32 Steering and Wheel Alignment

		Instructions	32–00/1
		General information and definitions	32–00/2
32	00 100	Alignment of complete car – check with electronic alignment tester	32–00/4
	600	Front wheel alignment – adjust	32–00/5
	605	Rear wheel alignment – adjust	32–00/5
		Front wheel alignment – troubleshoot	32–00/6
		Rear wheel alignment – troubleshoot	32–00/7
32	13 006	Power steering – fill and bleed	32–13/1
	...	Pressure point – adjust	32–13/2
	060	Power steering gear – remove and install	32–13/3
		Ball-and-nut power steering – design and description	32–13/5
		Power steering – troubleshoot	32–13/7
	631	Radial oil seal for sector shaft and steering worm – replace / intermediate cover – seal	32–13/8
32	21 080	Steering guide arm – remove and install	32–21/1
	091	Steering guide arm fluid mount – replace	32–21/2
	101	Tie rod arm, left or right – replace	32–21/3
	151	Tie rod end, left or right – replace	32–21/4
	281	Tie rod, center – replace	32–21/5

32 Steering and Wheel Alignment

32 21 500	Steering drop arm – remove and install	. . . . .	32–21/6
510	Steering drop arm – adjust	. . . . .	32–21/7
32 31 090	Steering column assembly – remove and install	. . . . .	32–31/1
...	Steering column assembly – disassemble and assemble	. . . . .	32–31/3
800	Electric steering column control unit – replace	. . . . .	32–31/6
32 32 001	Steering lock assembly – replace	. . . . .	32–32/1
050	Steering lock cylinder – remove and install or replace	. . . . .	32–32/3
32 33 000	Steering wheel – remove and install		
	— without airbag (SRS)	. . . . .	32–33/1
	— with airbag (SRS)	. . . . .	32–33/1
	Airbag system (SRS)	. . . . .	32–34/1
32 34 020	Airbag unit – remove and install or replace	. . . . .	32–34/4
510	Airbag contact ring – replace	. . . . .	32–34/5
65 77 010	Airbag diagnosis unit – remove and install or replace	. . . . .	32–34/6
015	Air bag diagnosis unit capacitor – replace	. . . . .	32–34/7
020	Airbag crash sensor – remove and install or replace	. . . . .	32–34/8

32 Steering and Wheel Alignment

32 41 005	Power steering (H-31 System) – check	32–41/1
060	Power steering impeller (tandem) pump – remove and install	32–41/4
	Impeller pump layout	32–41/6
553	Impeller pump – disassemble and assemble (pump removed)	32–41/7
	Tandem pump layout	32–41/9
555	Tandem pump – disassemble and assemble (pump removed)	32–41/10
	Power steering components and pipes – layout	32–41/12
	Power steering oil tank – layout	32–41/13
	Power steering oil tank with ASC + T – layout	32–41/14

GENERAL INFORMATION

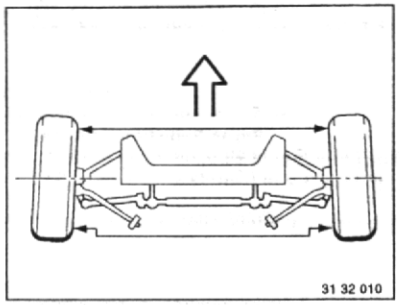
Steering Gear:
Impact-type loads could cause damage in the steering gear when a car is involved in an accident or from accident-similar driving conditions. Conform with factory specifications in the interest of safety
– see Service Information 32 01 88 (828).

Tie Rod Joints:
Evaluate wear of ball joints – see Service Information 32 03 87 (733).

Servotronic:
Troubleshoot electronic components – see Car Electric/Electronic Test Plan.

Airbag (SRS):
Troubleshoot with BMW DIAGNOSING SYSTEM or by putting out the flashing code – see Car Electric/Electronic Test Plan.

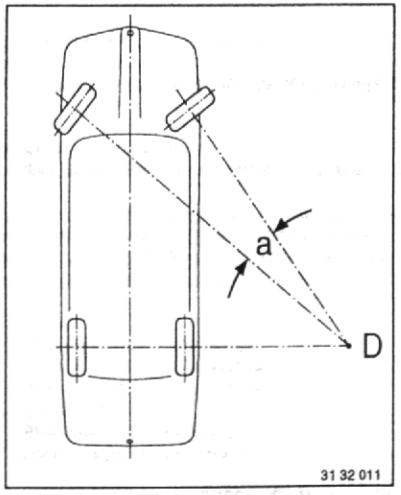
Electric Steering Column Control:
Troubleshoot electronic components – see Car Electric/Electronic Test Plan



GENERAL INFORMATION AND DEFINITIONS

Toe

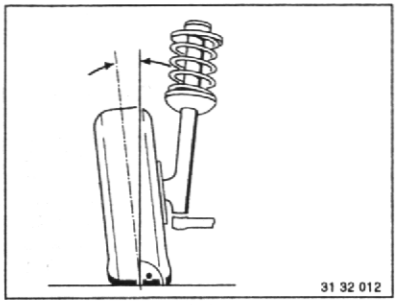
Is the reduction in distance of front of front wheels to rear of front wheels. Toe prevents the wheels from running apart while driving and consequently wheel shimmy and grinding, excessive tire wear, excessive loads on steering linkage and joints as well as hard steering of car. Toe is measured in "straight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



Toe Difference Angle

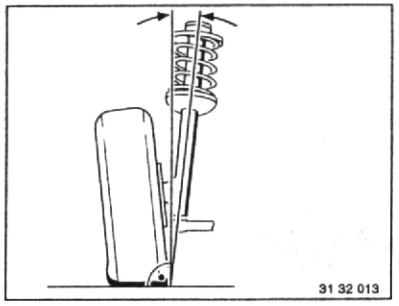
Is the angular position of the wheel on the inside of a curve to the wheel on the outside of a curve when driving in a curve. The steering is designed that the angular position of the wheels changes as steering lock progresses. The toe difference angle provides information on the pertinent operation 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



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.

32 00 100 ADJUSTING ALIGNMENT OF ENTIRE CAR WITH ELECTRONIC WHEEL ALIGNMENT TESTER

Requirements Prior to Checking Wheel Alignment:

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

Only check and adjust wheel alignment with recommended electronic wheel alignment tester – see "Workshop Equipment". Also use rotating plates on the rear wheels.
Check and note actual wheel alignment values.

In case of deviation from nominal values*, a difference must be made as shown below.

1. Only Front Axle Actual Values Deviate:

1.1 Adjust toe to nominal value.
1.2 Car is okay.

2. Only Rear Axle Actual Values Deviate:

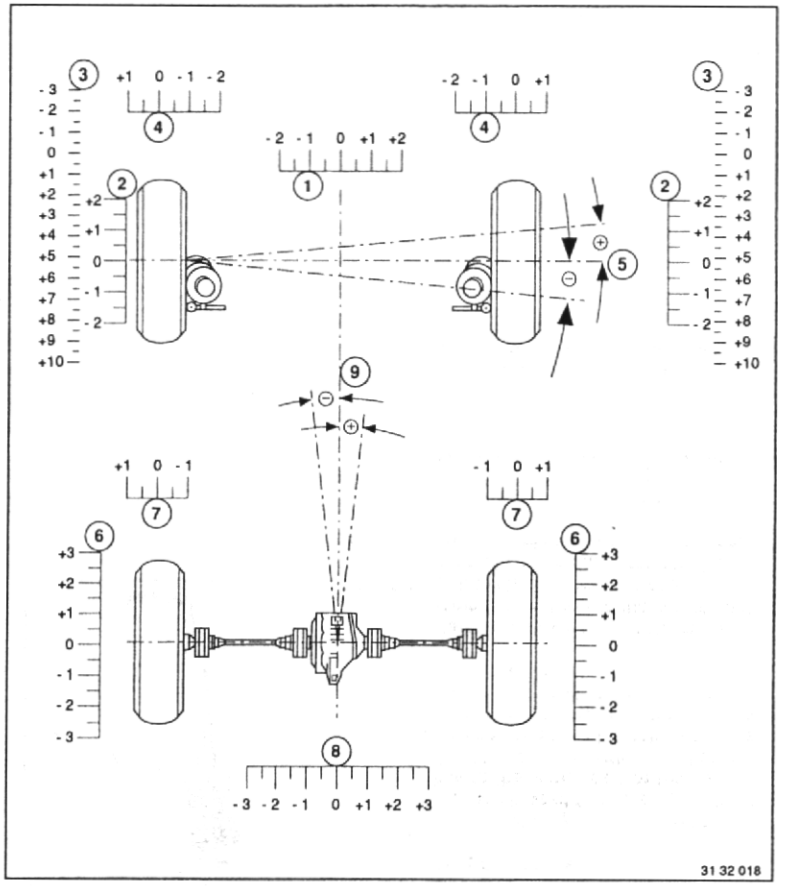
2.1 Adjust front wheels to straight ahead (to symmetrical axis) — hold steering wheel.
2.2 Remove rear angle pickups.
2.3 Transfer angle pickups from left front to right rear and from right front to left rear. Attach connecting string.

Important!
This causes toe values to be shown with a minus sign and exchanging of left and right sides.
2.4 Adjust camber to nominal value.
2.5 Adjust toe to nominal value.
2.6 Car is okay.

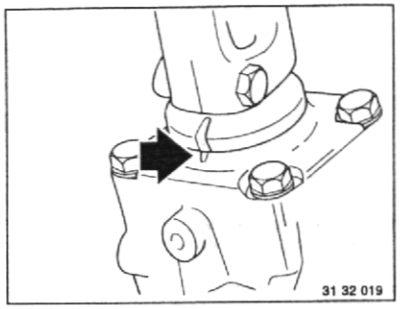
3. Front and Rear Axle Actual Values Deviate:

3.1 Same jobs as described in 2.1 through 2.5.
3.2 Remove angle pickups at rear and install front. Attach connecting string.
3.3 Adjust toe to nominal value.
3.4 Car is okay.

* See Specifications in Groups 31/32/33/36
** See Service Information of Gr. 36

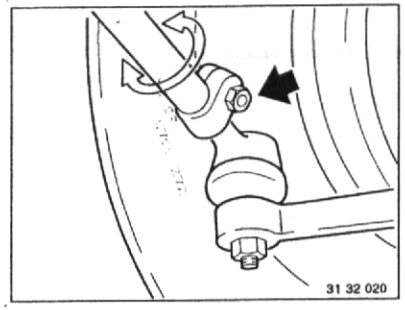


1 Toe
2 Camber
3 Caster (with 10° or 20° wheel lock)
4 Toe difference angle (with 20° wheel lock)
5 Wheel offset
6 Camber
7 Rear wheel position
8 Toe
9 Geometrical axis



32 00 600 ADJUSTING FRONT AXLE

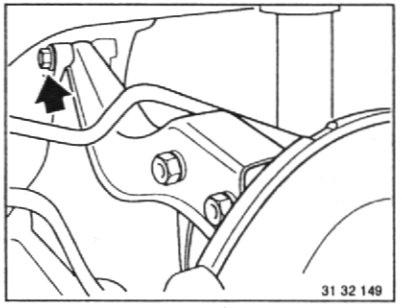
Adjust toe and toe difference angle. Bring steering gear to straight ahead position (marks on case and steering shaft).



Loosen both tie rod mounting bolts. Adjust toe of left and right wheels to the nominal value by turning the threaded sleeve.

Installation:
Make sure that ball joints are not turned.
Tightening torque*.

* See Specifications

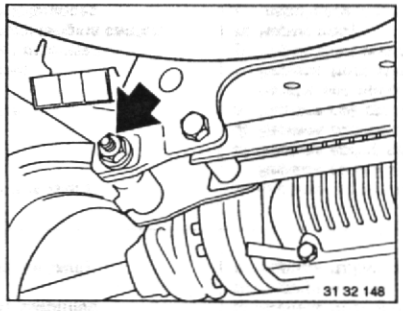


32 00 605 ADJUSTING REAR AXLE

Wheels must be on rotating plates to make adjustments.

Adjusting Camber:
Loosen control arm mounting nut.
Adjust camber to the nominal value* by turning the eccentric bolt.

Installation:
Tightening torque*.



Adjusting Toe:
Loosen inside support arm mounting nut.
Adjust toe of left or right wheel to the nominal value* by turning the eccentric bolt.

Installation:
Tightening torque*.

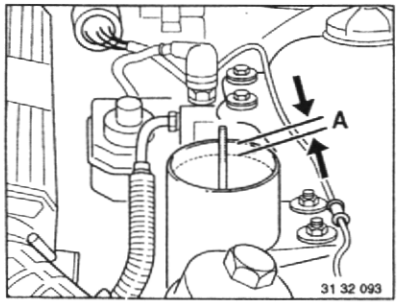
* See Specifications

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 deformed d) Tie rod ball joints worn e) Rubber mount in control arm faulty	a) Height, see Specifications of Group 31 b) Replace tie rod(s) c) Replace track arm d) Replace tie rods 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) Suspension sag excessive f) Front axle carrier deformed g) Spring strut mount holder deformed h) Distortion in floor assembly (engine carrier) i) Summary of unfavorable tolerances	a) Replace rubber mount b) Replace control arm c) Replace spring strut d) Replace control arm e) Replace coil springs Height, see Specifications of Group 31 f) Replace front axle carrier g) Repair front end of body h) Repair body i) Install eccentric mounts
3 Caster deviation Caster is given by design and cannot be adjusted.	a) Rubber mounts 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 mounts b) Replace thrust strut c) Replace control arm d) Replace spring strut e) Repair front end of car 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 to same value on left and right sides b) Replace track arm
5 Wheel offset deviation (alignment tester Type F 1600)	Assuming front wheels have equal single toe to the 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/suspension sag excessive 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) 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 or replace rubber mounts in rear axle carrier b) Repair body
8 Toe deviation	a) Car not in normal position/suspension sag excessive b) Rubber mounts in rear axle carrier faulty c) Support arm deformed d) Silent blocks in trailing arm faulty e) Rear axle carrier deformed f) Trailing arm deformed	a) Height, see Specifications of Group 33 b) Replace rubber mounts c) Replace support arm d) Replace silent blocks e) Check or replace rear axle carrier f) Check or replace trailing arm
9 Geometrical axis deviation (alignment tester Type F 1600)	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 (1") 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 2 times each against left and right locks, operate brake pedal 5 times, wait about 30 seconds and operate brake pedal five more times.

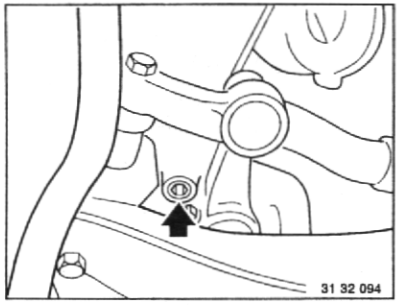
3. **Checking Oil Level with Engine Stopped:**

   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).

   Oil level must be about 10 mm (3/8") below upper edge of tank.

   Correct deviation in oil level with the engine stopped.

* See Specifications



32 13 ... ADJUSTING PRESSURE POINT

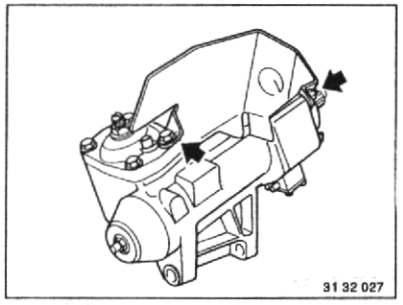
Important!
The pressure point of steering gears with automatic pressure point adjustment – recognized on punch-locked socket head bolt – should only be adjusted after a repair – see 32 13 631.

32 13 060 REMOVING AND INSTALLING POWER STEERING GEAR

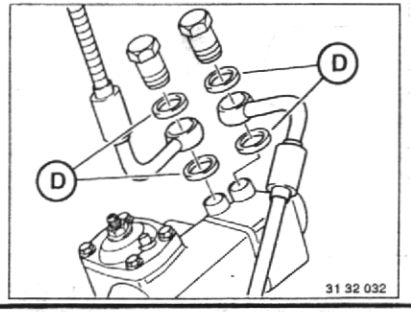
Cars with Airbag (SRS):
Remove steering wheel – see 32 33 000.

Discharge the pressure reservoir by operating the brake pedal about 10 times.
Draw off hydraulic fluid in supply tank – never reuse it.

Installation:
Fill and bleed hydraulic system – see 32 16 006.



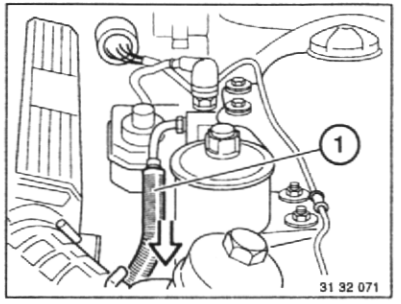
Unscrew heat shield on steering gear.



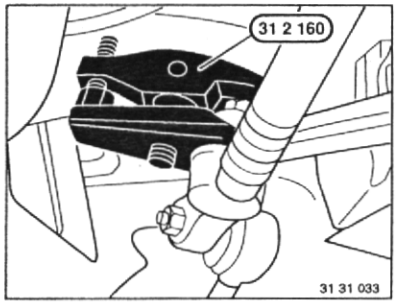
Unscrew hydraulic fluid pipes.
Plug open bores with dust caps.

