed.
Then pull up the parking brake lever into the next catch and drive approx. 400 meters in this position.
(A basic requirement is that the parking brake is adjusted uniformly.)

Note:
The parking brake is completely independent of the service brake and consequently is only subjected to limited wear.
Quite often dirt and corrosion will cause the braking effect of the parking brake to give in the course of time.

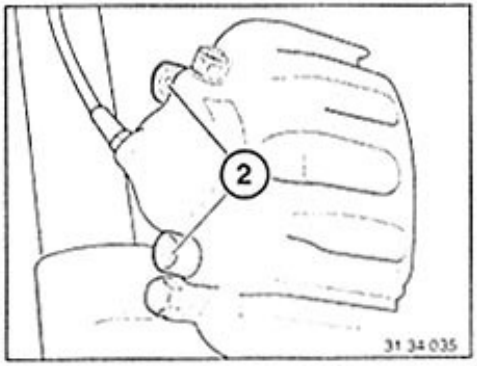
34 11 000 Removing and installing or replacing brake blocks on both front disc brakes

Note:
When operation is complete, actuate brake pedal several times until brake linings locate against brake disc.

Remove wheels, see 36 10 300.

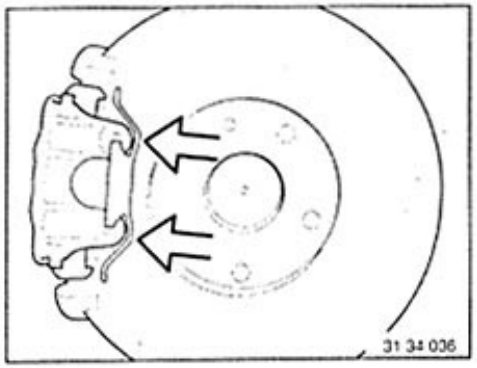


Press off plastic caps (1).
Left:
remove connector for wear indicator display.



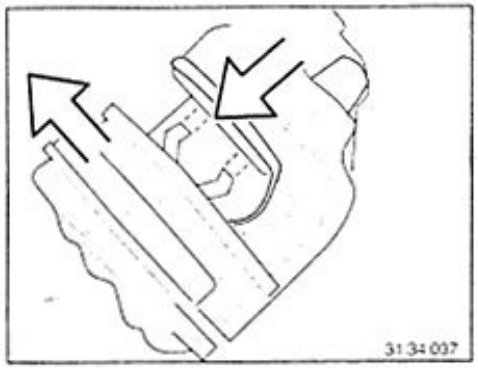
Unfasten guide bolts (2).

Installation:
Only clean guide bolts, do not grease.
Check thread.
Replace guide bolts that are not in perfect condition.
Tightening torque 34 11 3AZ*

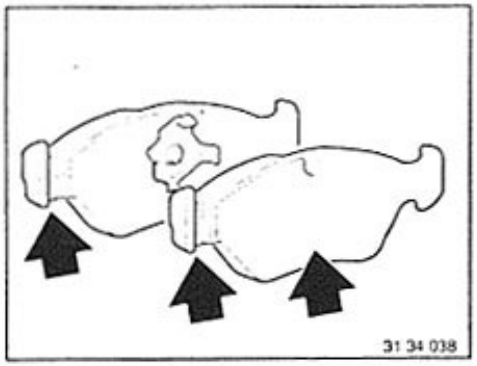


Lift out retaining spring.
Pull out brake caliper forwards.

* Refer to Technical Data

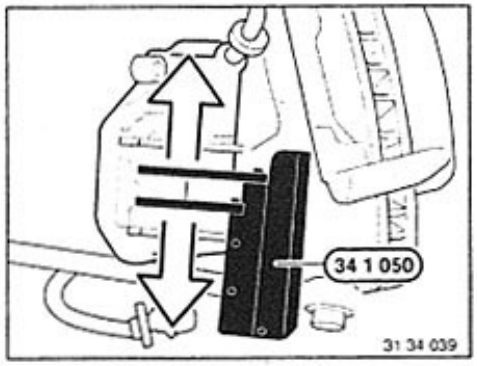


Remove outer brake lining.
The inside brake lining is seated in the piston with the spring.



Caution!
Only install new brake linings * if brake disc thickness is greater than or equal to minimum thickness (MIN TH)*.

Apply light coat of Plastilube** to brake piston contact points on baseplate of brake lining.



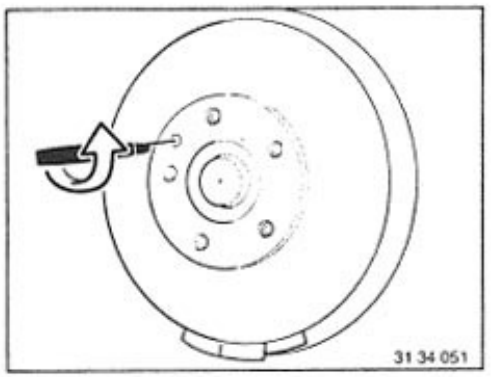
Installation:
Press in piston firmly with tool 34 1 050.
Clean brake lining guides on brake caliper and brake carrier with a brush**.
Check dust cover for signs of damage.
Apply light coat of Plastilube** to guides.

* Refer to Technical Data
** Refer to BMW Parts Service

34 11 220 Removing and installing or replacing both front brake discs

Remove wheels, see 36 10 300.

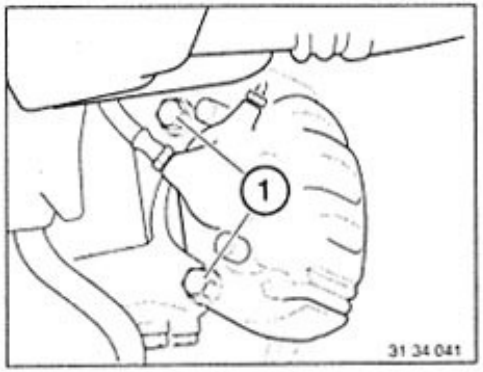
Caution!
If brake disc thickness (MIN TH)* falls below minimum, the old brake lining kit can still be used up.
New brake linings* must only be installed if the brake disc thickness is greater than or equal to the minimum thickness (MIN TH)*.
Always replace both brake discs on an axle at the same time.



Unfasten screw and remove brake disc.

Note:
The brake discs on the 850 CSi are directional. If the last digit in the parts number is an odd number, this denotes the left brake disc: an even number denotes the right brake disc.

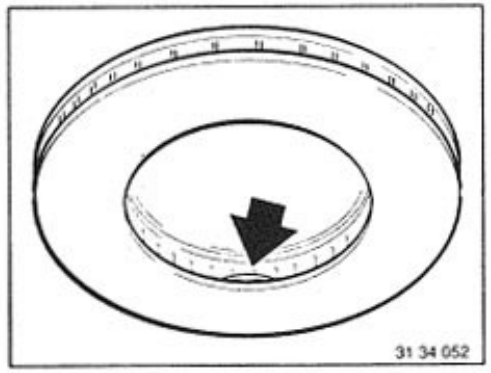
Installation:
Tightening torque 34 11 1AZ*.



Unfasten screws (1), remove brake caliper and tie up with wire.

Note:
Brake line remains connected.

Installation:
Tightening torque 34 11 2AZ*.



Caution!
Internally-vented brake discs are balanced. Under no circumstances remove or relocate the balancing clips.

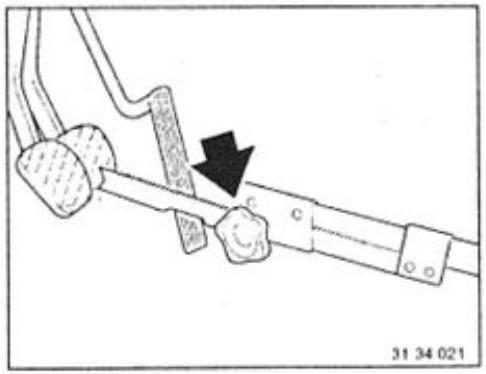
* Refer to Technical Data

* Refer to Technical Data

34 11 519 Removing and installing or replacing front left or right brake caliper
(without bleeding brakes)

When operation is complete, bleed the brake system, see 34 00 047 for ABS, or 34 00 048 for ABS/ASC+T.

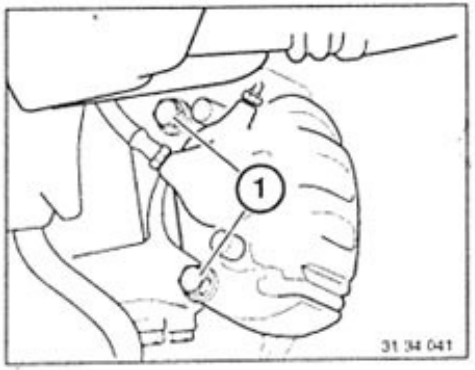
Remove wheels, see 36 10 300.



Install pedal support and gently depress brake pedal. This prevents brake fluid from escaping out of the expansion tank when the brake lines are disconnected, something which would enable air to enter the brake system.

Separate brake line at connection with brake hose.

Installation:
Tighten brake hose on brake caliper.
Move wheels into straight-ahead position.
Screw brake hose onto brake line, taking care not to twist brake hose.
Tightening torque 34 32 1AZ*



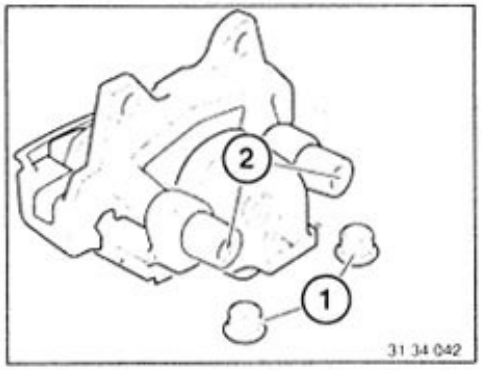
Unfasten screws (1).
Left: disconnect wear indicator display.
Pull out brake caliper forwards.

Installation:
Tightening torque 34 11 2AZ*

* Refer to Technical Data

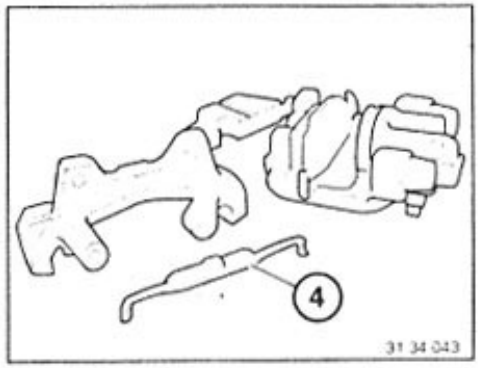
34 11 552 Overhauling front left or right brake caliper
(brake caliper removed)

Use repair kit



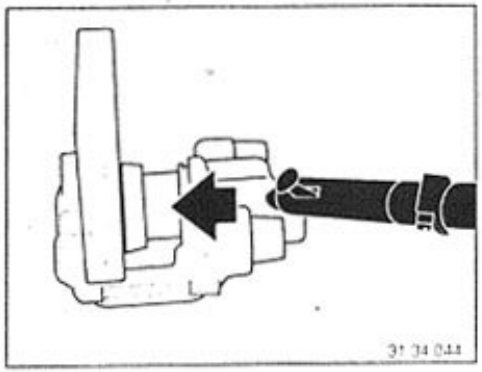
Press off plastic caps (1).
Unfasten guide screws (2).

Installation:
Only clean guide screws - do not grease.
Check guide screws and replace if necessary.
Tightening torque 34 11 3AZ*



Dismantle brake caliper and remove brake linings.

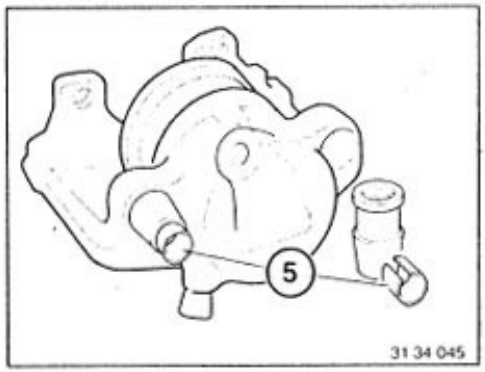
Installation:
Before installing retaining springs (4), completely press out brake linings.



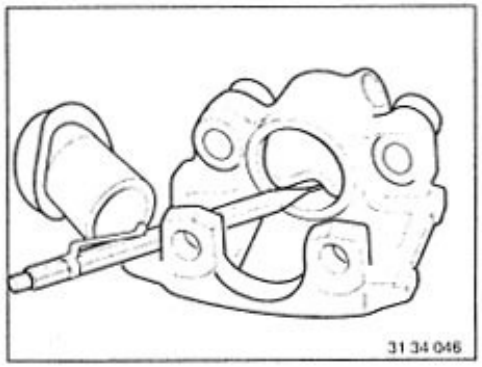
To protect the piston, install a protective plate (hardwood, hard felt or similar) in the caliper duct.
Press piston out through connecting bore using compressed air.

Caution!
Compressed air at 10 bar (atmospheres) produces a force of approx. 1250 N.

* Refer to Technical Data

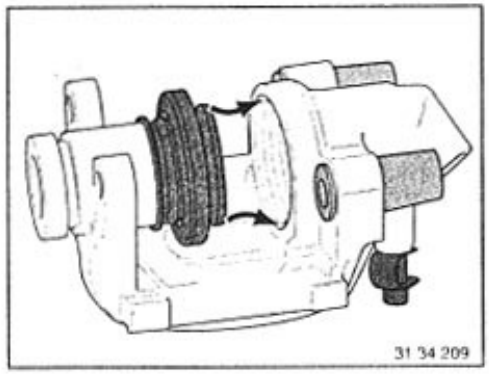


Check guide sleeves (5) and, if necessary, fit repair kit guide sleeve.



Carefully remove sealing ring with a plastic needle.
Clean cylinder bores and components with spirits and dry with compressed air.
Carefully check cylinder bore, piston and flange faces for signs of damage. Metal-cutting machining of cylinder and piston is not permitted.

Installation:
Apply light coat of Ate brake cylinder compound to all parts and install.



First fit protective rubber cap to the piston.
Insert sealing bulge of protective cap in the groove of the cylinder bore and press in piston with a hardwood plate.

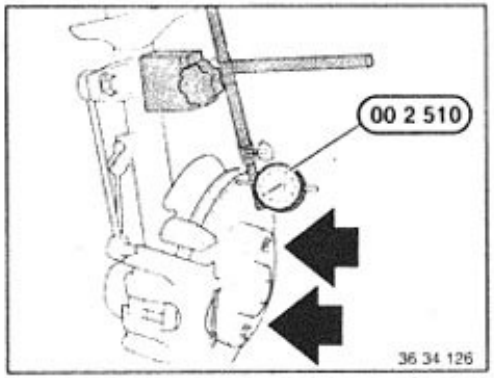
Caution!
Do not tilt piston.

Assemble brake caliper.

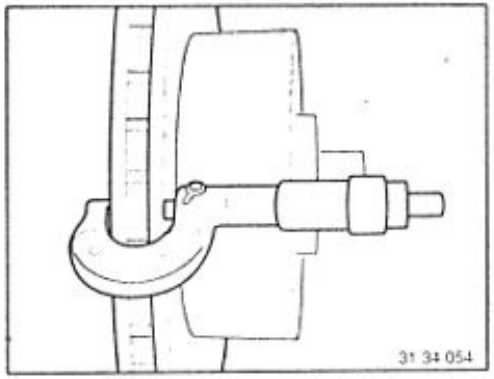
34 11 599 Checking both front brake discs for runout and thickness deviation
(front wheels removed)

Wheel bearing clearance must conform to specification*.

Secure brake disc with 2 M 12 x 1.5 screws.
Press back brake linings (brake disc must not make contact).



Secure dial gage 00 2 510 with magnetic stand to spring strut shock absorber.
With slight preload, apply measuring tip to outer edge of brake disc.
Rotate brake disc slowly and read off end float*.



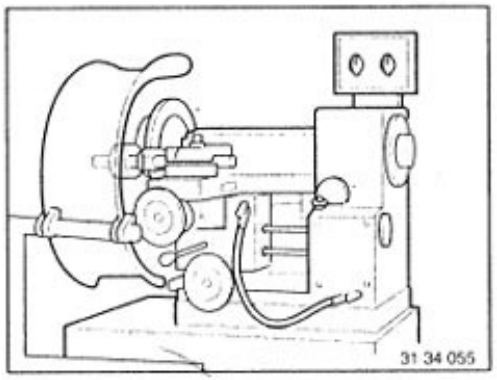
Read off thickness deviation * on braking surface at approx. 8 points using the micrometer.

* Refer to Technical Data

34 11 667 Fine grinding both sides of both front brake discs
(brake discs removed)

Caution!
Note MAX. machining size* per friction ring side and minimum thickness of brake discs (MIN TH)*.
Always fine-grind both sides of both brake discs on one axle.

Note:
Only fit one more set of brake linings to brake discs which have been machined to minimum thickness (MIN TH)*.



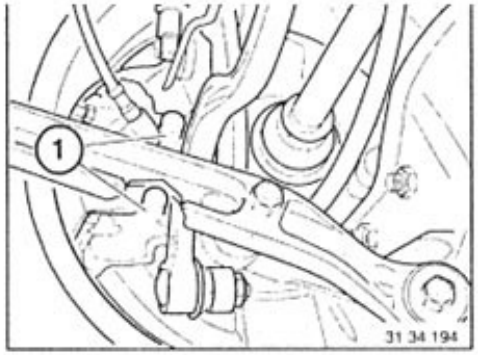
Machining equipment**
Follow instructions in equipment manufacturer's operating manual**.

* Refer to Technical Data
** Refer to BMW Workshop Equipment Planning documentation

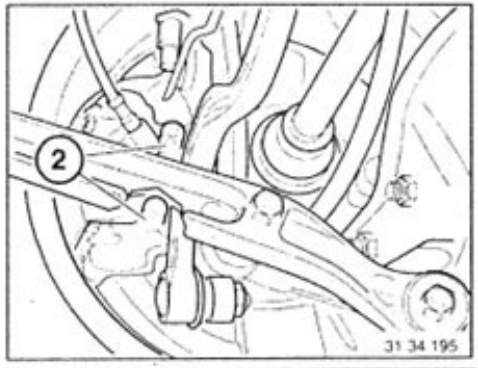
34 21 200 Removing and installing or replacing brake pads on both rear disc brakes

Note:
When operation is complete, actuate brake pedal several times to enable the brake linings to bed down on the brake disc.

Remove wheels, see 36 10 300.

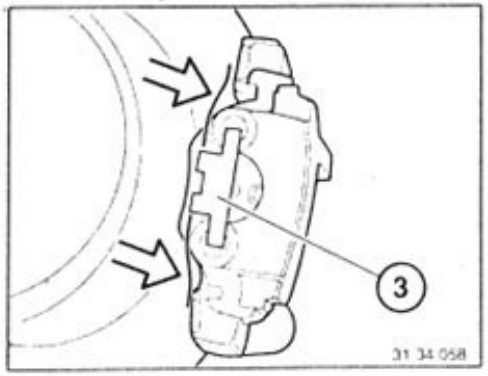


Press off plastic caps (1).
Right:
Remove connector for wear indicator



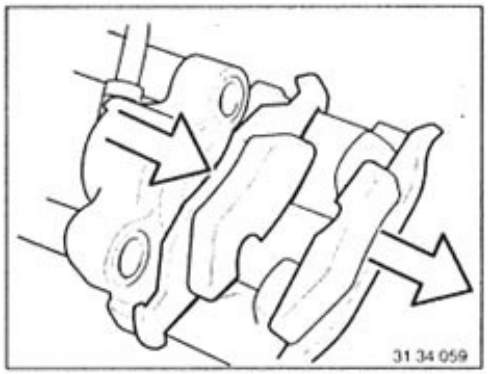
Unfasten guide screws (2).

Installation:
Only clean guide screws, do not coat with grease.
Check thread.
Replace guide screws which are not in perfect condition.
Tightening torque 34 21 5AZ*

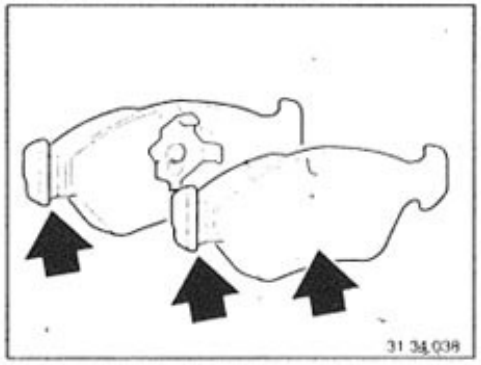


Lift out retaining spring (3).
Pull brake caliper out forwards.

* Refer to Technical Data

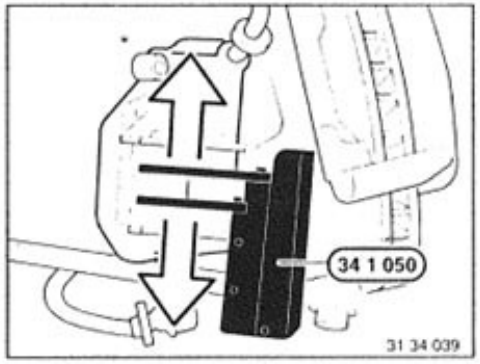


Remove outer brake lining.
The inner brake lining locates against the spring in the piston.



Caution!
New brake linings* can only be installed if the brake disc thickness is greater than or equal to the minimum thickness (MIN TH)*.

Apply light coat of Plastilube** to brake piston contact points on brake lining baseplate.



Installation:
Press piston fully back using special tool 34 1 050.
Clean brake lining guides on brake caliper and brake carrier with a brush**.
Check dust cover for signs of damage.
Apply light coat of Plastilube** to guides.

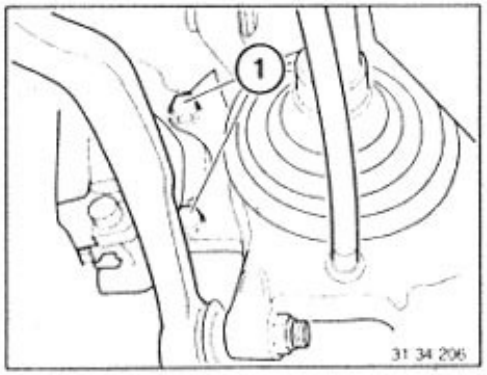
* Refer to Technical Data
** Refer to BMW Parts Service

34 21 320 Removing and installing or replacing both rear brake discs

Remove wheels, see 36 10 300.

Caution!
If the brake disc thickness falls below the minimum level (MIN TH)*, the old brake lining kit can be used up.
New brake linings* may only be installed if the brake disc thickness is greater than or equal to the minimum thickness (MIN TH)*.
When replacing, always replace both brake discs on one axle.

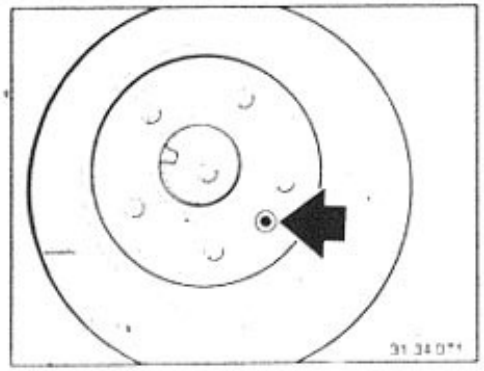
After completion of operation, adjust handbrake, see 34 10 014.



Unfasten screws (1), remove brake caliper and tie up with wire.

Note:
Brake line remains connected.

Installation:
Tightening torque 34 21 4AZ*



Unfasten screw and remove brake disc.

Note:
If necessary, release handbrake cables, see 34 41 100.

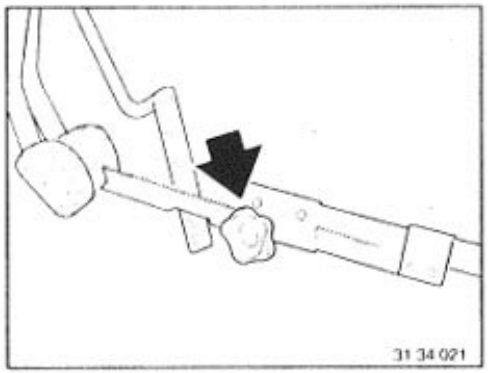
Installation:
Tightening torque 34 21 1AZ*

* Refer to Technical Data

34 21 745 Removing and installing or replacing left or right brake caliper
(without bleeding the brakes)

When operation is completed, bleed the brake system, see 34 00 047 for ABS or 34 00 048 for ABS/ASC+T.

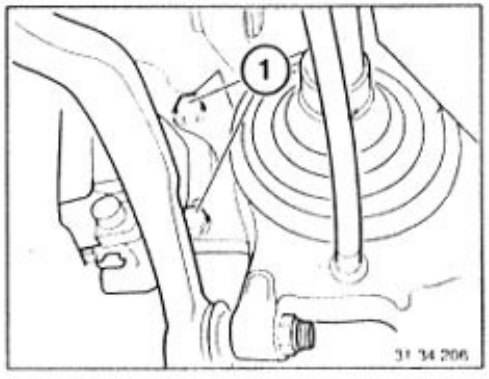
Remove wheel, see 36 10 300.



Install pedal support and press brake pedal down gently.This prevents brake fluid from escaping out of the expansion tank when the brake lines are disconnected, something which would enable air to enter the brake system.

Disconnect brake line at its connection with the brake hose.

Installation:
Tighten brake hose to the brake caliper.
Screw brake hose to the brake line, taking care to avoid twisting the brake hose.
Tightening torque 34 32 1AZ*



Unfasten screws (1).
Disconnect wear indicator.
Remove brake caliper by pulling forwards.

Installation:
Tightening torque 34 21 4AZ*

* Refer to Technical Data

34 21 812 Overhauling left or right brake caliper
(brake caliper removed)

Operation is identical to 34 11 552.

