

DRIVELINE/AXLE

Rear Axle - Operating Fluids

1.0 GENERAL INFORMATION ON FINAL DRIVE OIL

Final Drive oil or hypoid gear lubricant must conform with the following requirements because of the high loads which occur on the profiles of the hypoid gear teeth:

- Load carrying capacity.
- Sufficient protection against seizure.
- Good wear protection.
- Optimal friction and temperature behavior.
- Seal compatibility.
- Aging resistance.

These and other properties are already contained in brand-name hypoid gear lubricants because of the high content of EP additives (EP = extreme pressure).

OIL ADDITIVES

The factory has **not approved** oil additives for hypoid gear lubricants.

All final drives are designed in such a manner that they do not require any type of oil additives. Any type of additives is fundamentally rejected by the factory. BMW NA cannot accept any liability for follow-up damage resulting from the use of additives.

2.0 APPROVED FINAL DRIVE OILS FOR FRONT AND REAR AXLE FINAL DRIVES WITH AND WITHOUT LIMITED SLIP OR VISCOUS COUPLING

Mineral based final drive oils are no longer recommended due to the release of synthetic final drive oils for all vehicles with or without limited slip differentials.

Limited Slip Differentials

With the introduction of the Z3 roadster a new synthetic final drive oil for all vehicles with a multi-plate limited-slip differential has been released. The new BMW final drive oil SAF-XJ will replace the old final drive oil SAF-XLS.

The SAF-XLS final drive oil is not to be used in the final drive of the Z3 roadster.

Use only the SAF-XJ in the final drive of the Z3 roadster.

NOTE: If a non-limited slip differential oil is used in a limited slip differential a whining or chattering sound can be heard on very tight turns and will eventually result

in a failure of the differential.

BMW PARTS NUMBER SPECIFICATION

Description	Quantity	Part Number
BMW Synthetic Final Drive Oil (with multi-plate Limited Slip Differential)	55 liter drum (SAF-XJ)	83 22 1 470 080

Motorsport Vehicles:

All E46 M3, E60 M5, E63/E64 M6 and E85 M roadster and M coupe require SAF-XJ Fluid.

Non Limited Slip Differentials

BMW PARTS NUMBER SPECIFICATION

Description	Quantity	Part Number
BMW Synthetic Final Drive Oil (without multi-plate limited slip differential, or with viscous differential lock (325iX/iXA)	55 liter drum (SAF-XO)	83 22 9 407 768

3.0 FINAL DRIVE OIL FOR BMW M1 MOTORSPORT COUPE

The final drive of a BMW M1 is integrated in the manual transmission and oil supply is accomplished with a mutual oil filling.

Use reputable brand SAE 80 manual transmission oil conforming with specifications MIL-L-2105 A or API-GL 4.

4.0 OIL CHANGE INTERVALS

Maintenance requirements per the vehicle's Service Booklet or the respective Service Maintenance Checklist.

Replacement final drives: same as for new vehicles.

All models as of 9/97 production are factory-filled with synthetic rear axle oil having a lifetime service rating. No oil changes are required for the life of the vehicle.

5.0 CARS WITHOUT SERVICE INDICATOR (INCLUDING BMW M1)

First oil change at 600 miles

Further oil changes at 18,000 miles

Special rule for BMW 530i, 528i (E 12):

1st oil change at 600 miles after final drive replacement

2nd oil change at 4,500 miles after final drive replacement

Further oil changes at 9,000 miles intervals, beginning at 9,000 miles.

6.0 CARS WITH SERVICE INDICATOR

BREAK-IN PROCEDURES

Drive the car with changing engine speeds and road speeds during the first 1,200 miles/2,000 km, but never faster than 2/3rds of maximum speed in a selected gear. Avoid using full throttle and kick-down positions of the accelerator pedal during this period.

BMW PARTS NUMBER SPECIFICATION

BMW	Up to 1,200 miles max. engine speed 5500 RPM Generally avoid full-throttle position
M3/M5/M6	of the accelerator.

These break-in procedures are, of course, also applicable to replacement final drives.

7.0 OUTPUT SHAFTS

The joints of output shafts have permanent grease lubrication and require no servicing. The amount of joint grease required after repairing is supplied in the "dust cover repair kit".

