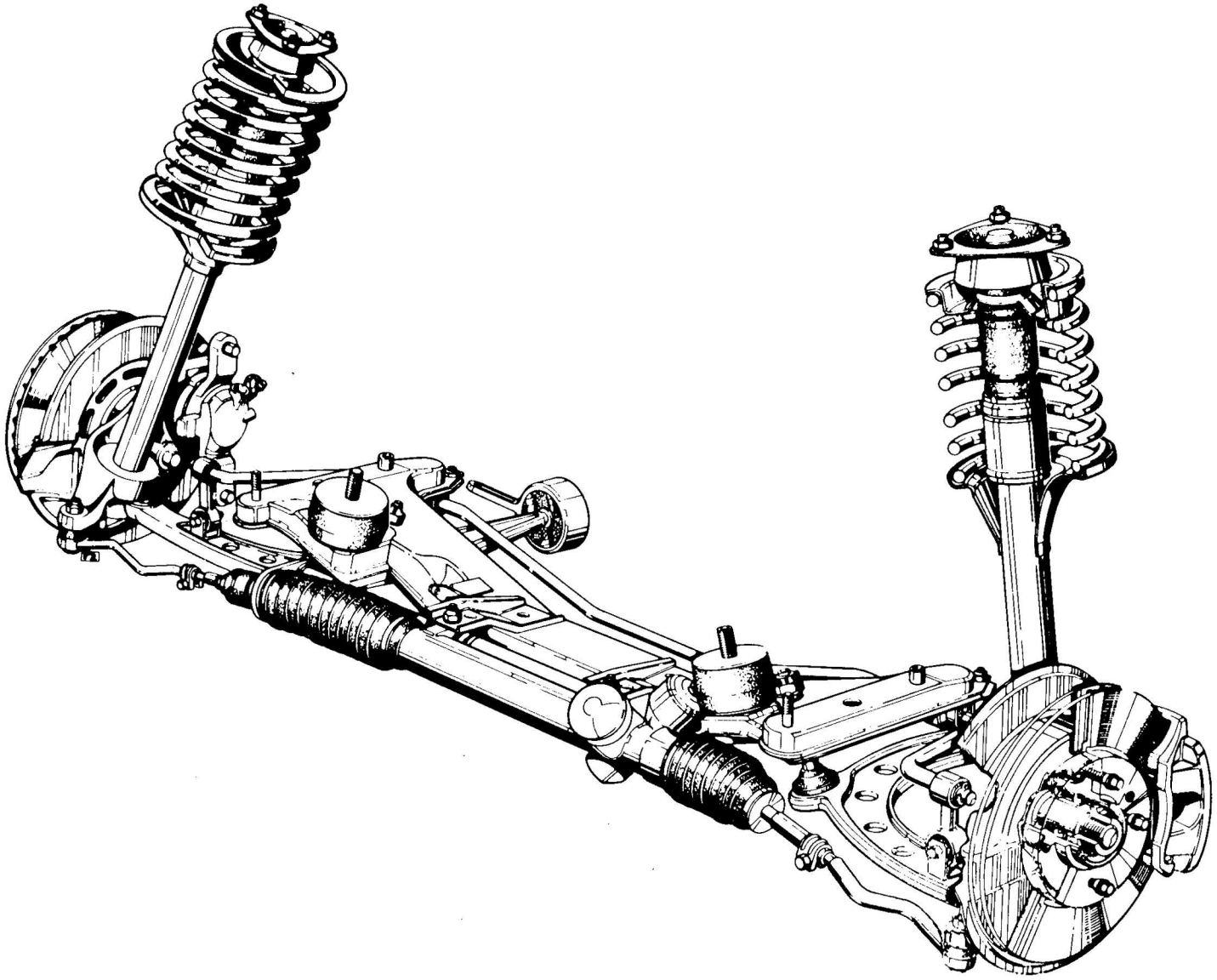
31 Front Axle

31 Front Axle

31 Front Axle

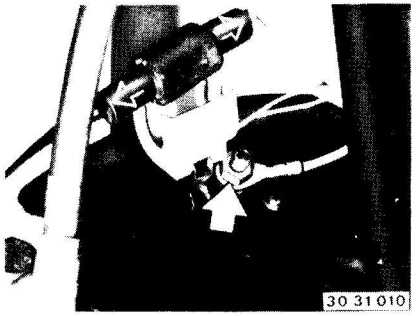
LAYOUT DRAWING OF FRONT WHEEL SUSPENSION



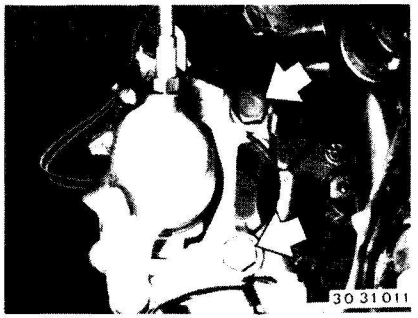
30 31 047

31 10 000 REMOVING AND INSTALLING FRONT AXLE ASSEMBLY

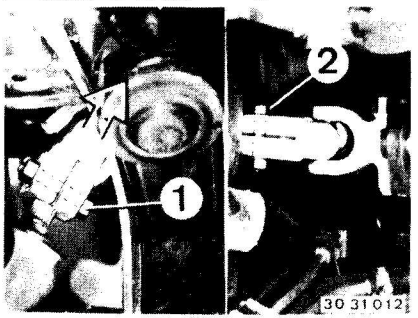
Only Cars with SRS:
Remove steering wheel – see Group 32.
Remove front wheels – see Group 36.
Note:
Check front wheel alignment with an optical tester after installation - see Group 32.



Disconnect plugs for brake pad wear indicator and EDC (see information in Group 37).
Unscrew ground lead.
Disconnect wires and brake hoses in holders on left and right spring struts.
Remove ABS pulse sender – see Group 61.

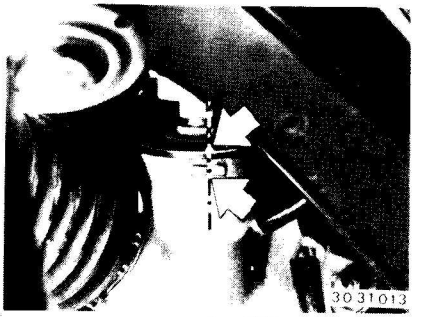


Unscrew left and right brake calipers and suspend from body on pieces of wires.
Brake hoses remain connected.
Installation:
Tightening torque*.

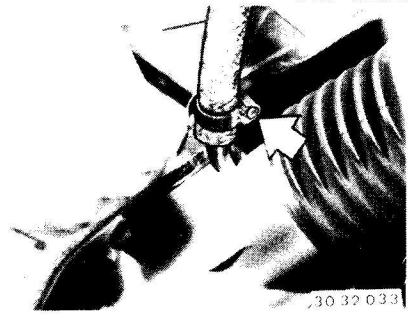


Remove bolt (1).
Loosen bolt (2).
Press steering spindle off of steering gear and remove.
Installation:
Bolt (1) must be located in groove of steering shaft.
Replace self-locking nut.
Tightening torque*.

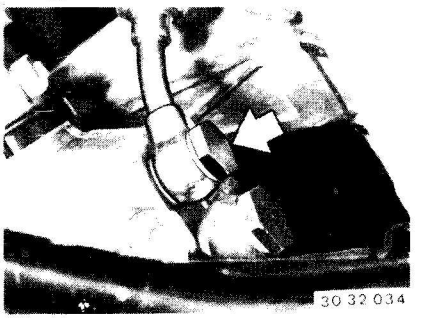
* See Specifications of Gr. 32 and 34



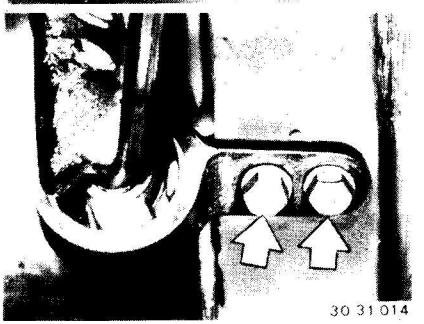
Installation:
Steering wheel and front wheels in straight ahead position (marks on case and steering shaft aligned).
Mount steering spindle on the steering gear in such a manner, that clamping slot of universal joint is aligned with mark on steering gear.



Draw off hydraulic fluid in tank.
Disconnect hydraulic return hose.
Important!
Never reuse drained hydraulic fluid.

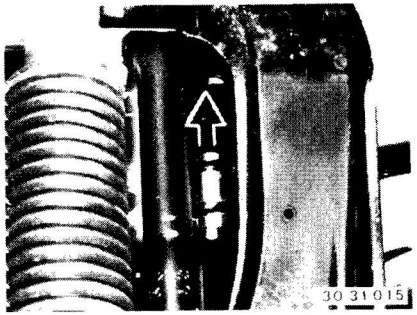


Disconnect pressure hose.
Plug open connections with dust caps.
Installation:
Replace seals.
Tightening torque*.
Fill power steering – see Group 32.

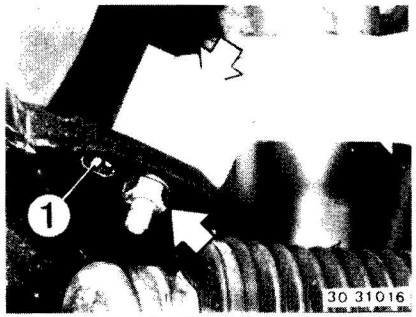


Unscrew holders for left and right control arms.
Remove heat shield for right control arm holder.
Installation:
Tightening torque*.

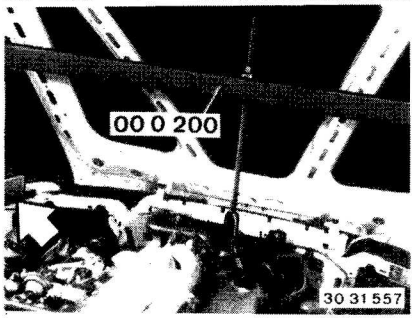
* See Specifications of Gr. 32



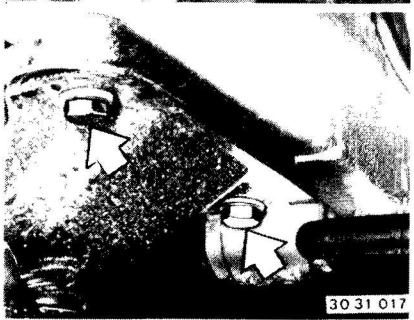
Four Cylinder Models:
Unscrew engine damper on front axle carrier.



Unscrew left and right engine mounts on front axle carrier.
Loosen right engine mount at top.
Installation:
Engine mount turning lock (1) must engage in the bore.
Tightening torque*.

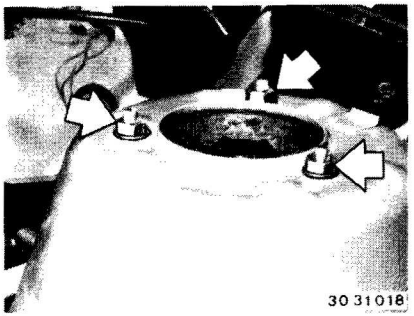


Attach Special Tool 00 0 200 on the engine.
Adapters bear on bolts of side panel walls.
Support front axle carrier from underneath with a shop jack.



Unscrew bolts on left and right sides.
Installation:
Tightening torque*.

* See Specifications of Gr. 11

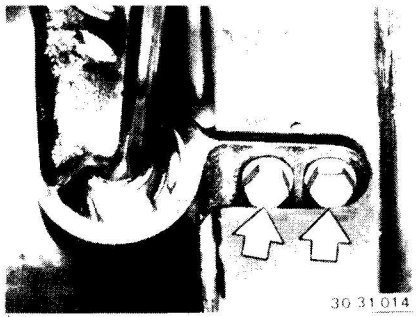


Unscrew nuts on left and right sides.
Lower front axle slowly.
Caution!
Don't let spring struts tilt out or sag through.
This would damage the ball joints.
Installation:
Replace self-locking nuts.
Tightening torque*.

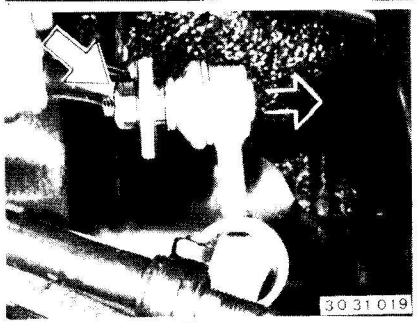
* See Specifications

31 11 001 REPLACING FRONT AXLE CARRIER

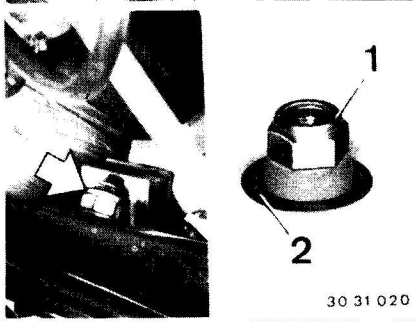
Remove and install front wheels 36 10 300.
Installation:
Check front wheel alignment with optical tester 32 00



Disconnect left and right control arm brackets.
Installation:
Tightening torque*.



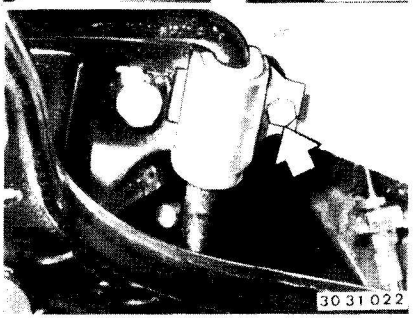
Unscrew thrust rods on left and right sides of stabilizer.
Installation:
Tightening torque*.



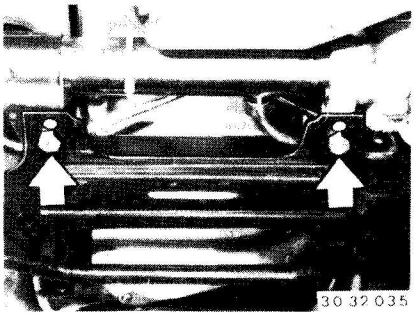
Unscrew left and right nuts.
Installation:
Pins and bores cleaned to remove grease.
Use lock nut (1) and washer (2) instead of standard polystop nut.
Tightening torque*.

* See Specifications

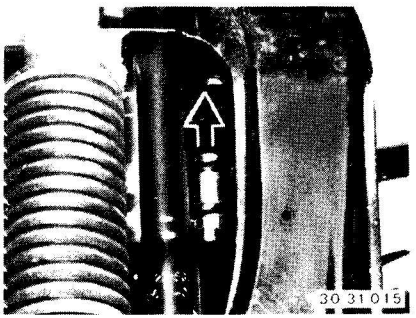
Loosen pin by applying knocks with a plastic hammer.



Remove stabilizer.
Installation:
Tightening torque*.

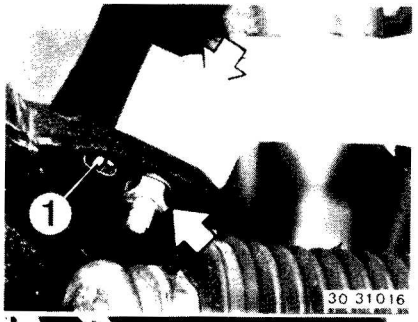


Unscrew steering gear on front axle carrier.
Installation:
Replace self-locking nuts.
Tightening torque*.
Important!
Mounting points = rear bores of front axle carrier.

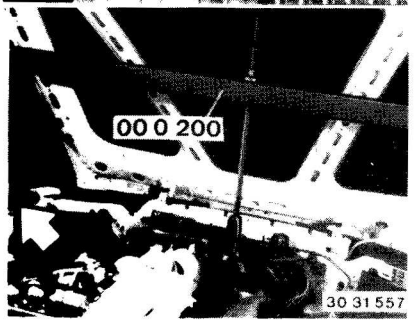


Four Cylinder Engines:
Disconnect engine damper on front axle carrier.

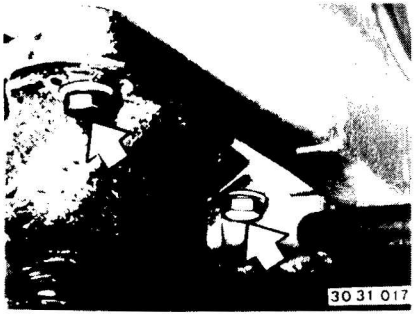
* See Specifications of Gr. 32



Unscrew left and right engine mounts on front axle carrier.
Loosen right engine mount at top.
Installation:
Engine mount turning lock (1) must engage in bore.
Tightening torque*.



Attach Special Tool 00 0 200 on engine.
Adapters bear on bolts of side walls.

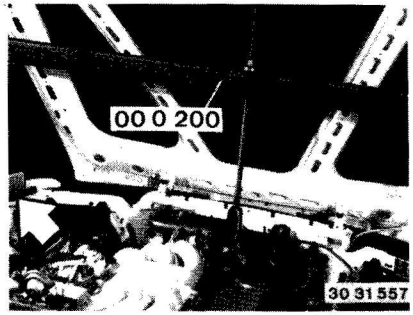


Unscrew left and right bolts.
Remove front axle carrier.
Installation:
Tightening torque*.

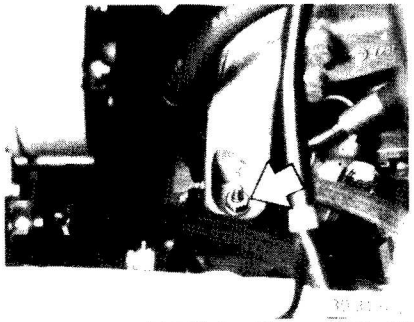
* See Specifications

31 11 001 REPLACING FRONT AXLE CARRIER
– All Wheel Drive –

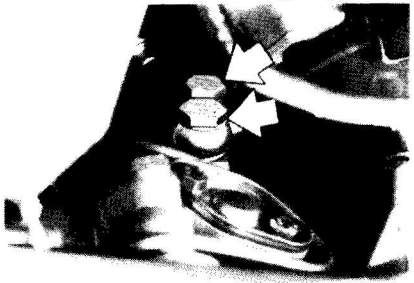
Remove splash guard – see Group 51.
Remove front wheels – see Group 36.
Remove air cleaner – see Group 13.
Draw off hydraulic fluid in tank.
Installation:
Fill power steering – see Group 32.



Attach Special Tool 00 0 200 on engine.
Support bear on bolts of side panels.

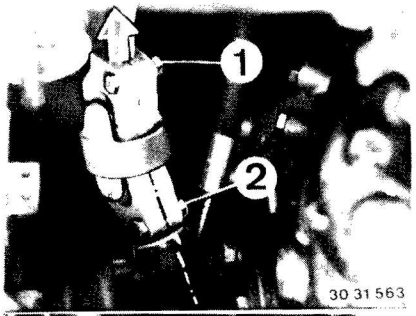


Unscrew left and right engine mounts.
Installation:
Tightening torque*.