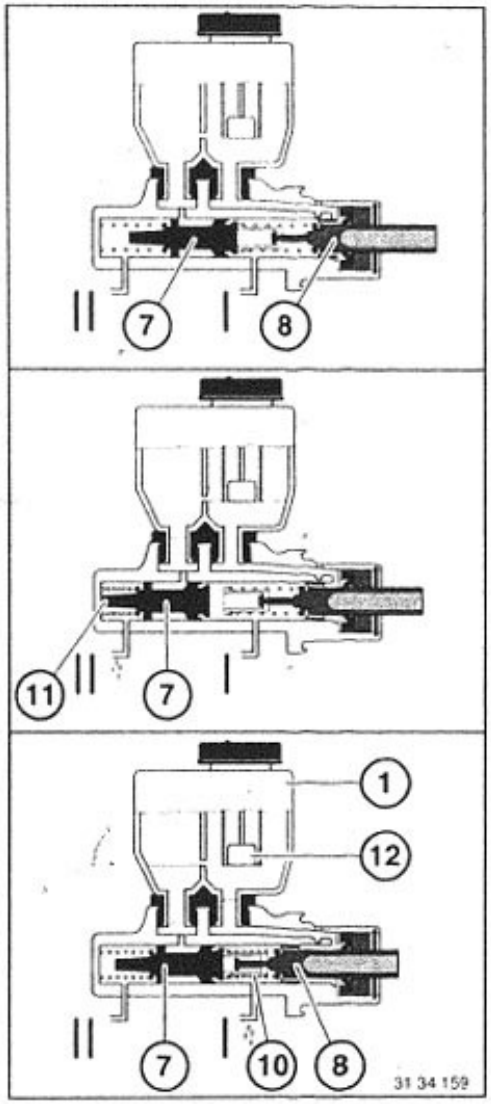
34 21 879 Checking both rear brake discs for runout and thickness deviation
(rear wheels removed)

Operation is identical to 34 11 599.

Note:
Secure magnetic stand to upper control arm.

34 21 947 Fine grinding both sides of both rear brake discs
(brake discs removed)

Operation is identical to 34 11 667.

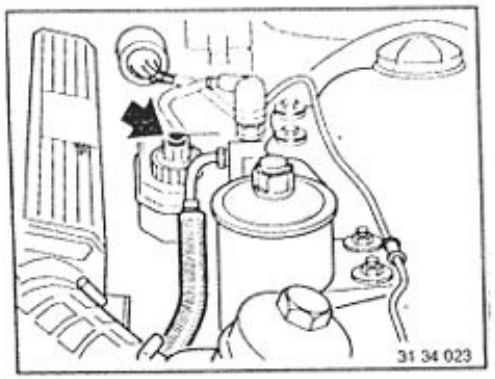


DESCRIPTION OF BRAKE MASTER CYLINDER OPERATION

The operating force applied on push rod piston (8) produces hydraulic braking pressure in the first pressure chamber of the tandem master cylinder and the connected brake circuit I. This pressure also acts on the second, intermediate piston and moves it in the tandem master cylinder. In this manner (almost) equal hydraulic braking pressure is also produced in the second pressure chamber and connected brake circuit II.

If braking pressure cannot be built up due to an assumed leak in brake circuit II, intermediate piston (7) is pushed out of the first pressure chamber without mentionable resistance (only low spring force has to be overcome) by an initially low hydraulic pressure far enough that pin (11) of the intermediate piston bears on the bottom of the cylinder. Stroke of the first pressure chamber is held in this position and normal braking pressure can be built up in this brake circuit. Overcoming the "loss travel" causes a corresponding extension of brake pedal travel.
If brake circuit I (push rod piston brake circuit) leaks due to an assumed damage, so that braking pressure can no longer be built up, push rod piston (8) is pushed so far without mentionable resistance (only low spring force has to be overcome) until it bears on stop sleeve (10). In this manner there is mechanical connection with intermediate piston (7), so that normal braking pressure can be built up in brake circuit II (intermediate piston brake circuit). Overcoming the "loss travel" causes a corresponding extension of brake pedal travel.

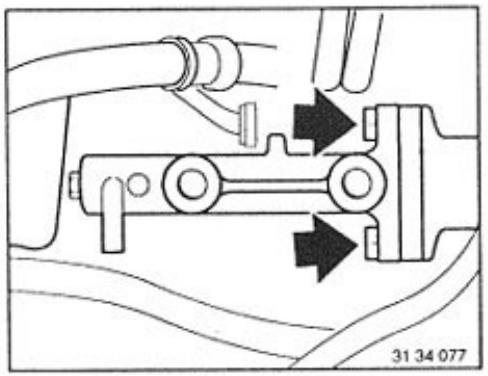
A tandem master cylinder can be operated direct via the brake pedal or via a brake booster (hydraulically, with vacuum or pneumatically).
Connection of brake circuits on a tandem master cylinder depends on the brake circuit division of a pertinent car.
Brake fluid tanks (1) on the tandem master cylinder contains the brake fluid reservoir and corrects the hydraulic fluid level in the brake system.
They are normally divided into two supply chambers (one for each brake circuit) and can be equipped with an electric float warning device (12) for indication of brake fluid loss.



34 31 000 REMOVING AND INSTALLING BRAKE MASTER CYLINDER

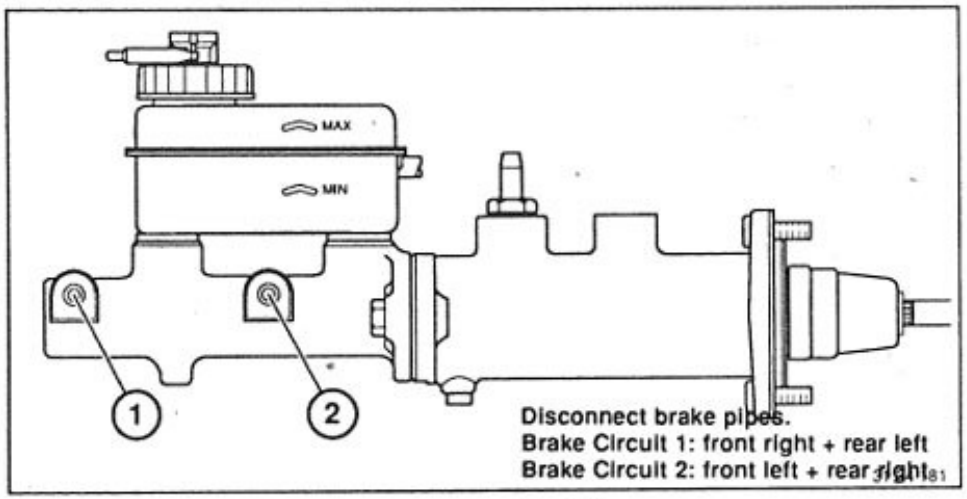
Draw brake fluid take out of tank with a standard syringe.
Pull off brake fluid tank.

Installation:
Bleed brakes – see 34 00 047.



Unscrew tandem brake master cylinder on the brake booster.

Installation:
Tightening torque*.
Only install a brake master cylinder with the same diameter – identification is located raised on the body.



Disconnect brake pipes.
Brake Circuit 1: front right + rear left
Brake Circuit 2: front left + rear right

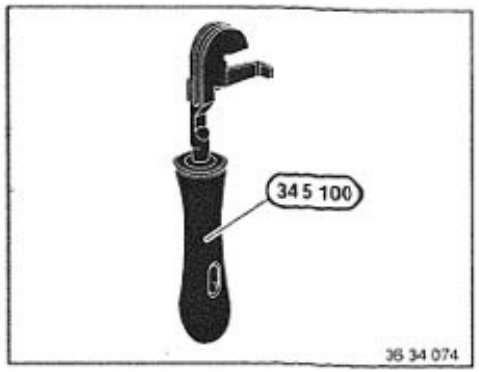
Installation:
Tightening torque*.

* See Specifications

* See Specifications

34 32 . . . Replacing all brake lines

The brake lines are now only supplied as straight units, cut to the correct length and fitted with a connection nipple.



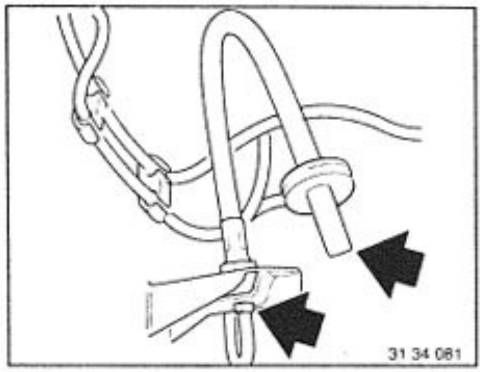
The new brake lines are bent to the correct angle using special tool 34 5 100.
The removed brake line can be used as a sample for the bending operation.

Caution!

- Avoid damaging the protective layer on the brake line when bending.
- Do not bend brake lines sharply or fold backwards.
- Only tighten down screw connections on brake lines using torque wrench. Tightening torque 34 32 1AZ*

After completion of the work, bleed braking system, refer to 34 00 046/047.

* Refer to Technical Data



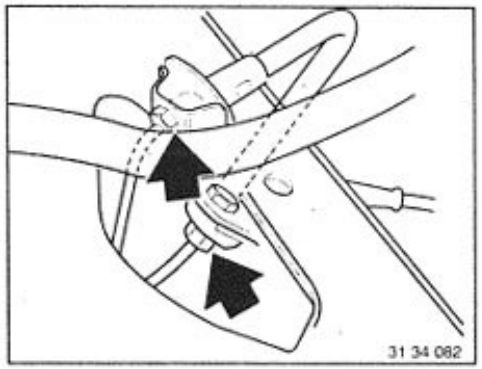
34 32 941 Replace all front brake hoses

Draw off brake fluid in expansion tank with a suction device which must only ever come into contact with brake fluid. Unfasten brake hose.

Installation:
First tighten brake hose on brake caliper.
Move wheels into straight-ahead setting.
Screw brake hose onto brake line, taking care not to twist brake hose.
Tightening torque 34 32 1AZ*

Bleeding brake system, refer to 34 00 047 for ABS and 34 00 048 for ABS/ASC+T respectively.

* Refer to Technical Data



34 32 983 Replacing both rear brake hoses

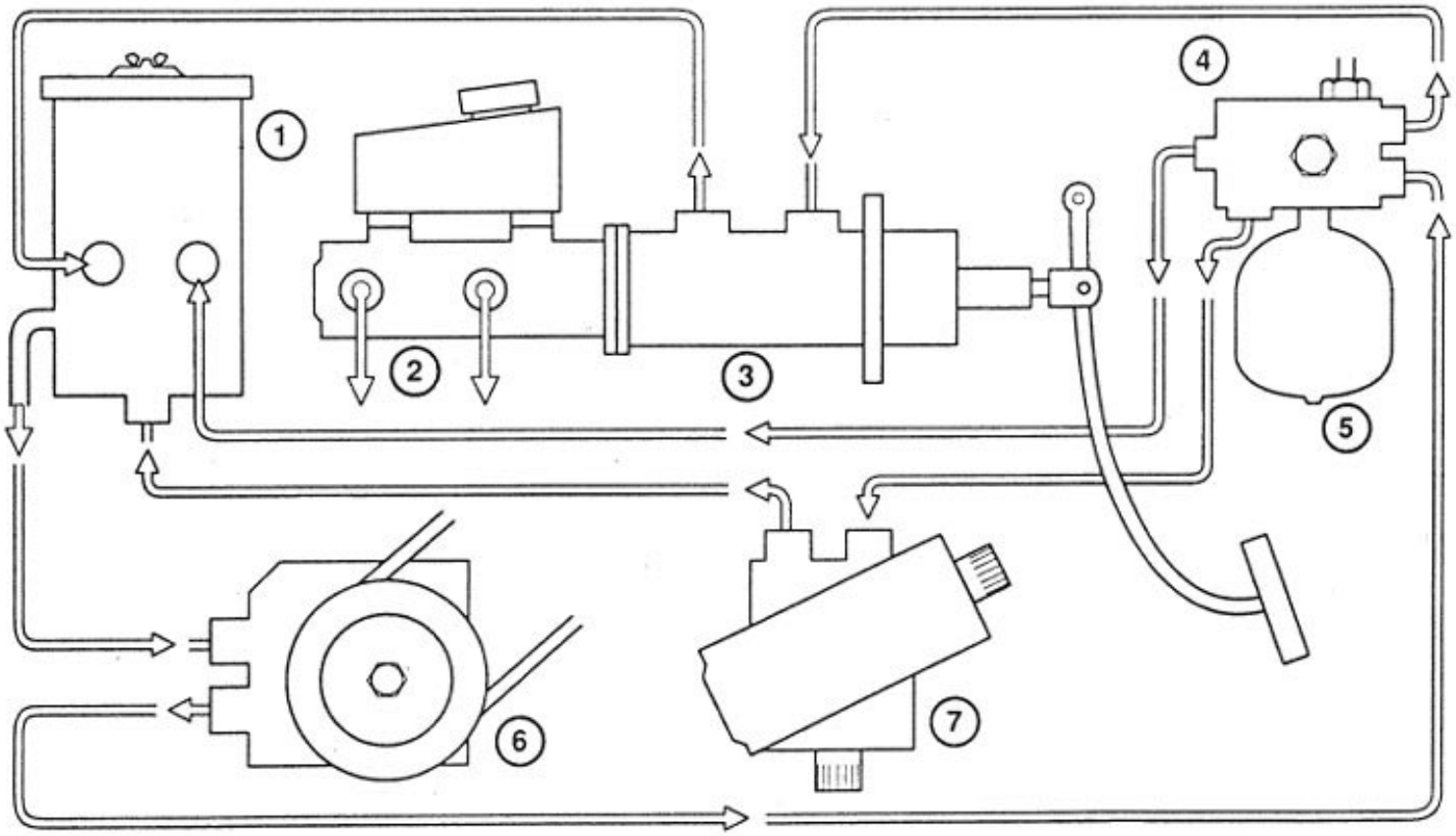
Draw off brake fluid in expansion tank with a suction device which must only ever come into contact with brake fluid. Unfasten brake hose.

Installation:
Never twist brake hose during assembly.
Tightening torque*.

Bleeding brake system, refer to 34 00 047 for ABS or 34 00 048 for ABS/ASC+T respectively.

* Refer to Technical Data

1 = Supply tank
2 = Tandem master cylinder and tank
3 = Hydraulic booster
4 = Pressure controlled flow regulator
5 = Hydraulic reservoir
6 = Power steering



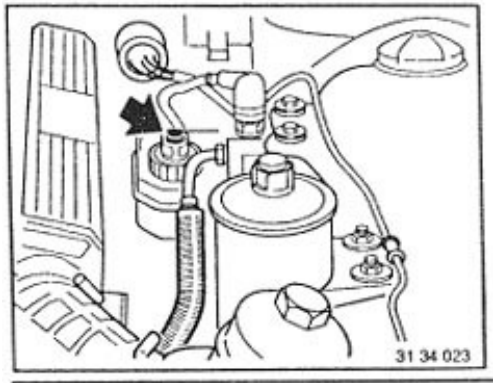
31 34 158

DESCRIPTION OF ENTIRE H 31 SYSTEM

The power flow regulator (or pressure controlled flow regulator) taps a slight delivery flow = 0.7 ltr. (1.5 pints)/minute from the operating circuit of the power steering (circulating system) and charges the hydraulic reservoir in a pressure range without impairing the function of the power steering.
The hydraulic oil volume stored under pressure is available for the booster to support the operating force and is called by operating the bolted standard tandem brake master cylinder.
If the power steering pump fails, sufficient reserve pressure will be stored in the hydraulic reservoir to be able to execute several braking actions with full brake boosting support.
After consumption of this reserve pressure, the brakes can still be applied, but without boost and therefore with considerably more force on the brake pedal.

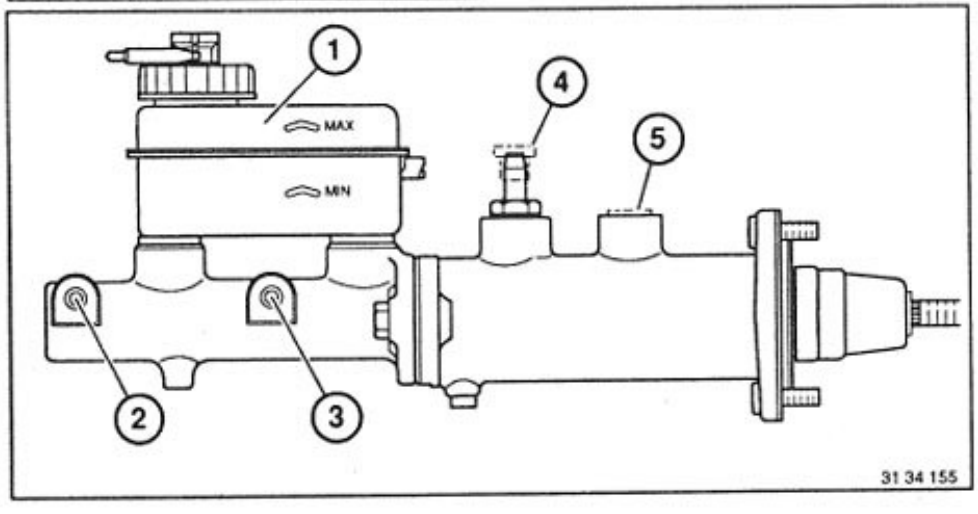
FUNCTION TEST

Operate brake pedal 20 times with the engine stopped.
Hold brake pedal down and start engine.
System is okay, if brake pedal gives.
If brake pedal does not give, there could be a fault in the power steering pump, power flow regulator, hydraulic reservoir or hydraulic brake booster.



34 33 505 REMOVING AND INSTALLING BRAKE BOOSTER WITH BRAKE MASTER CYLINDER

Discharge hydraulic reservoir by operating brake pedal about 20 times with same force required for full stop braking and with the engine stopped.
Draw brake fluid out of tank with a syringe reserved exclusively for use with brake fluid.
Disconnect plug.



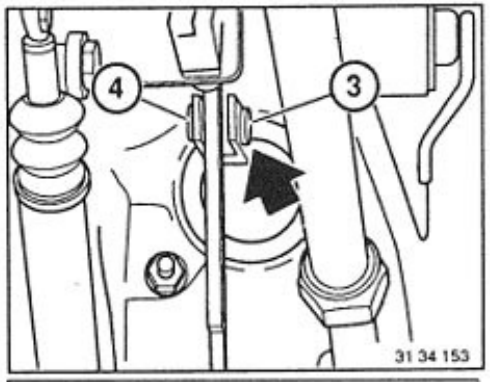
Disconnect brake pipes (2 and 3).

1 Supply tank (pulled off)
2 Brake pipe front right (left rear brake circuit)
3 Brake pipe front left (right rear brake circuit)
4 Booster return
5 Pressure pipe from power flow regulator

Pull off hose for clutch hydraulic system.

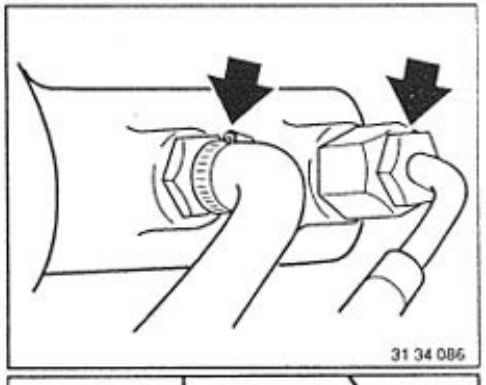
Installation:
Tightening torque*.
Bleed brakes – see 34 00 047.
Cars with ASC+T – see 34 00 ...

* See Specifications



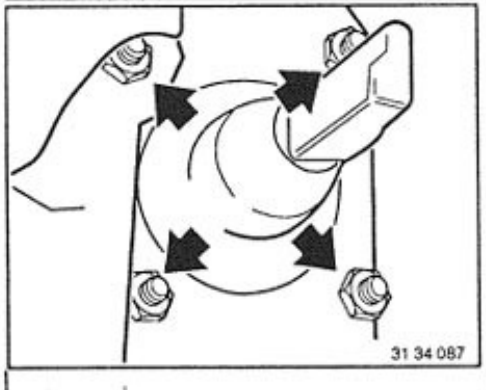
Remove dashboard trim panel at bottom left – see 51 45 180.
Press off clip (3) and pull out pin (4).

Installation:
Stop light switch (self-adjusting) – see Group 61.



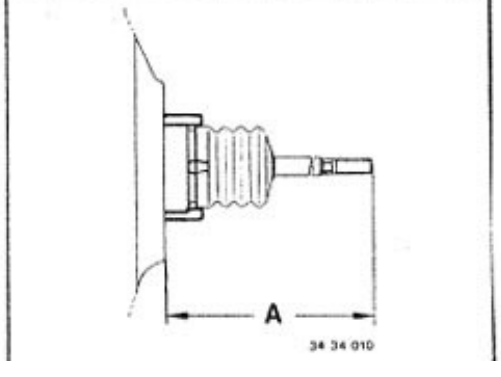
Unscrew hydraulic hoses on brake booster.

Installation:
Make sure that all pipes and hoses are clean before connecting.
Tighten return pipe with Special Tool 34 3 153 and pressure pipe with Special Tool 34 3 152, both in conjunction with a torque wrench.
Tightening torque*.



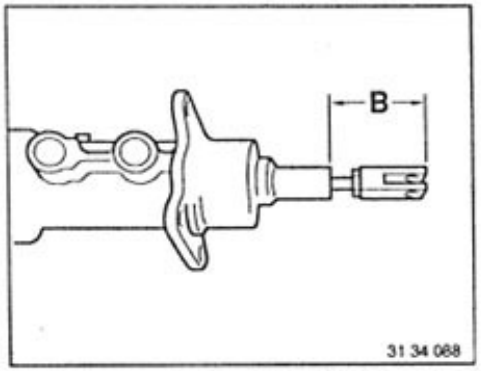
Unscrew brake booster on pedal console.
Remove brake booster and tandem brake master cylinder.

Installation:
Replace self-locking nuts.
Tightening torque*.

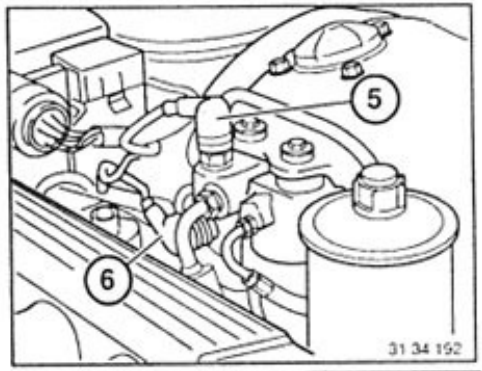


Basic setting distance A = 143 ± 1 mm (5.630 ± 0.039") measured from firewall to center of swivel head/operating pin – also refer to Group 35.

* See Specifications

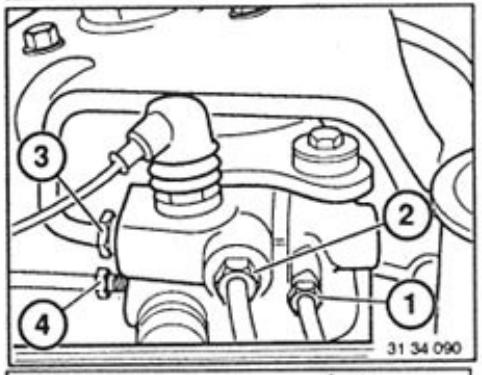


Installation:
Unscrew swivel on brake booster.
Install swivel on new brake booster and adjust to same distance B.
If necessary, check control distance A on brake pedal in installed state – see 35 21 000.

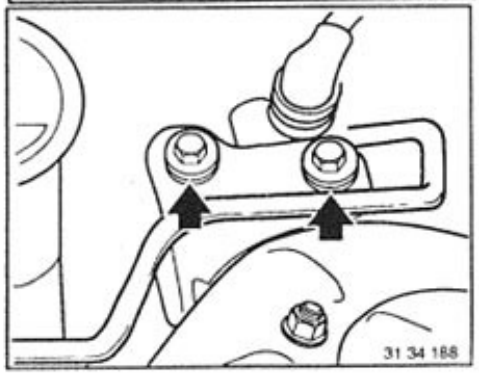


34 33 100 REMOVING AND INSTALLING POWER FLOW REGULATOR

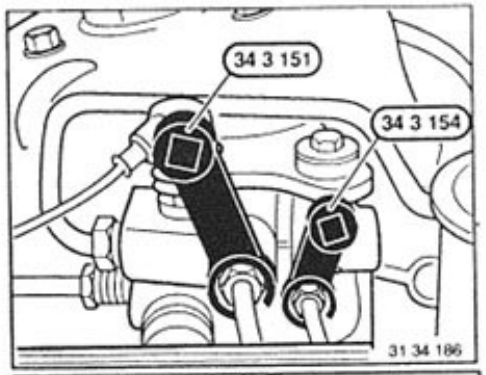
Discharge the hydraulic reservoir by operating the brake pedal about 20 times with the force required for full stop braking and with the engine stopped.
Pull off wires on circulating pressure warning switch (5) and hydraulic pressure switch (6).



Unscrew
pipe (1) from power flow regulator to tank,
pipe (2) from power flow regulator to power steering gear,
pipe (3) from power flow regulator to power steering pump and
pipe (4) from power flow regulator to brake booster.

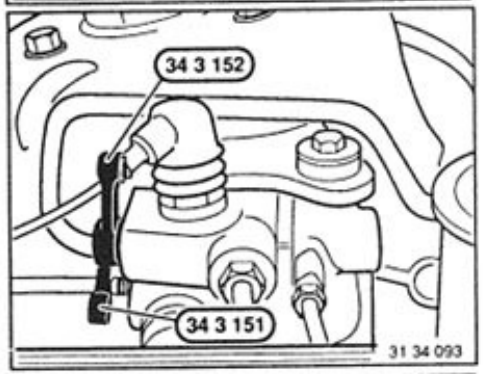


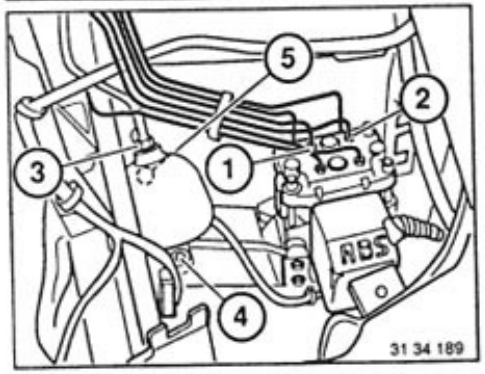
Unscrew power flow regulator mounting bolts.