Installation:
Replace seals (D).
Tightening torque*.

* See Specifications

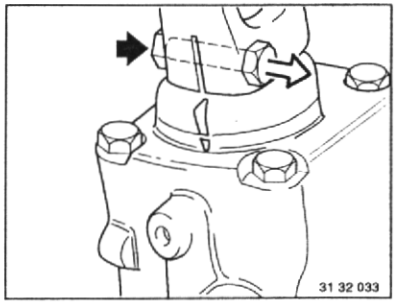


Installation:
Push heat shield (1) downward.



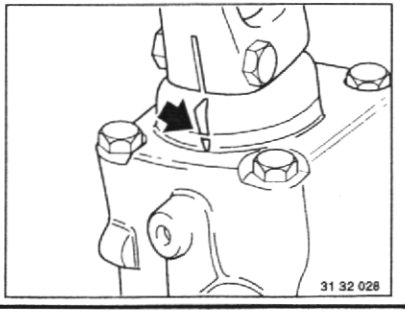
Unscrew nut.
Press tie rod off of the steering drop arm with Special Tool 31 2 160.

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



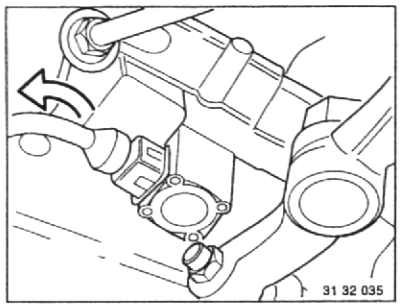
Unscrew bolt.
Slide universal joint off of steering gear.

Bolt must be in locking groove of the steering stub.
Tightening torque*.

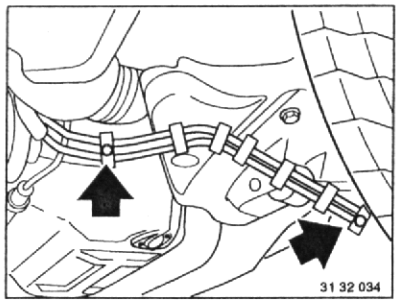


Installation:
Check that steering wheel and steering gear are in straight ahead position.
Turn the steering gear against lock on left or right side and then turn it back by about 1.7 turns until the marks are aligned.

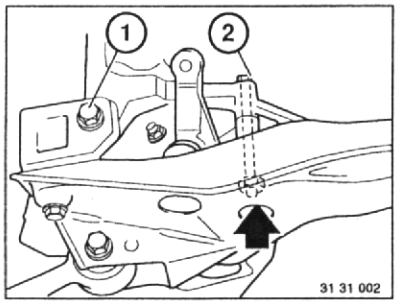
* See Specifications



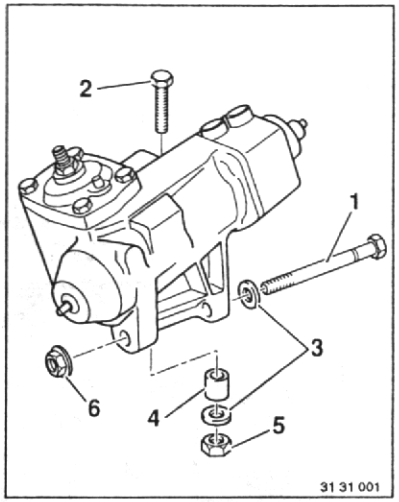
If applicable, pull plug off of the Servotronic converter.



Loosen mounting clamps of oil cooler pipes.

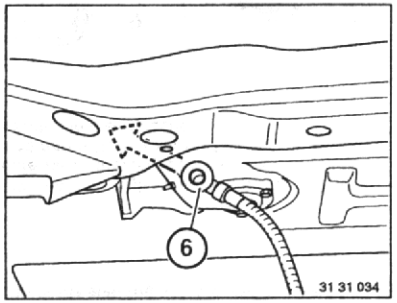


Unscrew bolts (1 and 2).
Pull back the disconnected tie rod – turn the left front wheel against lock if necessary.
Take out the steering gear downward – if necessary, move the steering drop arm into a more favorable position by turning the steering stub.



Installation:
1 Bolt
2 Bolt
3 Washer
4 Sleeve
5 Nut
6 Nut with washer (replace)

Tightening torque*.



Installation:
Install nut (6) with a flexible magnetic holder.

* See Specifications

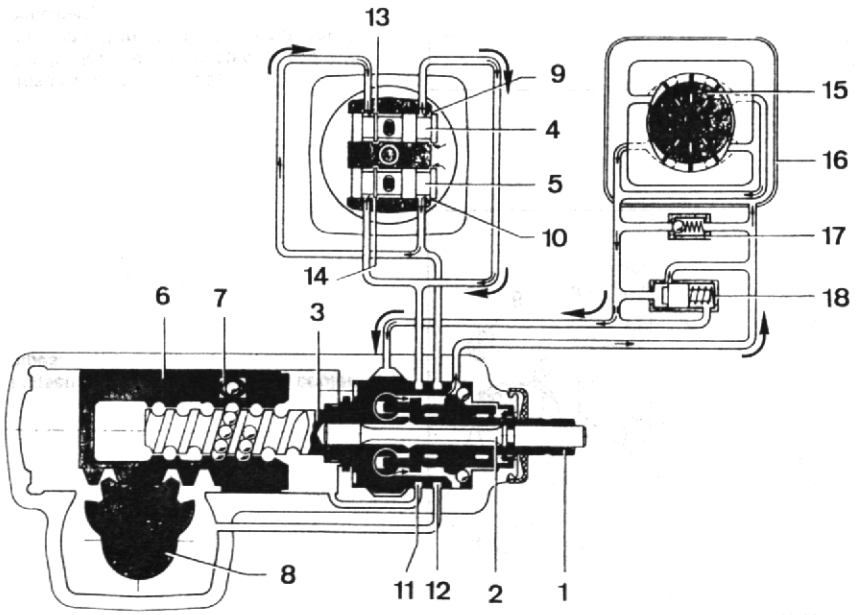
DESIGN AND FUNCTION OF BALL AND NUT POWER STEERING

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 valve pistons (4 and 5) are moved out of neutral position. This happens 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:

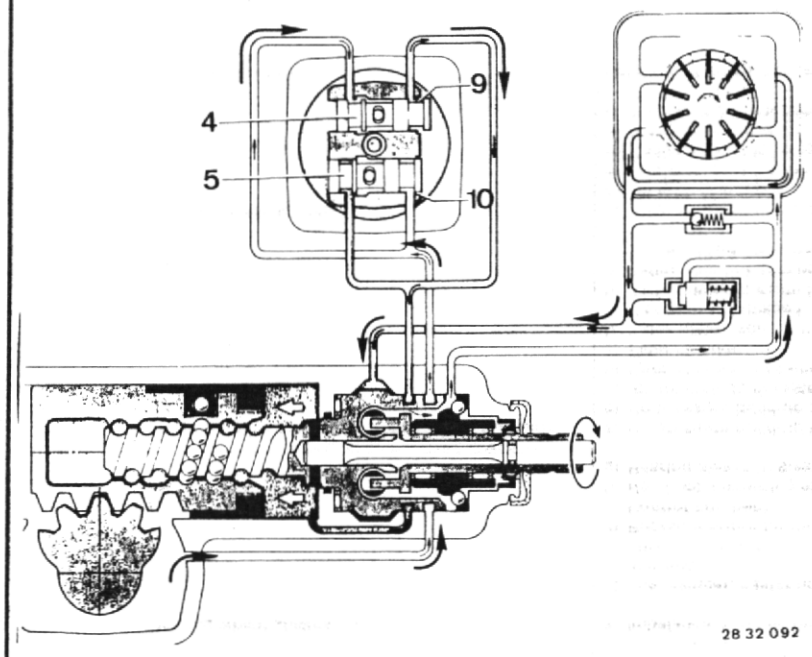
Oil flows from the impeller pump into the worm head, through feed grooves (9 and 10) to radial grooves (11 and 12). From here via connecting bores to the right and left cylinder chambers and via opened return flow grooves (13 and 14) back to the oil tank. The valve is also illustrated in cross section.



15 = Pump
16 = Oil tank
17 = Safety valve
18 = Control valve

Steering Wheel Turned Clockwise:

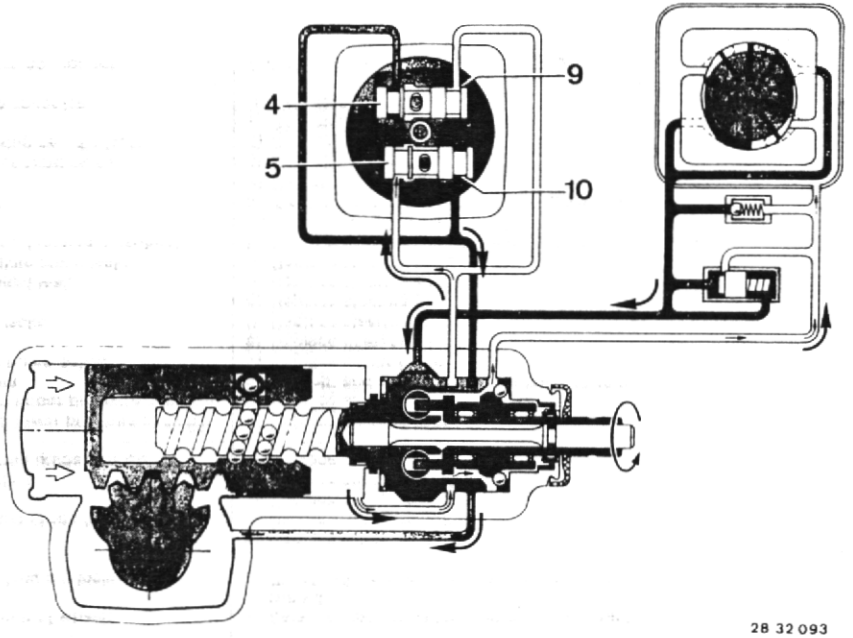
Valve piston (4) is displaced to the right and feed groove (9) opened. Valve piston (5) is displaced to the left and feed groove (10) closed. This lets the oil flow into the right cylinder chamber. Oil in the left cylinder chamber is forced out and flows back into the oil tank.



28 32 092

Steering Wheel Turned Anticlockwise:

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.



28 32 093

TROUBLESHOOTING POWER STEERING

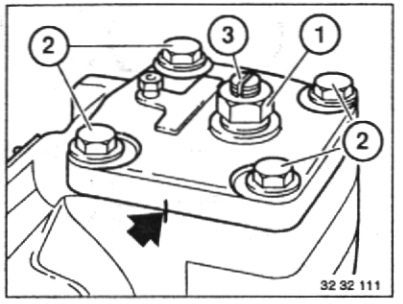
Condition	Cause	Correction
Steering runs onesidedly to final position on its own	Valve setting for hydraulic center incorrect	Replace steering gear – adjusting only possible by the manufacturers
Steering wheel has excessive play	a) Steering gear loose on front axle carrier b) Universal joints have excessive 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* and bleed power steering – 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 mounts for thrust struts faulty e) Control arm bent f) No shock absorbing effect g) Bearing sleeve in steering guide arm faulty	a) Balance wheels; replace rim or tire with radial runout b) Check/adjust front wheel alignment optically c) Replace thrust strut d) Replace rubber mounts e) Replace control arm f) Replace shock absorbers g) Replace bearing sleeve
Steering difficult to move against left or right lock	a) No pressure build-up in lower pressure chamber b) No pressure build-up in upper pressure 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* and bleed power steering – 32 13 006 d) Replace power pump e) Replace filter, clean lines 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 faulty 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

* See Specifications

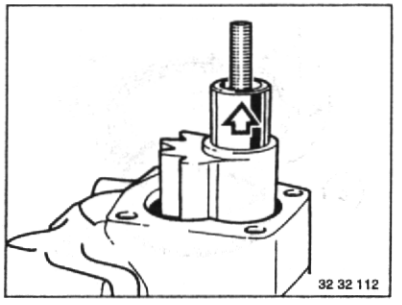
32 13 631 REPLACING RADIAL OIL SEAL FOR SECTOR SHAFT AND STEERING WORM AND SEALING INTERMEDIATE COVER – Power Steering Gear Removed –

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

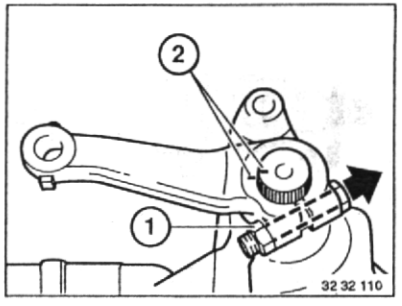
Drain hydraulic fluid in steering gear.



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

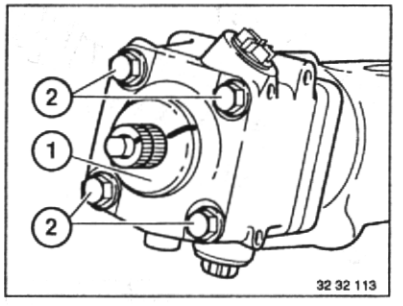


Pull sector shaft out of case.

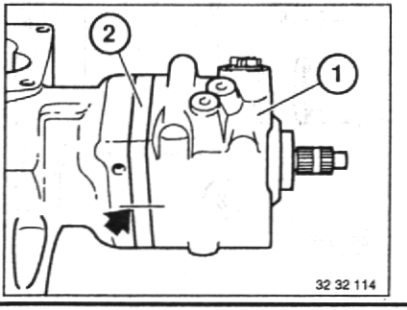


Mark position of sliding steering drop arm to sector shaft before unscrewing bolt (1) – if applicable, adjust steering drop arm – see 32 21 510.

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

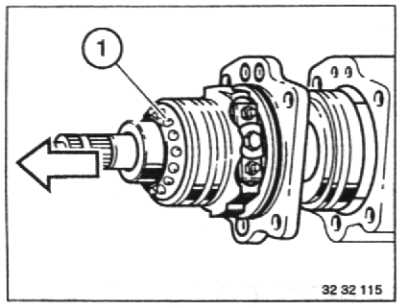


Pull off cap (1).
Unscrew bolts (2).

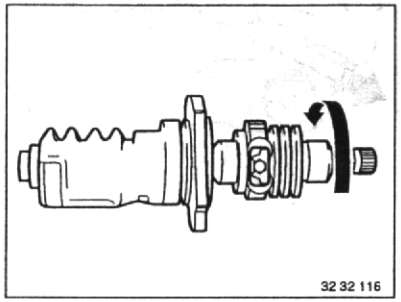


Mark position of valve housing (1) and intermediate cover (2) to case, and remove.

* See Specifications

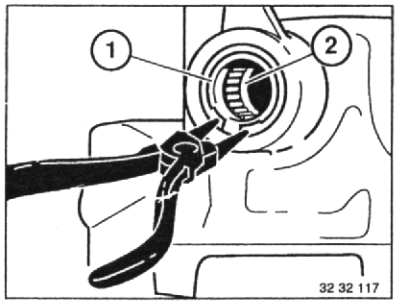


Take off ball bearing (1).
Pull out worm and piston.

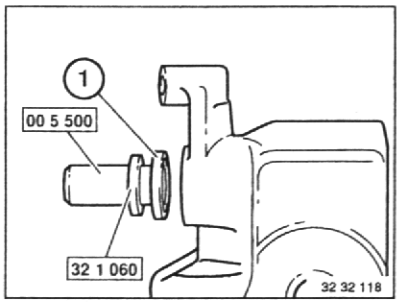


Unscrew worm clockwise.

Important!
23 loose balls.

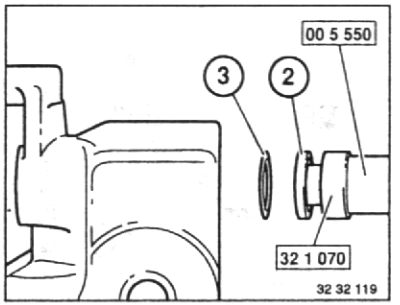


Lift out circlip.
Press out outer radial oil seal (1) and inner radial oil seal (2).

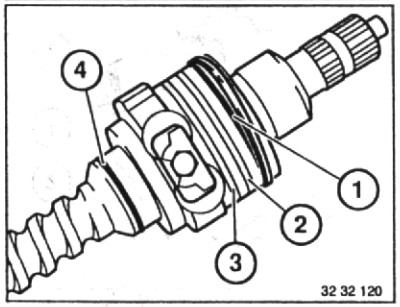


Lubricate sealing lips of radial oil seals with grease.
Drive in outer radial oil seal (1) that sealing lip faces inside of case with Special Tools 00 5 500 and 32 1 060.

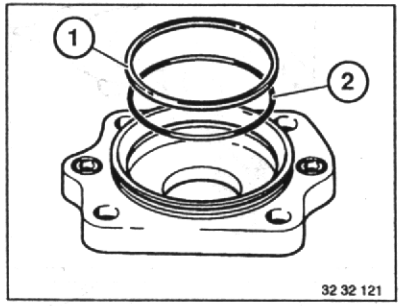
Important!
Install circlip.