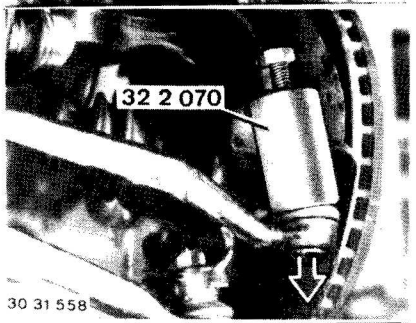


Unscrew hydraulic lines.
Insert plugs in openings.
Installation:
Replace gaskets.
Tightening torque*.

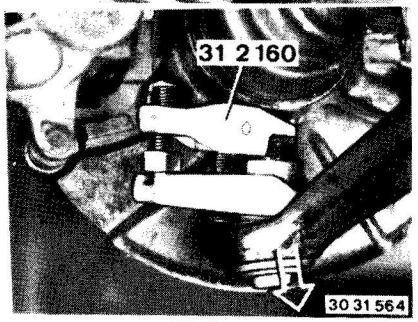
* See Specifications of Groups 31 and 32



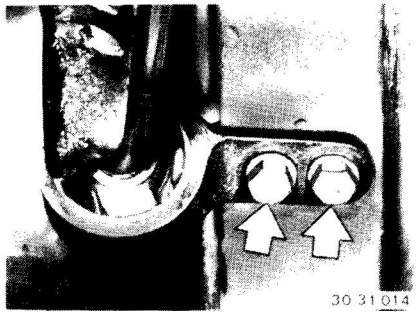
Loosen bolt (1).
Remove bolt (2) and pull steering spindle off of steering gear.
Installation:
Slot of steering spindle faces mark of cap.
Bolt (2) must be in locking groove of steering shaft.
Replace self-locking nuts.
Tightening torque*.



Unscrew left and right nuts.
Press off tie rods with Special Tool 32 2 070.
Installation:
Keep grease out of bore and off of pin.
Replace self-locking nuts.
Tightening torque*.

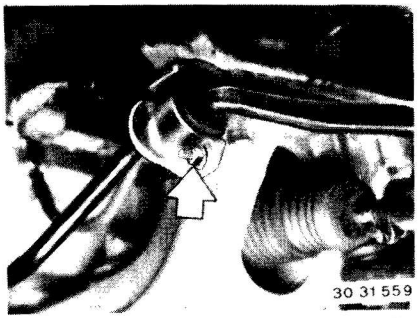


Unscrew left and right nuts.
Press off control arms with Spec. Tool 31 2 160.
Installation:
Keep grease out of bore and off of pin.
Tightening torque*.
Lock nuts with cotter pins.

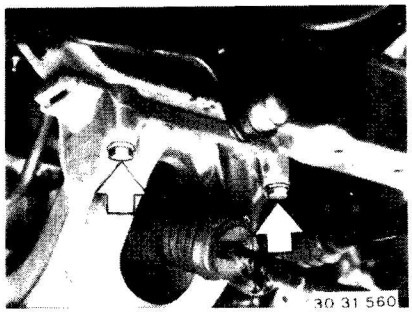


Unscrew left and right control arm brackets.
Installation:
Tightening torque*.

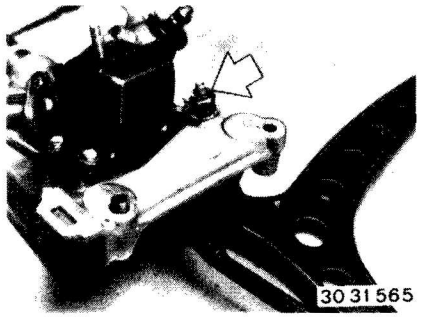
* See Specifications of Groups 31 and 32



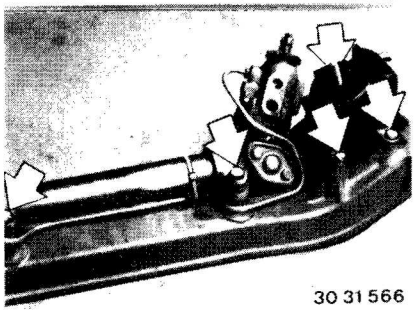
Unscrew left and right stabilizer mounts.



Support front axle carrier with Special Tool 00 2 020 and a workshop jack.
Unscrew bolts and lower front axle carrier.
Installation:
Clean tapped bores.
Always replace and install bolts with a bolt cement**.
Tightening torque*.

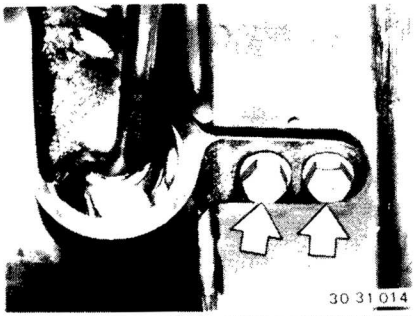


Unscrew both control arms.
Installation:
Mount control arms in installed position, so that rubber parts of tapered joints are not turned wrong.
Replace self-locking nuts.
Tightening torque*.



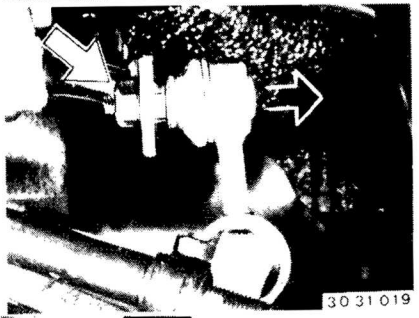
Unscrew engine mounts and steering gear.
Installation:
Replace self-locking nuts.
Tightening torque*.

* See Specifications of Groups 31 and 32
** Source: HWB

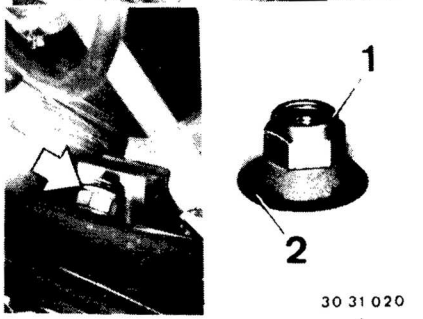

30 31 014

31 12 000 REMOVING AND INSTALLING LEFT OR RIGHT CONTROL ARM

Remove front wheel – see Group 36.
Unscrew holder for control arm.
Installation:
Tightening torque*.

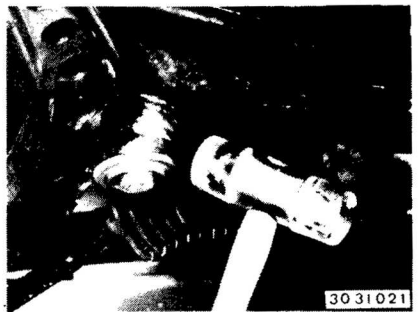

30 31 019

Unscrew push rod on stabilizer.
Installation:
Tightening torque*.

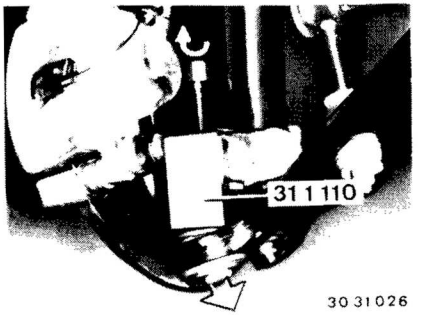


30 31 020

Unscrew nut.
Installation:
Keep grease off of pins and bores.
Install locknut (1) and washer (2) instead of the standard polystop nut.
Tightening torque*.


30 31 021

Knock pin loose with a plastic hammer.

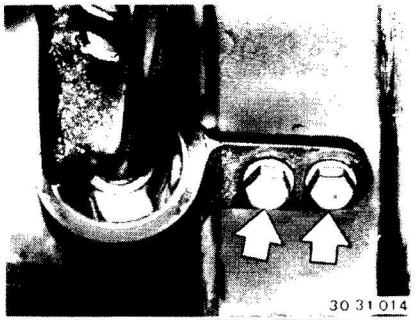


30 31 026

Unscrew nut and press off guide joint with Special Tool 31 1 110 (or 31 2 160 for M 3 cars).
Installation:
Keep grease off of pins and bores.
Replace self-locking nut.
Tightening torque*.

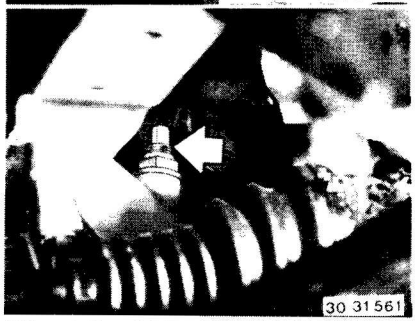
* See Specifications

* See Specifications

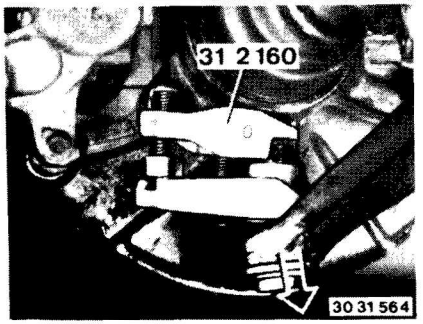


31 12 000 REMOVING AND INSTALLING LEFT OR RIGHT CONTROL ARM
— All Wheel Drive —

Remove front wheel — see Group 36.
Unscrew control arm bracket.
Installation:
Tightening torque*.

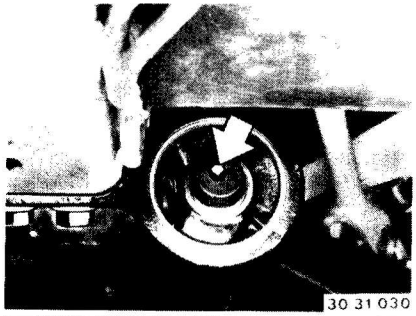


Unscrew nut.
Installation:
Replace self-locking nut.
Tightening torque*.



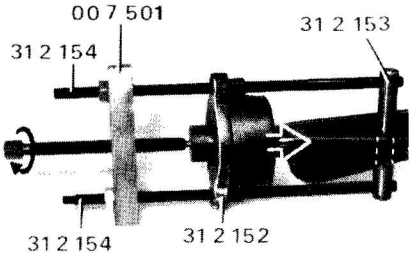
Unscrew nut.
Press off control arm with Special Tool 31 2 160.
Installation:
Keep grease out of bore and off of pin.
Tightening torque*.
Lock nut with cotter pin.

* See Specifications

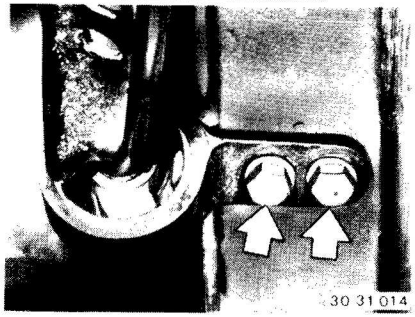


31 12 048 REMOVING AND INSTALLING/ REPLACING BRACKET FOR LEFT OR RIGHT CONTROL ARM

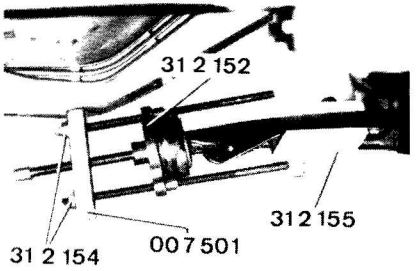
Punch mark center of control arm.



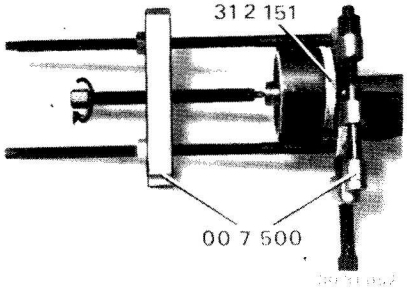
Coat control arm journal with an approved lubricant**.
Engage Special Tool 31 2 153 in control arm bore.
Pull on bracket/mount against stop on control arm with Special Tools 31 2 152/154 and 00 7 501.



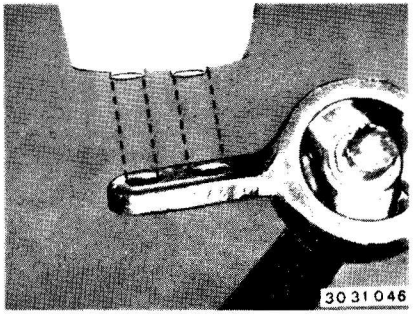
Unscrew control arm bracket.
Remove heat shield, if applicable.
Installation:
Tightening torque*.



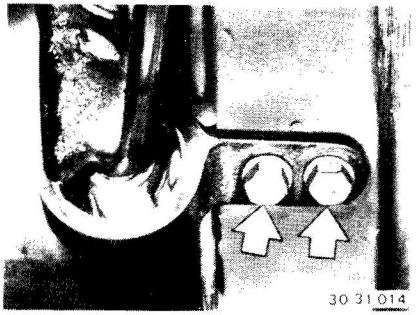
All Wheel Drive:
Use Special Tool 31 2 155 instead of Special Tool 31 2 153.



Pull bracket off of control arm with Special Tools 31 2 151 and 00 7 500.
Important!
Never reuse a rubber mount pulled off of the control arm.
The rubberized inner sleeve will be destroyed when pulled off dry.
Replace rubber mounts 31 12 130.
Always replace left and right mounts and use mounts of same make (visible on mount).



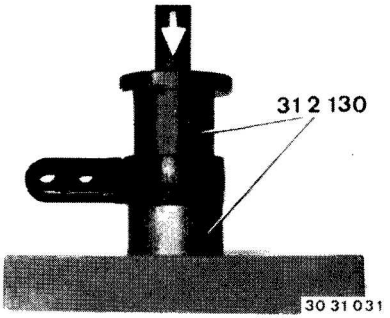
Note:
Centering bores (large diameter) of bracket face engine carrier.



Important!
Bolt bracket on body immediately.
Tightening torque*.
Load down car to normal position*.
Leave car in normal position at least 30 minutes and avoid any suspension movement.
The lubricant will evaporate after 30 minutes, so that the control arm fits tight and is positioned correctly in the rubber mount.
Non-conformance with these procedures could impair handling considerably!

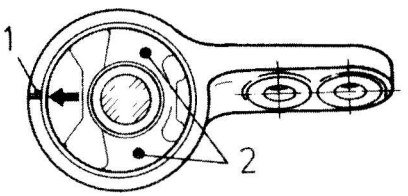
* See Specifications

* See Specifications
** Source: HWB

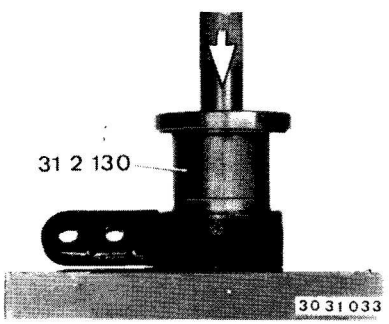


31 12 130 REPLACING RUBBER MOUNT FOR LEFT OR RIGHT CONTROL ARM

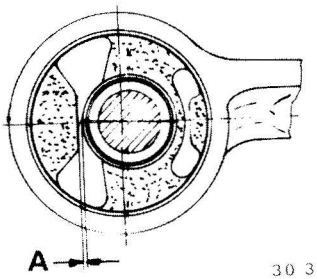
Remove and install control arm bracket 31 12 048.
Press rubber mount out of bracket with Special Tool 31 2 130.
Always replace rubber bearings on both sides and use bearings of same make (visible on bearing).



Installation:
Check installed position!
Arrow on rubber mount faces cast boss (1) on bracket.
Bracket and rubber mount cleaned to remove grease.
Rubber mounts for 6 cylinder and M 3 models are marked with an "orange" paint dot (2).



Press rubber mount into bracket from the angled end of bracket with Special Tool 31 2 130.



Checking Rubber Mount:
Car in normal position*.
Measure gap (A) with a feeler gauge blade.
Nominal value A = 0.7 to 1.7 mm (0.028 to 0.067").
If measured value deviates from nominal value, replace rubber mount.

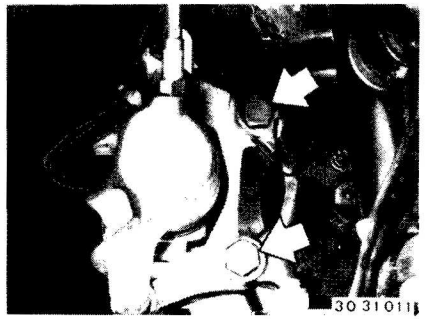
* See Specifications

31 21 121 REMOVING AND INSTALLING LEFT OR RIGHT WHEEL HUB (DRIVE FLANGE)
— All Wheel Drive —

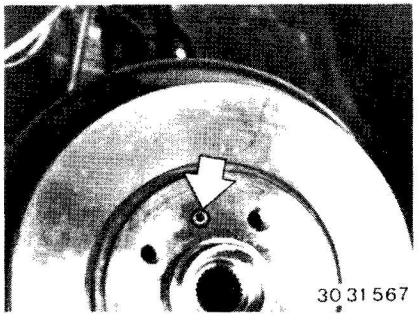
Pulling off the drive flange will destroy the wheel bearing, which must always be replaced.
Procedures are identical with those described in 31 21 151.

31 21 151 REPLACING BEARING OF LEFT OR RIGHT WHEEL HUB (DRIVE FLANGE) – All Wheel Drive –

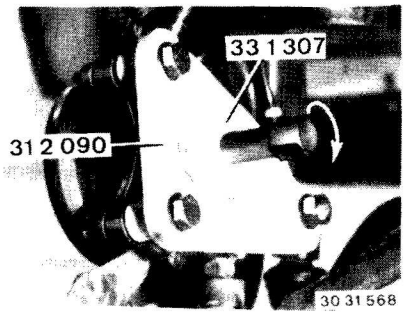
Remove output shaft – 31 60 000.
Mount control arm again finger tight, so that the spring strut is held in position for further procedures.



Unscrew brake caliper and suspend from body on a piece of wire.
Brake line remains connected.
Installation:
Tightening torque*.

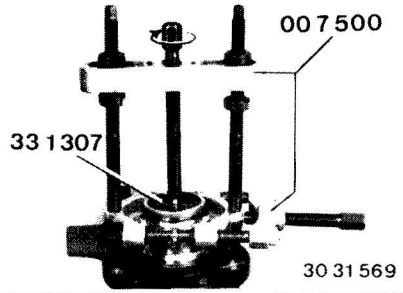


Unscrew brake disc.

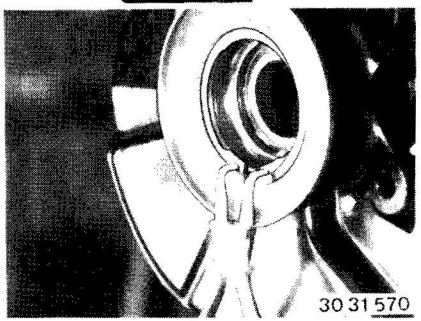


Apply Special Tool 33 1 307.
Mount Special Tool 31 2 090 with the hook attached on tie rod arm and press off the drive flange.

