

SUSPENSION**Front Axle - Repair Instructions - AWD****00 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 absorbents.

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.

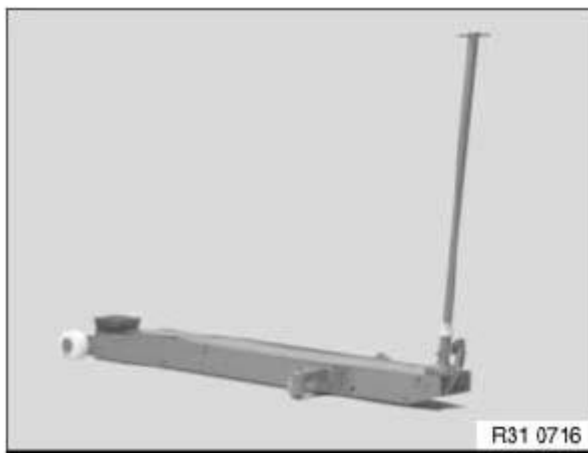


Fig. 1: Identifying Trolley Jack
Courtesy of BMW OF NORTH AMERICA, INC.

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!

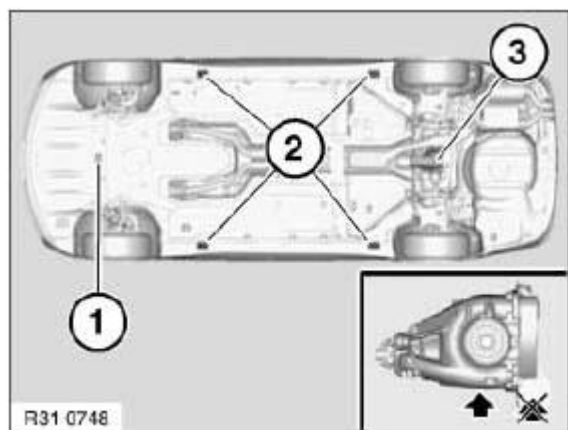
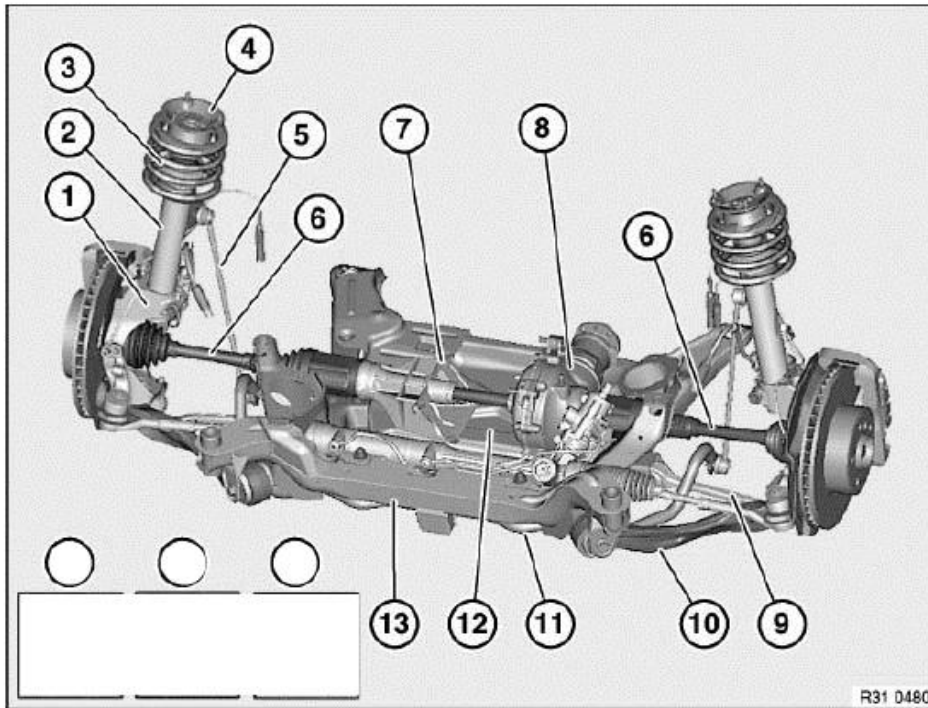


Fig. 2: Identifying Vehicle Jacking Point
Courtesy of BMW OF NORTH AMERICA, INC.

31.... OVERVIEW OF FRONT AXLE (AWD)



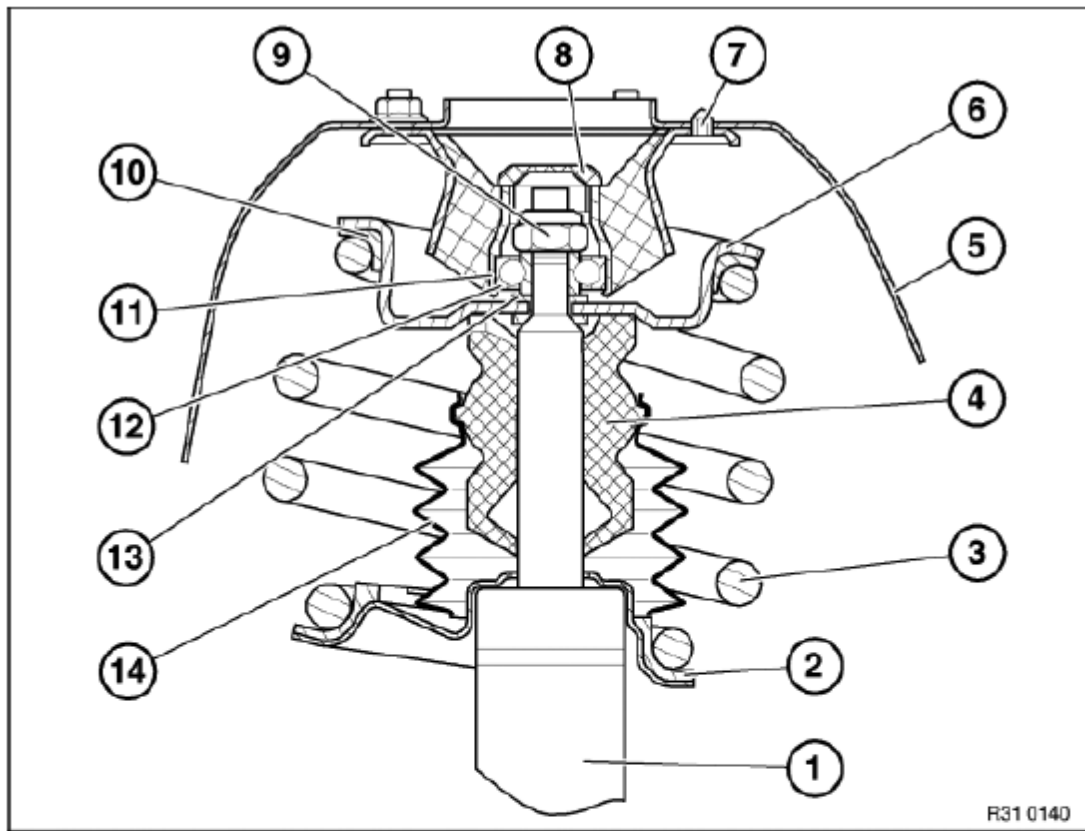
0 Safety precautions and general information

- | | | | |
|---|-----------------------------|----|---------------------|
| 1 | Swivel bearing | 10 | Tension strut |
| 2 | Spring strut shock absorber | 11 | Stabiliser |
| 3 | Coil spring | 12 | Reinforcement plate |
| 4 | Thrust bearing | 13 | Front axle support |
| 5 | Stabilizer link | | |
| 6 | Output shaft | | |
| 7 | Bearing block | | |
| 8 | Front differential | | |
| 9 | Control arm | | |

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

0 Safety precautions and general information

31.... LAYOUT OF SPRING STRUT SHOCK ABSORBER



- | | |
|-------------------------------|-----------------------|
| 1 Spring strut shock absorber | 10 Upper spring pad |
| 2 Lower spring pad | 11 Thrust bearing |
| 3 Coil spring | 12 Dust sleeve |
| 4 Auxiliary spring | 13 Thrust washer/shim |
| 5 Wheel arch | 14 Rubber gaiter |
| 6 Upper spring plate | |
| 7 Centering pin | |
| 8 Grease cap | |
| 9 Nut | |

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

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

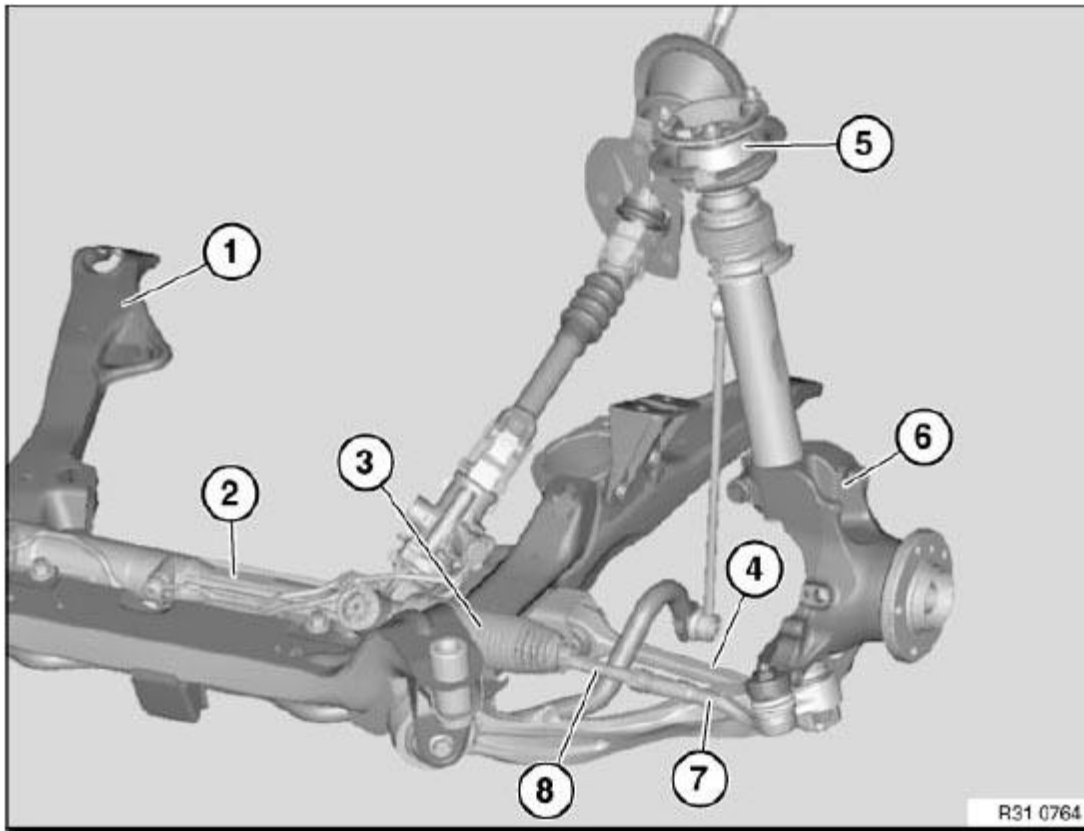


Fig. 5: Identifying Front Axle + Steering (AWD) Components
Courtesy of BMW OF NORTH AMERICA, INC.

A wheel/chassis alignment check must be carried out after the following work:

- Release of following screw/bolt connections:
 - Steering gear to front axle carrier
 - Control arm to front axle carrier
 - Support bearing to body (if centering pin is missing)
 - Tie rod end to tie rod
- Replacement of following parts:
 1. Front axle carrier
 2. Steering gear
 3. Gaiter (if the tie rod end has to be screwed off)
 4. Control arm
 5. Support bearing (if centering pin is missing)
 6. Swivel bearing
 7. Tie rod end
 8. Tie rod

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:

Shock absorbers may be replaced on one side only until they have completed 50 000 km service.

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

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 °C, even for brief periods! Temperatures in paint facilities do not have the same impact

31 00... INSTRUCTIONS (DAMAGE TO SUSPENSION)

Substandard road holding, typical noises, tires worn on one side, camber and toe-in values which deviate from nominal value and misshaped components are all indicators of damage to the suspension caused by road traffic accidents or similar impacts.

To repair vehicle correctly, depending on condition of vehicle, perform the following troubleshooting procedure:

You must also follow the rules and guidelines for accident-related repairs to the steering gear.

TROUBLESHOOTING CHART

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Saturday, September 05, 2015 9:17:00 AM	Page 8	© 2011 Mitchell Repair Information Company, LLC.

Vehicle condition	Possible cause	Remedy
1. Camber inside/toe-in outside the nominal value, adjustment of track alignment possible	a. Screw connection not OK b. Tie rod or journal of tie rod end is deformed c. One or both tension struts is/are deformed d. Control arm deformed	a. Check screw connections: Tie rod end to swivel bearing Tie rod to power steering gear Power steering gear to front axle carrier b. Replace tie rod, tension strut and swivel bearing IMPORTANT: If the journal of the tie rod end is deformed, the power steering gear must also be replaced c. Replace tension strut and swivel bearing d. Replace control arm, tension strut and swivel bearing
2 Camber inside/toe-in outside the nominal value, adjustment of track alignment possible	Powerful forces acting on steering/front axle components	Replace tie rods Replace swivel bearing Replace power steering gear Replace tension strut Replace control arms
3 Camber/toe-in outside the nominal value, adjustment of track alignment not possible	Powerful forces acting on front axle with distortion of: a. Screw connections b. Front axle support c. See Pt. 1b) to d) d. Spring strut/piston rod	a. Check screw connections, replace the relevant part if necessary b. Replace front axle carrier c. See Pt. 1b) to d) d. Replace spring strut

31 00... NOTES ON REPAIRING THREADS

IMPORTANT: Install Heli-coil thread inserts so that they are flush with the original thread.

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



Fig. 6: Identifying Heli-coil Thread
Courtesy of BMW OF NORTH AMERICA, INC.

Procedure:

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

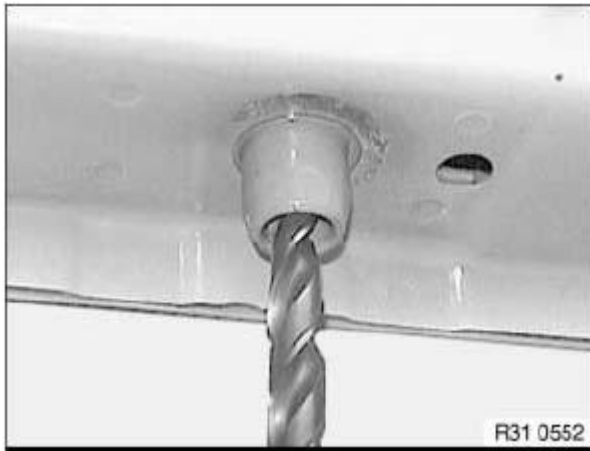


Fig. 7: Drilling Out Screw
Courtesy of BMW OF NORTH AMERICA, INC.

2. Create locating thread for Heli-coil thread insert



Fig. 8: Applying Thread For Heli-coil Thread
Courtesy of BMW OF NORTH AMERICA, INC.

3. Pick out Heli-coil thread insert in accordance with the table and screw into the locating thread until flush with the original thread

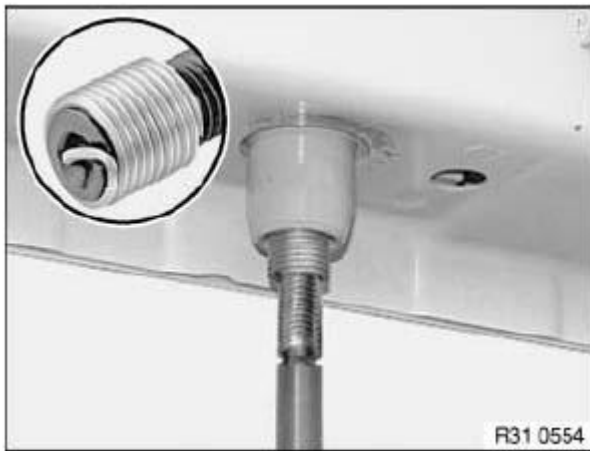


Fig. 9: Identifying Heli-coil Thread
Courtesy of BMW OF NORTH AMERICA, INC.

4. Break drive pin and remove

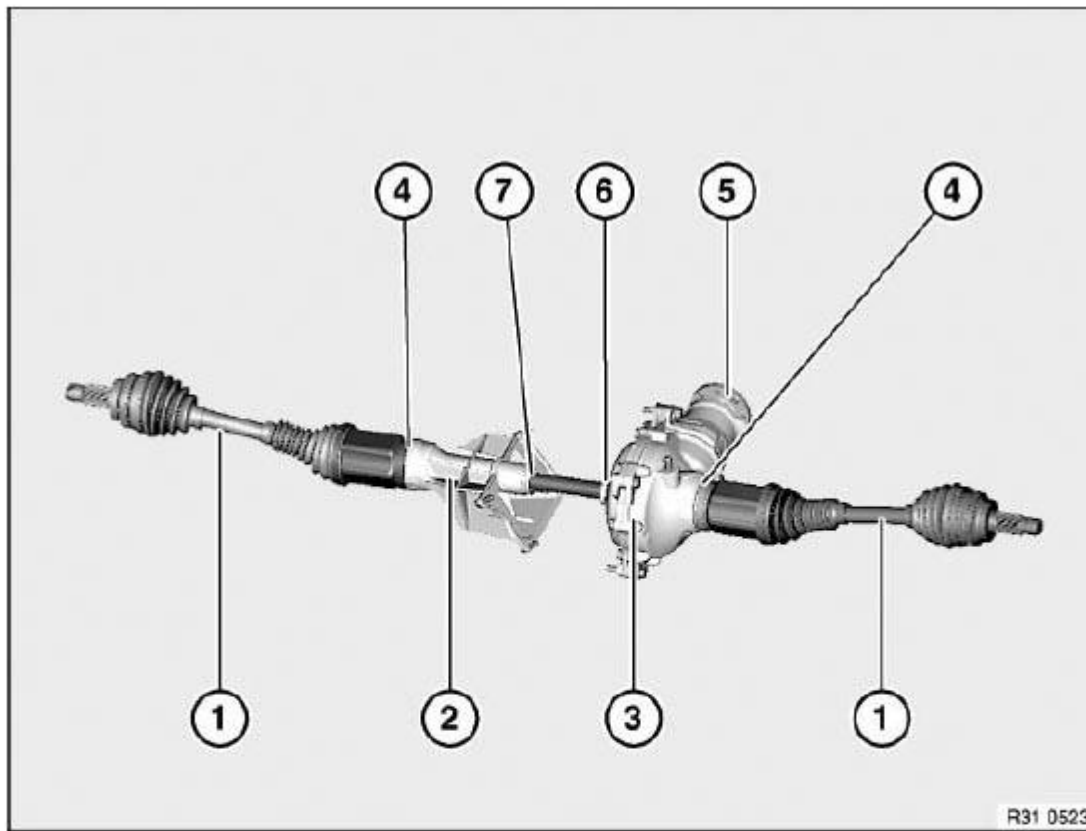


Fig. 10: Removing Drive Pin

Courtesy of BMW OF NORTH AMERICA, INC.