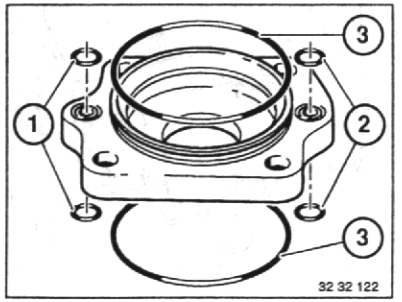
Insert support ring (3).
Drive in radial oil seal (2) that sealing lip faces inside of case with Special Tools 00 5 550 and 32 1 070.



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

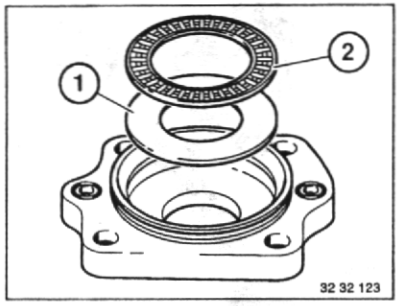


Replace seal (1) and O-ring (2) located underneath.
Coat seal with hydraulic fluid*.

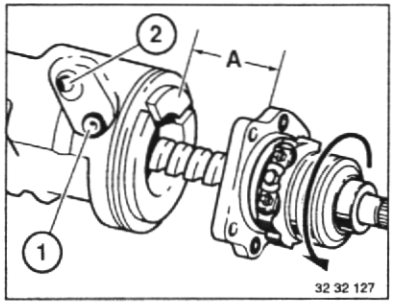


Replace O-rings (1 ... 3) on both sides.
Install O-rings (1 and 2) with grease.

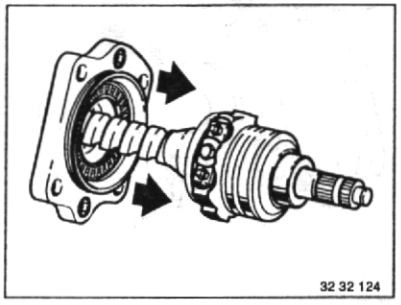
* See Operating Fluids



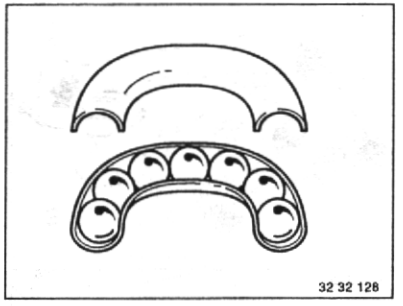
Place bearing ring (1) and axial bearing (2) in intermediate cover (with a small amount of grease).



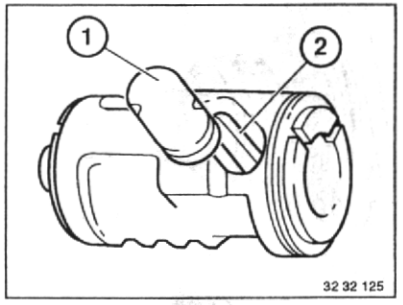
Slide worm head into piston.
A = about 6 cm (2.362").
Slide 16 balls into threads of worm through hole (1) and turn the worm until the balls are forwarded to hole (2).



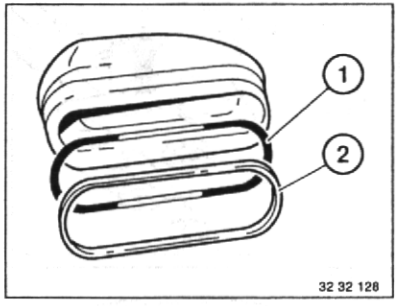
Mount intermediate cover on the worm head (do not damage seal of worm).



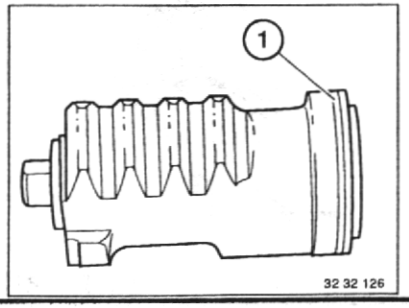
Install 7 balls in half of circulating pipe (grease both outer balls) and install circulating pipe in piston.



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

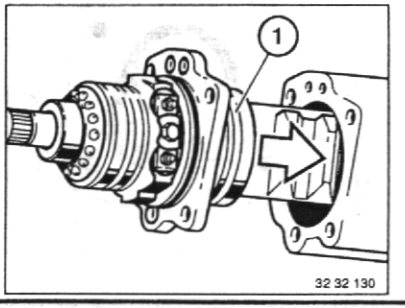


Place O-ring (1) and seal (2) in cap.
Press cap into piston.

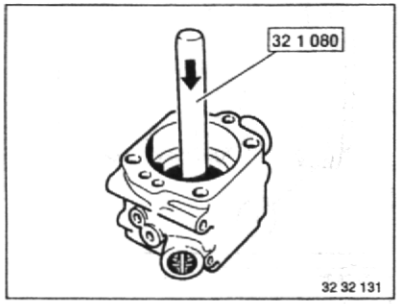


Replace seal (1) and O-ring located underneath.
Coat seal with hydraulic fluid*.

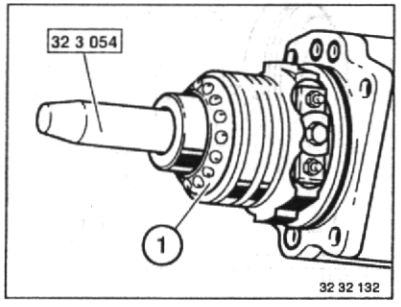
* See Operating Fluids



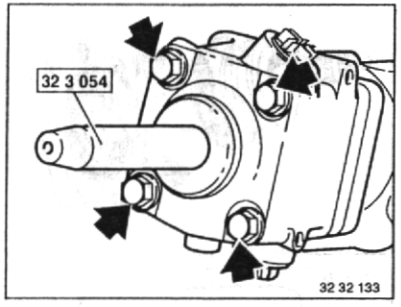
Slide piston into steering case, being careful not to damge seal (1).



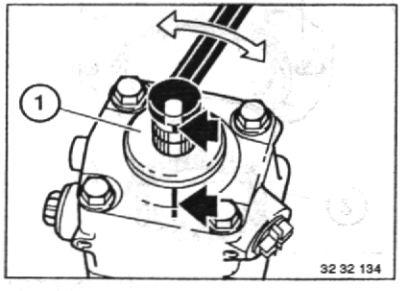
Replace radial oil seal (sealing lip greased) in valve housing with Special Tool 32 1 080.
Sealing lip faces inside of case.



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

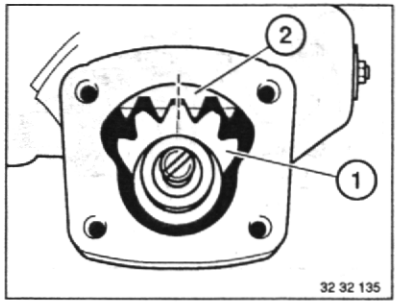


Slide valve housing over seals of worm head carefully and tighten bolts.
Tightening torque*.
S = washer
Remove Special Tool 32 3 054.

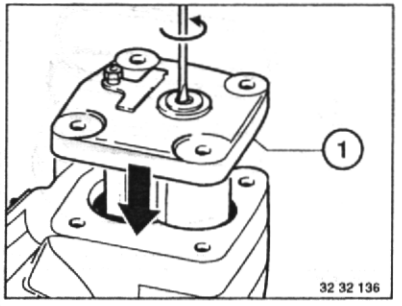


Turn steering to a final position.
Turn back about 2 turns until marks on spindle and case are aligned = straight ahead position.
Press grease-filled cap (1) on spindle.
Marks on spindle, cap and case must be aligned.

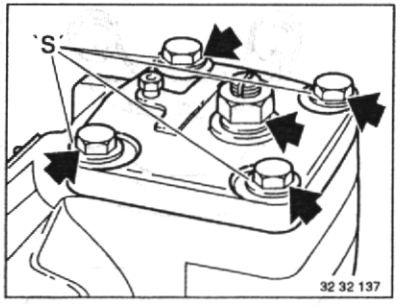
* See Specifications



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).

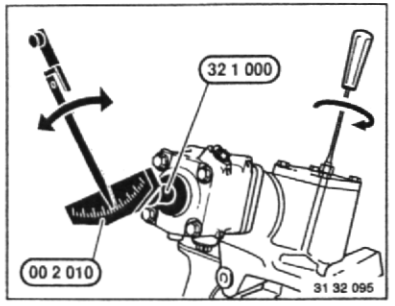


Replace O-ring (1) in cover.
Position cover by turning the adjusting screw on the case counterclockwise.



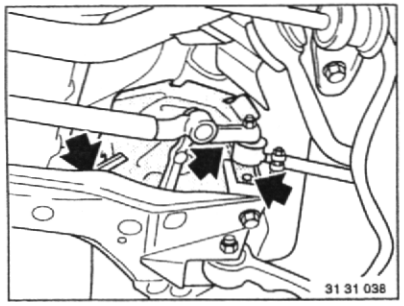
Tighten cover bolts.
Tightening torque*.
S = washer
Tighten lock nut – sealing surface facing cover – finger tight.

* See Specifications



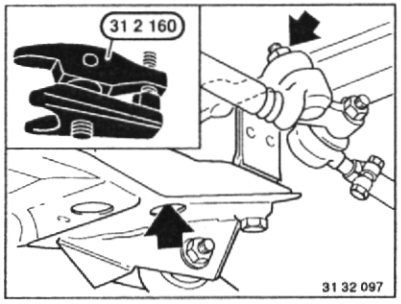
Adjusting Pressure Point:
Mount Special Tool 32 1 000 on the spindle and apply friction torque tester 00 2 010.
Measure friction torque about 1/2 turn before reaching final lock.
Move steering gear to straight ahead position.
Turn adjusting screw until a friction torque 0.4 to 0.6 Nm (0.3 to 0.4 ft. 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.

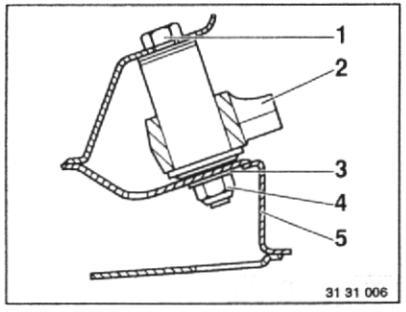


32 21 080 REMOVING AND INSTALLING STEERING GUIDE ARM

Unscrew heat shield.



Unscrew nut and press off ball joint with Special Tool 31 3 160.
Unscrew steering guide arm.

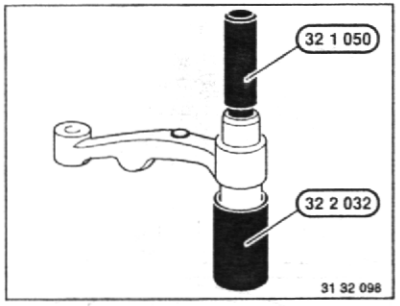


Installation:
Replace self-locking nuts.
Tightening torque*.

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

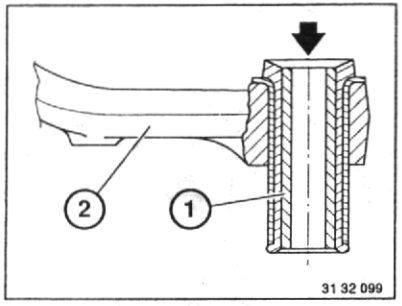
Important!
If the steering guide arm is replaced, adjust the steering drop arm – see 32 21 510.

* See Specifications

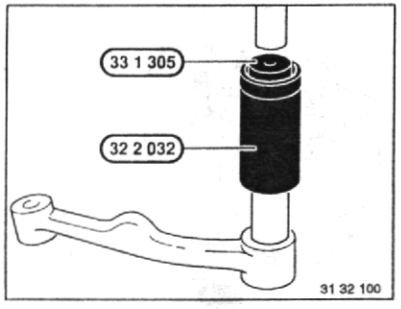


31 21 091 REPLACING DAMPER FOR STEERING GUIDE ARM

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

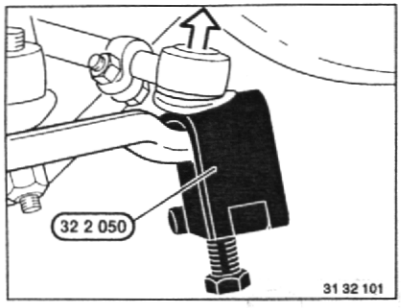


Note pressing-in direction.
1 = Damper
2 = Steering guide arm.



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

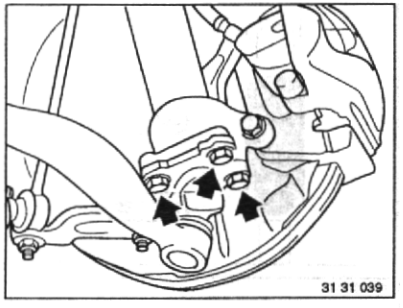
Important!
Adjust steering drop arm after installation – see 32 21 510.



32 21 101 REPLACING LEFT OR RIGHT TIE ROD ARM

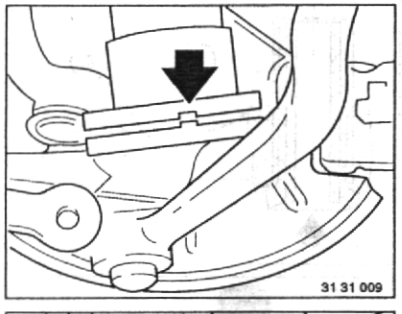
Remove front wheel – see Group 36.
Unscrew nut.
Press ball joint off of tie rod arm with Special Tool 32 2 050.

Installation:
Replace self-locking nut.
Tightening torque*.
Check alignment – see 32 00 100.

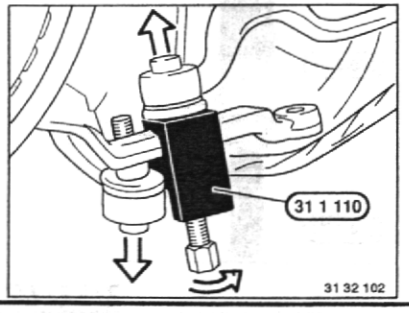


Unscrew bolts.

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



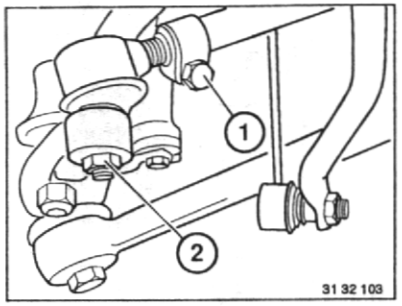
Check for correct installed position.



Unscrew nut on control arm and thrust strut.
Press off ball joints with Special Tool 31 1 110.

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

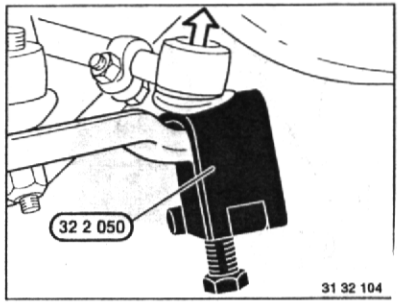
* See Specifications
** Source of Supply: HWB



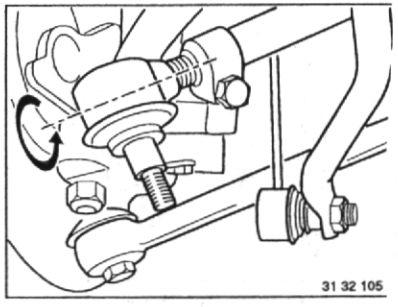
32 21 151 REPLACING LEFT OR RIGHT TIE ROD END

Remove front wheel – see Group 36.
Loosen bolt (1).
Unscrew nut (2).

Installation:
Replace self-locking nut.
Tightening torque*.
Check alignment – see 32 00 100.

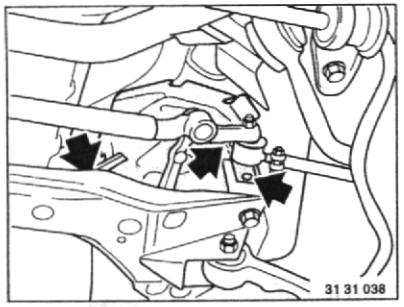


Press off ball joint with Special Tool 32 2 050.



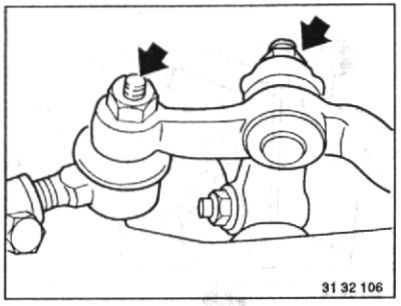
Unscrew tie rod end.

* See Specifications



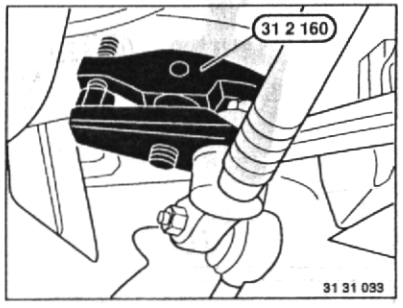
32 21 281 REPLACING CENTER TIE ROD

Unscrew heat shield on right side.