8.0 WHEEL BEARINGS

Ball Bearings E24 (Since 5/82), E28, E30, E31, E32 And All Following

Bearing unit is lubricated for its service life, cannot be disassembled and does not require subsequent lubrication.

Grooved Ball Bearings E12, E21, E23, E24 Before 5/82

Grease type: Retinax A (former BMW Part No. 81 22 9 407 710)

CRC Part No. SL 3131

9.0 DIFFERENTIAL HOUSING FINAL DRIVE COVERS AND HOUSING

On 735i/iL, 750iL, M6 and M5 (E28) models, the attaching bolts are to be installed with Hylogrip/Loctite 270 (green) thread sealant (former BMW Part No. 81 22 9 400 086).

BMW PARTS NUMBER SPECIFICATION

Würth	Part No. 8932700
Loctite	

SUSPENSION

Rear 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 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.

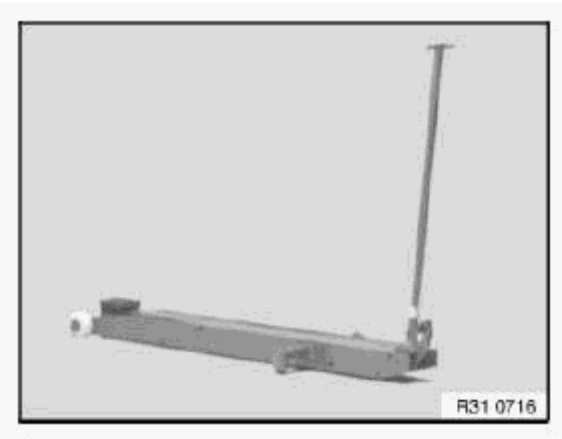


Fig. 1: Identifying Trolley Jack

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!

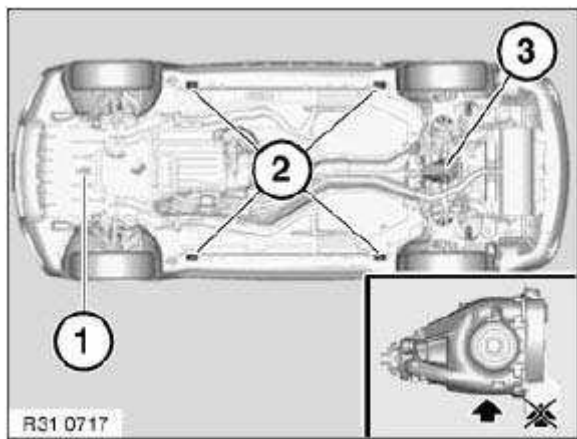
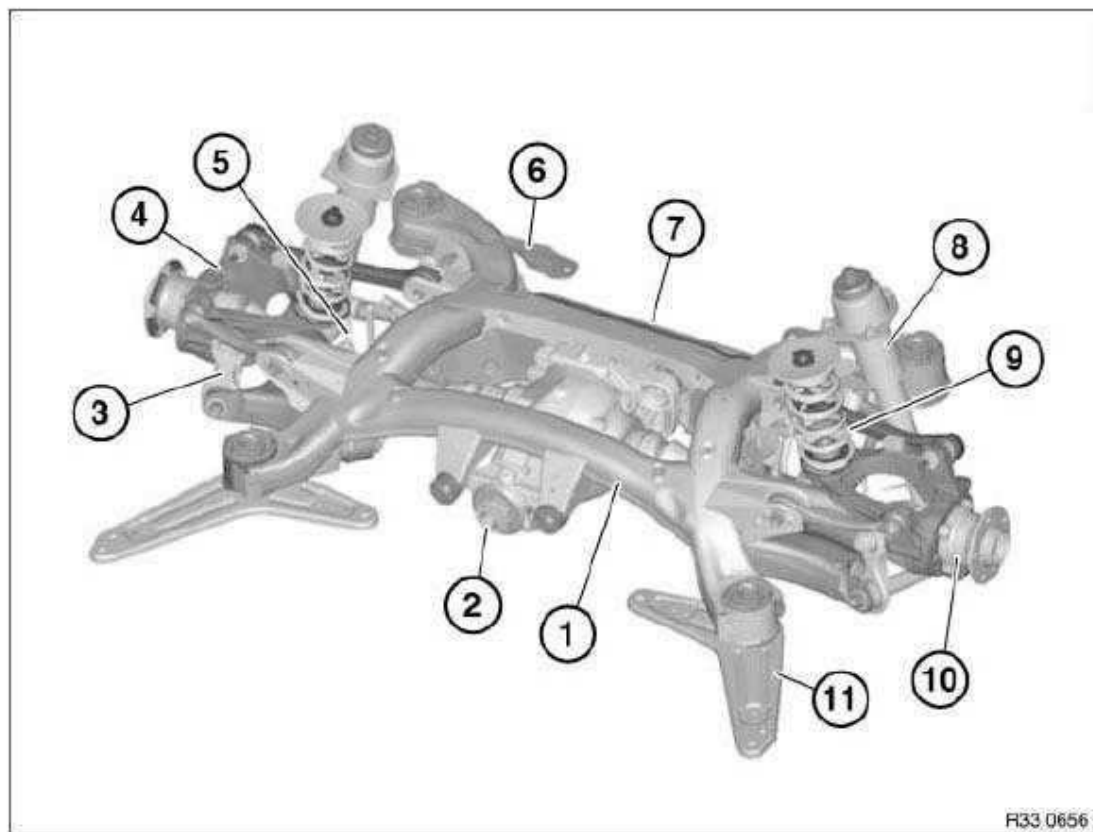