Important!
Fine particles of dirt could impair the function of the power flow regulator in the H 31 system, which in turn could lead to failure of hydraulic steering and braking support.
Make sure that all pipes and hoses are clean before connecting.

Installation:
Tighten pipe (1) with Special Tool 34 3 154, pipes (2 and 4) with Special Tool 34 3 151 and pipe (3) with Special Tool 34 3 152, in each case together with a torque wrench.
Tightening torque*.
Bleed power steering – see 32 13 006.



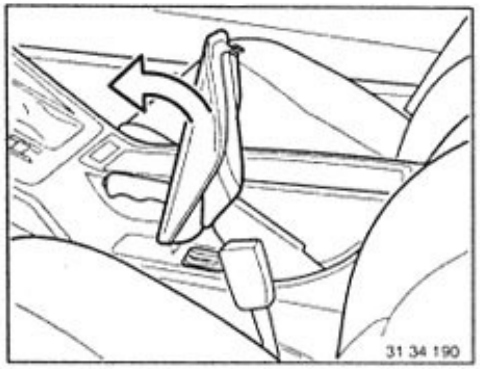


34 33 110 REMOVING AND INSTALLING HYDRAULIC RESERVOIR

Discharge pressure – see 34 33 100.
Remove left front wheel house trim panel – see Group 51.
Unscrew coupling nuts (3).
Unscrew bolts (4 and 5).

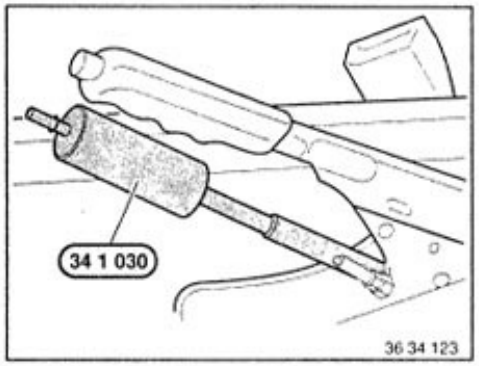
Installation:
Hydraulic reservoir tightening torque*.

* See Specifications



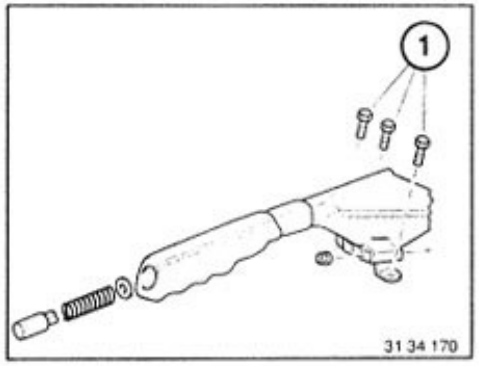
34 41 000 Removing and installing handbrake lever

Lift out dust cover.
Remove oddments tray, see 51 16 200.

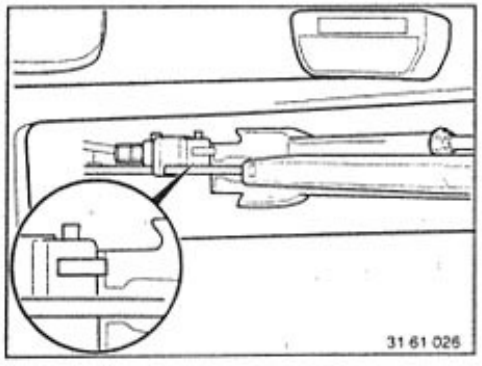


Unfasten lock nut with special tool 34 1 030, unscrew adjusting nut.

Installation:
Adjust handbrake, see 34 10 014.



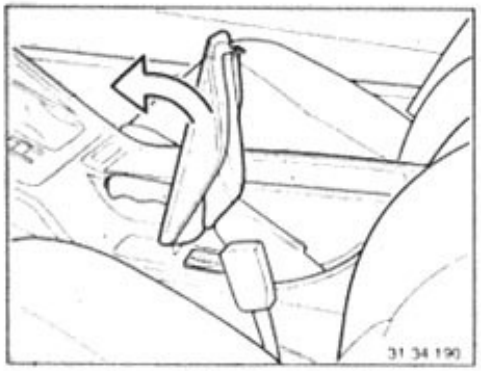
Unfasten screws (1).



Caution!
Do not damage switch for handbrake indicator light when removing and installing the handbrake lever.

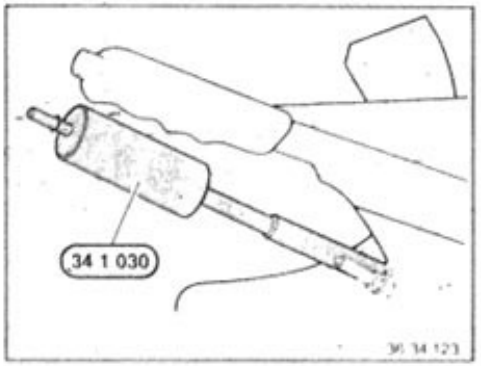
Remove the handbrake lever.

Installation:
Adjust switch for handbrake indicator light, see 61 31 320.



34 41 100 Removing and installing or replacing left or right Bowden cable for handbrake

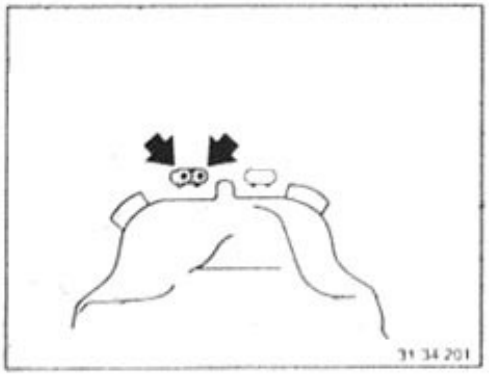
Lift out dust cover.



Unfasten lock nut with special tool 34 1 030, unscrew adjusting nut.
Move handbrake lever into release setting.

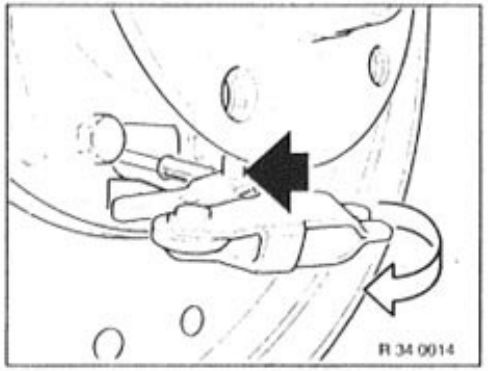
Installation:
Adjust handbrake, see 34 10 014.

Remove both rear mufflers, see 18 00 020.
Loosen heat shield under the tank and press down slightly.



Press handbrake Bowden cable out of tank mount and pull out of guide tube.

Remove handbrake shoes, see 34 41 220.



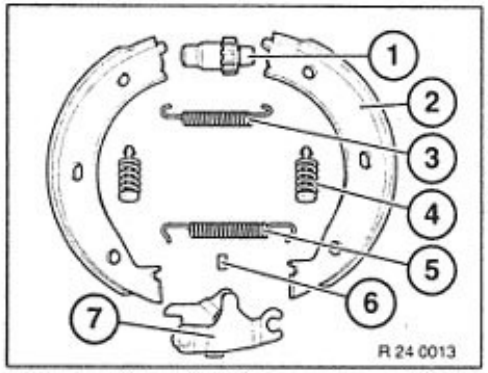
Fold open brake shoe expander, press out pin and remove brake shoe expander from Bowden cable.

Installation:
The inside lever on the brake shoe expander must point to the left.

Remove handbrake Bowden cable from the wheel carrier and the guide on the rear axle carrier.

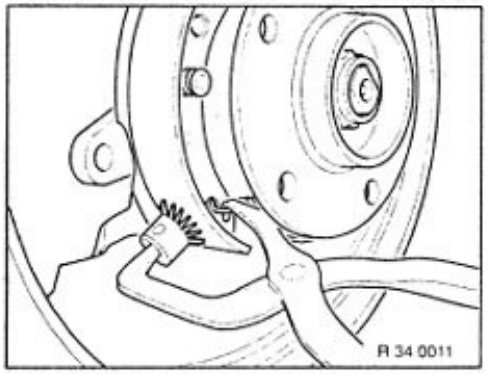
34 41 220 Removing and installing or replacing all handbrake shoes

Remove rear brake discs, see 34 21 320.

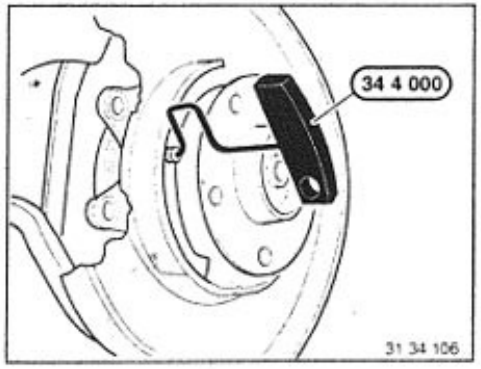


Arrangement of components:
(applies to left and right side)

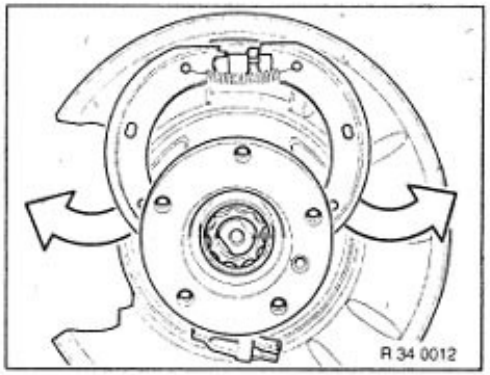
1 Adjusting screw
2 Brake shoe
3 Upper tension spring
4 Clamping pin with compression spring
5 Lower tension spring
6 Pin
7 Brake shoe expander



Disconnect lower tension spring with brake spring pliers.



Twist clamping pins with special tool 34 4 000 90° and remove.



Pull lower brake shoes apart and remove from wheel hub.

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Brakes pull to one side	a) Tire inflation pressure incorrect b) Uneven tire tread wear c) Oil on pads/liners d) Pad/liner type not as specified e) Caliper recesses dirty f) Rear wheel geometry incorrect g) Corrosion in calipers h) Shock absorbers without action i) Pad of one caliper worn k) Pad glazed	a) Correct tire inflation pressure b) Change or replace tires c) Replace brake pads/liners and eliminate cause d) Replace brake pads/liners e) Remove, clean and install calipers f) Check/adjust wheel alignment g) Remove and install, repair or replace calipers h) Check or replace shock absorbers i) Replace brake pads; check calipers k) Replace brake pads; check calipers
Brakes excessively hot while driving	a) Compensation bore in master cylinder clogged b) No play between push rod and master cylinder piston c) Rubber parts swollen from contact with wrong type of brake fluid d) Vent hole in brake fluid tank clogged e) Corroded calipers f) Parking brake lever not released fully	a) Check or replace master cylinder b) Adjust push rod c) Replace master cylinder or remove and install, repair or replace brake calipers d) Clean brake fluid tank e) Remove and install, repair or replace calipers f) Check parking brake and parking brake cables, repairing if necessary
Braking effect insufficient inspite of great force on pedal Brake pedal travel - normal - short - long	a) Brake pads coated with oil or burnt; wrong type of brake pads b) Brake booster malfunctions c) One brake circuit failed due to leaks or damage	a) Replace brake pads b) Check brake boosting system c) Check brake system for leaks

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Brake pedal motion too soft and spongy	a) Air in brake system b) Insufficient brake fluid in brake fluid tank c) Overheated brake fluid - vapoor lock due to excessive water content in brake fluid or excessive brake loads	a) Add or replace brake fluid and bleed brakes b) See a) c) See a)
Brake pedal travel excessive even though brakes have been bled and adjusted	a) Primary cup in master cylinder damaged b) Separating cups on floating piston of tandem master cylinder leak c) Leak in brake system	a) Overhaul or replace brake master cylinder b) See a) c) Check brake system for leaks
Uneven pad wear	a) Wrong type of brake pads b) Caliper recesses dirty, caps damaged c) Corrosion in calipers d) Rubber ring for piston control swollen	a) Replace brake pads b) Remove and install, repair or replace calipers c) See b) d) See b)
Brake pads worn at angle	a) Wheel bearing play excessive b) Brake disc not aligned with caliper c) Corrosion in calipers d) Brake disc wear angular e) Pads worn less than minimum thickness	a) Replace wheel bearings b) Check caliper installation and caliper guide bolts c) Remove and install, repair or replace calipers d) Grind or replace brake discs e) Replace brake pads

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized brake pads, pads stuck on brake disc	a) Caliper recesses dirty, caps damaged b) Corrosion in calipers c) Compensation bore in master cylinder clogged	a) Remove and install, repair or replace calipers b) See a) c) Overhaul or replace master cylinder
Brakes squeal or knock	a) Wrong type of brake pads b) Caliper recesses dirty c) Brake disc not aligned with caliper d) Brake disc runout e) Excessive thickness deviation within braking surface f) Rust on edges of brake discs g) Pads loose h) Wheel bearing play excessive	a) Replace brake pads b) Remove and install, repair or replace calipers c) Check caliper installation and caliper guide bolts d) Check brake disc runout, replacing discs if necessary e) Measure brake disc thickness and grind or replace f) Grind or replace brake discs g) Replace brake pads h) Replace wheel bearings
Brake pedal dead travel excessive	a) Wheel bearing play excessive b) Brake disc not aligned with caliper c) Brake disc runout d) Excessive thickness deviation within braking surface e) Brake system has a leak f) Air in brake system g) Wrong type of brake pads	a) Replace wheel bearings b) Check caliper installation and caliper guide bolts c) Check brake discs for runout, replacing if necessary d) Measure brake thickness deviation and grind or replace discs e) Check brake system for leaks f) Bleed brakes g) Replace brake pads

TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized pistons in calipers	a) Caliper recesses dirty, caps damaged b) Brake disc not aligned with caliper c) Corrosion of pistons in calipers	a) Remove and install, repair or replace calipers b) Check caliper installation and caliper guide bolts c) See a)
Pulsating effect on brake pedal	a) Wheel bearing play excessive b) Brake disc not aligned with caliper c) Brake disc runout d) Excessive thickness deviation within braking surface	a) Replace wheel bearings b) Check caliper installation and caliper guide bolts c) Check brake discs for runout, replacing if necessary d) Measure disc thickness and grind or replace
Parking brake effect insufficient	a) Oil on brake shoes b) Excessive dead travel between brake shoes and brake drums c) Excessive dead travel in cables d) Cables maladjusted e) Corroded transmitting elements	a) Replace brake liners and eliminate cause b) Adjust parking brake c) See b) d) See b) e) Remove and install parking brake and expander locks; check cables, replacing if necessary

1. ANTIBLOCK SYSTEM (ABS) – DESCRIPTION AND DESIGN

DESCRIPTION

The basis of a braking action is the friction between the tires and road surface. To brake a vehicle the tires have to transmit a frictional force to the road surface. In so doing there will be slip between the tires and road surface, i.e. the tire peripheral velocity will be slower than the road speed of the vehicle.

Figure 730 34 112 shows the relation between the frictional force and slip for a typical case on a dry road surface. The transmitted braking force reaches its maximum value in shaded area A. This is also the control range of ABS. When a wheel is locked, i.e. when there is 100 % slip, the frictional force will normally be lower than when a wheel is rolling.

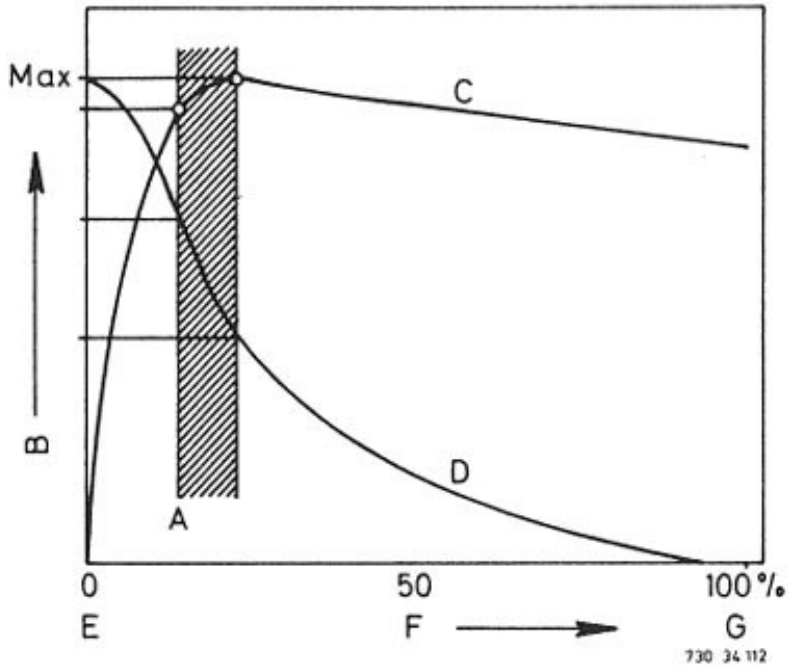
Consequently the ABS must control the brake pressure in the wheel brake cylinder in such a manner that the slip remains in the shaded area, because here the highest frictional force is available.

The amount of slip, with which there is maximum frictional force, and the amount of frictional force itself depend chiefly on the tires (type, treads, rubber composition), the road surface (material, surface condition, wet, ice), the road speed and the slip angle of the wheels.

The ABS detects the frictional conditions between the tires and road surface prevailing at the moment. It automatically adjusts to each change in road surface/tire relation and makes use of the highest coefficient of friction, without that the vehicle slips or skids because of wheel locking.

Non-uniform friction conditions between the separate wheels will be held under control just as also instantaneous changes in the road surfaces, e.g. through patches of ice.

BRAKING AND LATERAL FORCES IN RELATION TO SLIP



A ABS operating range
B Braking and lateral force
C Braking force
D Lateral force
E Rolling wheel
F Slip
G Locked wheel

DESIGN

ABS consists of a control unit, hydraulic unit, speed sensors and a wire harness. Components are described separately below.

Speed Sensors:
Each speed sensyr has a gear wheel, which runs past the permanently magnetized edge of the speed sensor and is installed in the wheel hub.
The rotary motion of the wheels is recorded by inductive sensors and an electric signal is sent to the electronic control unit.

Electronic Control Unit:
The electronic control unit is located in the car's side member, see layout drawing on page 52/6. In a small multi-channel computer acceleration, deceleration and slip factors are derived from the electric signals of the speed sensors, which are proportional to wheel velocity. By logical connection of these factors there are control commands for the electromagnetically operated valves in the hydraulic unit.

The signal processing in the computer determines the control behavior of the system. The expected degree of dependability is based on digital engineering with highly integrated circuitry.

The control unit contains electronic monitoring circuits, which control the function prior to each trip and the ABS wire harness with equipment constantly during a trip. If the control unit detects a defect in the wire harness or electrical part of the equipment, the monitoring circuit will switch off the ABS and guarantee normal use of the brake system. An ABS indicator lamp reports this condition to the driver.

Hydraulic Unit:
The hydraulic unit is located in the engine compartment and integrated in the conventional brake system.
To control the brake pressure in the wheel brake cylinders, the brake hydraulic unit has three-way valves which permit three brake pressure conditions.
Pressure build-up, pressure holding and pressure drop. These three pressure phases adapt themselves in the sequences and length to the requirements of the desired control characteristic and power flow between the road surface and tires.
In principle control procedures are as follows.
As soon as wheel deceleration or slip indicates the locking of a wheel, the brake pressure is first held. If the wheel still tends to lock, the pressure will be dropped so long until the wheel accelerates or the slip limit is exceeded. Afterwards the pressure is raised again and the control phases begin from new.
An electrically driven return delivery pump returns the brake fluid taken from the wheel brake cylinder while dropping the pressure to the appropriate brake circuit.
The pump is designed as a two-piston pump so that the circuits of a dual brake circuit system remain fully separated.

Wire Harness:
The control unit is connected with the speed sensors and electric part of the hydraulic unit via a special wire harness for the sake of signal input and order output. These wires as well as electric power supply are integrated in the main wire harness.

2. Function and Checking of ABS Control Lamp

The ABS control lamp lights up after switching the ignition on.
The control lamp must go out after starting the engine if ABS is okay.

The procedure is repeated each time the ignition is switched off and on.

The causes for faulty display — control lamp does not light up, does not go out or lights up while driving (even sporadically) — can be determined by reading the fault memory with a BMW Service Tester, refer to Car Electric/Electronic Test Plan.

The control unit automatically switches to "conventional brakes" in case of an electric or electronic fault in ABS.
This means that the car can still be braked, but without regulation (the wheels could lock!).

AUTOMATIC STABILITY CONTROL (ASC)

Description

Automatic Stability Control (ASC) is a control system to improve active safety in that it reduces the slip of driven wheels on roads with insufficient traction (prevents spinning of the wheels).

It employs Electronic Engine Power Control (EML) and Digital Motor Electronics DME) for regulation.

The sensors of ABS are used to recognize the speed of individual wheels.

ASC is integrated with ABS in one control unit, but is a completely independent system.

While ABS exploits the maximum friction force while braking the car, this is reached with ASC while accelerating.

As soon as the driven wheels turn 0.25 km/h (0.15 mph) faster than the non-driven wheels, ASC regulates the throttle valve position smaller via EML. In order to have fast regulation, the ignition timing is retarded in steps or there is ignition blend-out by DME. DME also adapts the fuel injection signal to protect the engine and catalyst.

ASC is combined with Engine Drag Torque Control (MSR), which prevents sliding of the driven wheels in case of sudden engine overrun.

Engine Drag Torque Control (MSR)

Again with the help of wheel sensors ASC recognizes the difference in speed between driven (engine braked) wheels and non-driven (unbraked) wheels. ASC switches off overrun cut-out when values are below the slip limits.

Displaying and Switching Logic

The system is switched on after starting the engine and can be switched off as desired with a passive switch button. ASC lamp is off with the system switched on.

Current regulation is indicated to the driver by a flashing ASC lamp in the instrument cluster.

If the ASC lamp lights up continuously, the system has been switched off on its own due to an occured fault or it had been switched off by hand.

Troubleshooting:
See Car Electric/Electronic Test Plan.

AUTOMATIC STABILITY CONTROL PLUS TRACTION (ASC + T)

General

This system has the task of regulating the slip of driven wheels to the lowest possible value regardless of road surface conditions.

During regulation the engine torque is reduced with help of DME (ignition timing control) and EML (throttle valve control). If this measure is not sufficient, the driven wheel turning too fast is slowed down by the wheel brake via a hydraulic element.

Displaying and Switching Logic

The system isswitched on after starting the engine and can be switched off as desired with a passive switch button. ASC lamp is off with the system switched on.

Current regulation is indicated to the driver by a flashing ASC lamp in the instrument cluster.

If the ASC lamp lights up continuously, the system has been switched off on its own due to an occured fault or was switched off by hand.

Safety Information

ASC must be switched off before testing a car on a brake or dynamometer test stand.

Either the ignition or ASC must be switched off before towing a car with a lifted front end.

Throttle Valve Control by EML

The throttle valve is regulated with help of Electronic Engine Power Control (EML).
If unwanted drive slip occurs during a certain driving situation, ASC calculates the maximum transmittable drive torque and informs EML about the throttle valve position required for the duration of regulation.
EML continuously reports the current throttle valve position to ASC via the DKV wire. If the throttle valve angle has to be reduced, EML receives this information via the DKR wire.
If a larger throttle valve angle is requested by ASC, this is reported via the DKE wire to EML (only when a control unit with engine drag torque control is installed in the car).

Ignition Timing Control by DME

Retarding the ignition timing is another measure for reduction of the engine torque.
In ASC mode (regulation) Digital Motor Electronics (DME) receives a digital signal from ASC and retards the ignition timing afterwards.
Troubleshooting:
See Car Electric/Electronic Test Plan.

34 50 511 Checking ASC+T braking action
(without test equipment)

Vehicle on a lifting platform (wheels free).

Test sequence:
- Back left wheel is free to rotate.

- Move shift lever into neutral setting or move selector lever into "N" setting.

Switch on engine.

- Gove.n engine speed using accelerator pedal to 2000 · 100 rpm.

- Quickly spin left rear wheel by hand in direction of travel (possibly holding right rear wheel firmly during test to prevent it from turning).

Reaction:
- Left rear wheel is tangibly braked.

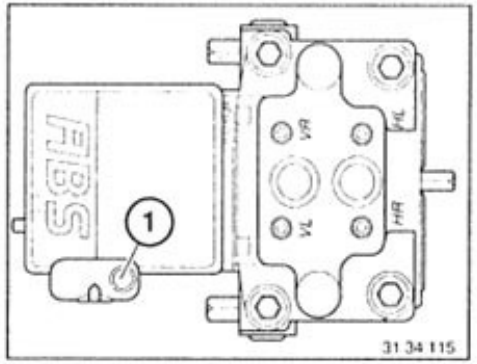
Test sequence:
- Repeat test on rear right wheel.

34 51 520 Removing and installing or replacing complete hydraulic unit (for ABS)

When operation is complete:
- Venting brake system, refer to 34 00 047 for ABS or 34 00 048 for ASC+T.
- Perform final ABS inspection, refer to BMW Diagnosis System.

Disconnect battery ground lead.
Observe General Information, Gr. 61!

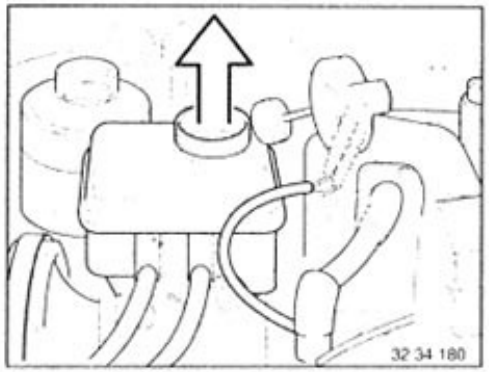
Removing front left headlight, refer to 63 12 460.
Removing air filter housing, refer to Gr. 13.
Remove cover from front left wheel arch.
Remove air intake (for cooling brakes).