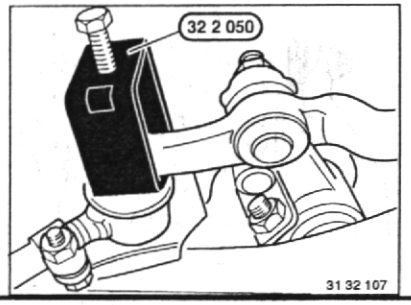


Unscrew nuts on left and right sides.

Installation:
Replace self-locking nuts.
Tightening torque*
Adjust steering drop arm – see 32 21 510.
Check alignment – see 32 00 100.

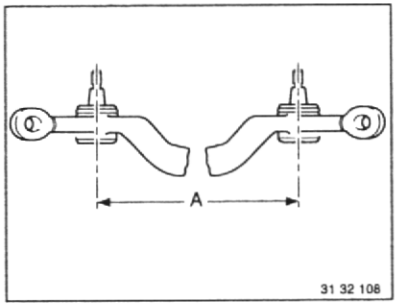


Press center tie rod off of steering drop and steering guide arms with Special Tool 31 2 160.



Press off side tie rods with Special Tool 32 2 050.

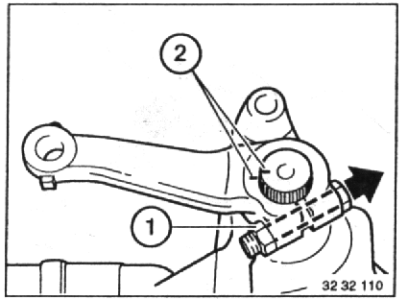
* See Specifications



Control distance A = 534 ± 1 mm (21.023 ± 0.039").

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.

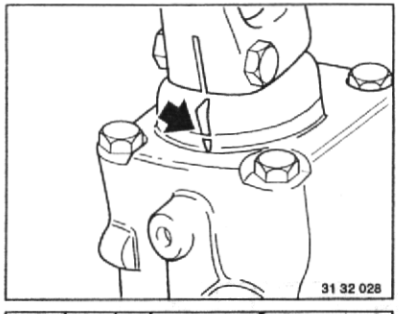


Installation:
Slide on steering drop arm up to the mark, whereby marks (2) must also be aligned.
Replace self-locking nut.
Tightening torque*.

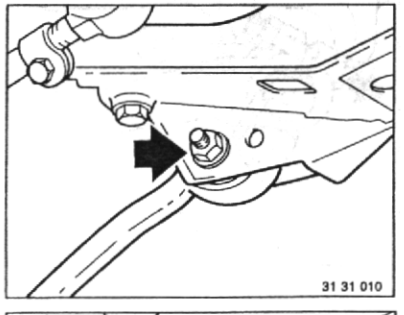
* See Specifications

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.

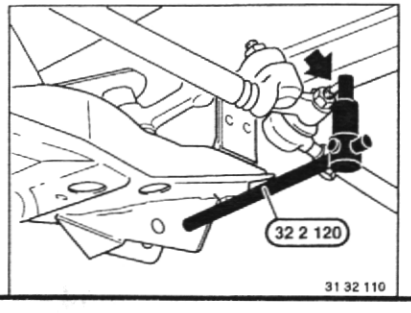


Set steering gear to straight ahead position (marks on spindle and case aligned).



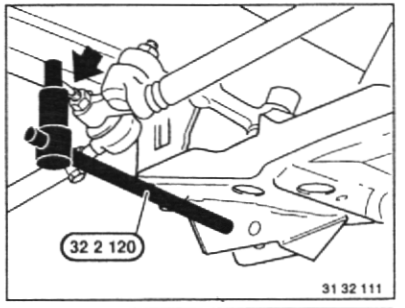
Unscrew left and right control arms on front axle carrier.

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

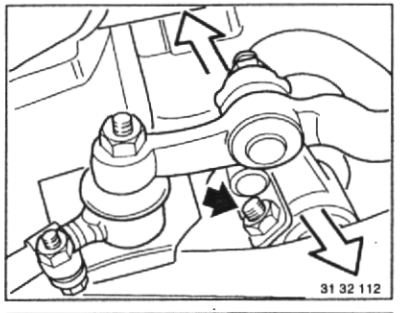


Mount Special Tool 32 2 120 on the side of the steering guide arm on the control arm mount.
Align the master mandrel with the centering bore in the pivot pin and clamp.

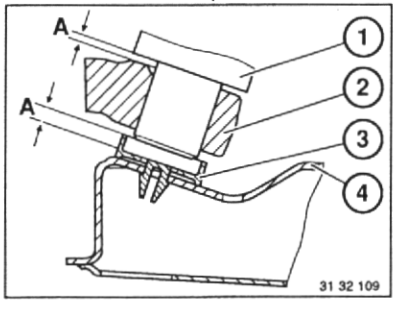
* See Specifications



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 = æ 3 mm (0.118").
Tighten nut with correct tightening torque*.
Recheck adjustment, if necessary.



Important!
Turn steering gear from stop to stop – steering drop arm must move easily – distance A = 0.5 mm (0.020").

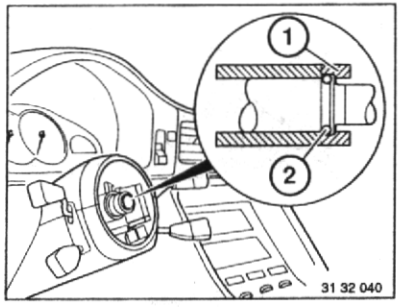
1 Steering gear
2 Steering drop arm
3 Spacer
4 Front axle carrier

* See Specifications

32 31 090 REMOVING AND INSTALLING STEERING COLUMN ASSY.

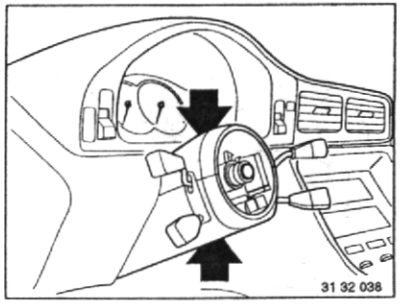
Disconnect battery ground lead.
Remove steering wheel – see 32 33 000.
Remove bottom dashboard trim panel – see Group 51.

Important!
Carry out steering angle offset test after installation – see Car Electric / Electronic Test Plan in Group 37.

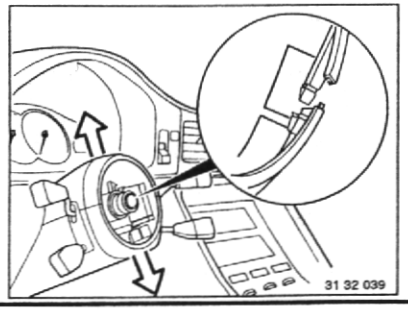


Take off collar (1).

Installation:
Check position of collar (1) to circlip (2).

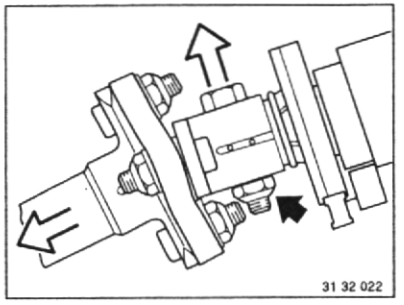


Unscrew bolts.



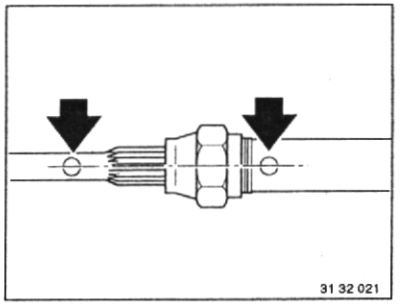
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of lock.

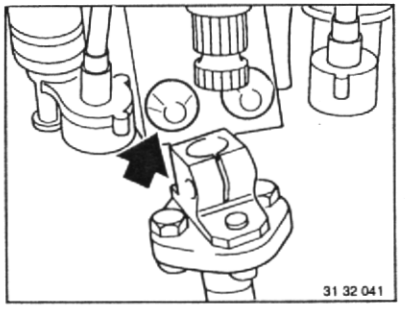


Remove bolt.
Press down on steering spindle.

Installation:
Bolt must be located in locking groove of the steering spindle.
Replace self-locking nut.
Tightening torque*.

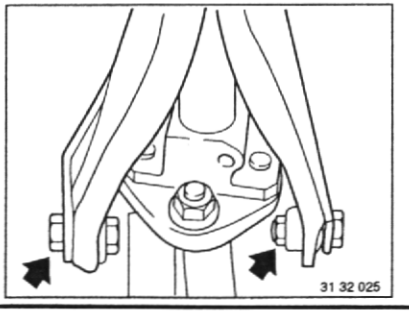


Note:
Mark alignment of splines with a dot of paint.
Screw on the adjusting nut far enough, that the sliding force is 40 ± 25 N (9 ± 5.5 lbs.).



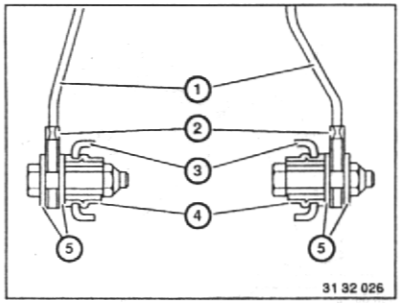
Remove shear-off bolt with a chisel or grind off the bolt head.

Installation:
Use spacer.
Tighten shear-off bolts until they shear off.

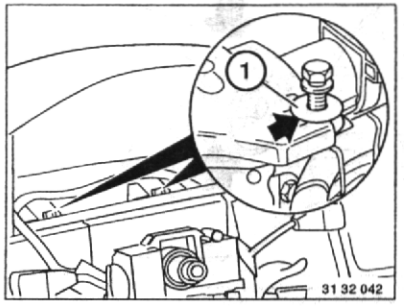


Mechanical Adjustment:
Loosen bolts.

* See Specifications

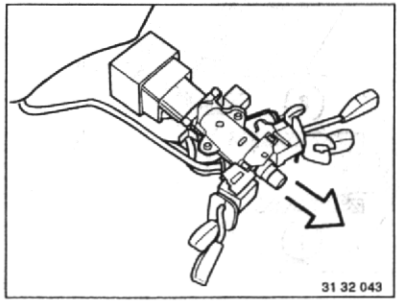


Installation:
1 Lever (left, right)
2 Sliding cover
3 Steering column slide
4 Rubber mount
5 Washer
Replace self-locking nuts.
Tightening torque*.



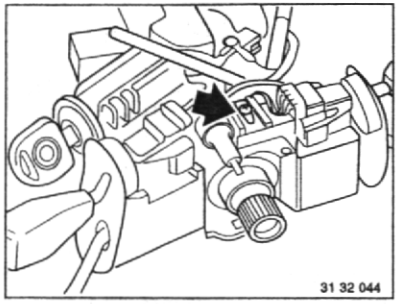
Remove instrument cluster – see Group 62.
Loosen bolts.

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



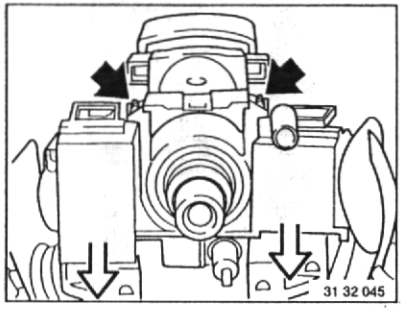
Pull off plugs on potentiometers.
Disconnect all wires leading to the steering column on the plugs.
Press down and remove steering column.

* See Specifications

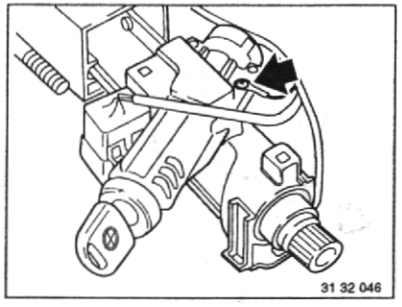


32 31 ... DISASSEMBLING AND ASSEMBLING STEERING COLUMN ASSEMBLY

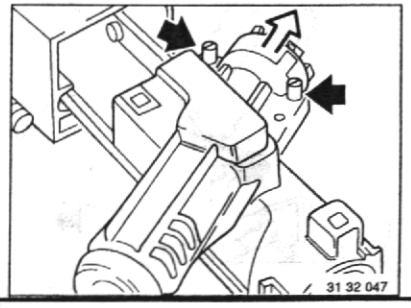
Remove steering column assembly – see 32 31 090.
Unscrew bolt.



Compress retainers and pull off switch.

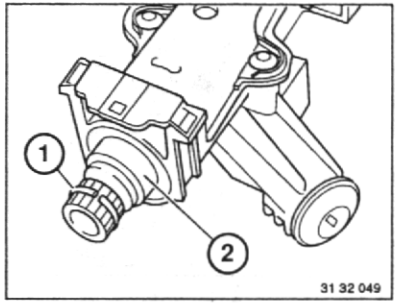


Disconnect ground lead.
Turn and remove relay socket.

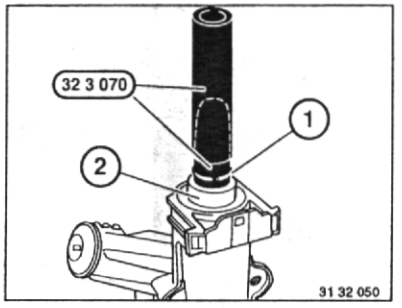


Unscrew both setscrews.

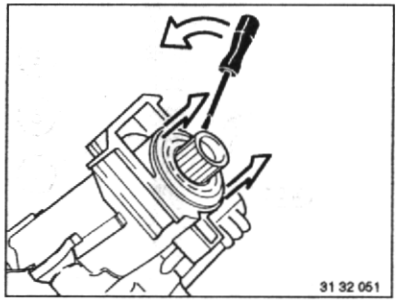
Installation:
Lock setscrews with paint.



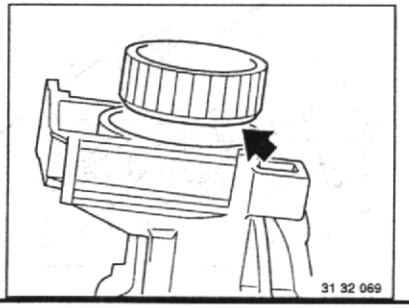
Lift out circlip (1) and remove with sleeve (2).



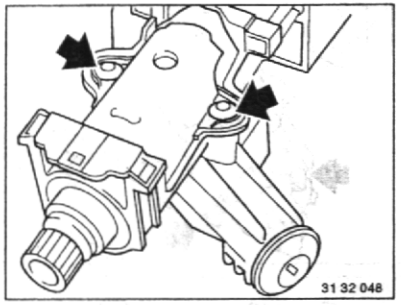
Installation:
Install sleeve (2) and mount circlip (1) with Special Tool 32 3 070 (hammer knocks).
Counterhold on steering spindle.



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

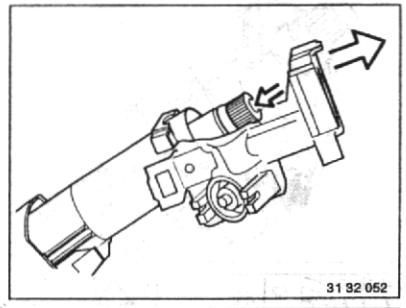


Installation:
Insert bearing inner sleeve with the bevelled side facing the steering lock.

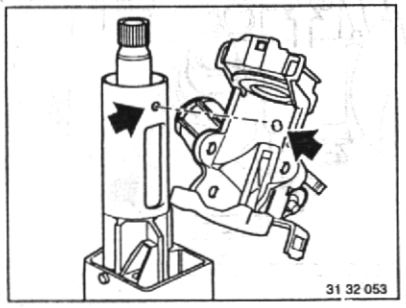


Remove shear-off bolts.

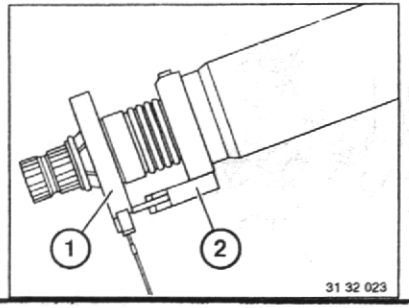
Installation:
Tighten Torx bolts until they shear off.



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

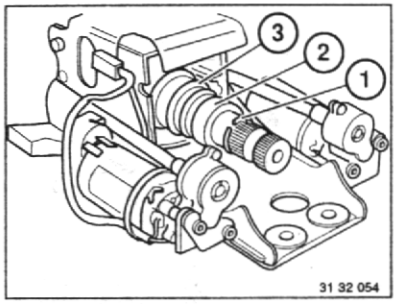


Installation:
Dowel pin must be in the bore.

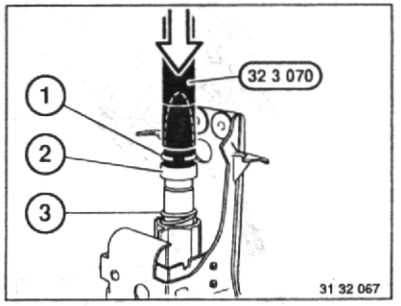


Pull steering angle sensor (1) off of the steering spindle.

