

DRIVELINE/AXLES

Front Axle - Operating Fluids

1.0 GENERAL INFORMATION ON HIGH TEMPERATURE MULTI-PURPOSE GREASE

High temperature multi-purpose grease consists of a lithium complex soap in a mineral oil product with a selected combination of additives. Extremely fine soap is contained in the oil, and serves as the basic ingredient.

This lubricating grease possesses the following properties:

- Very good thermal resistance and penetration stability

The structure and consistency must be maintained over long service life with temperatures from -22°F to +302°F (-30°C to +150°C) in continuous operation and very high loads.

- Oxidation stability

A lubricating grease contains effective inhibitors (which limit or prevent chemical reactions) in order to stop oxidation at very high operating temperatures.

- Water resistance and corrosion inhibition

A high temperature multi-purpose grease is water resistant. At the same time lubricated parts are given maximum protection against rust by the corrosion inhibitors.

2.0 APPROVED HIGH TEMPERATURE MULTI-PURPOSE GREASE

High temperature multi-purpose grease is used for the lubrication of wheel bearings.

Ball Bearings (E24 from mid 1982, E28, E30, E31, E32 and all following)

Provided with lifetime lubrication.

No subsequent lubrication approved!

Tapered Roller Bearings (E23, E21)

50 grams grease packing in wheel hub and 20 grams in wheel hub grease cap per wheel.

Grease type: Retinax A

CRC Part No. SL 3131 (former BMW Part No. 81 22 9 407 710)

3.0 APPROVED FRONT AXLE FINAL DRIVE OILS

Approvals are the same as for rear axle final drive oils.

SUSPENSION

Front Axle - Repair Instructions - X6

GENERAL

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct:

- Pour oil only into appropriately marked containers
- Do **not** pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures:

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures:

- **Eye contact:** Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- **Skin contact:** Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

**WARNING: DANGER OF POISONING if oil is ingested/absorbed through the skin!
RISK OF INJURY if oil comes into contact with eyes and skin!**

Recycling:

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released:

- **Personal precautionary measures:** Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- **Environmental protection measures:** Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- **Limiting spread:** Use oil blocks to prevent the surface spread of oil.
- **Cleaning procedure:** Bind and dispose of escaped oil with nonflammable absorbent.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

00 ... RAISING VEHICLE WITH TROLLEY JACK

IMPORTANT: Observe the following trolley-jack-related instructions:

1. Use only BMW-distributed/approved trolley jacks which have rubber plate contact points.
2. Trolley jacks must be regularly serviced and always checked for functional reliability before they are used!
3. Check the rubber plate on the trolley jack prior to each use, replacing if necessary.

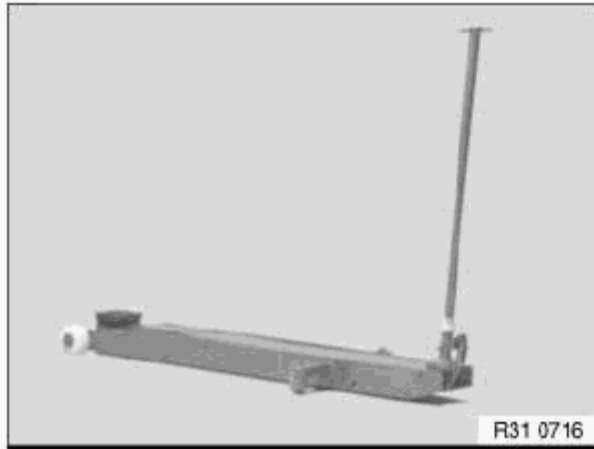


Fig. 1: Identifying Trolley Jack

Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: The vehicle may be raised with a trolley jack only at the following jacking points!

1. Car jacking point
2. Side car jacking points
3. Rear differential

Risk of damage: It is not permitted to raise the vehicle at the rear differential cover!

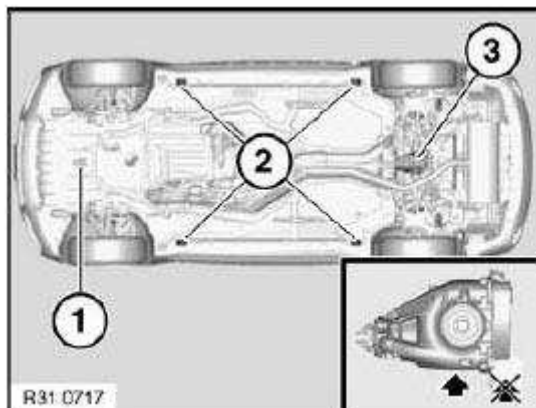
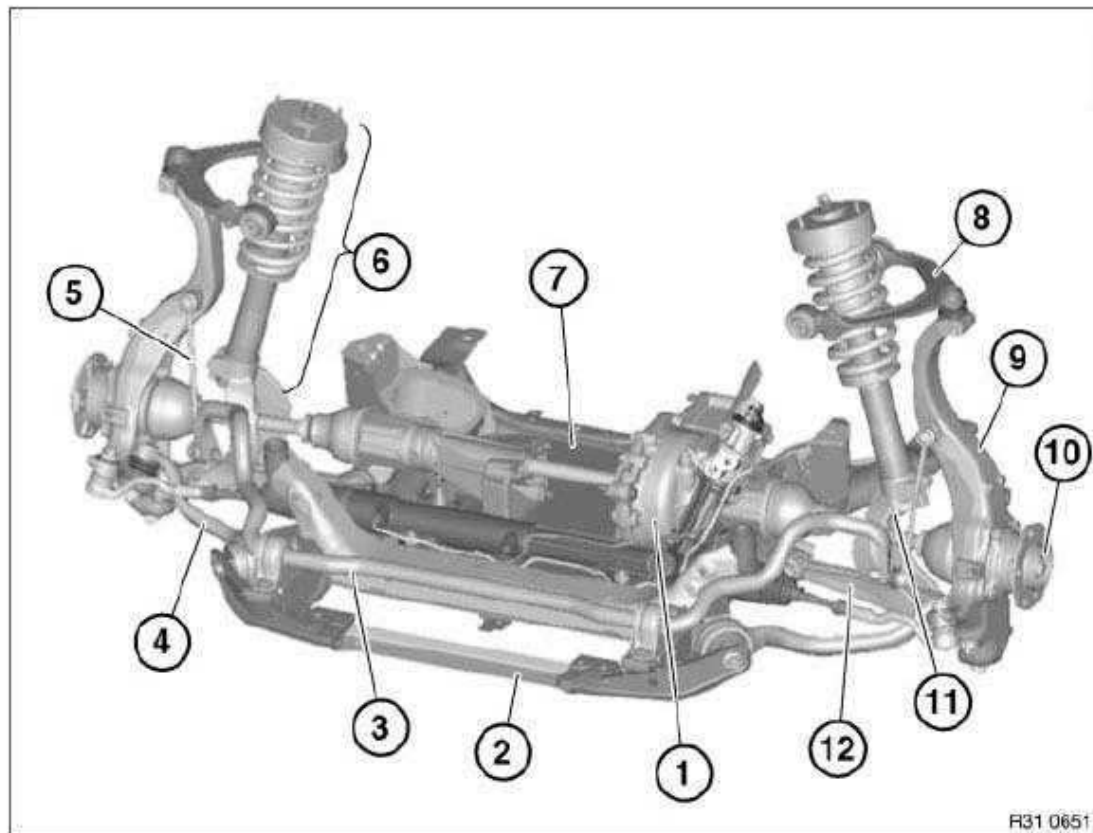


Fig. 2: Identifying Car Jacking Point
 Courtesy of BMW OF NORTH AMERICA, INC.

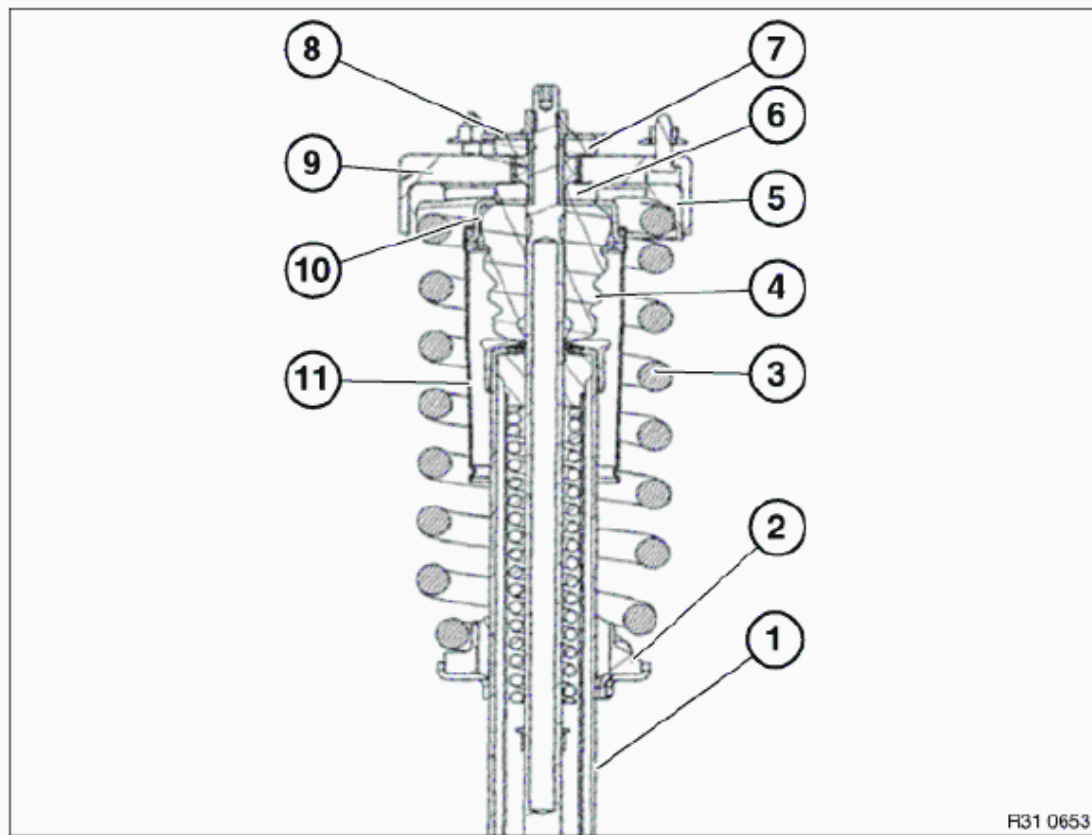
31 ... FRONT AXLE OVERVIEW



- | | | | |
|----|---|----|---|
| 1 | <u>Overview of front differential/output shafts</u> | 11 | <u>Spring strut holder</u> |
| 2 | <u>Front axle support</u> | 12 | <u>Lower control arm / rubber mount</u> |
| 3 | <u>Stabiliser</u> | | |
| 4 | <u>Tension strut / rubber mount</u> | | |
| 5 | <u>Stabilizer link</u> | | |
| 6 | <u>Layout of spring strut shock absorber</u> | | |
| 7 | <u>Reinforcement plate</u> | | |
| 8 | <u>Upper control arm</u> | | |
| 9 | <u>Swivel bearing</u> | | |
| 10 | <u>Wheel bearing</u> | | |

Fig. 3: Overview Of Front Axle
 Courtesy of BMW OF NORTH AMERICA, INC.

31 ... LAYOUT OF SPRING STRUT SHOCK ABSORBER

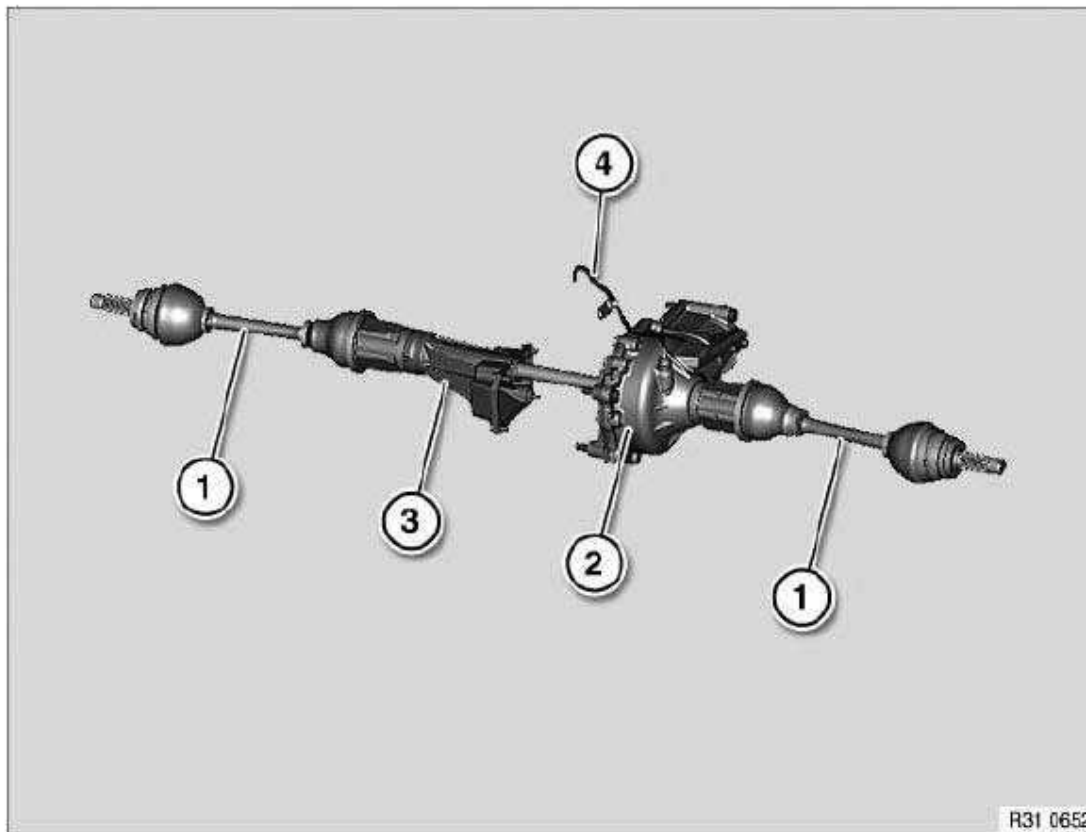


F31 0653

- | | | | |
|---|--|----|--|
| 1 | <u>Spring strut shock absorber.</u> | 7 | <u>Support bearing upper section</u> |
| 2 | <u>Lower spring pad</u> | 8 | Joint seat |
| 3 | <u>Coil spring</u> | 9 | <u>Support bearing flange</u> |
| 4 | <u>Auxiliary damper</u> | 10 | Support pot |
| 5 | <u>Upper spring pad</u> | 11 | <u>Protective tube</u> |
| 6 | <u>Support bearing lower section</u> | | |

Fig. 4: Layout Of Spring Strut Shock Absorber
 Courtesy of BMW OF NORTH AMERICA, INC.

31 ... OVERVIEW OF FRONT DIFFERENTIAL/OUTPUT SHAFTS



- | | | | |
|---|---|---|-----------|
| 1 | <u>Output shaft / gaiters</u> | 4 | Vent pipe |
| 2 | <u>Front differential</u> (incl. O-ring, shaft seals) | | |
| 3 | <u>Bearing block</u> (incl. O-ring, shaft seal) | | |

Fig. 5: Overview Of Front Differential/Output Shafts
Courtesy of BMW OF NORTH AMERICA, INC.

31 00 ... FRONT AXLE + STEERING: WHEEL/CHASSIS ALIGNMENT CHECK MUST BE CARRIED OUT AFTER THE FOLLOWING WORK

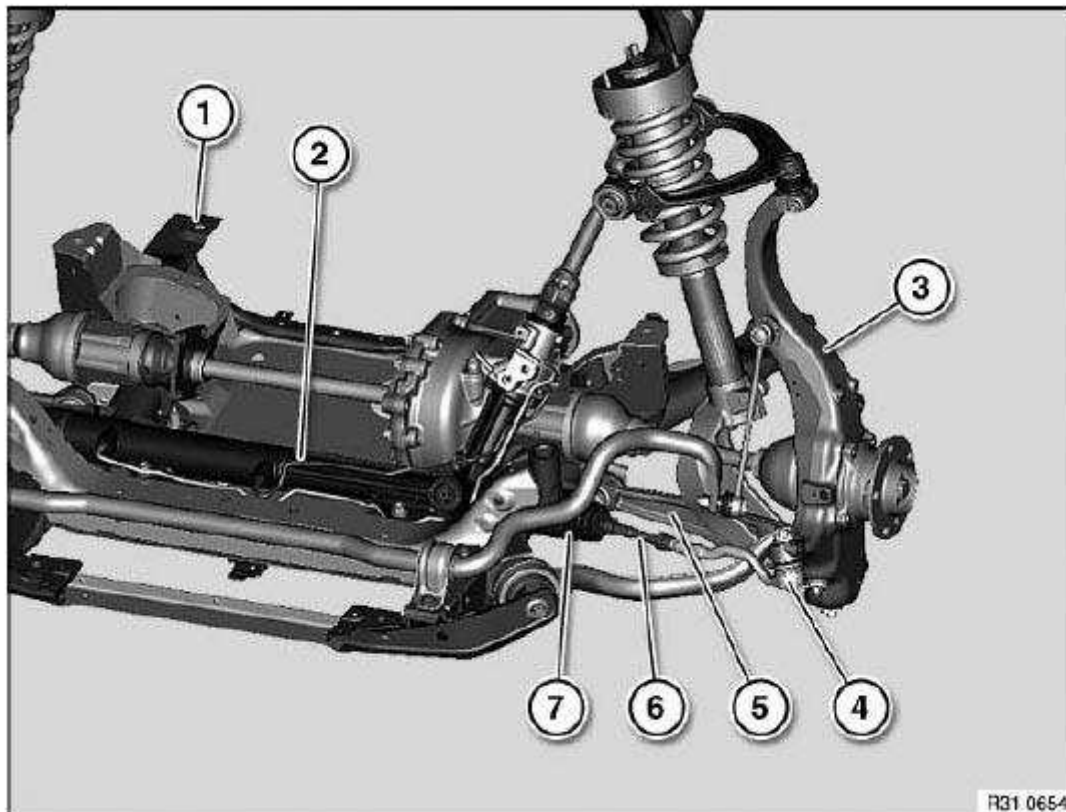


Fig. 6: Identifying Front Axle And Steering Wheel Components
 Courtesy of BMW OF NORTH AMERICA, INC.

A wheel/chassis alignment check (See **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** or **32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD**) must be carried out after the following work:

- **Release of following screw/bolt connections:**
 - Steering gear to front axle carrier
 - Lower control arm to front axle carrier
 - Tie rod end to tie rod
- **Replacement of following parts:**
 1. Front axle carrier
 2. Steering gear
 3. Swivel bearing
 4. Tie rod end
 5. Lower control arm/rubber mount
 6. Tie rod
 7. Gaiter (if the tie rod end has to be screwed off)

31 00 ... INFORMATION ON REPLACING SHOCK ABSORBERS

Facts:

When a shock absorber is faulty on one side (leaking, noises, limit values exceeded on the shock tester), often both shock absorbers on the axle in question are replaced.

Consequence:

This is not necessary for technical reasons and causes the manufacturer not to recognize the unnecessarily removed shock absorbers as damaged parts. Unnecessarily high costs for the customer can be avoided by replacing the shock absorber on one side only.

Procedure:

If one shock absorber is damaged, it is only necessary to replace both shock absorbers when the car has driven in excess of 50,000 km.

Exception: On all M-GmbH models, when a limit value is exceeded on one side, it is still necessary always to replace both shock absorbers on the relevant axle.

Information on replacing shock absorbers on E65/E66 models with EDC before production 03/07

Component version (build date) before 03/07:

- Both shock absorbers must be replaced.

Component version (build date) after 03/07:

- The shock absorbers can be replaced again individually.

If in doubt, always replace both shock absorbers.

31 00 ... INSTRUCTIONS (CHASSIS COMPONENTS MADE OF ALUMINUM)

Due to the chemical and corrosion characteristics of aluminum, always comply with the following points when handling aluminum components:

- Do not bring into contact with battery acid!
- Do not clean with wire brushes made of brass or iron! Always use wire brushes with stainless steel bristles!
- Do not expose to flying sparks when grinding/separating! Cover components!
- Do not strike with steel welding splashes! Cover components!
- Do not expose to temperatures $> 80^{\circ}\text{C}$, even for brief periods! Temperatures in paint facilities do not have the same impact

31 00 ... NOTES ON REPAIRING THREADS

IMPORTANT: Install Helicoil thread inserts so that they are flush with the original thread.

NOTE: Damaged threads in engine carrier may be repaired with Helicoil thread inserts. Comply with the procedure described in the example.



Fig. 7: Identifying Helicoil Thread Damaged Area
Courtesy of BMW OF NORTH AMERICA, INC.

Procedure:

1. Create a clean core hole; if necessary, drill out screw remnants

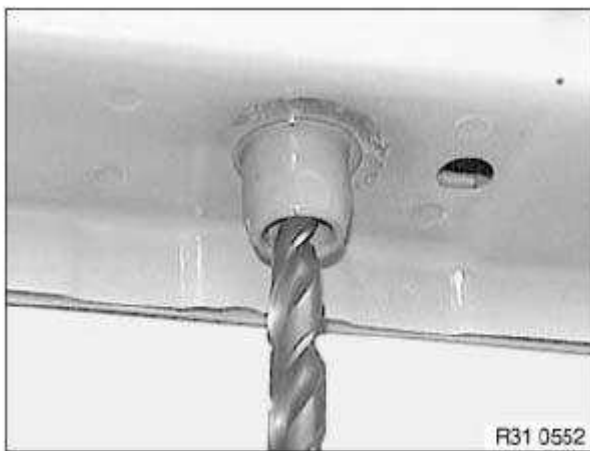


Fig. 8: Drilling Out Screw
Courtesy of BMW OF NORTH AMERICA, INC.

2. Create locating thread for Helicoil thread insert



Fig. 9: Creating Thread For Helicoil Thread Insert
Courtesy of BMW OF NORTH AMERICA, INC.

3. Pick out Helicoil thread insert in accordance with the **TABLE** and screw into the locating thread until flush with the original thread

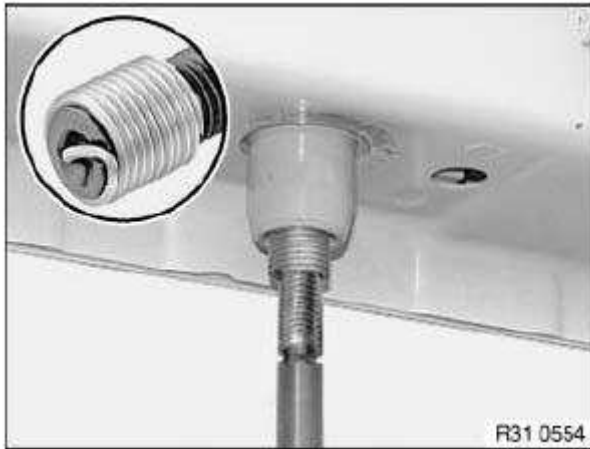


Fig. 10: Identifying Helicoil Thread Insert
Courtesy of BMW OF NORTH AMERICA, INC.

4. Break drive pin and remove

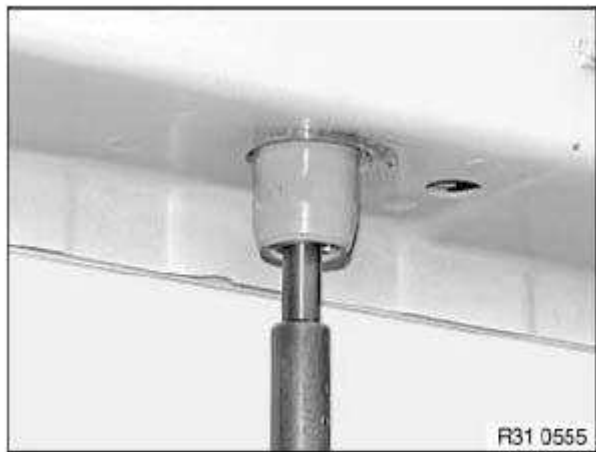


Fig. 11: Removing Break Drive Pin

Courtesy of BMW OF NORTH AMERICA, INC.