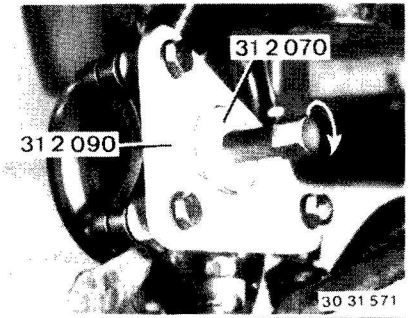
* See Specifications of Group 34



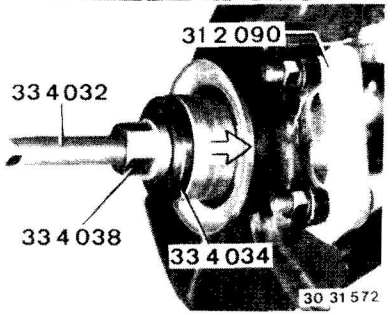
Note:
If applicable, pull bearing inner race off of drive flange with Special Tools 33 1 307 and 00 7 500.



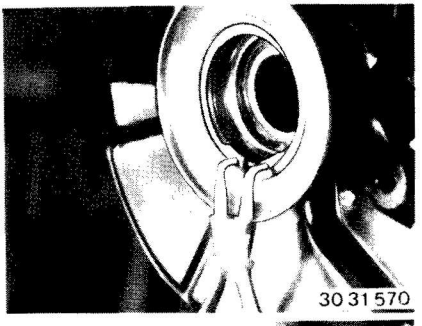
Lift out circlip.



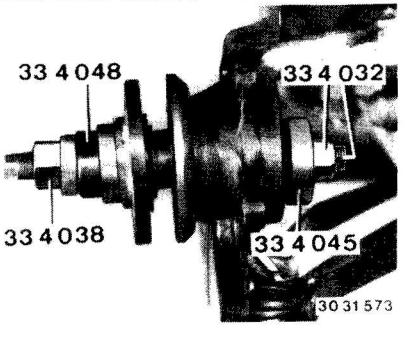
Remove Special Tool 31 2 090, apply Special Tool 31 2 070, mount Special Tool 31 2 090 again and press out bearing.
Special Tool 31 2 090 remains installed.



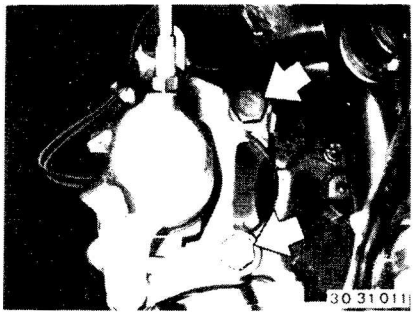
Unscrew spindle of Special Tool 31 2 090 and screw in Special Tool 33 4 032 flush.
Pull in new bearing with Special Tools 33 4 034 and 33 4 038.
Remove Special Tool 31 2 090.



Important!
Install circlip with open end facing down.

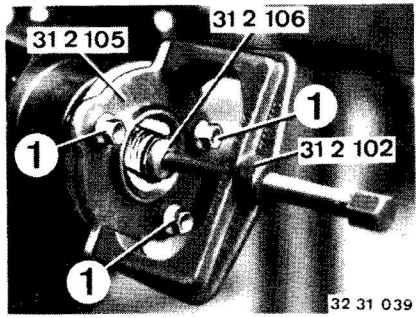


Pull in drive flange with Special Tools
33 4 032 / 038 / 045 / 048.

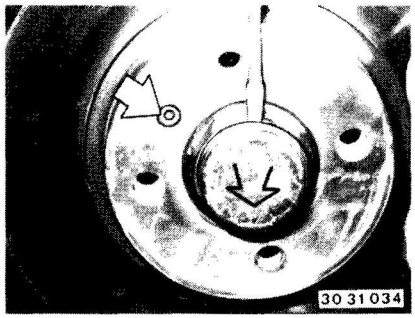


31 21 180 REPLACING BEARING FOR FRONT WHEEL

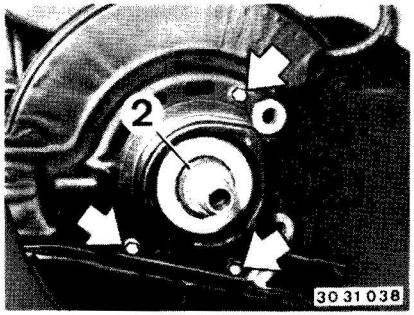
Remove front wheel – see Group 36.
Unscrew and suspend brake caliper from body on a piece of wire – brake hose remains connected.
Installation:
Tightening torque*.



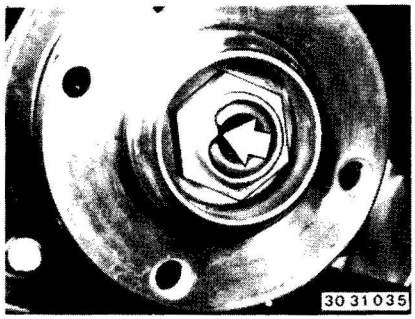
M 3:
Pull off bearing unit with Special Tools 31 2 102/105/106 and wheel bolts (1).
Bearing unit must not be reused.



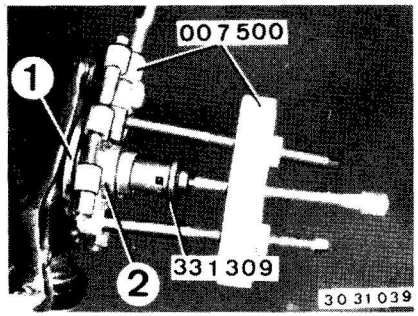
Unscrew brake disc and take off grease cap.
Important!
Always replace grease caps.
Install new grease cap with cement, HWB No. 81 22 8 407 420.



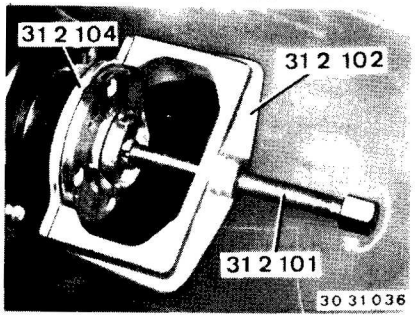
Important!
Remove the guard, if the inside bearing inner race (2) remains on the stub axle after pulling off the bearing unit.



Break the collar nut with a cross chisel and unscrew with Special Tool 11 2 180.
M 3:
Special Tool 31 2 080.
Installation:
Replace collar nut.
Tightening torque*.
Lock collar nut.

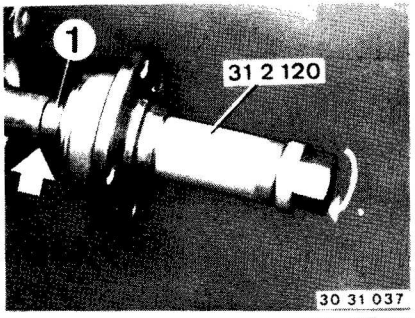


Bend dust guard (1) back and pull off bearing inner race (2) with Special Tool 00 7 500 and Special Tool 33 1 309.
Installation:
Replace dust guard (1).

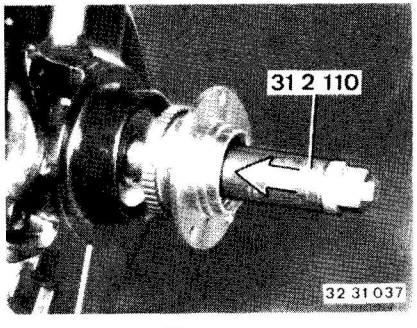


Pull off bearing unit with Special Tools 31 2 101/102/104.
Important!
A pulled off bearing unit must not be reused.

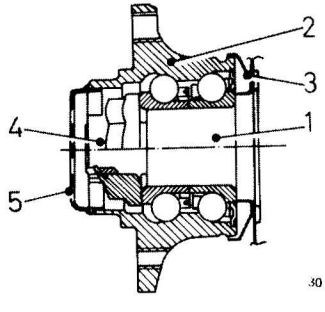
* See Specifications of Gr. 34



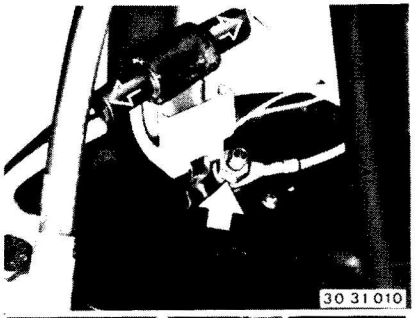
Installation:
If applicable, install guard.
Screw in guide sleeve (1) entire length of threads.
Pull on new bearing unit with Special Tool 31 2 120.
M 3:
Special Tool 31 2 110.



Installation:
M 3:
If applicable, install guard.
Pull on new bearing unit with Special Tool 31 2 110.

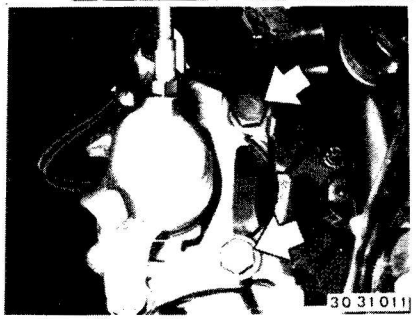


1 Stub axle
2 Wheel hub
3 Dust guard
4 Collar nut
5 Cover

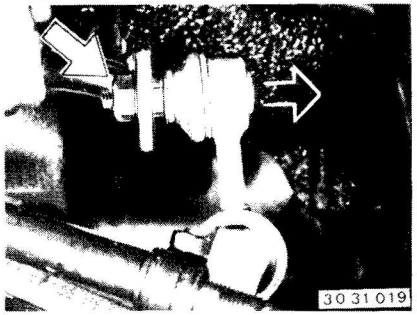


31 31 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT SPRING STRUT ASSEMBLY

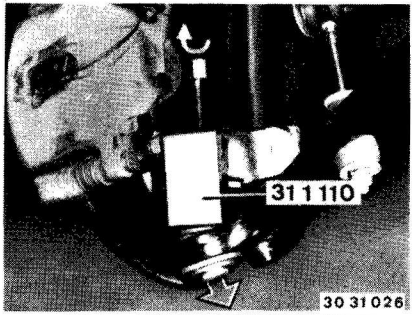
Remove front wheel – see Group 36.
Disconnect plugs for brake pad wear indicator and EDC (see information in Group 37).
Unscrew ground lead.
Disconnect wires and brake hose in holder on spring strut.
Remove ABS pulse sender – see Group 61.



Unscrew brake caliper and suspend from body on a piece of wire – brake hose remains connected.
Installation:
Tightening torque*.

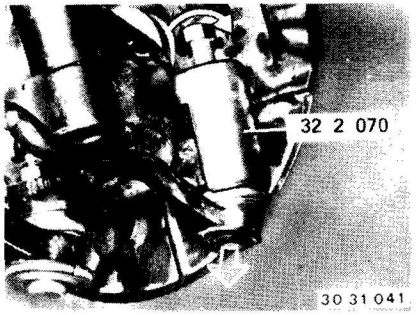


Unscrew push rod on stabilizer.
Installation:
Tightening torque*.

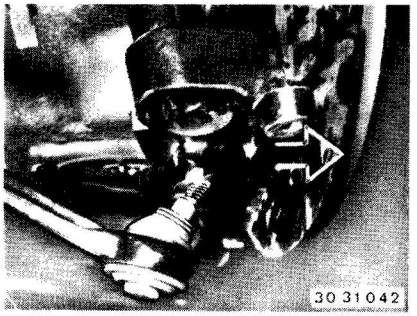


Unscrew nut and press off guide joint with Special Tool 31 1 110 (or 31 2 160 for M 3 cars).
Installation:
Replace self-locking nut.
Keep grease off or out of pin and bore.
Tightening torque*.

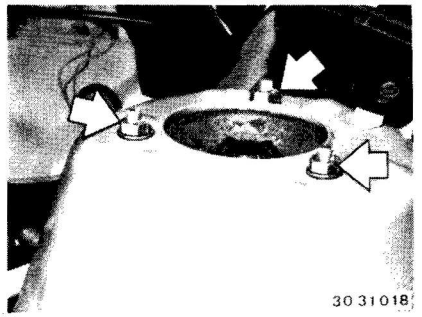
* See Specifications



Unscrew nut and press off tie rod joint with Special Tool 32 2 070 (or 31 2 160 for M 3 cars).
Installation:
Replace self-locking nut.
Keep grease off and out of pin and bore.
Tightening torque*.



Press spring strut out and push over the guide joint pin.



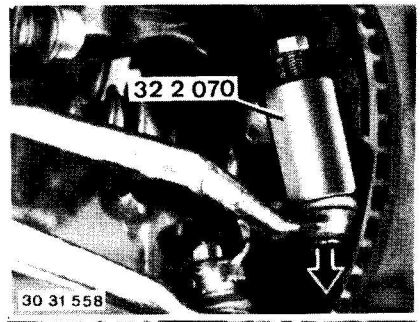
Support spring strut.
Unscrew nuts.
Installation:
Replace self-locking nuts.
Tightening torque*.

Important!
Always store shock absorbers in upright position. If shock absorbers are stored laying down with their piston rods moved in, this could cause a knocking noise when used in car again.
Remedy:
Store shock absorbers standing upright and with piston rods moved out at ambient temperature for 24 hours.

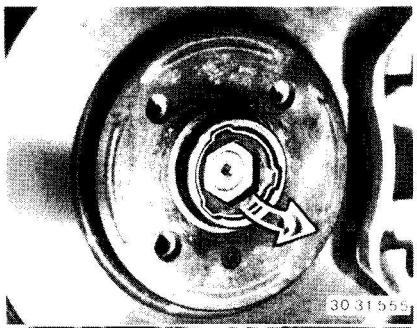
* See Specifications

31 31 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT SPRING STRUT ASSEMBLY – All Wheel Drive –

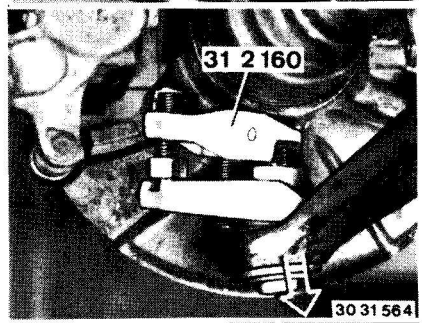
Remove front wheel – see Group 36.
Remove ABS pulse transmitter – see Gr. 61



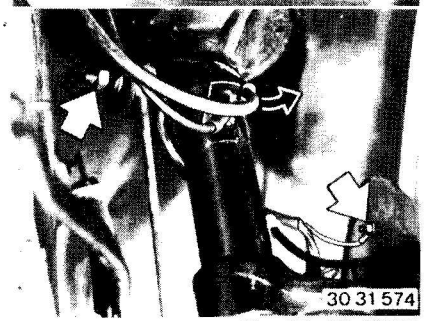
Unscrew nut and press off tie rod joint with Special Tool 32 2 070.
Installation:
Keep grease off of pin and out of bore.
Replace self-locking nut.
Tightening torque*.



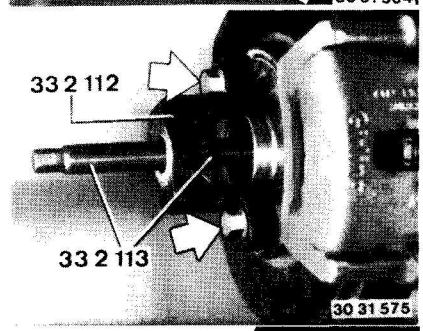
Lift out lockplate with a screwdriver.
Unscrew collar nut.
Installation:
Tightening torque*.
Replace lockplate and lock with Special Tools 00 5 500 and 33 4 050.



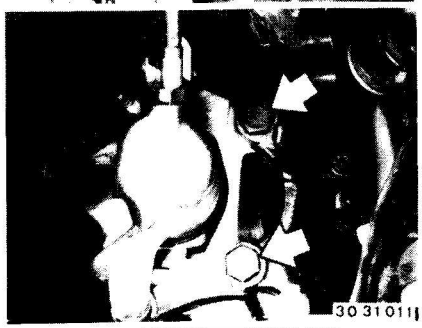
Unscrew nut and press off guide joint with Special Tool 31 2 160.
Installation:
Keep grease out of bore and off of pin.
Tightening torque*.
Lock nut with cotter pin.



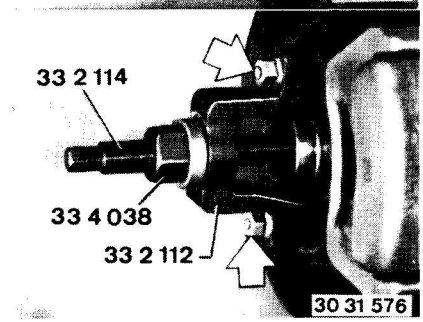
Disconnect brake pad wear indicator plug.
Disconnect ground wire.
Disconnect wires and brake hose on spring strut holders.
Unscrew push rod.
Installation:
Tightening torque*.



Mount Special Tools 33 2 112 / 113 with two wheel bolts and press off output shaft.



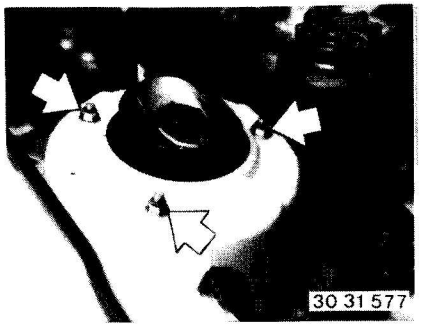
Unscrew brake caliper and suspend from body on a piece of wire.
Brake line remains connected.
Installation:
Tightening torque*.



Installation:
Lubricate splines of output shaft lightly with oil and pull in output shaft with Special Tools 33 2 112, 33 2 114 and 33 4 038.

* See Specifications of Gr. 31 and 34

* See Specifications of Gr. 31 and 32

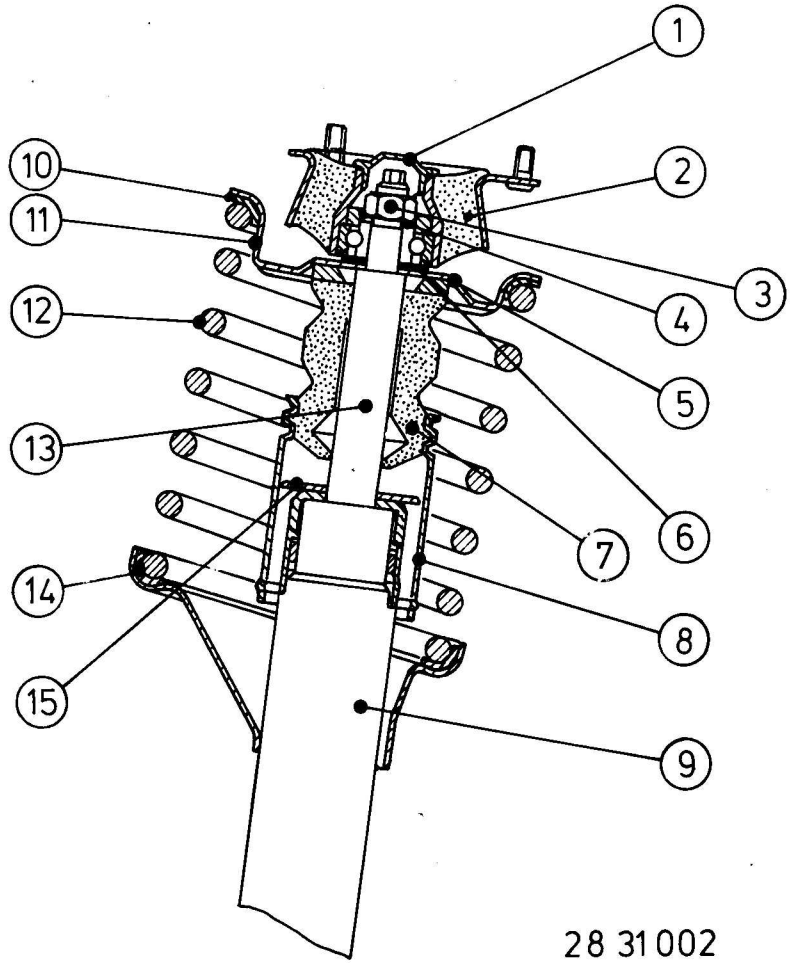


Support spring strut.
Unscrew nuts.
Installation:
Replace self-locking nuts.
Tightening torque*.