31 50... OVERVIEW OF FRONT DIFFERENTIAL/OUTPUT SHAFTS

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- | | | | |
|---|---------------------------|---|-----------------------------|
| 1 | Output shaft / gaiters | 5 | Shaft seal (drive flange) |
| 2 | Bearing block | 6 | O-ring (front differential) |
| 3 | Front differential | 7 | O-ring (bearing block) |
| 4 | Shaft seal (output shaft) | | |

Fig. 11: Identifying Front Differential/Output Shafts Components

Courtesy of BMW OF NORTH AMERICA, INC.

10 FRONT AXLE SUSPENSION

31 10 010 REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE (AWD)

IMPORTANT: Observe safety instructions for raising the vehicle
Driving without reinforcement plate is not permitted!

Necessary preliminary tasks:

- Remove underbody protective plate

Release screw (1).

Release screws (2) and remove reinforcement plate (3).

Installation:

Replace screws.

Tightening torque **31 10 9AZ** .

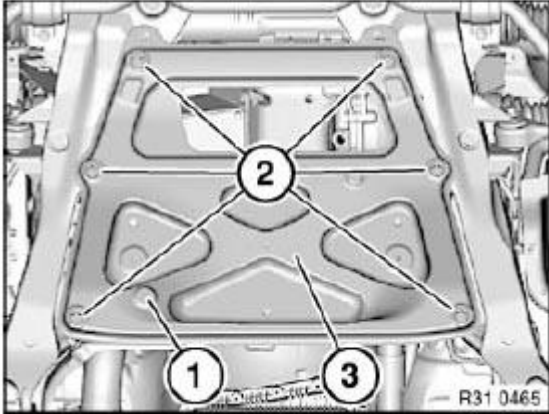


Fig. 12: Identifying Screws And Reinforcement Plate
Courtesy of BMW OF NORTH AMERICA, INC.

51 47 490 REMOVING AND INSTALLING / REPLACING FRONT UNDERBODY PROTECTION

All except M5:

Release screws (1 and 2) and pull out underbody protection (3) from under bumper trim.

Installation:

Ensure that seals are correctly seated.

Center underbody protection (3) and tighten down screws (1) and (2).

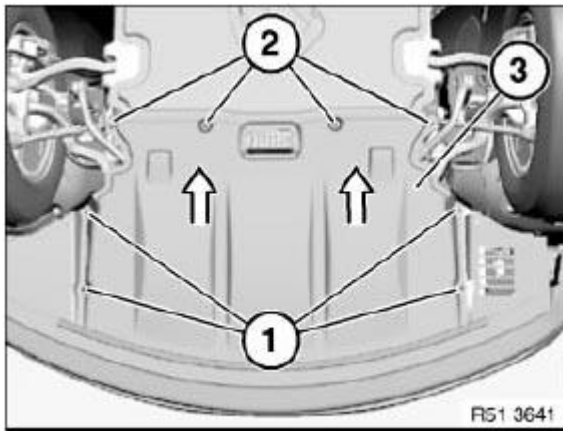


Fig. 13: Identifying Center Underbody Protection And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, remove catches (1) on cover (2).

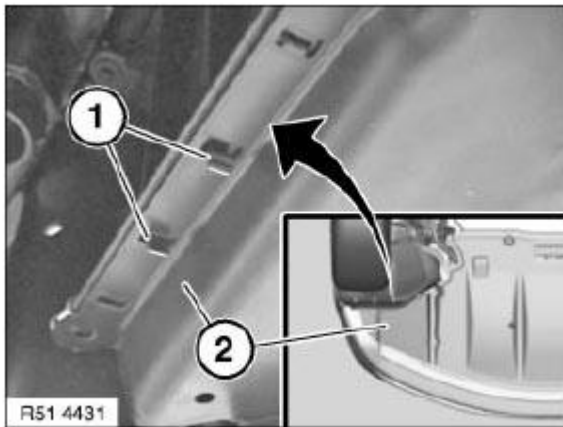


Fig. 14: Identifying Catches And Cover
 Courtesy of BMW OF NORTH AMERICA, INC.

Version with rough road package:

Release screws (1 and 2).

Feed out underbody protection (3) towards rear.

Installation:

Replace screws (1).

Tightening. Refer to **51 EXTERNAL GEARSHIFT COMPONENTS**.

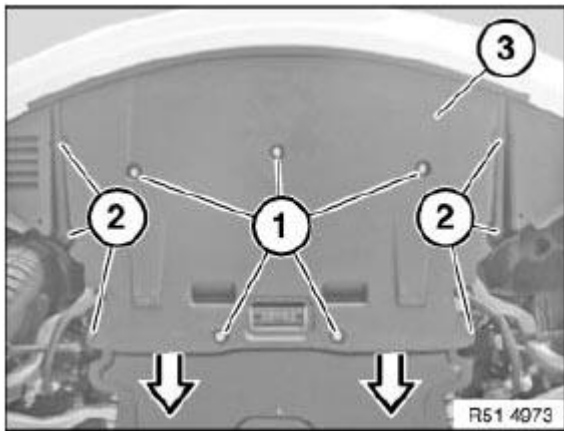


Fig. 15: Identifying Underbody Protection And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

M5 only:

Release screws (1 and 2).

Release screws (3) at side from wheel arch trim.

Pull underbody protection (4) forward under bumper trim.

Installation:

Ensure that seals are correctly seated.

Center underside protection (4) and tighten down screws (1, 2 and 3).

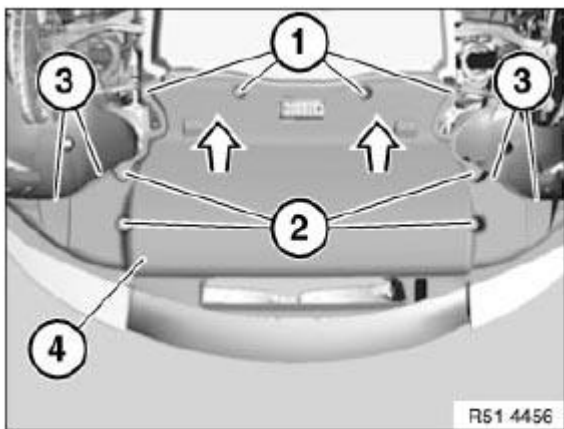


Fig. 16: Identifying Center Underside Protection And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

51 47 491 REMOVING AND INSTALLING/REPLACING REAR UNDERBODY PROTECTION

Necessary preliminary tasks:

- Remove front underbody protection

Not M5

Unfasten screws (1... 3).

Press heat shield (5) back.

Release screws (4) and remove underbody protection (6).

Installation:

Ensure correct seating.

Center underbody protection (6) and tighten down all screws.

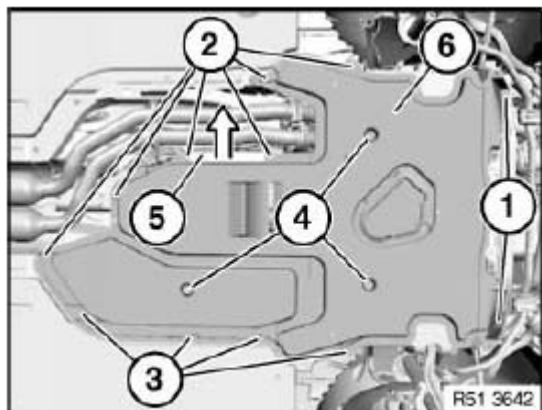


Fig. 17: Identifying Heat Shield, Center Underbody Protection And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

M5 only

Unfasten screws (1 and 2).

Remove underbody protection (3).

Installation:

Ensure correct seating.

Center underbody protection (3) and tighten down all screws.

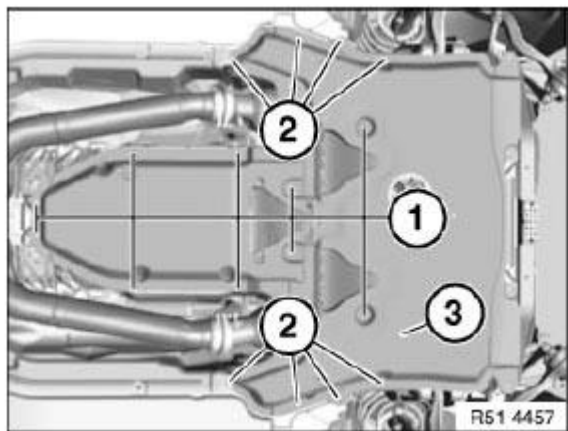


Fig. 18: Identifying Center Underbody Protection And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

11 FRONT SUB-FRAME

31 11 001 REPLACING FRONT AXLE CARRIER (AWD)

WARNING: Danger to life!

Secure engine in installation position to prevent it from falling down.

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Seal off hydraulic lines with plugs.

Necessary preliminary tasks:

- Disconnect **BATTERY NEGATIVE LEAD**
- Draw off and dispose off hydraulic fluid from fluid reservoir
- Secure engine in installation position
- Remove front wheels
- Remove **stabilizer**
- Remove **reinforcement plate**
- Remove steering gear cover on both sides
- Remove lower steering spindle from power steering gear. See **32 31 070 REMOVING AND INSTALLING / REPLACING STEERING SPINDLE LOWER SECTION (AWD)** .
- If necessary, disconnect plug connection from EH converter and remove line from front axle carrier.
- If necessary, remove ride-height sensor with line from front axle carrier. See **37 14 511 REPLACING FRONT RIDE-HEIGHT SENSOR** .
- If necessary, unclip vacuum line for engine mount from engine support arm and disconnect.
- Remove **tension strut** from front axle carrier.

- Remove **control arm** from front axle carrier.
- Remove tie rod end from swivel bearing. See **32 21 151 REPLACING LEFT OR RIGHT TIE ROD END (AWD)** .
- Lower **front axle carrier** until power steering gear rests on output shaft.
- Remove power steering gear. See **32 13 060 REMOVING AND INSTALLING/REPLACING POWER STEERING GEAR (AWD)** .

Remove heat shield(s).

Remove both engine mounts and if necessary remove with vacuum lines from front axle carrier. See **22 11 001 REPLACING LEFT ENGINE MOUNT (N52/N52K/N53)** or **22 11 001 REPLACING RIGHT ENGINE MOUNT (N52/N52K/N53)** .

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

Installation:

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

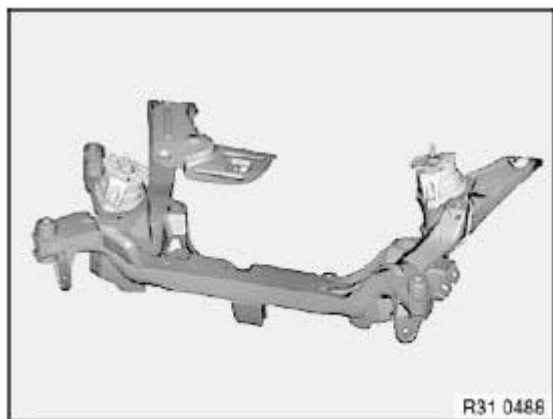


Fig. 19: Identifying Front Axle Subframe
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system. See **32 13 006 BLEEDING POWER STEERING UNIT** .
- Check pipe connections for leaks.
- Perform chassis alignment check.
- Carry out steering angle sensor adjustment.

31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (AWD)

Special tools required:

- 00 2 040
- 31 4 060
- 31 4 070

WARNING: Danger to life!

Secure engine in installation position to prevent it from falling down.

IMPORTANT: Before installing the front axle carrier, make sure there is zinc foil (1) present on middle bolting point (2).
Replace damaged zinc foil (1).
Do not stick over zinc foil (1).

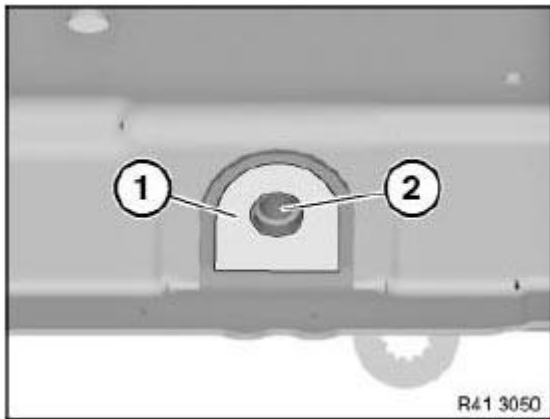


Fig. 20: Identifying Zinc Foil And Middle Bolting Point
Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Secure engine in installation position
- Remove **reinforcement plate**
- Remove steering gear cover on both sides
- Remove lower steering spindle from power steering gear
- If necessary, disconnect plug connection from EH converter and remove line from front axle carrier
- If necessary, disconnect plug connection from ride-height sensor and remove line from front axle carrier
- If necessary, disconnect vacuum line of electrically operated valve from Y-distributor and expose

If necessary, position special tool 00 2 040 with a 2nd person helping on workshop jack.

Insert special tool 31 4 070 into corresponding receptacles 1 and 2 of special tool 00 2 040.

Insert special tool 31 4 060 with marking 1 into receptacle 4 of special tool 00 2 040.

Insert special tool 31 4 060 with marking 2 into receptacle 3 of special tool 00 2 040.

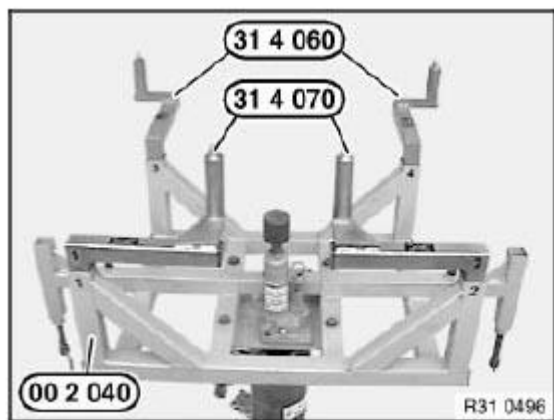


Fig. 21: Identifying Special Tool (31 4 060), (31 4 070) And (00 2 040)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Failure to comply with the following instructions may result in the vehicle slipping off the lifting platform and critically injuring other persons.

When supporting components, make sure that

- the vehicle can no longer be raised or lowered
- the vehicle does not lift off the locating plates on the lifting platform

Align special tool 00 2 040 to front axle carrier.

If necessary, lower special tool 33 3 274.

Support front axle carrier by raising special tool 00 2 040.

NOTE: Make sure when raising that special tools 31 4 070 and 31 4 060 are correctly inserted in the front or rear recesses on the front axle carrier.

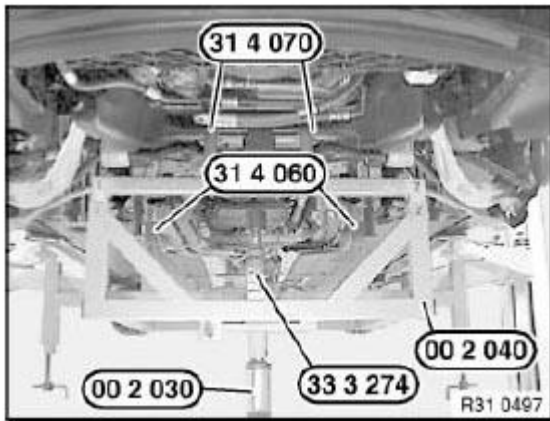


Fig. 22: Identifying Special Tool (31 4 070), (31 4 060) And (33 3 274)
Courtesy of BMW OF NORTH AMERICA, INC.

M57T2:

NOTE: This bracket is only installed on the left side.

Release bolts (1).

Tightening torque **31 10 13AZ** .

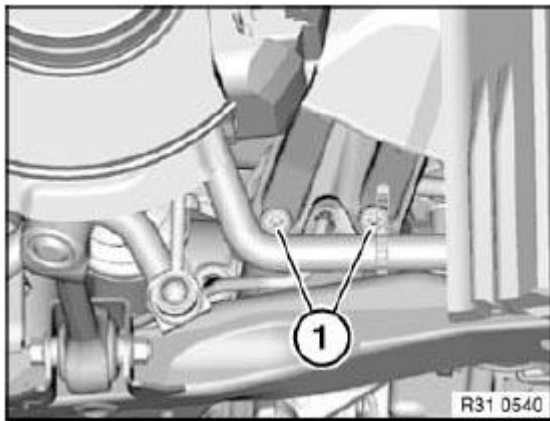


Fig. 23: Identifying Bracket Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Pay attention to power steering hoses and lines when lowering and raising.
Hoses/lines must not be kinked/tensioned/bent!
When lowering and raising, make sure the cover for the relevant tension strut rubber mount is free to move.

Release screws (1, 2).

Installation:

Check threads for damage; if necessary, repair with Heli-coil thread inserts.

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

Tightening torque **31 10 1AZ** .

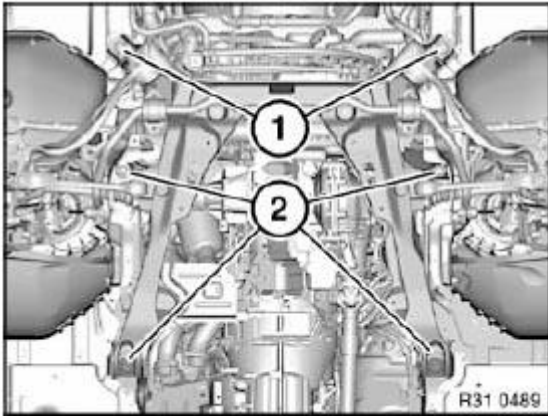


Fig. 24: Identifying Screws

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

The following operation must be carried out during lowering:

- N54 with automatic transmission: Release screws (1) and remove bracket (2) for transmission oil cooler lines from front axle carrier

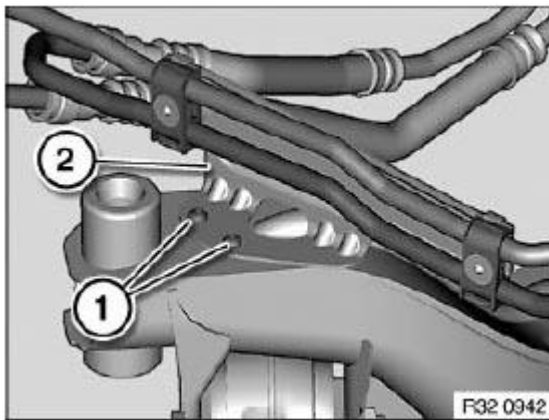


Fig. 25: Identifying Screws And Bracket

Courtesy of BMW OF NORTH AMERICA, INC.

Lower front axle carrier until power steering gear rests on output shaft.

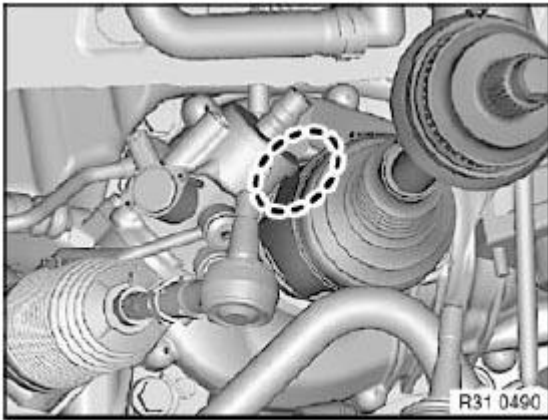


Fig. 26: Identifying Lower Front Axle Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out steering angle sensor adjustment

12 STRUTS WITH RUBBER MOUNTS

31 12 000 REMOVING AND INSTALLING / REPLACING LEFT OR RIGHT CONTROL ARM (AWD)

Special tools required:

- 31 2 240
- 31 2 241
- 31 2 242
- 31 2 243
- 31 2 244
- 31 2 245
- 31 2 246

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

After installation:

- Perform chassis alignment check
- Carry out steering angle sensor adjustment

Necessary preliminary tasks:

- Remove front wheel

Release nut (1) and remove screw towards front.