Fig. 2: Identifying Car Jacking Point

Courtesy of BMW OF NORTH AMERICA, INC.

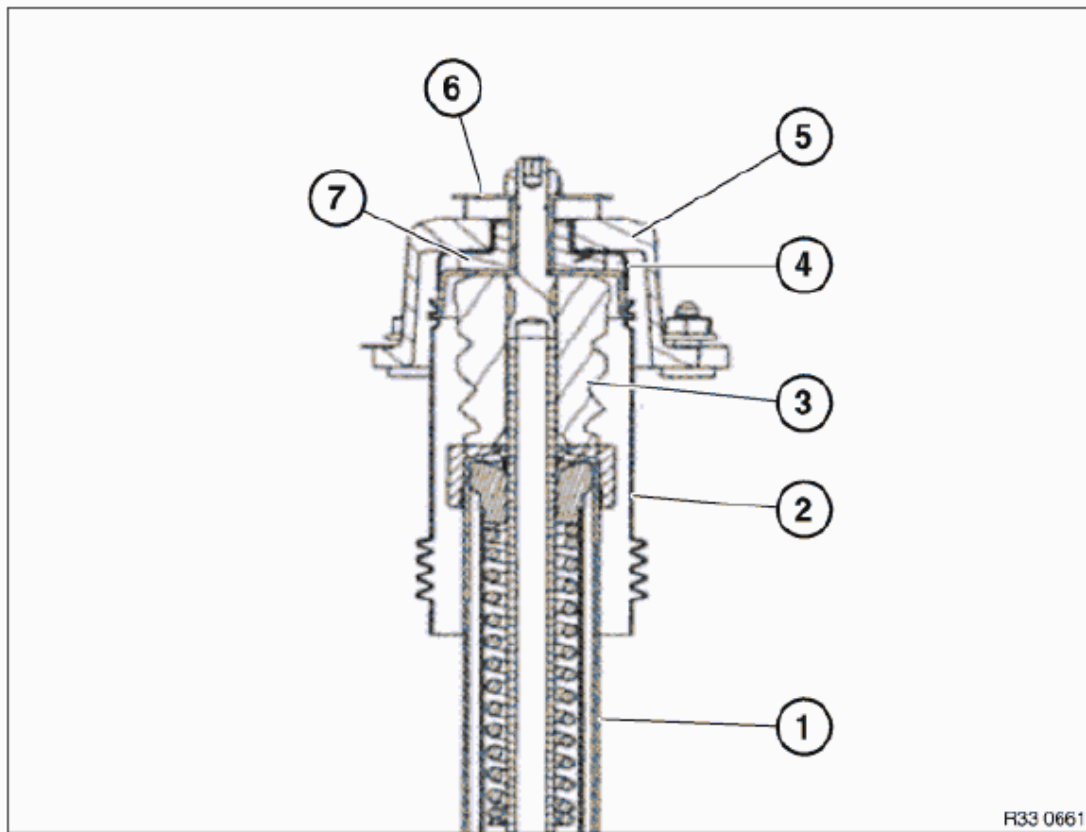
33 REAR AXLE LAYOUT



- | | | | |
|----|--|----|---------------------------------|
| 1 | <u>Overview, rear axle carrier with rubber mount</u> | 11 | <u>Compression strut, front</u> |
| 2 | <u>Overview of rear differential/output shafts</u> | | |
| 3 | <u>Overview of steering links</u> | | |
| 4 | <u>Wheel carrier</u> | | |
| 5 | <u>Stabilizer link</u> | | |
| 6 | <u>Compression strut, rear</u> | | |
| 7 | <u>Stabilizer / rubber mount</u> | | |