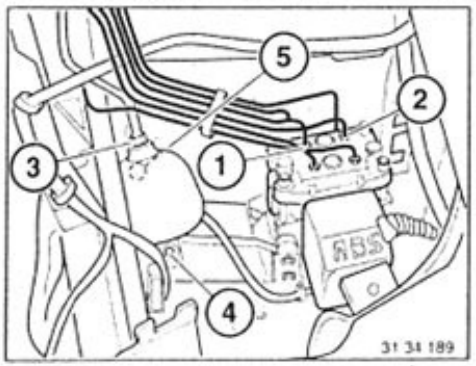
Caution!
Do not confuse brake lines and, if necessary, mark before removal.

Remove brake lines FL, FR, RL, RR.
Seal brake lines and ABS hydraulic unit with suitable plugs.

Installation:
FL to front left brake caliper
FR to front right brake caliper
RL to rear left brake caliper
RR to rear right brake caliper
Tightening torque 34 32 1AZ*



Draw brake fluid out of the expansion tank.
Use a suction lifter to do this: it must only make contact with brake fluid.

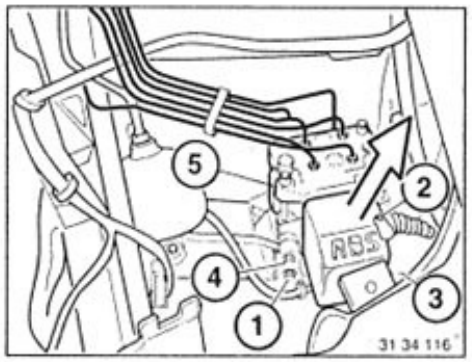


Remove brake lines (1 and 2).

Caution!
Catch brake fluid and do not allow to contact clothing or paintwork.

Installation:
Line to (1) rear master brake cylinder.
Line to (2) front master brake cylinder.
Tightening torque 34 32 1AZ*

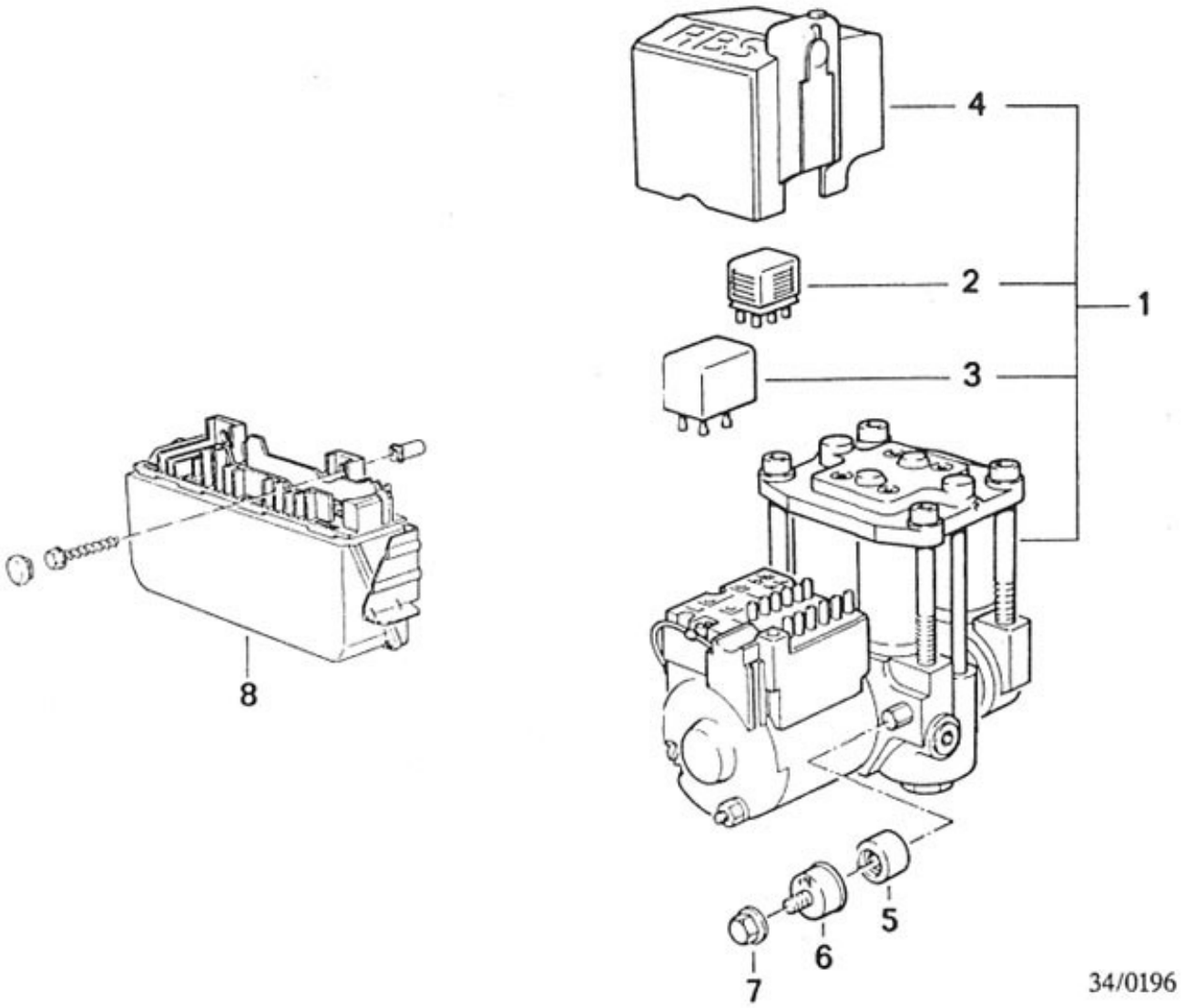
* Refer to Technical Data



Unfasten nuts (3 . . . 5).
Remove ground cable (1).
Unfasten screw (2) and remove cover.
Remove multi-pin plug.
Remove hydraulic unit.

* Refer to Technical Data

ABS / ASC COMPONENTS



1 Hydraulic control unit
2 Valve relay
3 Motor relay
4 Cover
5 Rubber sleeve
6 Sleeve cover
7 Cap
8 ABS/ASC control unit or ASC+T control unit

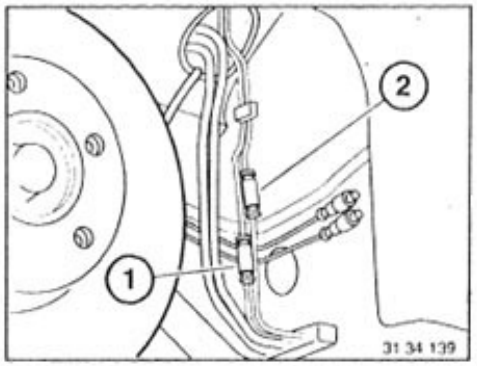
34 51 525 Removing and installing or replacing hydraulic unit for ASC + T

(brake unit and master brake cylinder removed)

After completion of work:

- Bleeding brake system, refer to 34 00 048.
- Perform final inspection of ABS/ASC+T, refer to BMW Diagnosis System.
- Checking ASC+T brake intervention, refer to 34 50 511.

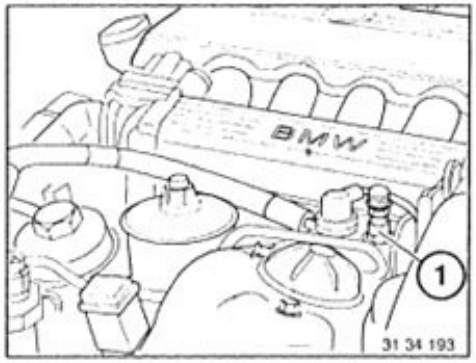
Disconnect battery,
refer to instructions on disconnect and reconnecting the battery, MG 12 .



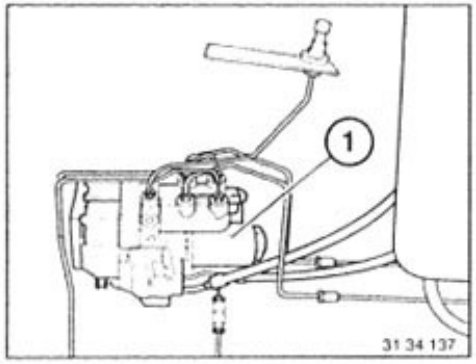
Remove trim from front left wheel arch.

Disconnect brake lines on adapters (1. . .2).

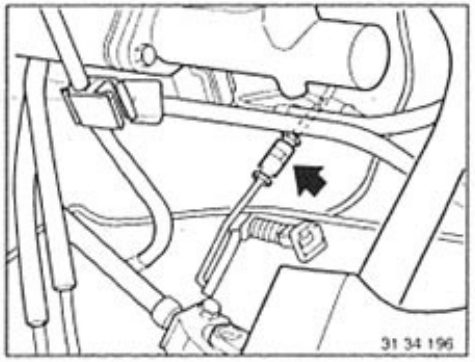
Installation:
Tightening torque,
refer to Technical Data 34 32 1AZ.



Relieve pressure on the bleed screw (1) of the plunger unit and unfasten bleed line.

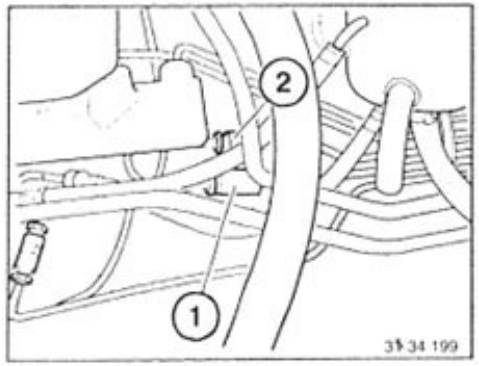


1 Hydraulic plunger unit



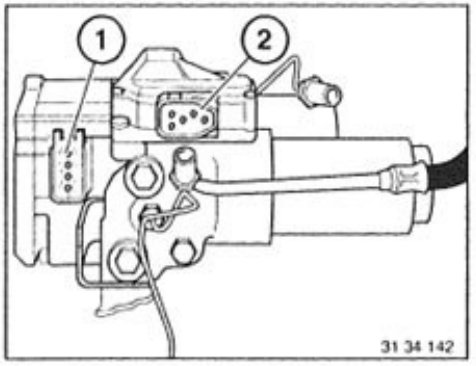
Unfasten pressure line from tandem pump on adapter.

Installation:
Tightening torque,
refer to Technical Data 34 32 1AZ.

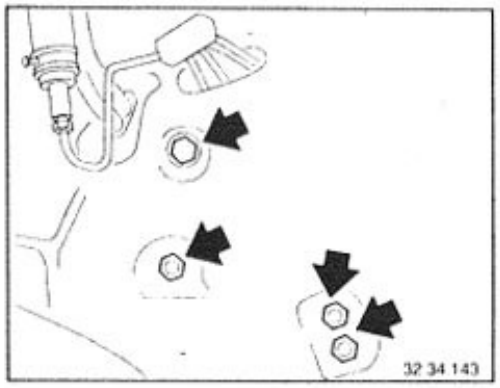


Disconnect brake lines between ABS and hydraulic plunger unit on adapters (1. . .2).

Installation:
Tightening torque,
refer to Technical Data 34 32 1AZ.



Remove connector (1) for solenoid valves and connector (2) for pressure sensor.



Unfasten retaining screws on hydraulic plunger unit and remove hydraulic plunger unit.

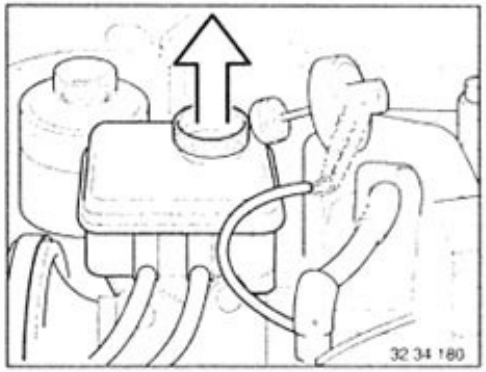
34 51 525 Removing and installing or replacing hydraulic unit (for ASC+T)

(from model year 94)

After completion of the work:

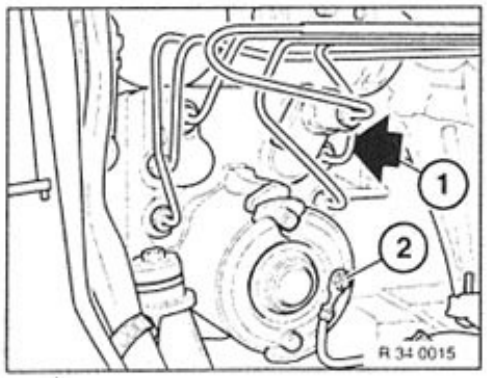
Bleeding brake system, refer to 34 00 048.
Perform ABS/ASC+T or ABS/DSC final inspection, refer to BMW Diagnosis System.

Note:
Switch off ignition.

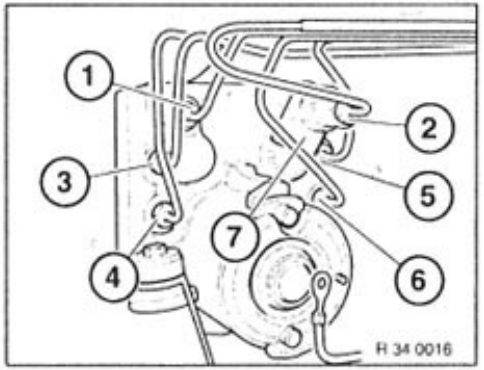


Draw brake fluid out of the expansion tank.
Use a suction lifter to do this: it must only make contact with brake fluid.

Remove front left wheel, see 36 10 300.
Remove front left cover from wheel arch.
Remove air intake (for cooling brakes).



Unlock and remove conne (1).
Unfasten nut (2) and rem ground cable.



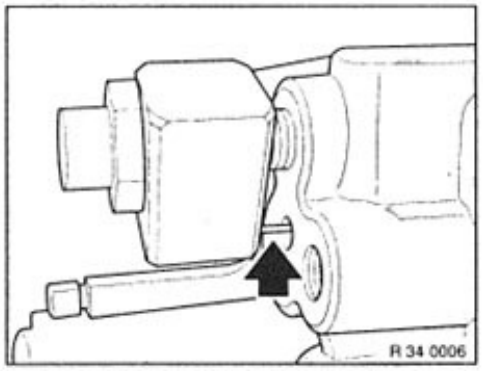
Caution!
Do not confuse brake lines: if necessary, mark them before disconnecting them.

Unfasten brake lines (1 . . . 6).
Seal brake lines and hydraulic unit with suitable plugs.

Brake line:

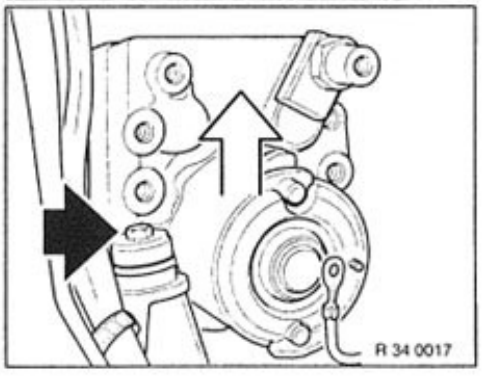
1 (V)	from master brake cyl. connection (V)
2 (H)	from master brake cyl. connection (H)
3 (FR)	to front right brake caliper
4 (FL)	to front left brake caliper
5 (RR)	to rear right brake caliper
6 (RL)	to rear left brake caliper
7	Diaphragm pressure damper

Installation:
Tightening torque 34 32 1AZ*



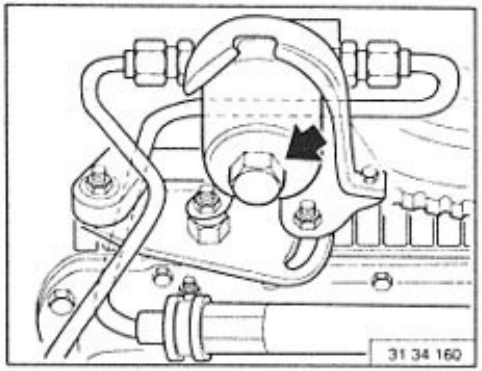
Note:
Note installation position of diaphragm pressure damper.
The pin must enter the bore.

Installation:
Tightening torque 34 50 2AZ*



Unfasten screw, press brake lines to one side and lift out hydraulic unit.

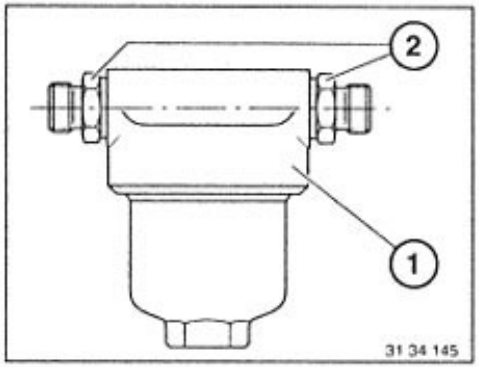
* Refer to Technical Data



34 51 540 Removing and installing or replacing ASC +T filter

Unfasten filter bell, replace filter element and O-ring.

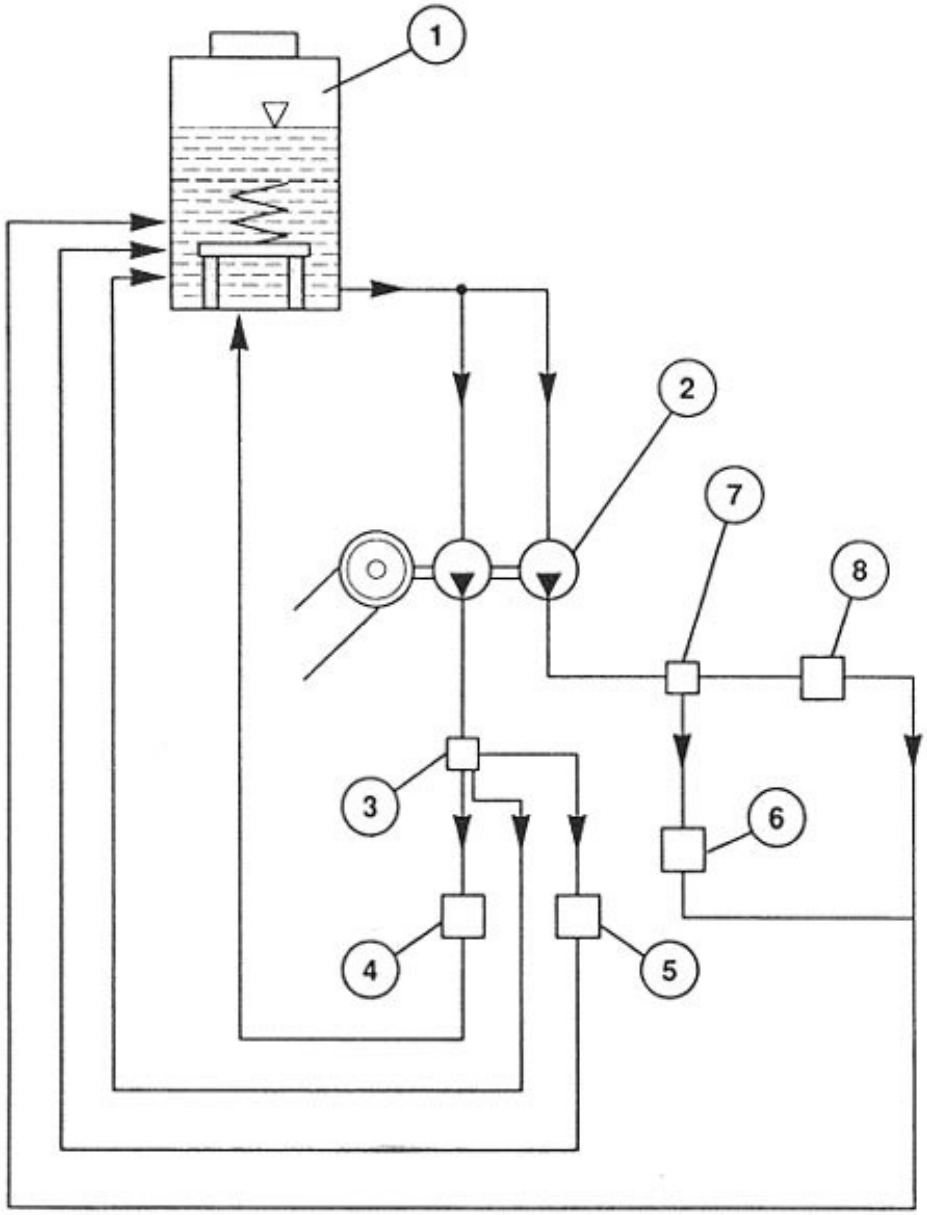
Note:
Filter change intervals: see Gr. 00.



Installation:
1 Tightening torque 34 50 1AZ*
2 Tightening torque 34 50 2AZ*

* Refer to Technical Data

ASC + T OIL CIRCUIT

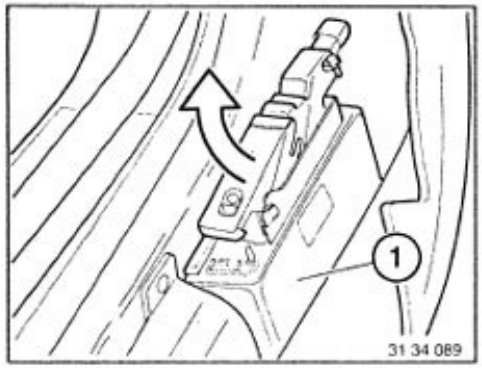


32 34 167

1 Tank
2 Dual pump
3 Charging valve
4 Power steering
5 Brake booster
6 ASC plunger
7 ASC charging valve
8 Ride level height control

34 52 510 Removing and installing / replacing control unit (for ABS)

Remove cover strip from left door spoiler.
Remove loudspeaker cover from front left footwell.
Fold away carpet from door spoiler.



Caution!
Only remove and install control unit when ignition is switched off.

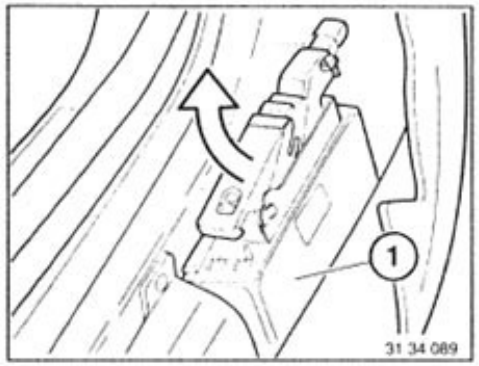
Unlock cable connector and remove from control unit (1).

Unfasten retaining screws from control unit and lift out control unit.

Installation:
Encode new control unit,
refer to BMW Diagnosis System.

34 52 515 Removing and installing / replacing control unit (ASC+T)

Remove cover strip from left door spoiler.
Remove loudspeaker cover from front left footwell.
Fold away carpet from door spoiler.

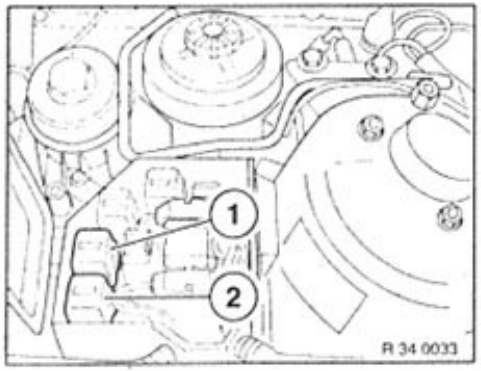


Caution!
Only remove and install control unit when ignition is switched off.

Unlock cable connector and remove from control unit (1).

Unfasten retaining screws from control unit and remove control unit.

Installation:
New control unit:
- Encoding control unit, refer to BMW Diagnosis System.
- On vehicles with Dynamic Stability Control (DSC), a steering angle adjustment must also be made, refer to BMW Diagnosis System.



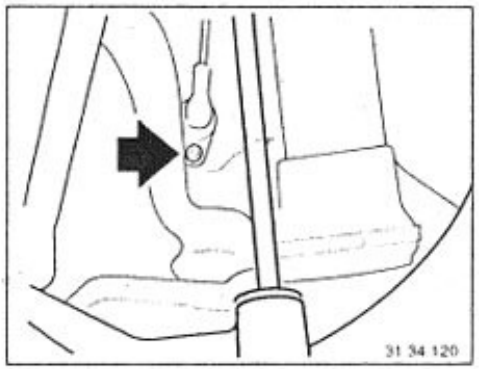
Vehicles with ABS/ASC+T from 12/94:

If the ABS/ASC+T control unit is replaced, the ABS engine relay (2) must also be replaced.

Note:
- Valve relay (1) clicks when ignition is switched on and off.
- Engine relay (2) does not demonstrate any reaction when switching the ignition on and off.

34 52 525 Replacing one front impulse sensor

Switch off ignition.



Unfasten socket head cap screw.
Remove cable from retaining clips and pull out impulse sensor.

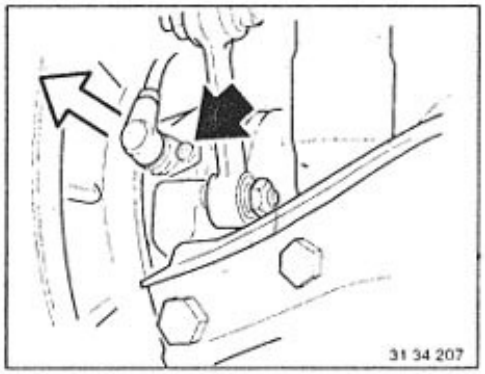
Installation:
Clean impulse sensor and insert bore and apply light coat of Staborax NBU 12K*.

Remove inside trim section from wheel arch, pull cable connector for impulse sensor out of bracket and disconnect.

* Refer to BMW Parts Service

61 12 535 Replace one back impulse sensor

Switch off ignition.