23 0 020 HOLDER

Minimum set: Mechanical tools

NOTE: For all three- and four-hole flanges during releasing and tightening down

Series: E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E71, E81, E82, E83, E85, E86, E87, E88, E90, E91, E92, E93, F01, F02

Transmission: A4S 200R, A5S 360R, A5S 390R, GA6 HP19Z, GA6 HP26Z, GA6 HP32Z, GS6-17BG, rear diff. type M, S5D 200G, S5D 250G

Storage location: A1, B1, C1



Fig. 12: Special Tool (23 0 020)

Courtesy of BMW OF NORTH AMERICA, INC.

Order number: 23 0 020

Holder

FRONT AXLE SUSPENSION

31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE

IMPORTANT: Observe SAFETY INSTRUCTIONS for raising the vehicle
Driving without reinforcement plate is not permitted!

Release bolts (1) for assembly underside protection at front.

Release screws (2).

Remove reinforcement plate (3).

Installation:

Replace screws.

Tightening torque 31 10 2AZ .

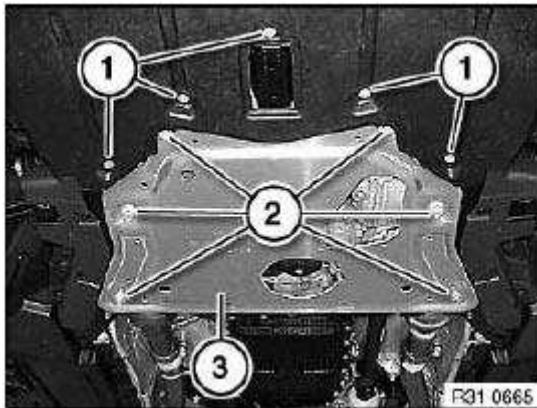


Fig. 13: Identifying Reinforcement Plate With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

FRONT SUB-FRAME

31 11 001 REPLACING FRONT AXLE CARRIER

WARNING: Danger to life!

Secure engine in installation position with special tool to prevent it from falling down. See 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N54) or 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N63) .

IMPORTANT: Before removing front axle carrier:
In order to avoid damage to lifting platform, perform weight compensation on vehicle.
Load spring strut domes with sand bags.

Necessary preliminary tasks:

- Lower **FRONT AXLE SUPPORT**
- Remove **BOTH LOWER CONTROL ARMS FROM FRONT AXLE CARRIER**
- Remove **BOTH TENSION STRUTS FROM FRONT AXLE CARRIER**

Remove both engine mounts from front axle carrier

Take front axle carrier down and set down on a suitable surface.

Installation:

Use previous front axle carrier as a template for modifying or replacing small parts.

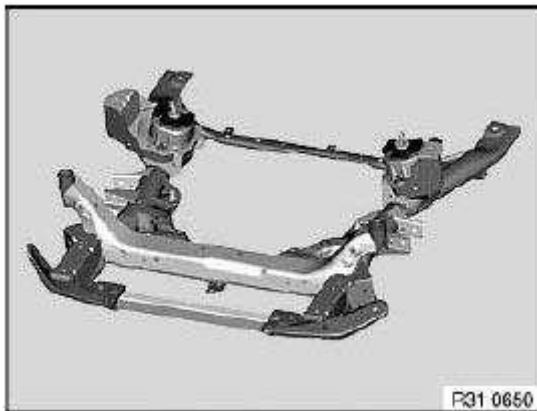


Fig. 14: Identifying Front Axle Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform chassis alignment check. See **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** or **32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD** .
- Carry out steering angle sensor adjustment/adjustment for active front steering. See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRYING OUT STEERING ANGLE SENSOR ADJUSTMENT** .

31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (UNIVERSAL LIFTER)

Special tools required:

- 00 2 030
- 31 4 170
- 31 5 250
- 31 5 255
- 31 5 256

IMPORTANT: Before lowering front axle carrier:

In order to avoid damage to lifting platform, perform weight compensation on vehicle.

Load spring strut domes with sand bags.

WARNING: Secure engine in installation position with special tool to prevent it from falling down. See 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N54) or 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N63) .

Necessary preliminary tasks:

- Secure engine in installation position with special tool. See 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N54) or 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N63) .
- Remove FRONT WHEELS

IMPORTANT: Use special tool to avoid preliminary damage to ball joint in upper control arm and the necessary removal of the swivel bearing.

Press plug on left and right out of spring strut dome.

Secure swivel bearing (1) on left and right with special tool 31 4 170 in installation position.

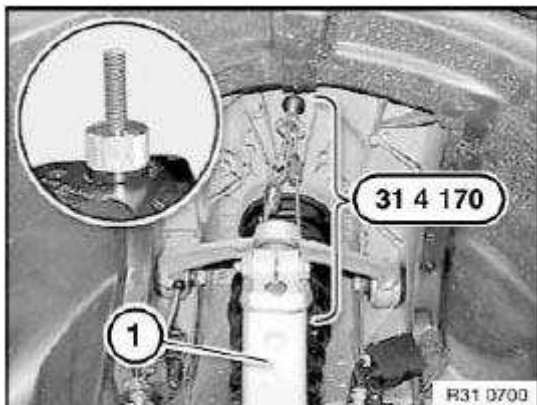


Fig. 15: Identifying Special Tool (31 4 170) In Installation Position
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove **UNDERBODY PROTECTION AT FRONT AND REAR** .

Remove steering gear cover at top left and right. See **51 71 ... REMOVING AND INSTALLING/REPLACING TOP LEFT STEERING GEAR COVER** and **51 71 ... REMOVING AND INSTALLING/REPLACING TOP RIGHT STEERING GEAR COVER**

Remove **REINFORCEMENT PLATE**.

Partially detach **FRONT LEFT AND RIGHT WHEEL ARCH COVERS (REAR SECTION)** in rear area.

Remove **LOWER CONTROL ARM FROM SPRING STRUT HOLDER**.

Version with active steering:

Disconnect plug connection (1) and unclip line (2) from front axle carrier.

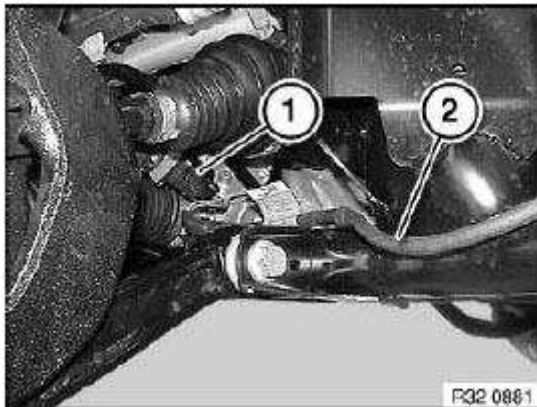


Fig. 16: Identifying Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and remove screws (1) towards bottom.

Tie up power steering gear (2).

Installation:

Replace screws and nuts.

Tightening torque **32 00 1AZ** .

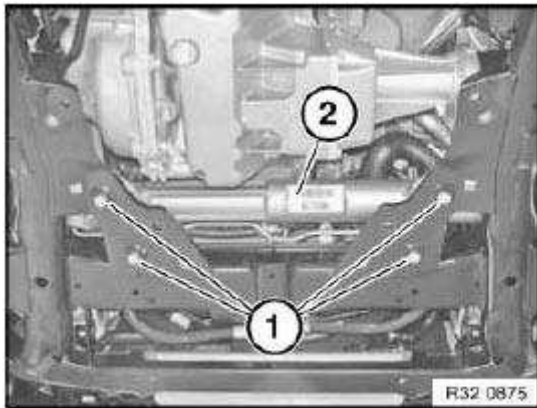


Fig. 17: Identifying Power Steering Gear Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Engage special tool 31 5 250 with a 2nd person helping completely on workshop jack 00 2 030.

Insert special tools 31 5 255 in telescopic supports of a profile rail pair.

NOTE: In a profile rail pair two profile rails are connected to each by toothing.

Insert special tools 31 5 256 in telescopic supports of other profile rail pair.

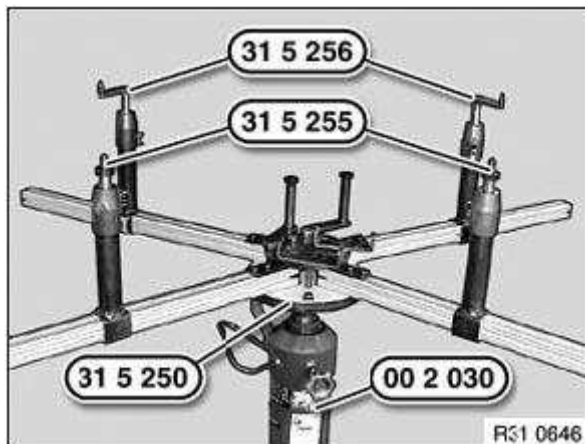


Fig. 18: Identifying Special Tools (31 5 256, 31 5 255 And 31 5 250 With 00 2 030)
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The jacking points on the left side are shown.

Align special tools 31 5 255 and 31 5 256 to front axle carrier.

Support front axle carrier by operating workshop jack 00 2 030.

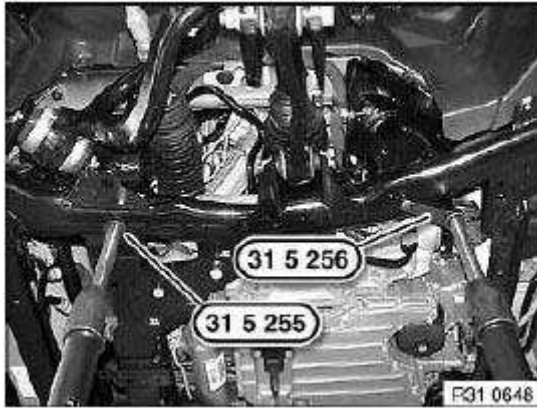


Fig. 19: Aligning Special Tools (31 5 255 And 31 5 256) To Front Axle Carrier
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1, 2).

Installation:

Check threads for damage; if necessary, repair with **HELICOIL THREAD INSERTS**.

Tighten down first screws (1) and then screws (2).

Tightening torque **31 10 1AZ** .

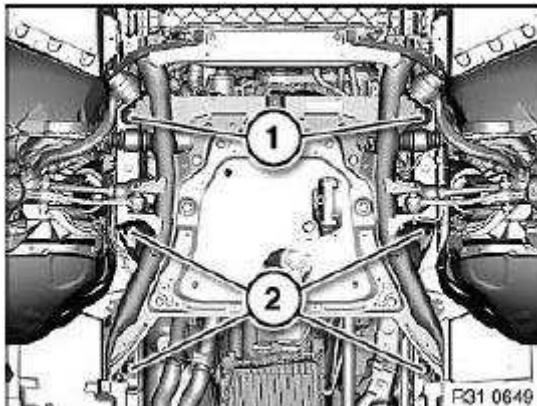


Fig. 20: Identifying Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Follow operations must be carried out during lowering:

- Remove heat exchanger from front axle carrier and tie up
- Remove **STABILIZER (CONVENTIONAL) FROM FRONT AXLE CARRIER** and tie back

- Remove all hydraulic lines on front axle carrier or stabilizer retaining bracket and tie up
- Version with active front steering: Disconnect plug connection and expose connecting line up to power steering gear

Lower front axle carrier by max. 10 cm.

After installation:

- Perform chassis alignment check. See **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** or **32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD** .
- Carry out steering angle sensor adjustment/adjustment for active front steering. See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRYING OUT STEERING ANGLE SENSOR ADJUSTMENT** .

STRUTS W/RUBBER MOUNTS

31 12 002 REMOVING AND INSTALLING/REPLACING TOP LEFT CONTROL ARM

Special tools required:

- **31 5 220**

NOTE: Control arms with + or - marking (see **Fig. 21**) are camber correction arms:
 - Underdimension variant
 + Overdimension variant

These camber correction arms are used to correct the camber values by 30 minutes. To be used only if the tolerance values are exceeded or undershot!

An unmarked control arm is a standard part.

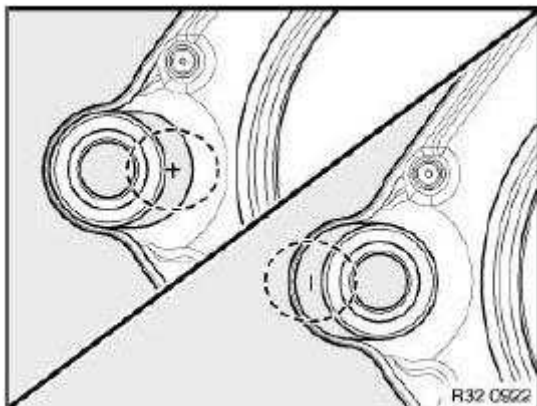


Fig. 21: Identifying Control Arms Marking Area
Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Remove **LEFT PARTITION WALL FOR EQUIPMENT COMPARTMENT**
- Detach coolant expansion tank and place to one side

NOTE: Level switch can slip out of the coolant expansion tank in the process.

- Remove **FRONT WHEELS**

Unscrew nuts (1).

Installation:

Replace self-locking nuts.

Tightening torque **31 31 1AZ** .

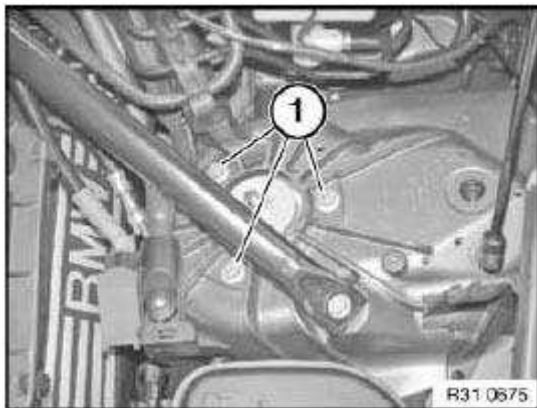


Fig. 22: Identifying Self-Locking Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Slacken nut (1).

Remove jointed rod (2) from upper control arm (3).

Installation:

Replace self-locking nut.

Tightening torque **37 14 5AZ** .

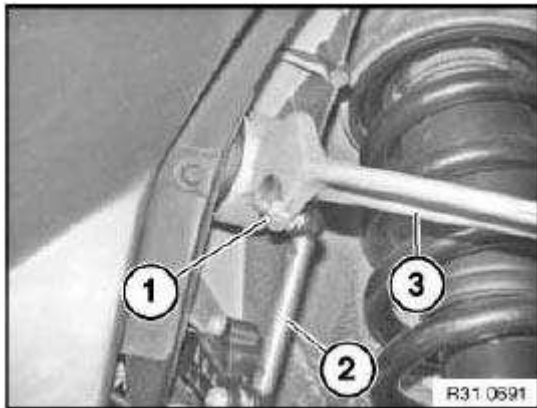


Fig. 23: Identifying Jointed Rod And Upper Control Arm
 Courtesy of BMW OF NORTH AMERICA, INC.

Secure special tool 31 5 220 to drive flange with wheel studs.

Support swivel bearing with special tool 31 5 220 and workshop jack.

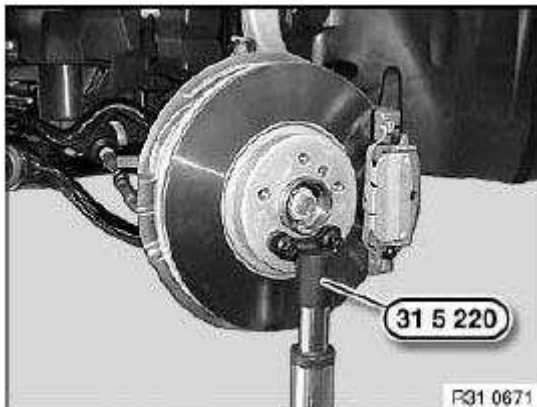


Fig. 24: Supporting Swivel Bearing With Special Tool (31 5 220) And Workshop Jack
 Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten nut (1) and remove screw (2).

Installation:

Keep control arm to swivel bearing connection clean and free from oil and grease.

Note insertion direction of screw.

Screw must rest correctly in groove of ball stud.

Replace self-locking nut.

Tightening torque **31 12 6AZ** .

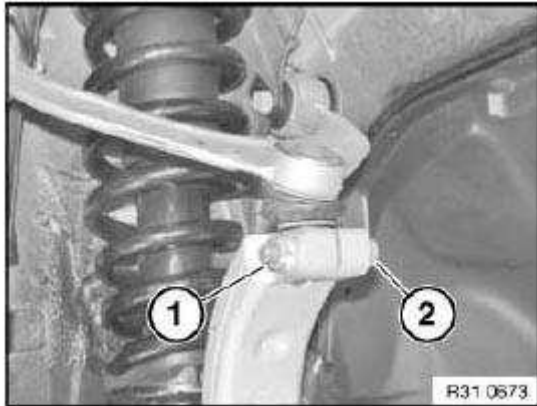


Fig. 25: Identifying Unfasten Nut And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts of screws (1).

Remove screws (1); if necessary, lower/raise swivel bearing and spring strut using workshop jack.

Remove control arm (2) from swivel bearing.

Installation:

Replace screws and nuts.

Set ride height at front left (right) to normal position (see **31 00 FRONT AXLE - RIDE HEIGHT E71**) and tighten screw/bolt connection.

Tightening torque **31 12 5AZ** .



Fig. 26: Identifying Control Arm Screws
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out **RIDE-HEIGHT CALIBRATION**

31 12 003 REMOVING AND INSTALLING/REPLACING TOP RIGHT CONTROL ARM

NOTE: Control arms with + or - marking (see **Fig. 27**) are camber correction arms:
- Underdimension variant
+ Overdimension variant

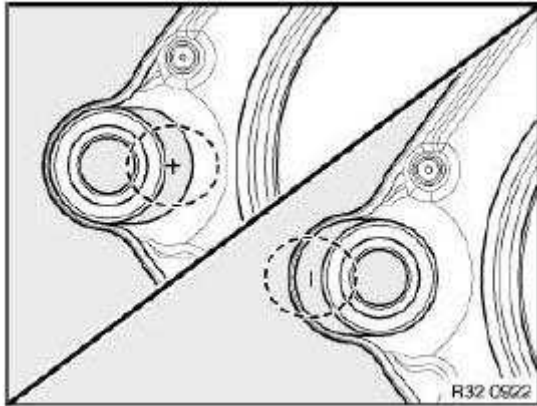


Fig. 27: Identifying Control Arms Marking Area
Courtesy of BMW OF NORTH AMERICA, INC.

These camber correction arms are used to correct the camber values by 30 minutes. To be used only if the tolerance values are exceeded or undershot!

An unmarked control arm is a standard part.

Necessary preliminary tasks:

- Remove **RIGHT PARTITION WALL FOR EQUIPMENT COMPARTMENT**
- Remove **REAR RIGHT WHEEL ARCH COVER**

Release screws (1).

Remove auxiliary part (2).

Installation:

When installing, make wiring harness penetration (3) is in correct position.

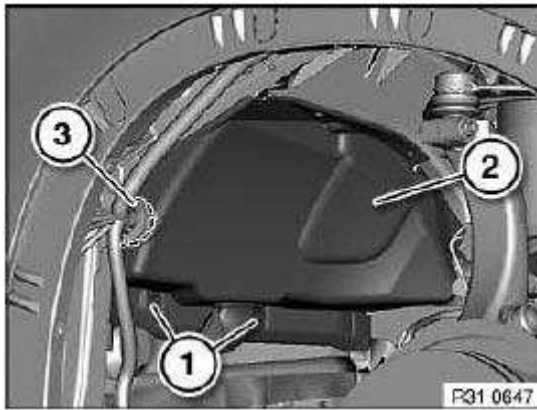


Fig. 28: Identifying Auxiliary Part With Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Further procedure is identical to:

- Removing and installing/replacing **TOP LEFT CONTROL ARM**

31 12 003 REMOVING AND INSTALLING / REPLACING TOP RIGHT WISHBONE

NOTE: Control arms with + or - marking (see illustration) are camber correction arms:

- - Underdimension variant
- + Overdimension variant

These camber correction arms are used to correct the camber values by 30 minutes. To be used only if the tolerance values are exceeded or undershot! An unmarked control arm is a standard part.

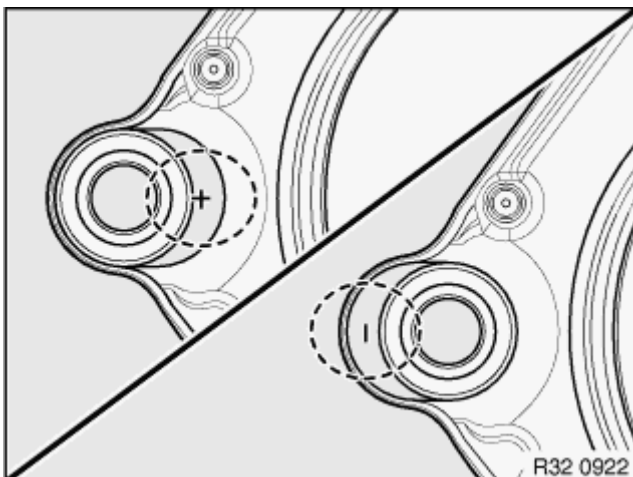


Fig. 29: Identifying Control Arms
 Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks: Remove control unit box

Important! The spring strut/lower wishbone screw connection does not have to be released!

Further procedure is identical to: **Removing and installing/replacing top left control arm.**

31 12 004 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT LOWER CONTROL ARM

Special tools required:

- **31 2 240**
- **31 2 247**
- **31 5 220**

NOTE: If the lower control arm is detached from the front axle carrier, it is necessary after reinstallation to carry out a wheel/chassis alignment check.

Necessary preliminary tasks:

- Remove **FRONT WHEELS**
- Remove **STEERING GEAR COVER AT SIDE BOTTOM**

Secure special tool **31 5 220** to drive flange with wheel studs. Support swivel bearing with special tool **31 5 220** and workshop jack.

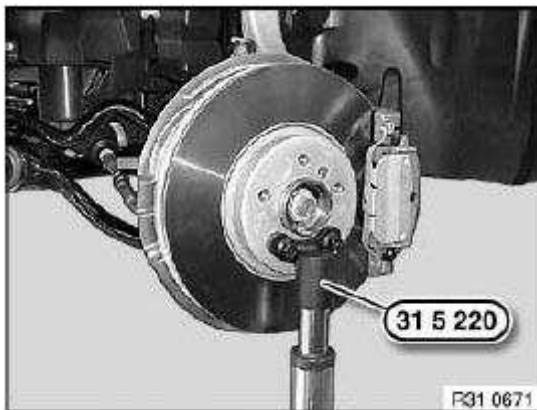


Fig. 30: Supporting Swivel Bearing With Special Tool (31 5 220) And Workshop Jack
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) and remove screw (2).

Installation:

Replace screw and nut.

Note insertion direction of screw.

Tighten bolt connection in **NORMAL POSITION** .

Tightening torque **31 12 7AZ** .

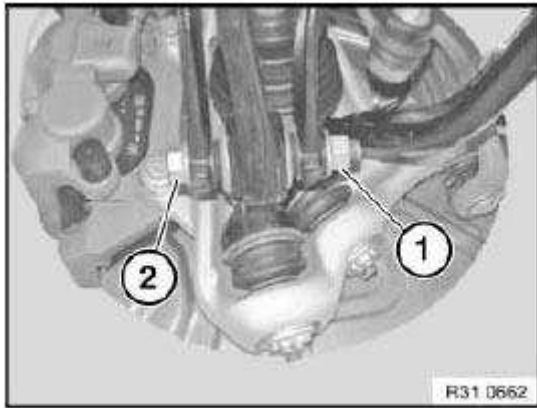


Fig. 31: Identifying Nut And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Slacken nut (1).

Remove screw (2) and remove control arm (3) from front axle carrier.

Installation:

Note insertion direction of screw.

Replace self-locking nut.

Tighten screw connection in **NORMAL POSITION** .