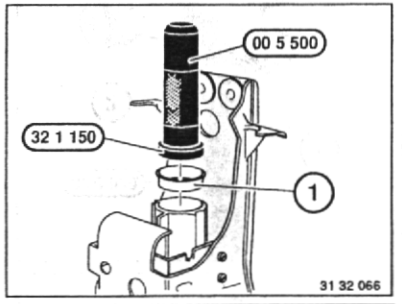
Installation:
Pin of steering angle sensor (1) must fit in turning lock (2).



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



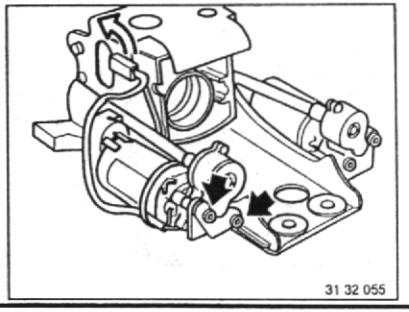
Installation:
Mount spring (3) and collar (2).
Recess in the collar must face the circlip.
Install circlip (1) with Special Tool 32 3 070.



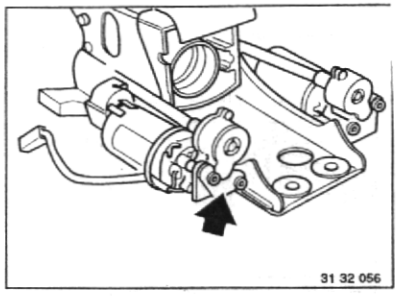
Knock lower steering spindle bearing out of the outer sleeve.

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

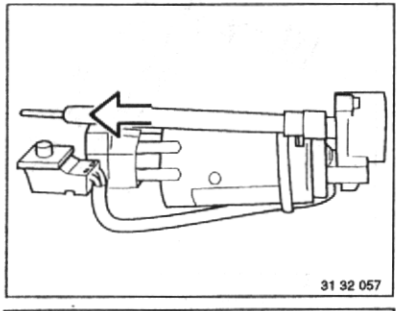
Important!
Press contact ring – for horn ground – into the bearing again.



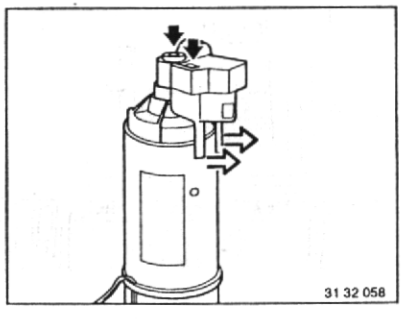
Unscrew screws.
Turn plug out of the holder.
Take off gearbox motor.



Installation:
Use washer.

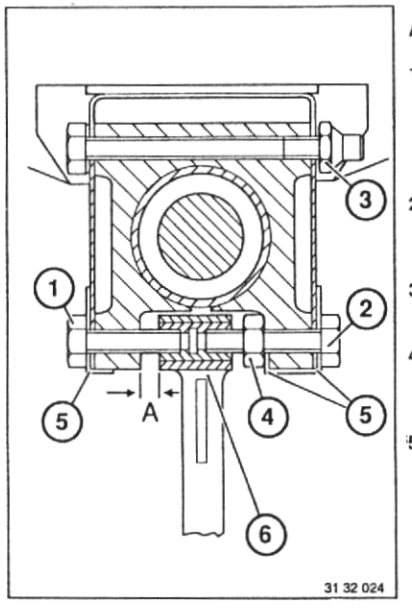


Pull off shaft.



Unscrew screws, press hooks out and take off potentiometer.

Mechanical Steering Column Control:
Bend open lockplates (5).
Unscrew bolts (1 ... 3).
Bolt (1) = left-hand threads.

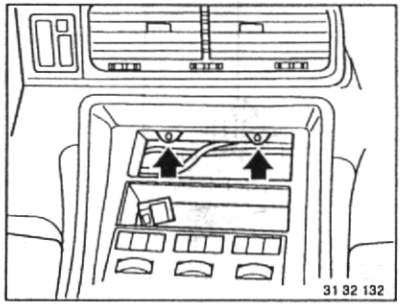


Assembling Procedures (Note Order):

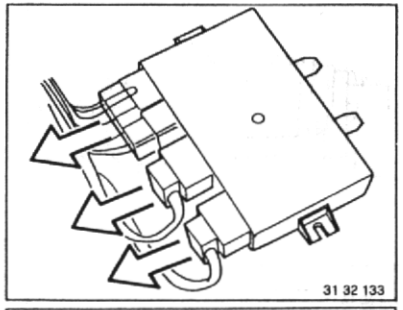
1. **Screw in left M 8 x 32 bolt (1) with lockplate (5) – tightening torque = 7 Nm (5 ft. lbs.).**
   Distance A between lever and clamp = 6 ± 1 mm (0.236 ± 0.039").
2. **Screw in M 8 x 40 bolt (2) with lockplate (5) and nut (4) – tightening torque = 8 Nm (6 ft. lbs.).**
3. **Tighten nut (4) – tightening torque = 7 Nm (5 ft. lbs.).**
4. **Tighten hexagon nut (3) with lever (6) in "CLOSED" position – tightening torque = 12 Nm (8.7 ft. lbs.).**
5. **Bend lockplate (5).**

32 31 800 REPLACING CONTROL UNIT FOR ELECTRIC STEERING COLUMN CONTROL

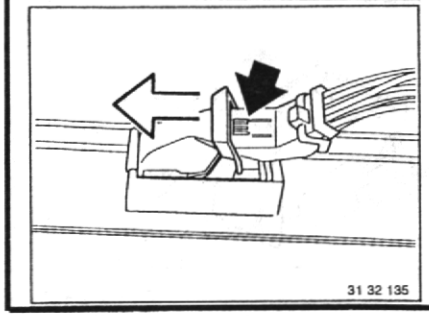
Remove multi-information display – see Group 65.



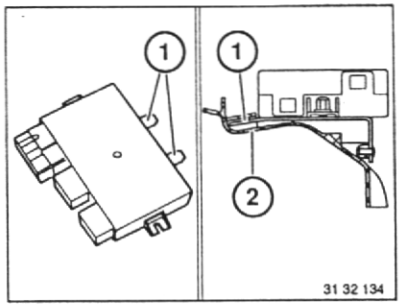
Unscrew screws.



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



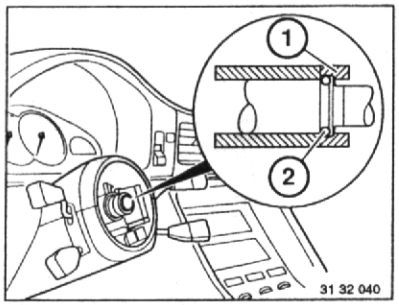
Important!
Press down on retainer and lift lever.



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

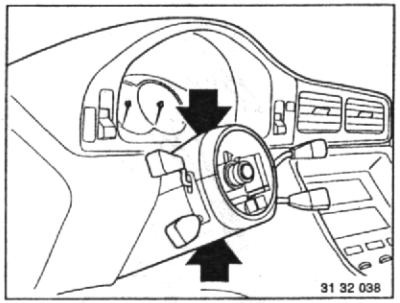
32 32 001 REPLACING COMPLETE STEERING LOCK

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.

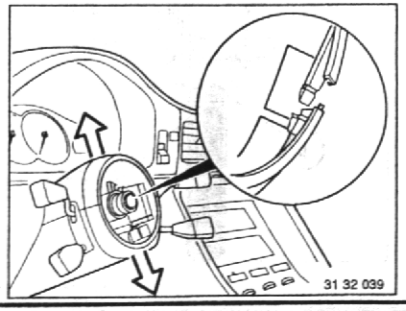


Take off collar (1).

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

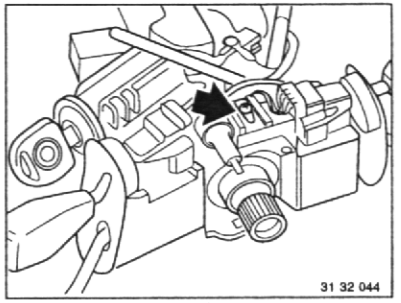


Unscrew screws.



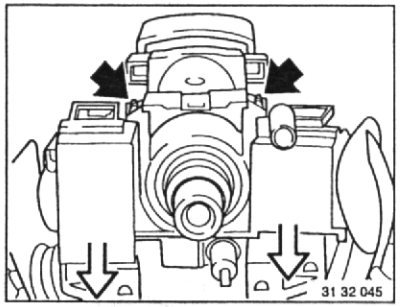
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of the lock.

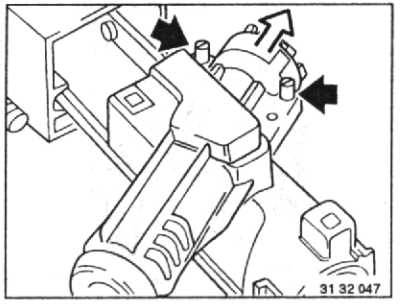


Remaining procedures are shown on a removed steering column for better understanding.

Unscrew screw.

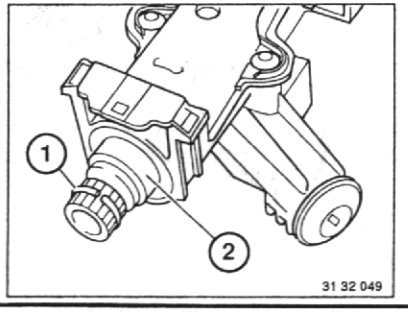


Compress retainers and pull off switch.

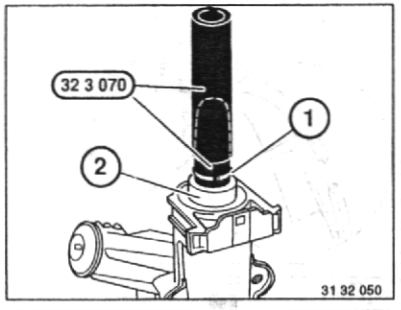


Unscrew both setscrews.

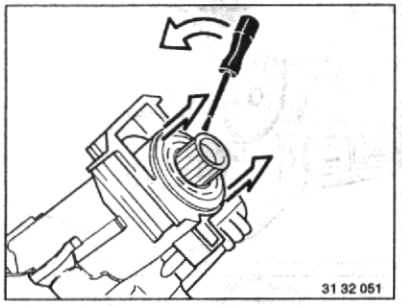
Installation:
Lock setscrews with paint.



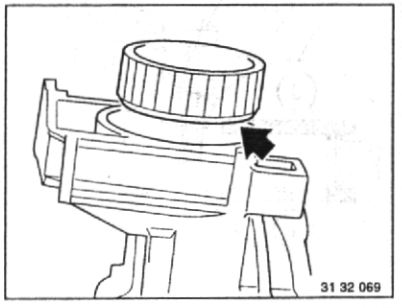
Lift out and remove circlip (1) with sleeve (2).



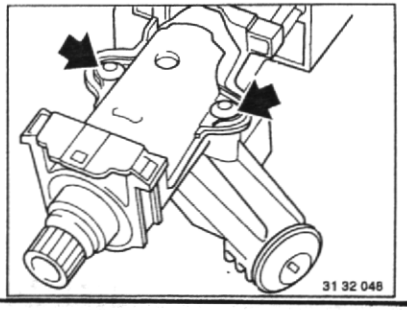
Installation:
Mount sleeve (2) and install circlip (1) with Special Tool 32 3 070 (hammer knocks) – counterhold steering spindle.



Lift out and remove steering spindle bearing.
Take off bearing inner sleeve.

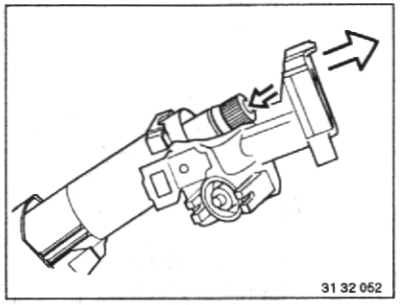


Installation:
Insert bearing inner sleeve with the bevelled side facing the steering lock.

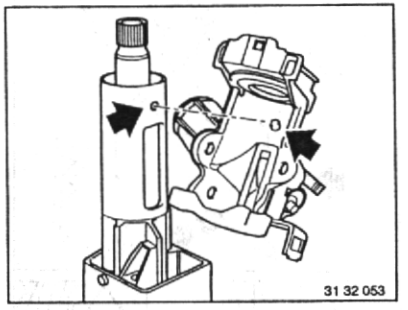


Remove shear-off bolts.

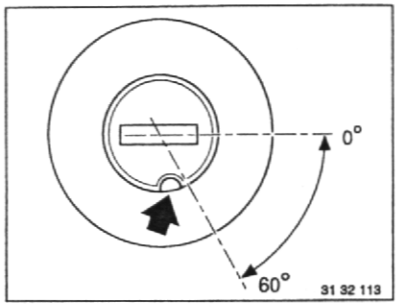
Installation:
Tighten Torx bolts until they shear off.



Turn steering lock to "R" position.
Press down on steering spindle and take off steering lock.

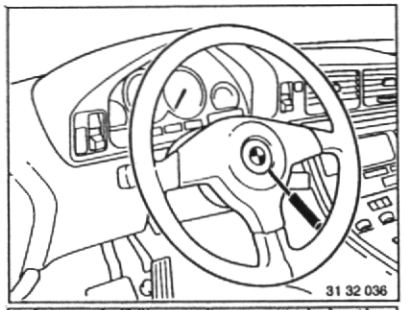


Installation:
Dowel pin must fit in bore.



32 32 050 REMOVING AND INSTALLING OR REPLACING STEERING LOCK CYLINDER

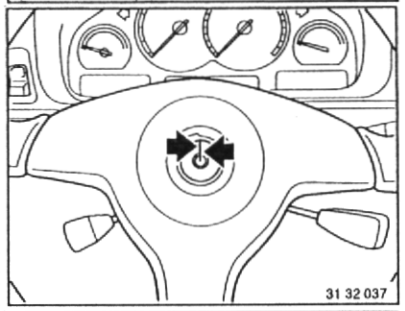
Turn lock cylinder 60° to position "R" with the ignition key.
Insert Special Tool 32 3 110 or a piece of 1.2 mm (0.047") dia. wire in the bore of the lock cylinder and pull out the lock cylinder.



32 33 000 REMOVING AND INSTALLING STEERING WHEEL

Without Airbag (SRS):

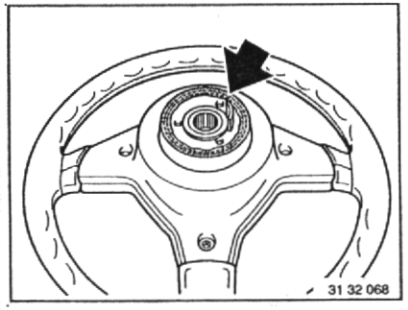
Lift out BMW emblem.



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.

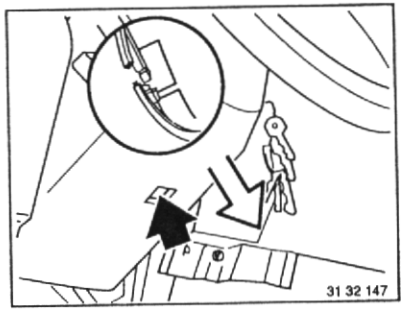


Installation:
Coat slip ring with grease**.

* See Specifications
** See Operating Fluids

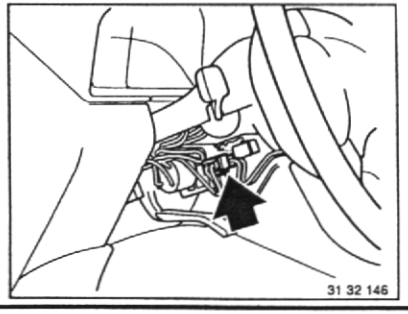
With Airbag (SRS):

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.

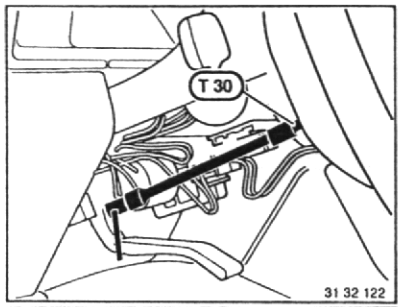


Unscrew screw.
Pull lower steering column casing section off of the upper section.

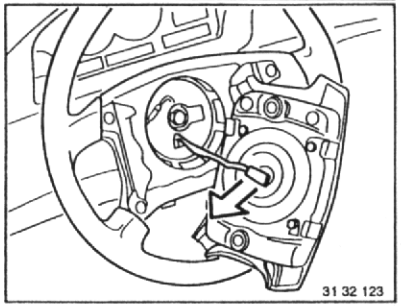
Installation:
Check for correct seating of the lock.



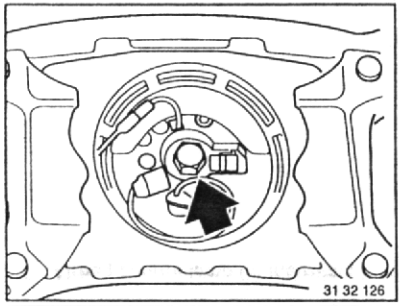
Turn plug (orange) out of the holder and disconnect.