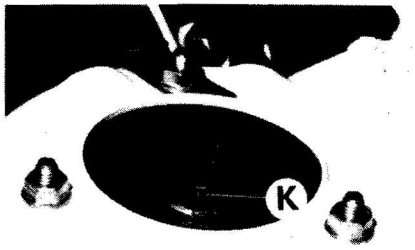
* See Specifications

LAYOUT DRAWING OF SHOCK ABSORBER WITH MOUNT AND COIL SPRING

1 Cap
2 Mount
3 Self-locking nut
4 Washer
5 Insulator
6 Washer
7 Rubber damper
8 Protective tube
9 Spring strut tube
10 Upper rubber ring
11 Upper spring retainer
12 Coil spring
13 Shock absorber piston rod
14 Lower rubber ring
15 Screw-on ring



28 31 002

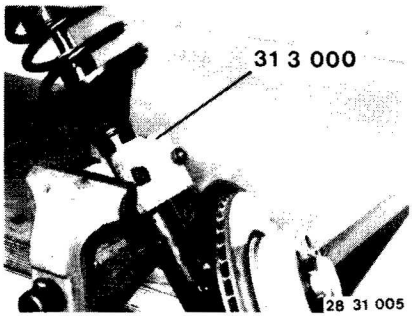


28 31 035

31 32 001 REPLACING FRONT SPRING STRUT SHOCK ABSORBER

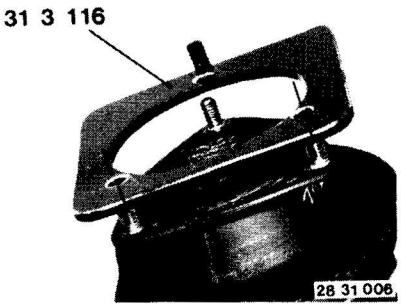
Important!
Always replace shock absorbers with ones having same code K.
To know whether shock absorbers have to be replaced, check installed absorbers with a "Shock Tester" or removed in an absorber testing machine.
Also refer to Service Information 37 02 83 (177).

Cars with Electronic Absorber Control (EDC):
Refer to information in Group 37.



28 31 005

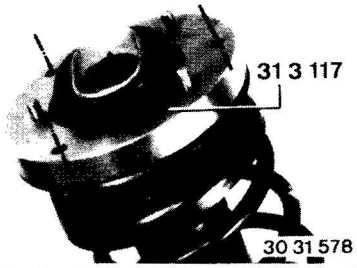
Remove spring strut assembly – see 31 31 000.
Take up spring strut in a vise with Special Tool 31 3 000.



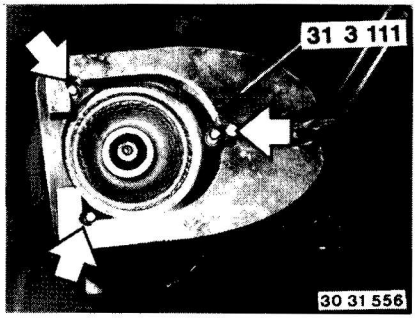
28 31 006

Set up Special Tool 31 3 116 on mount.

All Wheel Drive Cars:
Set up Special Tool 31 3 117 on mount.

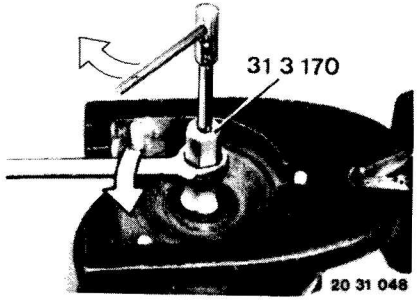


30 31 578



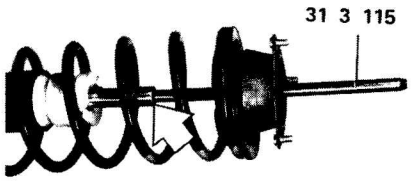
30 31 556

Compress coil spring with Special Tool 31 3 111.
Important!
Pins must fit in openings.



20 31 048

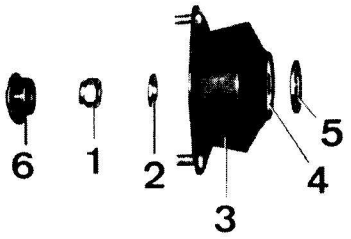
Lift off cap.
Unscrew self-locking nut with Special Tool 31 3 170 – counterholding on the piston rod.
Installation:
Replace self-locking nut.
Tightening torque*.



28 31 020

Take off washer (2).
Screw in Special Tool 31 3 115 entire length of threads.
Release and take off special tool compressor.

* See Specifications

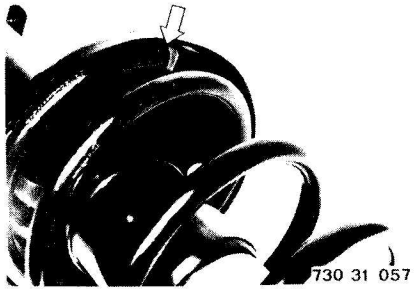


20 31 045

Take off mount.

Installed Order:
1 Self-locking nut
2 Washer with small diameter
3 Mount
4 Insulator
5 Washer with large diameter
6 Cap

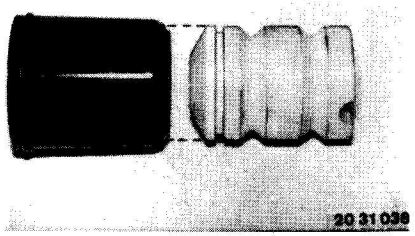
Inside curved surface of insulator (4) faces mount.



730 31 057

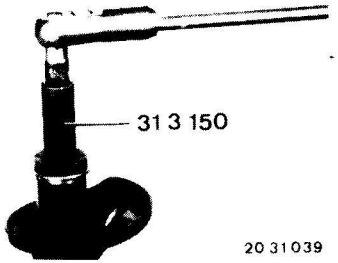
Lift off upper spring retainer with rubber ring and coil spring.

Installation:
Check upper and lower rubber rings, replacing if necessary.
Ends of coil spring must rest on shoulders in lower and upper spring retainers.



20 31 038

Installation:
Check protective tube and rubber damper or rubber bellows, replacing if necessary.

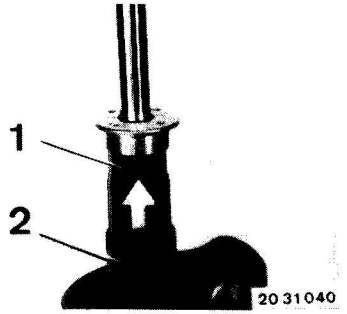


20 31 039

Unscrew screwed-on ring with Special Tool 31 3 150 or 31 3 180.

Installation:
Tightening torque*.

* See Specifications



20 31 040

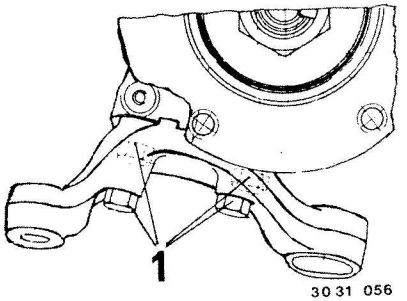
Pull out shock absorber (1).

Installation:
Remove old oil from spring strut tube (2). Fill new shock absorber with engine oil** prior to installing. Engine oil will carry off heat from shock absorber to the spring strut tube.

Important!
Single-pipe gas pressure cartridges, recognized on piston rod diameter of at least 33 mm (1.299") may not be installed with oil.
See Service Information of Group 37.

Only store shock absorbers standing upright. If shock absorbers are stored laying down with their piston rods run in, this could cause rattling or knocking noise when used in car again.

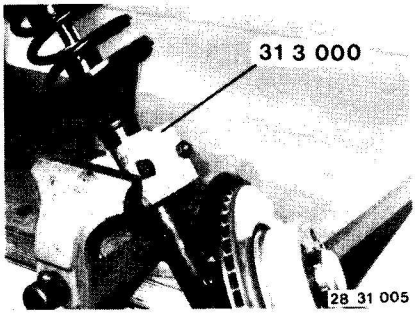
Remedy:
Store shock absorbers in upright position with piston rods run out at room temperature for 24 hours.



30 31 056

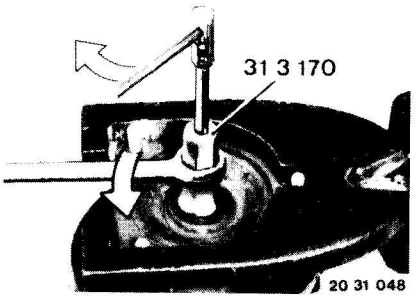
M 3 with EDC:
Install bolts (1) with a bolt cement***.
Tightening torque*.

* See Specifications
** See Operating Fluids
*** Source of Supply: HWB

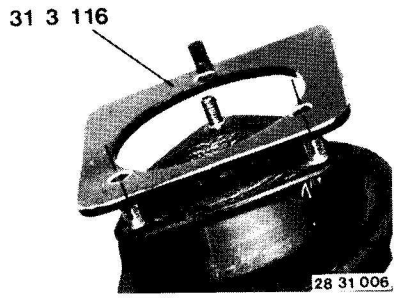


31 33 001 REPLACING SPRING STRUT MOUNT

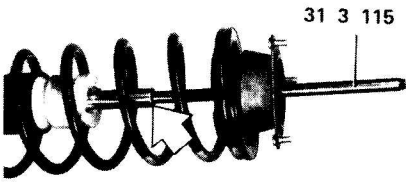
Remove spring strut assembly – see 31 31 000.
Take up spring strut in a vise with Special Tool 31 3 000.
Important!
If a correction mount (see Group 32) is used, install a new mount with the same code.



Pull off cap.
Unscrew self-locking nut with Special Tool 31 3 170.
Installation:
Replace self-locking nut.
Tightening torque*.

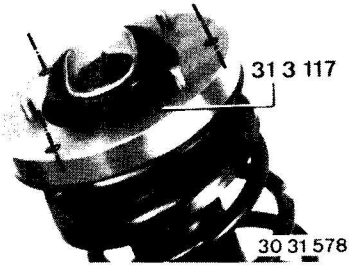


Set up Special Tool 31 3 116 on mount.

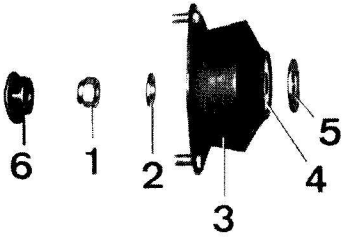


Remove washer (2).
Screw in guide sleeve 31 3 115 entire length of threads.
Release and remove special tool compressor.

28 31 020

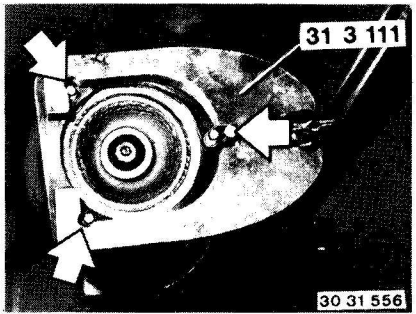


All Wheel Drive Cars:
Set up Special Tool 31 3 117 on mount.

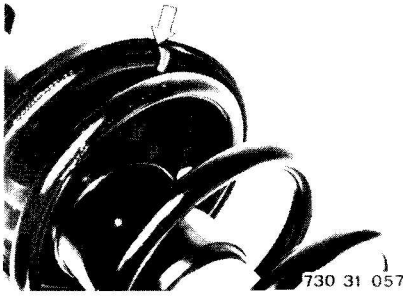


Lift off mount.
Installed Order:
1 Self-locking nut
2 Washer with small diameter
3 Mount
4 Seal
5 Washer with large diameter
6 Cap
Internal curved surface of seal (4) faces the mount.

20 31 045

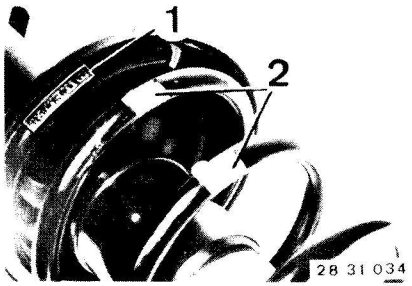


Compress coil spring with Special Tool 31 3 111.
Important!
Pins must fit in openings.



Lift off upper spring retainer with rubber ring and coil spring.
Installation:
Check upper and lower rubber rings, replacing if necessary.
Ends of coil spring must rest on shoulders in lower and upper spring retainers.

* See Specifications

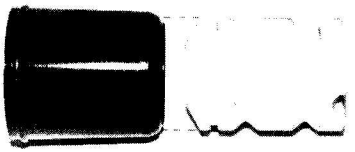


31 33 100 REMOVING AND INSTALLING/ REPLACING LEFT OR RIGHT FRONT SPRING STRUT COIL SPRING

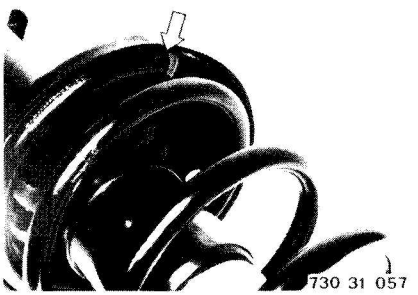
Remove spring strut mount 31 33 001.
Remove upper spring retainer with rubber ring and coil spring.
Important!
Only install pairs of springs on one axle with same BMW number (1) (on end of spring) and same color code (2) (either with or without a red paint stripe).
Refer to spare part microfiche for cross reference of springs and vehicle types as well as, if applicable, special equipment (air conditioner, sport suspension, etc.) and introduction dates.

The BMW number on the spring can be used to find the spare part number and therefore the spring belonging to a vehicle type as shown on the spare part microfiche.
Example:
1. Spring with red color code:
   Number on spring, e.g. 1 125 332
   Add 1 = part number = 1 125 333

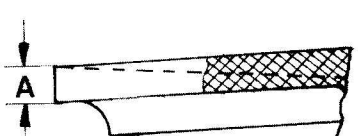
2. Spring without red color code:
   Number on spring, e.g. 1 125 332
   Add 2 = part number = 1 134



Installation:
Check protective tube and rubber damper, replacing if necessary.

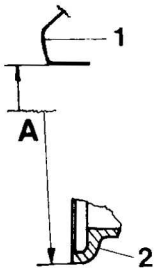


Installation:
Check upper and lower rubber rings, replacing if necessary.
Ends of coil spring must rest on shoulders in lower and upper spring retainers.



Installation:
Install upper rubber ring* with thickness (A) for coil springs with red color code.
A = 9 mm (0.354").

* See Specifications of Gr. 31



28 32 091

31 33 ... CHECKING AND CORRECTING HEIGHT

– Load down car to normal position*.

– Measure actual height (A) from wheel house lower edge (1) to rim flange (2) at center of wheel height.
Determine the mean value of each wheel after lifting and lowering the car body, and then the mean value of the axle.

– Determine any deviation from the nominal height value*.

– Identify the installed springs – see 31 33 100.

– Find correction spring in the table. The numbers are height deviation (nominal values in mm) between the pertinent springs.

Example:

The car is equipped with coil springs having BMW No. 1 126 516 and is, for example, 7 mm (0.275") too deep due to so many optional extra equipment parts.
The nominal height is reached by installing springs with BMW No. 1 127 282 (see 31 33 100 for determination of part numbers).

Table for 318 i, 325 e up to 1986 Models:

A = Equipment after correction
B = Equipment of delivered car
a = Adjusted higher
b = Adjusted lower

Information:
Thick spring ring for coil springs with red stripe.
Thin spring ring for coil springs without red stripe.
The height can be adjusted additionally by ± 5 mm (0.197") by exchanging these spring rings.