Installation:

Replace self-locking nut.

Tightening torque **31 12 2AZ** .

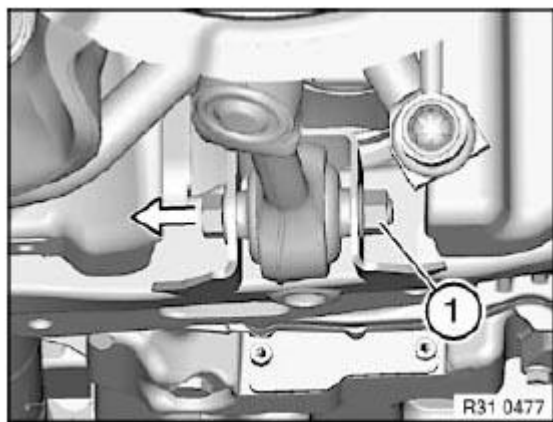


Fig. 27: Identifying Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) approx. 3-4 thread turns; if necessary, grip hexagon.

If necessary, replace special tool lower section 31 2 242 with lower section 31 2 246.

Press control arm off swivel bearing with special tool 31 2 240 (comprising 31 2 241, 31 2 243, 31 2 244, 31 2 245 and 31 2 246).

Unscrew nut (1) and remove control arm.

Installation:

Keep journal on ball head and bushing in swivel bearing clean and free from grease.

Replace self-locking nut.

Tightening torque **31 12 6AZ** .

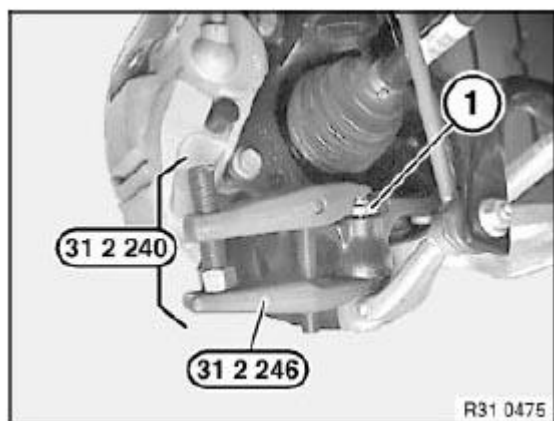


Fig. 28: Identifying Special Tool (31 2 240) And (31 2 246)
 Courtesy of BMW OF NORTH AMERICA, INC.

31 12 003 REMOVING AND INSTALLING / REPLACING TOP RIGHT WISHBONE

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

- - Under dimension variant
- + Over dimension 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.

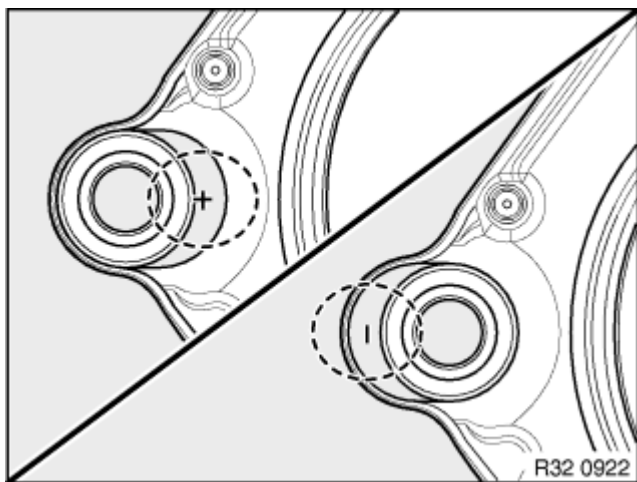


Fig. 29: Identifying Control Arms
 Courtesy of BMW OF NORTH AMERICA, INC.

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 12 024 REPLACE WHEEL CONTROL JOINT IN WISHBONE (ALL-WHEEL DRIVE VEHICLE)

Necessary preliminary tasks: Remove front wheel

Release screws. If necessary, push wheel control joint off swivel bearing using a suitable tool.

Installation note: Recondition thread in swivel bearing. Keep recess for wheel control joint, bushing in trailing link and wheel control joint journal clean and free from grease. Replace microencapsulated screws.

Tightening torque, see **31 12 21AZ**

31 12 026 REMOVING AND INSTALLING / REPLACING GUIDE JOINT IN SWIVEL BEARING (4WD)

Special tools required:

- 33 4 200
- 33 4 205

Necessary preliminary tasks:

- Remove front wheel
- Remove **tension strut** from guide joint

Release screws (1).

If necessary, press guide joint (2) off swivel bearing with a suitable tool.

Installation:

Recondition thread in swivel bearing.

Keep recess for guide joint, bushing in tension strut and guide joint journal clean and free from grease.

Replace micro-encapsulated screws.

Tightening torque **31 12 21AZ** .

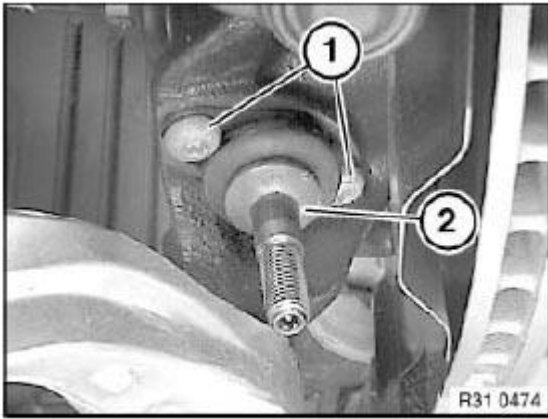


Fig. 30: Identifying Guide Joint And Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Guide joint tightly seated in swivel bearing:

IMPORTANT: The guide joint must be replaced once it has been driven out with the special tools.

Secure special tool 33 4 205 to guide joint.

Drive guide joint out of swivel bearing with special tool 33 4 200.

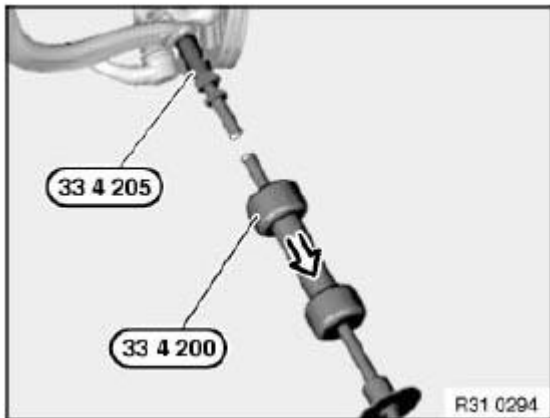


Fig. 31: Identifying Special Tool (33 4 205) And (33 4 200)
 Courtesy of BMW OF NORTH AMERICA, INC.

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

Necessary preliminary tasks:

- Remove front wheel

- Remove front assembly underside protection

Wheel suspension cover:

Remove clip (1).

Unscrew bolt (3).

Unclip wheel suspension cover (2) from front axle carrier (in vicinity of tension strut) and remove.

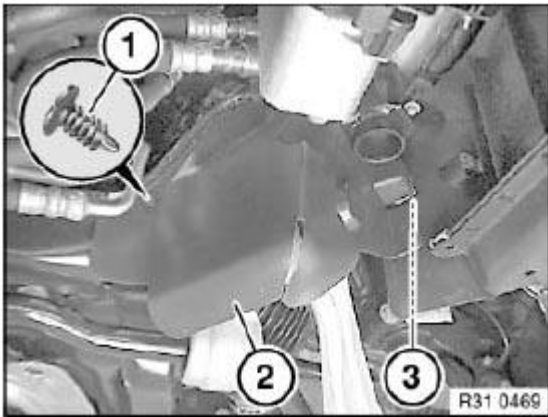


Fig. 32: Identifying Wheel Suspension Cover, Clip And Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Right side only on version with xenon headlight:

Unscrew nut (1).

Tightening torque **37 14 7AZ** .

Remove jointed rod (2) from tension strut on right.

Installation:

Sensor lever (3) must point from ride-height sensor to right front wheel.

Replace self-locking nut.

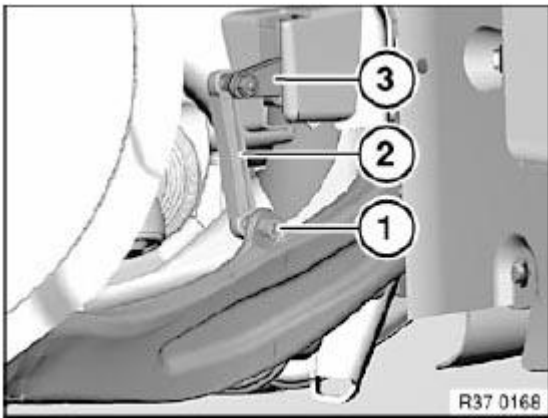


Fig. 33: Identifying Sensor Lever And Jointed Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolt (1).

Installation:

Replace self-locking nut.

Tighten bolt connection in normal position.

Tightening torque **31 12 1AZ** .

Release nut (3); if necessary, grip at Torx socket.

Remove tension strut (2).

Installation:

Keep tension strut to guide joint connection clean and free from oil and grease.

Replace self-locking nut.

Tightening torque **31 12 20AZ** .

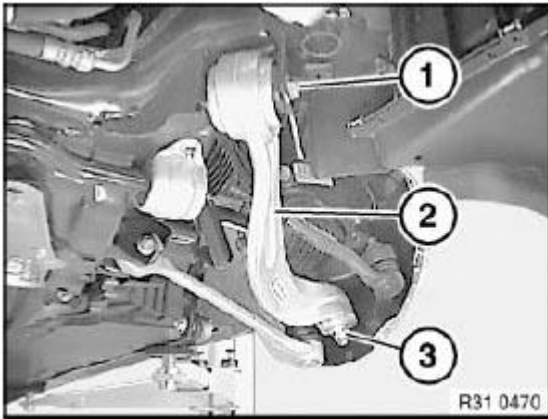


Fig. 34: Identifying Tension Strut And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

31 12 138 REPLACING RUBBER MOUNTS ON BOTH TENSION STRUTS (AWD)

Special tools required:

- 31 3 031
- 31 3 032

IMPORTANT: The rubber mounts on both tension struts must be replaced! Note that the rubber mounts may only be changed once.

Carry out check:

There must always be a minimum amount of play in the guide joint.

1. Check guide joint play

NOTE: For this purpose, apply light pressure to the tension strut (in the area of the guide joint) in the horizontal and vertical directions.

- Play is OK: Check bolt connection (see Point 2)
- Play is not OK: Replace rubber mount and guide joint

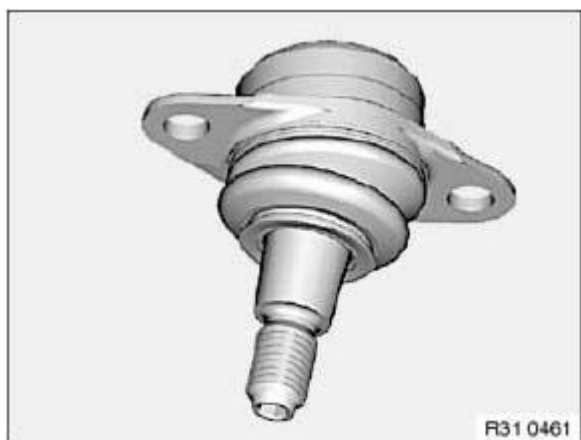


Fig. 35: Identifying Guide Joint

Courtesy of BMW OF NORTH AMERICA, INC.

2. Check bolt connection (tension strut to guide joint) by tightening to 60 % of tightening torque and listening for cracking sound.

Tightening torque **31 12 20AZ** .

- Torque wrench cracking sound: Replace rubber mount
- Bolt connection turns: Replace tension strut and guide joint

Replacing rubber mount:

Remove both tension struts.

IMPORTANT: If the tension struts already feature an identification mark with a center punch, it is necessary to replace both tension struts.

Mark tension struts with a punch mark in area (A).

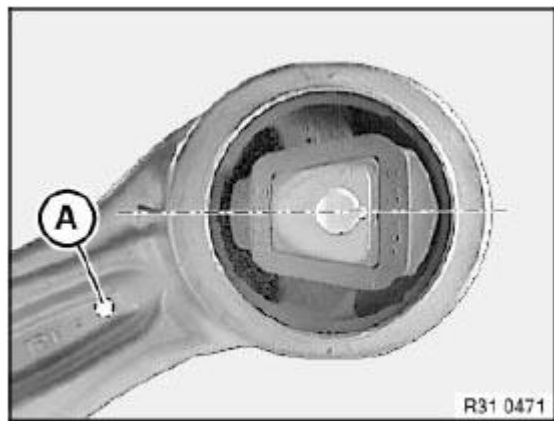


Fig. 36: Identifying Punch Mark On Tension Struts
 Courtesy of BMW OF NORTH AMERICA, INC.

Using a press and special tools 31 3 031 and 31 3 032, press rubber mount out of tension strut.

NOTE: Special tool 31 3 031 must be exactly flush with rubber mount bushing.

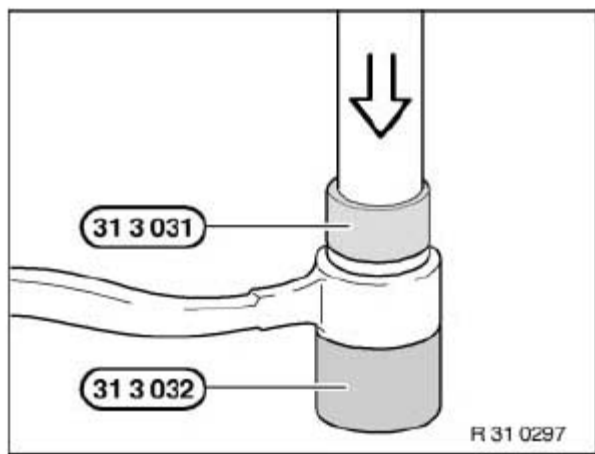


Fig. 37: Identifying Special Tool (31 3 031) And (31 3 032)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Align rubber mount by way of arrow to marking on tension strut and press in. The deviation (A) must not exceed $\pm 5^\circ$.

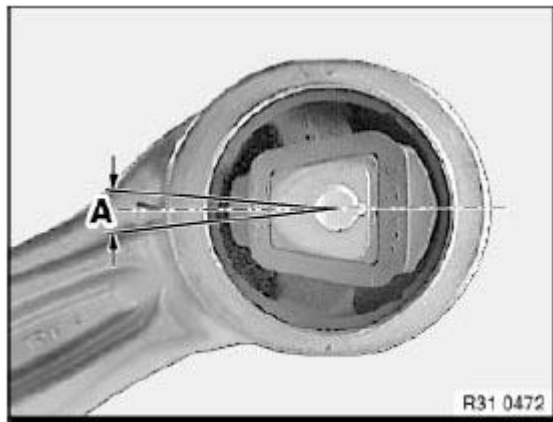


Fig. 38: Identifying Tension Strut Bushing Clearance
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Protrusion (A) equally large.

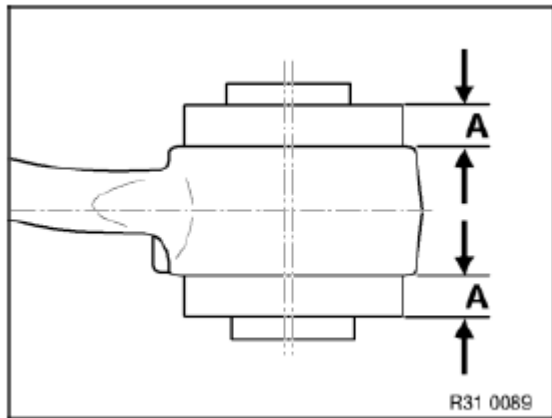


Fig. 39: Identifying Protrusion A

Courtesy of BMW OF NORTH AMERICA, INC.

21 WHEEL BEARINGS AND STUB AXLE

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

Special tools required:

- 31 2 230

Remove front wheel.

Release collar nut; to do so, press brake pedal to floor.

Installation:

Replace collar nut, apply a light coating of oil to contact surface and tighten down.

Tightening torque **31 21 2AZ** .

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

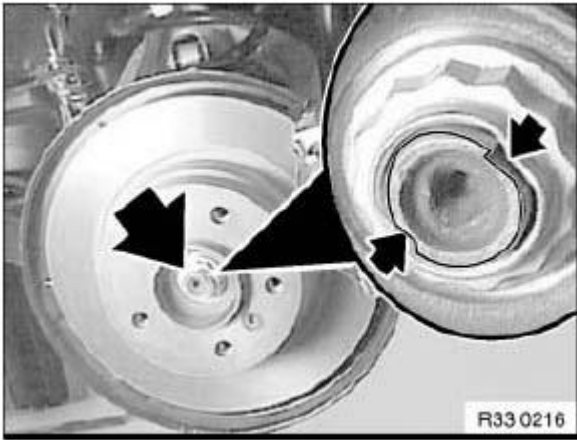


Fig. 40: Locating Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Remove brake disk.

Replacement only: Drive out drive flange.

Remove front pulse generator from swivel bearing and remove line from bracket.

Remove tie rod end from swivel bearing.

Remove tension strut from guide joint.

Remove control arm from swivel bearing.

Remove stabilizer link from spring strut and rotate swivel bearing to one side.

Press output shaft out of drive flange and tie up.

Support swivel bearing with workshop jack and a suitable mounting.

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

Pull out bolt (3) towards front.

Spread swivel bearing with special tool 31 2 230.

Lower workshop jack and remove swivel bearing.

Installation:

Keep press fit of swivel gearing and spring strut in lower area clean and free from oil and grease.

Spread swivel bearing with special tool 31 2 230, align by means of gap to positioning pins on back of spring strut and raise as far as it will go.

Replace self-locking nut.

Tightening torque. Refer to **31 31 3AZ** .

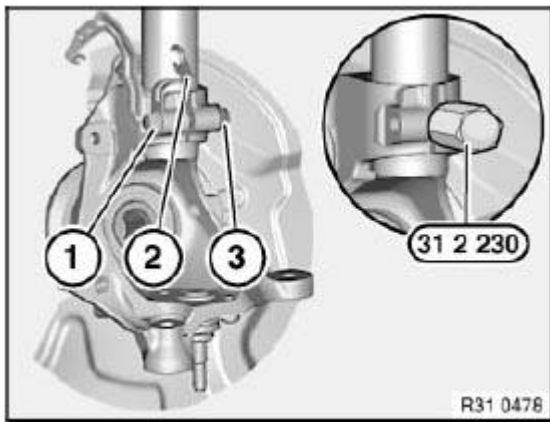


Fig. 41: Identifying Special Tool (31 2 230)
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

Modify guide joint.

Modify dust sleeve (1).

Modify brake guard plate (2).

Installation:

Install new wheel bearing.

Draw in drive flange.