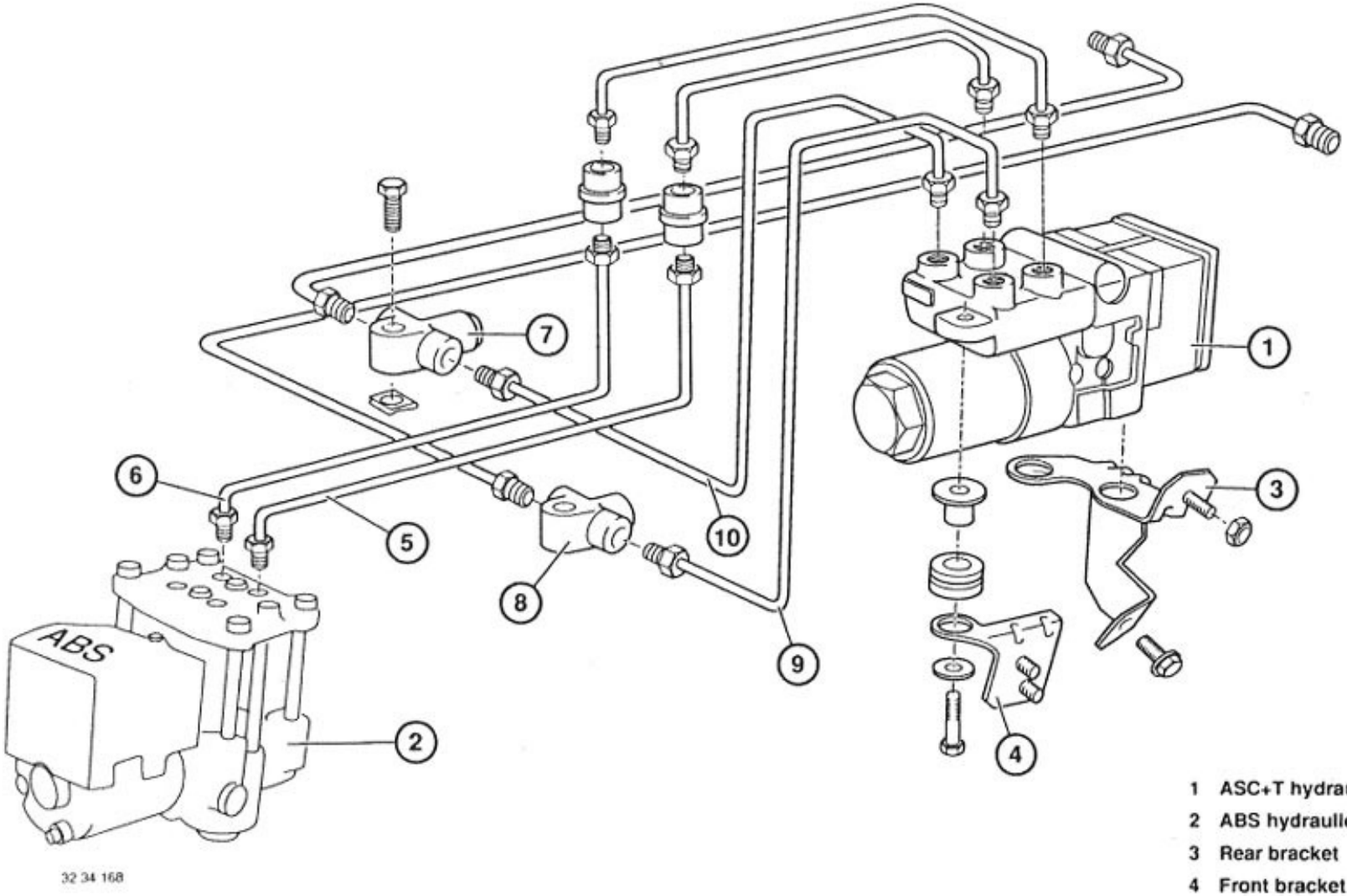
Unfasten socket head cap screw.
Lift cable out of retaining clips and pull out impulse sensor.

Installation:
Clean impulse sensor and bore and apply light coat of Staborax NBU 12K*.

Remove cable connector for impulse sensor from bracket on rear axle carrier and disconnect.

* Refer to BMW Parts Service

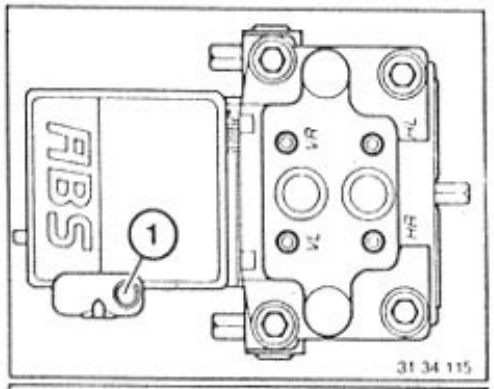
AUTOMATIC STABILITY CONTROL (Pipe Routing from ABS Hydraulic Unit to ASC+T Hydraulic Unit)



32 34 168

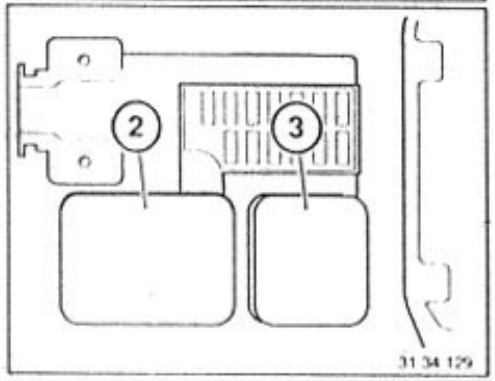
1 ASC+T hydraulic control unit
2 ABS hydraulic control unit
3 Rear bracket
4 Front bracket
5 Left rear pipe (M 10 threads)
6 Right rear pipe* (M 12 threads)
7 Right rear connector (M 12 x 1)
8 Left rear connector (M 10 x 1)
9 Right rear pipe (RZ)
10 Left rear pipe (RZ)

* ABS end (M 10 threads)

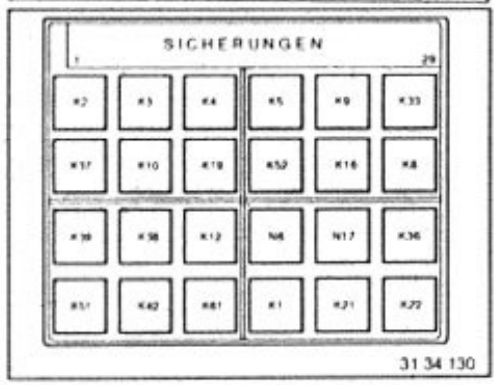


61 31 570 REPLACING RELAYS ON HYDRAULIC CONTROL UNIT (FOR ABS)

Unscrew screw.
Pull off cover.

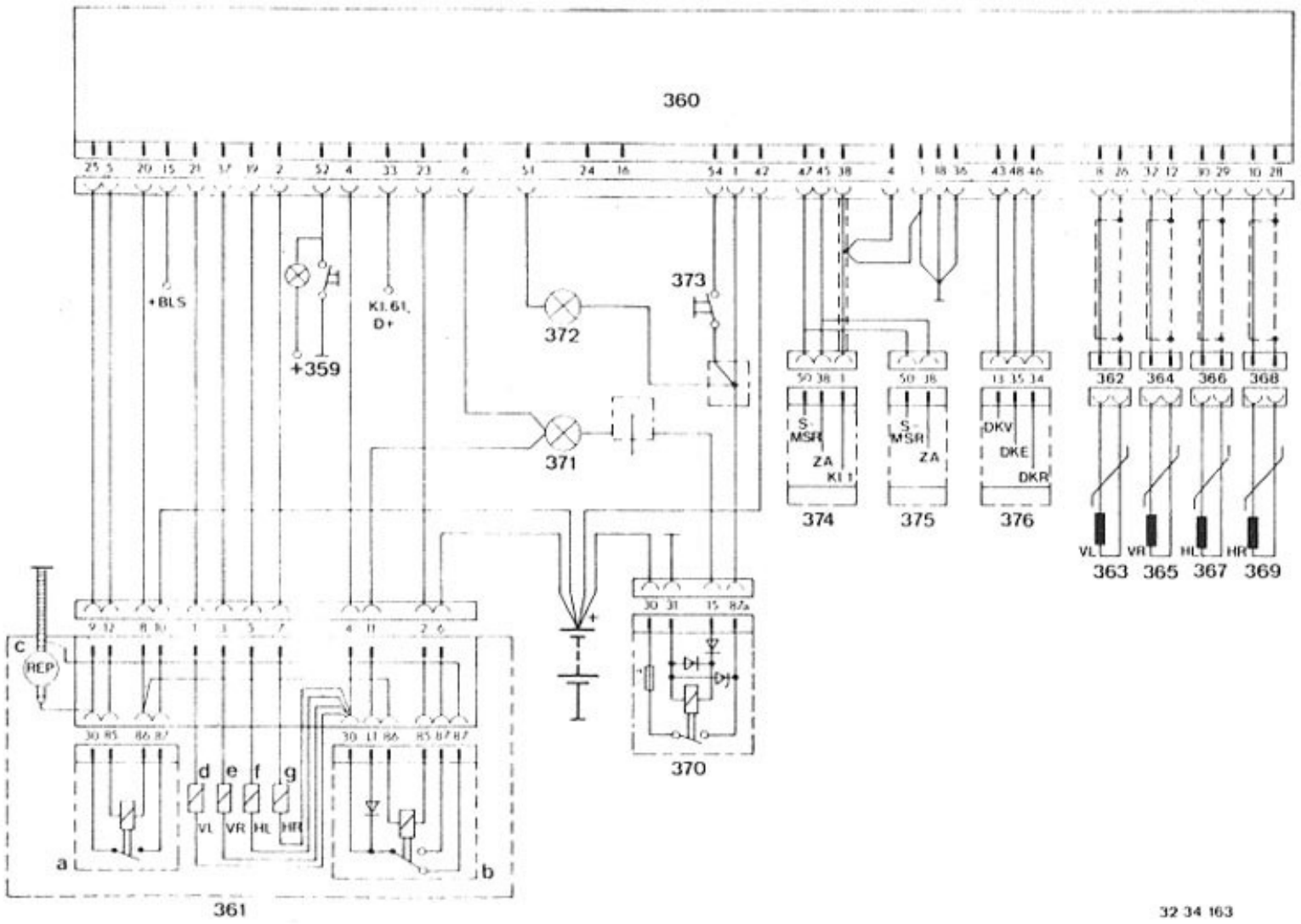


Pull out motor relay (2) or valve relay (3).



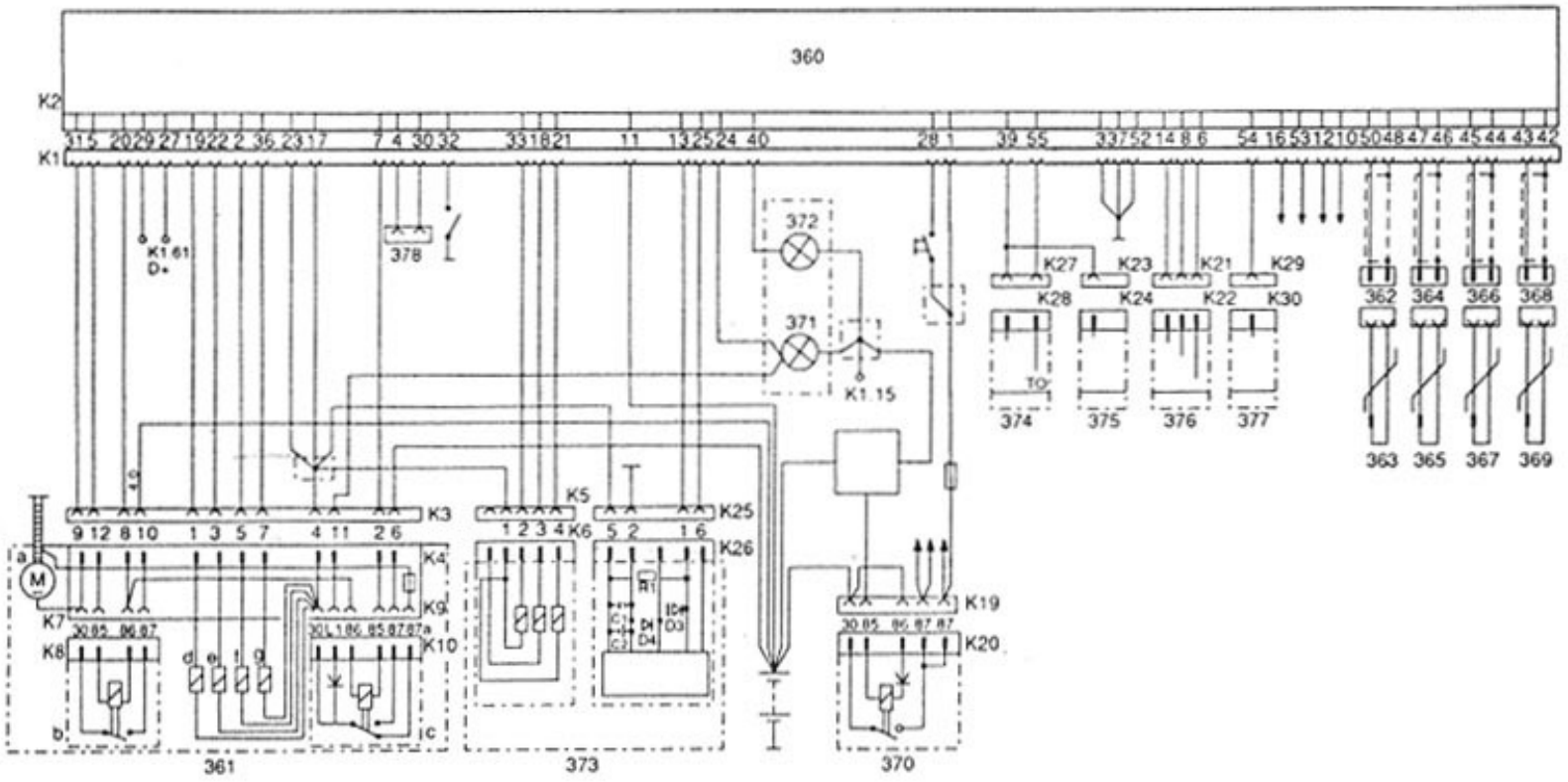
Replacing Electronic Relay for ABS:
Remove cover from relay plate in the engine compartment.
Pull out and replace ABS electronic relay/overload cutout K 10 (Bosch) with Special Tool 61 1 250 – see Group 61.

WIRING DIAGRAM FOR ABS/ASC-DKZ (Since 9.88)



KL 61	Terminal 61 (charge control)
+ BLS	Stop light switch
360	Electronic control unit
361	Hydraulic control unit
a	Return delivery pump motor
b	Motor relay
c	Valve relay
d	Valve - left front
e	Valve - right front
f	Valve - left rear
g	Valve - right rear
362	Conn. -signal sender left front
363	Signal sender left front
364	Conn. - signal sender right front
365	Signal sender right front
366	Conn. - signal sender left rear
367	Signal sender left rear
368	Conn. - signal sender right rear
369	Signal sender right rear
370	Master relay (DME)
371	ABS lamp

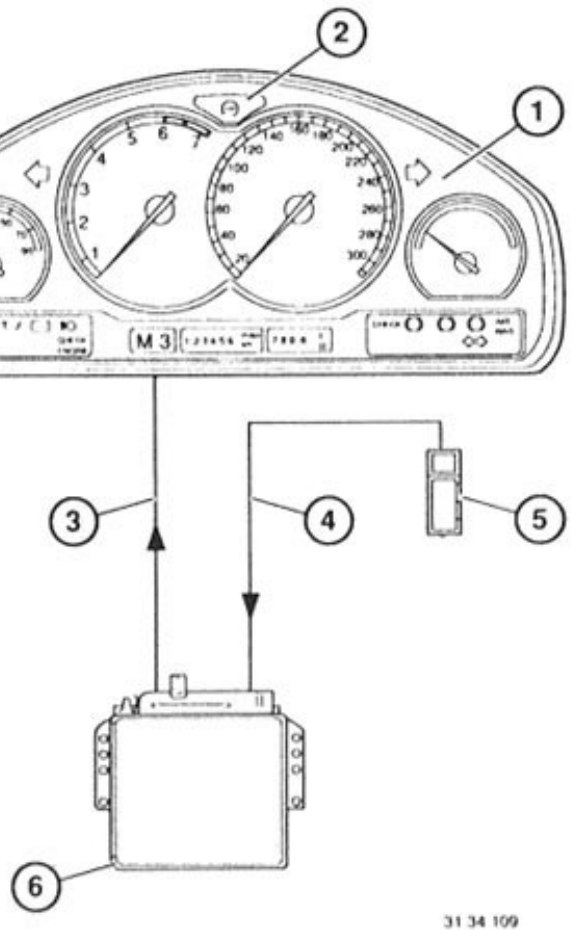
WIRING DIAGRAM FOR ASC+T



31 34 169

KL 61	Terminal 61 (charge control)
+ BLS	Stop light switch
360	Electr. control unit ABS/ASC+T
361	Hydr. control unit
a	Return delivery pump motor
b	Motor relay
c	Valve relay
d	Valve - left front
e	Valve - right front
f	Valve - left rear
g	Valve - right rear
h	Plunger relay
i	Pressure sender relay
362	Conn. - signal sender left front
363	Signal sender left front
364	Conn. - signal sender right front
365	Signal sender right front
366	Conn. - signal sender left rear
367	Signal sender left rear
368	Conn. - signal sender right rear
369	Signal sender right rear
370	Master relay (DME)
371	ABS lamp
372	ASC lamp
373	Plunger hydraulic control unit
374	DME
375	DME
376	EML
377	Transmission control
378	Diagnosis
379	DME

ASC+T DISPLAYING AND SWITCHING MODE



1 Instrument cluster

2 ASC lamp

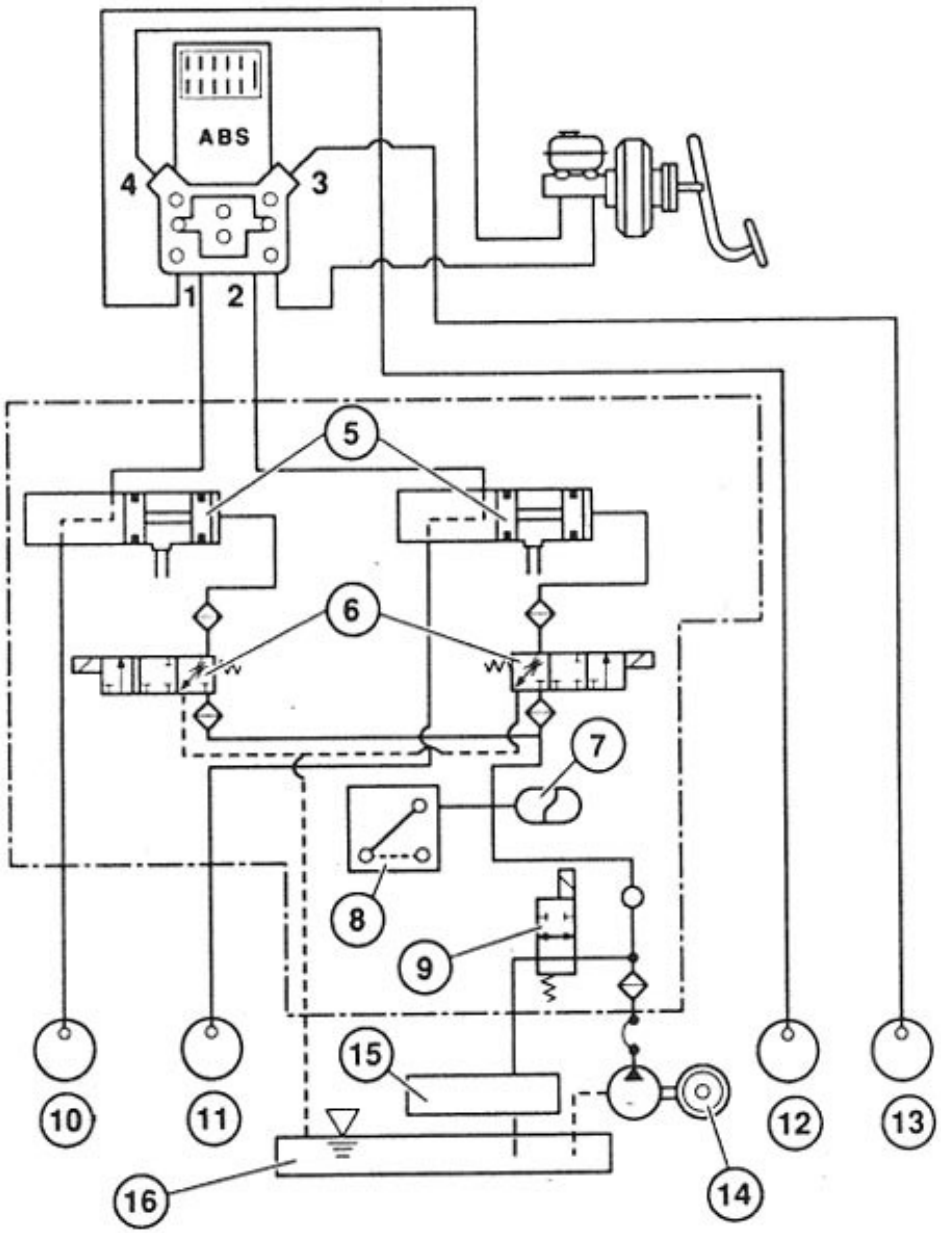
3 ASC active display / fault display / passive display

4 Switching signal

5 ASC passive push button switch

6 Control unit

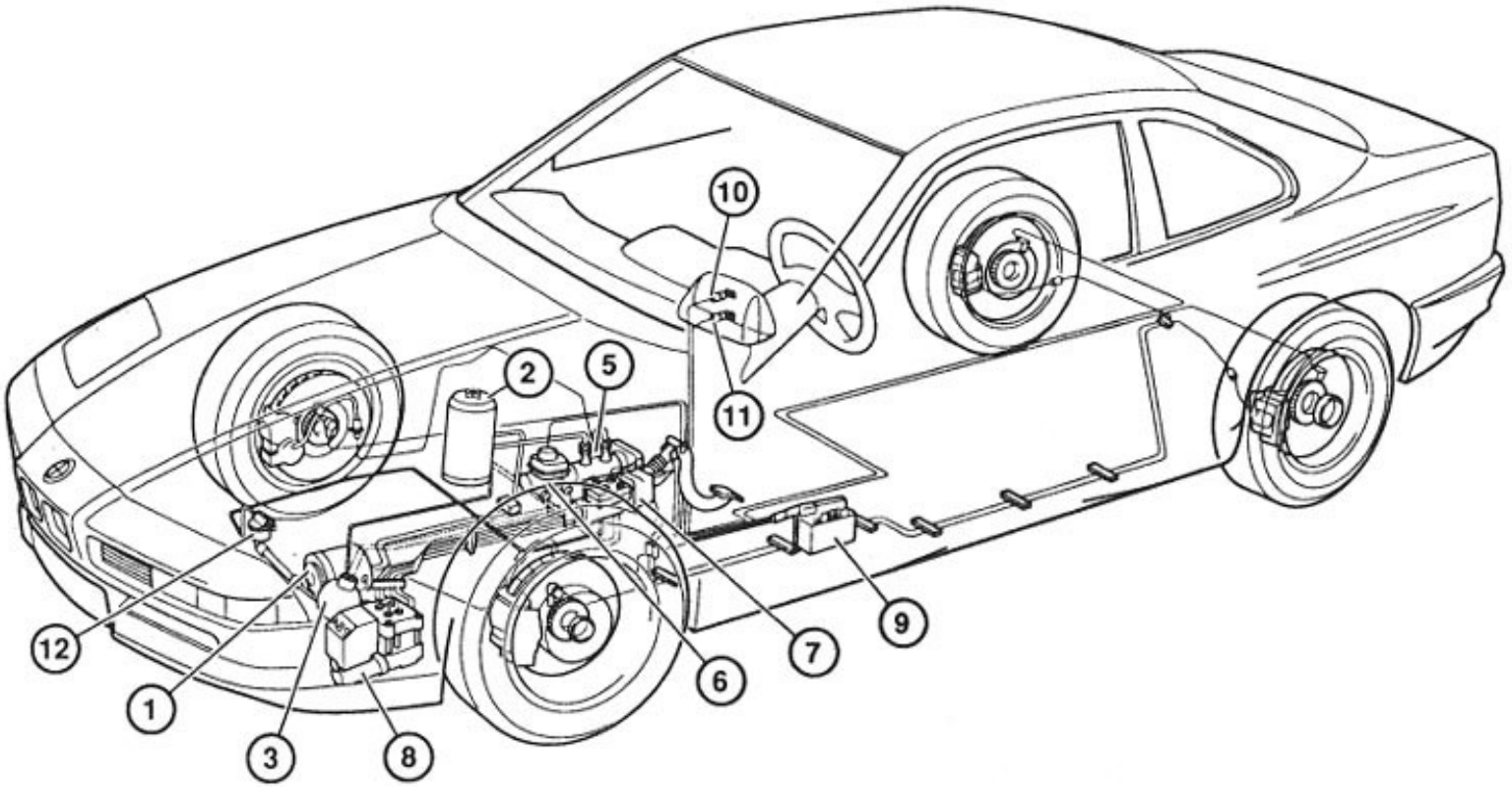
PLUNGER HYDRAULIC DIAGRAM
ASC+T
(Diagonal Brake Circuit Division)



32 34 166

1 Right rear pipe
2 Left rear pipe
3 Right front pipe
4 Left front pipe
5 Plunger piston
6 Solenoid valves
7 Pressure reservoir
8 Pressure switch
9 Charging valve
10 Right rear brake
11 Left rear brake
12 Left front brake
13 Right front brake
14 Tandem pump
15 Consumer
16 Oil supply tank