Tightening torque **31 12 3AZ** .

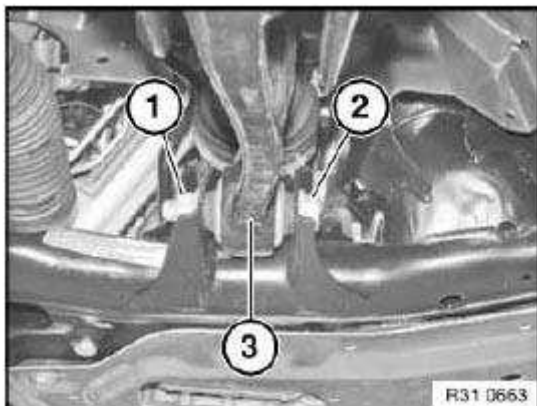


Fig. 32: Identifying Control Arm Screw
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not release control arm from swivel bearing with impact tool.
Make sure special tool rests correctly on steel bushing of swivel bearing. The swivel bearing must be removed if the steel bushing moves.
Rubber gaiter of control arm must not be damaged!
Do not pull stainless steel ring off journal.

Slacken nut (1) two to three thread turns.

If necessary, replace lower section 31 2 242 with lower section **31 2 247**.

Press control arm (2) with special tool 31 2 240 off swivel bearing.

Unscrew nut (1) and remove control arm (2) from swivel bearing.

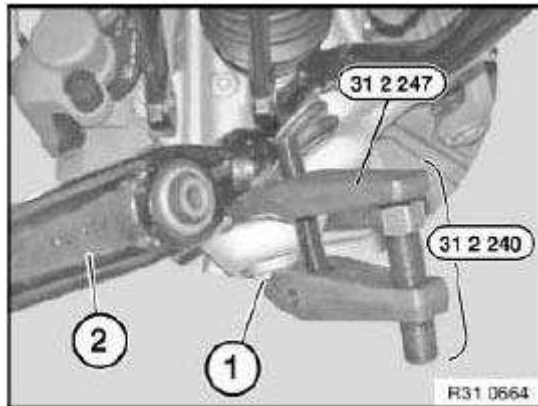


Fig. 33: Pressing Control Arm With Special Tool 31 2 240 Swivel Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep control arm to swivel bearing connection clean and free from oil and grease.

Replace self-locking nut.

Tightening torque **31 12 4AZ** .

After installation:

- Perform chassis alignment check. See **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** or **32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD**
- Carry out steering angle sensor adjustment/adjustment for active front steering. See **32 10 005**

ADJUSTMENT FOR ACTIVE FRONT STEERING and 61 31 996 CARRYING OUT STEERING ANGLE SENSOR ADJUSTMENT .

31 12 007 REPLACING RUBBER MOUNTS FOR FRONT AXLE CARRIER IN BOTH LOWER CONTROL ARMS

Special tools required:

- **31 4 151**
- **31 4 152**
- **31 4 153**

IMPORTANT: For reasons of driving dynamics, the rubber mounts may only be replaced in pairs (refers to left and right control arms)!

Necessary preliminary tasks:

- Check ball joint of both control arms while installed, replace **LOWER CONTROL ARM** if necessary
- Remove both **LOWER CONTROL ARMS**

Press rubber mount with special tools **31 4 151** and **31 4 152** out of control arm.

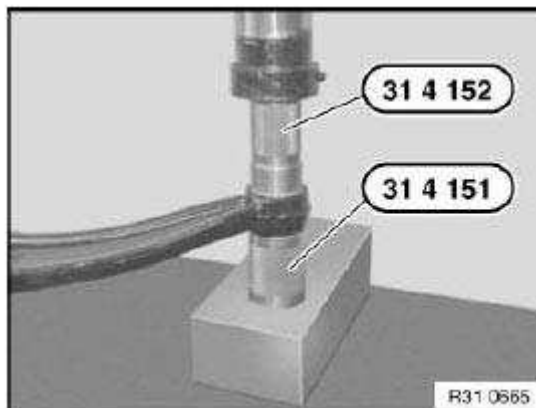


Fig. 34: Pressing Rubber Mount With Special Tools (31 4 151 And 31 4 152) Out Of Control Arm
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Use rubber mount with spline teeth (1)!

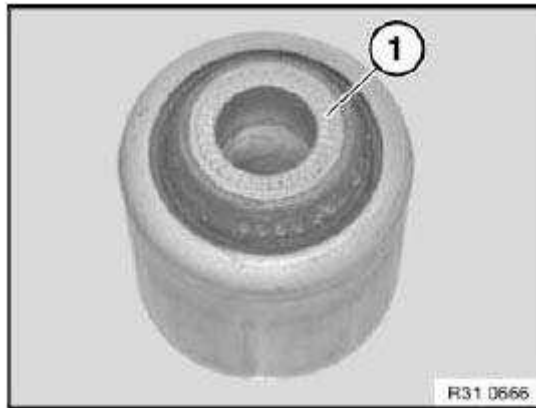


Fig. 35: Identifying Rubber Mount
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep rubber mount (1) and bushing in control arm clean and free from oil and grease.

Press rubber mount (1) (from chamfered end of control arm bushing) with special tools **31 4 152** and **31 4 153** into control arm bushing as far as it will go.

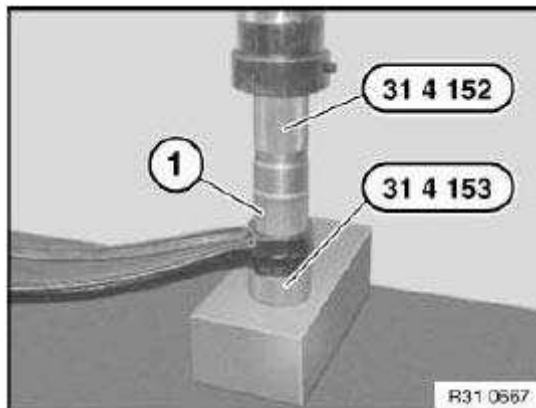


Fig. 36: Pressing Rubber Mount Into Control Arm Bushing
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform chassis alignment check. See **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** or **32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD**
- Carry out steering angle sensor adjustment/adjustment for active front steering. See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRYING OUT STEERING ANGLE SENSOR ADJUSTMENT** .

31 12 008 REPLACING RUBBER MOUNTS FOR SPRING STRUT HOLDER IN BOTH LOWER CONTROL ARMS

Special tools required:

- 31 4 151
- 31 4 152
- 31 4 154

IMPORTANT: For reasons of driving dynamics, the rubber mounts may only be replaced in pairs (refers to left and right control arms)!

Necessary preliminary tasks:

- Check ball joint of both control arms while installed, replace LOWER CONTROL ARM if necessary
- Remove both LOWER CONTROL ARMS

Press rubber mount with special tools **31 4 151** and **31 4 152** out of control arm.

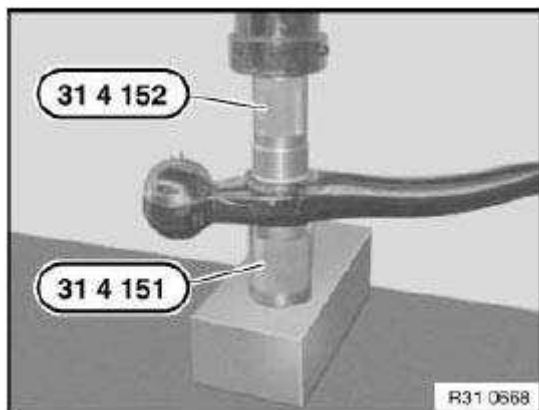


Fig. 37: Pressing Rubber Mount With Special Tools (31 4 151 And 31 4 152) Out Of Control Arm
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep rubber mount (1) and bushing in control arm clean and free from oil and grease.

Press rubber mount (1) (from chamfered end of control arm bushing) with special tools **31 4 152** and **31 4 154** into control arm bushing as far as it will go.

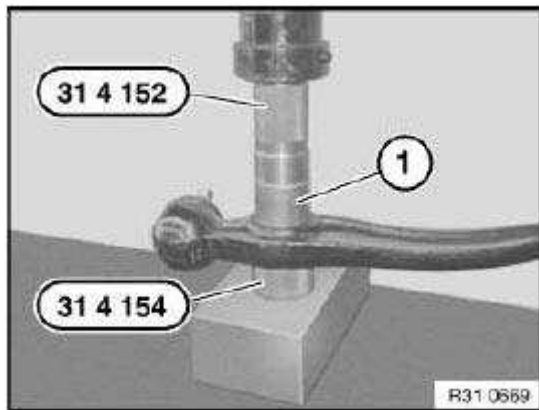


Fig. 38: Pressing Rubber Mount Into Control Arm Bushing
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform chassis alignment check. See **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** or **32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD**
- Carry out steering angle sensor adjustment/adjustment for active front steering. See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRYING OUT STEERING ANGLE SENSOR ADJUSTMENT** .

31 12 043 REMOVING AND INSTALLING/REPLACING COMPLETE FRONT LEFT OR RIGHT SPRING STRUT HOLDER

Special tools required:

- **31 2 230**
- **31 5 220**

Necessary preliminary tasks:

- Remove **FRONT WHEELS**
- Remove **STABILIZER LINK FROM SWIVEL BEARING**

Secure special tool **31 5 220** to drive flange with wheel studs.

Support swivel bearing with special tool **31 5 220** and workshop jack.

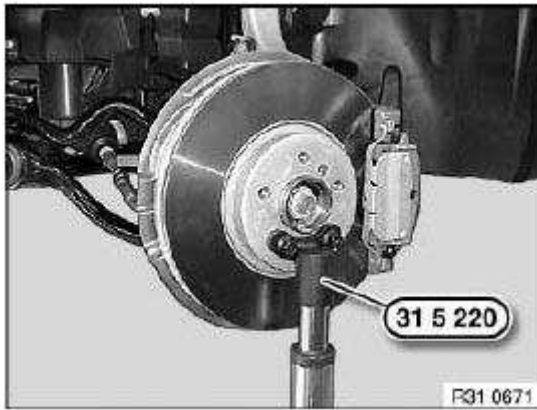


Fig. 39: Supporting Swivel Bearing With Special Tool (31 5 220) And Workshop Jack
Courtesy of BMW OF NORTH AMERICA, INC.

Slacken nut (1).

Release bolt (2) and remove upper control arm from swivel bearing.

Installation:

Keep upper control arm to swivel bearing connection clean and free from oil and grease.

Note insertion direction of screw.

Screw must rest correctly in groove of ball stud.

Replace self-locking nut.

Tightening torque **31 12 6AZ** .

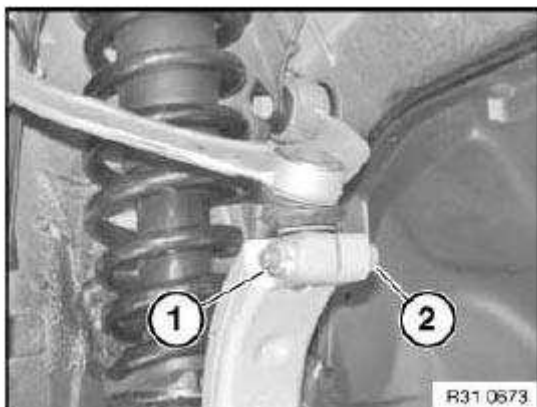


Fig. 40: Identifying Upper Control Arm Nut And Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: To be able to lower the swivel bearing far enough, it is necessary to align the output shaft so that one of the marked surfaces (1) points upwards.

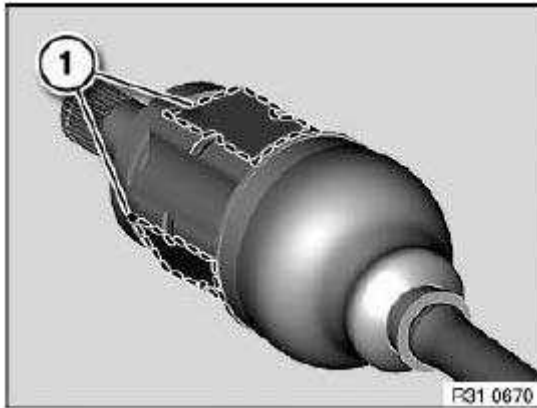


Fig. 41: Identifying Mark On Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolt (2) and remove with holder (1).

Expand spring strut holder (3) with special tool 31 2 230.

Release nut (5) and remove screw (4).

Lower swivel bearing until spring strut holder (3) is below spring strut.

Remove spring strut holder (3), taking care not to damage the output shaft.

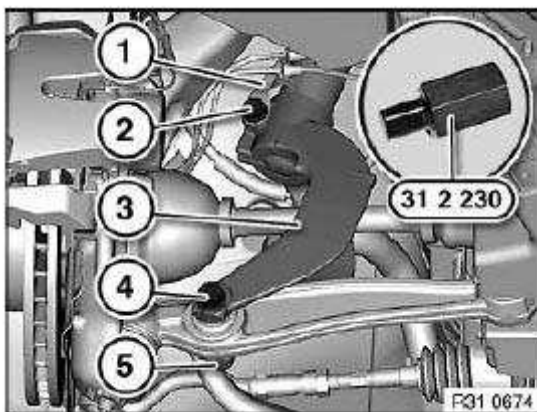


Fig. 42: Expanding Spring Strut Holder With Special Tool (31 2 230)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep spring strut holder to spring strut connection clean and free from oil and grease.

Version with Vertical Dynamics Management: Align spring strut holder by way of gap to positioning pin on back of spring strut.

Release bolt (4) and nut (5).

Note insertion direction of bolt (4).

Tighten down first bolt (4) and then bolt (2) in **NORMAL POSITION** .

Tightening torque **31 12 8AZ** (to spring strut).

Tightening torque **31 12 7AZ** (to lower control arm).

31 12 050 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT TENSION STRUT

Special tools required:

- **31 2 240**
- **31 2 247**

Necessary preliminary tasks:

- Remove **FRONT WHEELS**
- Remove front assembly underside protection
- Remove **STEERING GEAR COVER AT SIDE BOTTOM**

Release bolts (1).

Remove front wheel arch cover (2) from bumper trim.

Installation:

Make sure wheel arch cover is in correct position.

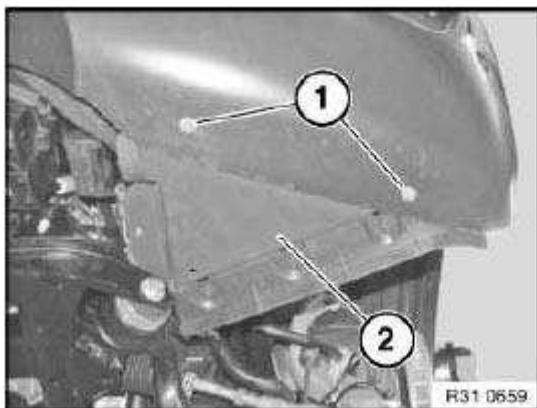


Fig. 43: Identifying Front Wheel Arch Cover Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) and remove screw (2).

Remove tension strut (3) from front axle carrier.

Installation:

Replace screw and nut.

Tighten bolt connection in **NORMAL POSITION** .

Tightening torque **31 12 1AZ** .

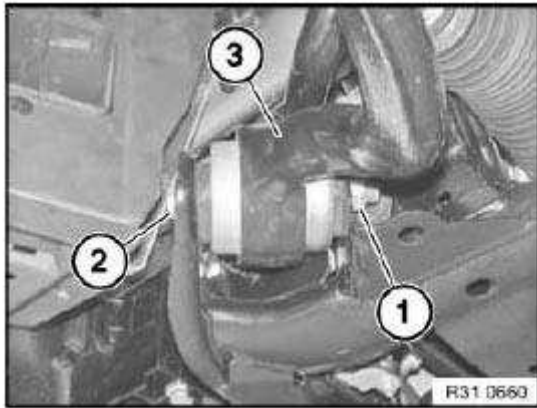


Fig. 44: Identifying Front Axle Carrier And Tension Strut
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not release tension strut from swivel bearing with impact tool.

Make sure special tool rests correctly on steel bushing of swivel bearing. The swivel bearing must be removed if the steel bushing moves.

Rubber gaiter of tension strut must not be damaged!

Do not pull stainless steel ring off journal.

Slacken nut (1) two to three thread turns.

If necessary, replace lower section 31 2 242 with lower section **31 2 247**.

Press tension strut (2) with special tool **31 2 240** off swivel bearing.

Unscrew nut (1) and remove tension strut (2) from swivel bearing.

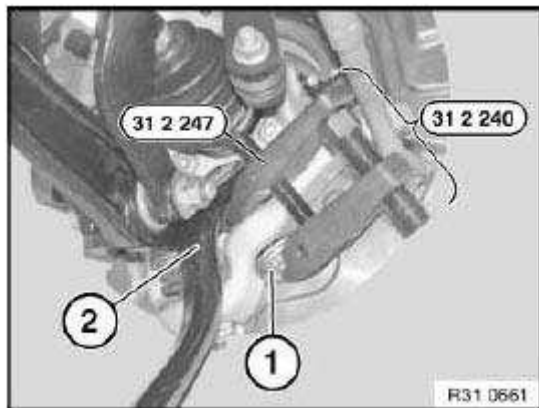


Fig. 45: Pressing Tension Strut With Special Tool (31 2 240) Swivel Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep tension strut to swivel bearing connection clean and free from oil and grease.

Replace self-locking nut.

Tightening torque **31 12 2AZ** .

31 12 138 REPLACING RUBBER MOUNTS ON BOTH TENSION STRUTS

Special tools required:

- 31 3 032
- 33 3 322

Necessary preliminary tasks:

- Check wheel control joints of tension struts while installed, replace **TENSION STRUTS** if necessary
- Remove **TENSION STRUTS**

Using a press and special tools 33 3 322 and 31 3 032 , press rubber mount out of tension strut.

NOTE: **Special tool 33 3 322 must be exactly flush with rubber mount bushing.**

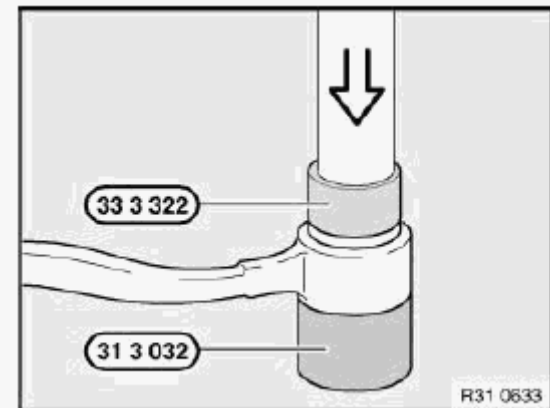


Fig. 46: Pressing Rubber Mount Out Of Tension Strut
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep rubber mount and bushing in tension strut clean and free from grease.

Align rubber mounts to each other using markings and press in. The deviation (A) must not exceed $\pm 5^\circ$.

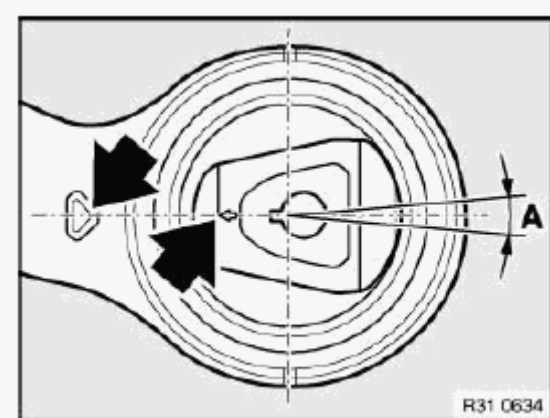


Fig. 47: Aligning Rubber Mounts And Bushing
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Protrusion (A) equally large.

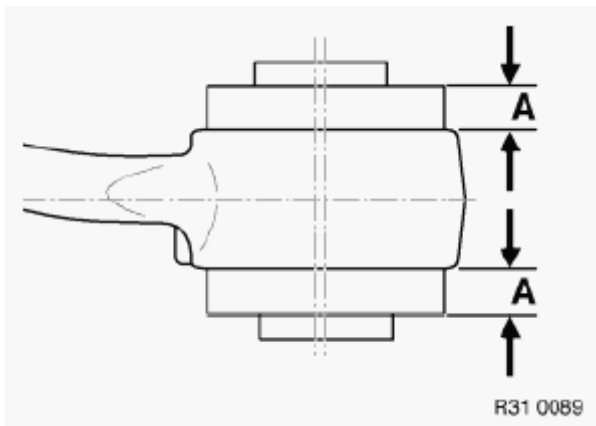


Fig. 48: Identifying Protrusion Equally Large
 Courtesy of BMW OF NORTH AMERICA, INC.

WHEEL BEARING AND STUB AXLE

31 21 090 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT SWIVEL BEARING

Necessary preliminary tasks:

- Remove WHEEL BEARING

IMPORTANT: Secure swivel bearing against falling out.

Replacement only: Remove BRAKE ANCHOR PLATE/BRAKE GUARD PLATE

Remove STABILIZER LINK FROM SWIVEL BEARING.

Remove upper control arm from swivel bearing. See 31 12 002 REMOVING AND INSTALLING/REPLACING TOP LEFT CONTROL ARM and 31 12 003 REMOVING AND INSTALLING/REPLACING TOP RIGHT CONTROL ARM

Remove TENSION STRUT FROM SWIVEL BEARING

Remove TIE ROD END FROM SWIVEL BEARING .

Remove LOWER CONTROL ARM FROM SWIVEL BEARING.

Remove swivel bearing.

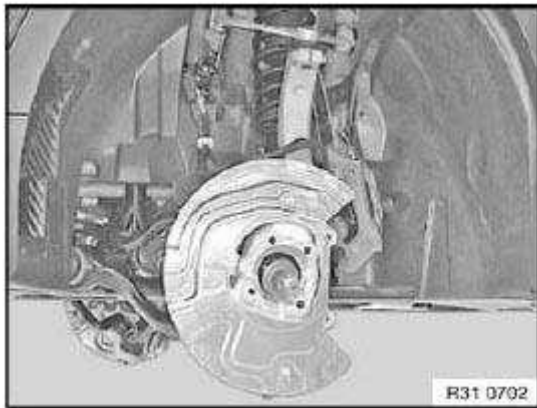


Fig. 49: Identifying Brake Anchor Plate And Brake Guard Plate
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Replacement only: Perform chassis alignment check. See **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** or **32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD**

31 21 180 REPLACING BEARING (WHEEL BEARING) FOR FRONT WHEEL

IMPORTANT: Bearing cannot be dismantled.
 Do not wash out bearing.

Remove **FRONT WHEELS** .

IMPORTANT: Expand turning lock sufficiently to avoid damaging thread when releasing collar nut.

Release collar nut (1), press brake pedal to floor for this purpose.

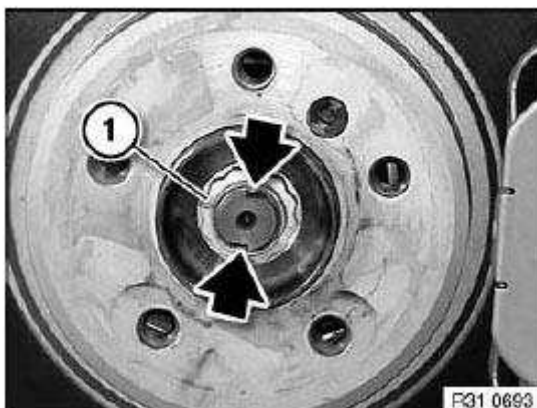


Fig. 50: Identifying Collar Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace collar nut, oil collar nut/wheel bearing contact surface only and tighten down.

No oil permitted on thread of shaft journal or collar nut.

Tightening torque **31 21 2AZ** .

Secure collar nut by positive peening on flat areas of output shaft.

Remove **BRAKE DISK** .

Release screw (1) and pull pulse generator out of bore.

Installation:

Clean bore for pulse generator and lubricate with Staburags NBU 12/K grease.

Tightening torque **34 51 3AZ** .

Release screws (2) and remove holder from swivel bearing.