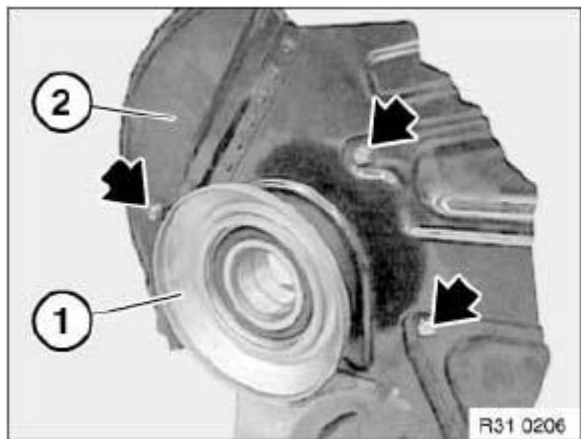


Fig. 42: Locating Brake Guard Plate And Dust Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Replacement only: Perform chassis alignment check

31 21 180 REPLACING BEARING FOR FRONT WHEEL (AWD)

Special tools required:

- 22 1 018
- 31 2 113
- 33 2 116
- 33 2 160
- 33 2 201
- 33 3 261
- 33 3 266
- 33 3 268
- 33 4 200
- 33 4 261
- 33 4 262

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

Remove front wheel.

Release collar nut; to do so, press brake pedal to floor.

Remove front brake disk

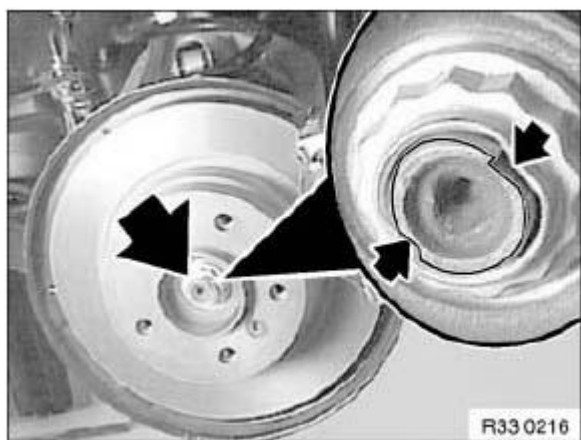


Fig. 43: Locating Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Force drive flange with special tools 33 2 116 / 33 2 201, 33 2 160, 33 4 200 and 5 wheel bolts out of wheel bearing.

NOTE: Rounded inside edge of special tool 33 2 160 must point to drive flange. Detach wheel bearing inner race from drive flange.

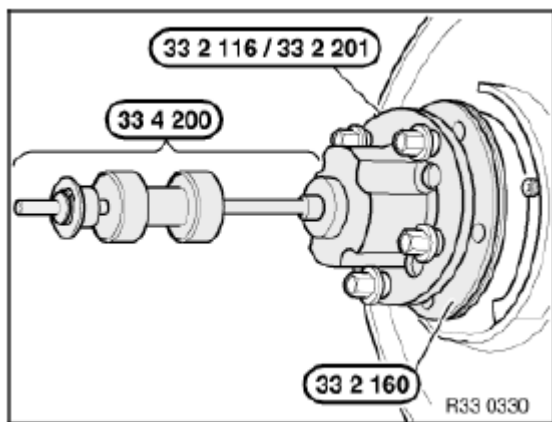


Fig. 44: Identifying Special Tool (33 2 116 / 33 2 201) And (33 4 200)

Courtesy of BMW OF NORTH AMERICA, INC.

Remove swivel bearing and clamp with aluminum clamping jaws in vice.

IMPORTANT: The bearing was destroyed when the drive flange hub was removed and must not be reused!

Lift out retaining ring (1).

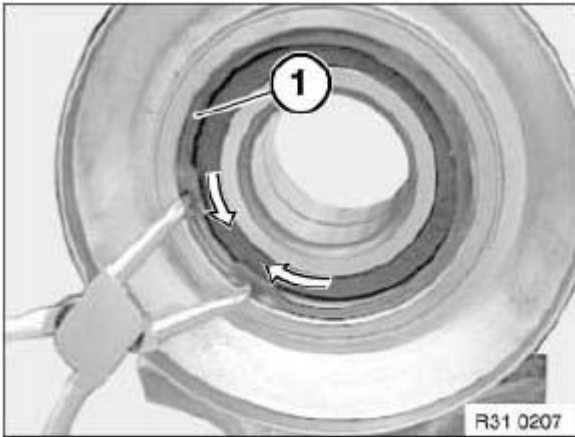


Fig. 45: Identifying Retaining Ring

Courtesy of BMW OF NORTH AMERICA, INC.

Pull out bearing with special tools 31 2 113, 33 4 261, 33 3 266 and 33 3 261.

NOTE: The bearing can be forced out of the swivel bearing on a press.
Check dust sleeve, replace if necessary.

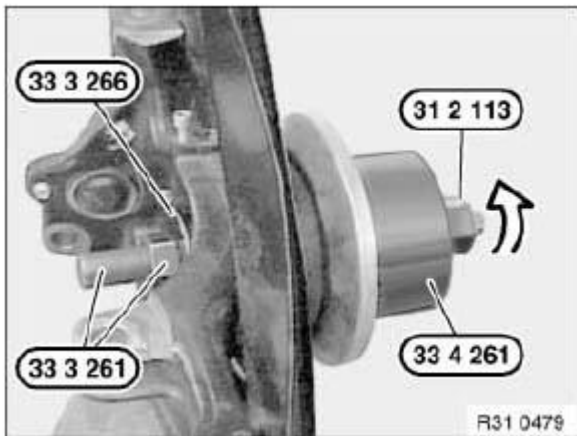


Fig. 46: Identifying Special Tool (31 2 113), (33 4 261) And (33 3 266)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Keep press-fit areas clean and free of oil and grease.
Coat bearing seat in swivel bearing over 50 % of its length with Loctite 638.
Wider chamfer of bearing must point to swivel bearing!

Clean press-fit area of new bearing.

Clean bearing seat in swivel bearing and coat over 50 % of its length with Loctite 638.

IMPORTANT: Wider chamfer (1) of bearing must point to swivel bearing!

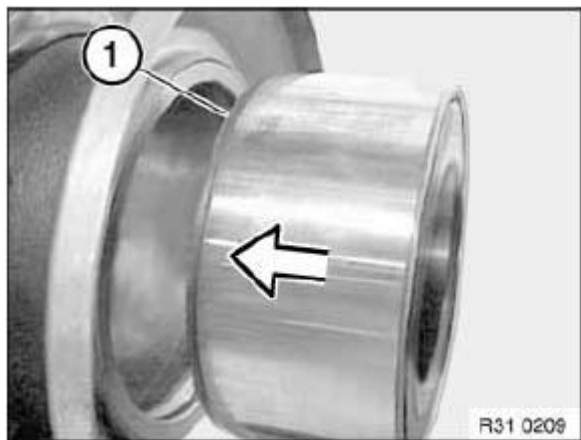


Fig. 47: Locating Wider Chamfer

Courtesy of BMW OF NORTH AMERICA, INC.

Align bearing by way of wider chamfer to swivel bearing and draw in with special tools 31 2 113, 22 1 018, 33 4 262 and 33 3 261.

NOTE: The bearing can be forced out of the swivel bearing on a press.

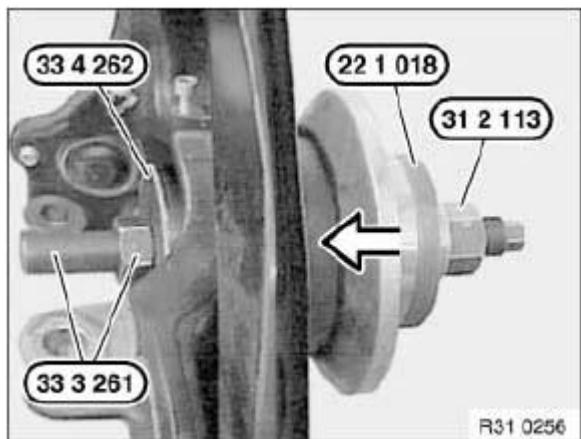


Fig. 48: Identifying Special Tool (31 2 113), (33 4 262) And (22 1 018)

Courtesy of BMW OF NORTH AMERICA, INC.

Install new circlip (1).

NOTE: Make sure circlip (1) is correctly seated.

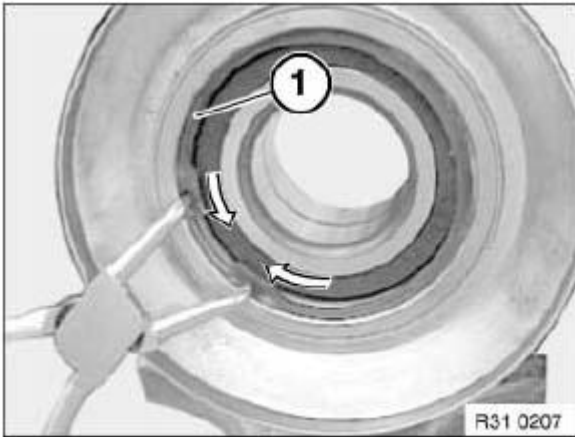


Fig. 49: Identifying Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in drive flange (1) with special tools 31 2 113, 33 3 268, 33 3 266 and 33 3 261.

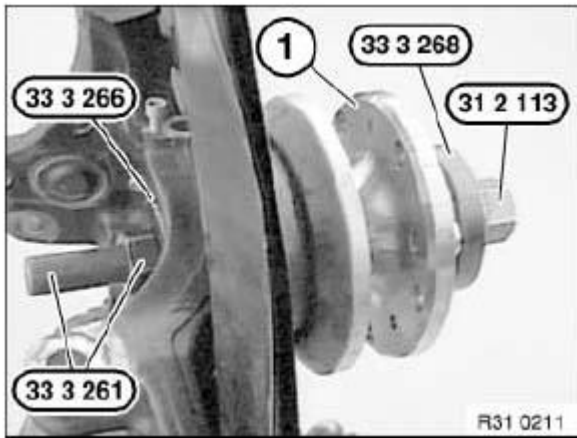


Fig. 50: Identifying Special Tool (31 2 113), (33 3 268) And (33 3 266)
Courtesy of BMW OF NORTH AMERICA, INC.

Install swivel bearing.

Draw output shaft into drive flange.

Install front brake disk.

Install front brake caliper.

Replace collar nut, apply a light coating of oil to contact surface and tighten down.

Tightening torque **31 21 2AZ** .

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

Install front wheel.

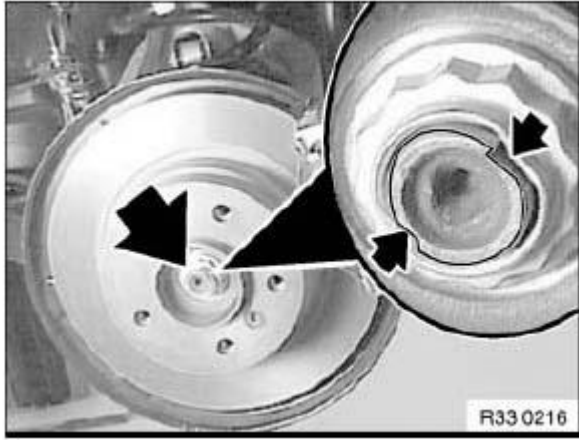
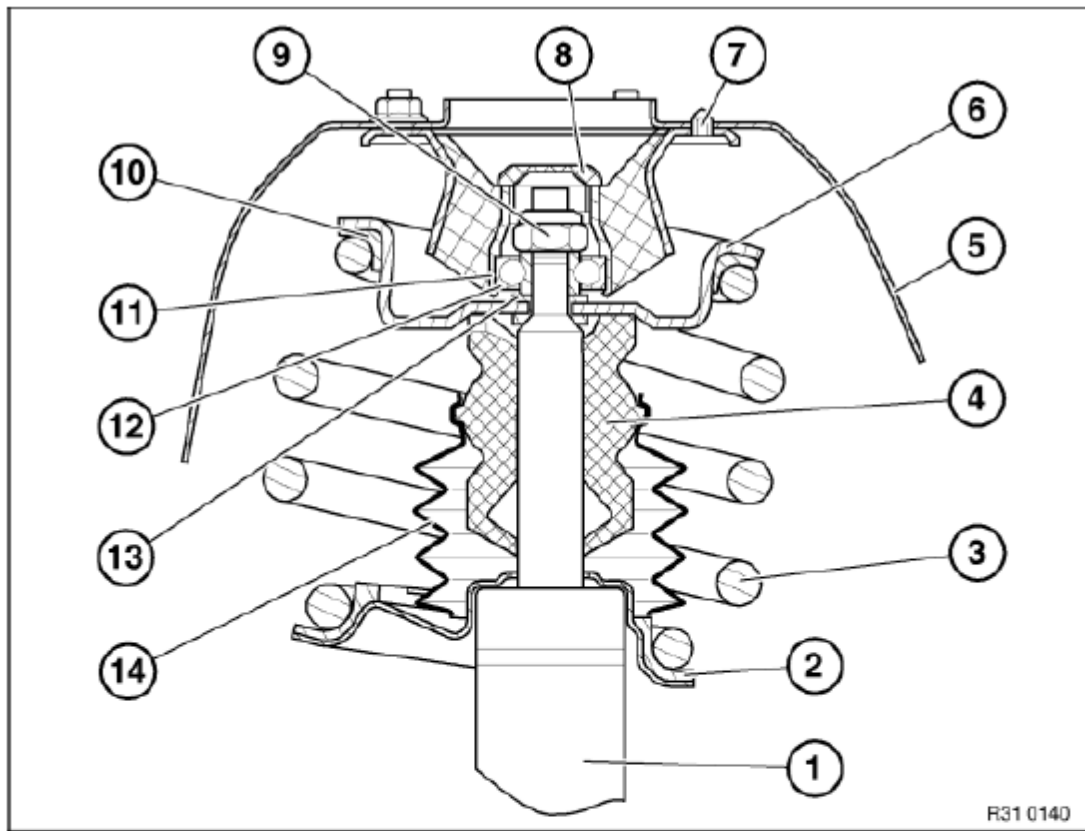


Fig. 51: Locating Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

31 SPRING STRUT

31.... LAYOUT OF SPRING STRUT SHOCK ABSORBER



- | | |
|-------------------------------|-----------------------|
| 1 Spring strut shock absorber | 10 Upper spring pad |
| 2 Lower spring pad | 11 Thrust bearing |
| 3 Coil spring | 12 Dust sleeve |
| 4 Auxiliary spring | 13 Thrust washer/shim |
| 5 Wheel arch | 14 Rubber gaiter |
| 6 Upper spring plate | |
| 7 Centering pin | |
| 8 Grease cap | |
| 9 Nut | |

Fig. 52: Layout Of Spring Strut Shock Absorber
 Courtesy of BMW OF NORTH AMERICA, INC.

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:

Shock absorbers may be replaced on one side only until they have completed 50 000 km service.

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

31 31 000 REMOVING AND INSTALLING COMPLETE FRONT LEFT OR RIGHT SPRING STRUT (AWD)

**IMPORTANT: If the centering pin is missing from the support bearing, the position of the studs to the wheel arch must be marked so that the original camber is approximately maintained.
Only one nut may ever be released for marking.**

Remove front wheel.

Release collar nut; to do so, press brake pedal to floor.

Installation:

Replace collar nut, apply a light coating of oil to contact surface and tighten down.

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

Tightening torque **31 21 2AZ** .

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

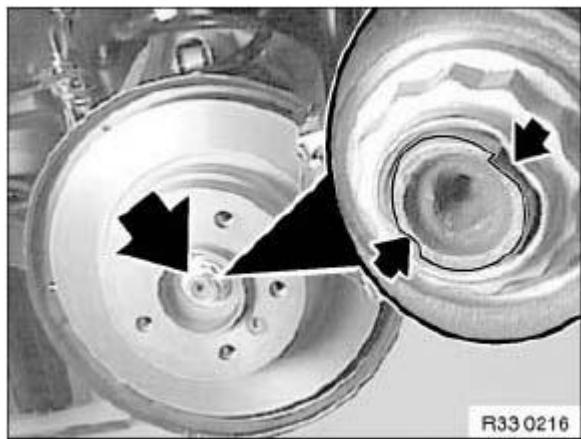


Fig. 53: Locating Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Remove brake disk.

Remove tie rod end from swivel bearing.

Remove tension strut from guide joint.

Remove control arm from swivel bearing.

Remove stabilizer link from spring strut.

Turn swivel bearing to one side.

Press output shaft out of drive flange and tie up.

Remove pulse generator from swivel bearing and remove line from bracket on spring strut.

Centering pin missing: Make position of studs in relation to wheel arch.

Secure spring strut against falling out.

Unscrew nuts.

Remove spring strut with swivel bearing downwards out of wheel arch.

Installation:

Clean contact surface in spring strut dome.

Replace faulty sealing washer for spring strut support bearing (corrosion protection).

Align spring strut using centering pin to bore in wheel arch or studs to wheel arch and push upwards.

Replace self-locking nuts.

Tightening torque **31 31 1AZ** .

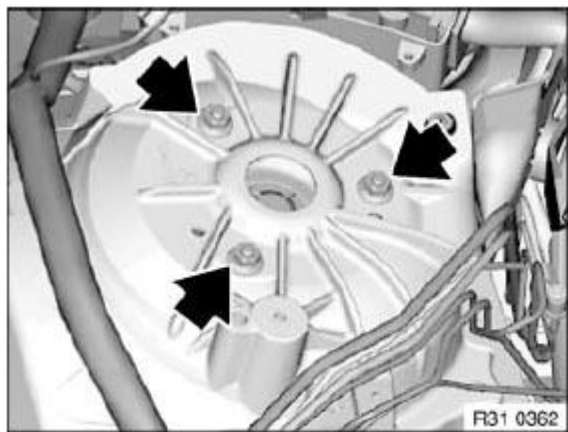


Fig. 54: Locating Spring Strut

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out wheel alignment check if a spring strut with support bearing was or has been installed without centering pin.

31 31 031 REPLACING FRONT LEFT OR RIGHT SPRING STRUT (AWD)

Special tools required:

- 31 2 210
- 31 2 230
- 31 3 341
- 31 3 354
- 31 3 355
- 31 3 356

WARNING: Observe the following instructions to avoid any risk of injury by the coil springs.

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 free of grease.
6. Impact screwdrivers may not be used!
7. Do not compress coil spring to full extent.
8. Observe manufacturer's instructions.

IMPORTANT: Replace auxiliary dampers in pairs only.

NOTE: The support ring on the auxiliary damper has been modified from plastic to steel.

NOTE: Read and comply with Information on replacing shock absorbers.

Necessary preliminary tasks:

- Remove front spring strut

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

Remove bolt (3) towards front.

Spread swivel bearing with special tool 31 2 230.

Pull spring strut out of swivel bearing.

Installation:

Keep press fit of swivel gearing and spring strut in lower area clean and free from oil and grease.

Spread swivel bearing with special tool 31 2 230, align by means of gap to positioning pins on back of spring strut and push together as far as it will go.

Replace self-locking nut.