LAYOUT OF ABS/ASC+T



31 34 157

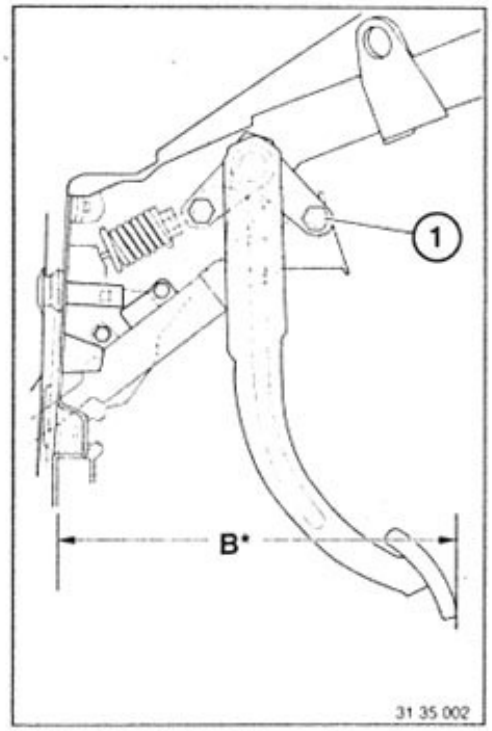
1 Tandem hydraulic pump
2 Supply tank
3 Pressure reservoir
4 Pressure control valve
5 Brake booster
6 Brake master cylinder
7 ASC+T (plunger hydr. control unit)
8 ABS (hydraulic control unit)
9 ABS/ASC or ASC+T control unit
10 ASC (control lamp)
11 ABS (control lamp)
12 ASC+T hydraulic filter

35 Pedals

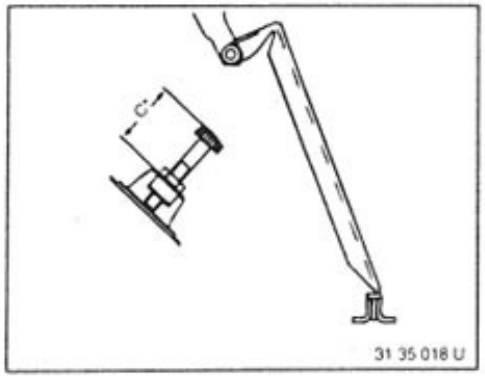
	Layout of pedals	35-00/1
	Control dimensions for spacing between pedals	35-00/2
35 11 000	Console for pedals, complete unit – remove and install	35-11/1
001	Console for pedals – replace	35-11/2
35 21 000	Brake pedal – remove and install or replace	35-21/1
35 41 000	Accelerator pedal – remove and install or replace	35-41/1
010	Accelerator pedal – remove and install or replace	35-41/2
480	Kick-down switch – remove and install or replace	35-41/3

35-00/1

Arrangement of pedals



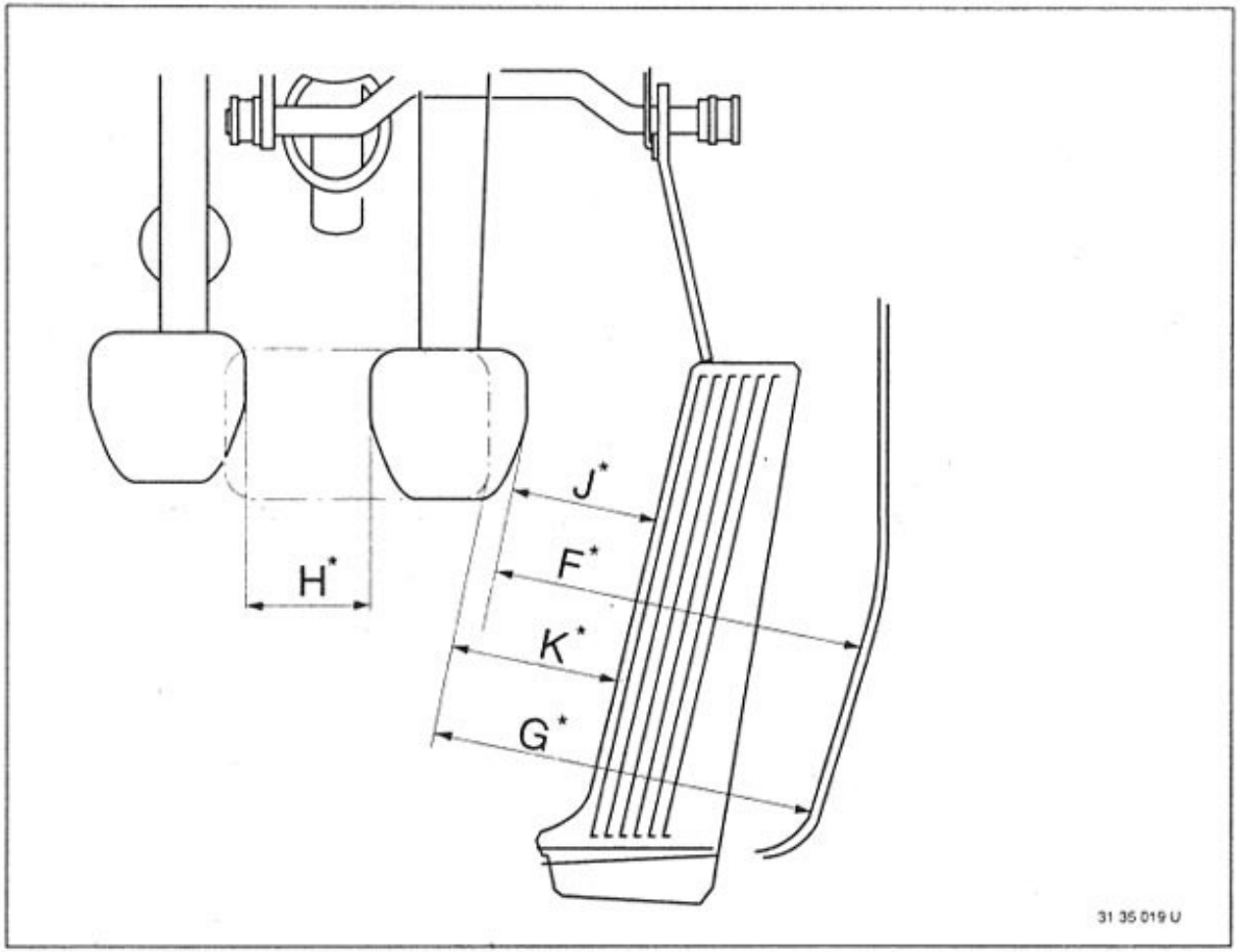
Brake pedal



Accelerator pedal

* Refer to Technical Data

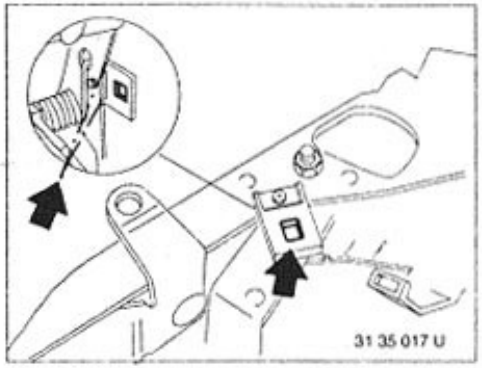
CONTROL DISTANCES FOR SIDE SPACING OF PEDALS



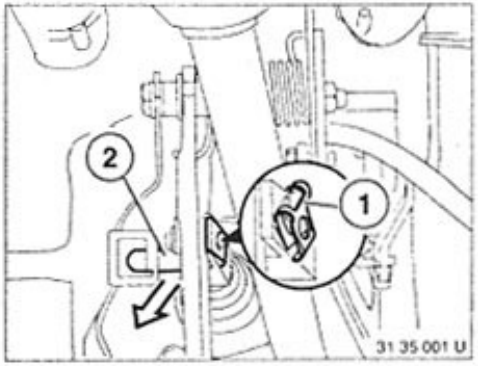
* See Specifications

35 11 000 Removing and installing complete mounting bracket for pedals

Removing accelerator pedal shaft, refer to 35 41 010.
Removing complete steering column, refer to Group 32.
Removing brake light switch, refer to Group 61.
Unfastening lines from clutch master cylinder.
Disconnect plug connection to accelerator sensor.



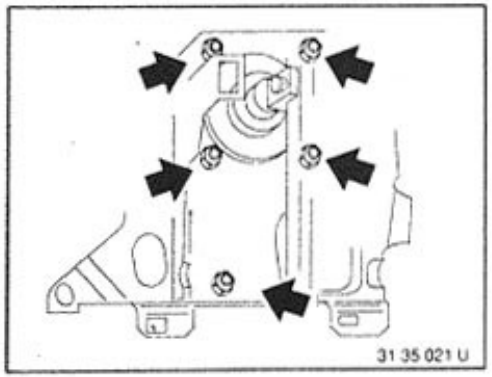
Unscrew bracket.



Remove clip (1) and pull out pin (2).

Installation:
Apply light coating of grease** to sliding face of pin and contact face of brake light switch.

Caution!
Stroke limitation should take place in master brake cylinder and must not occur in brake light switch.

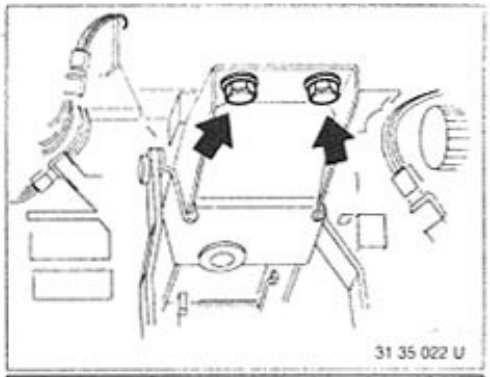


Unfasten nuts on end wall.

Installation:
Replace self-locking nuts, tightening torque*

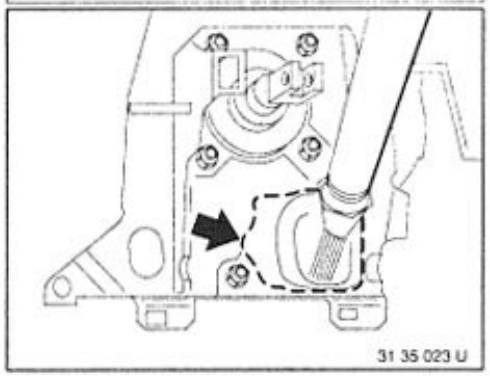
Note:
To illustrate them more clearly, accelerator and steering column are shown as removed units.

* Refer to Technical Data
** Refer to Operating Fluids Specifications



Unfasten screws.

Installation:
Tightening torque *



Cut away antidrumming lining.

Pull mounting bracket upwards to remove.

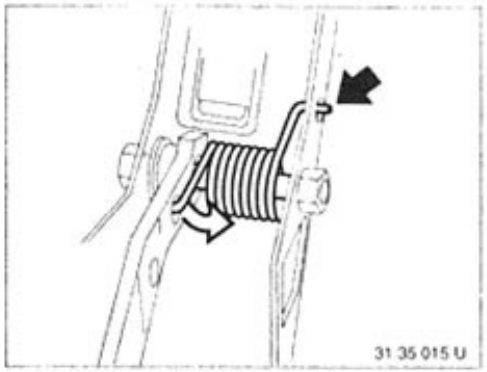
Installation:
Do not jam noise insulation on end wall!

* Refer to Technical Data

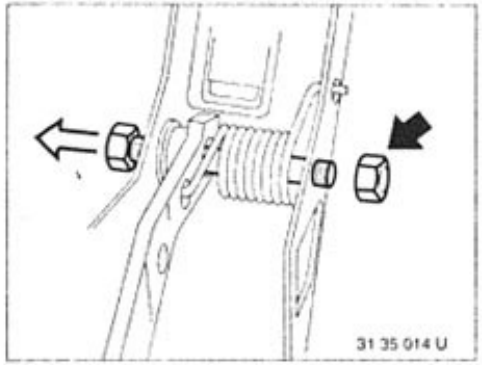


35 11 001 REPLACING CONSOLE FOR PEDALS

Automatic:
Remove pedal console – see 35 11 000.
Remove pedal value sender – see Group 12.

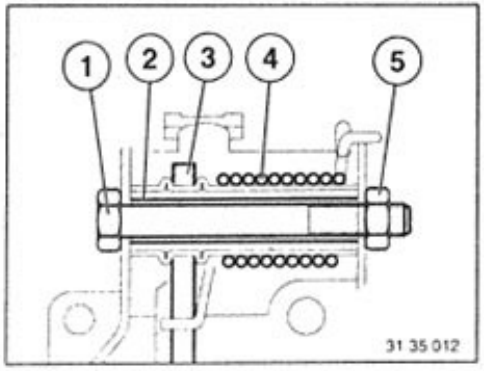


Disconnect spring.



Unscrew nut and take off brake pedal.

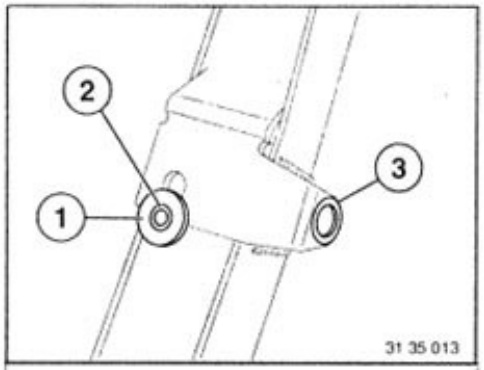
Installation:
Replace self-locking nut.
Tightening torque*.



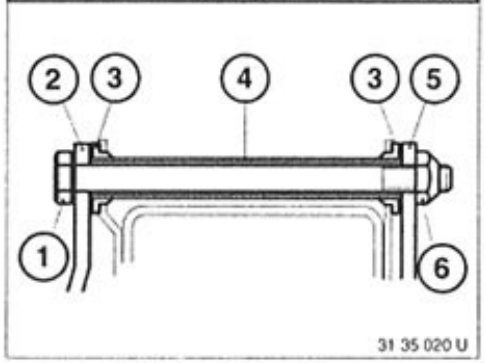
Installation:
1 Bolt
2 Sleeve
3 Brake pedal
4 Spring
5 Self-locking nut

Important!
Lubricate sleeve (2) with grease**.

* See Specifications
** See Operating Fluids



Remove guide sleeve (1) and spacer (2).
Take off bearing sleeve (3).



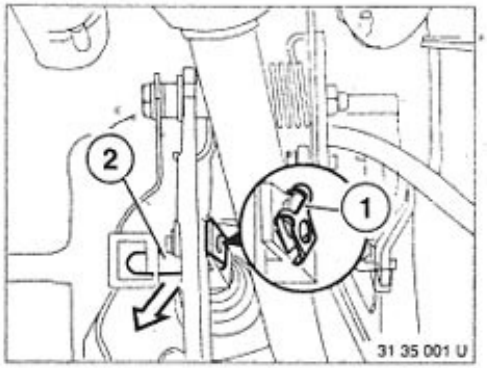
Mechanical Steering Column Control:
Transfer levers.

Installation:
1 Bolt
2 Lever, left
3 Bearing sleeve
4 Spacer
5 Lever, right
6 Self-locking nut
Replace self-locking nut (6).
Tightening torque*.

* See Specifications

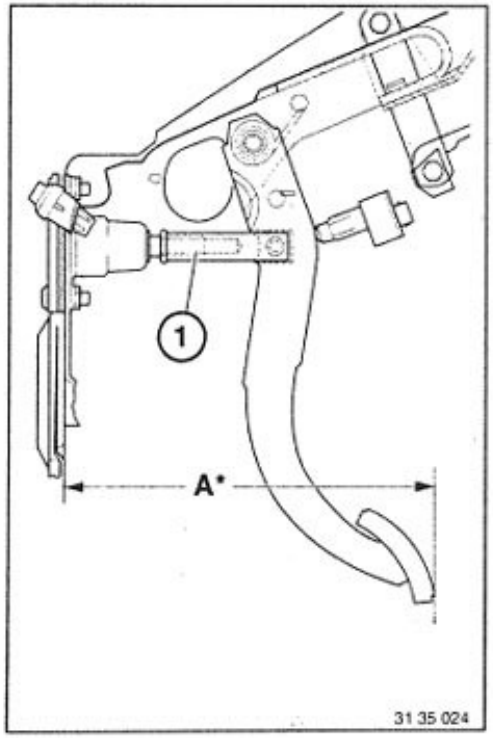
35 21 000 Removing and installing or replacing brake pedal

Remove lower left section of trim from instrument panel, see Group 51.
Remove brake light switch, see Group 61.



Remove clip (1), swivel pin and angle bracket (2) downwards, remove pin.

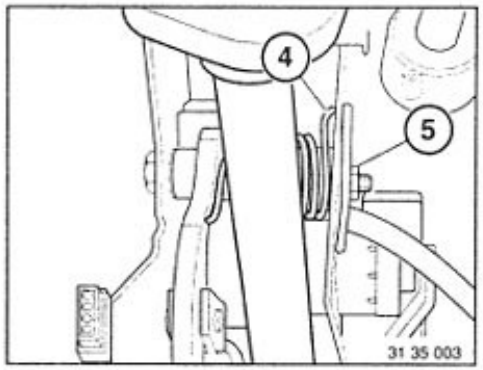
Installation:
Ensure that clip (1) is correctly located!
Apply light coat of grease** to sliding face and contact face of brake light switch.



Installation:
Adjust brake pedal on push rod (1) of master brake cylinder to dimension (A)*.

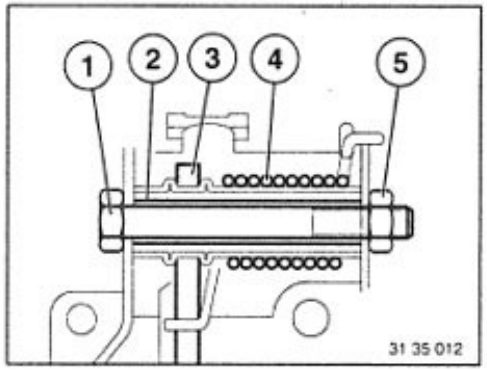
Caution!
Stroke restriction must take place in the master brake cylinder and not, for instance by the brake light switch.

* Refer to Technical Data
** Refer to Operating Fluids



Disconnect torsion spring (4) from brake pedal.
Unfasten nut (5) and remove bearing screw.
Remove brake pedal with spacer sleeve and torsion spring.

Installation:
First attach torsion spring (4) to pedal unit.
Replace self-locking nut (5), tightening torque *.



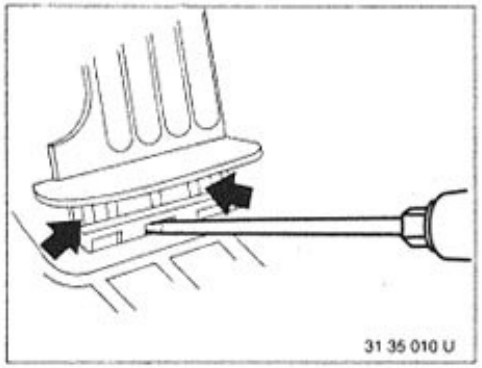
1 Hex screw
2 Spacer sleeve
3 Brake lever
4 Torsion spring
5 Self-locking nut

Installation:
Apply light coat of grease** to the hex screw (1) and the spacer sleeve (2).

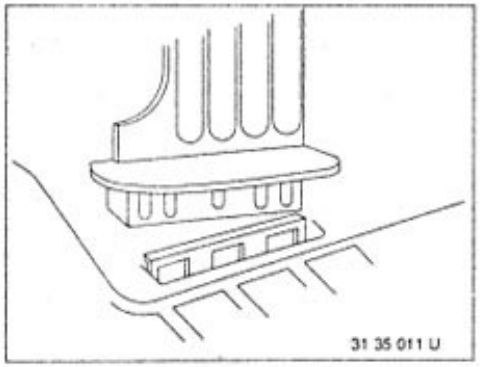
* Refer to Technical Data
** Refer to Operating Fluids

35 41 000 REMOVING AND INSTALLING OR REPLACING ACCELERATOR PEDAL

Installation:
Always replace a removed accelerator pedal.
Retaining clips of the old pedal could be damaged and cause the accelerator pedal to slide out of the plate – this could lead to an accident!

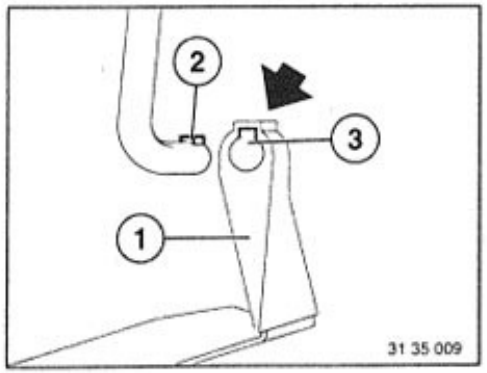


Press down on carpet, bend clips forward and lift out accelerator pedal from above.



Installation:
Install accelerator pedal with pocket at plate on the floor and let the clips engage.

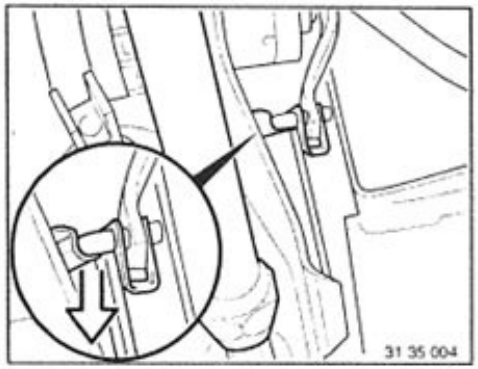
Important!
Always check for correct engagement of the clips.



Turn accelerator pedal (1) until linkage tab (2) of the accelerator shaft engages in opening (3).
Pull accelerator pedal off of the accelerator shaft.

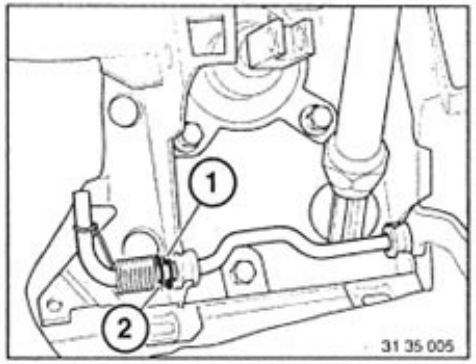
Installation:
Lubricate sliding surface on the accelerator shaft lightly with grease.**

** **See Operating Fluids**



35 41 010 Removing and installing or replacing accelerator pedal (gas pedal)

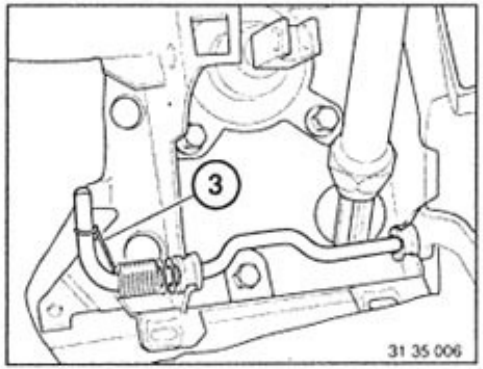
Remove lower left section of trim from instrument panel, see Group 51.
Disconnect clip, remove plunger rod.
Removing accelerator sensor, refer to Gr. 12.



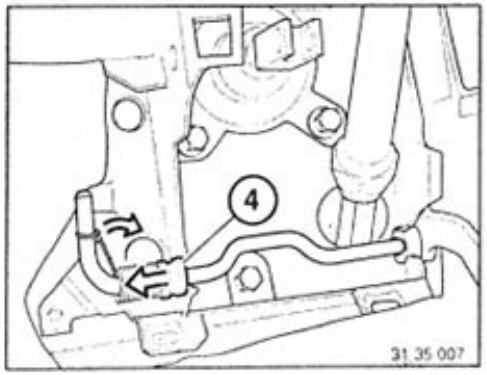
Remove retaining disc (1).

Installation:
Ensure disc is correctly located (2)!

Note:
Brake pedal and brake light switch have been removed to illustrate matters more clearly.



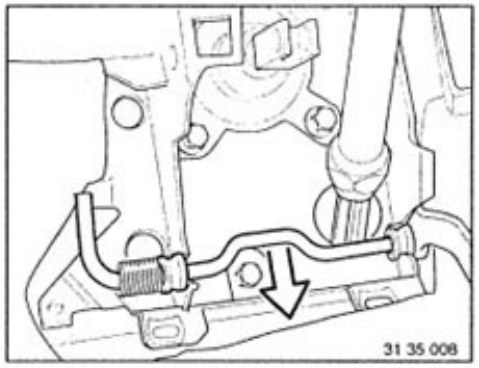
Remove torsion spring (3) from the accelerator pedal shaft.



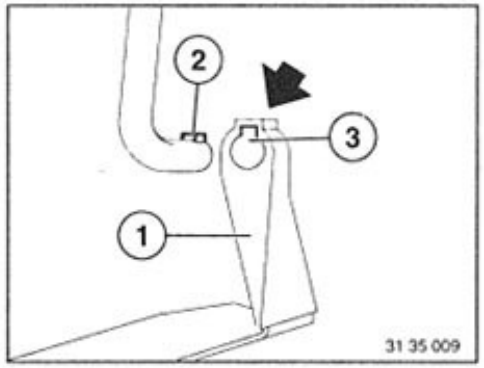
Slide left bearing bush (4) out of mounting bracket sideways, lift accelerator pedal shaft out to left.
Repeat procedure on right side.

Installation:
Check bearing bushes and replace if necessary.
Apply light coat of grease to sliding faces of accelerator shaft beside bearing bushes (4) on left and right sides**.

** Refer to Operating Fluids Specifications



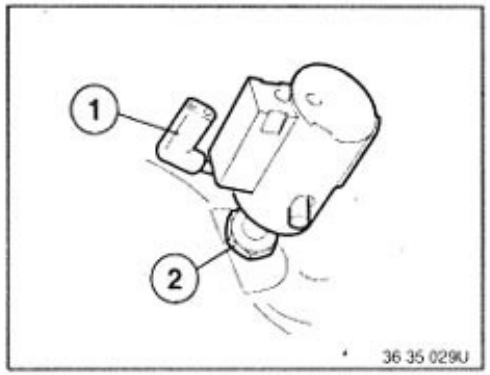
Remove torsion spring (3) from mounting bracket and lift out accelerator pedal shaft.



Rotate accelerator shaft and insert lug (2) through recess (3) in accelerator pedal (1).