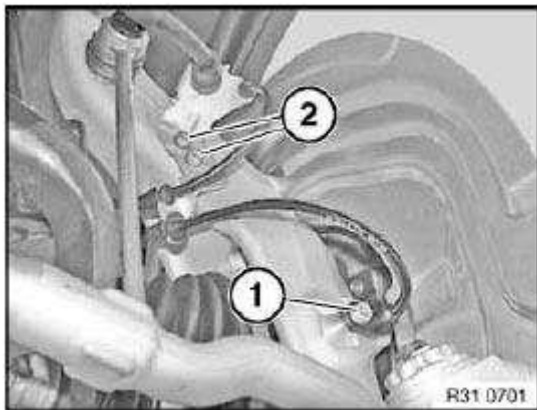


Fig. 51: Identifying Generator Screw
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Output shaft has been removed only for the purpose of creating the picture.**

Release bolts (1) and remove wheel bearing.

Installation:

Replace screws.

Tightening torque 31 21 1AZ

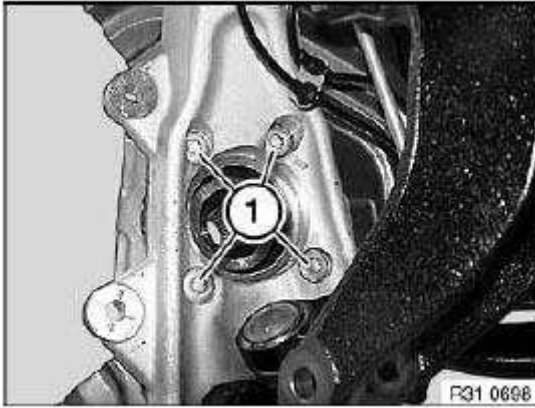


Fig. 52: Identifying Wheel Bearing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not damage inner race (1) of wheel bearing.

Detach wheel bearing from output shaft (refer to PRESSING OUTPUT SHAFT OUT OF DRIVE FLANGE).

Installation:

Keep contact surface of swivel bearing and wheel bearing clean and free from oil and grease.

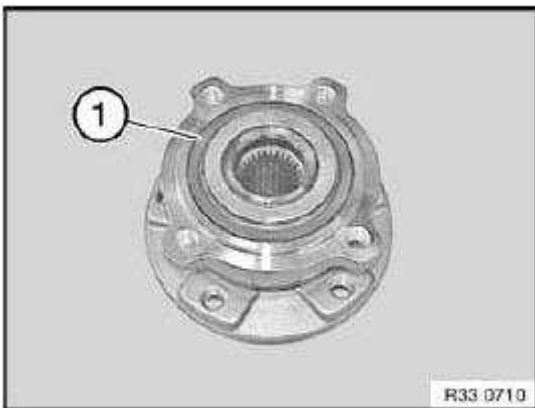


Fig. 53: Identifying Inner Race
Courtesy of BMW OF NORTH AMERICA, INC.

SPRING STRUT

31 31 000 REMOVING AND INSTALLING COMPLETE LEFT OR RIGHT SPRING STRUT SHOCK

ABSORBER

Necessary preliminary tasks:

- Remove **SIDE ASSEMBLY COMPARTMENT PARTITION WALL**
- Remove **SPRING STRUT HOLDER**

IMPORTANT: Risk of damage!
Secure spring strut against falling out.

Unscrew nuts (1).

Installation:

Clean contact surface in spring strut dome.

Replace self-locking nuts.

Tightening torque **31 31 1AZ** .

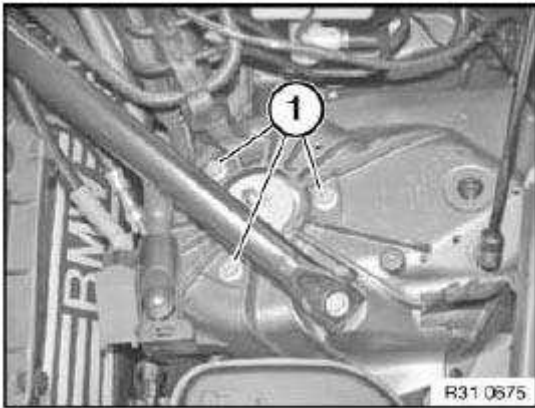


Fig. 54: Identifying Self-Locking Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Version with Vertical Dynamics Management: Disconnect both plug connections (1).

Disconnect plug connection (2) on impulse sensor.

Disconnect plug connection (3) from brake lining sensor.

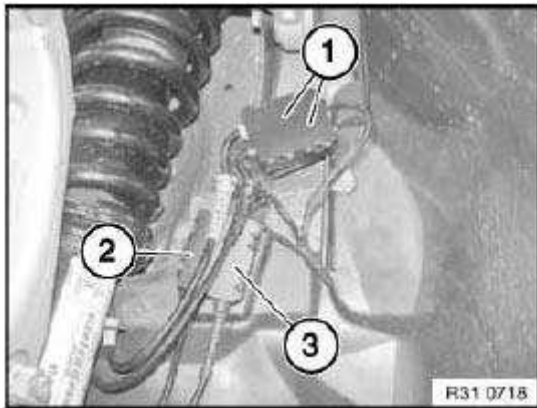


Fig. 55: Identifying Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove spring strut downwards out of wheel arch.



Fig. 56: Identifying Spring Strut Downwards Out Of Wheel Arch
 Courtesy of BMW OF NORTH AMERICA, INC.

31 31 031 REPLACING FRONT LEFT OR RIGHT SPRING STRUT SHOCK ABSORBER

Special tools required:

- 31 3 340
- 31 3 341
- 31 3 351
- 31 3 353

NOTE: Support bearing flange can only be mounted on spring strut dome in one position.

Version with Vertical Dynamics Management:

IMPORTANT: Handle the spring strut with care so as to avoid damaging the control unit (1) and control valve (2).

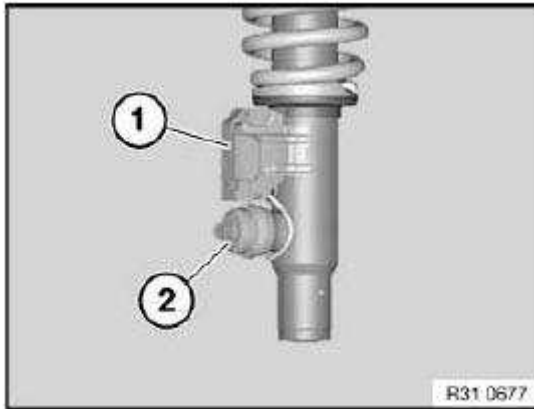


Fig. 57: Identifying Control Unit And Control Valve
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Prior to each use of the special tool 31 3 340 , it is essential to read the associated Owner's Handbook fully!
All the safety precautions and instructions contained in the Owner's Handbook must be strictly observed!
Failure to observe these safety precautions and instructions increases the risk of serious physical injury, damage to your health and damage to property and equipment!

- IMPORTANT:**
1. Prior to each use, check the special tools for defects, modifications and operational reliability.
 2. Damaged/modified special tools must not be used!
 3. No changes or modifications may be made to the special tools!
 4. These special tools are intended solely for the purpose of tightening and relieving cylindrical and tapered suspension springs.
 5. Keep special tools dry, clean and (down to the spindle) free from grease.
 6. Impact screwdrivers are prohibited!
 7. Do not compress coil spring to full extent.

Necessary preliminary tasks:

- Remove **FRONT SPRING STRUT**

IMPORTANT: E70 Security only:

Special tool 31 3 341 must be used in conjunction with special tool 31 3 351!

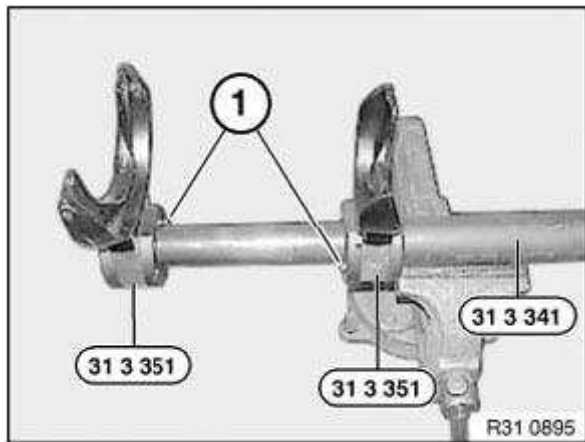


Fig. 58: Clamping Special Tool (31 3 341) In Vice
 Courtesy of BMW OF NORTH AMERICA, INC.

Removing:

Clamp special tool **31 3 341** in vice.

Fit special tools **31 3 351** and **31 3 353** from above on special tool **31 3 341** until locking pins (1) can be felt and heard to snap into place.

Check seating of special tools **31 3 351** and **31 3 353** , correct if necessary.

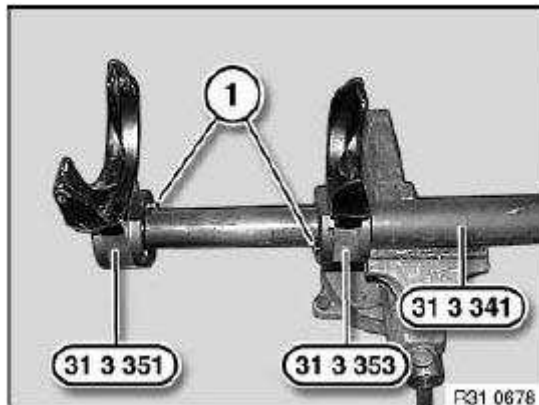


Fig. 59: Clamping Special Tool (31 3 341) In Vice
 Courtesy of BMW OF NORTH AMERICA, INC.

Clean coil spring to remove coarse contamination and take up with special tools **31 3 351** and **31 3 353**.

Turn spring strut until end of coil spring (1) points upwards.

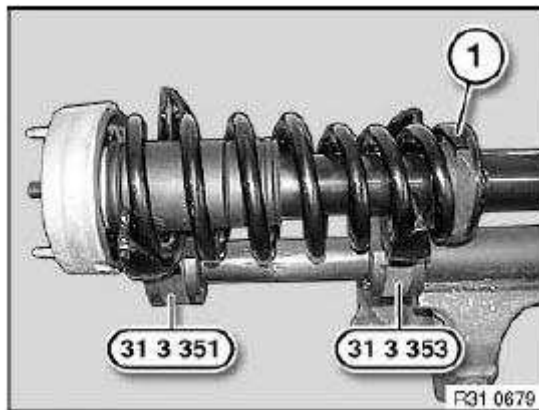


Fig. 60: Identifying Coil Spring And Special Tools (31 3 351, 31 3 353)
 Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Coils of coil spring must be located completely in recesses of special tools 31 3 351 and 31 3 353!

Compress coil spring until stress on piston rod is relieved.

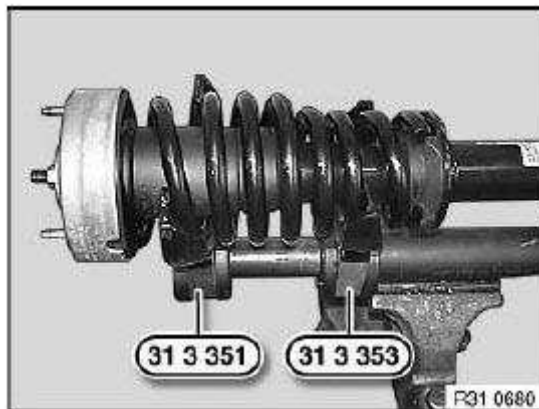


Fig. 61: Compressing Coil Spring Until
 Courtesy of BMW OF NORTH AMERICA, INC.

Slacken nut (1).

Remove joint disc (2), support bearing upper section (3) and support bearing flange (4).

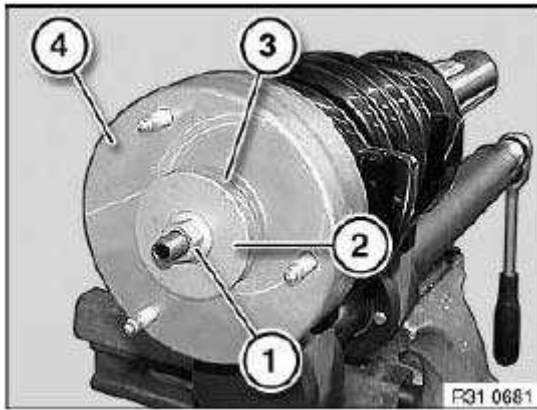


Fig. 62: Supporting Bearing Upper Section
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove support pot (1) and protective tube (2).

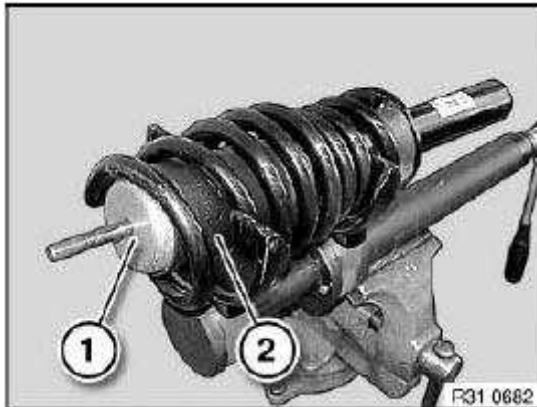


Fig. 63: Identifying Support Pot And Protective Tube
 Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on coil spring.

Remove coil spring with shock absorber from special tools **31 3 351** and **31 3 353**.

Remove shock absorber from coil spring.

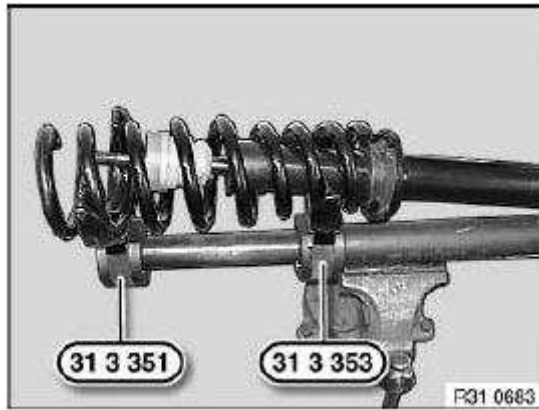


Fig. 64: Identifying Shock Absorber And Special Tools (31 3 351 And 31 3 353)
 Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove auxiliary damper (1) and spring pad (2) from shock absorber.

Assembly:

Check auxiliary damper (1) and spring pad (2) for damage, replace if necessary.

NOTE: Make sure spring pad (2) is correctly seated in spring plate.

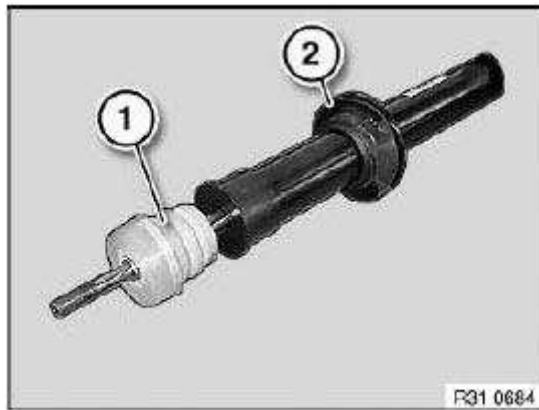


Fig. 65: Identifying Auxiliary Damper And Spring Pad
 Courtesy of BMW OF NORTH AMERICA, INC.

Check spring pad (1), support bearing lower section (2), protective tube (3) and support bearing upper section (4) for damage, replace if necessary.

NOTE: Align spring pad (1) by means of coding to support bearing flange (5).

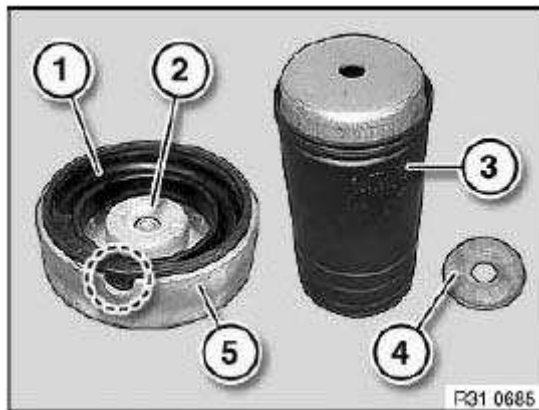


Fig. 66: Identifying Spring Pad, Protective Tube And Bearing Upper Section
 Courtesy of BMW OF NORTH AMERICA, INC.

Insert shock absorber into coil spring.

Accommodate coil spring and spring strut with special tools 31 3 351 and 31 3 353.

NOTE: End of coil spring (1) must point upwards.

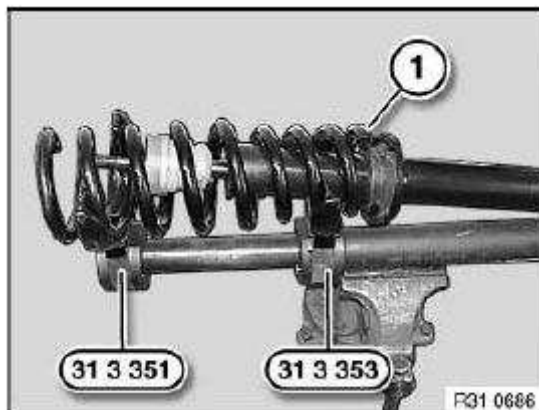


Fig. 67: Identifying Coil Spring With Special Tools (31 3 351)
 Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Do not compress coil spring to full extent.
 Coils of coil spring must be located completely in recesses of special tools 31 3 351 and 31 3 353!

Tension coil spring until support bearing flange can be mounted.

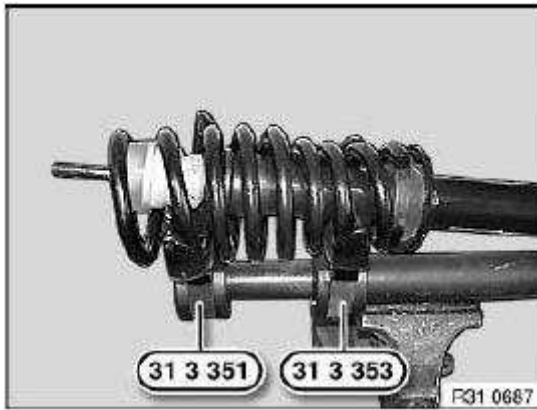


Fig. 68: Identifying Tension Coil Spring Until And Special Tools (31 3 351)
 Courtesy of BMW OF NORTH AMERICA, INC.

Attach support pot (1) and protective tube (2) to piston rod.

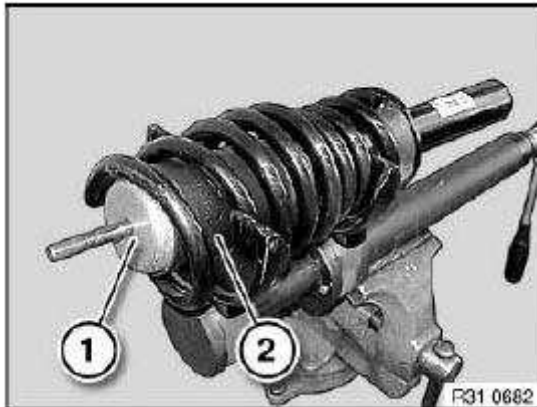


Fig. 69: Identifying Support Pot And Protective Tube
 Courtesy of BMW OF NORTH AMERICA, INC.

Left spring strut only:

IMPORTANT: Stud (1) above opening (2) must point in direction of travel (F)!
 Coding (3) of spring pad must be seated in opening (2) opposite stud (1)!
 Version with Vertical Dynamics Management:
 Stud (4) must be flush with positioning pin (5)!

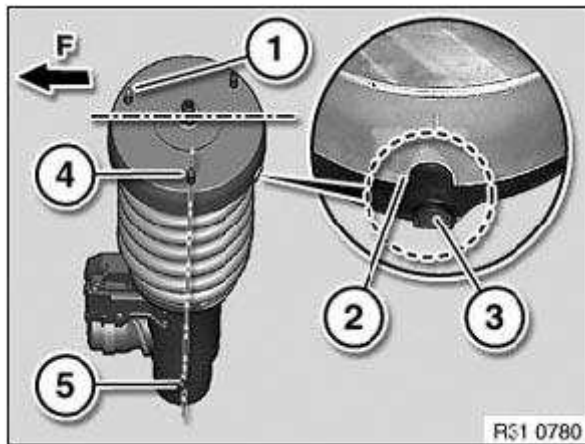


Fig. 70: Identifying Version With Vertical Dynamics Management (Left Spring)
 Courtesy of BMW OF NORTH AMERICA, INC.

Right spring strut only:

IMPORTANT: Stud (1) above opening (2) must point in direction of travel (F)!
Coding (3) of spring pad must be seated in opening (2) below stud (1)!
Version with Vertical Dynamics Management:
Stud (4) must be flush with positioning pin (5)!

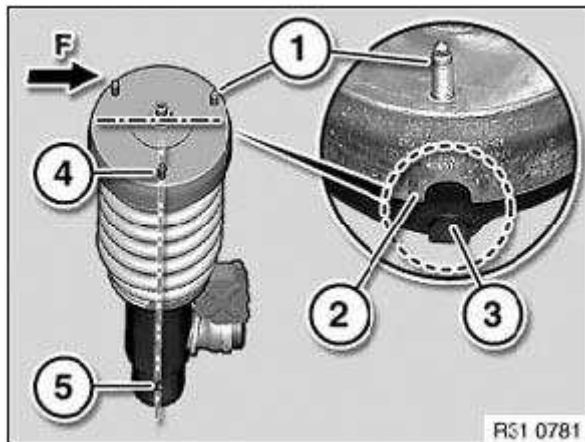


Fig. 71: Identifying Version With Vertical Dynamics Management (Right Spring)
 Courtesy of BMW OF NORTH AMERICA, INC.

Attach support bearing flange (1) to piston rod.

Align support bearing upper section (3) as illustrated and attach to inner section (2) of support bearing flange (1).

NOTE: Pay attention to edge (4) in shown in illustration.

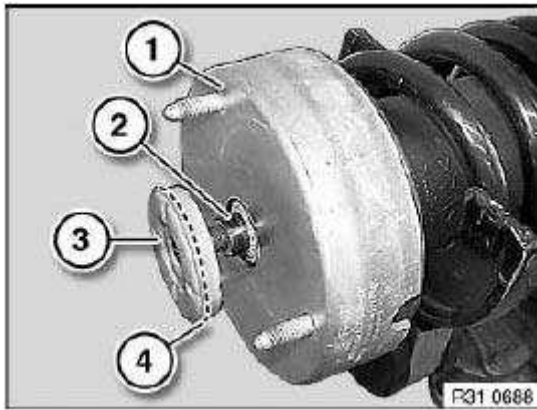


Fig. 72: Attaching Inner Section Of Support Bearing Flange
Courtesy of BMW OF NORTH AMERICA, INC.

Attach joint disc (1) to piston rod.

Replace nut (2) and tighten down (gripping piston rod in so doing).

Tightening torque **31 31 2AZ** .

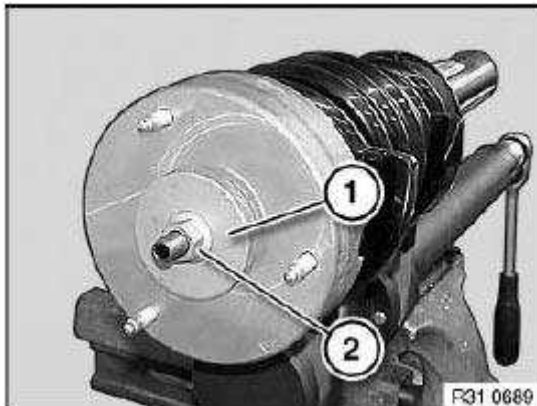


Fig. 73: Identifying Joint Disc And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Align support bearing flange (1) and shock absorber (3) by means of spring pads to coil spring ends.

Relieve tension on coil spring.

Check installation position of protective tube (2), correct if necessary.