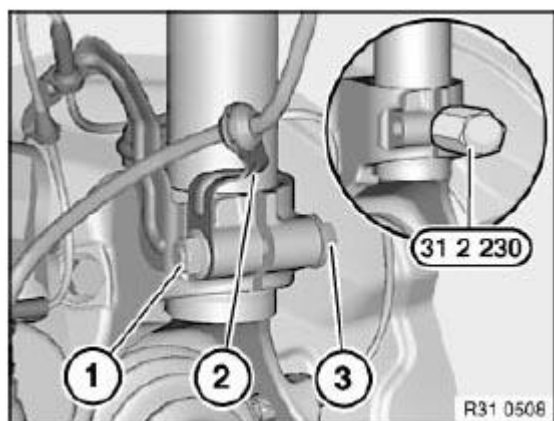


Fig. 55: Identifying Special Tool (31 2 230)
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening torque **31 31 3AZ** .

Removing:

Clamp special tool 31 3 341 in vice.

Insert centering ring 31 3 356 in special tool 31 3 354.

Position special tools 31 3 355 and 31 3 354 with centering ring 31 3 356 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 3 355 and 31 3 354 with centering ring 31 3 356, correct if necessary.

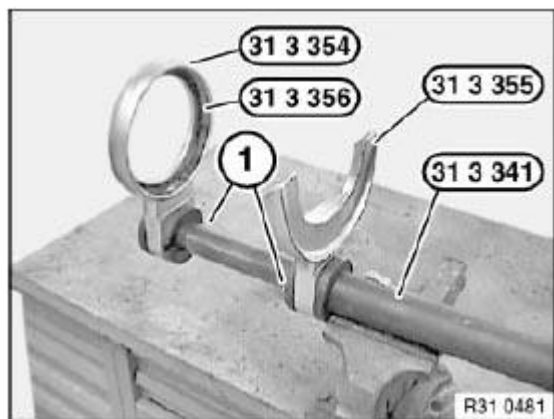


Fig. 56: Identifying Special Tool (31 3 354), (31 3 355) And (31 3 356)
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: During tensioning, spring plate must rest correctly in special tool 31 3 354 with centering ring 31 3 356!

**During tensioning, lower coil of coil spring must rest completely in recess of special tool 31 3 355!
Compress coil spring until stress on piston rod is relieved.**

Clean coil spring to remove coarse dirt and take up with special tools 31 3 355 and 31 3 354 with centering ring 31 3 356.

Twist spring strut until end of coil spring (1) is flush with end of special tool 31 3 355.

Compress coil spring until stress on piston rod is relieved.

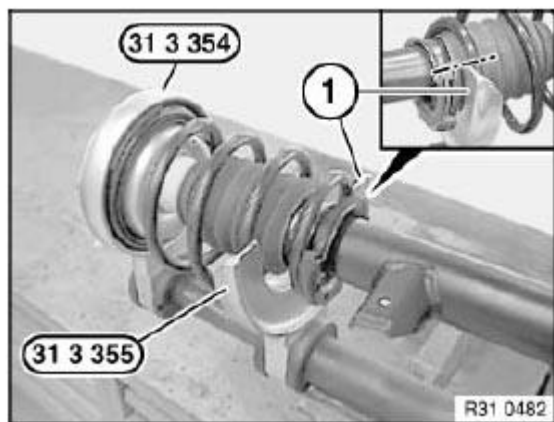


Fig. 57: Identifying Special Tool (31 3 355) And (31 3 354)
Courtesy of BMW OF NORTH AMERICA, INC.

Take off cap.

Release nut with special tool 31 2 210 (grip piston rod in the process).

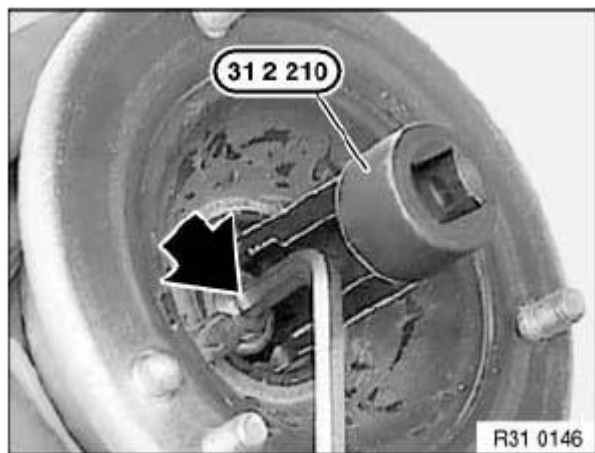


Fig. 58: Identifying Special Tool (31 2 210)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove support bearing (1), dust sleeve and supporting ring (2).

Remove spring strut with auxiliary damper, gaiter and lower spring pad sideways from tensioned coil spring.

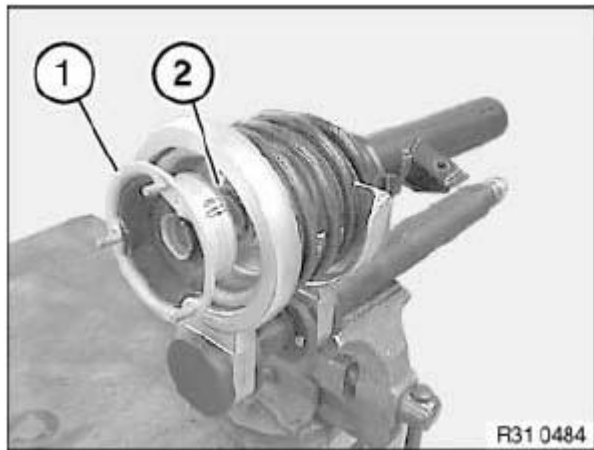


Fig. 59: Identifying Support Bearing And Supporting Ring

Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove auxiliary damper (1) with gaiter (2) and spring pad (3) from shock absorber.

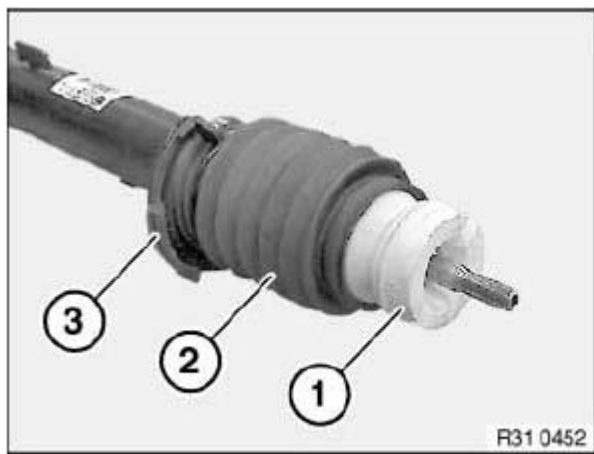


Fig. 60: Identifying Auxiliary Damper, Gaiter And Lower Spring Pad

Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on coil spring. Remove coil spring with spring plate from special tools 31 3 354, 31 3 356 and 31 3 355.



Fig. 61: Identifying Special Tool (31 3 354) And (31 3 355)

Installation: Check spring pad (1) for damage, replace if necessary. Attach spring plate (2) with spring pad (1) to coil spring.

NOTE: End of coil spring must be positively aligned to spring pad (1).

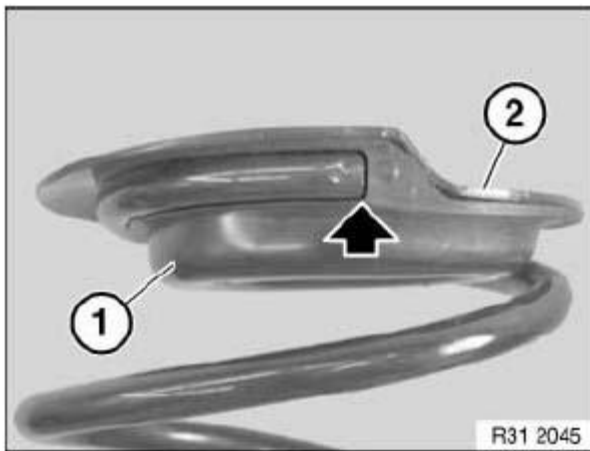


Fig. 62: Identifying Spring Plate And Upper Spring Pad

Hold coil spring and spring plate with special tools 31 3 355, 31 3 356 and 31 3 354. Twist coil spring until lower end of coil spring (1) is flush with end (2) of special tool 31 3 355.



Fig. 63: Identifying Special Tool (31 3 354) And (31 3 355)

WARNING: Do not compress coil spring to full extent. Special tool 31 3 354 and centering ring 31 3 356 must rest correctly on the upper spring plate! Bottom coil of coil spring must rest completely in recess of special tool 31 3 355!

Tension coil spring.



Fig. 64: Identifying Special Tool (31 3 354) And (31 3 355)

Check auxiliary damper (1), gaiter (2) and spring pad (3) for damage, replace if necessary.

NOTE: Make sure spring pad (3) is correctly seated on shock absorber.

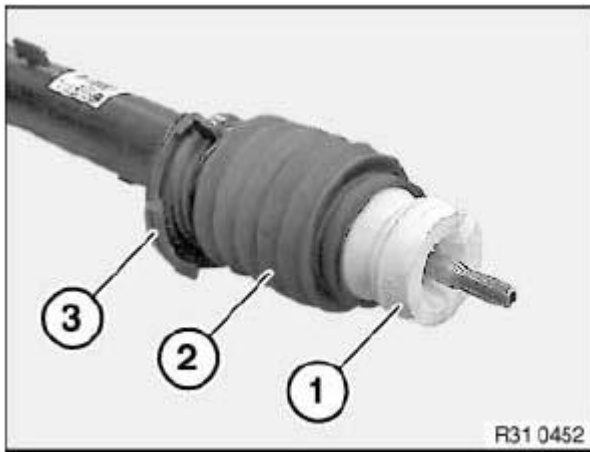


Fig. 65: Identifying Auxiliary Spring, Gaiter And Lower Spring Pad

Insert shock absorber in tensioned coil spring. Attach thrust washer (2) to piston rod. Check support bearing (1) for damage, replace if necessary. Attach dust sleeve and support bearing to piston rod.

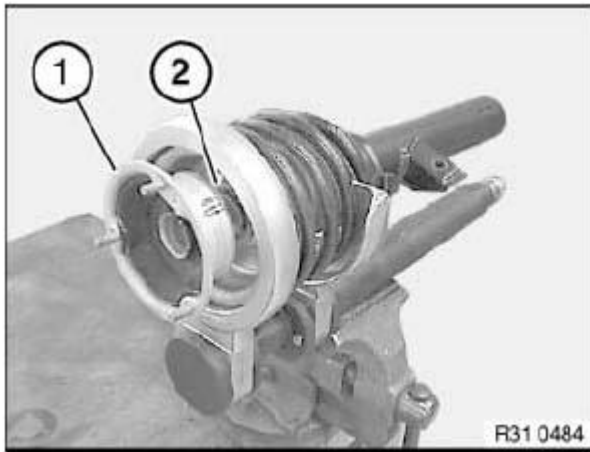


Fig. 66: Identifying Support Bearing And Supporting Ring

Replace nut and tighten down with special tool 31 2 210 (grip piston rod in the process). Tightening torque **31 31 2AZ** . Fit cover cap.

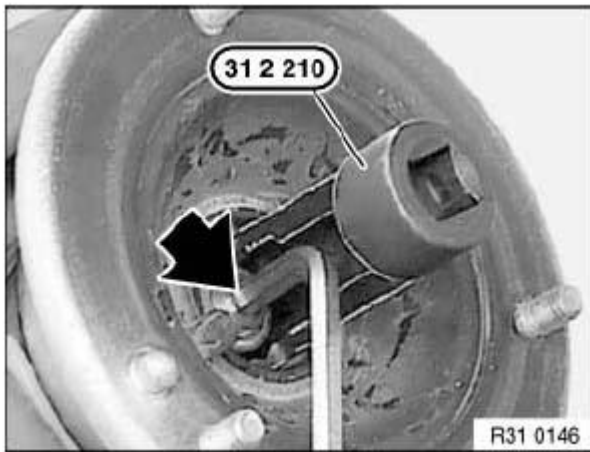


Fig. 67: Identifying Special Tool 31 2 210

IMPORTANT: Spring pad (1) must rest positively on spring plate (2)! Upper end of coil spring must rest on stop of spring pad (1)!

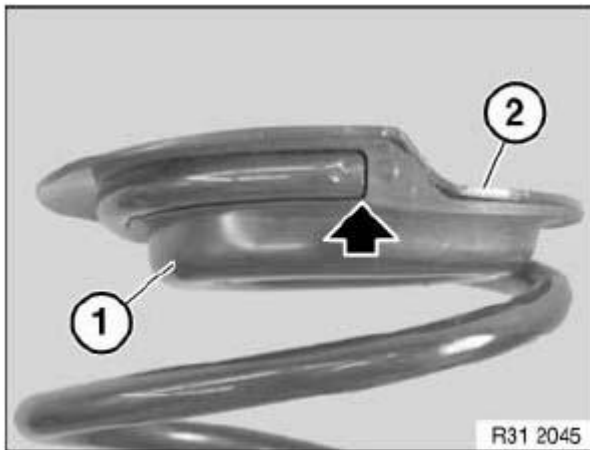


Fig. 68: Identifying Spring Plate And Upper Spring Pad

IMPORTANT: Lower end of coil spring (2) must rest on stop of spring pad (1)!

Relieve tension on coil spring. Check installation position of gaiter, correct fold if necessary.

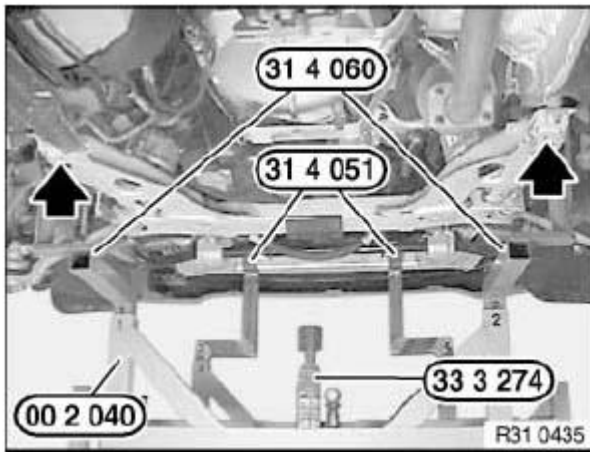


Fig. 69: Identifying Special Tools 31 4 051, 31 4 060, 33 3 274 And 00 2 040

After installation: Carry out wheel alignment check if a spring strut with support bearing was or has been installed without centering pin.

51 71 373 REMOVING AND INSTALLING/REPLACING TENSION STRUT ON SPRING STRUT DOME

**IMPORTANT: Vehicles must not be driven without tension struts.
Driving without tension struts will result in bodywork damage.**

Necessary preliminary tasks:

- Remove lower microfilter housing section on left/right

If necessary, remove cover on spring strut dome on left/right:

- Release expander rivets (1).
- Remove cover (3),
- taking care not to damage retaining lug (2)

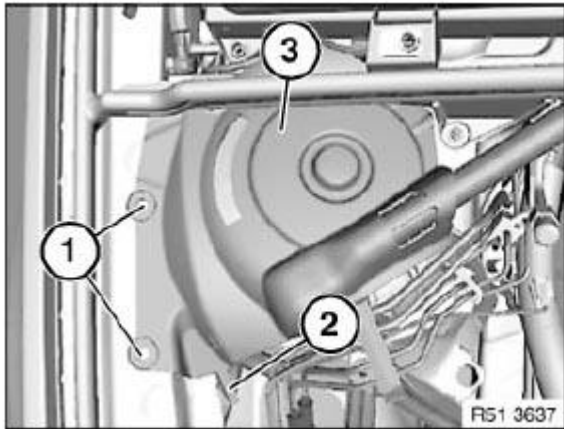


Fig. 70: Identifying Expander Rivets And Retaining Lug
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove tension strut panels:

- Release expander rivets on panel (2)
- Remove panel (2) in direction of arrow

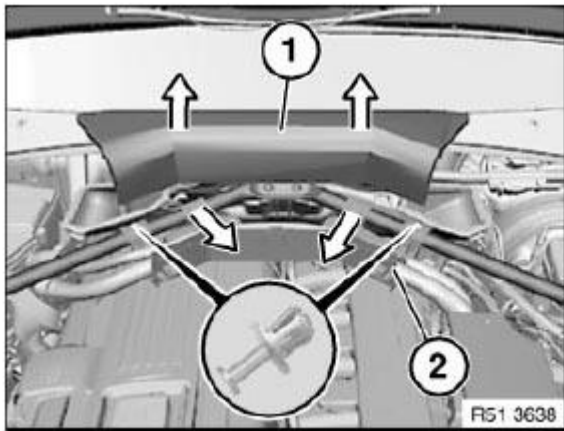


Fig. 71: Identifying Expander Rivets And Panel
Courtesy of BMW OF NORTH AMERICA, INC.

Important - modified screw connection!

Screws must be replaced and - because of the modified surface coating - tightened to increased torque!

Release screws (1).

Remove tension strut (2).

Installation:

Replace screws.

Tightening torque **51 61 1AZ.**

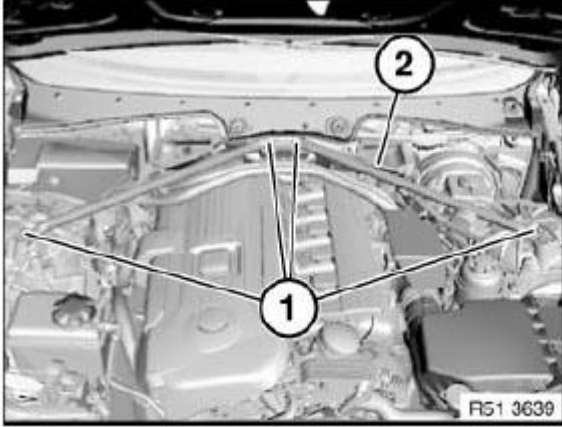


Fig. 72: Identifying Tension Strut And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

33 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).

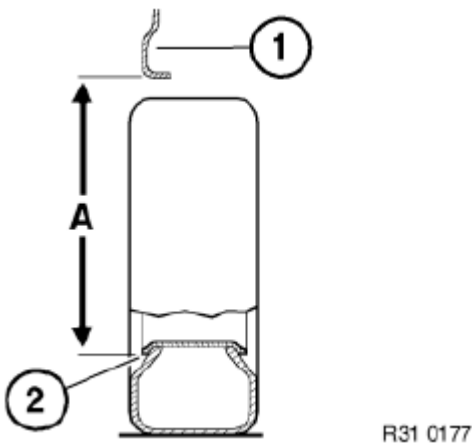


Fig. 73: Identifying Ride-Level Height Of Vehicle
Courtesy of BMW OF NORTH AMERICA, INC.

31 33 001 REPLACING FRONT LEFT OR RIGHT SPRING STRUT SUPPORT BEARING (AWD)

Installation note:

- All screws, nuts, bolts and hose clamps removed during the repair must be replaced.
- Retaining elements on chassis and suspension and steering parts must be replaced.

NOTE: Procedure is described in replacing front left or right spring strut.

Replacement: Vehicle with spacer ring:

NOTE: Spacer ring (A) is fitted in vehicles with "rough road package" version.

Unscrew nuts. Tightening torque **31 31 1AZ** . Remove spacer ring (A) from support bearing.

Installation note: Align spacer ring (A) using centering pin (1) to support bearing and place in position. Replace self-locking nuts.