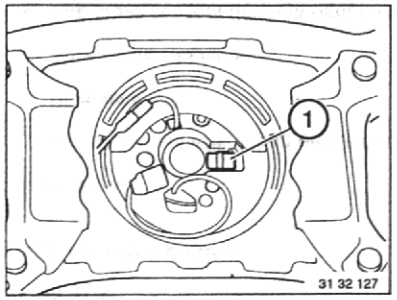
Installation:
Lockpin (1) must engage in opening (2).
Tightening torque*.



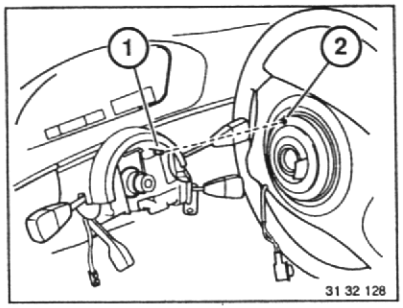
Adjusting Contact Ring if Necessary:
Press down on spring (1), turn contact ring to left or right stop, turn back about 3 turns until the arrows for the center position are aligned and then release spring (1).



Installation:
Coat slip ring with grease**.

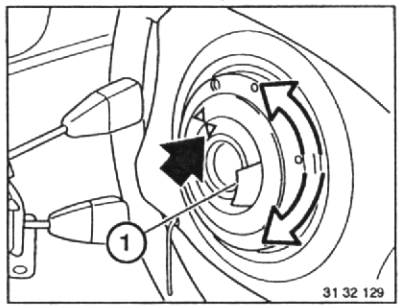


* See Specifications
** See Operating Fluids



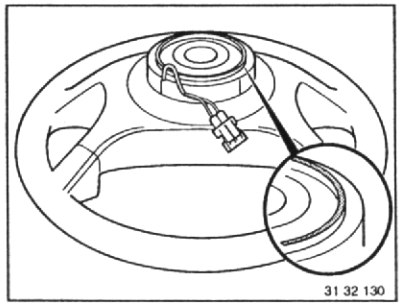
Unscrew screws (T 30 internal Torx).

Installation:
First tighten the right screw as seen looking forward in car.
Don't pinch the wires.
Tightening torque*.



Pull off plug and take out airbag unit.

Caution!
Airbag unit must always be placed (in trunk) with the padded surface facing up.



Turn steering wheel to straight ahead position (marks on steering gear and steering spindle aligned).
Unscrew bolt.
Mark position of steering wheel to steering spindle.
Pull off steering wheel.

Note:
Unscrewing the bolt activates turning lock (1) which holds the contact ring in center position.

* See Specifications

AIRBAG SYSTEM (SRS)

Components:

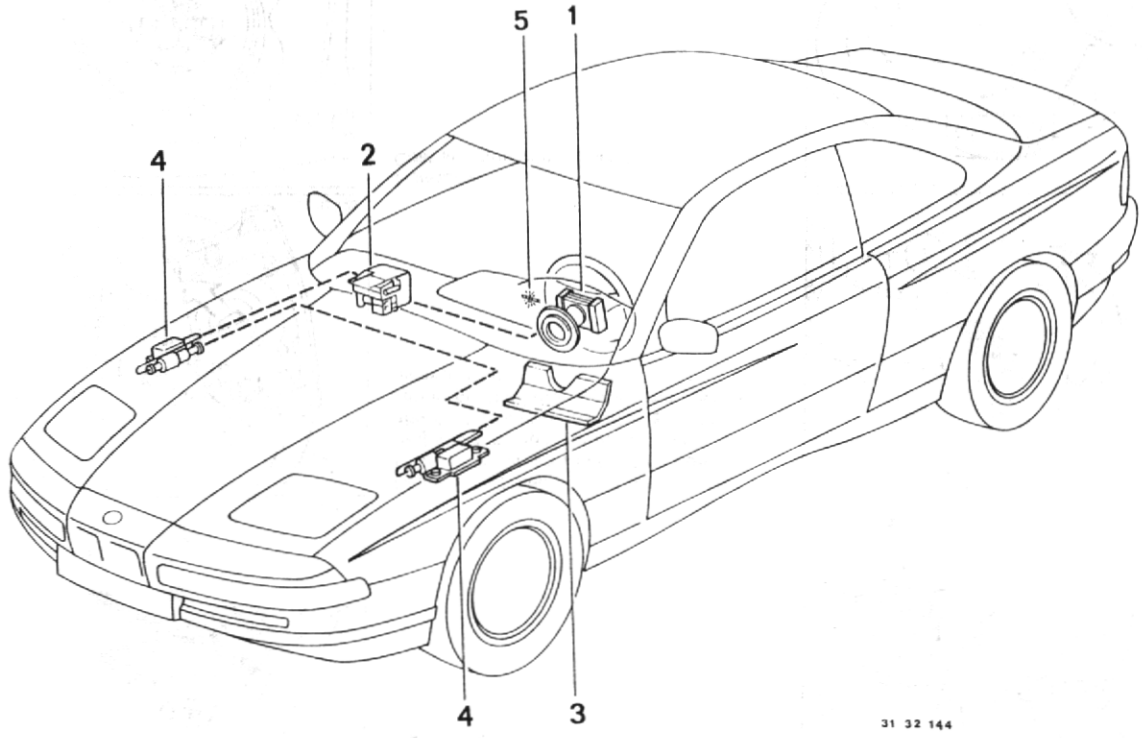
1 Steering wheel with airbag unit (airbag, gas generator, ignition pill and contact ring)

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)



32-34/2

Description:

The system is activated by sensors, whereby there must be car deceleration equal to a direct head-on collision impact of at least 18 km/h (11 mph) against a solid (non-giving) obstacle.

The electric circuit is made and gas generators ignited. This causes sudden burning of a solid fuel mixture, which releases non-poisonous gas to

a) completely inflate a folded airbag in the airbag steering wheel within approx. 30 milli-seconds. (The crash inflated airbag reduces the severity of injury to the head and upper part of the body in head-on collisions. Discharging takes place through two holes on the side of the airbag facing away from the driver.)

Monitoring:

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

If this lamp comes on again, there is a recognized fault in the system. Perform the self-diagnosis fault memory call with the BMW DIAGNOSING SYSTEM.

SAFETY PRECAUTIONS FOR HANDLING GAS GENERATORS FOR AIRBAG AND BELT TENSIONER

Non-conformance with these instructions could lead to unwanted activation and injuries.

Gas generators are pyrotechnical items. Handling, transporting and storing are subject to "legislation concerning explosive materials" (Explosive Substance Laws of Sept. 13, 1976).

The specifications listed below are in reference to Germany. There must always be conformance with local and national regulations in other countries.

1. Transporting:

1.1 It is forbidden to transport gas genertors in the passenger compartment!

1.2 Company level transportation must always be in the trunk (luggage compartment) or cargo room of a vehicle and in packed state – the quantity of units is limited to 50.

2. Storing:

2.1 The maximum permitted quantity of gas generators in one working room is 20.

2.2 Storage of up to 200 units is permitted in a suitable and lockable room.

2.3 Gas generators must be stored in packaging suitable for transportation.

3. Installing and Removing:

"Airbag" components and plugs can be recognized immediately on their orange color.

Tests and installation/removal may only be performed by persons with qualified training in BMW service.

Working on the "airbag system" always requires the battery to be disconnected, the negative pole or terminal to be covered, the "airbag" plug (steering column) to be disconnected and belt tongue to be inserted in the belt lock. If work on the system has to be interrupted, a gas generator must not be left laying around without unattended.

Components of the airbag system may not be repaired, but instead must always be replaced.

Conformance with the following points is essential.

— Never treat "airbag" components with cleaning solutions or grease.

— Never subject a gas generator to temperatures above 100° C (212° F).

— Gas generators, crash sensors and electronic diagnosis units, which have fallen down from a height of 0.5 meter (1 1/2 feet) or more, cannot be installed in cars.

— The "airbag system" may only be tested electrically in installed state and only with a BMW SERVICE TESTER.

— Airbag gas generators may only be stored with the padded side facing up, since if the generator of an airbag facing down were ignited, the generator would be catapulted up and could cause injury.

— The ignition pill of gas generators must never be aimed at persons regardless of the circumstances.

Procedures for Repairing and After Accidents:

Always disconnect the battery, cover the negative pole or terminal and disconnect both plugs for crash sensors in the engine compartment and plugs for gas generators, to be sure that power supply to the gas generators is interrupted, prior to performance of body straightening work or welding work with an electric welder. Also refer to other instructions in the repair manual.

After Accidents:

If the system had been activated, always replace all components with exception of wiring when not damaged.

4. Scrapping Cars with Airbag (SRS):

In accordance with accident prevention regulations "airbag" gas generators must be rended unusable prior to scrapping. This is necessary since the gas generator is a pyrotechnical item and could cause injury if activated incorrectly (for example with a torch during scrapping). "Airbag" gas generators must be ignited in the cars meant for scrapping from the outside and with doors of the cars closed. The igniter, Special Tool 62 1 270, developed by BMW for this purpose, must be used together with test lead 62 1 280.

Non-ignited generators are a source of danger (also for the environment)!

1. Driver's Airbag:

1.1 Remove lower steering column casing section and disconnect airbag unit plug (orange).

1.2 Connect igniter on the plug.

1.3 Connect igniter on a 12 V battery. Distance from car: 10 meters (32 feet).

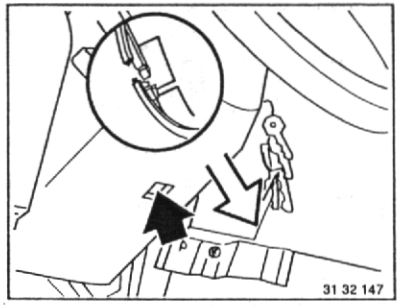
1.4 Keep as far away from car as length of ignition lead permits. Always stand in front of car (this also concerns other persons).

1.5 Operate switch of igniter.

Caution!
The burning of solid fuel will heat the airbag unit – danger of burning hands!
Wash hands after touching ignited gas generators!

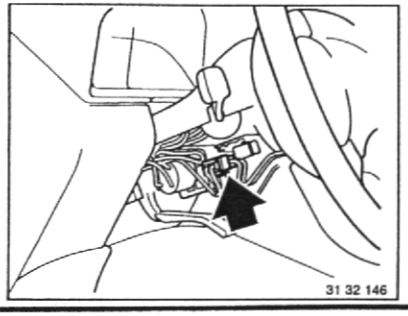
32 34 020 REMOVING AND INSTALLING OR REPLACING AIRBAG UNIT

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

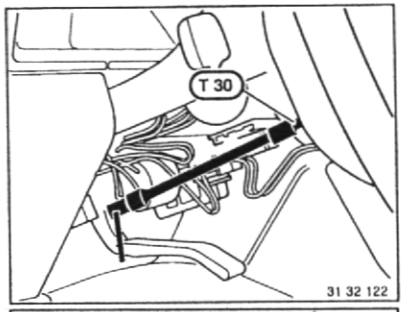


Unscrew screw.
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of the lock.

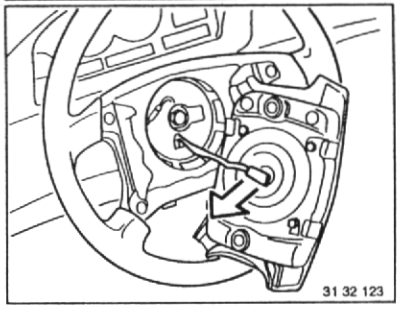


Twist plug (orange) out of the holder and disconnect.



Unscrew screws (T 30 internal Torx).

Installation:
First tighten right screw as seen looking forward in the car.
Don't pinch the wires.
Tightening torque*.



Pull off plug and take out airbag unit.

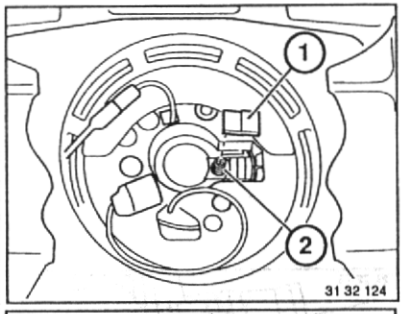
Caution!
Place airbag unit in trunk only with the padded side facing up.

* See Specifications

32 34 510 REPLACING CONTACT RING (AIRBAG)

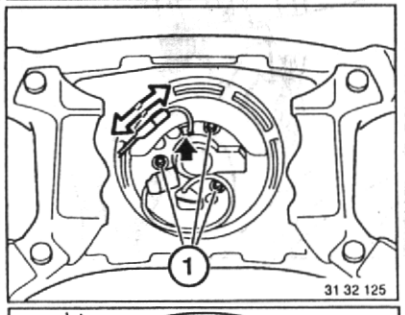
Caution!
Conform with safety precautions! Improper handling could cause activation of the airbag and lead to injuries.

Remove steering wheel – see 32 33 000.



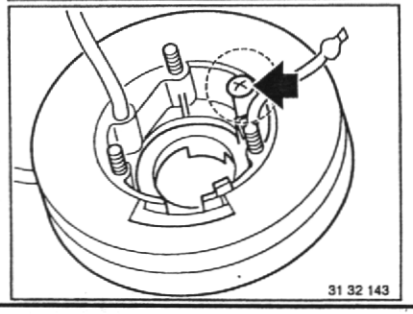
Lift out lock (1) with a screwdriver.

Installation:
Insert spring (2) in the bore and install the lock.
Press down on lock until it engages.



Disconnect plug.
Unscrew nuts (1) and take off contact ring.

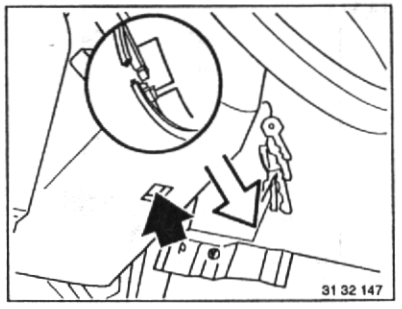
Installation:
Guide horn wires through rectangular opening.
Lock nuts with paint.



Important!
A new contact ring is held in center position by a screw. This screw must be removed after the contact ring has been screwed on the steering wheel.

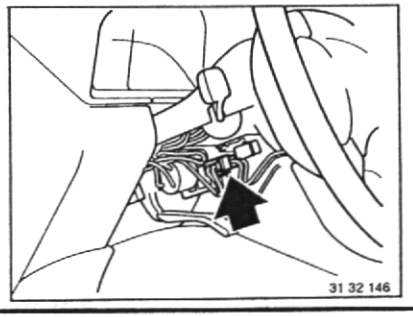
65 77 010 REMOVING AND INSTALLING OR REPLACING AIRBAG DIAGNOSIS UNIT

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.

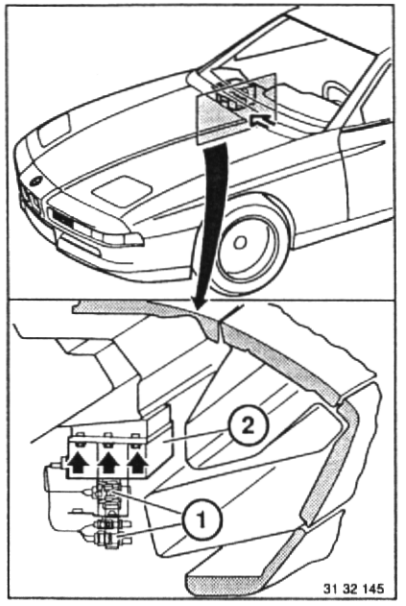


Unscrew screw.
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of the lock.



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



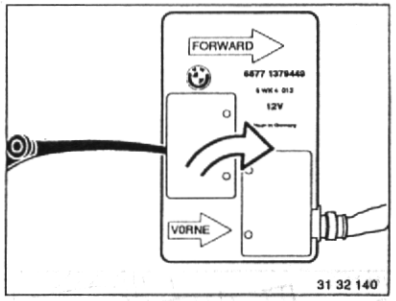
Remove trim panel for dashboard at bottom right.

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

Installation:
Arrow on unit faces forward.

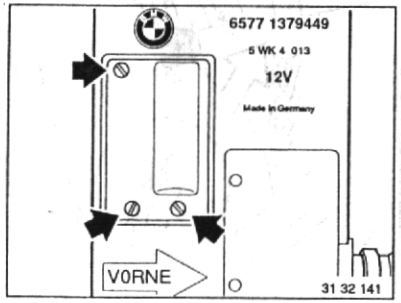
65 77 015 REPLACING CAPACITOR OF AIRBAG DIAGNOSIS UNIT

Remove diagnosis unit – see 65 77 010.

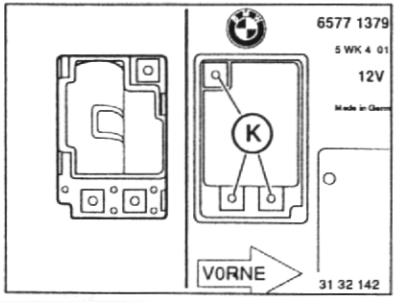


Open cover with a feeler gage blade (0.20 mm) or small screwdriver.

Installation:
Install new cover.