| 8 | <u>Shock absorber / support bearing</u> | | |
| 9 | <u>Coil spring</u> | | |
| 10 | <u>Wheel bearing / drive flange</u> | | |

Fig. 3: Layout Of Rear Axle
Courtesy of BMW OF NORTH AMERICA, INC.

33 ... LAYOUT OF SHOCK ABSORBER



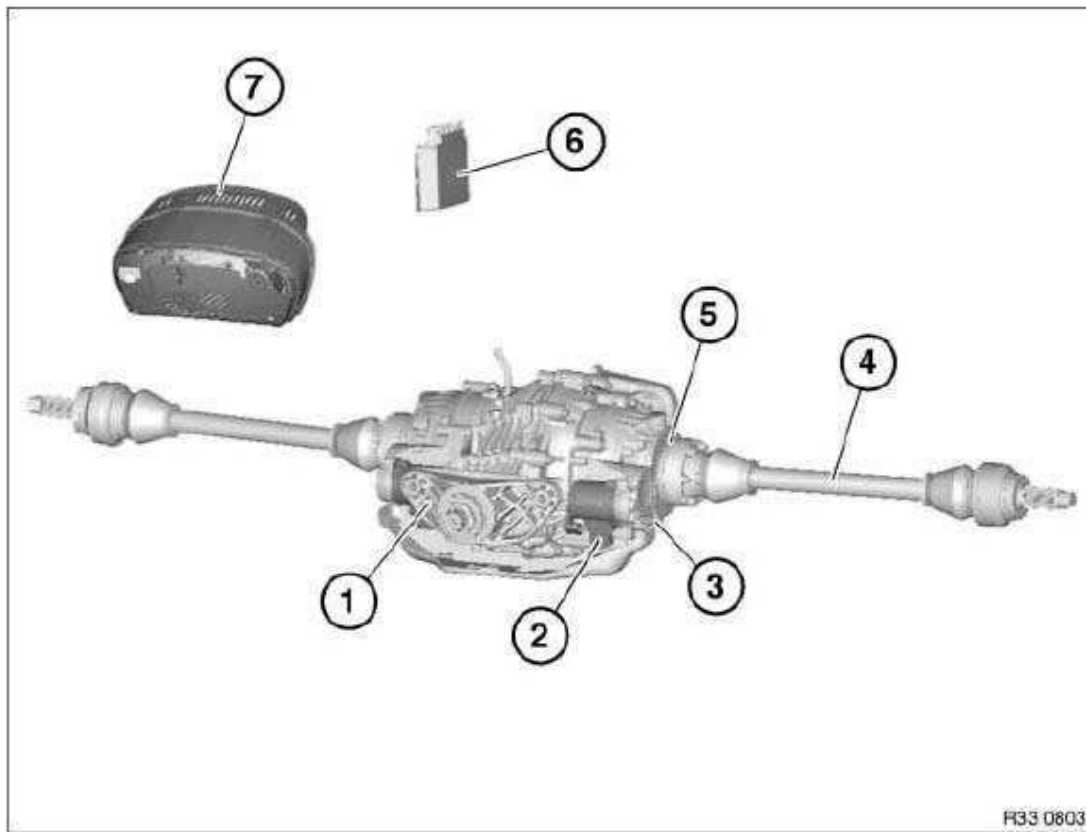
R33 0661

- | | | | |
|---|----------------------------------|---|--------------------------------|
| 1 | Shock absorber | 5 | Support bearing flange |
| 2 | Protective tube | 6 | Joint seat |
| 3 | Auxiliary damper | 7 | Thrust bearing |
| 4 | Support pot | | |

Fig. 4: Layout Of Shock Absorber

Courtesy of BMW OF NORTH AMERICA, INC.