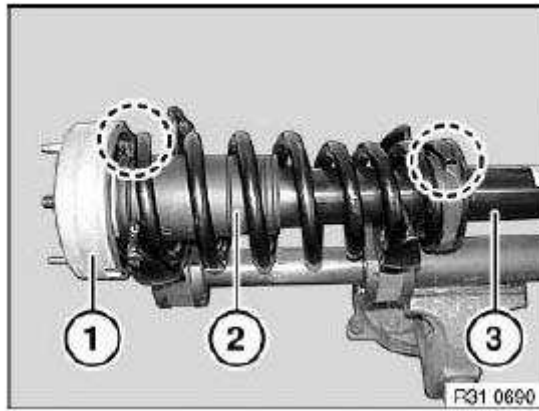


Fig. 74: Aligning Support Bearing Flange And Shock Absorber
Courtesy of BMW OF NORTH AMERICA, INC.

After fitting on version with Vertical Dynamics Management:

- Code spring strut with DIS Tester and check software status
- Carry out VERTICAL ACCELERATION SENSOR ADJUSTMENT

SPRING WITH SUSPENSION

31 33 ... MEASURING RIDE-LEVEL HEIGHT OF VEHICLE

Determine actual ride height (A) - to do so, attach tape measure to rim flange (2) at bottom middle and measure to lower edge of wheel arch (1).

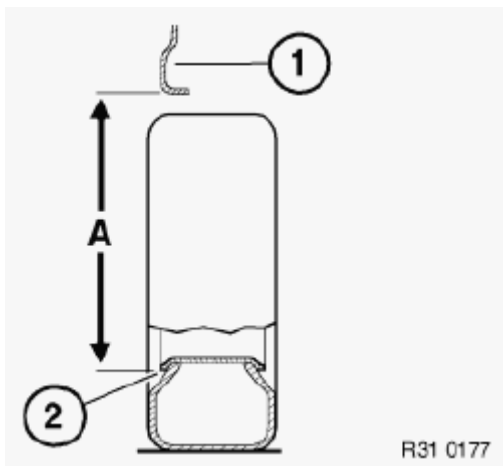


Fig. 75: Identifying Ride-Level Height Of Vehicle
Courtesy of BMW OF NORTH AMERICA, INC.

31 33 005 REPLACING FRONT LEFT OR RIGHT SPRING STRUT SUPPORT BEARING

NOTE: Procedure is described in the document "REPLACING FRONT LEFT OR RIGHT

SPRING STRUT".

31 33 095 MEASURING RIDE-LEVEL HEIGHT OF VEHICLE

Necessary preliminary tasks:

- Move vehicle into **NORMAL POSITION**

Determine actual ride height (A) - to do so, attach tape measure to rim flange (2) at bottom middle and measure to lower edge of wheel arch (1).

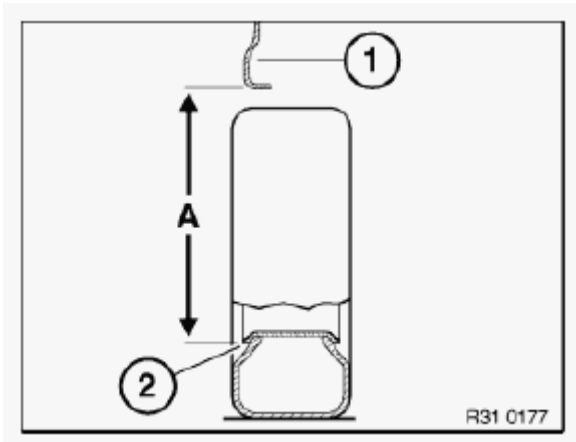


Fig. 76: Measuring To Lower Edge Of Wheel Arch
Courtesy of BMW OF NORTH AMERICA, INC.

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

IMPORTANT: Both coil springs on the relevant axle must be replaced only in the event of corrosion breakage!

NOTE: The coil spring is allocated in the Electronic Parts Catalogue (EPC) under the menu item "Spring table" after the vehicle identification number has been entered and the relevant optional extra of the car has been selected.

NOTE: Procedure is described in the document "**REPLACING FRONT LEFT OR RIGHT SPRING STRUT**".

STABILIZER BAR

31 35 000 REMOVING AND INSTALLING/REPLACING FRONT STABILIZER

Necessary preliminary tasks:

- Remove **FRONT WHEELS**
- Remove **FRONT UNDERBODY PROTECTION** .
- Remove **FRONT RIGHT WHEEL ARCH COVER (FRONT SECTION)**
- Remove **RADIATOR AIR DUCT**
- Remove right brake air duct with holder
- Remove fan cowl. See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N54)** or **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N63)** .
- Remove heat exchanger from front axle carrier and tie up. See **17 22 010 REMOVING AND INSTALLING/REPLACING HEAT EXCHANGER FOR AUTOMATIC TRANSMISSION (M57T2, N54)** or **17 22 010 REMOVING AND INSTALLING/REPLACING TRANSMISSION FLUID COOLER FOR AUTOMATIC TRANSMISSION (N63)** .
- Disconnect pressure line for power steering from front axle carrier
- Remove **BOTH STABILIZER LINKS FROM STABILIZER**

Release screws (1).

Remove both retaining brackets of stabilizer (2).

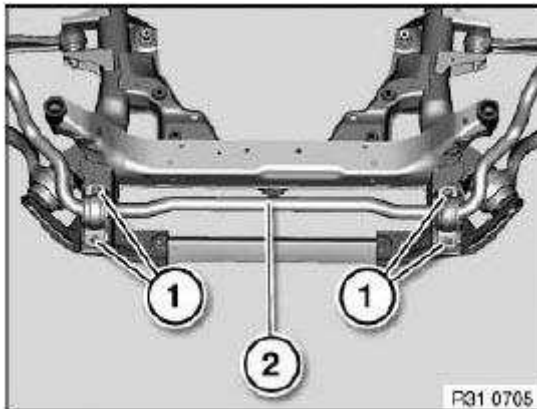


Fig. 77: Identifying Retaining Brackets Of Stabilizer (2)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Align retaining bracket (1) so that tapped holes are situated in middle of elongated hole.

Tightening torque **31 35 1AZ** .

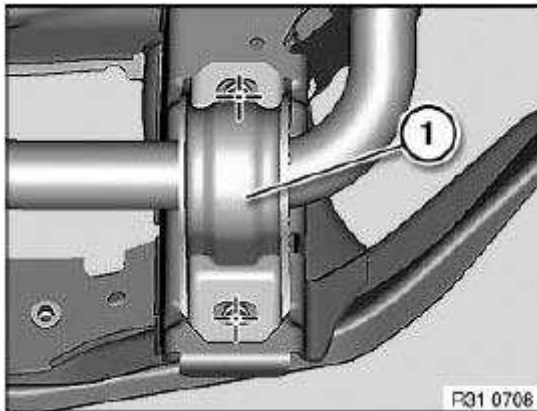


Fig. 78: Identifying Retaining Bracket
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove radiator box from engine carrier, extend out, press upwards and support with workshop jack.

IMPORTANT: Do not damage coating of stabilizer.

Remove stabilizer towards front.

Installation:

Check rubber mounting of radiator box for correct seating.

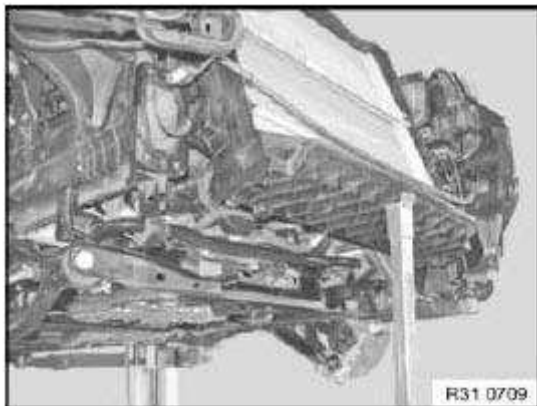


Fig. 79: Supporting With Workshop Jack
 Courtesy of BMW OF NORTH AMERICA, INC.

31 35 005 REMOVING AND INSTALLING/REPLACING PUSH ROD (STABILIZER LINK) FOR LEFT/RIGHT STABILIZER

IMPORTANT: Observe SAFETY INSTRUCTIONS for raising the vehicle
Do not mix up stabilizer links

- A. Stabilizer link for conventional stabilizer
- B. Stabilizer link for active stabilizer

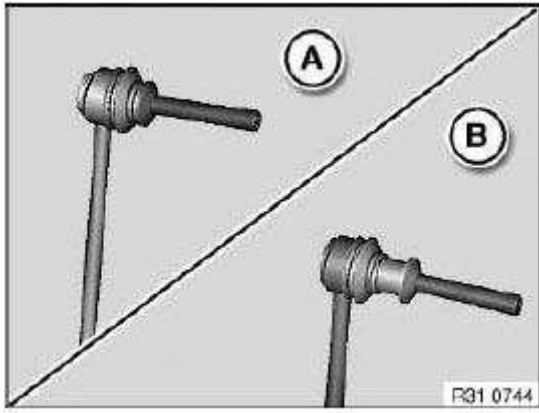


Fig. 80: Identifying Stabilizer Link

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1).

Installation:

Replace self-locking nut.

Tightening torque **31 35 2AZ** .



Fig. 81: Identifying Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1).

Remove stabilizer link (2).

Installation:

Replace self-locking nut.

Tightening torque 31 35 2AZ .

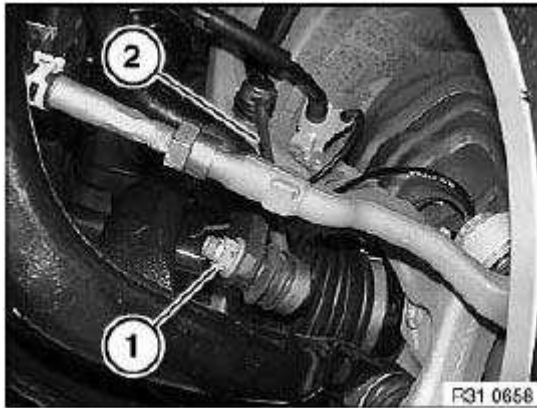


Fig. 82: Identifying Stabilizer Link And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

FRONT AXLE GEARBOX

31 50 ... CHANGING FRONT DIFFERENTIAL OIL

WARNING: DANGER OF POISONING if oil is ingested/absorbed through the skin!
RISK OF INJURY if oil comes into contact with eyes and skin!

IMPORTANT: Use only the approved front differential oil in this front differential.
Failure to comply with this requirement will result in serious damage to the differential!

NOTE: Only change oil when front differential is at normal operating temperature.

Necessary preliminary tasks:

- Remove REINFORCEMENT PLATE
- Remove STEERING GEAR COVER AT TOP LEFT

Checking/correcting front differential oil level:

Undo oil filler plug (1).

Check front differential oil level.

If necessary, pour in front differential oil up to lower edge of opening for oil filler plug (1).

Installation:

Replace oil filler plug.

Tightening torque **31 50 2AZ** .

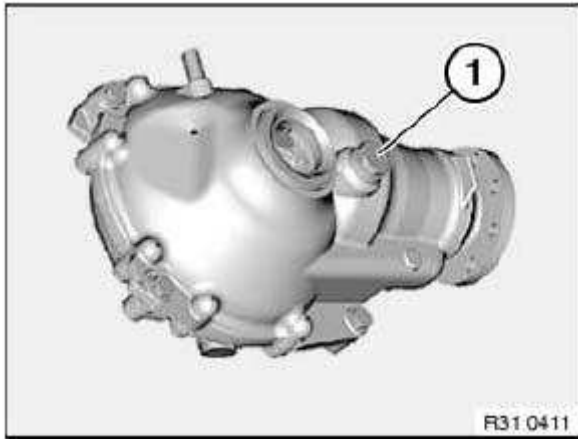


Fig. 83: Identifying Oil Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Changing front differential oil:

Place oil collecting apparatus underneath.

Remove oil drain plug (1).

Drain front differential oil.

Installation:

Replace oil drain plug.

Tightening torque **31 50 2AZ** .

Undo oil filler plug (2).

Pour in front differential oil up to lower edge of opening for oil filler plug (2).

Installation:

Replace oil filler plug.

Tightening torque **31 50 2AZ** .

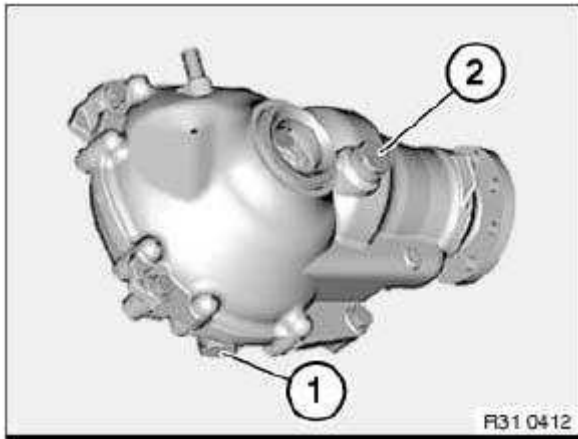


Fig. 84: Identifying Oil Filler And Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

31 50 001 REMOVING AND INSTALLING/REPLACING FRONT DIFFERENTIAL

Necessary preliminary tasks:

- Remove **LEFT OUTPUT SHAFT**
- Secure **RIGHT OUTPUT SHAFT WITH SPECIAL TOOL**
- Remove **FRONT PROPELLER SHAFT**
- Lower **FRONT AXLE SUPPORT**

IMPORTANT: Risk of injury!

When releasing the last bolt, grip the front differential to prevent it from falling down.

Detach vent line (1).

Release bolts (2-4).

Remove front differential downwards.

Installation:

During removal and installation: Replace **O-RING**.

Coat O-ring with front differential oil.

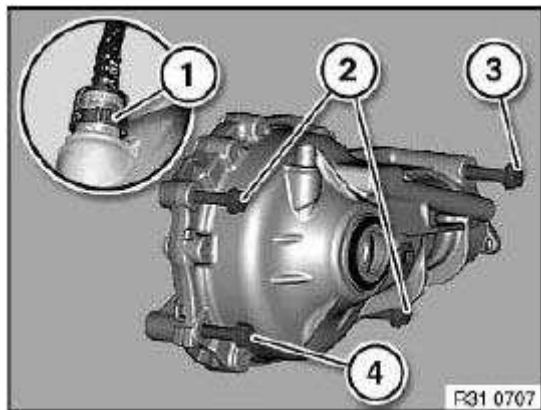


Fig. 85: Identifying Vent Line With Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

Make sure screws are installed in correct positions.

- Bolt (2) M12 x 60
- Bolt (3) M12 x 125
- Bolt (4) M12 x 85

Tightening torque **31 50 1AZ** .

Check **FRONT DIFFERENTIAL OIL LEVEL**, correct if necessary

After installation:

- Perform chassis alignment check. See **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** or **32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD** .
- Carry out steering angle sensor adjustment/adjustment for active front steering. See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRYING OUT STEERING ANGLE SENSOR ADJUSTMENT** .

DIFFERENTIAL WITH BEARINGS

31 51 010 REPLACING RADIAL SEAL FOR DRIVE FLANGE OF FRONT DIFFERENTIAL

Special tools required:

- **23 0 020**
- **31 5 130**
- **33 1 150**

Necessary preliminary tasks:

- Remove **REINFORCEMENT PLATE**
- Remove **FRONT PROPELLER SHAFT**

Mark position of nut with respect to shaft with punch marks (arrow).

Lever out lockplate (1) with a suitable tool.

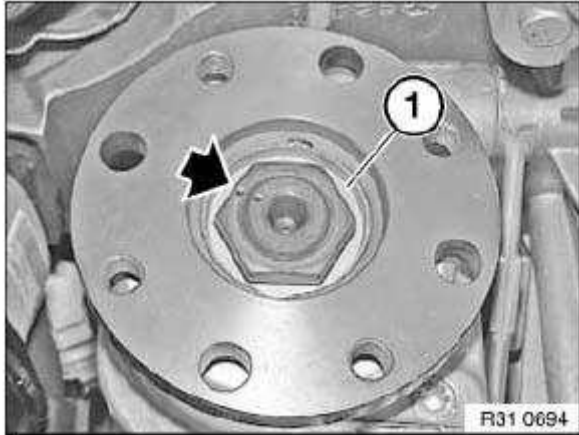


Fig. 86: Identifying Lockplate

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Do not place special tool on threaded holes of drive flange.

Secure drive flange with special tool **23 0 020** against turning and release nut (1).

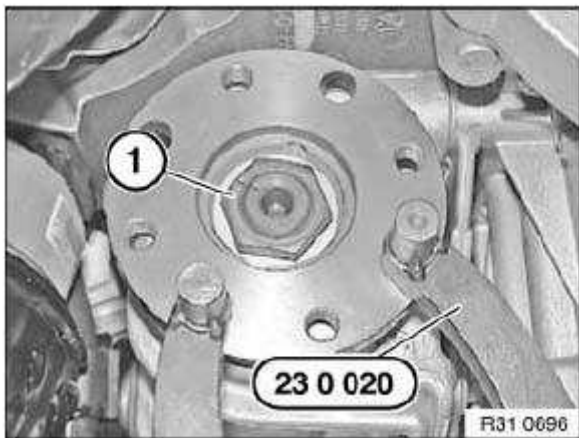


Fig. 87: Identifying Special Tool (23 0 020) And Nut

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Mount special tool only with longer screws (M10 x 30) on drive flange.

Pull drive flange off drive shaft with special tool 33 1 150.

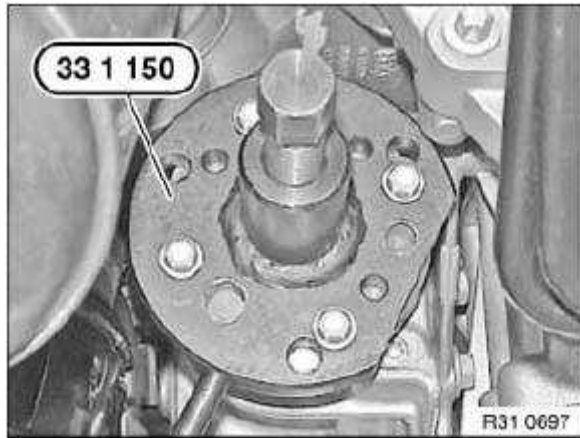


Fig. 88: Pulling Drive Flange
Courtesy of BMW OF NORTH AMERICA, INC.

Lever shaft seal (1) out of front differential with a suitable screwdriver (2).

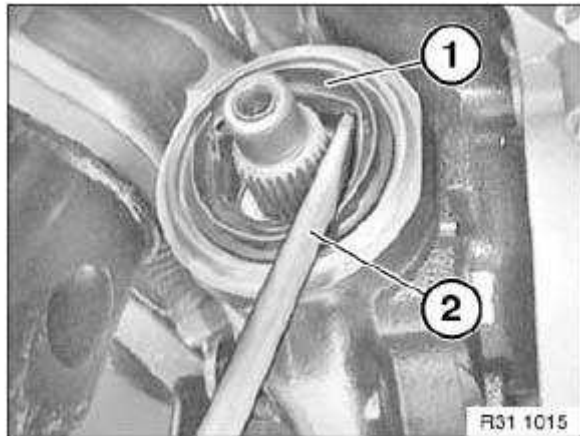


Fig. 89: Levering Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Drive in shaft seal with special tool 31 5 130 as far as it will go.

Coat sealing lips of new shaft seal (1) with front differential oil.

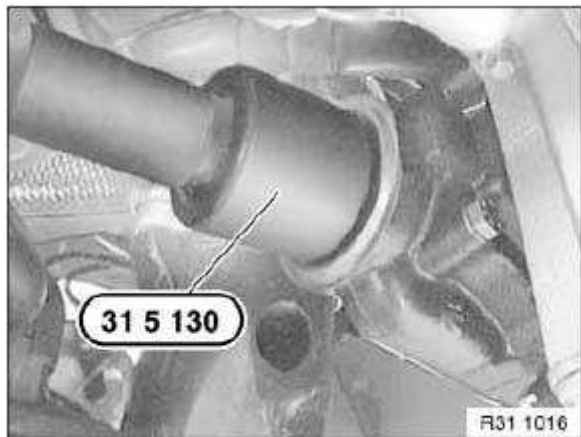


Fig. 90: Installing Shaft Seal With Special Tool (31 5 130)
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Do not tighten nut beyond punch marks. Otherwise the clamping sleeve will be damaged.

Clean drive flange and attach.

Tighten down nut until punch marks on nut and shaft are aligned.

Install new lockplate (1).

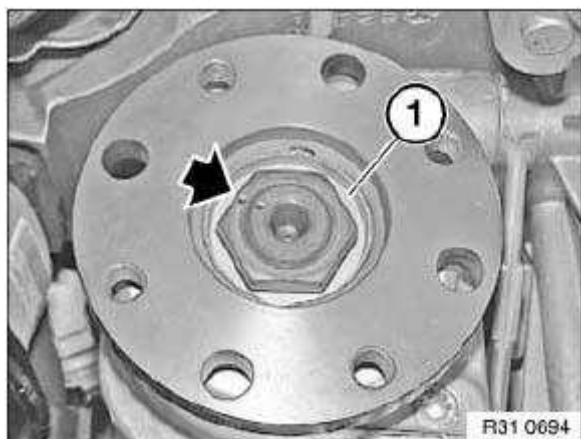


Fig. 91: Identifying Lockplate
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check **FRONT DIFFERENTIAL OIL LEVEL**, correct if necessary

31 51 015 REPLACING SHAFT SEAL FOR LEFT OUTPUT SHAFT

Special tools required:

- 31 4 160

Necessary preliminary tasks:

- Remove LEFT OUTPUT SHAFT

Lever shaft seal (1) out of front differential with a screwdriver (2).

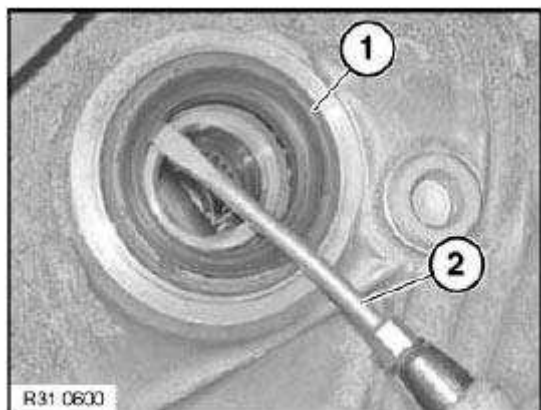


Fig. 92: Removing Shaft Seal

Courtesy of BMW OF NORTH AMERICA, INC.

Installing shaft seal:

NOTE: The installation protective ring (1) serves to protect the sealing lips on shaft seal (2) when the output shaft is being installed.

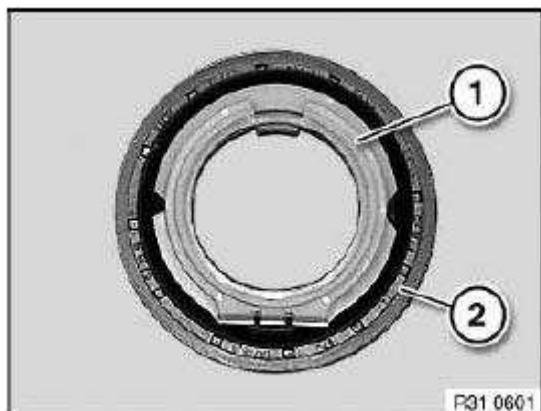


Fig. 93: Identifying Protective Ring And Shaft Seal

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Installation protective ring must not slip out of shaft seal!

Drive in shaft seal with special tool **31 4 160** as far as it will go.

Carefully remove special tool **31 4 160**.

Open installation protective ring (1).