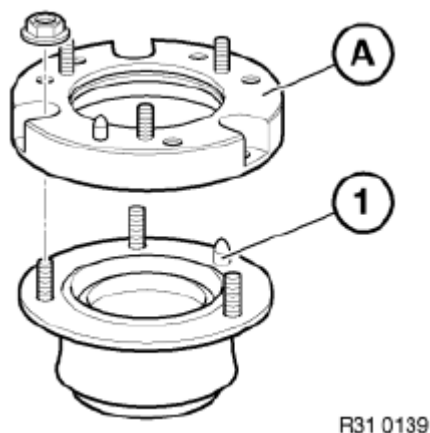


Fig. 74: Identifying Adapter And Centering Pin

If necessary, twist/drive out centering pin (1).

NOTE: If a support bearing (2) was fitted without centering pin (1), the centering pin (1) of the new support bearing (2) must be driven or twisted out.

After installation: If a support bearing is installed without a centering pin, perform a wheel alignment. If a support bearing is installed without a centering pin, perform a wheel alignment.

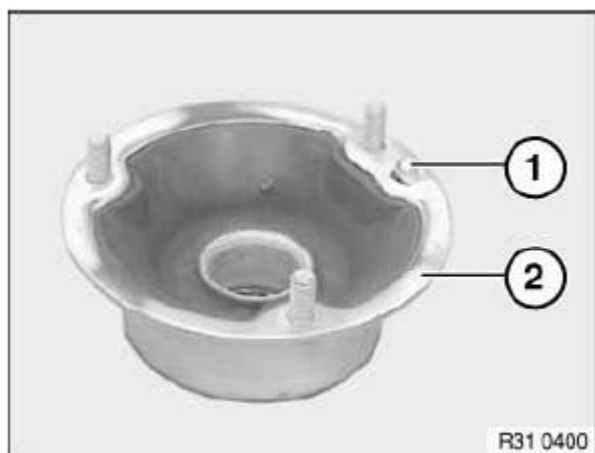


Fig. 75: Identifying Centering Pin And Support Bearing

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).

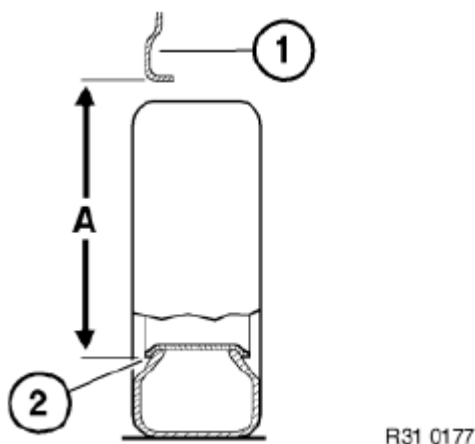


Fig. 76: Identifying Rim Flange Clearance

Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation note:

1. All screws, nuts, bolts and hose clamps removed during the repair must be replaced.

2. Retaining elements on chassis and suspension and steering parts must be replaced.

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

NOTE: Procedure is described in replacing front left or right spring strut.

35 STABILIZER BAR

31 35 000 REMOVING AND INSTALLING/REPLACING FRONT STABILIZER (AWD)

Necessary preliminary tasks:

- Remove front assembly underside protection
- Remove stabilizer link on both sides from stabilizer.

Unscrew nuts (1).

Remove stabilizer (2).

Installation:

Check rubber mount on both sides, replace if necessary.

Replace self-locking nuts.

Tightening torque 31 35 1AZ .

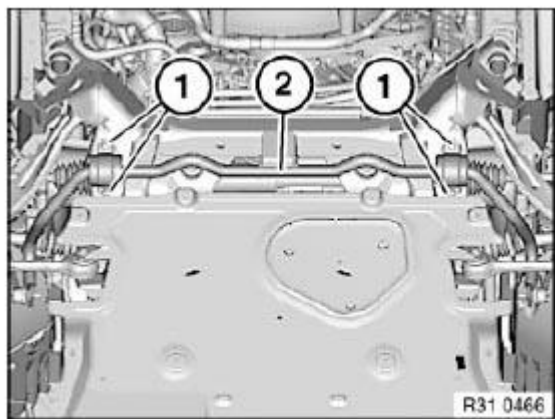


Fig. 77: Identifying Stabilizer And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement only:

Remove rubber mount on both sides from stabilizer.

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

IMPORTANT: Observe safety instructions on raising the vehicle.

NOTE: Stabilizer links may only be replaced in pairs.

Release nuts (1); if necessary, grip at Torx socket.

Remove stabilizer link (2).

Installation:

Replace self-locking nuts.

Tightening torque **31 35 11AZ.**

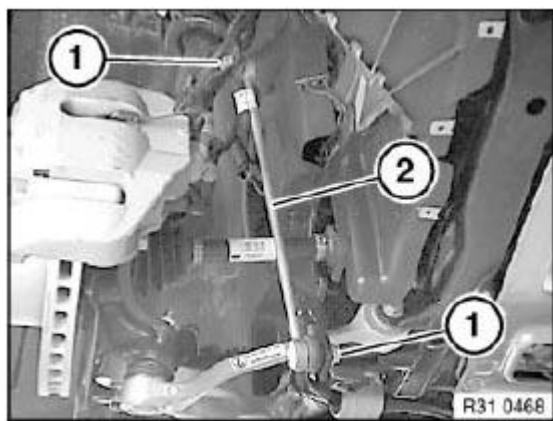


Fig. 78: Identifying Stabilizer Link And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Never tighten the anti-roll bar link with an impact wrench! Do not twist the joint of the anti-roll bar link while tightening the nut! Never twist the joint to hold against the screw connection!

The plastic bond (1) may never be broken as marked with arrows in area (2). If the plastic bond is broken, the anti-roll bar link must be replaced.

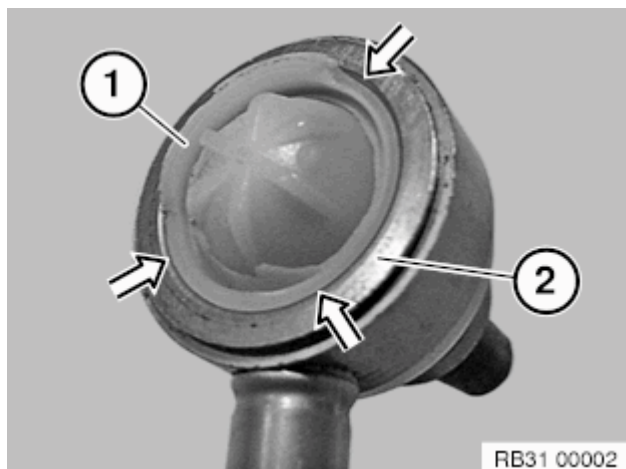


Fig. 79: Ensure Plastic Bond Is Not Broken

31 35 021 REPLACING BOTH RUBBER MOUNTS OF STABILIZER MOUNTING ON FRONT AXLE CARRIER (4WD)

Necessary preliminary tasks:

- Remove **stabilizer** from front axle carrier

Remove retaining bracket (1) and rubber mount (2) on both sides.

Installation:

Keep retaining bracket (1), rubber mount (2) and stabilizer clean and free from oil and grease.

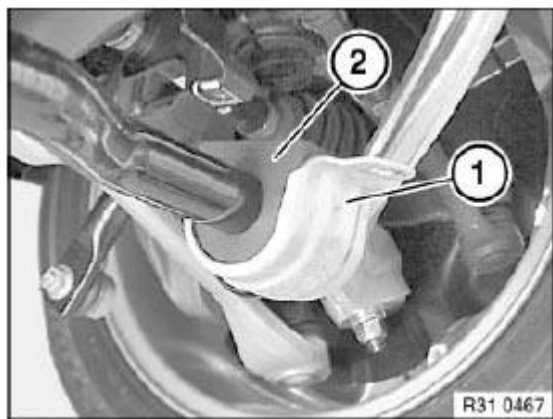
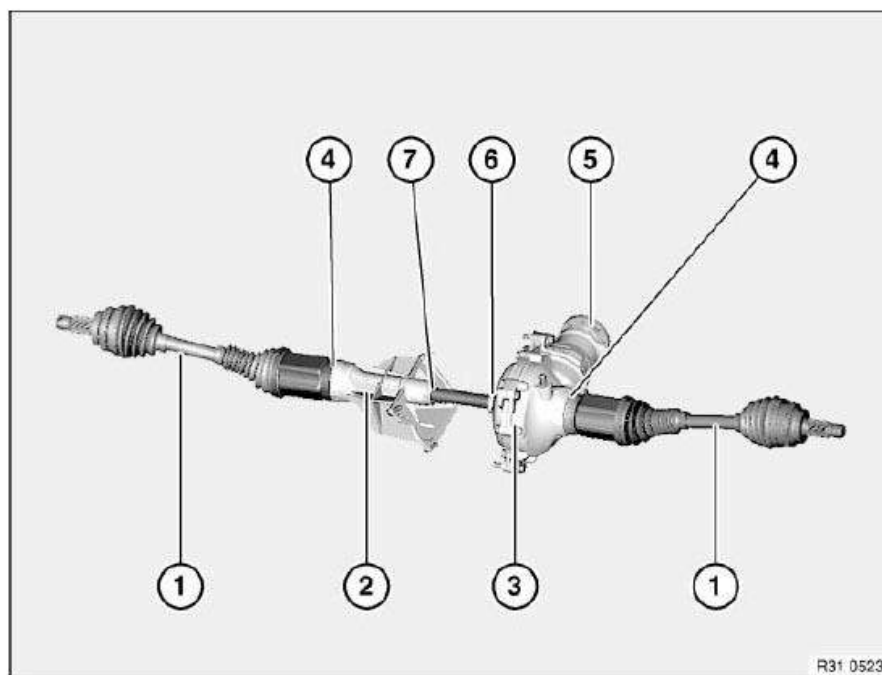


Fig. 80: Identifying Bracket And Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

50 FRONT AXLE GEARBOX

31 50... OVERVIEW OF FRONT DIFFERENTIAL/OUTPUT SHAFTS



- 1 Output shaft / gaeters
- 2 Bearing block
- 3 Front differential
- 4 Shaft seal (output shaft)

- 5
- 6
- 7

- Shaft seal (drive flange)
- O-ring (front differential)
- O-ring (bearing block)

Fig. 81: Identifying Front Differential/Output Shafts Components
 Courtesy of BMW OF NORTH AMERICA, INC.

Safety precautions & general information

31 50... CHANGING FRONT DIFFERENTIAL OIL

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**

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 sealing ring.

Tightening torque **31 50 8AZ** .

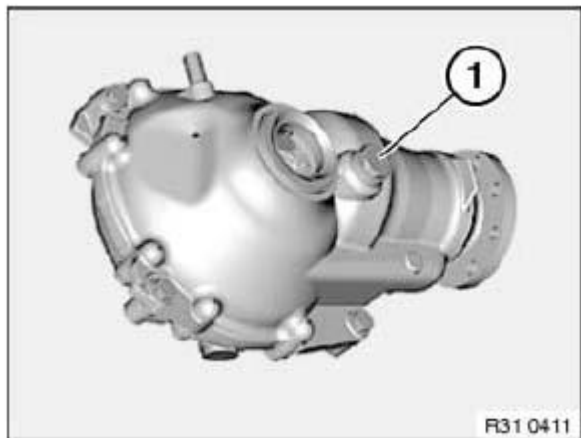


Fig. 82: Identifying Oil Filler Plug

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.

Replace sealing ring, screw in oil drain plug (1) and tighten down.

Tightening torque **31 50 8AZ** .

Undo oil filler plug (2).

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

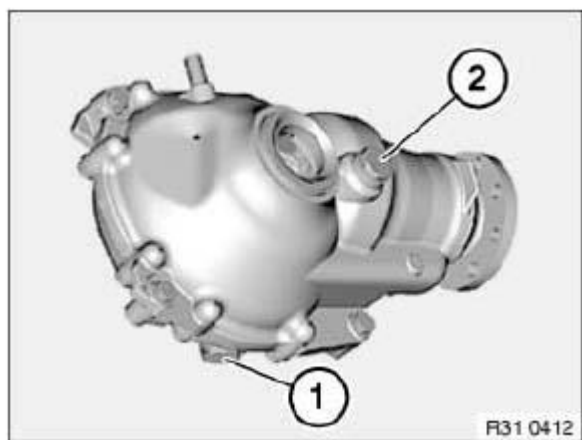


Fig. 83: Identifying Oil Filler Plug And Oil Drain Plug
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring.

Tightening torque **31 50 8AZ** .

31 50 001 REMOVING AND INSTALLING/REPLACING FRONT DIFFERENTIAL

WARNING: Danger to life!

Secure engine in installation position to prevent it from falling down.

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Seal off hydraulic lines with plugs.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Secure engine in installation position
- Disconnect pressure line from vane pump
- Disconnect return line from cooling coil
- Drain and dispose of front differential oil
- Remove **left output shaft**
- **Press right output shaft** approx. 6 to 7 cm out of front differential
- Remove propeller shaft from front differential
- Replacement only:
 - Replace front axle output flange on transfer box

NOTE: Replace the output flange to ensure a clean seal on the transfer case.

- Lower **front axle support**

IMPORTANT: Grip front differential firmly while releasing last bolt in order to avoid damage caused by the differential falling.

Version with automatic transmission: If necessary, disconnect hydraulic lines from oil sump.

Release screws (1).

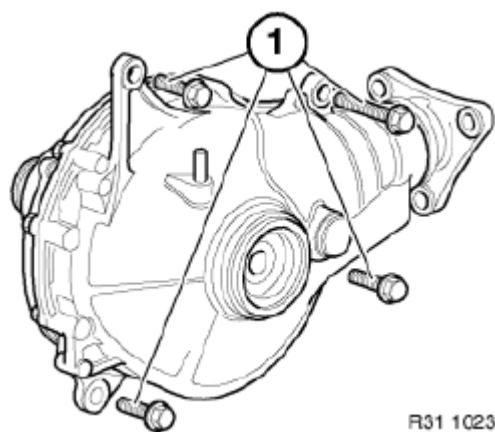
Tightening torque **31 50 7AZ.** .

Detach front differential from oil sump and remove towards rear.

Installation:

Replace O-ring if necessary.

Coat O-ring with front differential oil.



R31 1023

Fig. 84: Identifying Front Differential Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system
- Check pipe connections for leaks
- fill with front differential oil
- Check transfer case oil level, correct if necessary
- Carry out steering angle sensor adjustment

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.

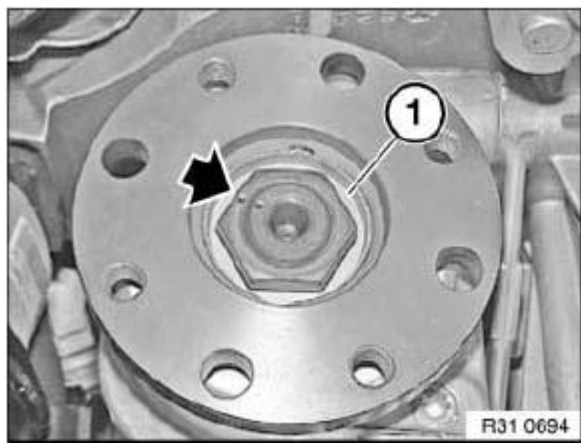


Fig. 85: Locating Lockplate

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).

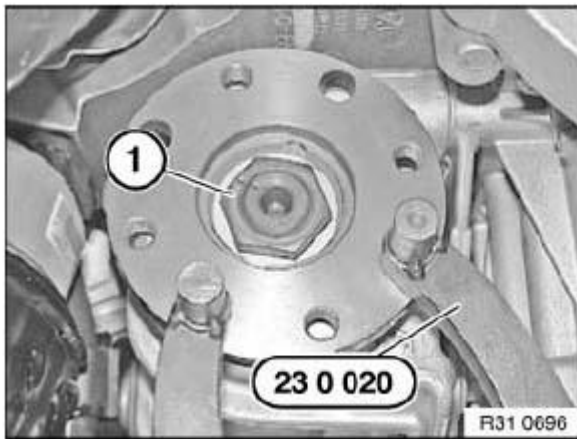


Fig. 86: Identifying Special Tool (23 0 020)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Mount special tool only with longer screws (M10x30) on drive flange.

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

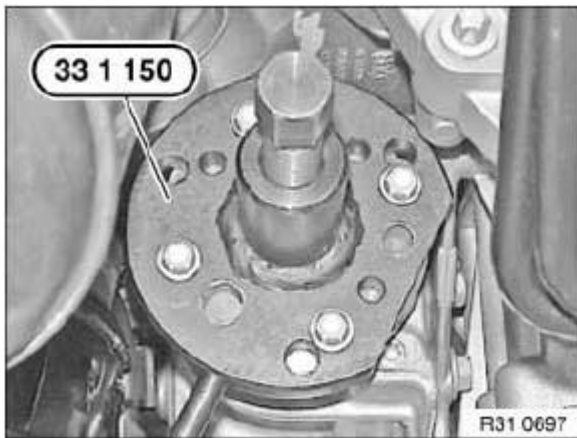


Fig. 87: Identifying Special Tool (33 1 150)

Courtesy of BMW OF NORTH AMERICA, INC.

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

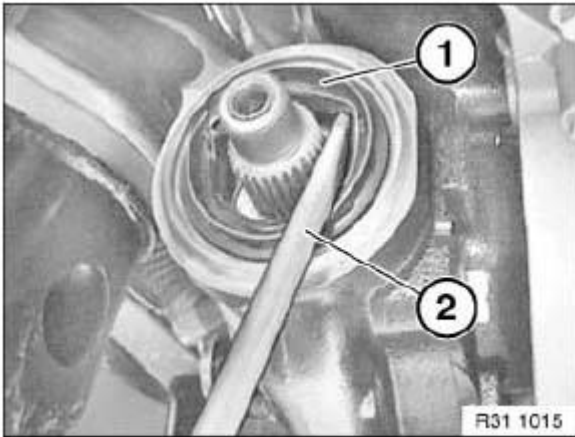


Fig. 88: Identifying Lever Shaft Seal And Screwdriver
Courtesy of BMW OF NORTH AMERICA, INC.

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.

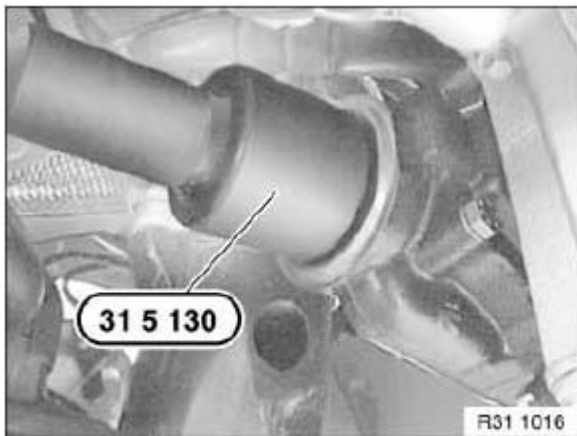


Fig. 89: Identifying Special Tool (31 5 130)
Courtesy of BMW OF NORTH AMERICA, INC.

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).