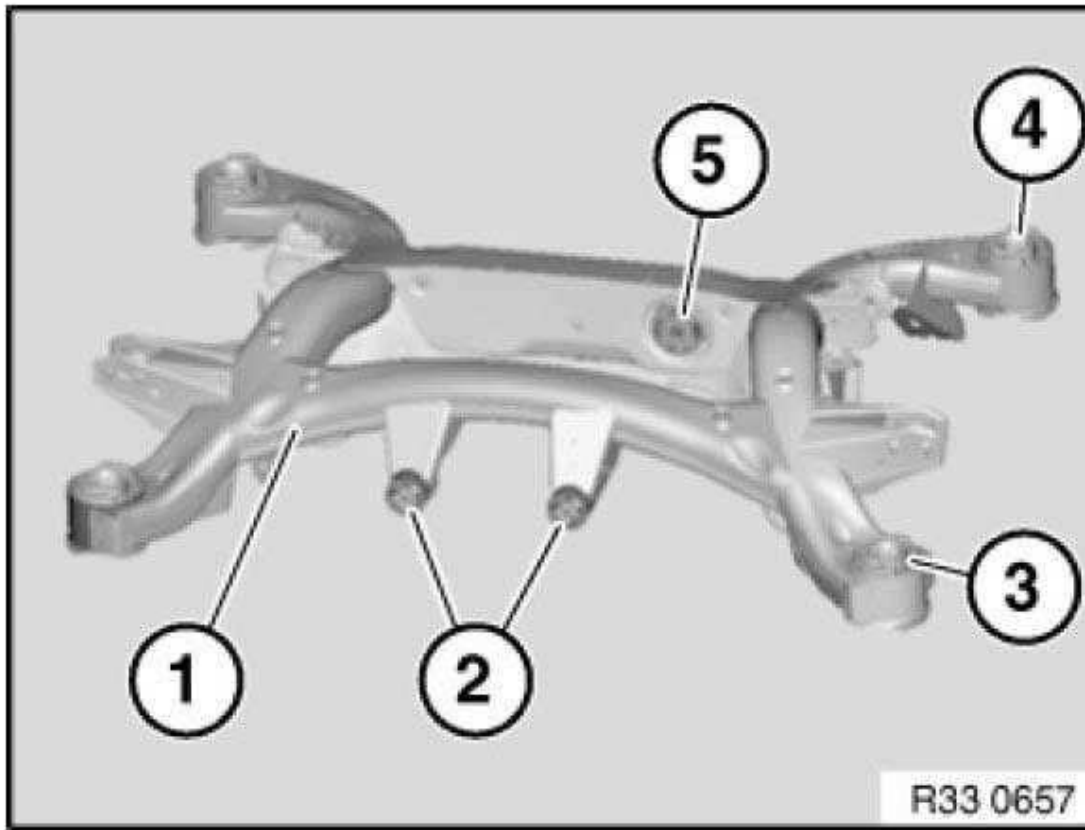
33 ... OVERVIEW OF DYNAMIC PERFORMANCE CONTROL (DPC)



- | | | | |
|---|--|---|---------------------------|
| 1 | <u>Rear differential</u> | 7 | <u>Instrument cluster</u> |
| 2 | <u>Servomotor (left / right)</u> | | |
| 3 | <u>Temperature sensor (left / right)</u> | | |
| 4 | <u>Output shaft / gaier</u> | | |
| 5 | <u>Drive flange / shaft seal</u> | | |
| 6 | <u>Control unit</u> | | |

Fig. 5: Overview Of Dynamic Performance Control (DPC)
 Courtesy of BMW OF NORTH AMERICA, INC.