Check **FRONT DIFFERENTIAL OIL LEVEL**, correct if necessary

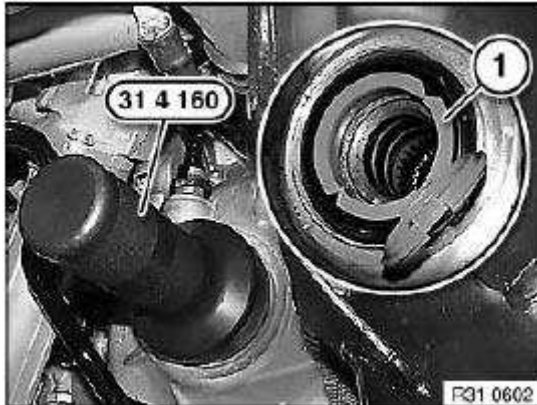


Fig. 94: Identifying Protective Ring With Special Tool (31 4 160)
Courtesy of BMW OF NORTH AMERICA, INC.

31 51 020 REPLACING SHAFT SEAL FOR RIGHT OUTPUT SHAFT

Special tools required:

- **31 4 160**

Necessary preliminary tasks:

- Remove **RIGHT OUTPUT SHAFT**

Lever shaft seal (1) out of bearing block with a screwdriver (2).

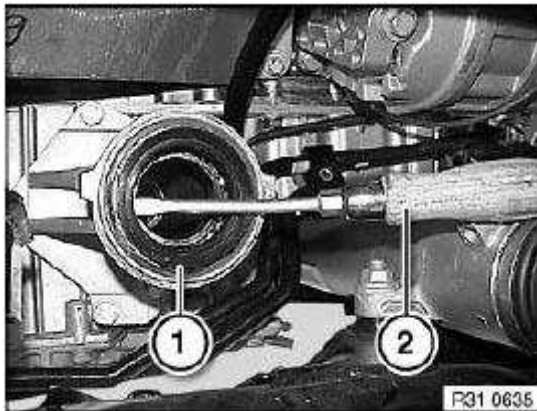


Fig. 95: Removing Shaft Seal Out Of Bearing
 Courtesy of BMW OF NORTH AMERICA, INC.

Installing shaft seal:

NOTE: The installation protective ring (1) serves to protect the sealing lips on shaft seal (2) when the output shaft is being installed.

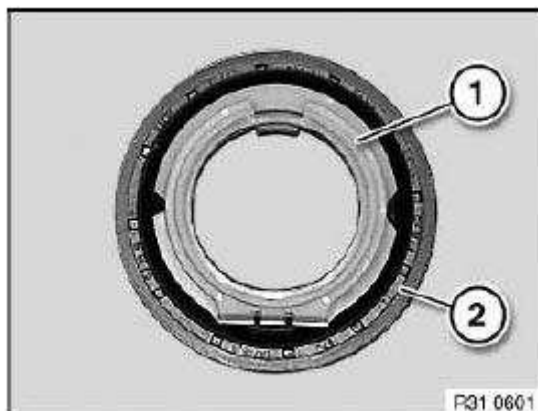


Fig. 96: Identifying Protective Ring And Shaft Seal
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Installation protective ring must not slip out of shaft seal!

Drive in shaft seal with special tool **31 4 160** as far as it will go.

Carefully remove special tool **31 4 160**.

Open installation protective ring (1).

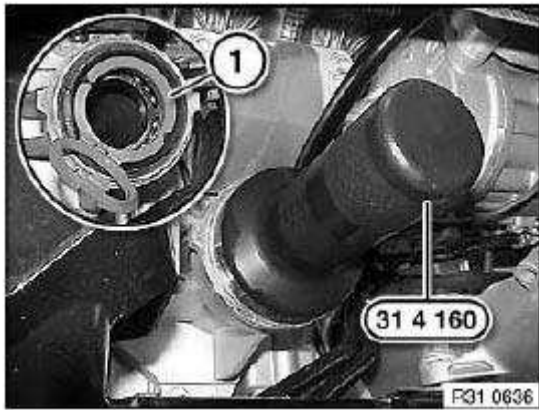


Fig. 97: Identifying Protective Ring With Special Tool (31 4 160)
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check **FRONT DIFFERENTIAL OIL LEVEL**, correct if necessary

31 51 060 REPLACING O-RING FOR FRONT DIFFERENTIAL ON RIGHT

Necessary preliminary tasks:

- Remove **FRONT DIFFERENTIAL**

Remove O-ring (1) with a suitable tool from front differential.

Installation:

Insert O-ring (1) in groove and coat with front differential oil.

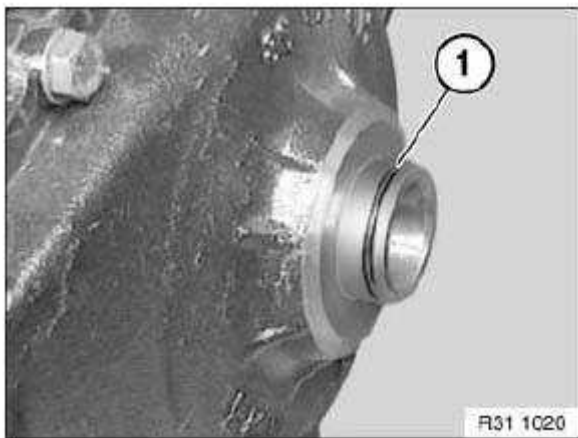


Fig. 98: Identifying O-Ring
 Courtesy of BMW OF NORTH AMERICA, INC.

31 51 065 REPLACING O-RING FOR BEARING BLOCK

Necessary preliminary tasks:

- Remove **BEARING BLOCK**

Remove O-ring (1) with a suitable tool from bearing block (2).

Installation:

Insert O-ring (1) in groove and coat with front differential oil.

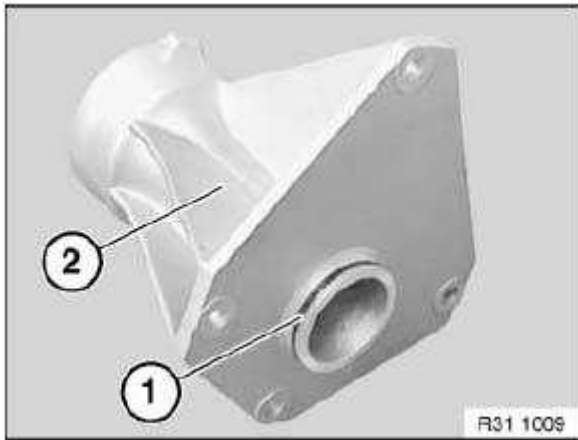


Fig. 99: Identifying O-Ring With Bearing Block
Courtesy of BMW OF NORTH AMERICA, INC.

31 53 040 REMOVING AND INSTALLING/REPLACING RIGHT OUTPUT SHAFT BEARING BLOCK

WARNING: N62, N63:

Danger of explosion!

There is a danger of short circuiting on account of the small distance between the bearing block screw connection and the starter motor.

Disconnect BATTERY NEGATIVE LEAD .

Necessary preliminary tasks:

- Remove **RIGHT OUTPUT SHAFT**

Release screws (1).

Remove bearing block from oil sump.

Installation:

Replace **O-RING**

Tightening torque **31 60 1AZ** .

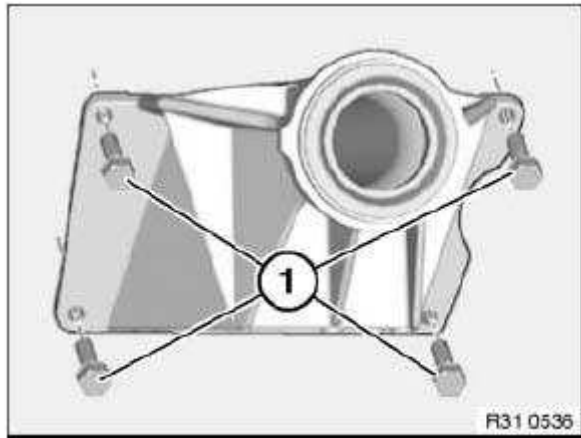


Fig. 100: Identifying Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- Remove sealing caps

OUTPUT SHAFT

31 60 ... NOTES ON REMOVING AND INSTALLING LOW PROFILE BAND CLAMPS

Special tools required:

- **31 5 200**

IMPORTANT: During removal Low Profile band clamp (dotted line) is overstretched and must not be reused!



Fig. 101: Identifying Low Profile Band Clamp (Dotted Line)
Courtesy of BMW OF NORTH AMERICA, INC.

Removing:

Place special tool **31 5 200** on lugs (1, 2).

NOTE: Make sure that the movable piece (3) of the special tool is placed on lug (1).

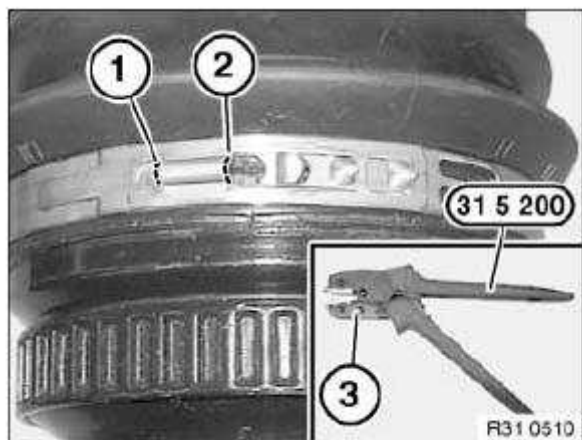


Fig. 102: Placing Special Tool (31 5 200) On Lugs
Courtesy of BMW OF NORTH AMERICA, INC.

Compress Low Profile band clamp with special tool **31 5 200** until end of band clamp (1) lifts up.

Relieve tension on special tool and remove Low Profile band clamp.

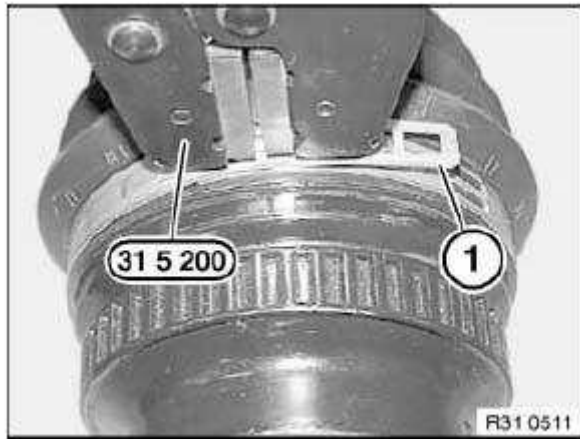


Fig. 103: Compressing Low Profile Band Clamp With Special Tool (31 5 200)
 Courtesy of BMW OF NORTH AMERICA, INC.

Assembly:

Position Low Profile band clamp in installation position (A) on gaiter.

Place special tool 31 5 200 on lugs (1, 2).

NOTE: Make sure that the movable piece (3) of the special tool is placed on lug (1).

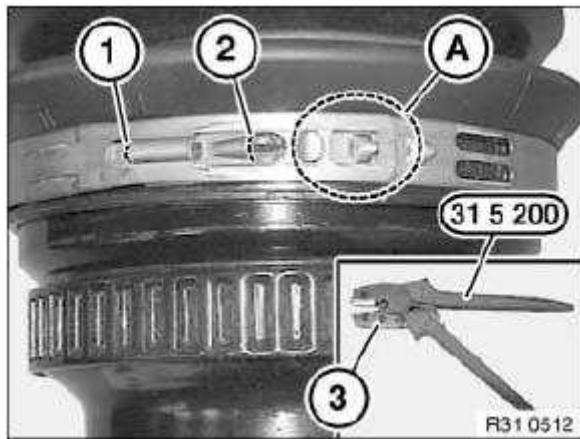


Fig. 104: Placing Special Tool (31 5 200) On Lugs
 Courtesy of BMW OF NORTH AMERICA, INC.

Check and if necessary correct positions of gaiter and

Low Profile band clamp.

Compress Low Profile band clamp with special tool 31 5 200 and press on end of band clamp (1).

Relieve tension on special tool and remove.

Check hook fastener (H); if necessary, repeat operation with new Low Profile band clamp.

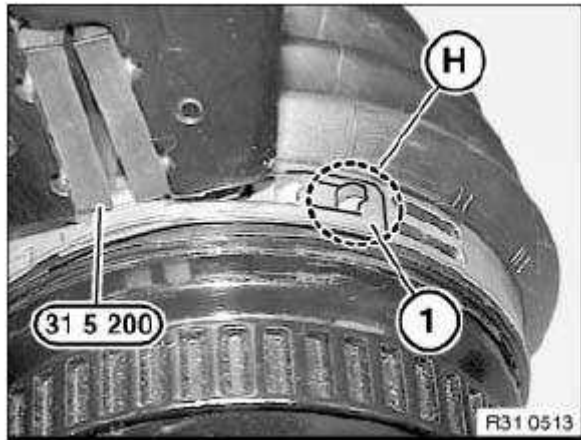


Fig. 105: Compressing Low Profile Band Clamp With Special Tool (31 5 200)
Courtesy of BMW OF NORTH AMERICA, INC.

31 60 ... SECURING RIGHT OUTPUT SHAFT WITH SPECIAL TOOL 31 4 180

Special tools required:

- **31 4 170**
- **31 4 180**

Remove **RIGHT MICROFILTER HOUSING COVER** .

IMPORTANT: Use special tool to avoid preliminary damage to ball joint in upper control arm.

Press plugs out of spring strut dome.

Secure swivel bearing (1) with special tool **31 4 170** in installation position.

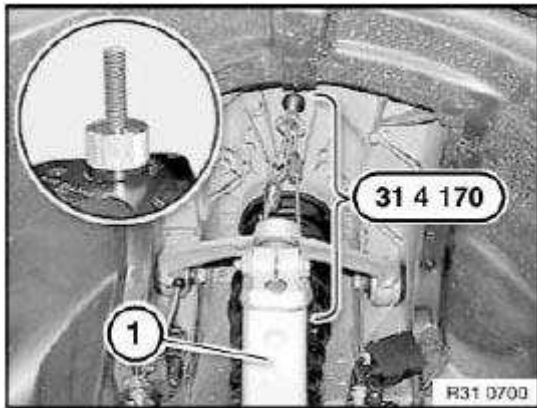


Fig. 106: Identifying Swivel Bearing And Special Tool (31 4 170)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **LOWER CONTROL ARM FRONT SPRING STRUT HOLDER AND FRONT AXLE CARRIER.**

Press output shaft (1) with a suitable tool out of front differential and pull out approx. 6 cm.

Insert special tool **31 4 180** from above between output shaft (1) and bearing block (2).

Installation:

Slide output shaft as far as it will go into front differential. Output shaft must snap audibly into place.

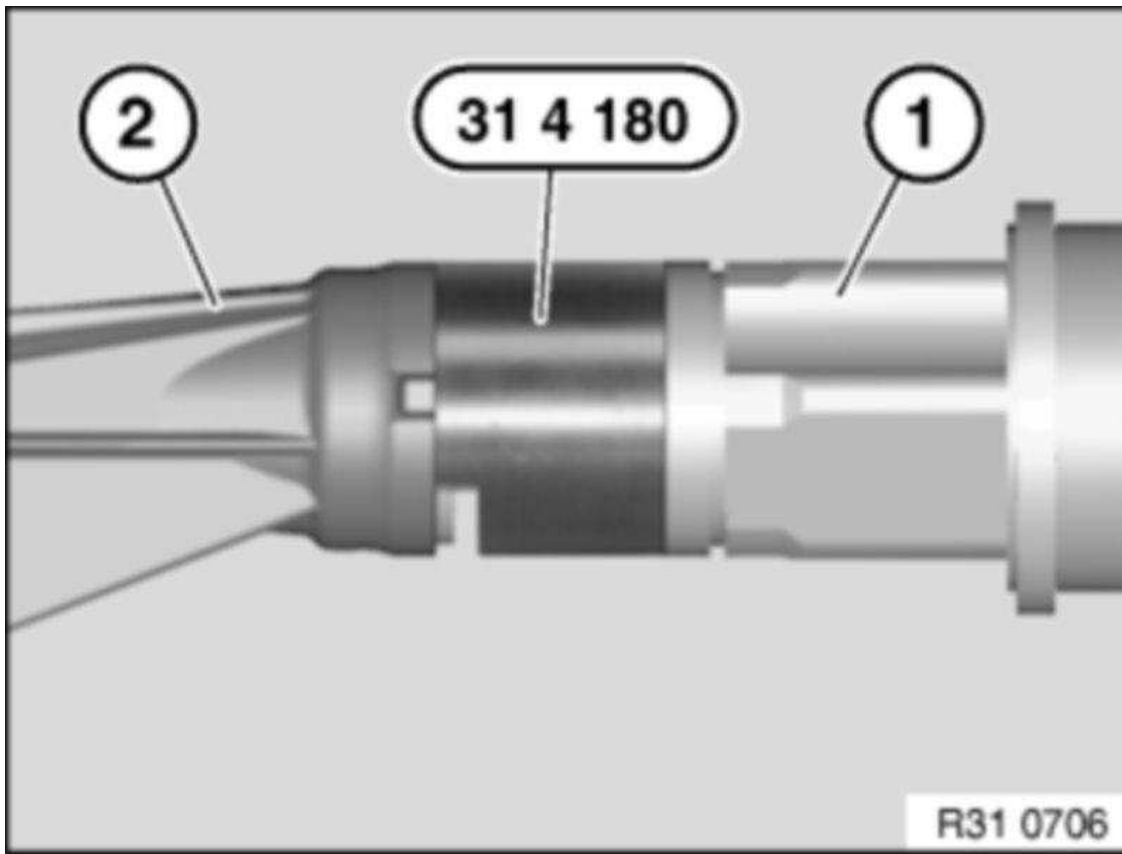


Fig. 107: Identifying Output Shaft, Beating Block, And Special Tool (31 4 180)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: High installation forces indicate that the spline teeth on the output shaft/rear differential side gear are damaged/deformed!
Check spline teeth, replaced damaged parts.

31 60 ... PRESSING OUTPUT SHAFT OUT OF DRIVE FLANGE (WHEEL HUB) AND DRAWING IN

Special tools required:

See **REAR AXLE - SPECIAL TOOLS** .

- 33 2 111
- 33 2 115
- 33 2 116
- 33 2 117
- 33 2 118
- 33 2 160
- 33 2 201
- 33 2 202

- 33 2 203
- 33 2 205
- 33 2 207
- 33 2 208
- 33 5 070

WARNING: Risk of injury!

It is not permitted to use the impact screwdriver to press out and draw in the output shaft.

IMPORTANT: Risk of damage!

To avoid damaging the output shaft and adjoining parts, it is essential during the pressing-out process to repeatedly check and if necessary correct the position of the output shaft.

IMPORTANT: To avoid damaging the dust sleeve, use special tool 33 2 160 to press out and draw in the output shaft after removing the brake disk.

NOTE: Rounded inside edge of special tool 33 2 160 must point to drive flange.

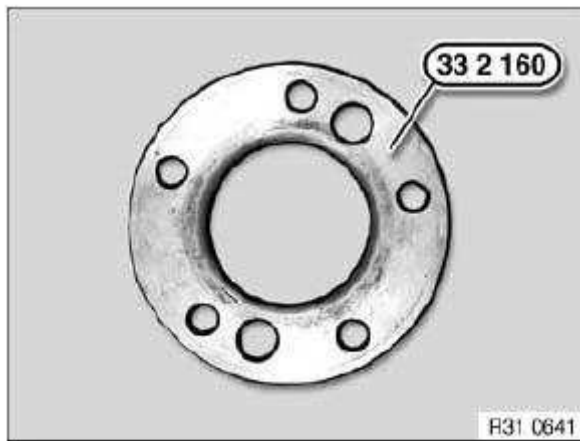


Fig. 108: Identifying Special Tool (33 2 160)

Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 33 2 200:

Screw on special tool 33 2 203 , 33 2 207 and 33 2 201 with **all** wheel studs to drive flange.

Press output shaft out of drive flange; in so doing, grip basic body 33 2 201 with special tools 33 2 202 and 33 5 070.

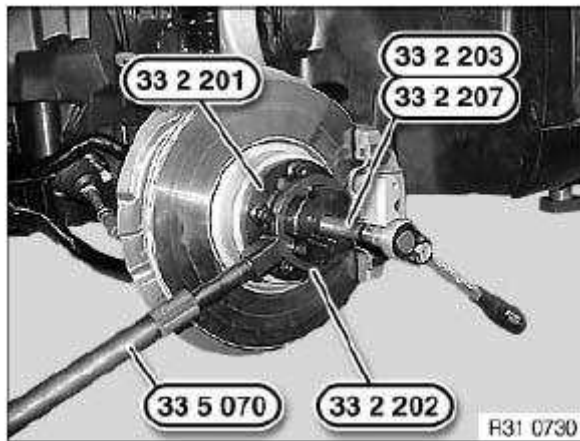


Fig. 109: Pressing Output Shaft Out Of Drive Flange
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: No oil permitted on shaft journal thread!

Lightly oil spline teeth of output shaft.

Insert output shaft into drive flange.

Screw special tool 33 2 205 onto output shaft.

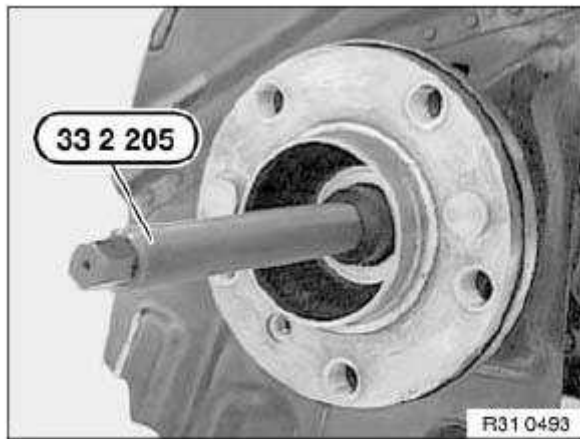


Fig. 110: Identifying Special Tool (33 2 205) Onto Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool 33 2 201 with three wheel studs to drive flange.

Draw in output shaft with special tool 33 2 208 up to stop; in so doing, grip basic body 33 2 201 with special tools 33 2 202 and 33 5 070.

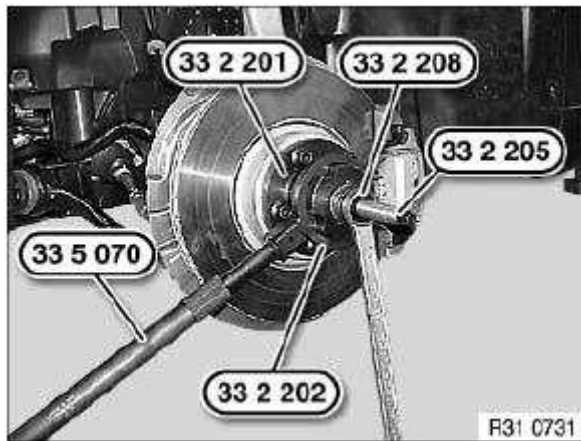


Fig. 111: Drawing Output Shaft With Special Tool (33 2 208)
 Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 33 2 100:

Screw on special tool 33 2 111 , 33 2 117 and 33 2 116 with **all** wheel studs to drive flange.

Press output shaft out of drive flange; in so doing, grip basic body 33 2 116 with special tools 33 2 202 and 33 5 070.

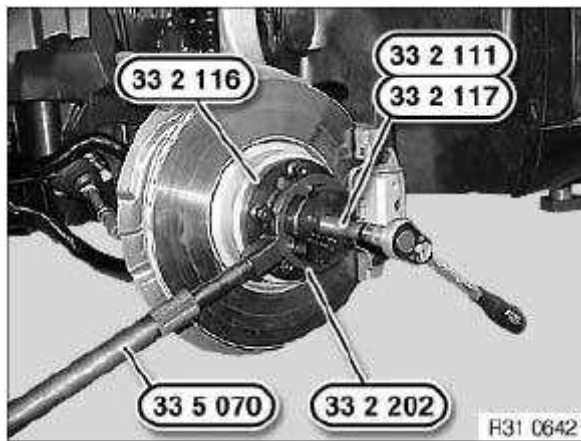


Fig. 112: Pressing Output Shaft Out Of Drive Flange
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: No oil permitted on shaft journal thread!

Lightly oil spline teeth of output shaft.

Insert output shaft into drive flange.

Screw special tool 33 2 118 onto output shaft.