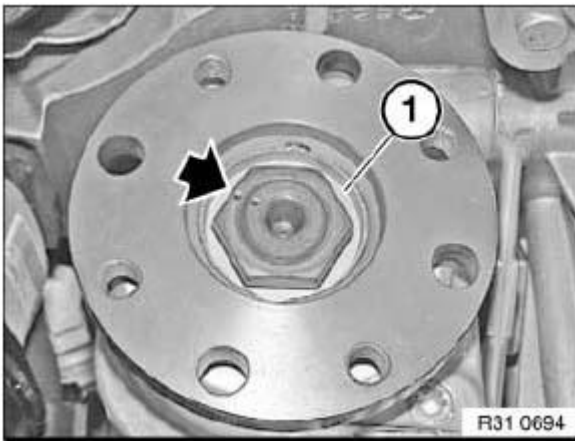


Fig. 90: Locating Lockplate

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 5 130

Necessary preliminary tasks:

- Remove **left output shaft**

Lever shaft seal (1) with a screwdriver (2) out of front differential (3).

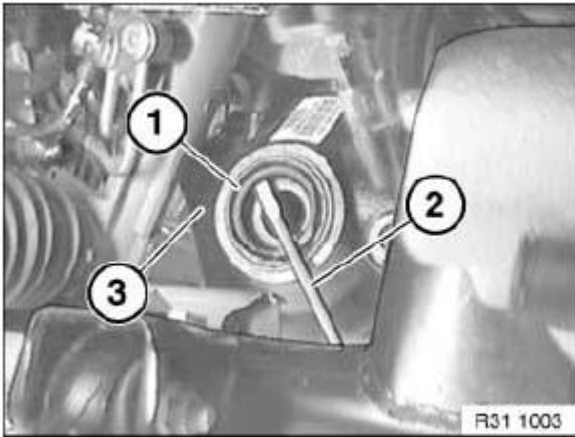


Fig. 91: Identifying Lever Shaft Seal And Screwdriver
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Protective sleeve (2) serves to protect the sealing lips of shaft seal (1) from being damaged when the output shaft is inserted into the front differential.



Fig. 92: Identifying Protective Sleeve And 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.

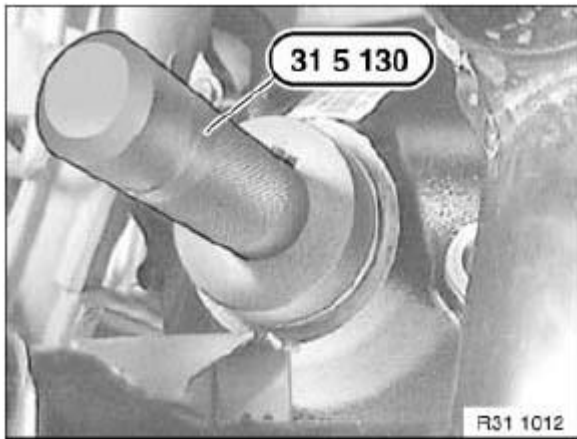


Fig. 93: Identifying Special Tool (31 5 130)

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.

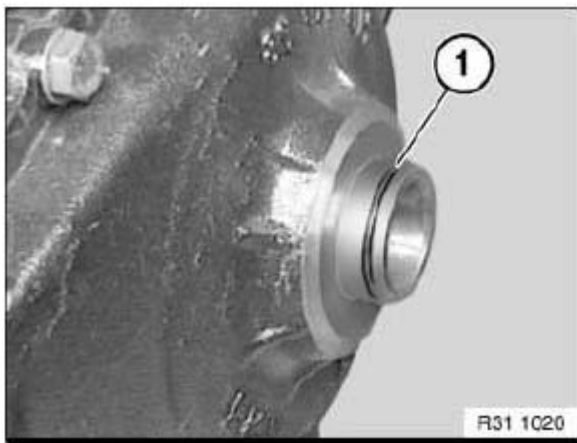


Fig. 94: Identifying O-Ring

Courtesy of BMW OF NORTH AMERICA, INC.

53 DIFFERENTIAL WITH BEARINGS

31 51 020 REPLACING SHAFT SEAL FOR RIGHT OUTPUT SHAFT

Special tools required:

- 31 5 130

Necessary preliminary tasks:

- Remove right output shaft

Lever shaft seal (1) with a screwdriver (2) out of bearing block (3).

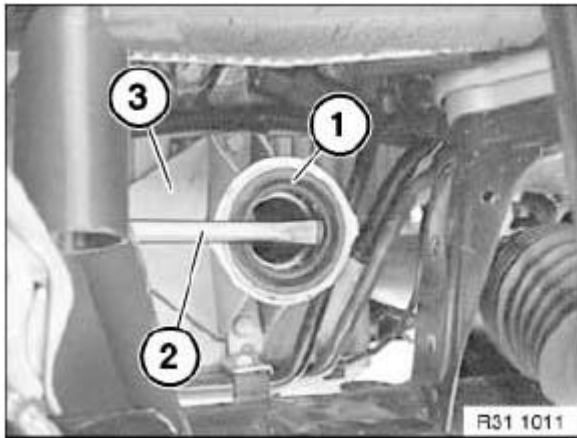


Fig. 95: Identifying Shaft Seal, Screwdriver And Bearing Block
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Protective sleeve (2) serves to protect the sealing lips of shaft seal (1) from being damaged when the output shaft is inserted into the bearing block.

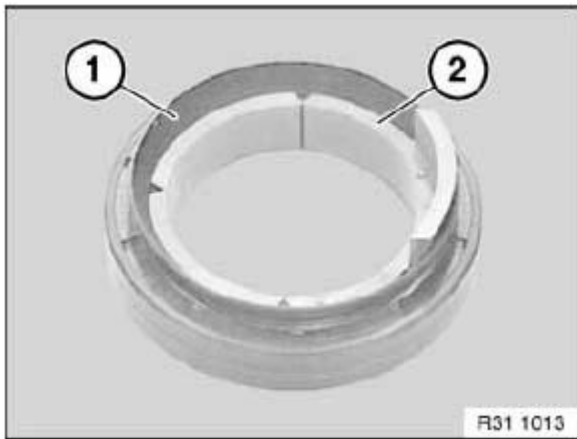


Fig. 96: Identifying Protective Sleeve And Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

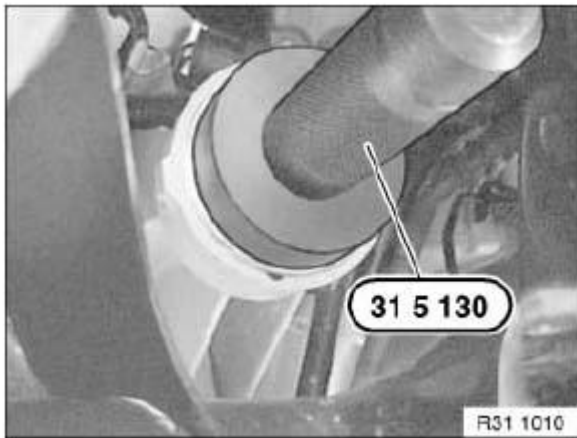


Fig. 97: Identifying Special Tool (31 5 130)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

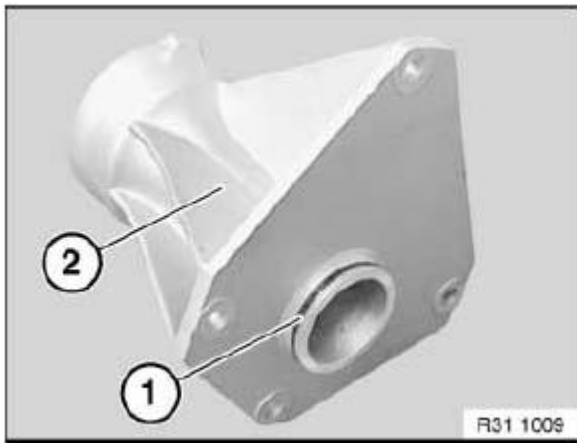


Fig. 98: Identifying O-Ring And Bearing Block
Courtesy of BMW OF NORTH AMERICA, INC.

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

Necessary preliminary tasks:

- Remove **right output shaft**

Release grounding strap on bearing block.

Unfasten screws.

Remove bearing block (1) from oil sump.

Installation:

Replace O-ring

Tightening torque **31 60 1AZ** .

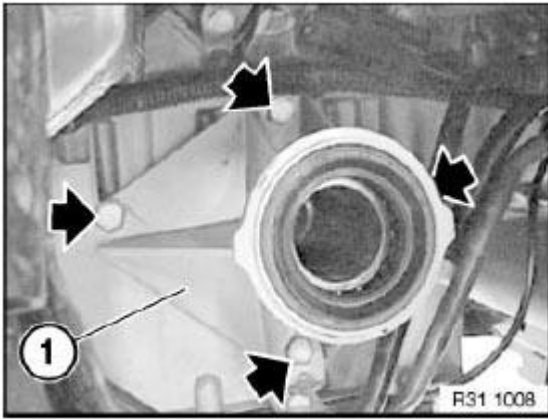


Fig. 99: Locating Bearing Block

Courtesy of BMW OF NORTH AMERICA, INC.

60 OUTPUT SHAFT

31 51 015 REPLACING SHAFT SEAL FOR LEFT OUTPUT SHAFT

Special tools required:

- 31 5 130

Necessary preliminary tasks:

- Remove left output shaft

Lever shaft seal (1) with a screwdriver (2) out of front differential (3).

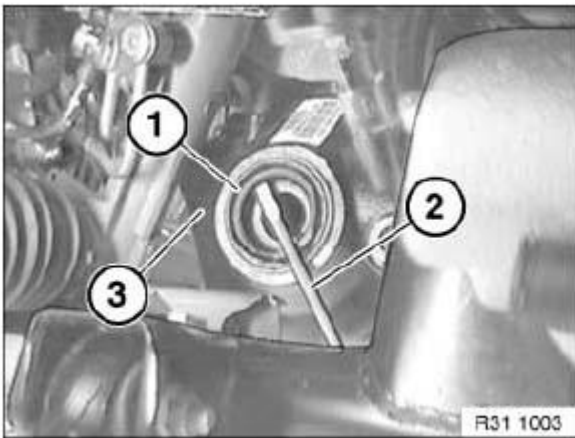


Fig. 100: Identifying Lever Shaft Seal And Screwdriver

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Protective sleeve (2) serves to protect the sealing lips of shaft seal (1) from being damaged when the output shaft is inserted into the front differential.



Fig. 101: Identifying Protective Sleeve And 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.

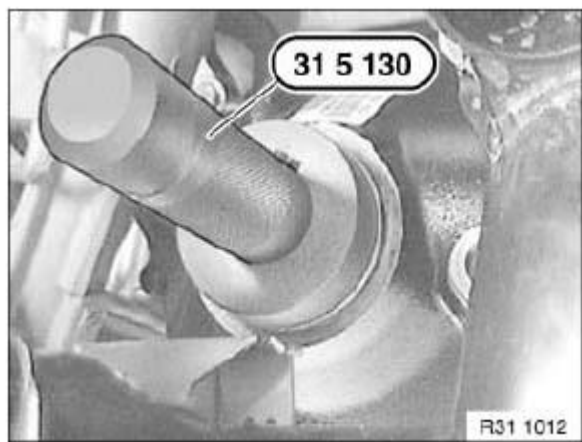


Fig. 102: Identifying Special Tool (31 5 130)
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check front differential oil level, correct if necessary

31 51 020 REPLACING SHAFT SEAL FOR RIGHT OUTPUT SHAFT

Special tools required:

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- 31 5 130

Necessary preliminary tasks:

- Remove **right output shaft**

Lever shaft seal (1) with a screwdriver (2) out of bearing block (3).

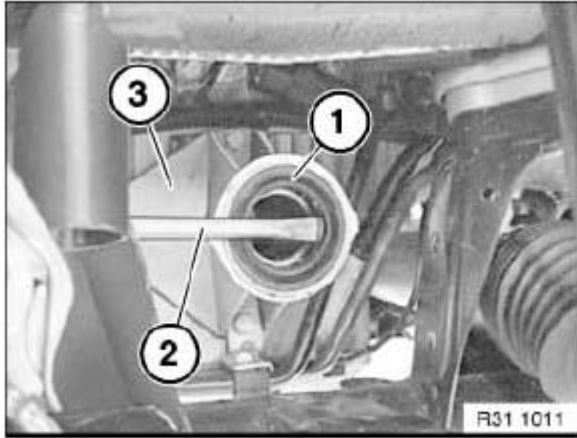


Fig. 103: Identifying Shaft Seal, Screwdriver And Bearing Block

Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Protective sleeve (2) serves to protect the sealing lips of shaft seal (1) from being damaged when the output shaft is inserted into the bearing block.

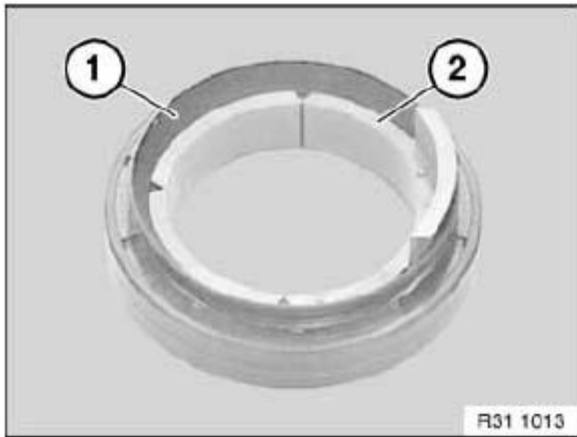


Fig. 104: Identifying Protective Sleeve And Shaft Seal

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

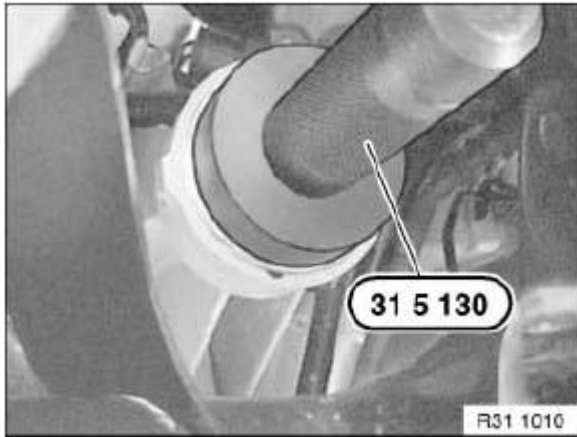


Fig. 105: Identifying Special Tool (31 5 130)

Courtesy of BMW OF NORTH AMERICA, INC.

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. 106: Identifying Low Profile Band Clamp

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).

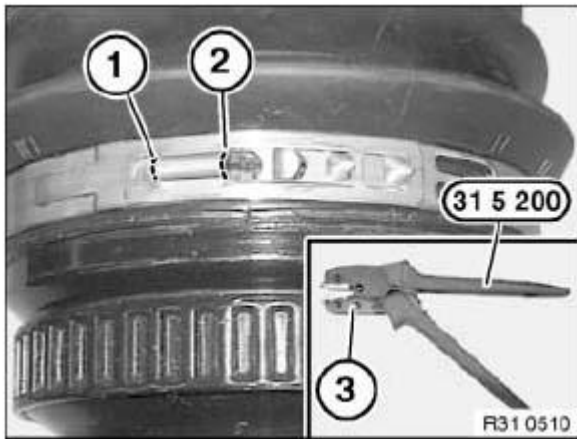


Fig. 107: Identifying Special Tool (31 5 200)

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.

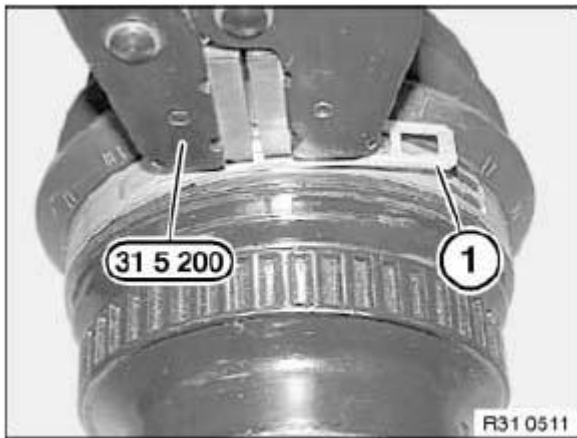


Fig. 108: Identifying Special Tool (31 5 200)

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).

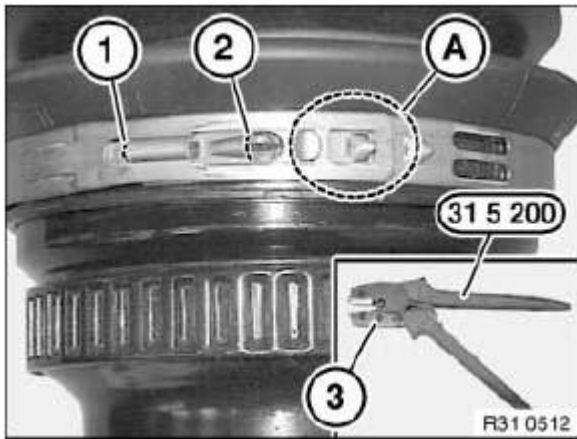


Fig. 109: Identifying Special Tool (31 5 200)

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.

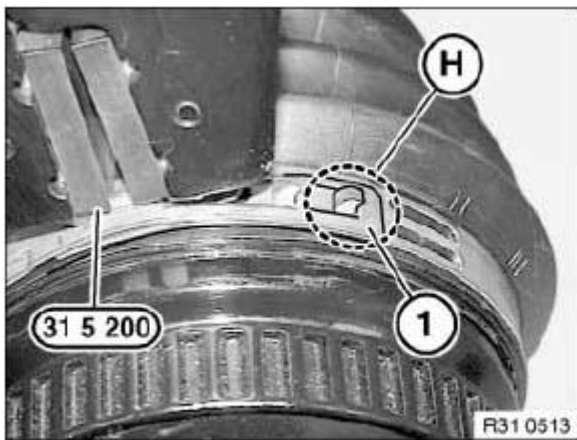


Fig. 110: Identifying Special Tool (31 5 200)

Courtesy of BMW OF NORTH AMERICA, INC.

31 60... PRESS RIGHT OUTPUT SHAFT APPROX. 6 TO 7 CM OUT OF FRONT DIFFERENTIAL

Special tools required:

- 31 5 110

Necessary preliminary tasks:

- Remove tie rod end from swivel bearing
- Remove **tension strut** from guide joint
- Remove **control arm from swivel bearing**

Press output shaft with special tool 31 5 110 out of front differential.

Insert spacer between bearing block and output shaft and secure with adhesive tape.

Installation:

Push output shaft over resistance of snap ring. Output shaft must snap audibly into place.

**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.**

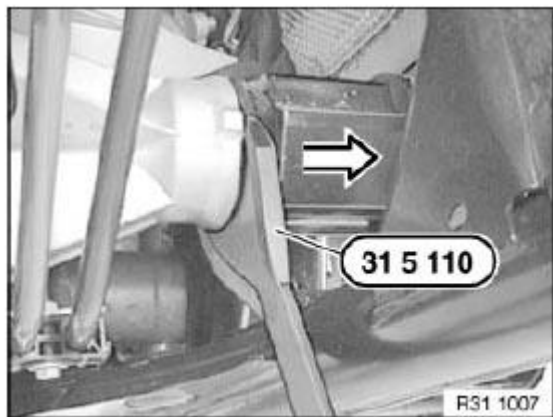


Fig. 111: Identifying Special Tool (31 5 110)

Courtesy of BMW OF NORTH AMERICA, INC.