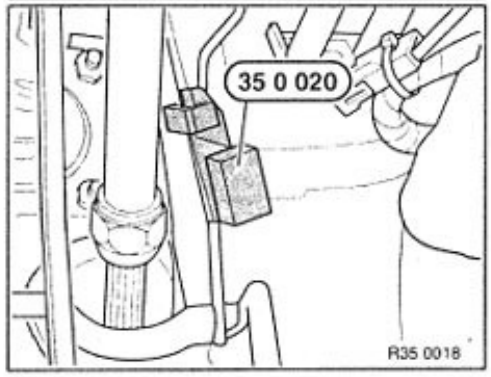
35 41 480 Replacing kick-down switch

Check switch, refer to BMW Diagnosis Program.



Remove flat-pin connector (1).
Unfasten nut (2) and twist switch to remove.

Installation:
Adjust Bowden cable for throttle valve actuation, refer to Repair Instructions Series 7 E38.

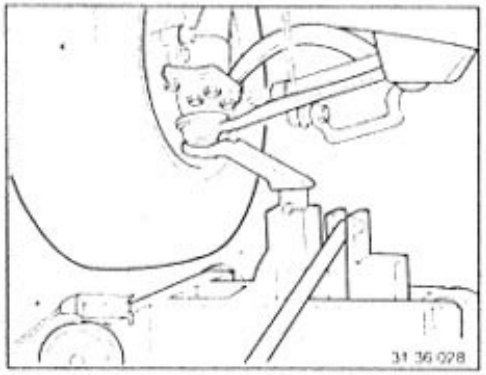


Vehicle with M 73 engine:

Installation:
Remove bottom left trim section from instrument panel.
Attach special tool 35 0 020 to the pedal bearing block.
Completely screw in kick-down switch.
Completely depress accelerator pedal and twist kick-down switch until it abuts against the accelerator pedal.
Fit lock nut (2).
Remove special tool.
Checking switch, refer to BMW Diagnosis Program.

36 Wheels and tires

36 10 008	Front wheel, left or right – balance electronically	36-10/1
058	Rear wheel, left or right – balance electronically	36-10/2
209	Wheel, front or rear – check lateral and radial runout	36-10/3
300	Wheel, front or rear – remove and install	36-10/4
508	Wheel – balance dynamically	36-10/5
713	Wheel – check lateral and radial runout in balancing machine	36-10/6
715	Rim – check lateral and radial runout	36-10/7
36 12 001	Tire for front, rear or spare wheel – replace	36-12/1
36 13 . . .	Wheel bolt lock – service install	36-13/1

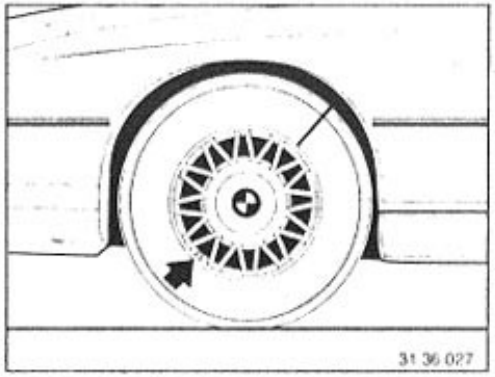


36 10 008 BALANCING LEFT OR RIGHT FRONT WHEEL ELECTRONICALLY (Finish Balancer)

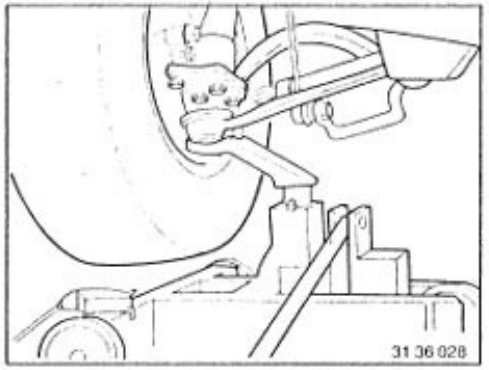
Prior to electronic balancing, always first balance the wheels stationary – see 36 10 508.

Set up gage for balancing on control arm end.
Use a suitable take-up fork or additional fork (see Service Information or Workshop Equipment/Planning).

Set up gage on the control arm as close as possible to the control arm end.



Make a chalk mark on the side of the tire, opposite the valve.



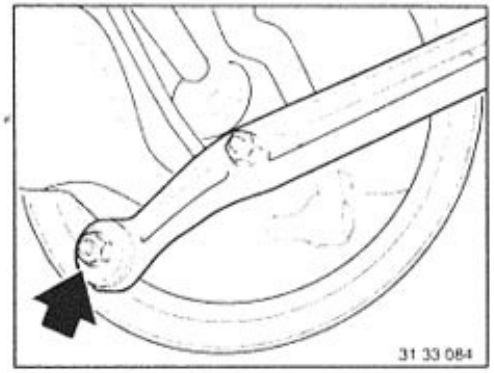
Connect leads for tester.

Important!
Balance wheel according to instructions supplied with pertinent balancing machine.
Balancing must be performed on a solid foundation (concrete floor without cellar).
Also refer to Service Information of Group 36.

If more than 15 grams of imbalance are displayed for one wheel during finish balancing, the possible causes (e.g. inaccurate stationary balancing, centering, etc.), also refer to Service Information 36 0 483 (196), must be eliminated before finish balancing and a previously finish balanced wheel must be rechecked.

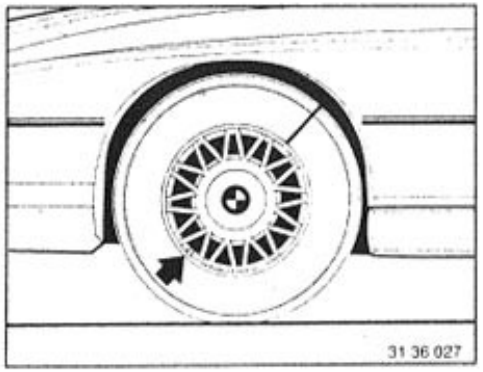
36 10 058 BALANCING LEFT OR RIGHT REAR WHEEL ELECTRONICALLY (Finish Balancer)

Prior to electronic balancing, always first balance the wheels stationary – see 36 10 508.



Set up gage for balancing on trailing arm as close as possible to the wheel. Use a suitable take-up fork or additional fork (see Service Information or Workshop Equipment/Planning).

Apply a workshop jack underneath the final drive with light pressure to deaden the final drive's own oscillation.



Make a chalk mark on the side of the tire, opposite the valve.
Check whether the rear wheels can be turned easily.

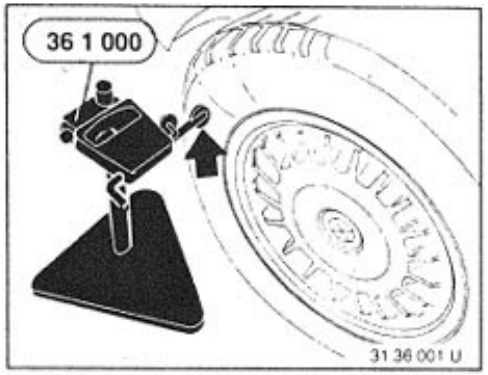
Connect leads for tester.

Important!
Balance wheel according to instructions supplied with pertinent balancing machine.
Balancing must be performed on a solid foundation (concrete floor without cellar).
Also refer to Service Information of Group 36.

Important!
Switch off ASC+T before finish balancing.

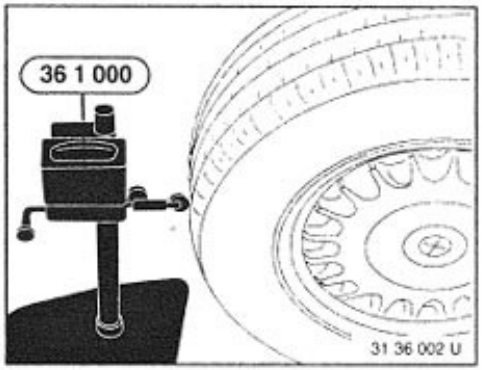
Balancing is performed with engine force at approx. 100 km/h (60 mph). This requires that the engine run smoothly and without misfire, doors, engine hood and trunk lid be closed and driver be seated in car as quietly as possible.
Exhaust extraction hoses must not touch the car's tail panel.

If more than 15 grams of imbalance are displayed for one wheel during finish balancing, the possible causes (e.g. inaccurate stationary balancing, centering, etc.), also refer to Service Information 36 0 483 (196), must be eliminated before finish balancing and a previously finish balanced wheel must be rechecked.

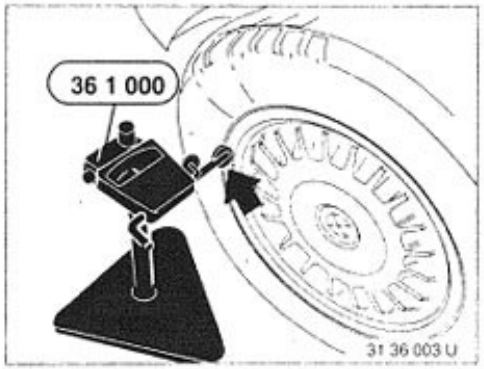


36 10 209 CHECKING WHEEL FOR LATERAL AND RADIAL RUNOUT

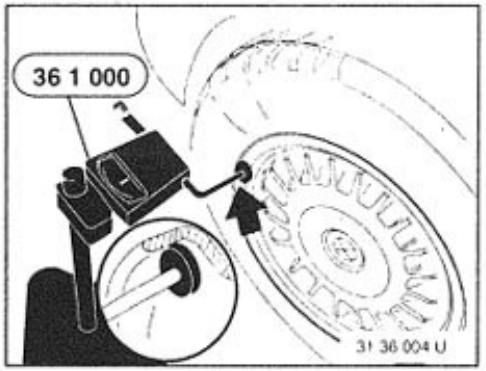
Wheel bearings must be in perfect condition.
Lift car.
Check wheel for lateral runout* with Special Tool 36 1 000.



Check wheel for radial runout* with Special Tool 36 1 000.



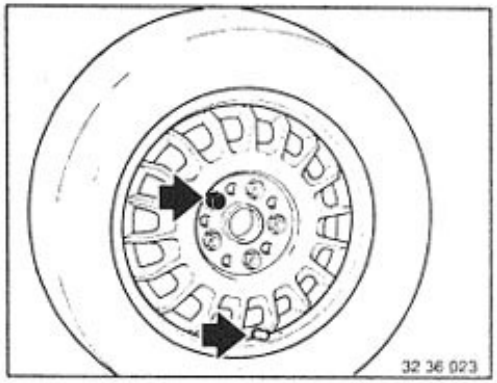
If necessary, remove balance weights.
Check lateral runout* of rim with Special Tool 36 1 100.



Check radial runout* of rim with Special Tool 36 1 000.

* See Specifications

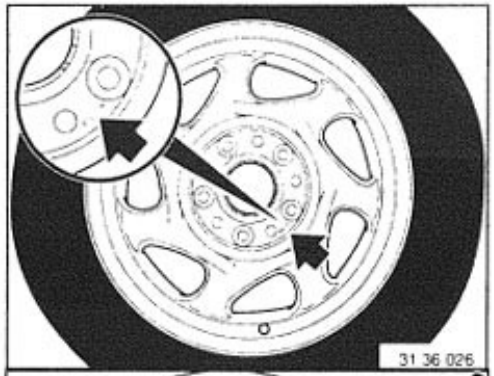
* See Specifications



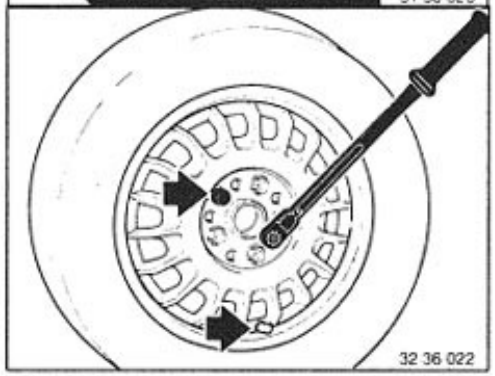
36 10 300 Removing and installing front wheel or rear wheel

Caution!
Wheel is electronically balanced.
To avoid clamping errors and imbalance, follow the procedure described below:

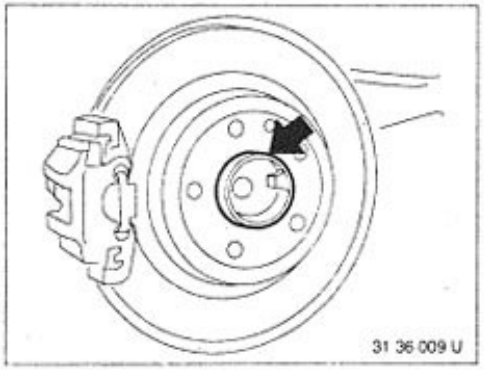
-- Unfasten wheel studs.
-- Wheel setting with valve pointing downwards, fitted in same position.
-- If several wheels are removed at once, mark the location of wheels on the tires (e.g. with chalk).
-- Mark position of wheel relative to wheel hub (to avoid clamping errors).
-- Mark position of wheel lock relative to wheel (to avoid balancing problems).
-- Unfasten wheel studs.



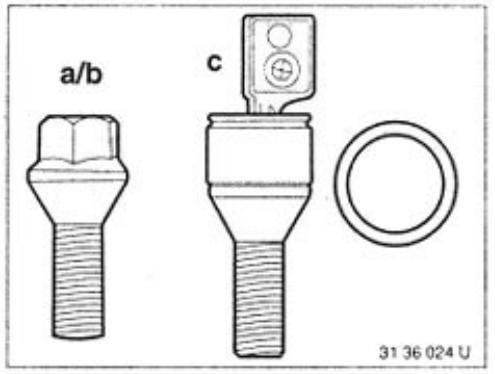
On directional wheels, note the location of the designation.
The arrow on the wheel indicates the direction of rotation.
If no designation can be found, check the parts number of the wheel in the Parts Catalogue and determine the correct location.



Tighten disc wheels crosswise.
Tightening torque*.
If new disc wheels are being fitted for the first time, recheck the tightening torque * after 1 000 km.
An appropriate note should be attached within the driver's field of view.



Installation:
Before fitting each wheel, clean all dirt or old grease residue off the wheel centering bead and contact faces of disc wheels and coat centering point with Plastilube **. Check wheel stud thread and taper for wear and replace wheel studs if necessary.
Apply light coat of grease to wheel stud thread but the taper must remain free of grease during assembly.

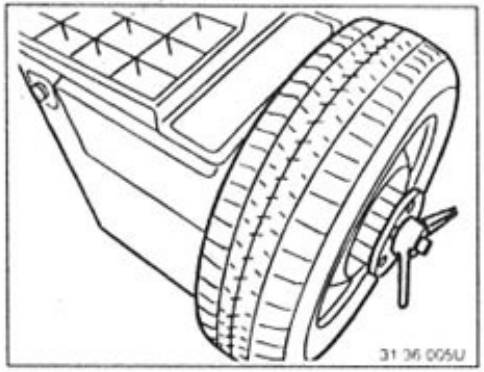


a) Wheel stud galvanized
b) Wheel stud with black chrome coating
c) Locking wheel stud with black chrome coating

Note for anti-theft wheel studs:
In the event of a missing adapter, use a suitable adapter from the
wheel stud adapter set
special tool 36 1 300
to unfasten the anti-theft wheel studs.

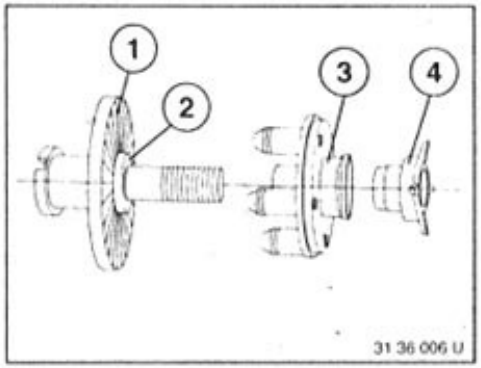
** Refer to Operating Fluids

* Refer to Technical Data



36 10 508 BALANCING WHEEL DYNAMICALLY (Wheel Removed)

Remove old balancing weights, stones in treads and large pieces of dirt. Check tire pressure, condition of tires, tires for damage or flat spots (caused by long parking of car with hot tires). If necessary, check wheel for radial and lateral runout – see 36 10 209.



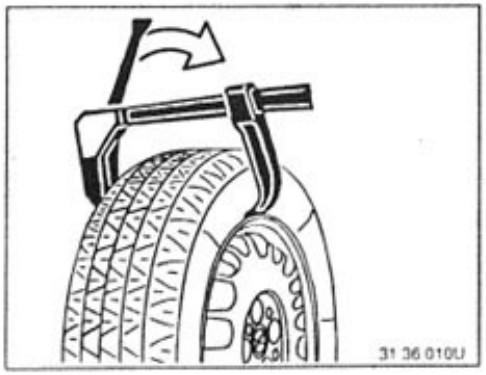
Use suitable center of pertinent balancing machine supplier.

1 = Basic flange
2 = Center
3 = Type flange
4 = Clamping nut

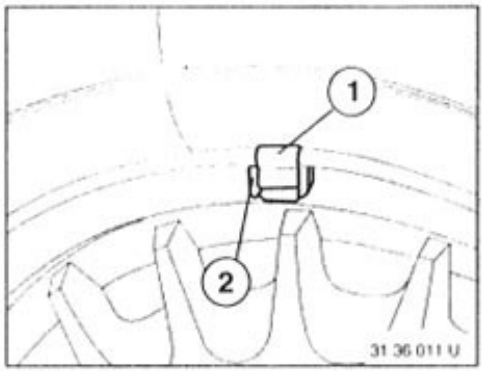
Also refer to Workshop Equipment and Planning.

Important!
It is necessary to mount the wheel on the balancing machine in the same manner as it will be mounted on the car afterwards (e.g. valve facing down), in order to avoid clamping-over errors.

Balance wheel according to instructions supplied with the pertinent balancing machine.



Pry the tire wall away from the rim flange slightly with a tire pliers** at a suitable point and insert a retainer in the case of light alloy rims.
Remove the tire pliers and slide a balance weight underneath the retainer and let it engage.



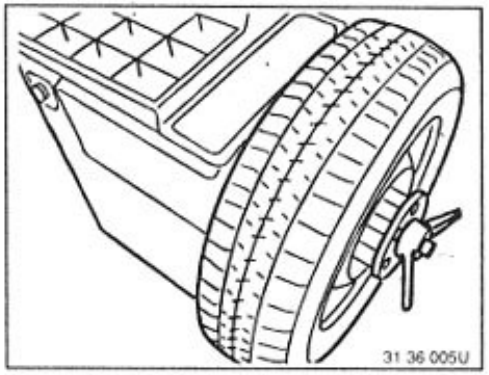
Arrangement of Balance Weights for Cast Light Alloy Wheel Rims:

1 = Spring clip
2 = Balance weight

Max. imbalance per wheel and side*.

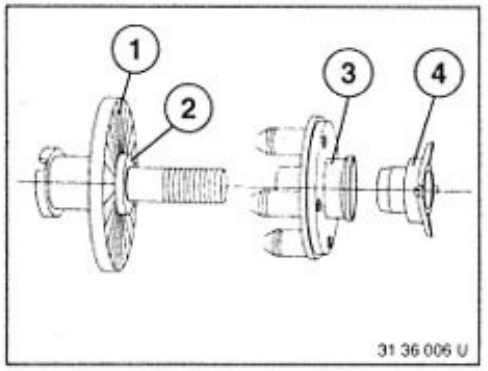
** See Workshop Equipment/Planning

* See Specifications



36 10 713 CHECKING ONE ROAD WHEEL FOR RADIAL AND LATERAL RUNOUT ON BALANCING MACHINE (Wheel Removed)

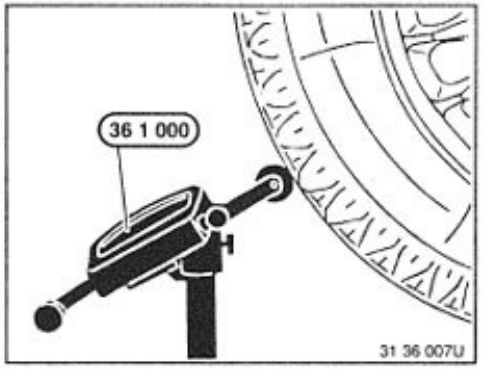
Remove wheel – see 36 10 300.
Mount wheel on balancing machine.
Wheel must be mounted on the balancing machine as it is mounted on the car (valve facing down) to avoid clamping-over errors.



Use suitable center of pertinent balancing machine supplier.

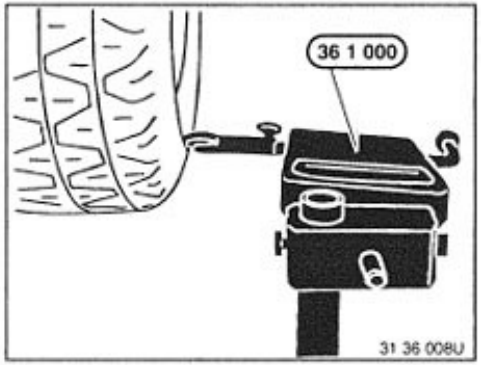
1 = Basic flange
2 = Center
3 = Type flange
4 = Clamping nut

Also refer to Workshop Equipment and Planning.



Set up Special Tool 36 1 000 on tire tread surface.
Turn wheel by hand and read maximum tire radial runout*.

Note:
Special tool must be perpendicular to the tire tread surface.



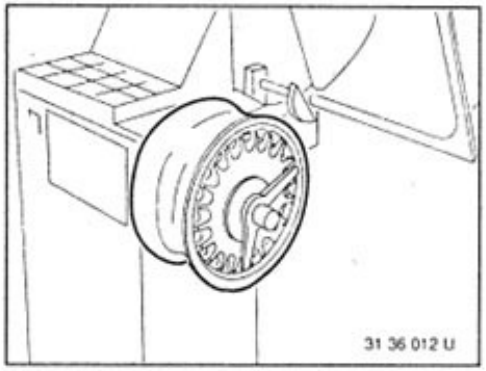
Set up Special Tool 36 1 000 on side surface of tire.
Turn wheel by hand and read maximum tire lateral runout*.

Note:
Special tool must be perpendicular to side surface of tire.
Never measure on tire data surface!
If necessary, check radial and lateral runout of wheel rim – see 36 10 715.

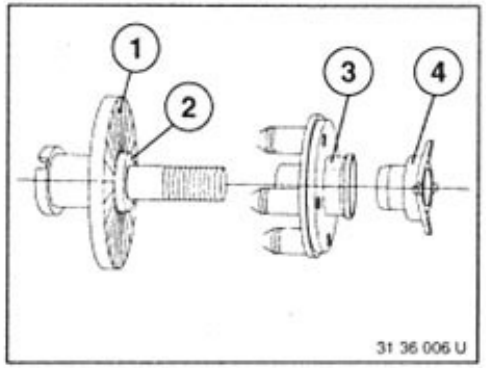
* See Specifications

36 10 715 CHECKING WHEEL RIM FOR RADIAL AND LATERAL RUNOUT

Remove wheel – see 36 10 300.
Check front or rear wheel for radial and lateral runout – see 36 10 209.
Take tire off of wheel rim.
Remove old balancing weights.
Remove dirt on rim well and rim flange.



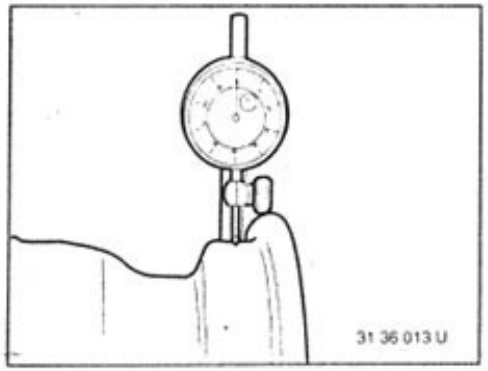
Mount wheel rim on balancing machine.



Use suitable center of pertinent balancing machine supplier.

1 = Basic flange
2 = Center
3 = Type flange
4 = Clamping nut

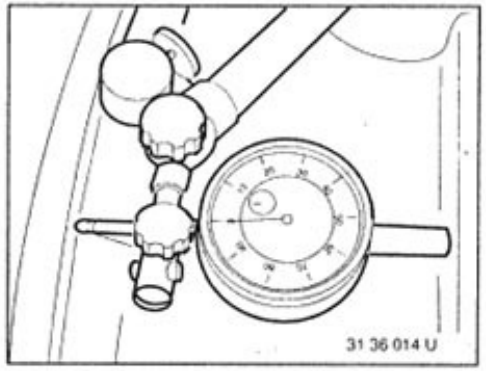
Also refer to Workshop Equipment and Planning.



Apply dial gage on rim well.
Turn wheel by hand and measure the maximum radial runout*.
Measure on both sides of rim well.

Note:
Dial gage must be perpendicular to the rim well.

* See Specifications

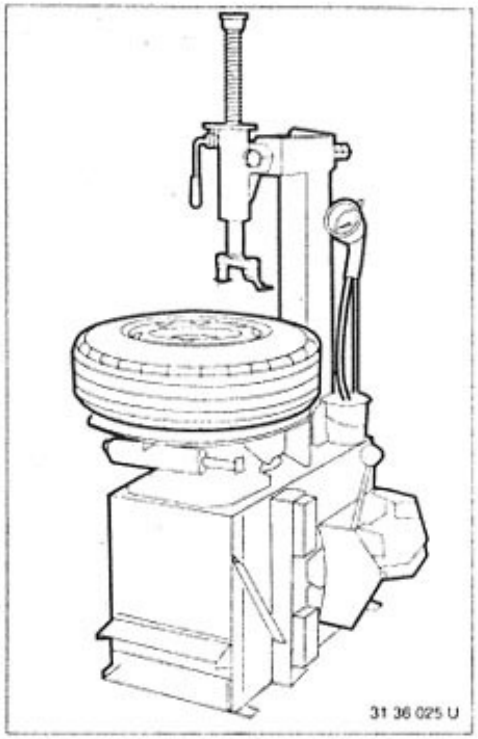


Apply dial gage on rim flange.
Turn wheel by hand and measure the maximum lateral runout*.
Measure on both rim flanges.

Note:
Dial gage must be perpendicular to the rim flange.