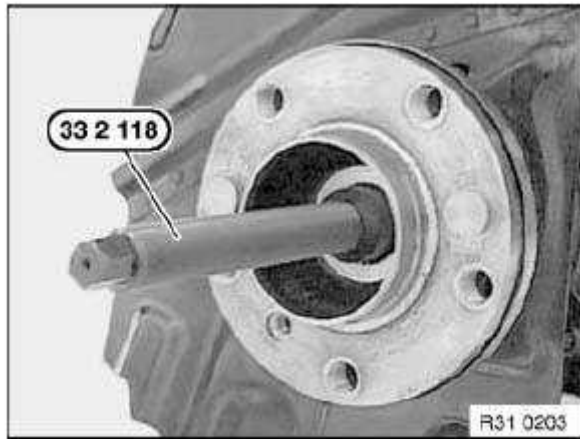


Fig. 113: Identifying Special Tool (33 2 118) Onto Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool 33 2 116 with **three** wheel studs to drive flange.

Draw in output shaft with special tool 33 2 115 up to stop; in so doing, grip basic body 33 2 116 with special tools 33 2 202 and 33 5 070.

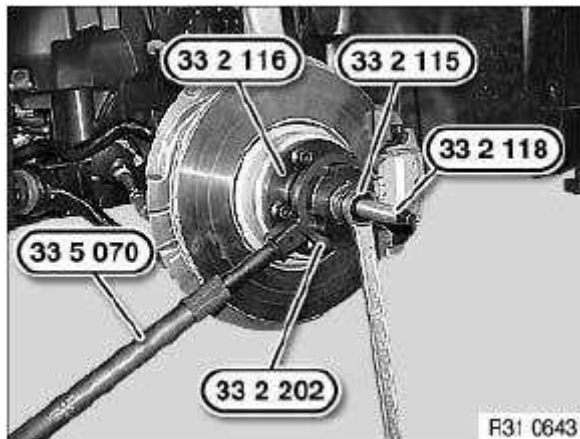


Fig. 114: Drawing Output Shaft With Special Tool (33 2 115)
Courtesy of BMW OF NORTH AMERICA, INC.

31 60 003 REMOVING AND INSTALLING OR REPLACING LEFT OUTPUT SHAFT

Special tools required:

- **31 4 170**

Remove **FRONT WHEELS** .

IMPORTANT: Expand turning lock sufficiently to avoid damaging thread when releasing

collar nut.

Release collar nut (1), press brake pedal to floor for this purpose.

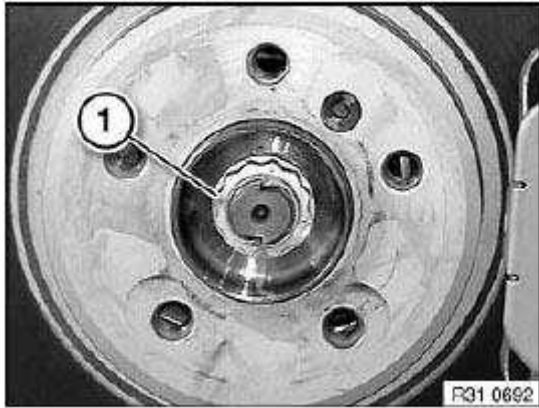


Fig. 115: Identifying Collar Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **LEFT MICROFILTER HOUSING COVER**

IMPORTANT: Use special tool to avoid preliminary damage to ball joint in upper control arm.

Press plugs out of spring strut dome.

Secure swivel bearing (1) with special tool **31 4 170** in installation position.

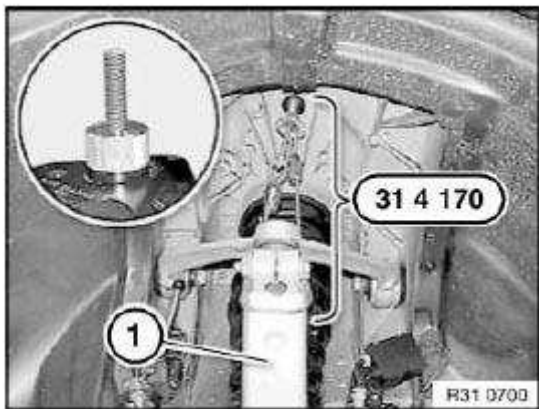


Fig. 116: Identifying Special Tool (31 4 170) In Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **REINFORCEMENT PLATE**.

Remove steering gear cover at top and bottom. See **51 71 ... REMOVING AND INSTALLING/REPLACING BOTTOM LEFT OR RIGHT STEERING GEAR COVER** , **51 71 ...**

**REMOVING AND INSTALLING/REPLACING TOP LEFT STEERING GEAR COVER , and 51 71 ...
REMOVING AND INSTALLING/REPLACING TOP RIGHT STEERING GEAR COVER .**

Remove **LOWER CONTROL ARM FRONT SPRING STRUT HOLDER AND FRONT AXLE CARRIER.**

Press **OUTPUT SHAFT OUT OF DRIVE FLANGE.**

IMPORTANT: Risk of damage!

Tape off output shaft and secure against falling off.

When removing output shaft, make sure that tripod does not fall into gaiter.

Turn steering wheel to right.

Press swivel bearing slightly to one side and remove output shaft from wheel bearing.

Press output shaft with a suitable tool out of front differential and remove between spring strut holder and control arm.

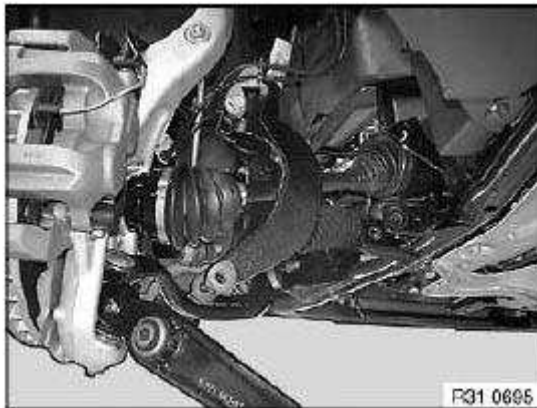


Fig. 117: Pressing Output Shaft With Suitable Tool Out Of Front Differential
Courtesy of BMW OF NORTH AMERICA, INC.

Installing output shaft:

Replace shaft seal in front differential. See **31 51 015 REPLACING SHAFT SEAL FOR LEFT OUTPUT SHAFT** and **31 51 020 REPLACING SHAFT SEAL FOR RIGHT OUTPUT SHAFT.**

Check **FRONT DIFFERENTIAL OIL LEVEL**, correct if necessary

IMPORTANT: High installation forces indicate that the output shaft spline teeth are damaged or deformed!

Check spline teeth, replaced damaged parts.

Replace circlip (1).

Coat highlighted contact surface (2) of output shaft with approved front differential oil.

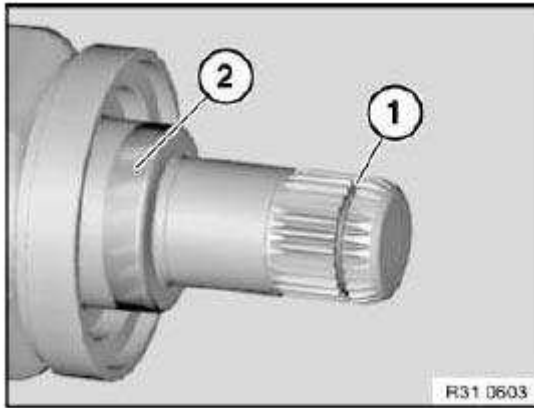


Fig. 118: Identifying Circlip And Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: When installing output shaft, make sure that tripod does not fall into gaiter.

Press swivel bearing slightly to one side and insert output shaft into front differential.

Pull out assembly protection ring at lug (1) until one of the two programmed rupture points gives.

Slide output shaft as far as it will go into front differential. Output shaft must snap audibly into place.

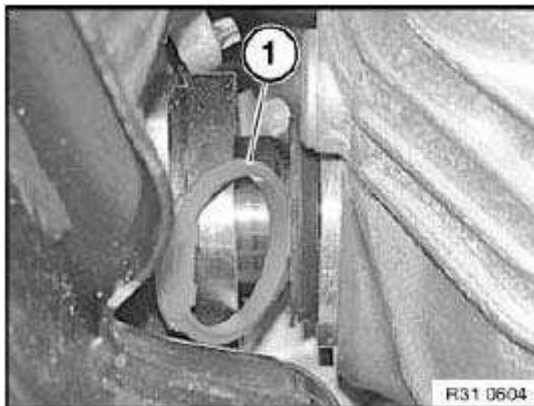


Fig. 119: Identifying Protection Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Press swivel bearing slightly to one side and insert output shaft into wheel bearing.

Move steering to straight-ahead position.



Fig. 120: Moving Steering To Straight-Ahead Position
Courtesy of BMW OF NORTH AMERICA, INC.

Draw **OUTPUT SHAFT INTO DRIVE FLANGE.**

Install **LOWER CONTROL ARM.**

Remove steering gear cover at top and bottom. See **51 71 ... REMOVING AND INSTALLING/REPLACING BOTTOM LEFT OR RIGHT STEERING GEAR COVER** , **51 71 ... REMOVING AND INSTALLING/REPLACING TOP LEFT STEERING GEAR COVER** , and **51 71 ... REMOVING AND INSTALLING/REPLACING TOP RIGHT STEERING GEAR COVER** .

Install **REINFORCEMENT PLATE.**

Remove special tool **31 4 170** for swivel bearing (1).

Use plugs from spring strut dome.

Install **LEFT MICROFILTER HOUSING COVER**

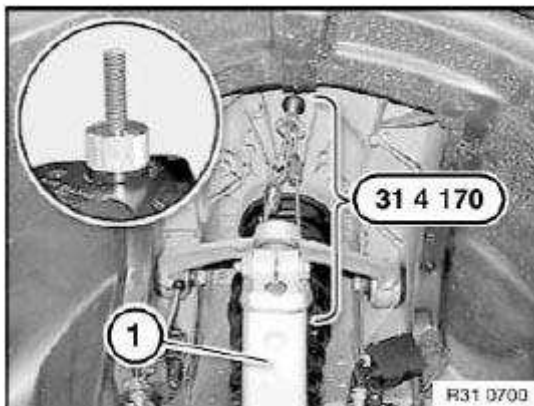


Fig. 121: Identifying Special Tool (31 4 170) In Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Replace collar nut (1), oil collar nut/wheel bearing contact surface only and tighten down.

No oil permitted on thread of shaft journal or collar nut.

Tightening torque **31 21 2AZ** .

Secure collar nut by positive peening on flat areas of output shaft.

Install **FRONT WHEELS** .

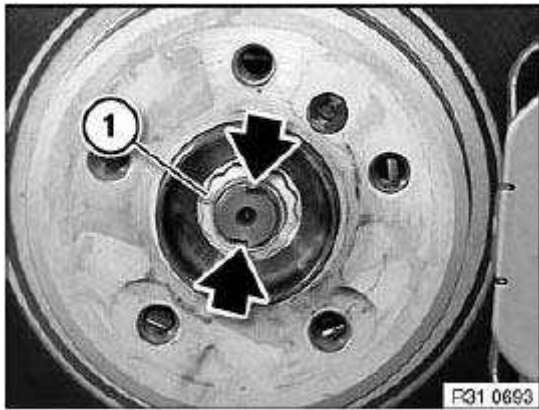


Fig. 122: Identifying Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform chassis alignment check. See **32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION** or **32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD**
- Carry out steering angle sensor adjustment/adjustment for active front steering. See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRYING OUT STEERING ANGLE SENSOR ADJUSTMENT** .

31 60 004 REMOVING AND INSTALLING/REPLACING RIGHT OUTPUT SHAFT

Necessary preliminary tasks:

- Remove **RIGHT SPRING STRUT**

Further procedure is identical to:

- Removing and installing/replacing **LEFT OUTPUT SHAFT**

31 60 530 REPLACING AN OUTPUT SHAFT GAITER (ON TRANSMISSION SIDE) (OUTPUT SHAFT REMOVED)

NOTE: Procedure is described in the document "**BOTH OUTPUT SHAFT GAITERS...**".

31 60 535 REPLACING TWO GAITERS ON OUTPUT SHAFT(S) (OUTPUT SHAFT(S) REMOVED)

Grip output shaft (1) in vice with aluminum clamping jaws.

NOTE: 2 = Joint, wheel side
3 = Joint, transmission side

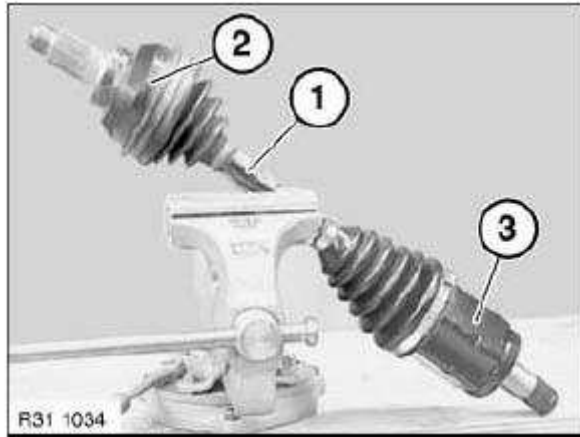


Fig. 123: Gripping Output Shaft In Vice
Courtesy of BMW OF NORTH AMERICA, INC.

Replacing gaiter of wheel-side joint:

Release **LOW PROFILE BAND CLAMP** (1) and band clamp (2).

Pull back rubber gaiter (3).

Installation:

Feed gaiter (3) into groove of joint.

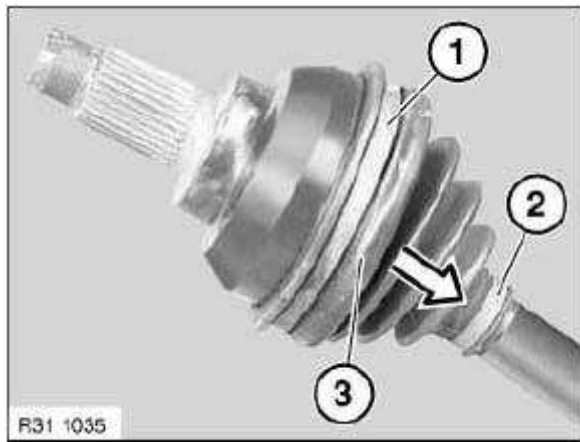


Fig. 124: Pulling Back Rubber Gaiter
 Courtesy of BMW OF NORTH AMERICA, INC.

Press off joint (1) via contact pressure of retaining ring on shaft (2).

Installation:

Push on joint until retaining ring can be heard to snap into place.

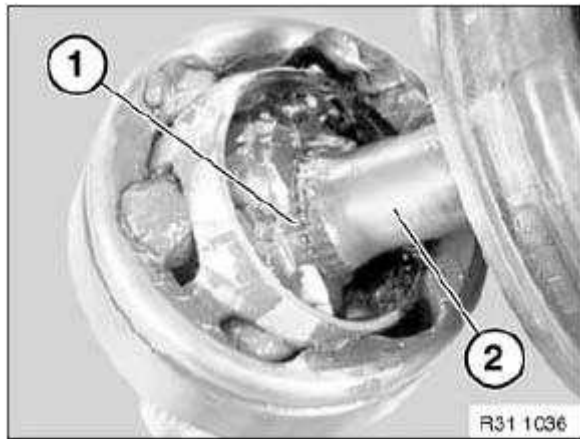


Fig. 125: Pressing Off Joint Via Contact Pressure Of Retaining Ring On Shaft
 Courtesy of BMW OF NORTH AMERICA, INC.

Lift out retaining ring (1).

Installation:

Replace circlip (1).

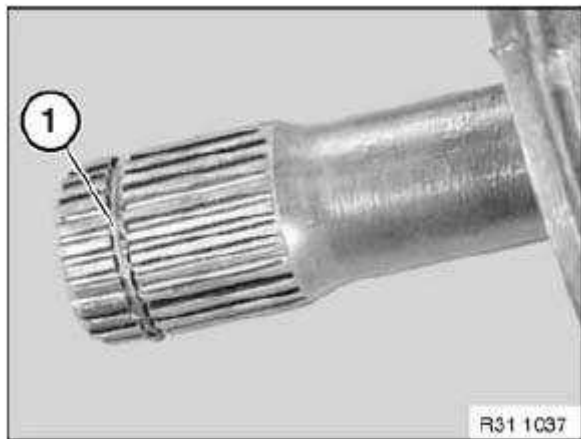


Fig. 126: Identifying Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Pull off gaiter (1) over shaft (2).

Carefully clean all parts with a cloth.

NOTE: Regrease constant-velocity joint with the grease from the repair kit.

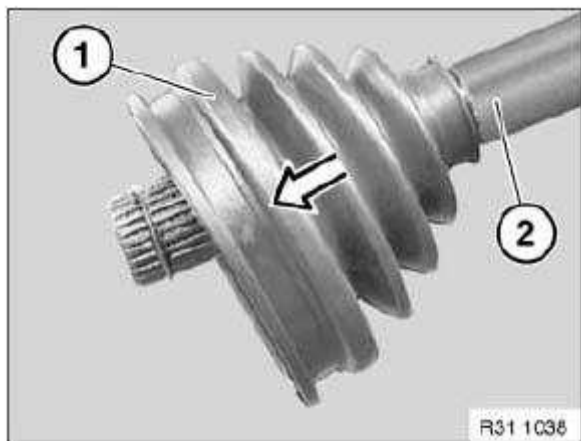


Fig. 127: Pulling Gaiter Over Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Replacing gaiter of transmission-side joint:

Release band clamps (1, 2).

Pull back rubber gaiter (3).

Detach tulip element (4).

Installation:

Feed gaiter (3) into groove of tulip element (4).

Align band clamp (1) so that hook fastener is as at flat end of tulip element (4).

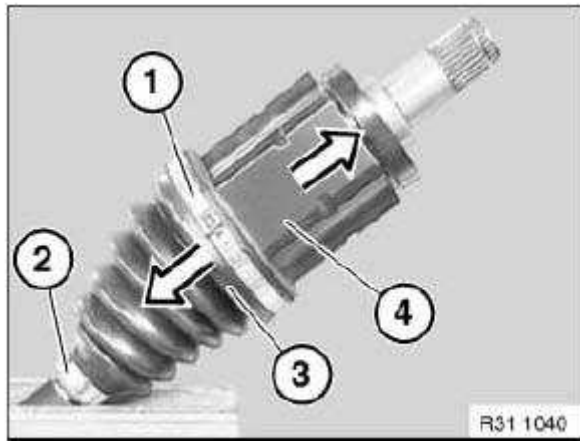


Fig. 128: Pulling Back Rubber Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

Remove retaining ring (1).

Installation:

Replace circlip (1).

Detach tripod element (2) from shaft (3).

Pull off gaiter over shaft (3).

Carefully clean all parts with a cloth.

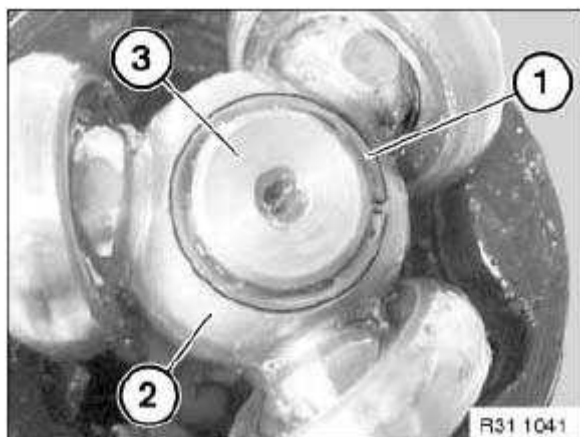


Fig. 129: Identifying Retaining Ring And Circlip With Tripod Element
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Flat side (2) of tripod element (1) must point to retaining ring.

NOTE: Regrease constant-velocity joint (tripod element) with the grease from the repair kit.

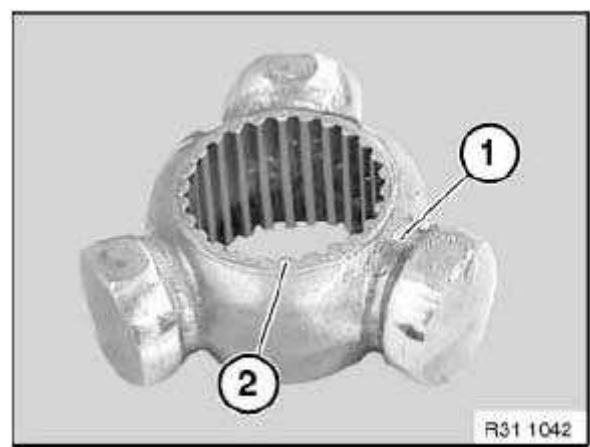


Fig. 130: Identifying Tripod Element
Courtesy of BMW OF NORTH AMERICA, INC.

TROUBLESHOOTING

31 90 ... FRONT AXLE TROUBLESHOOTING

Follow troubleshooting for steering/shock absorbers. See **31 90 ... TROUBLESHOOTING SHOCK ABSORBER** and **32 90 ... TROUBLESHOOTING ON STEERING**

TROUBLESHOOTING CHART

In event of edged road irregularity *On vehicles with ARS work through <u>TROUBLESHOOTING FOR ARS FIRST</u>	Cause (observe sequence)	Check (if OK, then next cause)	Measure (during preliminary check only)
	1. Stabilizer link loose	1. Check screw connection (see <u>INSPECTION SHEET</u>)	Tighten screw connections as specified in <u>REPAIR INSTRUCTION</u>
		1. Visually inspect for damage (see	

Rattling/banging NOTE: From 10 km/h and at approx. 20 mm height	2. Stabilizer link faulty	<u>INSPECTION SHEET)</u> 2. Check play (see <u>INSPECTION SHEET)</u>	If necessary, replace <u>STABILIZER LINK</u>
	3. Tension strut loose	1. Check screw connection (see <u>INSPECTION SHEET)</u>	Tighten screw connections as specified in <u>REPAIR INSTRUCTION</u>
	4. Tension strut faulty	1. Visually inspect for damage (see <u>INSPECTION SHEET)</u> 2. Check play (see <u>INSPECTION SHEET)</u>	If necessary, replace <u>TENSION STRUT</u>
	5. Lower control arm loose	1. Check screw connection (see <u>INSPECTION SHEET)</u>	Tighten screw connections as specified in <u>REPAIR INSTRUCTION</u>
	6. Lower control arm ball joint faulty	1. Visually inspect for damage (see <u>INSPECTION SHEET)</u> 2. Check play (see <u>INSPECTION SHEET)</u>	If necessary, replace lower <u>CONTROL ARM</u>
	7. Upper control arm loose	1. Check screw connection (see <u>INSPECTION SHEET)</u>	Tighten screw connection as specified. See <u>31 12 002 REMOVING AND INSTALLING/REPLACING TOP LEFT CONTROL ARM</u> and <u>31 12 003 REMOVING AND INSTALLING/REPLACING TOP RIGHT CONTROL ARM.</u>
	8. Upper control arm faulty	1. Visually inspect for damage (see <u>INSPECTION SHEET)</u> 2. Check play (see <u>INSPECTION SHEET)</u>	If necessary, replace upper control arm. See <u>31 12 002 REMOVING AND INSTALLING/REPLACING TOP LEFT CONTROL ARM</u> and <u>31 12 003 REMOVING AND INSTALLING/REPLACING TOP RIGHT CONTROL ARM.</u>
-> If noise can still be heard, check other cause			
In event of road irregularities and steering	Cause (observe	Check (if OK, then next cause)	Measure (during preliminary check only)

maneuvers	sequence)		
Cracking/clicking	1. Front axle carrier loose	1. Check screw connection (see <u>INSPECTION SHEET</u>)	Tighten screw connection as specified in <u>REPAIR INSTRUCTION</u>
	2. Front axle carrier/front axle truck twisted		1. Position vehicle over pit/on wheel alignment platform 2. Slacken screw connection of front axle carrier 3. Tighten screw connection as specified in <u>REPAIR INSTRUCTION</u>
-> If noises can still be heard, check other causes			

TROUBLESHOOTING CHART

In event of straightahead driving and cornering	Cause (observe sequence)	Check (if OK, then next cause)	Measure (during preliminary check only)
Grinding noise	Wheel bearing worn, dirty		Replace faulty <u>WHEEL BEARING</u>
-> If noise can still be heard, check other causes			

TROUBLESHOOTING CHART

In event of repeated impulse braking or road irregularities	Cause (observe sequence)	Check (if OK, then next cause)	Measure (during preliminary check only)
Muffled bang	1. Tension strut hydromount faulty (no mount fluid)	Check whether hydromount is leaking, for presence of cracks or rubber break-outs	If necessary, replace <u>TENSION STRUT</u>
-> If noise can still be heard, check other causes			

TROUBLESHOOTING CHART

	Cause (observe sequence)	Check (if OK, then next cause)	Measure (during preliminary check only)
No conspicuous noise	1. Upper control arm rubber mount faulty	Check rubber mounts for cracks and rubber breakouts	If necessary, replace upper control arm. See <u>31 12 002 REMOVING AND INSTALLING/REPLACING TOP LEFT CONTROL ARM</u> and <u>31 12 003 REMOVING AND INSTALLING/REPLACING TOP RIGHT CONTROL ARM</u> .
	2. Lower control arm rubber mount (on spring strut bracket)	Check rubber mounts for cracks and rubber break-	If necessary, replace lower <u>CONTROL ARM</u>

	faulty	outs	
Steering wheel inclination/steering backlash	Refer to BMW diagnosis system "Troubleshooting tree wheel/chassis alignment check"		
-> If noise can still be heard, check other causes			

NOTE: The tension strut rubber mount has an overload stop, which can cause knocking noises at high loads.