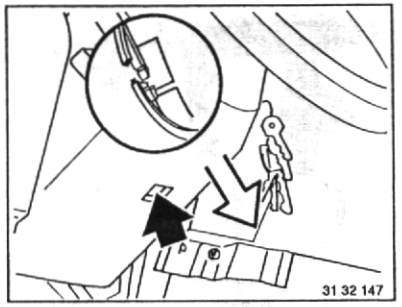
Unscrew screws and take off capacitor.



Installation:
Clean contact surfaces (K).

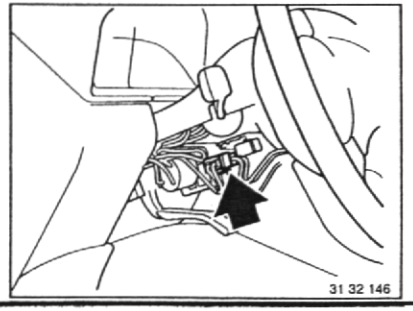
65 77 020 REMOVING AND INSTALLING OR REPLACING ONE AIR-BAG CRASH SENSOR

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.

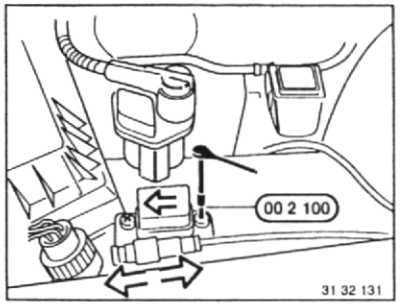


Unscrew screw.
Pull lower steering column casing section off of the upper section.

Installation:
Check for correct seating of the lock.



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



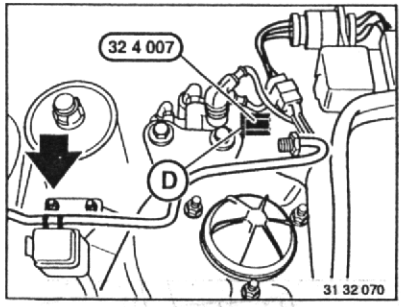
Disconnect plug and unscrew screws with Special Tool 00 2 100.

Installation:
Arrow on sensor faces forward. Tightening torque*.

* See Specifications

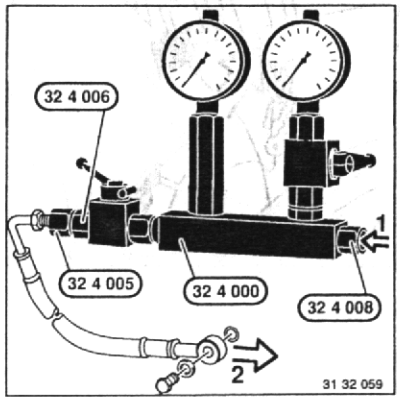
32 41 005 CHECKING OPERATION OF POWER STEERING (H-31 System)

– 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.



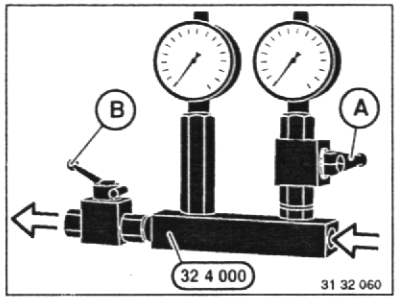
Discharging Pressure:
Stop engine and operate brake pedal about 20 times.
Unscrew pipe on power flow regulator and connect Special Tool 32 4 007.

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.

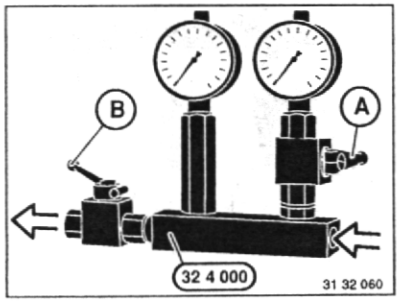
Hydraulic fluid temperature should be approx. 50° C (122° F) for all tests.
If necessary, increase the temperature by turning the steering wheel against locks with the engine running.

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.

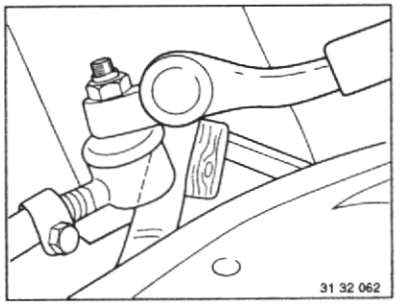
* See Operating Fluids

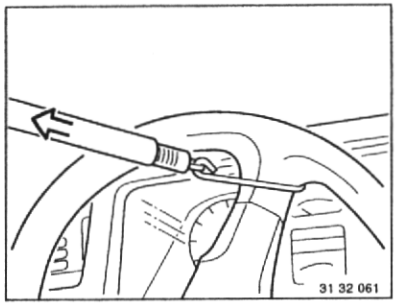


2. Checking Pump:
Install pressure tester between pump and power flow regulator.
Close valve (A).
Start engine.
Close valve (B) max. 10 seconds and read pressure.
Rated pump pressure* æ 10 % should be reached.
Rated pressure* exceeded, replace pump – see 32 41 061.
Rated pressure* not reached, check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

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

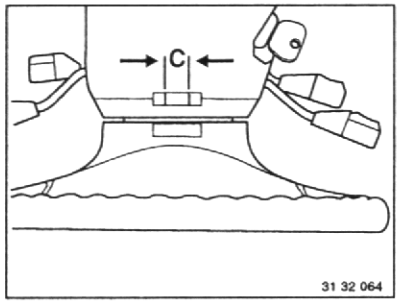




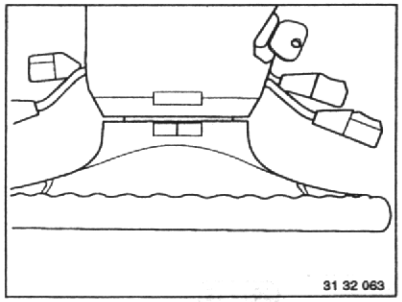
4. Power Steering:
Pressure tester between pump and power flow regulator – system bled – valve (B) open – valve (A) closed – engine not started.
Lift car.
Stop steering from reaching final left lock by 1/2 to 3/4 steering wheel turn with a piece of wood or something similar.

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.

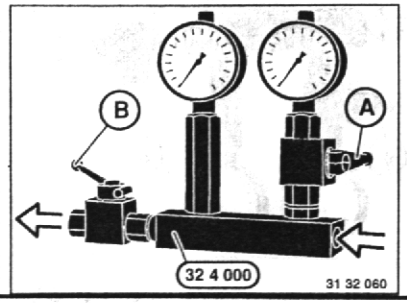
5. Checking Mech. Play of Steering:
-Pressure point adjusted, see 32 13 014.
-No play in steering column.
Pressure tester between pump and power flow regulator – system bled – valve (B) open – valve (A) closed – engine not started.
Hold steering drop arm in straight ahead position with Special Tool 32 4 070.



Turn steering wheel anticlockwise until pressure tester shows 1 bar (14 psi) more pressure than the flow pressure value.
Mark position of steering wheel hub.
Repeat this in clockwise direction.
If max. permissible travel (C) = 7 mm (0.276") is exceeded, replace steering gear – see 32 13 060.
Remove special tool holder and pressure tester.
Bleed hydraulic system and, if necessary, add hydraulic fluid**.



Paste strips of paper on the steering wheel hub and upper casing section.
Make mark (center) on steering wheel hub.

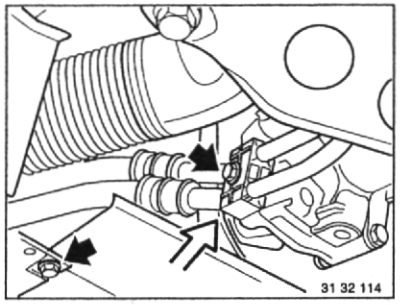


Start engine.
Open valve (A).
Read flow pressure.

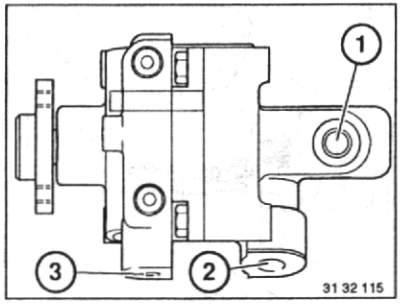
** See Operating Fluids

32 41 060 REMOVING AND INSTALLING IMPELLER ORTANDEM POWER STEERING PUMP

Discharge the pressure reservoir by operating brake pedal about 20 times.
Draw hydraulic fluid out of tank – never reuse it.



Unscrew splash guard.
Unscrew oil cooler pipe.

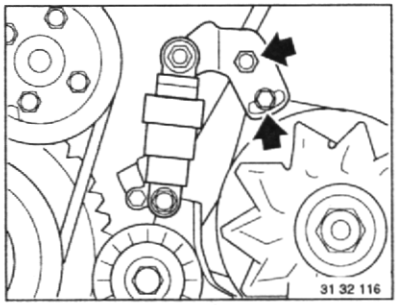


Disconnect pipes.

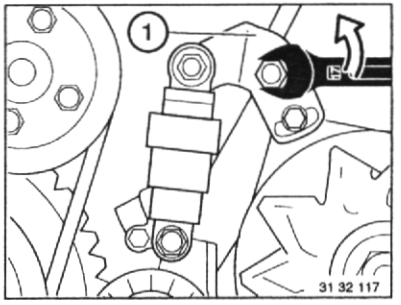
Installation:
Replace gaskets.
Tightening torque*.
Bleed power steering – see 32 13 006.

1 = To steering
2 = To tank
3 = To ASC+T plunger unit

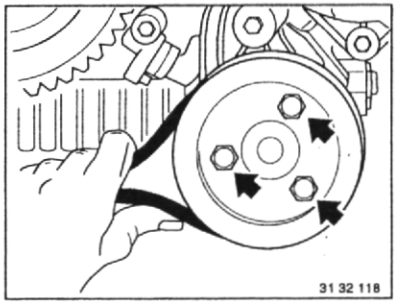
* See Specifications



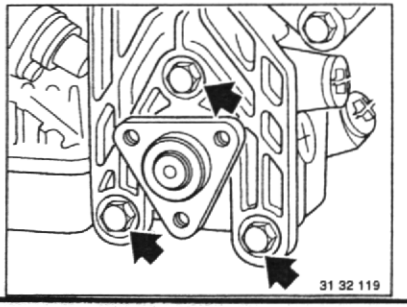
Loosen bolt and nut.
Take off drive belt.



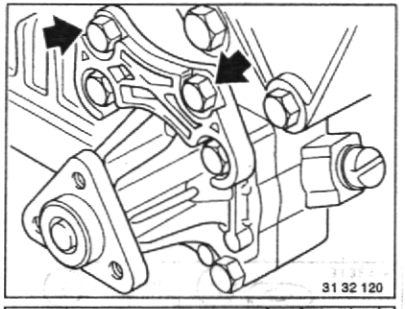
Installation:
Turn tensioning arm (1) against stop on the bolt.
Tighten bolt and nut.



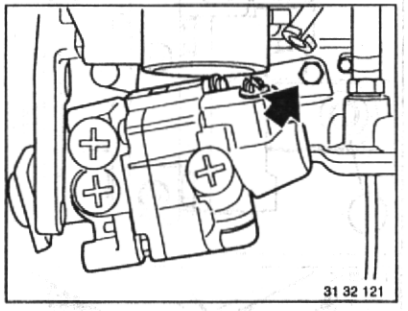
Hold pulley with help of the drive belt.
Unscrew bolts.



Tandem Pump:
Unscrew bolts.



Impeller Pump:
Unscrew bolts.

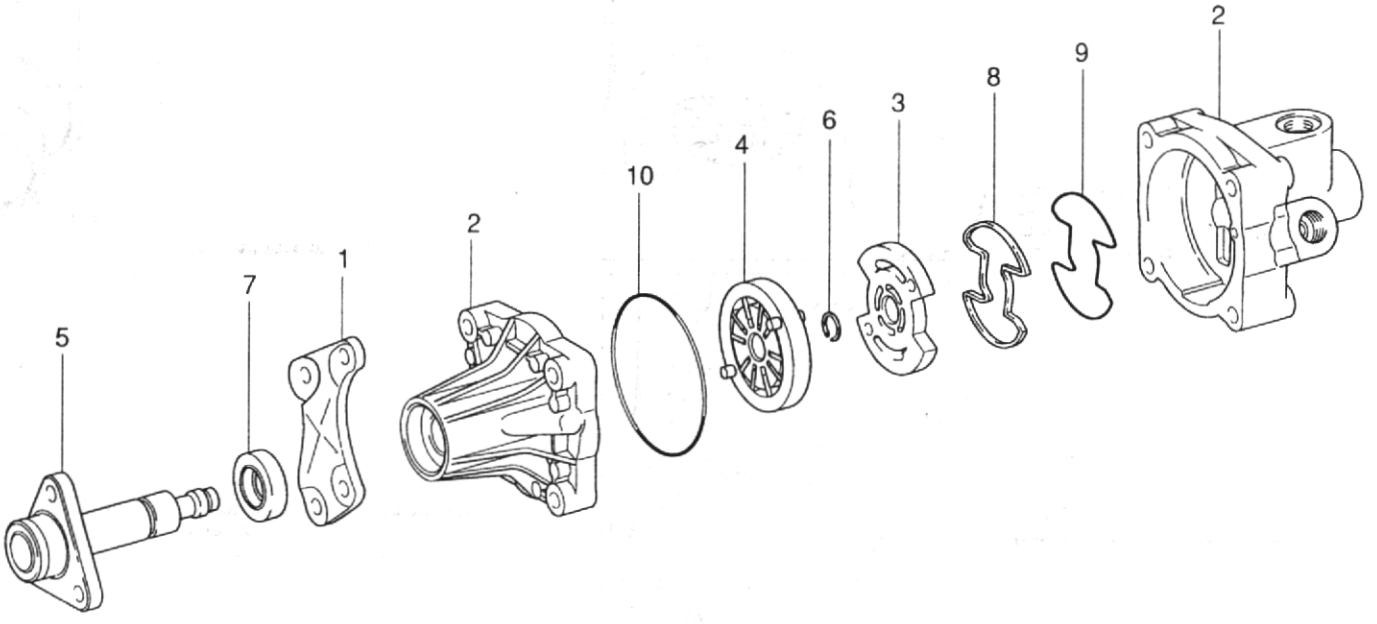


Unscrew bolt.
Take off wing or tandem pump.

32-41/6

POWER STEERING IMPELLER PUMP

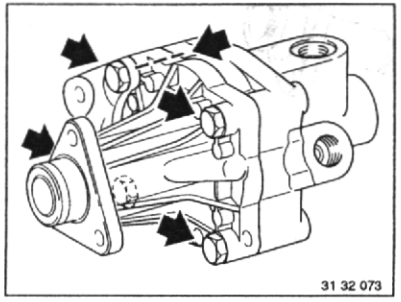
1 Holder
2 Body
3 Face plate
4 Rotor
5 Shaft
6 Circlip
7 Radial oil seal
8 Seal
9 Guide
10 O-ring



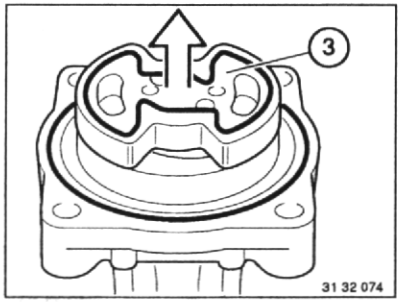
31 32 072

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

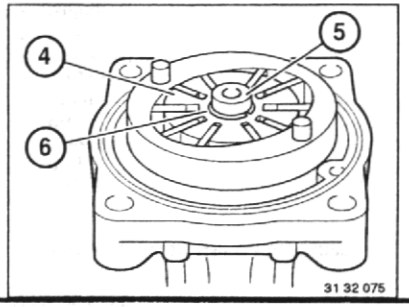
Absolute cleanliness is essential when working on pumps.



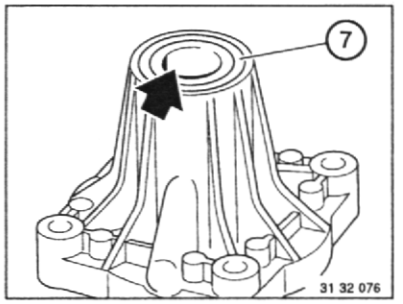
Mark position of holder (1) to pump body (2).
Unscrew bolts and separate housing.



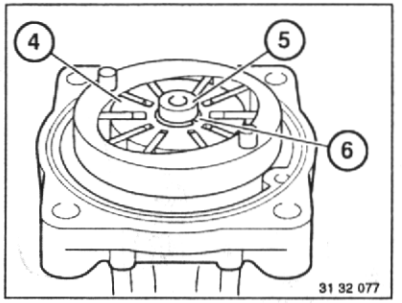
Take off face plate (3).



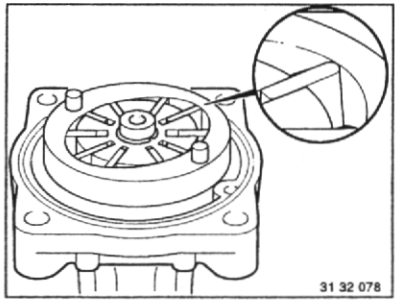
Press down rotor (4) on shaft (5).
Remove circlip (6) and pull shaft out of body.
Remove rotor (4).