B \ A	1 127 935	1 126 397	1 127 279	1 126 516	1 127.282	1 128 349	1 129 880	1 125 341	1 127 503	1 125 726
1 127 935		+6	+14	+20						
1 126 397	-6		+8	+14	+21					
1 127 279	-12	-7		+7	+14	+20				
1 126 516		-12	-7		+7	+14	+20			
1 127 282			-12	-7		+7	+13	+19		
1 128 349				-12	-6		+6	+11	+16	
1 129 880					-11	-5		+4	+9	+15
1 125 341						-9	-4		+4	+10
1 127 503							-8	-4		+6
1 125 726								-10	-6	

* See Specifications

Table for 325 e and 325 i since 1987 Models:
(see 31 33 . . . for explanations)

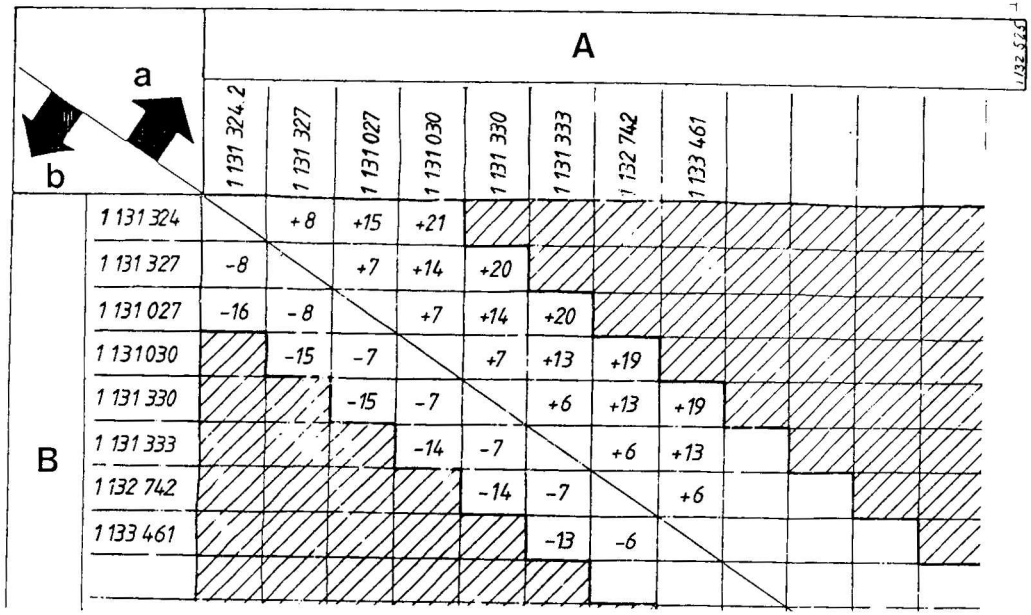


Table for Convertibles:
(see 31 33 . . . for explanations)

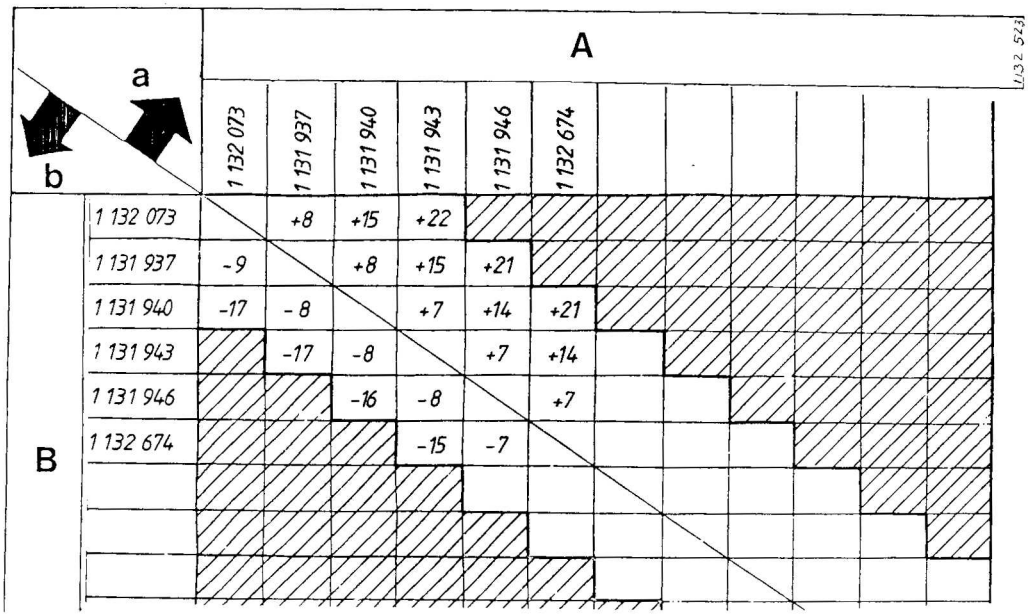


Table for Four Wheel Drive Cars:
(see 31 33 . . . for explanations)

Information:
Only install coil springs with stripes of red paint together with thick rubber rings 1 124 322.
Additional height corrections with rubber rings are not possible.

a \ A / b \ B	1 127 282	1 128 349	1 129 880	1 125 341	1 127 503	1 125 726	1 126 904
1 127 282		+7	+12	+16			
1 128 349	-7		+5	+9	+14		
1 129 880	-13	-6		+4	+9	+15	
1 125 341		-10	-5		+5	+11	+18
1 127 503			-9	-5		+6	+14
1 125 726				-12	-7		+8
1 126 904					-15	-9	

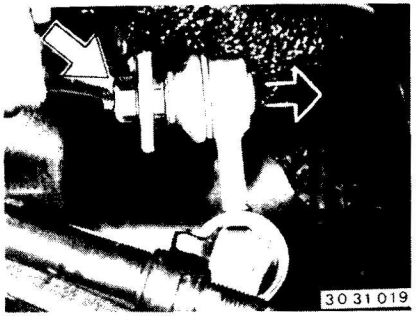
Four Wheel Drive Cars with M-Technic
(see 31 33 . . . for explanations)

Information:
See above.

a \ A / b \ B	1 133 542	1 133 543	1 133 544
1 133 542		+ 7	+ 14
1 133 543	- 7		+ 7
1 133 544	- 15	- 7	

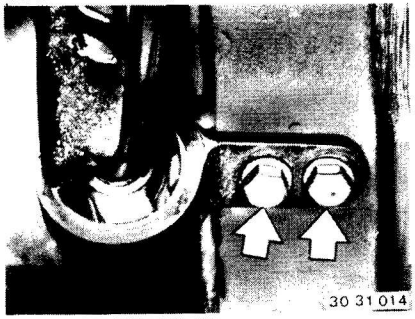
Table for M-Techic Sport Running Gear; Not for Convertibles and Four Wheel Drive Cars:
(see 31 33 . . . for explanations)

a / b	A: 1 130 037	A: 1 130 040	A: 1 130 043	A: 1 130 046	A: 1 130 049	A: 1 130 054
B: 1 130 037		+8	+15	+21		
B: 1 130 040	-8		+8	+15	+20	
B: 1 130 043	-16	-8		+7	+14	+19
B: 1 130 046		-15	-7		+7	+14
B: 1 130 049			-14	-7		+7
B: 1 130 054				-14	-7	

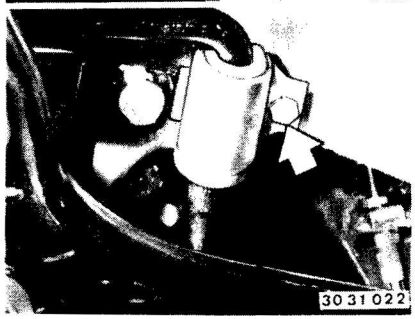


31 35 000 REMOVING AND INSTALLING OR REPLACING FRONT STABILIZER

Disconnect thrust rods on stabilizer at left and right sides.
Installation:
Tightening torque*.



Disconnect left bracket for control arm.
Installation:
Tightening torque*.



Disconnect left and right stabilizer mounts.
Remove stabilizer.
Installation:
Tightening torque*.

* See Specifications

TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Grinding noise (louder in curves)	Wheel bearings defective	Replace wheel bearings (wheel hub)
Vibration	Wheels unbalanced	Balance wheels
	Wheel rim lateral/radial runout	Replace rims, if necessary
	Tire lateral runout	Match or replace tires
	Output shaft defective	Replace output shaft
Steering wheel shake	Wheels unbalanced	Balance wheels
	Wheel rim lateral/radial runout	Replace rims, if necessary
	Shock absorber effect insufficient	Replace shock absorbers
	Control arm rubber mounts defective	Replace control arm rubber mounts
	Output shaft defective	Replace output shaft
Rattling noise	Shock absorber cartridge loose in spring strut	Tighten threaded ring (inspect threads)
	Ball joints of control arms worn	Replace control arms
	Stabilizer rubber mounts worn	Replace rubber mounts
	Front axle carrier mounted loosely on body	Tighten bolts (inspect threads)
Load change knock	Backlash excessive	Adjust backlash
	Output shaft defective	Replace output shaft
Acceleration or deceleration noise	Backlash excessive or insufficient	Adjust backlash
Oil loss	Radial oil seals leak	Replace radial oil seal
	Vent plugged	Clean vent
	Oil grade* incorrect	Replace front axle final drive oil

* See Service Information of Gr. 00

TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Long after-swinging of body after passing over rough road	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers
Wipping of body when passing over successive rough road surfaces	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers
Rising of body when accelerating	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers
Wheels jumping even on normal road surfaces	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers
Car breaking out when braking	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers
Breaking out (skidding) in curves due to poor track holding	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers

TROUBLESHOOTING SHOCK ABSORBERS

The condition of shock absorbers can only be checked with a Shock Tester or in a shock absorber testing machine.

Condition	Cause	Correction
Shock absorbers knocking (bottoming)	a) Rubber damper defective	a) Check/replace rubber damper
	b) Shock absorber efficiency insufficient	b) Replace shock absorber
Shock absorber noise	a) Shock absorber cartridge loose	a) Tighten threaded ring – inspect threads
	b) Installed shock absorber had been stored laying down with piston rod run in	b) Store shock absorber standing upright at room temperature 24 hours and with piston rod run out
	c) Shock absorber defective	c) Replace shock absorber
Poor handling	a) Shock absorber efficiency weak	a) Replace shock absorber
Flat spots on tire treads	a) Shock absorber defective	a) Replace shock absorber

FRONT AXLE FINAL DRIVE

Type of teeth:	Gleason hypoid spiral teeth, right-hand spiral direction – code F 86 on ring gear and pinion –.
Ratio*:	On data plate (oil sump).
Oil grade:	See Operating Fluids
Oil volume*:	Pour in oil slowly – recheck oil level approx. 30 seconds after the first overflow.

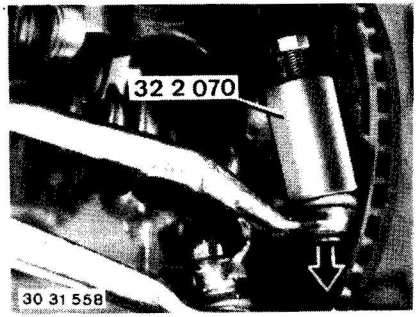
Breaking-in Procedures After Replacing or Repairing Front Axle Final Drive:

Max. permissible road speed during the first 1,000 km (600 miles) = 2/3rds of the top speed.
The breaking-in procedures and oil change intervals for new cars are applicable.
The driver must be reminded with a label or tag.

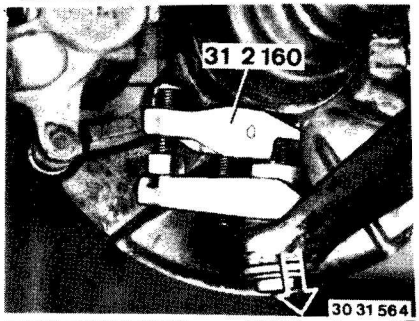
* See Specifications

31 50 000 REMOVING AND INSTALLING OR REPLACING FRONT AXLE FINAL DRIVE

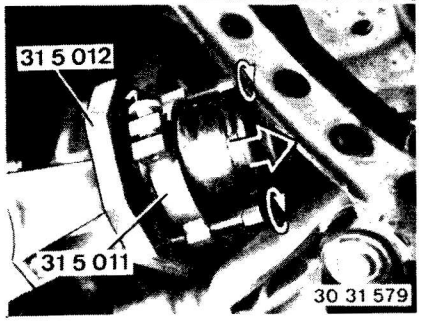
Remove front propeller shaft – see Gr. 26.
Remove left front wheel – see Gr. 36.
Unscrew splash guard – see Gr. 51.



Unscrew left nut and press off tie rod with Special Tool 32 2 070.
Installation:
Keep grease out of bore and off of pin.
Replace self-locking nut.
Tightening torque*.



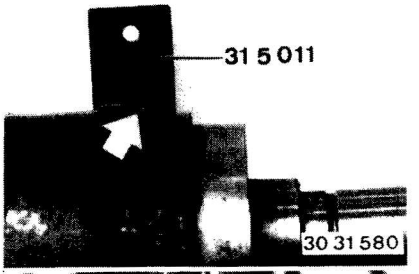
Unscrew left nut and press off control arm with Special Tool 31 2 160.
Installation:
Keep grease out of bore and off of pin.
Tightening torque*.
Lock nut with cotter pin.

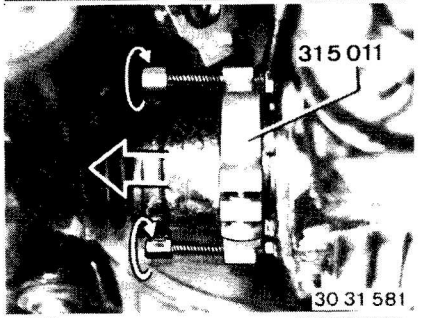


Pull right output shaft out of front axle final drive by approx. 15 mm (0.591") with Special Tools 31 5 011 / 012.
Press in pressure spindle alternately.

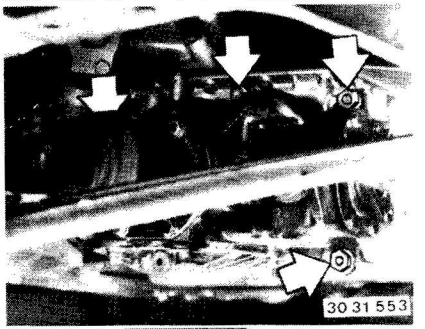
* See Specifications

Note:
Ring of Special Tool 31 5 011 is located in groove of shaft.

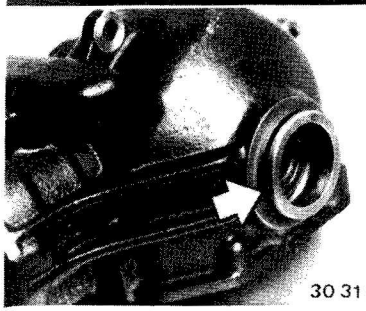




Pull off left output shaft with Special Tool 31 5 011.
Pressure spindle rests on bolt head.
Screw in pressure spindles alternately.
Push spring strut toward outside until output shaft slides out of front axle final drive.
Installation:
See 31 60 000.



Unscrew nuts and take off front axle final drive.
Installation:
Tightening torque*.



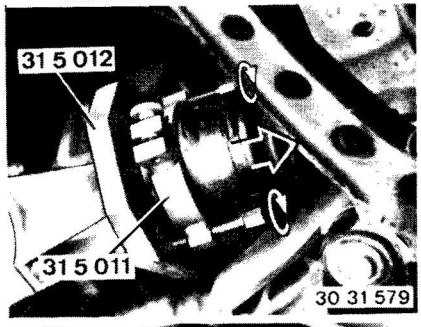
Note:
Replace seal.

* See Specifications

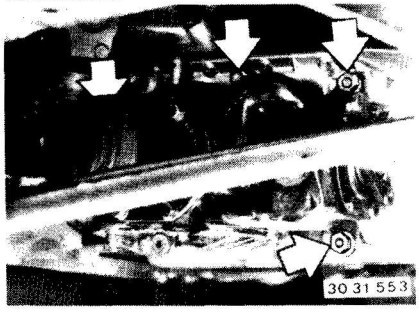
31 51 010 REPLACING SHAFT SEAL FOR INPUT FLANGE OF FRONT AXLE FINAL DRIVE

Remove splash guard – see Gr. 51.
Remove front propeller shaft – see Gr. 26.

Drain final drive oil.
Installation:
Pour in final drive oil**.
Tightening torque*.

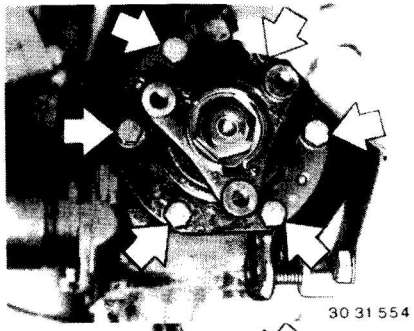


Pull right output shaft out of front axle final drive by approx. 15 mm (0.591") with Special Tools 31 5 011 / 012.
Installation:
See note for output shaft.

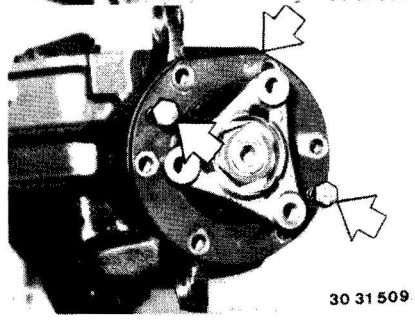


Unscrew nuts and press front axle final drive away from engine oil pan by 10 to 15 mm (0.394 to 0.591").
Installation:
Tightening torque*.

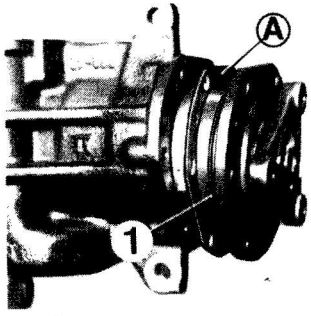
* See Specifications
** See Operating Material Specifications



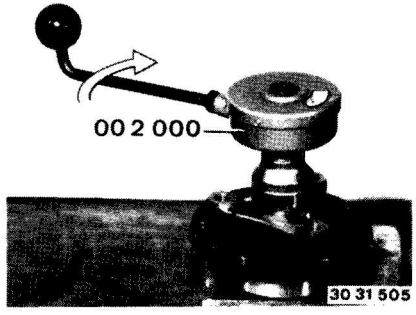
Unscrew bolts.
Installation:
Flat surface on drive set faces flat surface on case.
Tightening torque*.



Pull drive set out of case by screwing in two M 8 x 30 bolts uniformly.

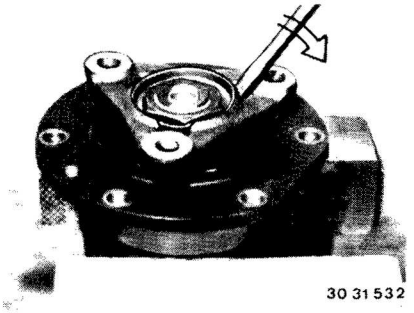


Installation:
Install shim (A) again and replace seal (1).

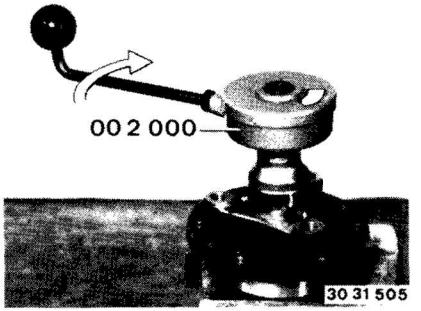


Clamp drive set in vise fitted with aluminum jaws.
Measure friction torque with Special Tool 00 2 000 while turning uniformly and note value.

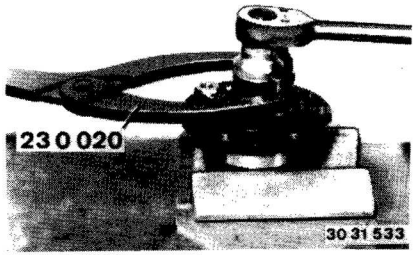
* See Specifications



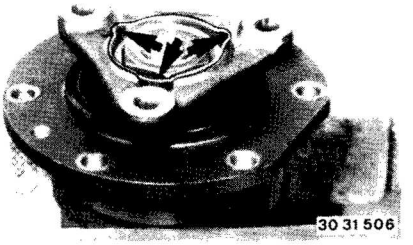
Lift out lockplate with a screwdriver.



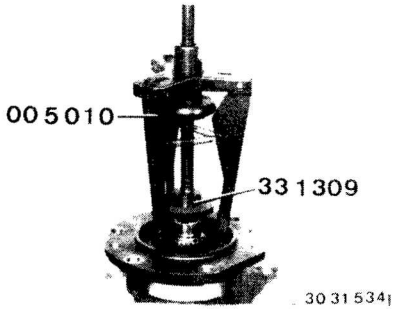
Mount flange and tighten collar nut in steps until previously measured friction torque + 0.2 Nm (1.4 ft. lbs.) for new shaft seal is reached.



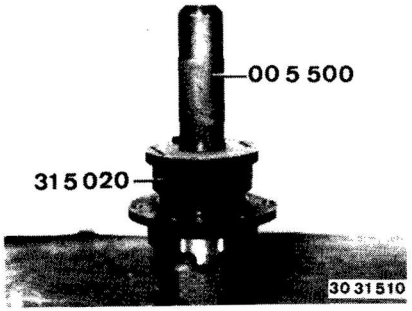
Hold flange with Special Tool 23 0 020 and unscrew collar nut.
Take off flange.
Note:
Replace flange, if bearing surface on flange for the shaft seal is scored seriously.



Install and lock new lockplate.



Pull out shaft seal with Special Tools 00 5 010 and 33 1 309.