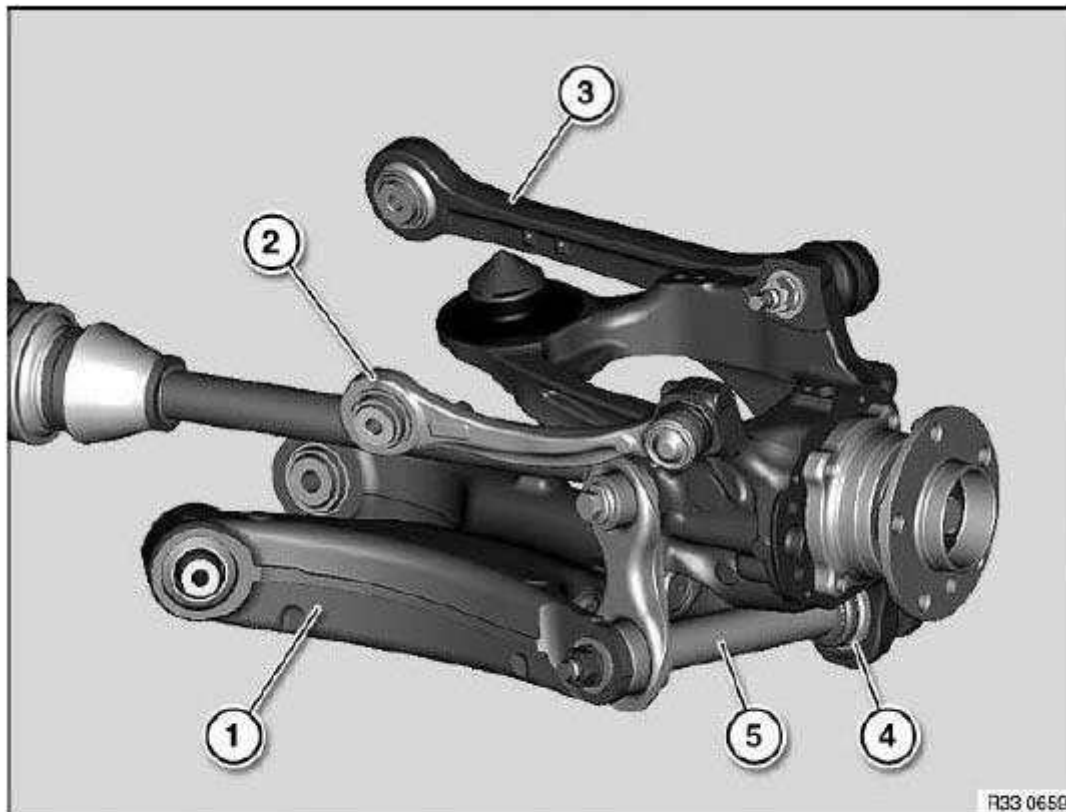
33 ... OVERVIEW OF REAR AXLE CARRIER WITH RUBBER MOUNTS



- | | | | |
|---|---|---|--|
| 1 | <u>Rear axle carrier</u> | 4 | <u>Rear axle carrier rubber mount rear</u> |
| 2 | <u>Rear differential rubber mount front</u> | 5 | <u>Rear differential rubber mount rear</u> |
| 3 | <u>Rear axle carrier rubber mount front</u> | | |

Fig. 6: Overview Of Rear Axle Carrier With Rubber Mounts
Courtesy of BMW OF NORTH AMERICA, INC.

33 ... OVERVIEW OF STEERING LINKS



- 1 Swinging arm
- 2 Traction strut
- 3 Control arm

- 4 Ball joint
- 5 Integral link

Fig. 7: Overview Of Steering Links

Courtesy of BMW OF NORTH AMERICA, INC.

33 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.

E32, E34, E38, E39: In the case of rear spring struts with ride-height control, there is always a slight oil spillage on the piston rod. These spring struts are permitted to be wet with oil over a maximum of half the shock absorber length on the outer tube, i.e. they are permitted to "sweat".

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.

33 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

33 00 ... NOTES ON REPAIRING THREADS

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

NOTE: Damaged threads in the frame side member may be repaired with Helicoil thread inserts. Comply with the PROCEDURE described in the example.