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

Special tools required:

- 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.

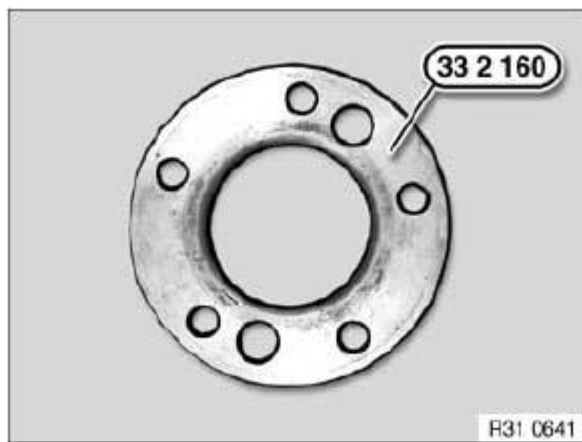


Fig. 112: Identifying Special Tool (33 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

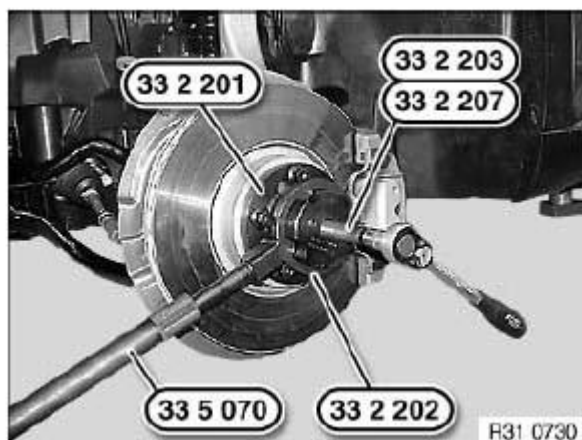


Fig. 113: Identifying Special Tool (33 2 203), (33 2 207) And (33 2 201)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

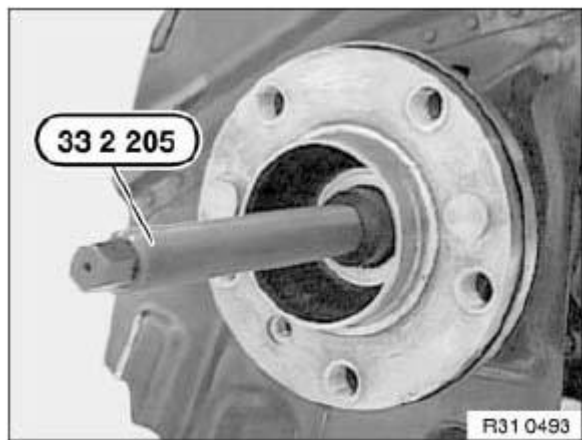


Fig. 114: Identifying Special Tool (33 2 205)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

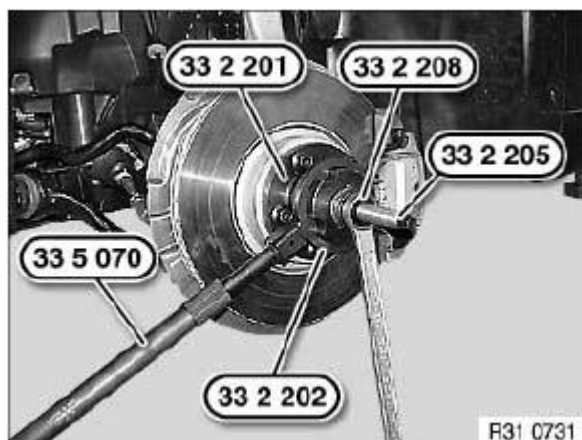


Fig. 115: Identifying Special Tool (33 2 203), (33 2 207) And (33 2 201)
 Courtesy of BMW OF NORTH AMERICA, INC.

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.

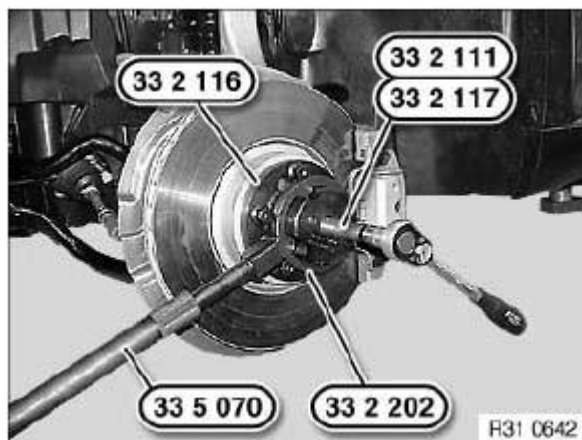


Fig. 116: Identifying Special Tool (33 2 203), (33 2 207) And (33 2 201)
 Courtesy of BMW OF NORTH AMERICA, INC.

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.

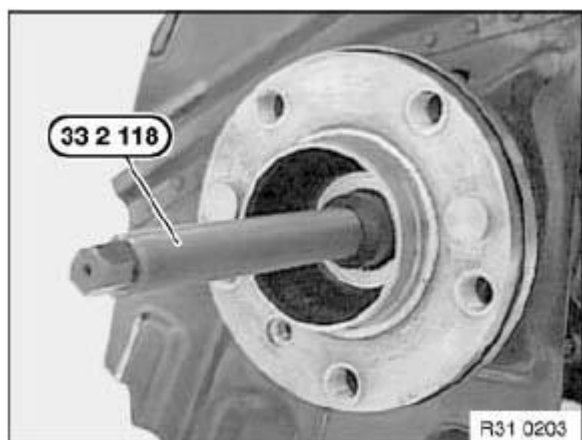


Fig. 117: Identifying Special Tool (33 2 118)

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.

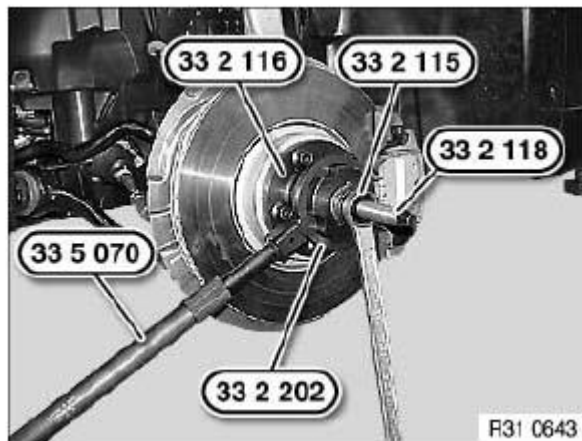


Fig. 118: Identifying Special Tool (33 2 116), (33 2 202) And (33 5 070)

Courtesy of BMW OF NORTH AMERICA, INC.

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

Special tools required:

- 31 5 110

IMPORTANT: Risk of damage!

Do not drive output shaft out of drive flange with an impact tool.

Remove front wheel.

Release collar nut; to do so, press brake pedal to floor.

Installation:

Replace collar nut, apply a light coating of oil to contact surface and tighten down.

Tightening torque **31 21 2AZ** .

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

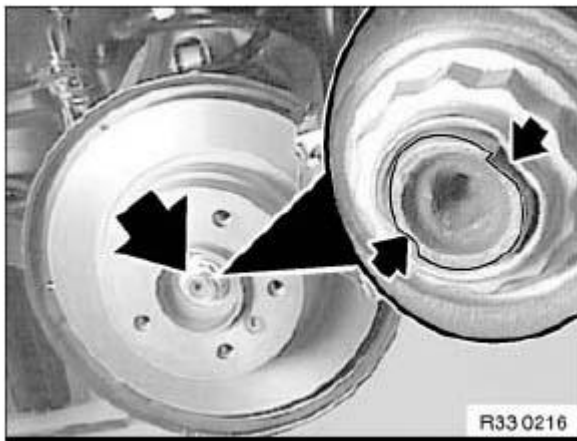


Fig. 119: Locating Collar Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **reinforcement plate**.

Remove steering gear cover at side.

Remove tie rod end from swivel bearing.

Remove **tension strut** from guide joint.

Remove **control arm from swivel bearing**.

Remove **stabilizer** link from spring strut.

Turn swivel bearing to one side.

Press **output shaft** out of drive flange and tie up.

Press output shaft with special tool 31 5 110 out of front differential/bearing block and remove.

Installation:

Replace shaft seal in front differential/bearing block and coat sealing lips with front differential oil.

Replace retaining ring and slide in output shaft over resistance of retaining ring. Output shaft must snap audibly into place.

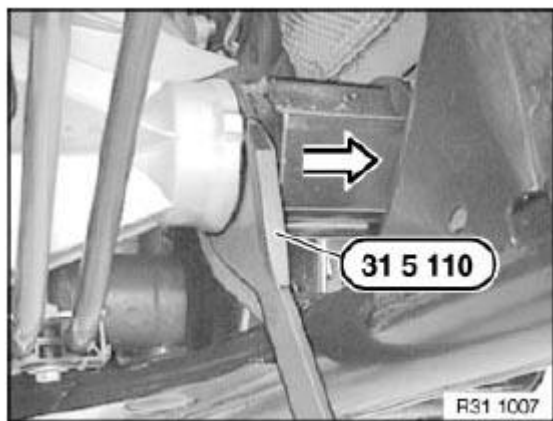


Fig. 120: Identifying Special Tool (31 5 110)

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.

After installation:

- Check front differential oil level, correct if necessary

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

NOTE: Procedure is described in both output shaft gaiters.

31 60 535 REPLACING BOTH GAITERS ON LEFT AND RIGHT OF OUTPUT SHAFT (OUTPUT SHAFT REMOVED)

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

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

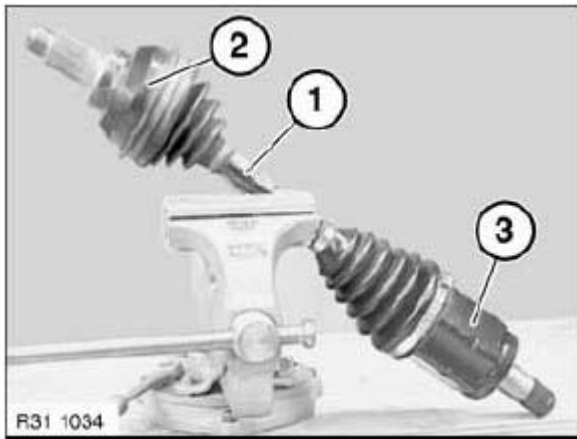


Fig. 121: Identifying Output Shaft And Joint
Courtesy of BMW OF NORTH AMERICA, INC.

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.

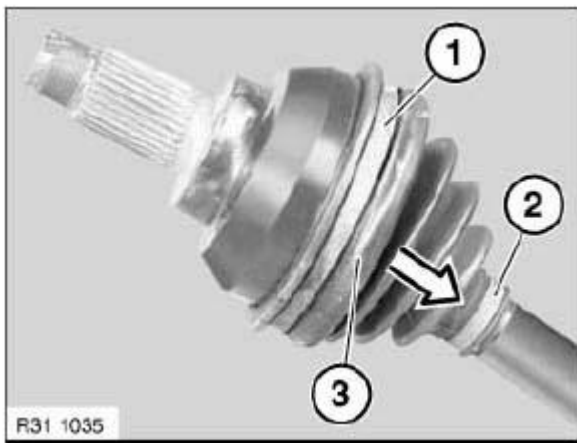


Fig. 122: Identifying Gaiter And Rubber Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

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.

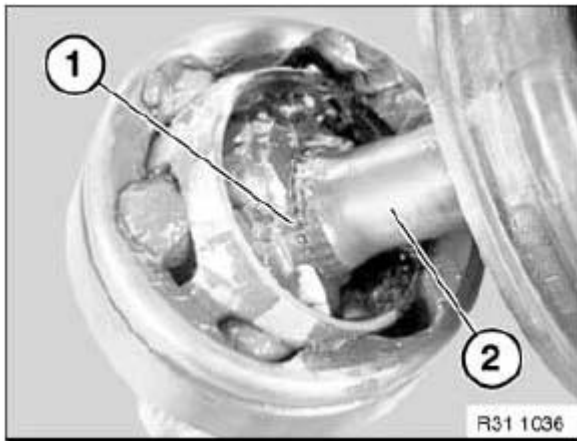


Fig. 123: Identifying Joint And Retaining Ring On Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out retaining ring (1).

Installation:

Replace retaining ring (1).

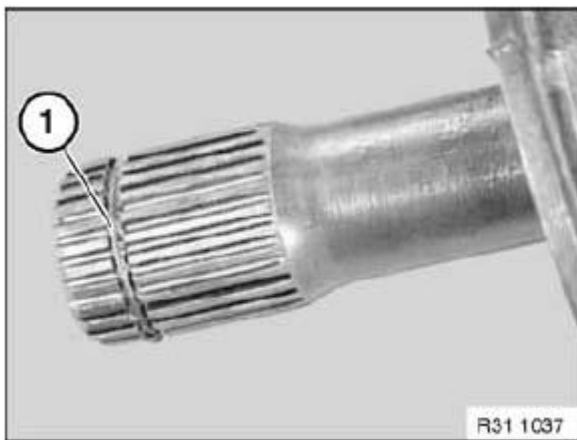


Fig. 124: Identifying Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

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.

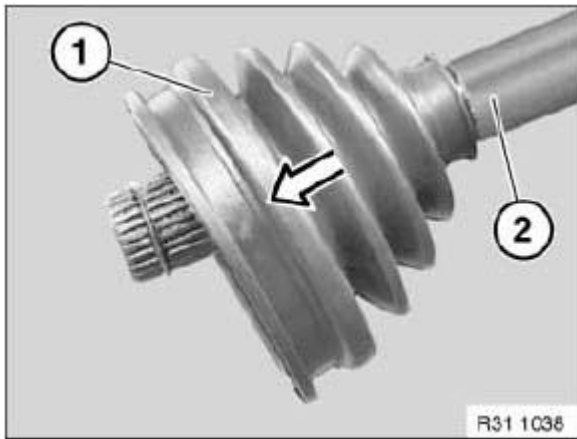


Fig. 125: Identifying Gaiter And Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

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).

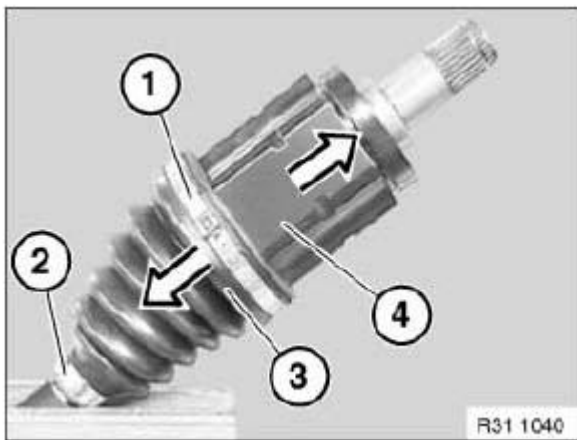


Fig. 126: Identifying Band Clamps, Rubber Gaiter And Element
Courtesy of BMW OF NORTH AMERICA, INC.

Remove retaining ring (1).

Installation:

Replace retaining ring (1).

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

Pull off gaiter over shaft (3).

Carefully clean all parts with a cloth.

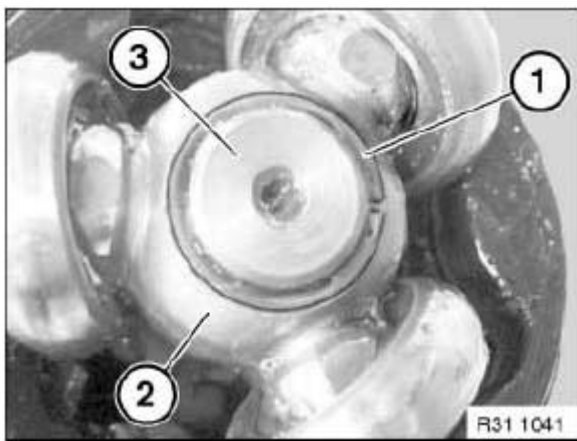


Fig. 127: Identifying Retaining Ring And Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

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.

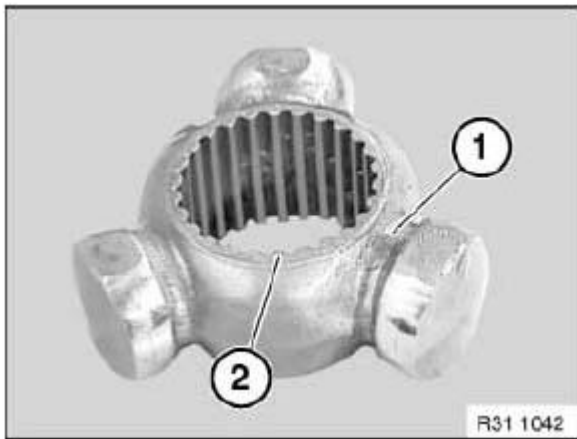


Fig. 128: Identifying Flat Side And Tripod Element
 Courtesy of BMW OF NORTH AMERICA, INC.

90 TROUBLESHOOTING

31 90... TROUBLESHOOTING ON FRONT AXLE (AWD)

Follow troubleshooting for steering/shock absorbers.

TROUBLESHOOTING CHART

Fault	Cause	Remedy
Grinding noise (louder when negotiating bends)	Wheel bearings faulty	Replace wheel bearings
Vibration	Wheel imbalance	Balance wheels
	Radial/lateral rim runout	Check rims, replace if necessary
	Radial tire runout	Match or replace tires
Steering-wheel shake	Wheel imbalance	Balance wheels
	Radial/lateral rim runout	Check rims, replace if necessary
	Rubber mount of control arm faulty	Replace control arms
	Ball joint in control arm worn	Replace control arms
	Rubber mount of tension strut faulty	Replace rubber mounts on both tension struts
	Guide joint worn	Replace guide joint
Excessive steering wheel play/steering wheel inclination	Rubber mount of control arm faulty	Replace control arms
	Ball joint in control arm worn	Replace control arms
	Rubber mount of tension strut faulty	Replace rubber mounts on both tension struts
	Guide joint worn	Replace guide joint
Rattling noise	Bolts for reinforcement plate	Tighten down bolts (refer to

	loose	<u>REMOVING AND INSTALLING/REPLACING REINFORCEMENT PLATE)</u>
	Bolts for front axle carrier to engine carrier loose	Replace bolts (refer to <u>LOWERING FRONT AXLE CARRIER)</u>
	Bolt for spring strut to swivel bearing loose	Replace bolt & nut (refer to <u>REMOVING AND INSTALLING FRONT SPRING STRUT)</u>
	Ball joint in control arm worn	Replace control arms
	Guide joint worn	Replace guide joint
	Rubber mounts for stabilizer bar bracket faulty	Replace both rubber mounts of stabilizer bar bracket
	Ball joints on stabilizer link(s) worn	Replace both stabilizer links
Excessive tire wear	Front or rear axle alignment incorrectly adjusted	Check suspension components for damage; if necessary, carry out chassis/wheel alignment check

31 90... TROUBLESHOOTING SHOCK ABSORBER

Read and comply with Information on replacing shock absorbers.

TROUBLESHOOTING CHART

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