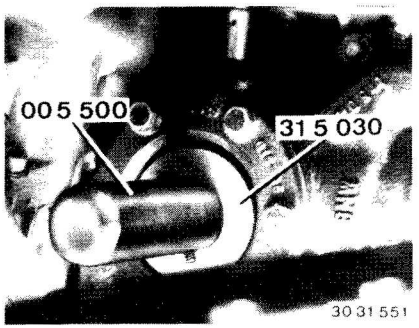


Dip shaft seal in gear lube* and drive in against stop with Special Tools 00 5 500 and 31 5 020.

* See Specifications

31 51 015 REPLACING SHAFT SEAL FOR LEFT OUTPUT SHAFT

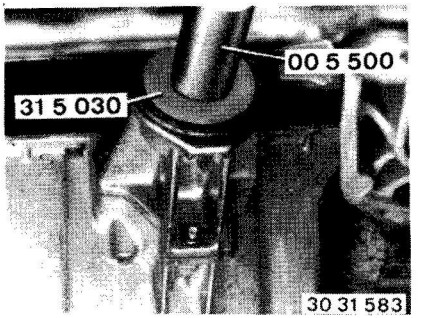
Remove output shaft 31 60 000, however only loosen collar nut of output shaft.



Lift out shaft seal.
Dip new shaft seal in gear lube and drive in against stop with Special Tools 31 5 030 and 00 5 500.

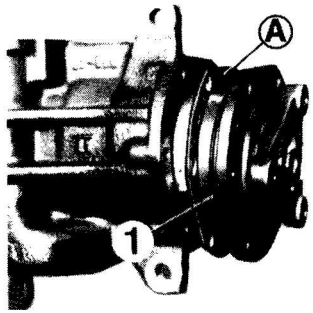
31 51 020 REPLACING SHAFT SEAL FOR RIGHT OUTPUT SHAFT

Remove output shaft 31 60 000.



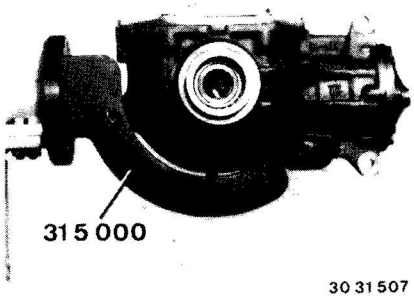
Lift out shaft seal.
Dip new shaft seal in gear lube and drive in against stop with Special Tools 31 5 030 and 00 5 500.

31 52 505 REMOVING AND INSTALLING DRIVE SET
– Front Axle Final Drive Removed –



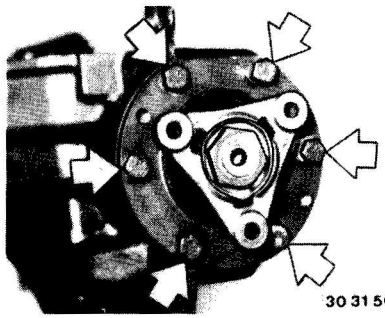
30 31 511

Measure and note thickness of shim (A).
Installation:
Replace seal (1).



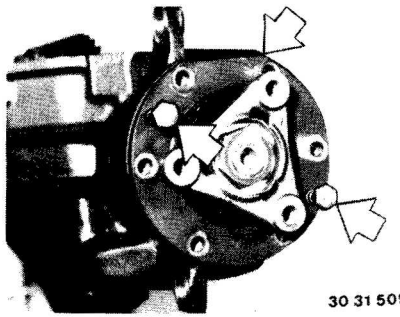
30 31 507

Mount front axle final drive in an assembly stand with Special Tool 31 5 000.



30 31 508

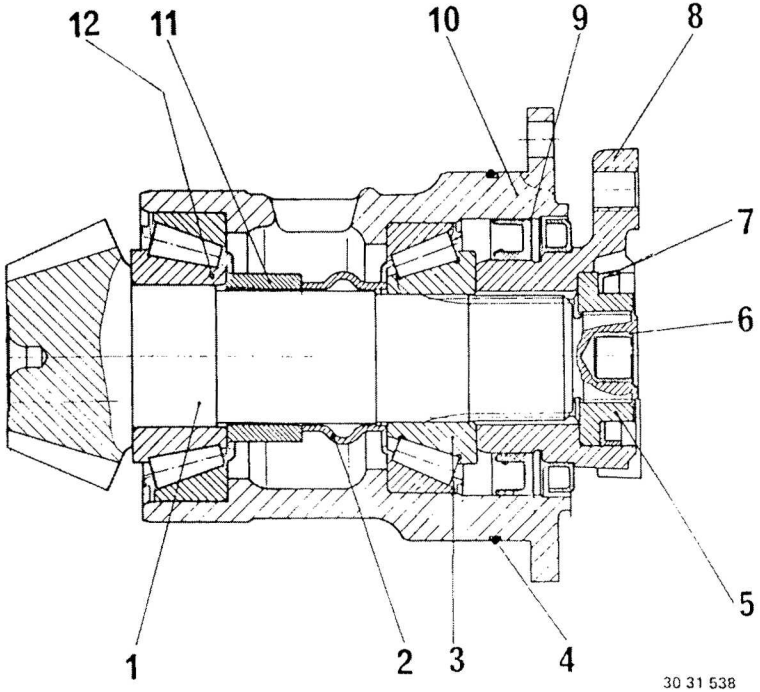
Unscrew bolts.
Installation:
Tightening torque*.



30 31 509

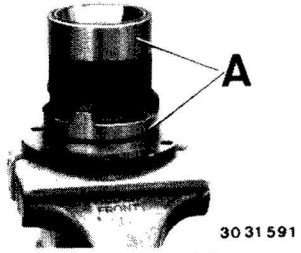
Pull drive set out of case by screwing in two M 8 x 30 bolts uniformly.
Installation:
Flat surfaces of drive set faces flat surface on case.

* See Specifications

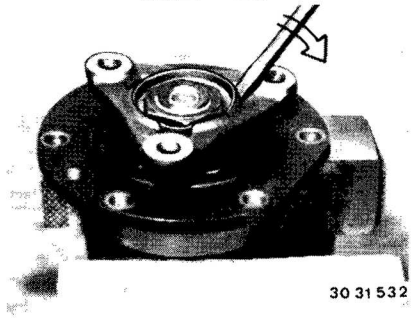


1 Bevel gear
2 Bushing
3 Tapered roller bearing
4 O-ring
5 Collar nut
6 Centering sleeve
7 Lockplate
8 Flange
9 Shaft seal
10 Case
11 Bushing
12 Tapered roller bearing

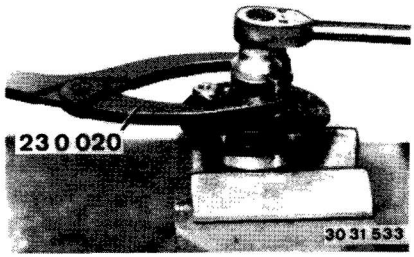
31 52 510 REPLACING BEARINGS FOR DRIVE PINION
– Front Axle Final Drive Removed –



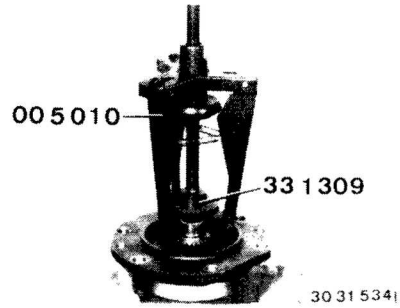
Always replace both bearings.
Remove drive set of front axle final drive – 31 52 505.
Important!
Surfaces A are finish machined (fit) – be careful not to damage them.



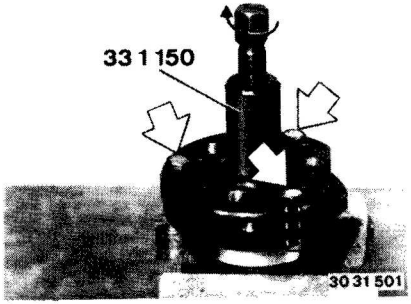
Clamp drive set in a vise fitted with aluminum jaws.
Lift out lockplate with a screwdriver.



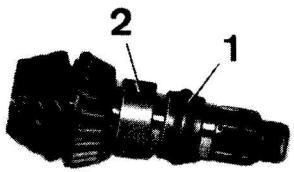
Hold flange with Special Tool 23 0 020 and unscrew collar nut.
Take off flange.
Note:
Replace flange, if shaft seal bearing surface on flange is scored seriously.



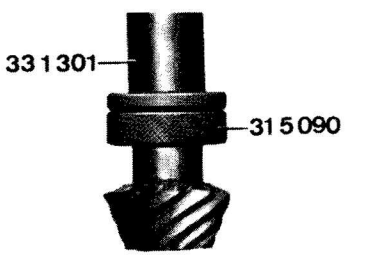
Pull out shaft seal with Special Tools 00 5 010 and 33 1 309.



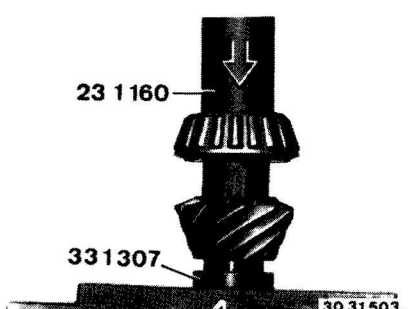
Bolt down Special Tool 33 1 150 with M 8 x 30 bolts and nuts.
Press off bevel gear.



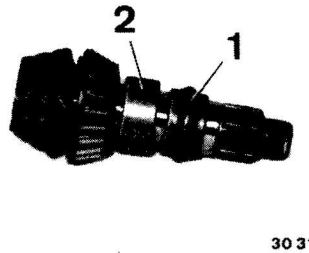
Take off bushing (1) and spacer (2).



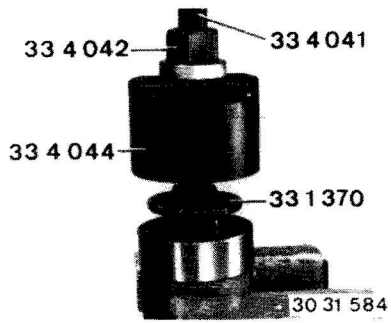
Pull off tapered roller bearing with Special Tools 31 5 090 and 33 1 301.



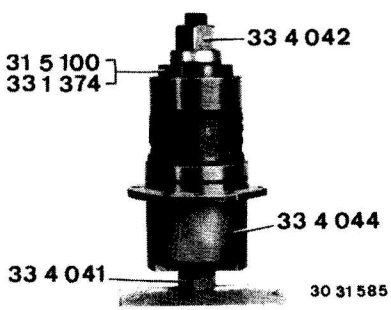
Press on new bearing with Special Tools 23 1 160 and 33 1 307.



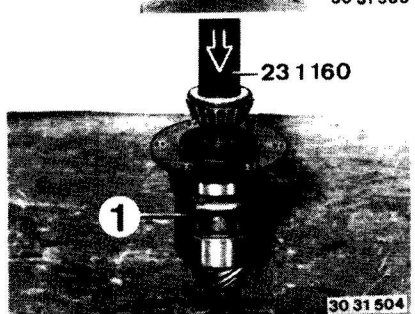
Install spacer (2) and new bushing.



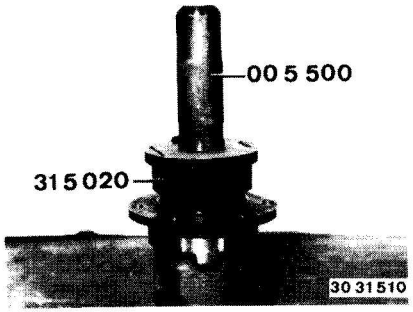
Press both bearing outer races out of case with Special Tools 33 1 370, 33 4 041 and 33 4 042 / 044.



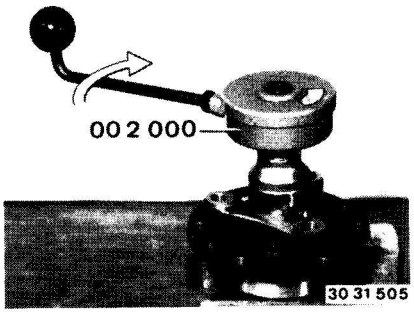
Press in new bearing outer races with Special Tools 31 5 100, 33 1 374 and 33 4 041 / 042 / 044.



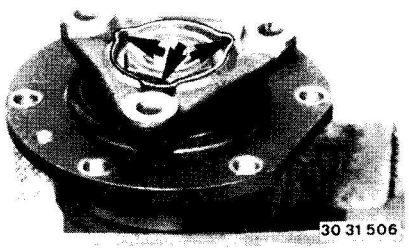
Slide bevel gear into case (1).
Drive in new bearing with Special Tool 23 1 160 far enough that rollers have light contact on bearing outer race.



Dip new shaft seal in gear lube and drive in against stop with Special Tools 31 5 020 and 00 5 500.



Mount flange and tighten collar nut in steps until specified friction torque* is reached, turning uniformly with Special Tool 00 2 000.
Replace bushing and repeat adjusting procedures, if friction torque is exceeded.

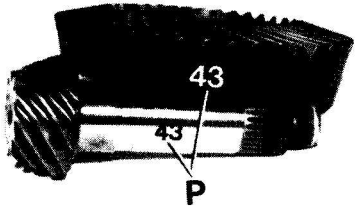


Install and lock new lockplate.
Important!
Because of new bearings, it is necessary to adjust
a) ring gear/pinion block distance,
b) backlash of ring gear and
c) tooth contact pattern.
See adjustments on front axle final drive.

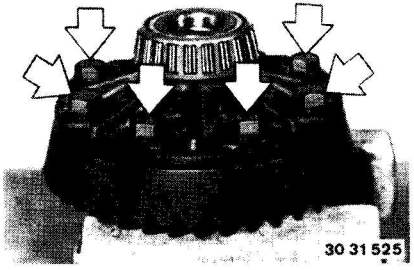
* See Specifications

31 52 520 REPLACING DRIVE PINION AND RING GEAR
–Frt. Axle Final Drive Removed–

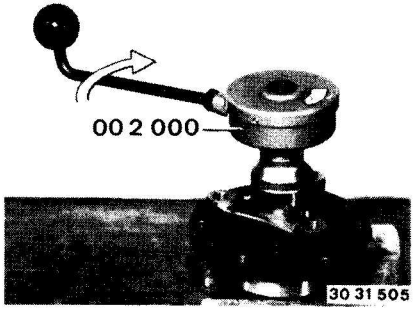
Disassemble drive set and replace drive pinion. Procedures are identical with those for replacing bearings for drive pinion – 31 52 510.



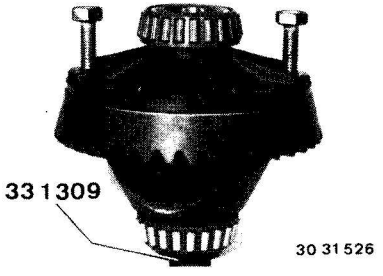
Important!
Drive pinion and ring gear were matched in a special machine for maximal quiet running. The pair code (P), e.g. 43, is electrically inscribed in the drive pinion and ring gear. Never install ring gear and drive pinion with different pair codes (P) together.



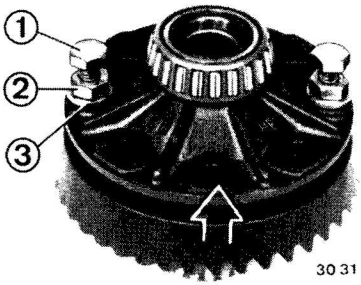
Remove differential 31 53 500.
Clamp differential in a vise fitted with aluminum jaws.
Unscrew bolts.



Remove drive set 31 52 505.
Measure friction torque with Special Tool 00 2 000 while turning uniformly and note value.
The friction torque must be adjusted to this friction torque value + 0.2 Nm (0.14 ft. lbs.) for new shaft seal, when reusing the bearings.

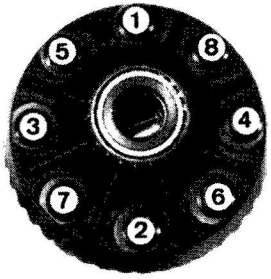


Place differential on Special Tool 33 1 309.
Screw two M 10 x 50 bolts in tapped bores against stop.
Loosen ring gear on differential case by applying alternate knocks on both bolts.



30 31 527

Pull new ring gear on to differential case by tightening both nuts uniformly.
1 = M 10 x 50 bolt
2 = Washer
3 = M 10 nut



30 31 528

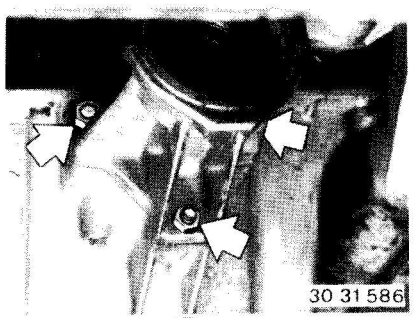
Always replace bolts.
Install new bolts with bolt cement** and tighten in order of 1 through 8.
Tightening torque* and torque angle*.

Important!
Adjust front axle final drive:
a) Ring gear/pinion block distance
b) Backlash
c) Tooth contact pattern
See adjustments on front axle final drive.

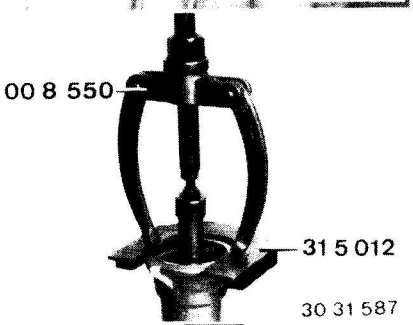
* See Specifications
** Source: HWB

31 53 050 REPLACING BEARING (IN CONSOLE) FOR RIGHT OUTPUT SHAFT

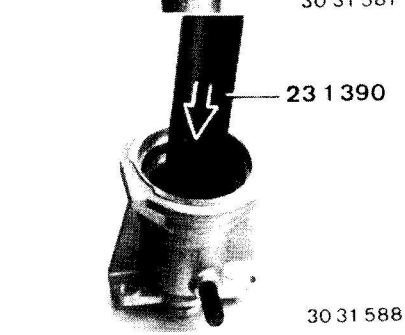
Remove output shaft 31 60 000.



Unscrew console.
Installation:
Replace seal.
Tightening torque*.

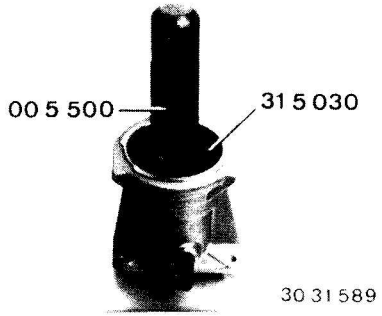


Pull off bearing with Special Tools 00 8 550 and 31 5 012.



Press in new bearing with Special Tool 23 1 390.