31 90 ... TROUBLESHOOTING - STEERING ACOUSTICS

TROUBLESHOOTING CHART

Phenomenon	Driving maneuver	Reason	Remedy
Clicking/grating from steering column	When stationary without engine running, apply different torques to steering wheel in both directions	Steering column to steering spindle center section connection not tight enough	Replace and tighten down screws Tightening torque, refer to repair instruction
Squeaking/grating	When stationary without engine running, apply different torques to steering wheel in both directions	Steering spindle sleeve incorrectly fitted or insufficiently greased	Check fitting; if necessary, remove and grease (with lubricating spray)
Hydraulic rattling	Drive at approx. 20 to 30 km/h with wheels not entirely turned over cleat	Hydraulic system	Check routing and part status of power steering lines; if necessary, replace <u>HYDRAULIC LINES</u> with current version.
Pump whining	Engine revving when stationary	Transmission of structure-borne noise from power steering pump to pressure lines	Check pressure lines and mounting for current status and correct fitting; modify if necessary.
Whistling	Whistling irrespective of speed with fluid at normal operating temperature when stationary	Sharp-edged restrictor in return	Replace return line.
Rattling	Parking when stationary with service brake pressed to low coefficient of friction	Undamped vibration in steering system	Check holder concept of <u>PRESSURE AND RETURN LINES</u> for current status and correct installation, modify if necessary.

31 90 ... TROUBLESHOOTING SHOCK ABSORBER

Read and comply with **INFORMATION ON REPLACING SHOCK ABSORBERS.**

TROUBLESHOOTING CHART

Fault	Cause	Remedy
Wheel knocking (bottoming)	Auxiliary spring faulty	Visually inspect auxiliary spring for cracking, replace <u>AUXILIARY SPRING</u>
	Shock absorber leaking (oil/gas)	Replace <u>SHOCK ABSORBER</u>
Rattling noise	Shock absorber mounting loose	Tighten <u>SHOCK ABSORBER</u>
	Support bearing faulty/hardened	Replace <u>SUPPORT BEARING</u>
	Shock absorber leaking (gas/oil)	Replace <u>SHOCK ABSORBER</u>
Worn down areas (flattened areas) on tire profile	Shock absorber leaking (gas/oil)	Replace <u>SHOCK ABSORBER</u>
Long after-swinging of body after driving over rough road	Shock absorber leaking (insufficient shock absorber effect)	Replace <u>SHOCK ABSORBER</u>
Building-up of body in case of successive uneven surfaces	Shock absorber leaking (insufficient shock absorber effect)	Replace <u>SHOCK ABSORBER</u>
Wheels jumping even on normal road surfaces	Shock absorber leaking (insufficient shock absorber effect)	Replace <u>SHOCK ABSORBER</u>
Whistling noises	Separating skin in vent holes of auxiliary dampers	Remove separating skin

SUSPENSION

Front Axle - Special Tools - X6

31 2 230 SOCKET

Minimum set: Mechanical tools

NOTE: For expanding steering knuckle during spring strut removal

Series: E60, E61, E63, E64, E65, E66, E67, E70, E71, E81, E82, E83, E85, E86, E87, E88, E90, E91, E92, E93

Storage location: C47

SI number: 1 05 03 (969)

Order number: 31 2 230

Socket

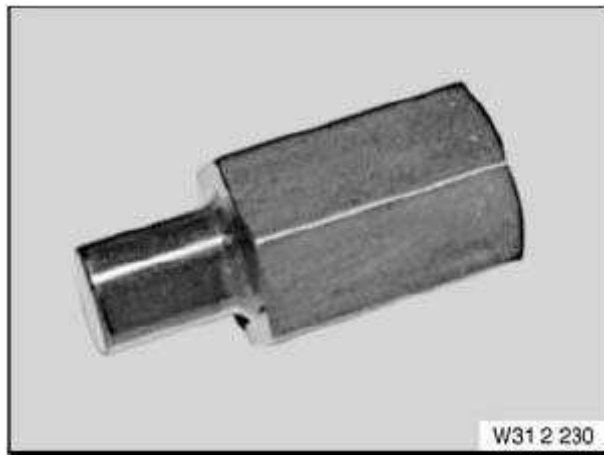


Fig. 1: Identify Special Tool (31 2 230)

Courtesy of BMW OF NORTH AMERICA, INC.

31 2 240 PULLER

Minimum set: Mechanical tools

NOTE: For removing control arms from steering knuckle.

Series: E38, E39, E52, E53, E60, E61, E70, E71, E83, E90, E91, E92, R50, R52, R53, RR1, RR2

Storage location: C12

SI number: 1 06 94 (801)

Order number: 31 2 240

Puller

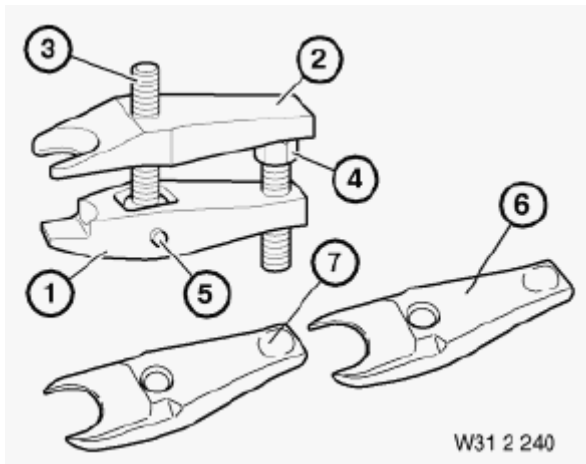


Fig. 2: Identify Special Tool (31 2 240)

Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 31 2 241 Upper part

2 = 31 2 242 Lower part

3 = 31 2 243 Spindle

4 = 31 2 244 Pressure screw

5 = 31 2 245 Straight pin

6 = 31 2 246 Lower part

NOTE: For forcing control arm off wheel guide joint E53, E83

7 = 31 2 247 Lower part

NOTE: For forcing control arm off wheel guide joint E70. SI 1 01 07 (333)

31 3 140 PIN WRENCH

NOTE: For loosening and tightening McPherson strut threaded connection when replacing shock absorber

Model: 2002

Order number: 31 3 140

Pin wrench

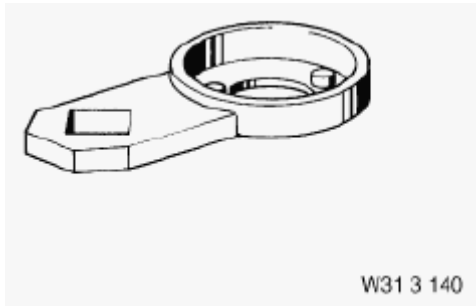


Fig. 3: Identify Special Tool (31 3 140)
Courtesy of BMW OF NORTH AMERICA, INC.

31 3 340 SPRING TENSIONER

Minimum set: Mechanical tools

NOTE: For tensioning coil springs when removing and installing spring strut. Used only in conjunction with repair instructions.

Series: E31, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, E46, E46/16, E46/2, E46/3, E46/5, E46/C, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E71, E81, E82, E83, E85, E86, E87, E88, E90, E91, E92, E93, F01, F02, R50, R52, R53, R55, R56

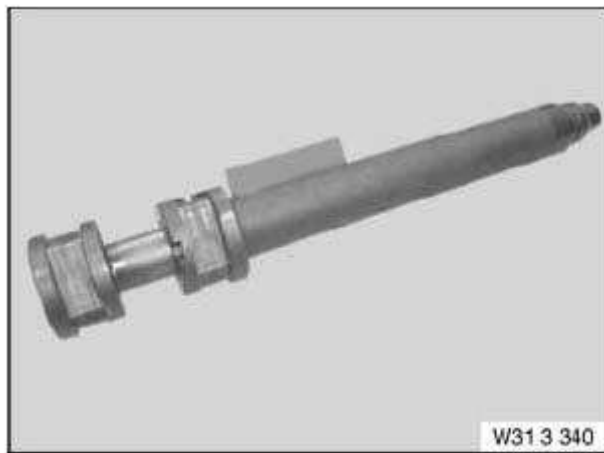


Fig. 4: Identify Special Tool (31 3 340)
Courtesy of BMW OF NORTH AMERICA, INC.

Storage location: Single

SI number: 1 11 99 (438)

Order number: 31 3 340

Spring tensioner

Consisting of:

1 = 31 3 341 Spring tensioner, individual

2 = 31 3 342 Replacement pin

31 3 350 SPRING HOLDER

Minimum set: Mechanical tools

In conjunction with: 31 3 340 and 31 3 360

NOTE: For locating coil springs during tensioning. No. 31 3 350 reserved for consecutive sub-number spring tensioner 31 3 340.

Series: E31, E36, E36/7, E38, E39, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E71, E81, E82, E83, E85, E86, E87, E88, E90, E91, E92, E93, F01, F02, R50, R52, R53, R55, R56

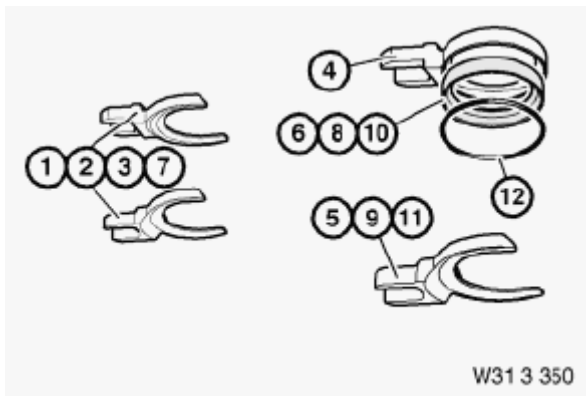


Fig. 5: Identify Special Tool (31 3 350)
Courtesy of BMW OF NORTH AMERICA, INC.

Storage location: Single

SI number: 1 11 99 (438)

Order number: 31 3 350

Spring holder

Consisting of:

1 = 31 3 351 Spring holder (2 x)

NOTE: To be used with repair instructions only

2 = 31 3 352 Spring holder (2 x)

NOTE: To be used with repair instructions only

3 = 31 3 353 Spring holder (2 x)

NOTE: To be used with repair instructions only

4 = 31 3 354 Spring holder ring

NOTE: To be used with repair instructions only

5 = 31 3 355 Spring holder

NOTE: To be used with repair instructions only

6 = 31 3 356 Centering ring

NOTE: To be used with repair instructions only

7 = 31 3 357 Spring holder (2 x)

NOTE: To be used with repair instructions only

In conjunction with: 31 3 340

8 = 31 3 358 Insertion ring

NOTE: To be used with repair instructions only. For insertion in spring retainer ring 31 3 354. Model series: E87

9 = 31 3 381 Spring retaining ring

NOTE: To be used with repair instructions only.

10 = 31 3 382 Spring retainer

NOTE: To be used with repair instructions only.

11 = 31 3 383 Spring retainer

NOTE: To be used with repair instructions only.

31 3 358 INSERT RING

NOTE: For inserting spring retainer ring 31 3 354 model series (PL2)

Order number: 31 3 358

Insert ring

31 4 150 FIXTURE

Minimum set: Mechanical tools

NOTE: For removing and installing rubber mount in lower control arm.

Series: E70, E71

SI number: 01 22 06 (307)

Order number: 31 4 150

Fixture



Fig. 6: Identify Special Tool (31 4 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 31 4 151 Bushing

2 = 31 4 152 Thrust member

3 = 31 4 153 Thrust member

4 = 31 4 154 Thrust member

31 4 160 DRIFT

Minimum set: Mechanical tools

NOTE: For driving shaft seal of output shaft into front differential.

Series: E70, E71

SI number: 01 22 06 (307)

Order number: 31 4 160

Drift



Fig. 7: Identify Special Tool (31 4 160)
Courtesy of BMW OF NORTH AMERICA, INC.

31 4 170 LOCATING TOOL

Minimum set: Mechanical tools

NOTE: For locating swivel bearing.

Series: E70, E71, RR1, RR2

SI number: 01 22 06 (307)

Order number: 31 4 170

Locating tool

Consisting of:

1 = 31 4 171 Spindle with cable and carbine

2 = 31 4 172 Pressure nut

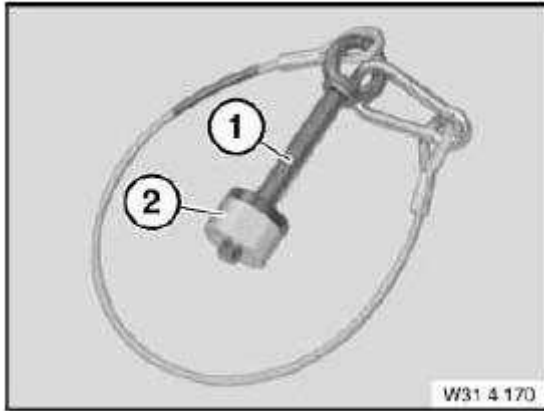


Fig. 8: Identify Special Tool (31 4 170)

Courtesy of BMW OF NORTH AMERICA, INC.

31 4 180 CLAMP

NOTE: For securing output shaft at front right when removing and installing front differential.

Series: E70, E71

SI number: 1 01 07 (333)

Order number: 31 4 180

Clamp



Fig. 9: Identify Special Tool (31 4 180)
Courtesy of BMW OF NORTH AMERICA, INC.

31 5 130 SET OF IMPACT DRIFTS

Minimum set: Mechanical tools

In conjunction with: 00 5 500

NOTE: For fitting rotary shaft seals of output shafts at front axle differential

Series: E46/16, E53, E60, E61, E70, E71, E83, E90, E91, E92

Storage location: C12

SI number: 1 15 99 (483)

Order number: 31 5 130

Set of impact drifts

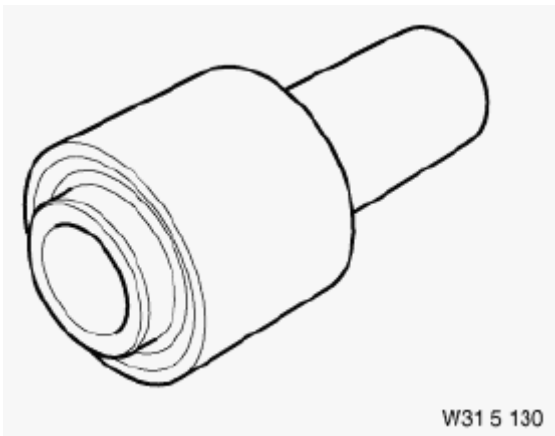


Fig. 10: Identify Special Tool (31 5 130)

Courtesy of BMW OF NORTH AMERICA, INC.

31 5 200 PLIERS

Minimum set: Mechanical tools

NOTE: For tensioning low profile binders of rubber sleeve on front output shaft (AWD).

Series: E60, E61, E70, E71, E90, E91, E92, R55, R56

SI number: 1 04 05 175

Order number: 31 5 200

Pliers

Consisting of:

1 = 31 5 201 Basic body

2 = 31 5 202 Matrix

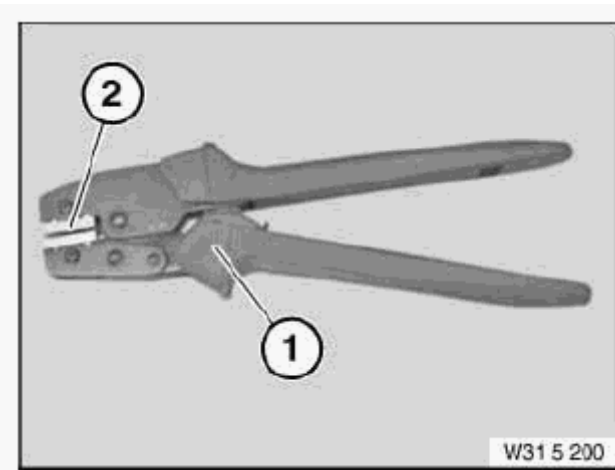


Fig. 11: Identify Special Tool (31 5 200)

Courtesy of BMW OF NORTH AMERICA, INC.

31 5 220 SUPPORT

NOTE: For securing wheel hub when removing and installing spring strut.

Series: E46, E70, E71, E83, E85, E86, E90, E91, E92, F01, F02, R55, R56, RR1, RR2

Storage location: A19

SI number: 1 23 05 (224)

Order number: 31 5 220

Support



Fig. 12: Identify Special Tool (31 5 220)
Courtesy of BMW OF NORTH AMERICA, INC.

SUSPENSION

Front Axle - Technical Data - X6

GENERAL

31 00 FRONT AXLE - RIDE HEIGHT E71

FRONT AXLE - RIDE HEIGHT E71 - SPECIFICATION

Ride level height in normal position			
Attach tape measure to bottom middle of rim flange and measure to lower edge of wheel arch			
Tolerance ride height in			
o <u>NORMAL POSITION</u> max. 10 mm			
o <u>DESIGN POSITION</u> max. 2 mm			
Difference ride height between left/right in			
o <u>NORMAL POSITION</u> 10 mm			
o <u>DESIGN POSITION</u> 2 mm			
STANDARD steel spring/ air spring			
19" rim	mm		713
20" rim	mm		725
21" rim	mm		737
Steel spring/ air spring with Adaptive Drive			
19" rim	mm		723
20" rim	mm		735
21" rim	mm		747

31 00 GENERAL - TRACK WIDTH/WHEELBASE E71 ADAPTIVE DRIVE

GENERAL - TRACK WIDTH/WHEELBASE E71 ADAPTIVE DRIVE - SPECIFICATION

Track width for normal position and offset (ET)		
o ET40	mm	- -
o ET48	mm	1640
Wheelbase		2933

31 00 GENERAL - TRACK WIDTH/WHEELBASE E71 STANDARD SUSPENSION

GENERAL - TRACK WIDTH/WHEELBASE E71 STANDARD SUSPENSION - SPECIFICATION

Track width for normal position and offset (ET)		
o ET40	mm	1660
o ET48	mm	1644

Wheelbase		2933
-----------	--	------

SHOCK ABSORBER

31 32 SHOCK ABSORBERS E71 1-AXLE AIR SPRING

SHOCK ABSORBERS E71 1-AXLE AIR SPRING - SPECIFICATION

Note:		Currently no details! Reason: Avoidance of incorrect assessments on account of different measurement procedures
Front Axle	mm	- -
Rear Axle	mm	- -

31 32 SHOCK ABSORBERS E71 ADAPTIVE DRIVE

SHOCK ABSORBERS E71 ADAPTIVE DRIVE - SPECIFICATION

Note:		Currently no details! Reason: Avoidance of incorrect assessments on account of different measurement procedures
Front Axle	mm	- -
Rear Axle	mm	- -

31 32 SHOCK ABSORBERS E71 SERIES

SHOCK ABSORBERS E71 SERIES-SPECIFICATION

Note:		Currently no details! Reason: Avoidance of incorrect assessments on account of different measurement procedures
Front Axle	mm	- -
Rear Axle	mm	- -

FRONT AXLE GEARBOX

31 50 FRONT AXLE DIFFERENTIAL E70/E71

FRONT AXLE DIFFERENTIAL E70/E71 - SPECIFICATION

Oil grade: refer to Operating Fluid Specifications		
New oil filling volume	ltr.	0.65

SUSPENSION

Front Axle - Tightening Torques - X6

FRONT AXLE SUSPENSION

31 10 FRONT AXLE SUSPENSION

FRONT AXLE SUSPENSION - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Front axle carrier to engine carrier	E70, E71	M14		165 Nm
2AZ Reinforcement plate to front axle carrier	E70, E71	M10	Replace screws	
			Jointing torque	56 Nm
			Torque angle	90°

STRUTS W/RUBBER MOUNTS

31 12 CONTROL ARMS AND STRUTS

CONTROL ARMS AND STRUTS - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Tension strut to front axle support	E70, E71	M12	Replace screw & nut <u>TIGHTEN IN NORMAL POSITION</u>	
			Jointing torque	100 Nm
			Torque angle	90°
2AZ Tension strut to swivel bearing	E70, E70		Replace nut	80 Nm
3AZ Lower control arm to front axle carrier	E70, E71	M14	Replace nut <u>TIGHTEN IN NORMAL POSITION</u>	165 Nm
4AZ Lower control arm to swivel bearing	E70, E71	M14	Replace nut	80 Nm
5AZ Upper control arm to body	E70, E71	M10	Replace screw & nut <u>TIGHTEN IN NORMAL POSITION</u>	
			Jointing torque	38 Nm
			Torque angle	90°
6AZ Upper control arm to swivel bearing	E70, E71	M10	Replace nut	56 Nm
7AZ Spring strut holder to lower control arm	E70, E71	M14	Replace screw & nut <u>TIGHTEN IN NORMAL POSITION</u>	
			Jointing torque	140 Nm

			Torque angle	90°
8AZ Spring strut holder to spring strut shock absorber	E70, E71	M12	Replace nut	81 Nm

WHEEL BEARINGS

31 21 WHEEL BEARINGS AND STEERING KNUCKLE

WHEEL BEARINGS AND STEERING KNUCKLE - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Wheel bearing to swivel bearing	E70, E71	M12	Replace screws	
			Jointing torque	80 Nm
			Torque angle	90°
2AZ Output shaft to wheel bearing	E70, E71	M27	Replacing collar nut, lightly oil contact face	420 Nm

SPRING STRUT

31 31 SPRING STRUTS

SPRING STRUTS - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Support bearing flange to body	E70, E71	M8	Replace nuts	28 Nm
2AZ Support bearing flange to spring strut shock absorber	E70, E71	M12	Replace nut	48 Nm
3AZ Spring strut shock absorber to spring strut fork	E70, E71	M12	Replace nut	81 Nm

STABILIZER BAR

31 35 STABILIZER BAR

STABILIZER BAR - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Retaining bar for stabilizer to front axle carrier	E70, E71	M10	Observe repair instruction.	56 Nm
2AZ Stabilizer link to stabilizer/swivel bearing	E70, E71	M12	Replace nut	100 Nm

FRONT AXLE GEARBOX

31 50 FRONT AXLE DIFFERENTIAL

FRONT AXLE DIFFERENTIAL - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Front axle final drive to engine oil pan	E70, E71	M12		102 Nm
2AZ Oil filler/oil drain plugs	E70, E71	M22	Replace oil filler and oil drain plugs	60 Nm

OUTPUT SHAFT

31 60 OUTPUT SHAFT

OUTPUT SHAFT - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Output shaft console to engine oil sump	E70, E71	M8		19 Nm
2AZ Output shaft to wheel bearing	E70, E71	M27	Replacing collar nut, lightly oil contact face	420 Nm