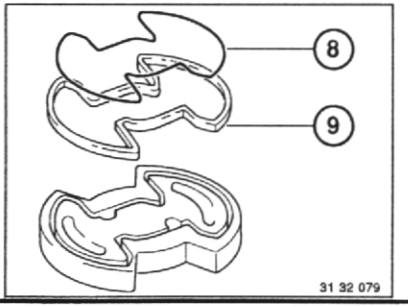
Assembling:
Clean and lubricate all parts with hydraulic fluid.
Replace radial oil seal (7) – sealing lip faces in – and pack space between sealing and dust lips with grease.



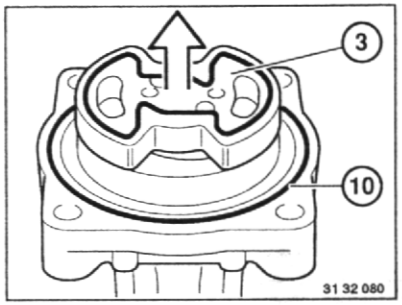
Insert shaft (5) in body.
Mount rotor (4) with recess for circlip facing up and install circlip (6) in radial groove of the shaft.



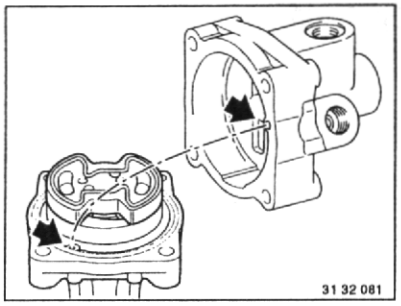
Install the impeller with the polished, rounded outside surfaces facing the cam ring.
Check that impeller moves easily.



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).



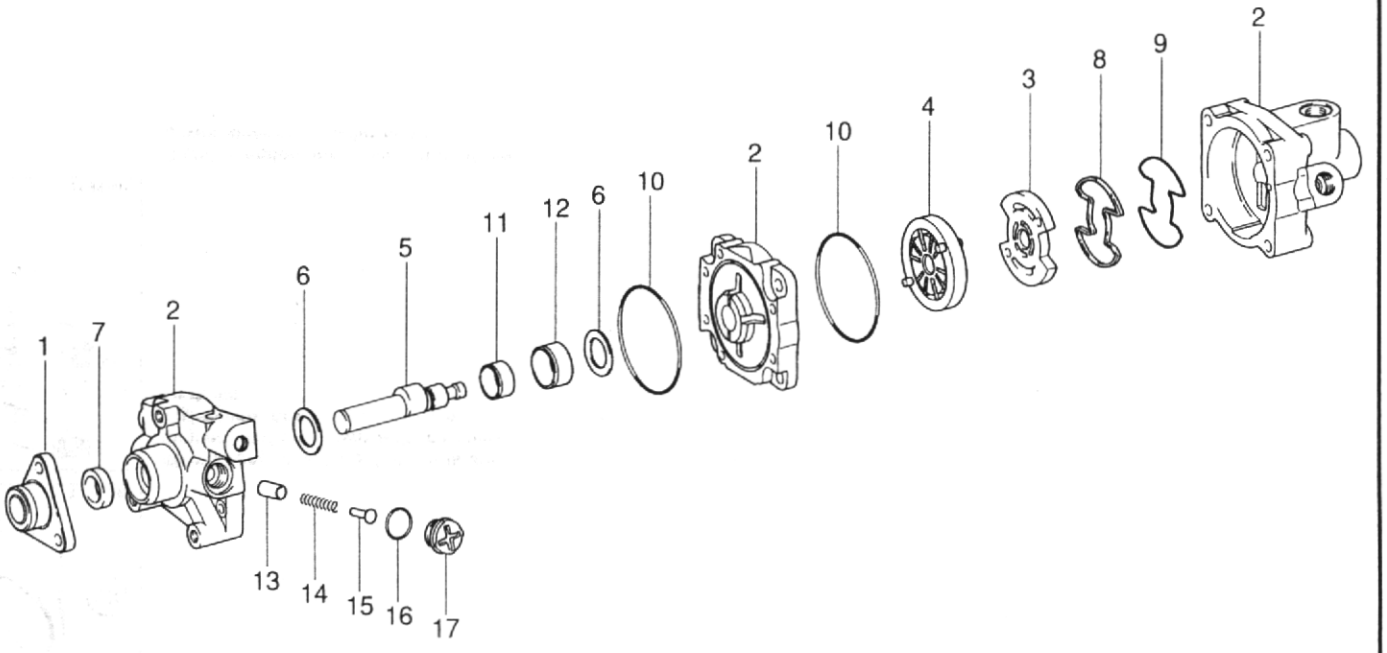
Mount body (checking that bores are aligned) and bolt down with the holder. Tightening torque = 16 ... 19 Nm (12 ... 14 ft. lbs.).

Check function after installation of the power steering impeller pump.

32-41/9

TANDEM PUMP

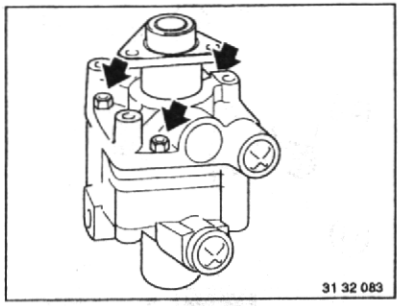
1 Flange
2 Body
3 Face plate
4 Rotor
5 Shaft
6 Axial washer
7 Radial oil seal
8 Seal
9 Guide
10 O-ring
11 Sleeve
12 Slide
13 Piston
14 Spring
15 Shaft
16 O-ring
17 Plug



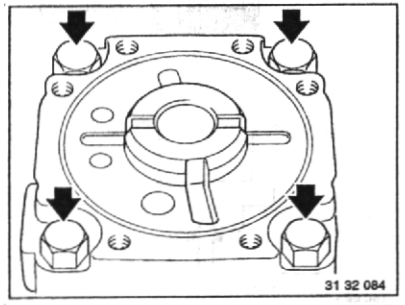
31 32 082

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

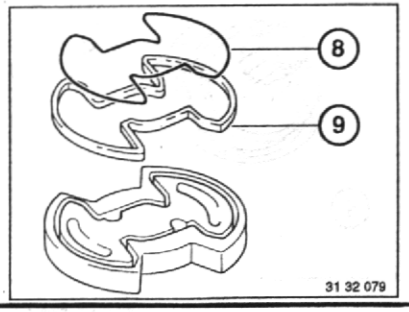
Absolute cleanliness is required when assembling the pump.
Lubricate all parts with hydraulic fluid.



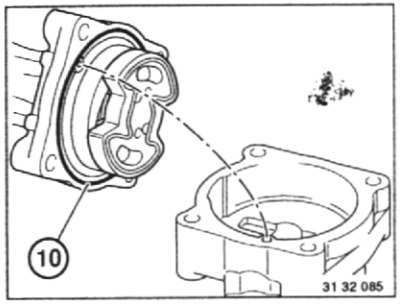
Mark position of the flange to the shaft and body sections to each other.
Unscrew bolts.
Take off body.



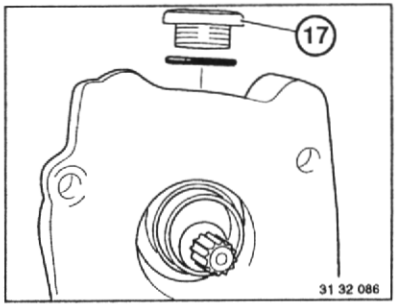
Unscrew bolts.
Take off body (4).



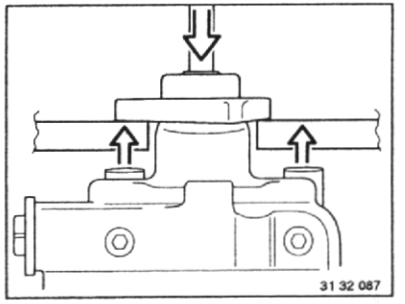
Replace seal (8) (wide end facing plate) and guide (9).



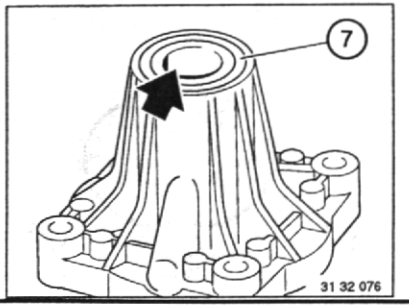
Replace O-ring (10).
Bolt body – bore to bore.
Tightening torque = 14 $^{+5}$ Nm (10 $^{+4}$ ft. lbs.).



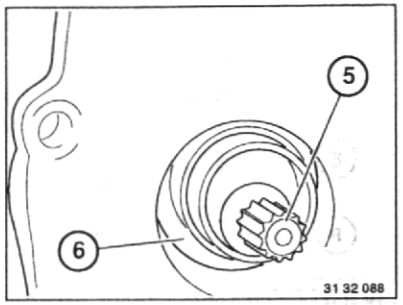
Unscrew both plugs (17).
Take off piston and sliding ring with sleeve.



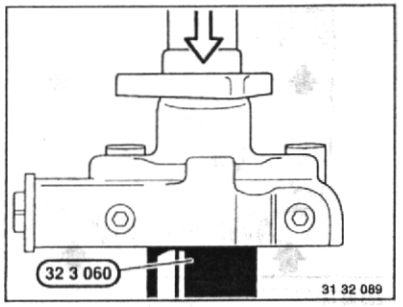
Press triangular flange off of the shaft with a press, while supporting on the flange.



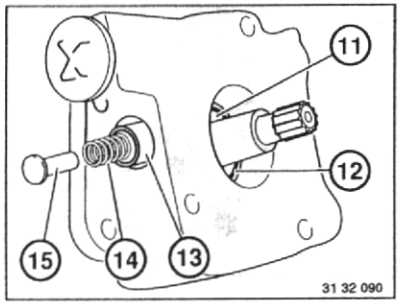
Replace radial oil seal (7) – sealing lip facing in and filled with grease.



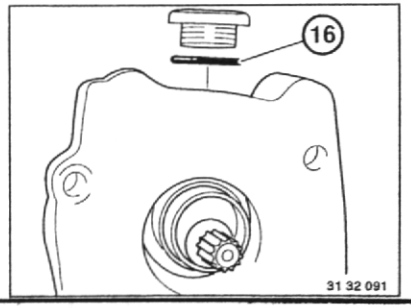
Install axial washer (6) and run in shaft (5).



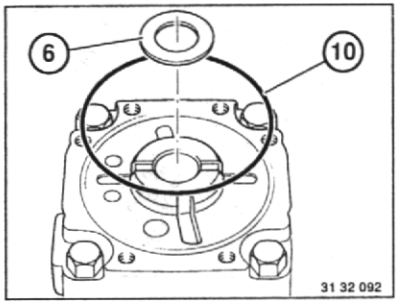
Press on flange with Special Tool 32 3 060.
Shaft protrusion = approx. 1 mm (0.039").
Check marks.



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.).



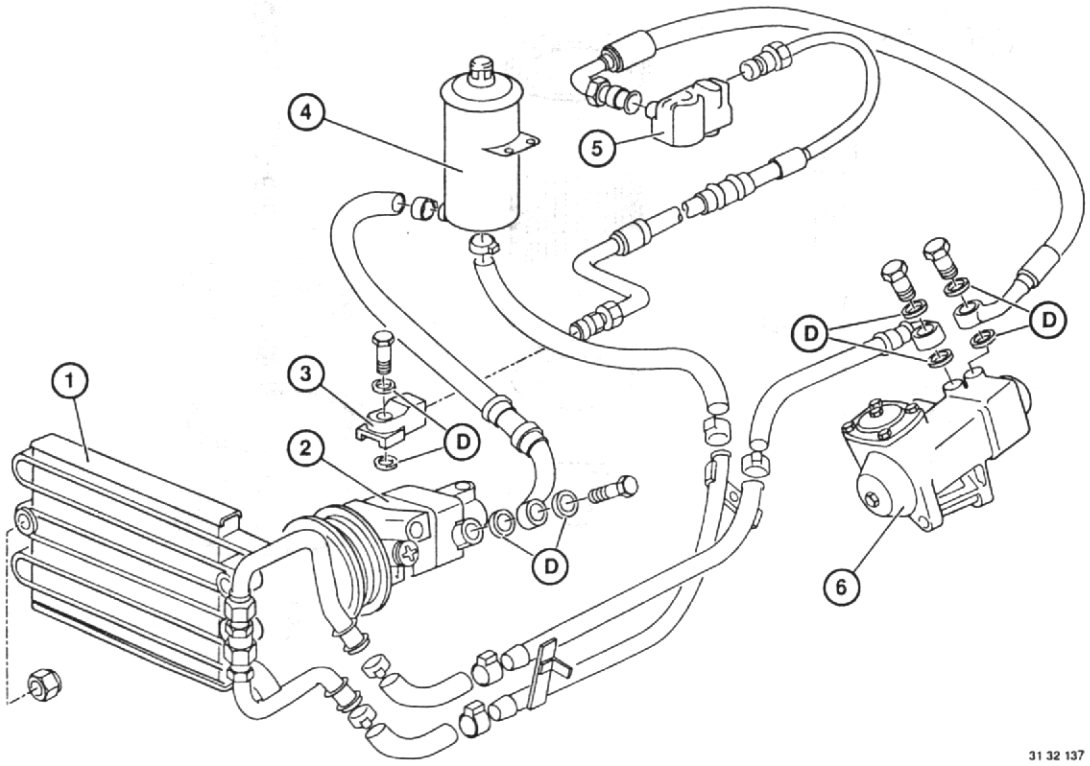
Replace O-ring (10).
Insert axial washer (6).
Mount and bolt body.
Tightening torque = 8 Nm (6 ft. lbs.).
Other jobs – see 32 41 553.

32-41/12

POWER STEERING COMPONENTS AND PIPES

1 Oil cooler
2 Impeller/tandem pump
3 Adapter
4 Oil supply tank
5 Power flow regulator
6 Steering gear

D Seals

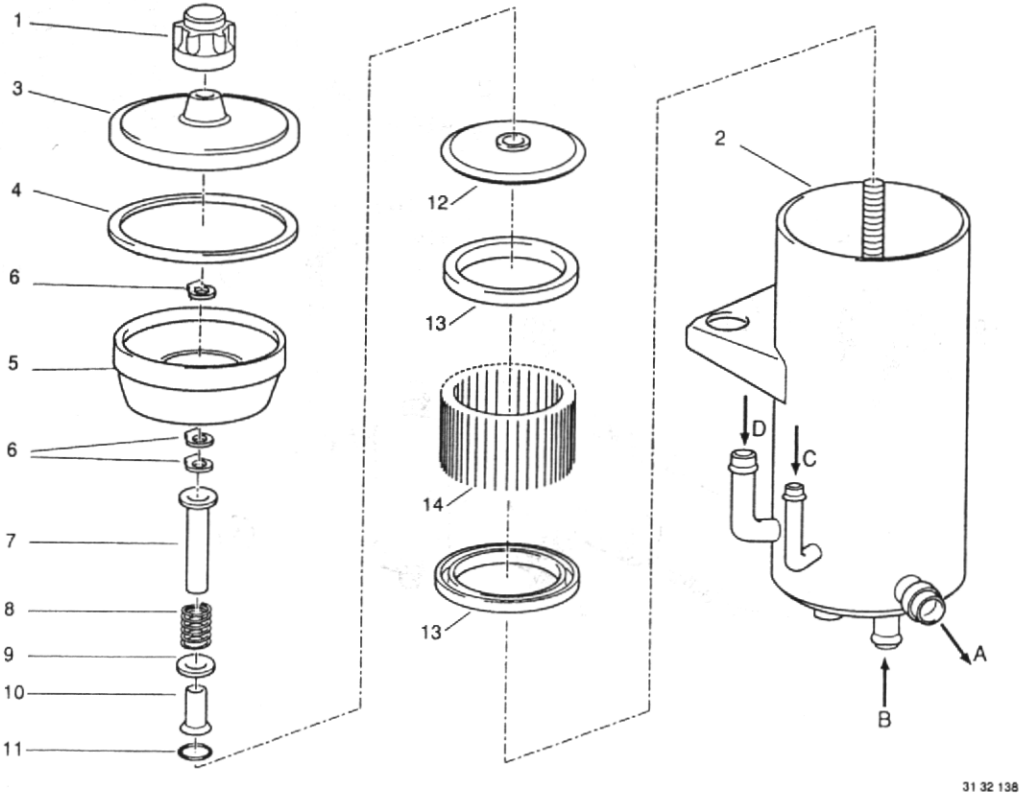


32-41/13

OIL SUPPLY TANK

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

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



32-41/14

OIL SUPPLY TANK (with ASC + T)

1 Cap
2 Cover
3 Seal
4 Nut
5 Pipe
6 Oil filter screen
7 Spring
8 Oil filter screen
9 Seal
10 Retainer
11 Guide pipe
12 Spring
13 Spacer
14 O-ring
15 Safety 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 Fromt ASC+T (return)