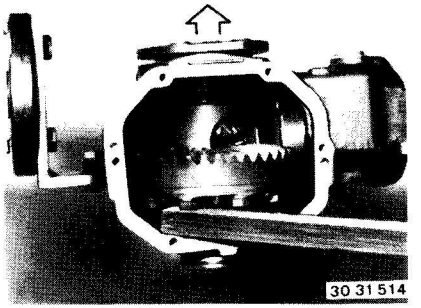
* See Specifications



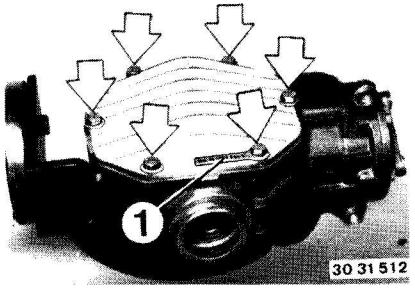
Dip new shaft seal in gear lube and drive in against stop with Special Tools 00 5 500 and 31 5 030.

31 53 500 REMOVING AND INSTALLING DIFFERENTIAL
– Front Axle Final Drive Removed –

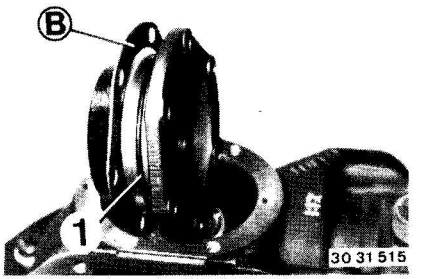
Remove drive set for front axle final drive – 31 52 505.



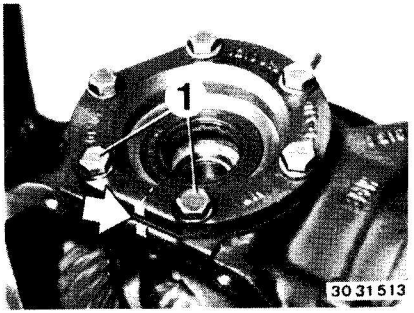
Push up differential with a piece of wood and take off bearing cover.



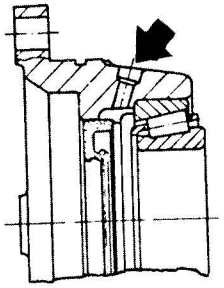
Unscrew bolts and take off oil pan.
Installation:
Replace gasket.
If applicable, clean sealing surfaces on case and oil pan.
Reinstall data plate (1).
Tightening torque*.



Measure and note thickness of shim (B).
Remove differential.
Installation:
Replace seal (1).



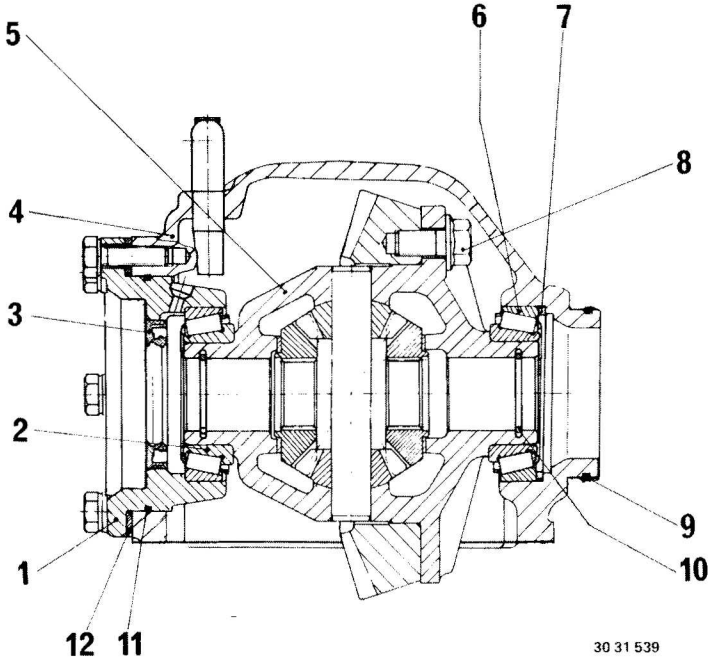
Mark position of bearing cover to case.
Unscrew bolts.
Installation:
Install bolts (1) with a bolt cement**.
Tighten bolts while turning tapered roller bearings simultaneously.
Tightening torque*.



Note:
Bore in cover faces up in installed position of case.

* See Specifications
** Source: HWB

DIFFERENTIAL BEARINGS

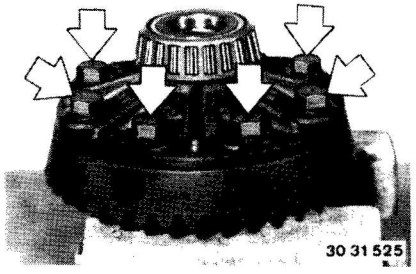


1 Bearing cover
2 Tapered roller bearing
3 Shaft seal
4 Case
5 Differential case
6 Bearing outer race
7 Shim
8 Ring gear bolt
9 O-ring
10 Circlip
11 O-ring
12 Shim

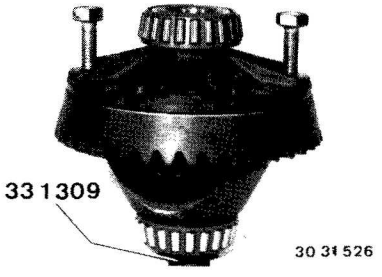
31 53 510 REPLACING DIFFERENTIAL GEARS

– Front Axle Final Drive Rmvd. –

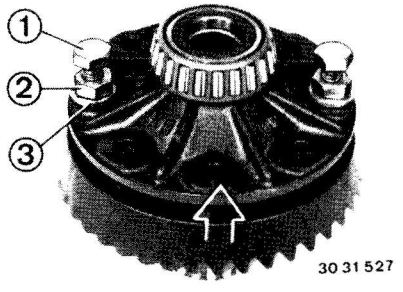
Remove differential for front axle final drive – 31 53 500.



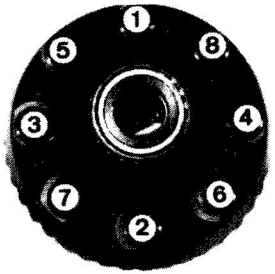
Clamp differential in vise fitted with aluminum jaws.
Unscrew bolts.



Place differential on Special Tool 33 1 309.
Screw two M 10 x 50 bolts into tapped bores against stop.
Loosen ring gear on differential case by applying alternating knocks on the bolts.

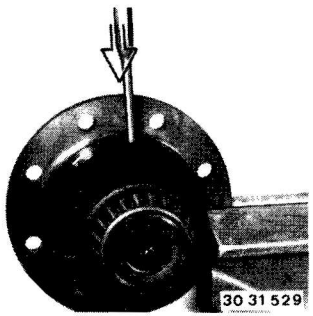


Installation:
Clean tapped bores of ring gear with a tapper.
Pull ring gear on to differential case by tightening both nuts uniformly.
1 = M 10 x 50 bolt
2 = Washer
3 = M 10 nut



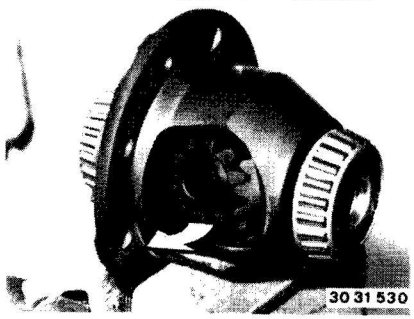
30 31 528

Installation:
Always replace bolts.
Install new bolts with bolt cement** and tighten in order of 1 through 8.
Tightening torque* and torque angle*.



30 31 529

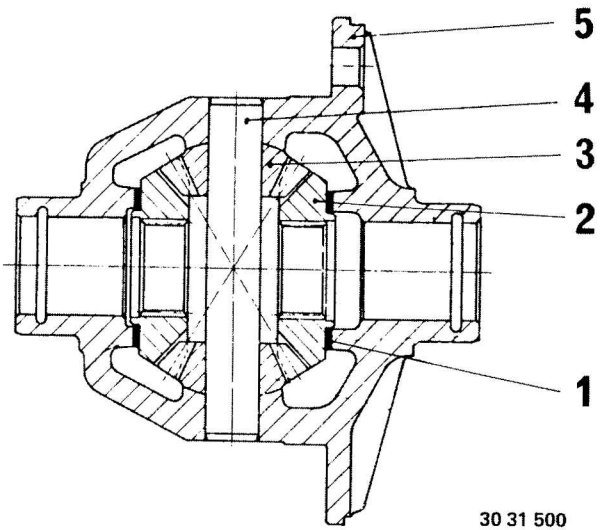
Drive out differential gear shaft with a mandrel.



30 31 530

Turn out differential gears.

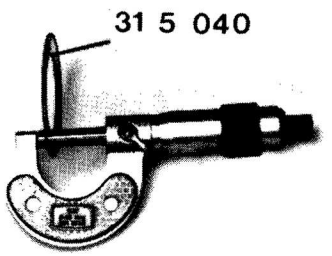
New differential gears must be adjusted with shim (1), whereby there must still be a play of 0.01 to 0.07 mm (0.0004 ... 0.0028").



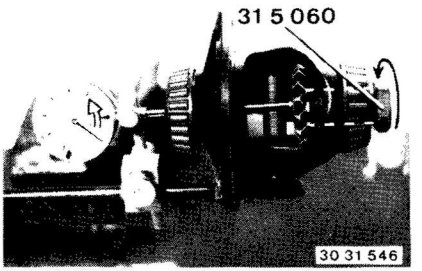
30 31 500

1 Shim
2 Shaft gear
3 Differential gear
4 Differential gear shaft
5 Case

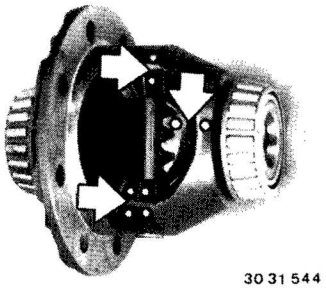
* See Specifications
** Source: HWB



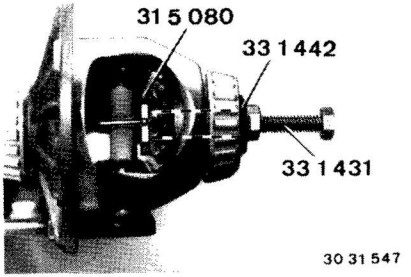
Measure thickness of washer (Special Tool 31 5 040) on four different points with a micrometer and note largest value.
For example: 1.30 mm (0.051").
Install new shaft gear and washer (Special Tool 31 5 040) in differential case.



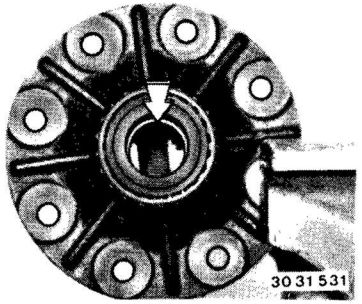
Turn shaft gear at least once with Special Tool 31 5 060.
Observe dial gage and determine maximum deflection in counterclockwise direction.
Set dial gage to zero in this position.



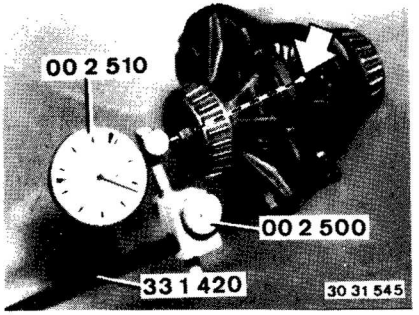
Install new differential gears and drive in differential gear shaft flush.
Mark position of differential gears and shaft gear to case.



Apply Special Tool 31 5 080 (flat surface facing dial gage point).
Screw in Special Tools 33 1 431 / 442 and move shaft gear against block by tightening nut.



Press open end of circlips into groove and knock circlip out of groove with one blow.



Mount dial gage 00 2 510 with Special Tools 00 2 500 and 33 1 420.
Apply gage needle on shaft gear with pre-load.

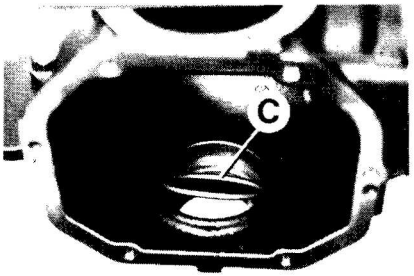
Read dial gage and note value, e.g. 0.30 mm (0.012").
Correct shim thickness comes from:

circlip thickness, e.g.	1.30 mm (0.051")
+ read value, e.g.	+ 0.30 mm (0.012")
	1.60 mm (0.063")
– specified play (0.01 to 0.07 mm) (0.0004 ... 0.0028")	– 0.02 mm (0.001")
= shim thickness (available in steps of 0.05 mm (0.002")	1.58 mm (0.062")

Important!
Mark shim for shaft gear.
Determine shim for second shaft gear – assemble differential.

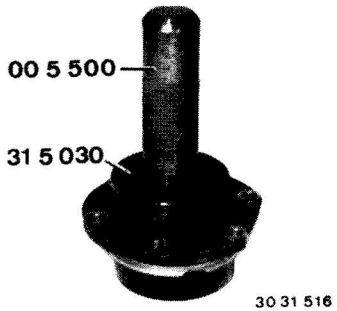
31 53 520 REPLACING BOTH BEARINGS FOR DIFFERENTIAL
– Front Axle Final Drive Removed –

Always replace both bearings.
Remove differential for front axle final drive – 31 53 500.



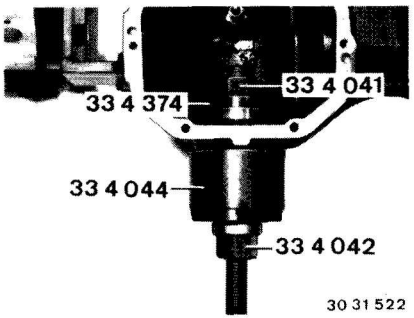
30 31 521

Measure and note thickness of shim (C).



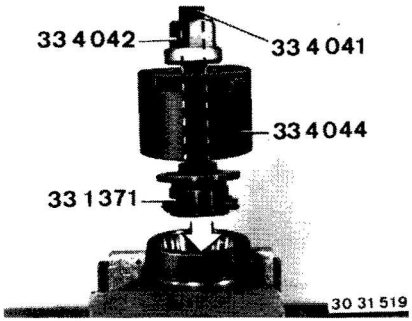
30 31 516

Drive shaft seal out of bearing cover.
Installation:
Replace shaft seal.
Dip new shaft seal in front axle final drive gear lube* and drive in with Special Tools 00 5 500 and 31 5 030.



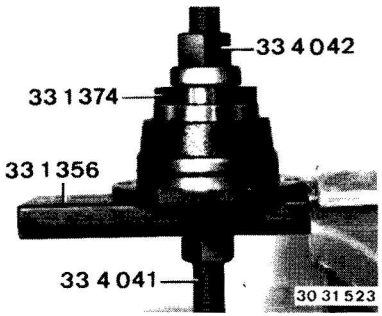
30 31 522

Install shim (C) and pull in bearing outer race with Special Tools 33 1 374, 33 4 041 / 042 / 044.



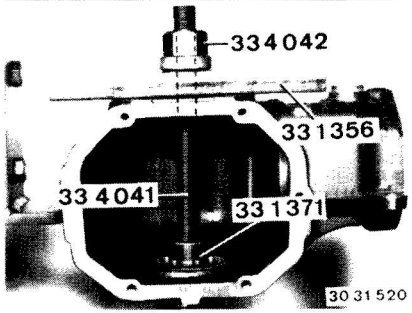
30 31 519

Clamp bearing cover in vise fitted with aluminum jaws.
Pull out bearing outer race with Special Tools 33 1 371 and 33 4 041 / 042 / 044.



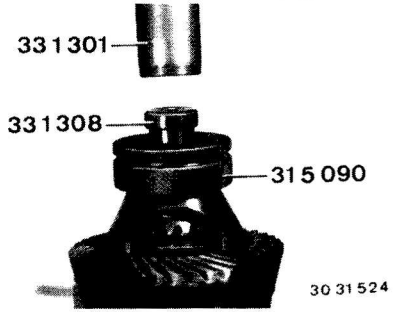
30 31 523

Pull in bearing outer race with Special Tools 33 1 356 / 374 and 33 4 041 / 042.



30 31 520

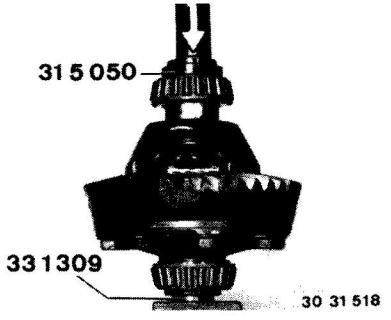
Pull out bearing outer race with Special Tools 33 1 356 / 371 and 33 4 041 / 042 .



30 31 524

Clamp differential in vise fitted with aluminum jaws.
Pull off both tapered roller bearings with Special Tools 33 1 301 / 308 and 31 5 090.

* See Operating Material Specifications



Press on tapered roller bearings with Special Tools 33 1 309 and 31 5 050.

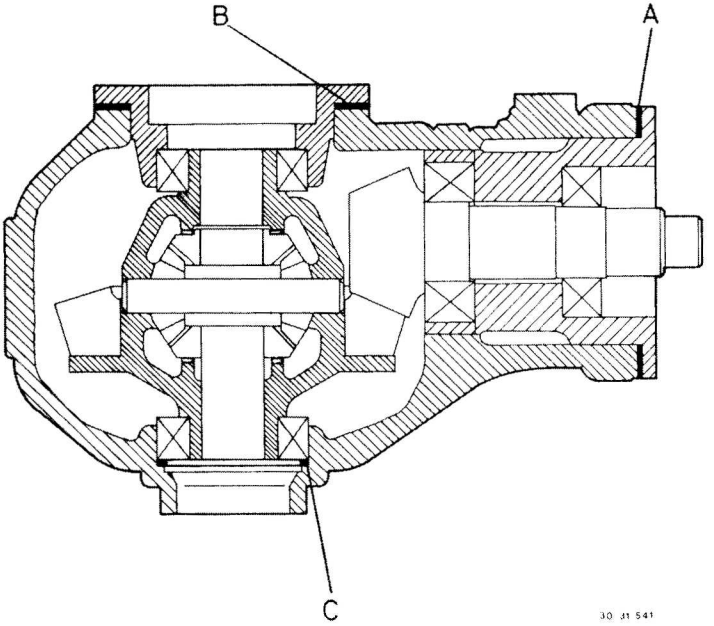
Important!
Adjustments necessary because of new bearings:

a) Friction torque of tapered roller bearings
b) Backlash of ring gear
c) Tooth contact pattern

See adjustments on front axle final drive.

ADJUSTMENTS ON FRONT AXLE FINAL DRIVE

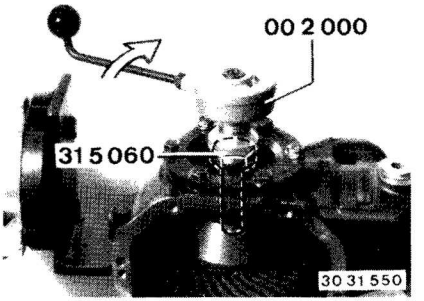
Adjustments are made with shims A, B and C, which are available in appropriate thicknesses.



A = Shim for block distance adjustment
B and C = Shim for differential bearing friction torque adjustment
Shim for backlash adjustment

1. Friction Torque Adjustment of Differential Tapered Roller Bearings:

Dip bearings in gear lube**.
Install differential with the originally installed shim (B).