Important!
Avoid clamping-over errors when mounting afterwards – also refer to 36 10 508.

* See Specifications



36 12 001 Replacing tire on front, back or spare wheel

Refer to operating instructions supplied with pertinent tire mounting machine for correct mounting of tires. However, also make sure that the equipment is in perfect condition and that the wheel rim and tire are not damaged.

General tire removing / mounting instructions

Removing:

Begin the removal of a tire at the valve.
After pressing the tire off the rim flange, remove balance weights, press tire bead into well and coat thoroughly with tire mounting paste **.
Clean disc wheel thoroughly and inspect for damage before fitting the tire.
The valve and valve insert must be replaced each time a tubeless tire is removed and installed.

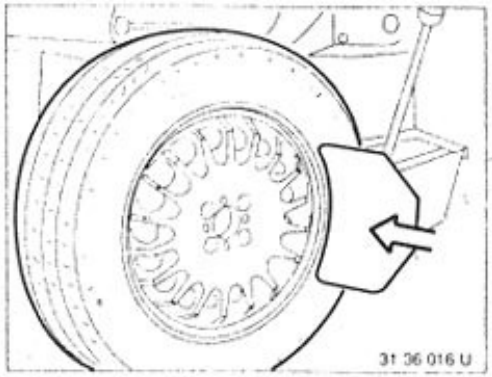
Caution!
It will be necessary to loosen the bead at several points on the bead periphery from the inside and outside with the pressing-off horn before pressing off the tire.
If it is very difficult to press off the tire, loosen tire from rim flange as well as possible with the pressing-off horn and then apply a coat of tire mounting paste between the tire and rim flange.
Repeat this step around the entire tire periphery.
Then press of tire completely.

Mounting:

Coat tire bead with tire mounting paste **.
Make sure tire is mounted on correct side, especially in case of asymmetric tires.
The "outside" of these tires is marked.
Mount tire with as little as possible stress on the beads, as otherwise there would be danger of damaging the tire.
Have the tire bead – coming from the well – first jump over the hump of the rim shoulder.
Build up pressure in steps while observing continuously.
Maximum "jumping pressure": 3.3 bar.
If the tire is not seated on the rim correctly, increasing the inflation pressure will not improve tire seating!
Instead it will be necessary to press off both tire beads, apply another coat of mounting paste and then reinflate the tire.
Only after the bead bears correctly on the rim shoulder should the pressure be slowly increased until the tire "seats".
Maximum "seating pressure": 4.0 bar.
Refer to Service Information of Group 36 for approved tires and tire sizes as well as special equipment.

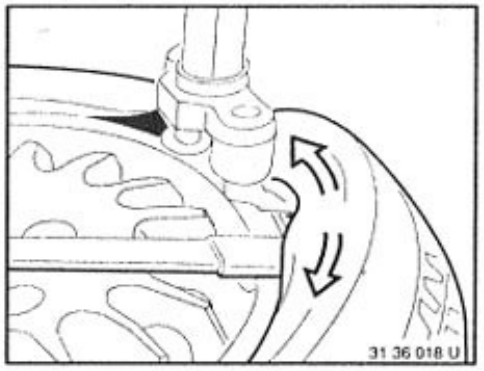
** Refer to BMW Parts Service

** Refer to BMW Parts Service

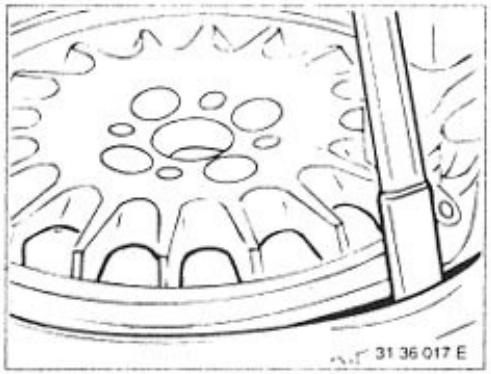


Mounting tires with a mounting machine:

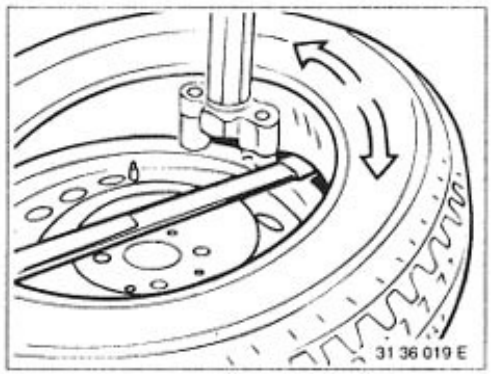
Unscrew valve and deflate tire.
Press off bead from rim flange all around on outside and inside using pressing-off horn of machine.
If tire beads fit too tight, first only loosen tire from flange at several points with the pressing-off horn prior to the actual pressing-off operation.
Push both tire beads into rim well completely until they are loose.
Pull off balance weights on rim and clean rim to remove large pieces of dirt.
Coat tire beads with mounting paste **.
Clamp wheel on mounting machine.
Narrow rim shoulder always faces up.



Let mounting machine run back a short distance (counterclockwise) so that the tire bead can slide fully on to the mounting finger.
Then let mounting machine run forward (clockwise) a short distance.
In so doing always check whether the bottom bead is in the well and the tire is given enough time to move.
Stop the machine and let it run back slightly if the bead jams.

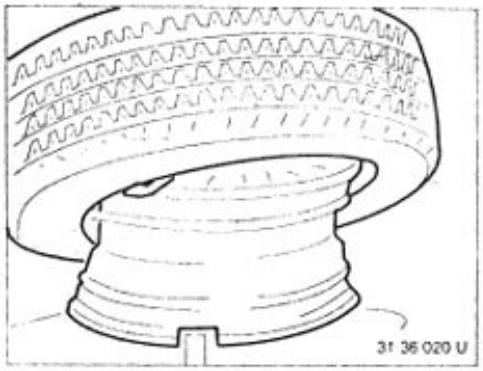


Swing mounting pillar into position or fold and let it engage.
Adjust mounting head, whereby it must be pressed on the rim edge fully and turn down the lever for the clamp fixture; normally the distance of the mounting head will set in automatically.
Valve should be about 10 cm to the right of the mounting head.
Lift tire bead over mounting finger using tire irons.
It is recommended to use coated or shrink-fit hose covered tire irons for light alloy rims.

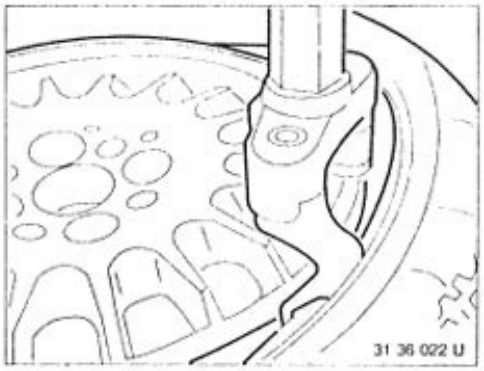


If the upper bead is pulled off the rim, now also lift the bottom bead over the mounting finger with the tire iron.
Let machine run back a short distance again and then forward (clockwise) briefly until there is complete separation of the tire from the rim.

** Refer to BMW Parts Service



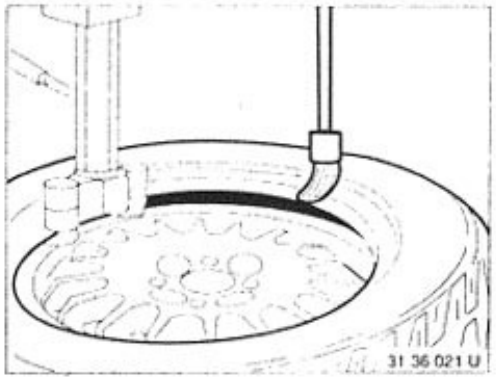
Release lock and tilt back or swing away the mounting pillar.
Unclamp and clean the rim.
Replace the valve.
Coat the rim flange and tire beads with mounting paste **.
Clamp the rim on the mounting machine.
Slide on the tire with the lower bead over the rim flange partially.
Valve is 10 cm to the right of the mounting head.



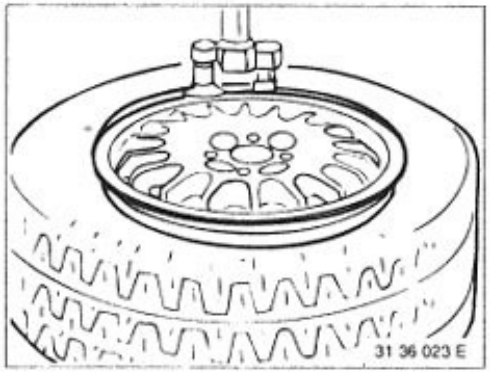
Press the upper tire bead underneath the mounting finger. Tire bead should seat in rollers next to the mounting finger.

Caution!
Do not pinch or damage the bead.

Run the mounting machine forward (clockwise) a short distance, while checking that the lower tire bead remains in the well.



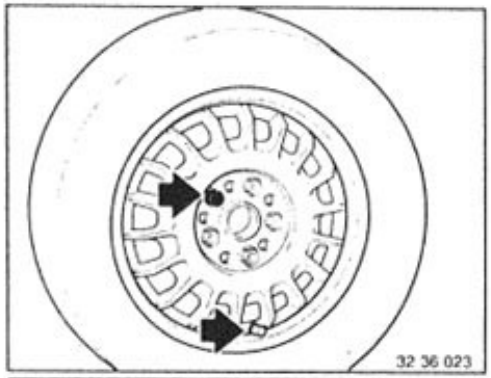
Swing or tilt the mounting pillar into position and lock.
Check adjustment of the mounting finger, readjusting if necessary and clamp.
Press the tire underneath the mounting finger by hand.
Tire bead should seat in the roll next to the mounting finger.
Let the mounting machine run forwards (clockwise) a bit at a time.
The lower tire bead will drop into the well.

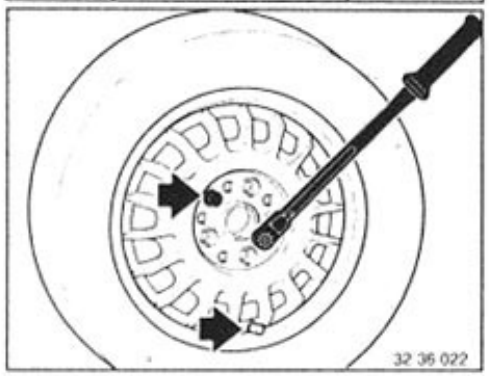


After mounting, first release the clamps and then inflate the tire (without valve).
Increase pressure up to 3.3 bar (330 kPA) in gradual steps (jumping pressure).
If the tire bead does not slide on to the rim edge all around, do not increase the pressure. Instead, deflate the tire and press off the tire bead, then coat the rim flange with mounting paste ** and reinflate to a pressure of 3.3 bar.
If the beads bear perfectly on the rim shoulders, increase the pressure to maximum 4.0 bar to "seat" the tire.
Screw in the valve and correct the tire pressure.

** Refer to BMW Parts Service

** Refer to BMW Parts Service





36 13 ... SERVICE INSTALLING ONE WHEEL BOLT LOCK

- Loosen wheel bolts.
- Lift car so that wheel can be turned easily.
- Loosen wheel bolts enough that wheel can be turned easily on the wheel hub.
- Position wheel with its valve facing down.
- Remove top wheel bolt and install wheel bolt lock.

Imbalance could be produced by play in the center and the wheel's own weight.
This imbalance is reduced to a minimum by installing a slightly heavier wheel bolt lock in the top wheel bolt position.

- Tighten wheel bolts crosswise hand tight in this position (wheel bolt lock at top, valve at bottom).
- Lower car and tighten wheel bolts crosswise.
  Tightening torque*.

If a customer complains about wheel imbalance after installation of the wheel bolt lock to these instructions, the wheels must be finish balanced.

* See Specifications

37 Integrated suspension system

	Electronic Damper Control EDC III	37- 0/1
	General information on EDC	37- 0/1
	Layout of EDC III model 850i	37-10/1
31 31 000	Spring strut shock absorber - (EDC) front – remove and install	37-14/1
33 52 000	Spring strut shock absorber - (EDC) rear – remove and install or replace	37-14/1
37 14 007	Longitudinal acceleration sensor – remove and install or replace	37-14/2
017	Body acceleration sensor, front – remove and install or replace	37-14/3
027	Body acceleration sensor, rear – remove and install or replace	37-14/4
050	Control unit – remove and install or replace	37-14/5

ELECTRONIC ABSORBER CONTROL EDC III

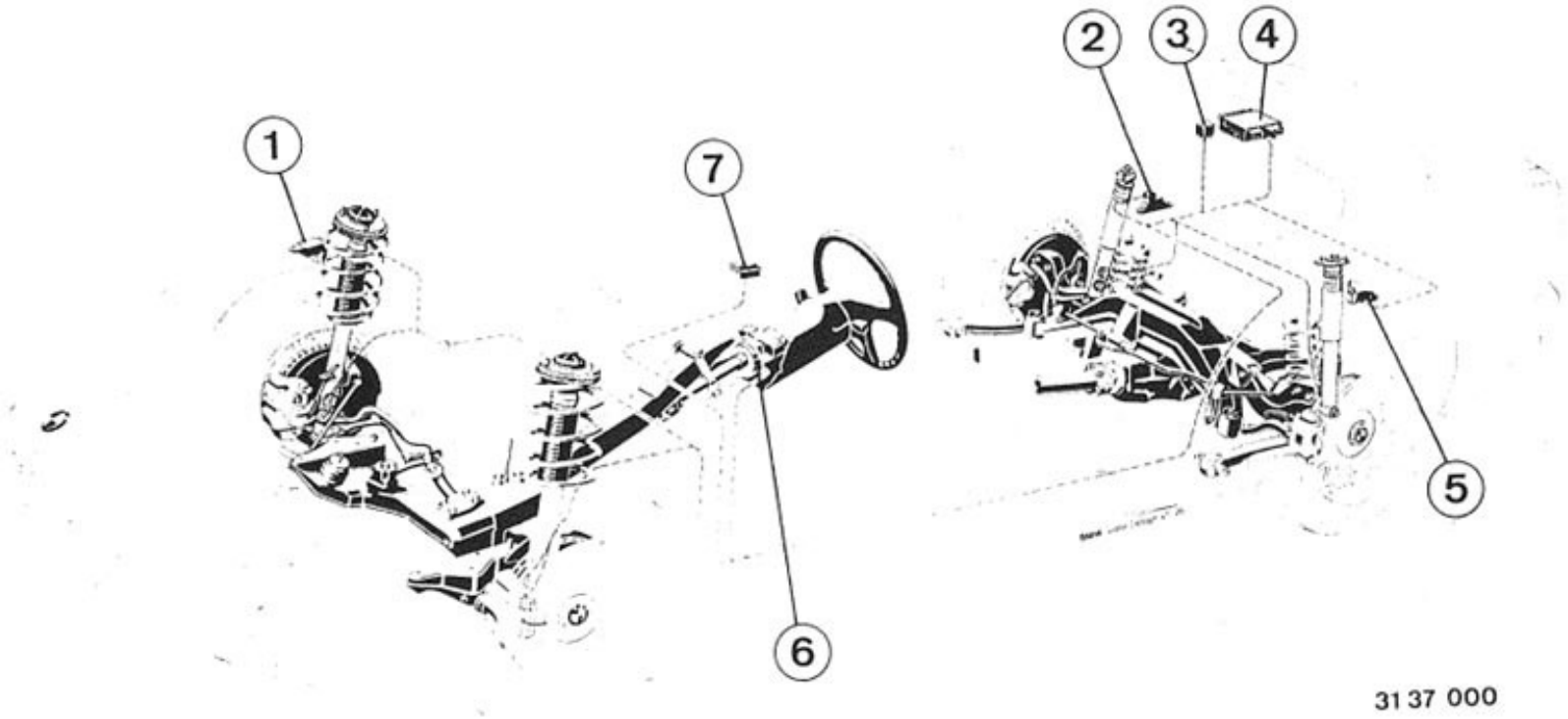
Program versions "Sport" (S) or "Comfort" (K) can be selected with the program button.
Suspension is adjusted automatically between medium and hard for (S) or soft, medium and hard for (K) depending on driving conditions.
The system tests itself after switching on the ignition.
If the system is okay, a control lamp corresponding with the selected program will light up in the program button.
Solenoid valves on the shock absorbers are activated by the control unit and adapt the absorbing force to the driving conditions. For this purpose the control unit processes electronic speed signals and signals from the following components.

Front body acceleration sensor, rear body acceleration sensor, axial acceleration sensor, steering angle sensor and road speed signal.

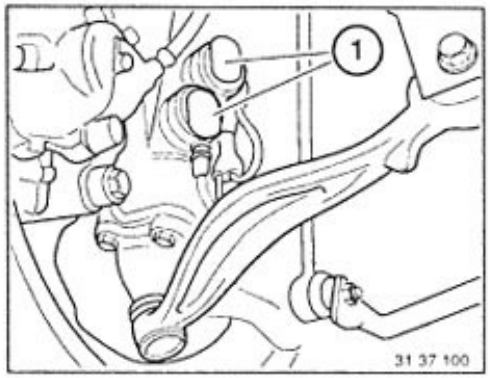
GENERAL INFORMATION ON EDC

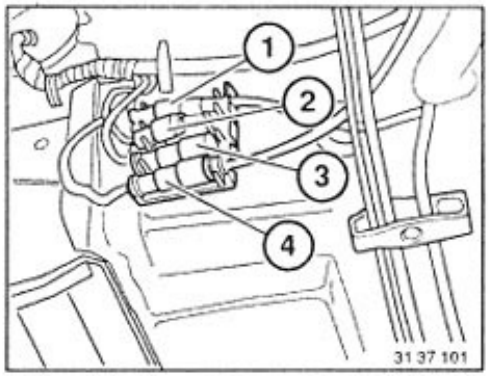
- EDC III is protected with fuse no. 32.
- Covers on the solenoid valves must not be opened.
- Shock absorbers must not be placed on solenoid valves or their connections.
- Shock absorbers may only be stored standing upright.
- Recommendation: only replace both shock absorbers of one axle.
- Fault memory must be cancelled with the BMW diagnosing system after elimination of faults and disconnection of electric connections with the ignition switched on.
- Steering angle offset must be performed with the BMW diagnosing system according to instructions in the EDC III diagnosis test program after working on the steering.
- Troubleshooting – see Car Electric/Electronic Test Plan of Gr. 37.

EDC III LAYOUT IN 850 I MODEL



1 Body acceleration sensor
2 Body acceleration sensor
3 Relay (power saver)
4 EDC III control unit
5 Axial acceleration sensor
6 Steering angle sensor
7 EDC III program button



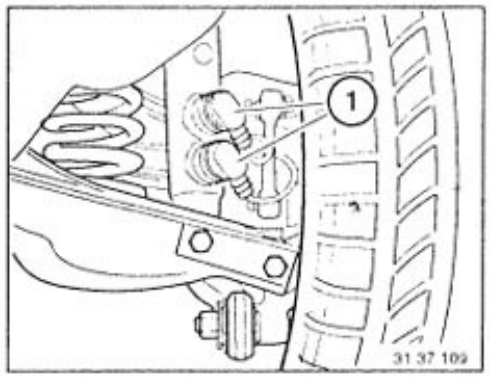


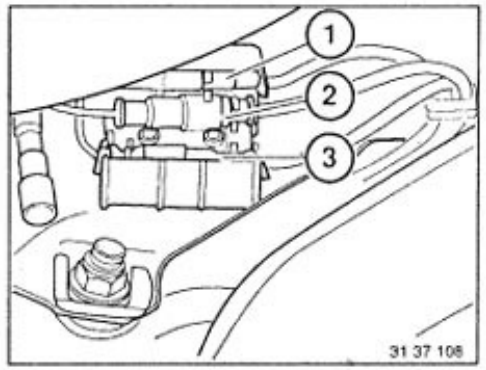
31 31 000 REMOVING AND INSTALLING OR REPLACING FRONT SPRING STRUT SHOCK ABSORBER (EDC)

Refer to page 37-00/1 for general information about EDC.
1 = Solenoid valves
Switch off ignition.
Disconnect plugs.
Location:
Firewall left/right front outside behind a cover.
Other steps - refer to Group 31.

Remove cover - refer to Group 51.

1 = ABS plug (white)
2 = Not used
3 = Not used
4 = EDC plug





33 52 000 REMOVING AND INSTALLING OR REPLACING REAR SPRING STRUT SHOCK ABSORBER (EDC)

Refer to page 37-00/1 for general information about EDC.
1 = Solenoid valves
Switch off ignition.
Disconnect plugs.
Location:
Protection box on rear axle carrier.
Other steps - refer to Group 33.

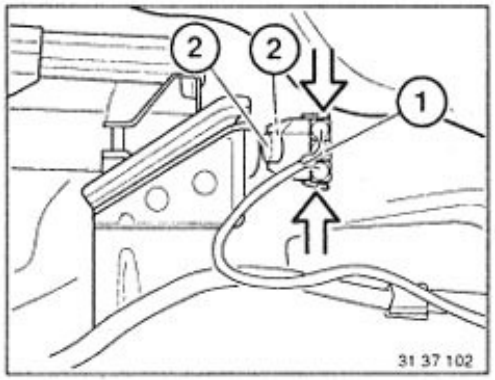
Open protection box.

1 = Brake pad wear indicator
2 = EDC plug
3 = ABS plug

37 14 007 REMOVING AND INSTALLING OR REPLACING AXIAL ACCELERATION SENSOR

Refer to page 37-00/1 for general information about EDC.

Location:
Inside of left rear wheel house, in front of car jack mounting point.

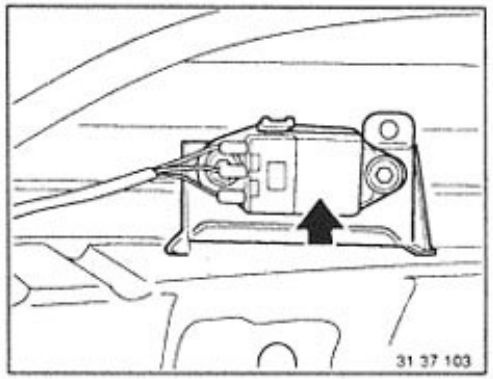


Switch off ignition.
Disconnect plug.
Unscrew screws.

Installation:
Tightening torque = 6.5 Nm.

Pin Connections:
31 = Ground
15 = > 11.8 V
A = Signal

Note:
Remove road speed sensor - refer to Group 62.

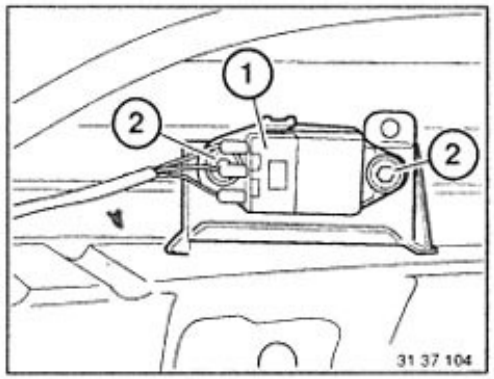


37 14 017 REMOVING AND INSTALLING OR REPLACING FRONT BODY ACCELERATION SENSOR

Refer to page 37-00/1 for general information about EDC.

Location:
In right wheel house.

Remove cover - refer to Group 51.



Switch off ignition.
Disconnect plug (1).
Unscrew screws (2).

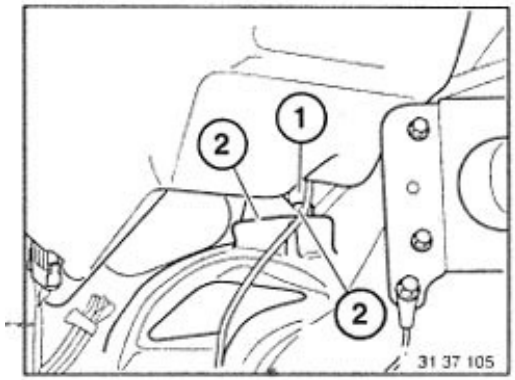
Installation:
Tightening torque = 6.5 Nm.

Pin Connections:
31 = Ground
15 = > 11.8 V
A = Signal

37 14 027 Removing and installing or replacing rear body acceleration sensor

Observe general instructions on EDC.

Installation:
In right-hand inside wheel arch, in front of spring strut shock absorber.
Remove and install cover, see Gr. 51



Switch off ignition.
Unfasten connector (1), disconnect screws (2).

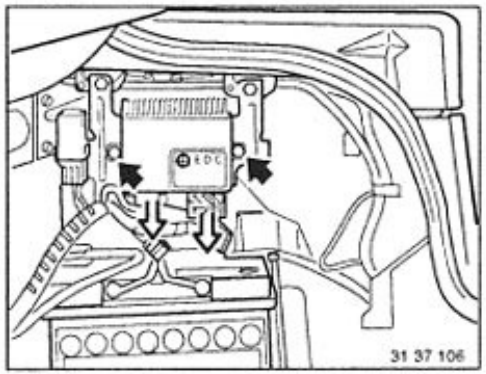
Installation:
Note tightening torque of 6.5 Nm.

Pin allocation:
31 = ground
15 = >11.8 V
A = signal

37 14 050 REMOVING AND INSTALLING OR REPLACING CONTROL UNIT

Refer to page 37-00/1 for general information about EDC.

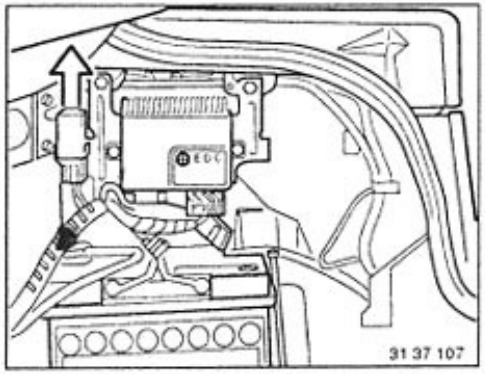
Location:
In trunk at right rear, behind trim panel.



Switch off ignition.
Disconnect plug.
Unscrew nuts.

1 = Power saving relay
2 = EDC III control unit

Note:
Troubleshoot - refer to Car Electric/Electronic Test Plan, Group 37.



Remove power saving relay.