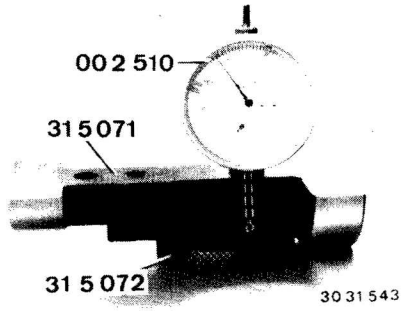


Measure friction torque with Special Tools 31 5 060 and 00 2 000, while turning uniformly.
Nominal value*.
Friction Torque Excessive.
Install thicker shim (B) until nominal value* is reached.
Friction Torque Insufficient:
Install thinner shim (B) until nominal value* is reached.
Shims are available in steps of 0.03 (0.0012"), 0.02 (0.0008") and 0.01 mm (0.0004").

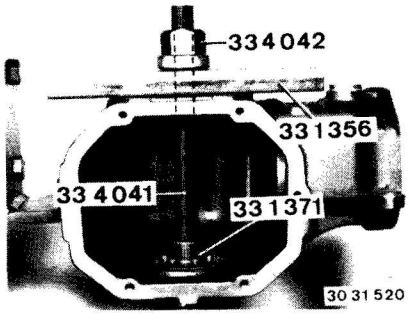
Add thicknesses of shims (B + C).
This total thickness must be maintained while adjusting the backlash afterwards.

* See Specifications
** See Operating Material Specifications

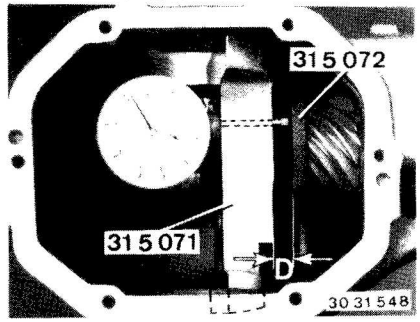
2. Block Distance Adjustment from Ring Gear and Pinion



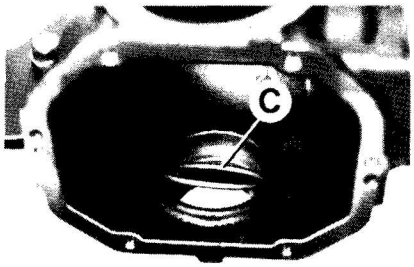
Mount dial gage 00 2 510 in Special Tool 31 5 071.
Apply Special Tool 31 5 072 and set dial gage to zero with pre-load.



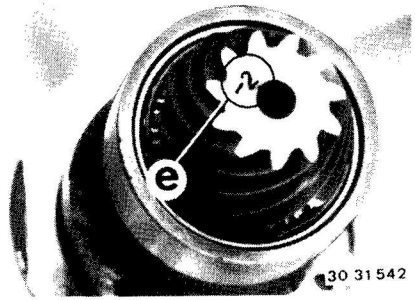
Pull out bearing outer race with Special Tools 33 1 356 / 371 and 33 4 041 / 042.



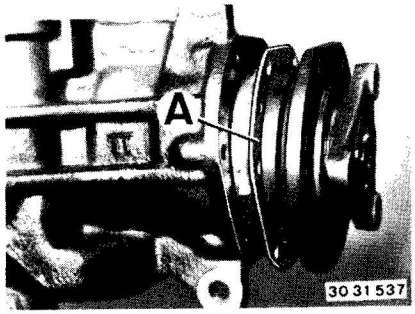
Place Special Tool 31 5 072 on pinion.
Insert Special Tool 31 5 071 in case bores.
Read distance (D) to special tool gage and note value, for example:
D actual = 3.90 mm (0.153").



Important!
Measure and note thickness of shim (C).



Determine D target.
D target = 4.00 mm / 0.157" (predetermined basic distance) + e or – e, e.g. – 2 (plus/minus sign and number indicating 100ths mm are engraved in pinion).



Install drive set with the originally installed shim (A), e.g. A = 1.80 mm (0.071"), and bolt.

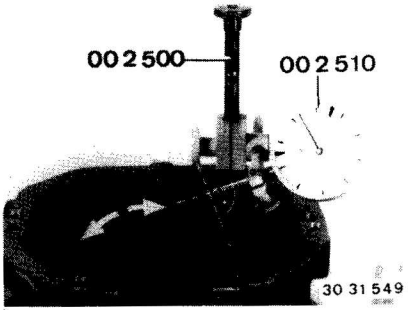
Example:
D target = 4.00 mm – 0.02 mm = 3.98 mm
(0.157" – 0.001" = 0.156")

Determine shim thickness.
Example:

Installed shim (A)	1.80 mm (0.071")
+ D target	+ 3.98 mm (0.156")
	5.78 mm (0.227")
– D actual	– 3.90 mm (0.153")
Shim thickness (A)	1.88 mm (0.074")

Max. deviation from determined shim thickness = ± 0.01 mm (0.0004").
This means in our example, for instance, a shim with a thickness of 1.89 mm (0.0744") must be installed.

Shims are available in appropriate thickness steps.



3. Backlash Adjustment for Ring Gear/Pinion

Mount dial gage 00 2 510 and Special Tool 00 2 500, with dial gage point at right angle to tooth, and measure play.
Nominal value*.

Backlash excessive = install thicker shim (C).
Backlash insufficient = install thinner shim (C).
Change shims until nominal value is reached.
Note:
The difference between the actual backlash and nominal backlash*, multiplied by the factor 1.15, produces the amount of which shim (C) must be thicker or thinner.
Example:

Measured backlash	0.19 mm (0.0075")
– specified min. play	0.06 mm (0.0024")
Difference	0.13 mm (0.0051")

Difference x factor =
0.13 mm x 1.15 = 0.15 mm or
0.0051" x 1.15 = 0.0059".

The thickness of installed shim(**C**), e.g. 2.01 mm (0.079"), must be increased by 0.15 mm (0.006").
Shims are available in thickness steps of 0.03 mm (0.0012").

Important!
The total thickness of shims (B + C) must not be **changed**.
If, for example, the thickness of shim (C) is reduced, the thickness of shim (B) must be increased by the same amount, or vice versa.

Check the tooth contact pattern to control the ring gear/pinion adjustment.

* See Specifications

4. Tooth Contact Pattern

Type of teeth – Gleason.
Coat ring gear with printer's ink.
Turn differential several times in both directions and stop ring gear suddenly with a piece of wood.

BASIC INFORMATION FOR TOOTH CONTACT PATTERN ADJUSTMENTS

Gleason Teeth

A Correct tooth contact pattern without load.

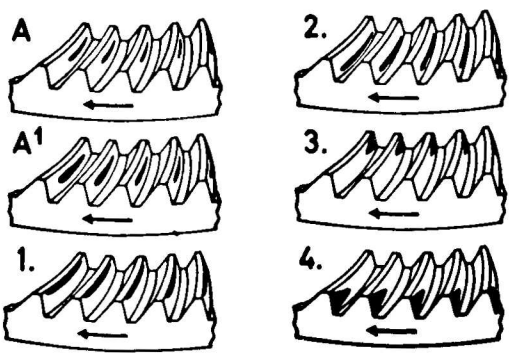
A 1 Loads will displace the tooth contact pattern slightly more toward the outside. Moving the ring gear will mainly change the backlash and also the tooth contact pattern in longitudinal direction of the teeth.
Moving the drive pinion will change the tooth contact pattern in direction of tooth height, while the backlash will be changed only slightly.
Here are the four basically wrong tooth contact patterns, which normally occur in combination and the knowledge of which will make practical adjustments easier.

1. High, narrow tooth contact pattern (head) on ring gear.
Move drive pinion toward ring gear axis and possibly correct backlash by pressing ring gear away from drive pinion.

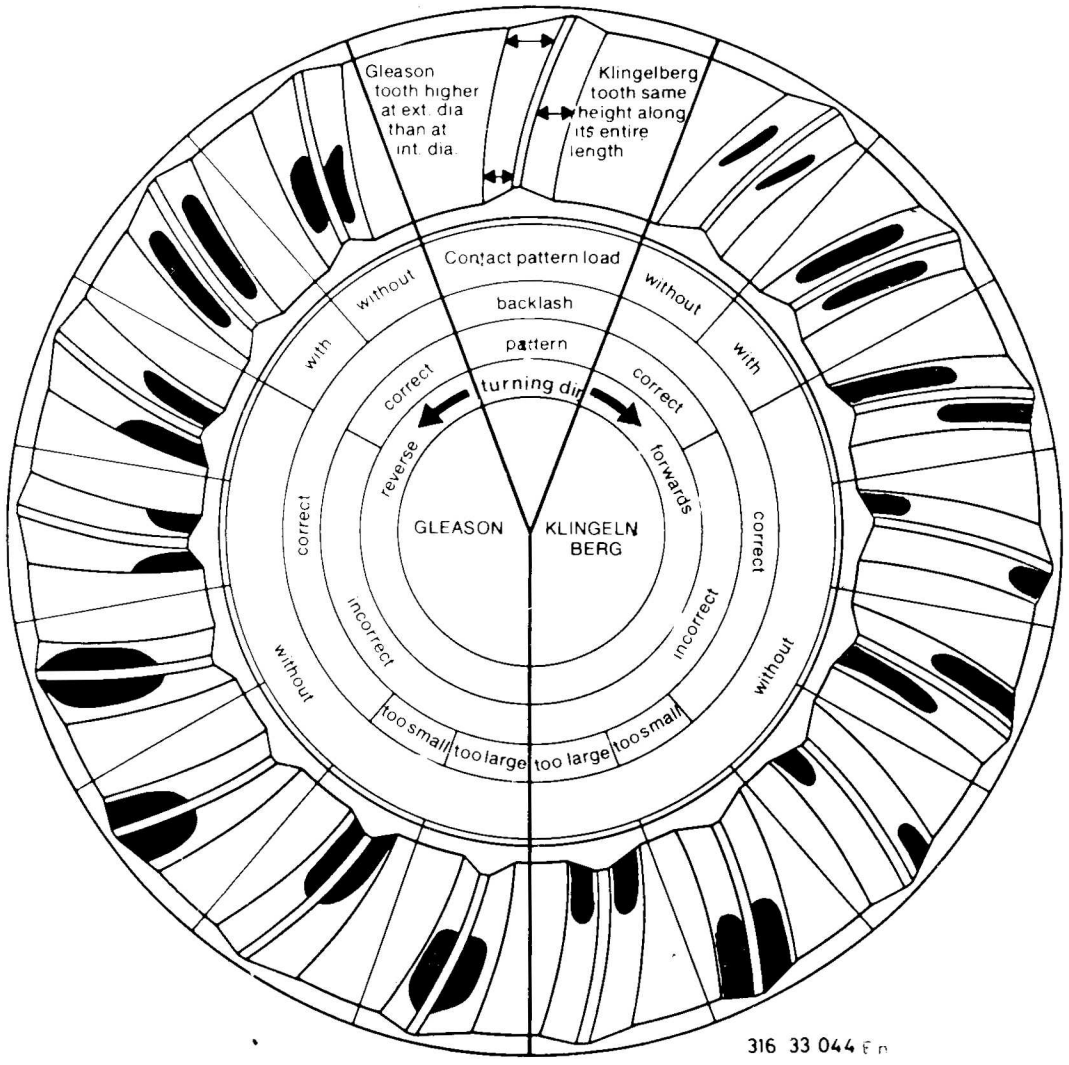
2. Deep, narrow tooth contact pattern (base) on ring gear.
Move drive pinion away from ring gear axis and possibly correct backlash by pressing ring gear closer.

3. Brief tooth contact pattern on small tooth end (tip) of ring gear.
Move ring gear away from drive pinion. If applicable, move drive pinion closer to ring gear axis.

4. Brief tooth contact pattern on large tooth end (heel) of ring gear.
Move ring gear closer to drive pinion. If applicable, move drive pinion away from ring gear axis.

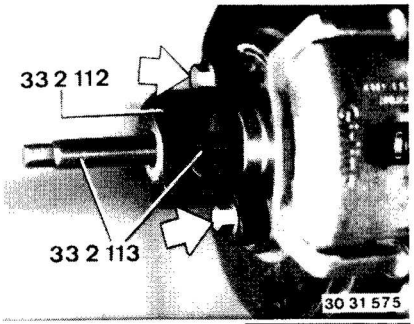


28 33 030

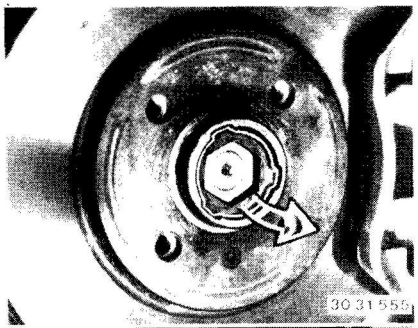

Gleason
tooth higher
at ext. dia
than at
int. dia.
Klingelberg
tooth same
height along
its entire
length
Contact pattern load
backlash
pattern
turning dir
without
with
correct
reverse
forwards
GLEASON
KLINGELN
BERG
incorrect
too small
too large
too large
too small
316 33 044 E n

31 60 000 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT OUTPUT SHAFT

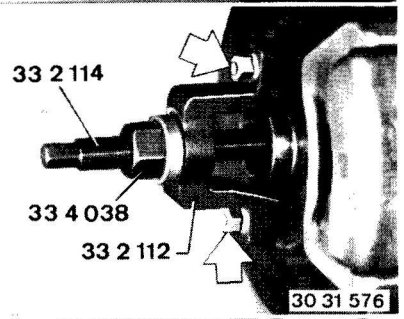
Remove front wheel – see Group 36.
Drain gear lube.
Installation:
Pour in gear lube**.
Tightening torque*.



Mount Special Tools 33 2 112 / 113 with two wheel bolts and press off output shaft.

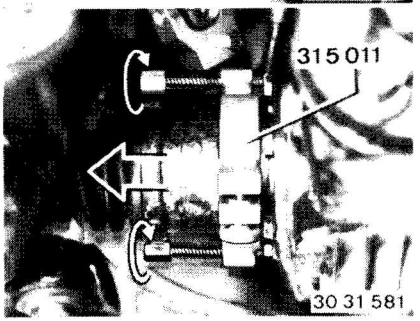


Lift out lockplate with a screwdriver.
Unscrew collar nut.
Installation:
Tightening torque*.
Drive in new lockplate with Special Tools 33 4 050 and 00 5 500.

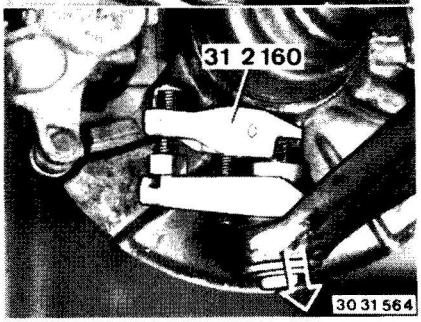


Installation:
Give splines of output shaft a light coat of oil and pull in output shaft with Special Tools 33 2 112 / 124 and 33 4 042.

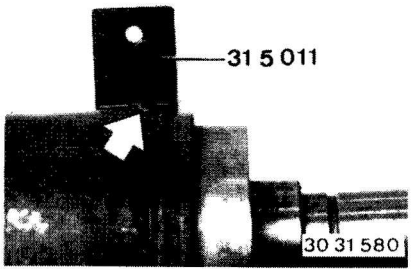
Unscrew nut and press off tie rod with Special Tool 33 2 070.
Installation:
Replace self-locking nut.
Tightening torque*.



Left Side:
Pull off output shaft with Special Tool 31 5 011.
Pressure spindle bears on bolt head.
Screw in pressure spindle alternately.

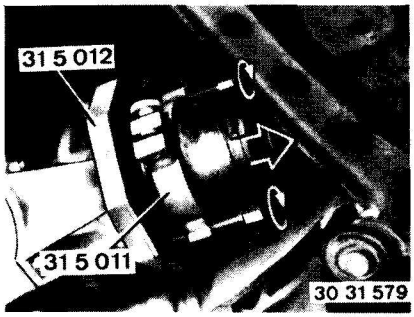


Unscrew nut and press off control arm with Special Tool 31 2 160.
Installation:
Tightening torque*.
Lock nut with a cotter pin.

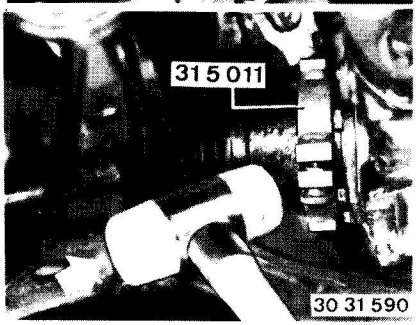


Note:
Ring of Special Tool 31 5 011 is located in groove of shaft.

* See Specifications
** See Operating Material Specifications



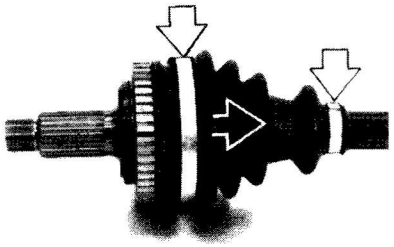
Right Side:
Apply Special Tool 31 5 012 and pull off output shaft with Special Tool 31 5 011.
Screw in pressure spindles alternately.



Installation:
Slide output shafts into front axle final drive until circlip in case engages in groove of shaft.
If necessary, apply knocks on Special Tool 31 5 011 with a plastic hammer to drive in shaft until circlip engages.

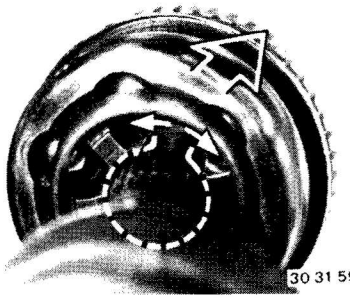
31 60 020 REPLACING ONE CONSTANT VELOCITY JOINT (OUTER)
31 60 021 REPLACING ONE CONSTANT VELOCITY JOINT (INNER) OF OUTPUT SHAFT

Remove front output shaft 31 60 000.



30 31 595

Loosen both hose clamps and pull dust cover off of joint.



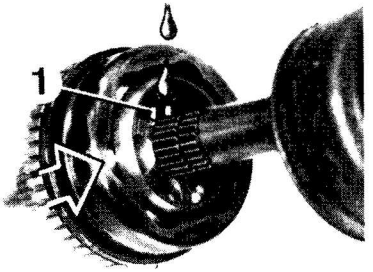
30 31 596

Spread open circlip and drive joint off of the shaft with a plastic hammer.

30 31 597

Constant Velocity Joint (Outer):
Add about half of the grease in a 80 gr. tube.

Constant Velocity Joint (Inner):
Add grease from a 80 gr. tube.



30 31 598

Clean and remove grease on splines of shaft and joint.
Coat splines of shaft completely with Loctite No. 270.
Drive joint on to shaft with a plastic hammer until circlip (1) engages.

Outer Joint:
Add remaining amount of grease in joint.

Inner Joint:
Add grease of 70 gr. tube in joint.

31 60 030 REPLACING ONE DUST COVER OF LEFT OR RIGHT OUTPUT SHAFT

Procedures are identical with those described in 31 60 020/021.
Clean joint to remove the old grease.
Do not disassemble a joint or let it fall apart.