Fig. 8: Identifying Helicoil Thread Damage Area
 Courtesy of BMW OF NORTH AMERICA, INC.

33 00 ... REAR AXLE: WHEEL/CHASSIS ALIGNMENT CHECK MUST BE CARRIED OUT AFTER THE FOLLOWING WORK

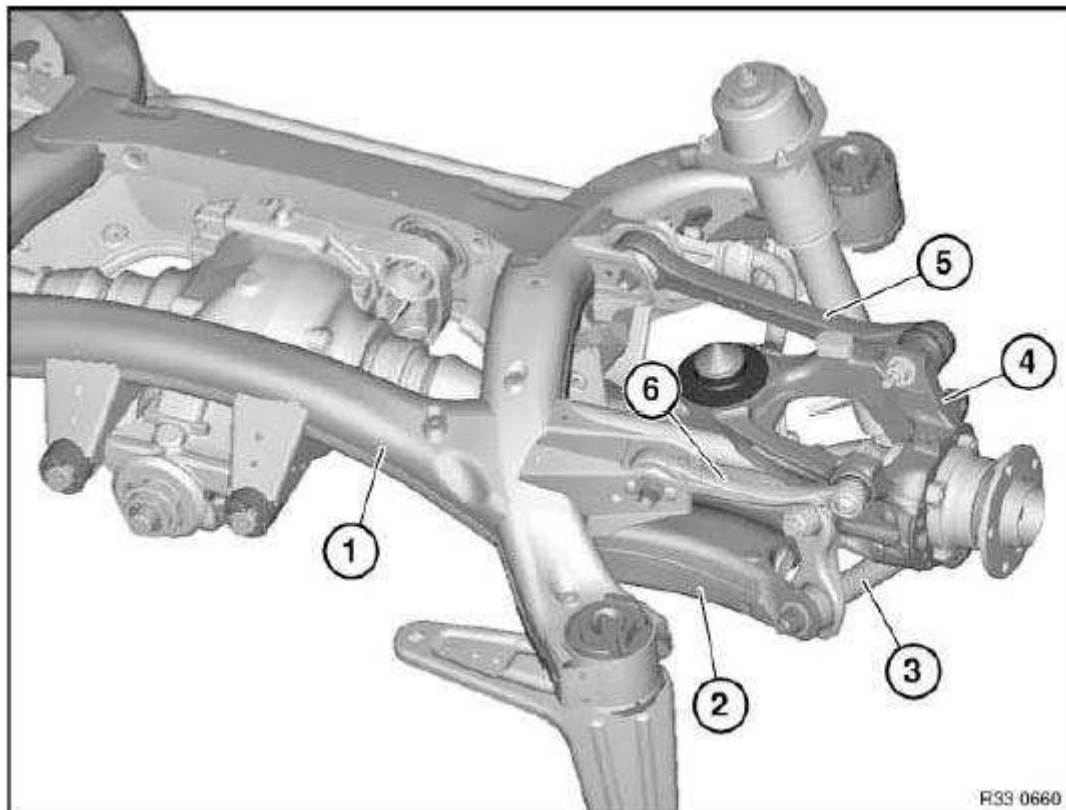


Fig. 9: Identifying Rear Axle And Wheel/Chassis Components
 Courtesy of BMW OF NORTH AMERICA, INC.

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:
 - Swinging arm, front/rear, to rear axle carrier
 - Swinging arm to integral link/wheel carrier
 - Integral link to wheel carrier
 - Guide arm to rear axle carrier
 - Control arm to rear axle carrier
- Replacement of following parts:
 1. Rear axle carrier
 2. Swinging arm
 3. Integral link
 4. Wheel carrier/ball joint
 5. Control arm
 6. Guide arm

FINAL DRIVE

00 11 ... CHECKING/TOPPING UP OIL LEVEL IN REAR DIFFERENTIAL (DYNAMIC PERFORMANCE CONTROL)

NOTE: The rear differential has three oil chambers. The outer chambers (1, 3) contain the oil "SAF carbon mod", but with different filling capacities. The middle chamber (2) contains the "SAF XO Burmah Castrol" oil (refer to REAR AXLE - OPERATING FLUIDS). The oils will mix if the rear differential is subject to a change in position in excess of 45°.

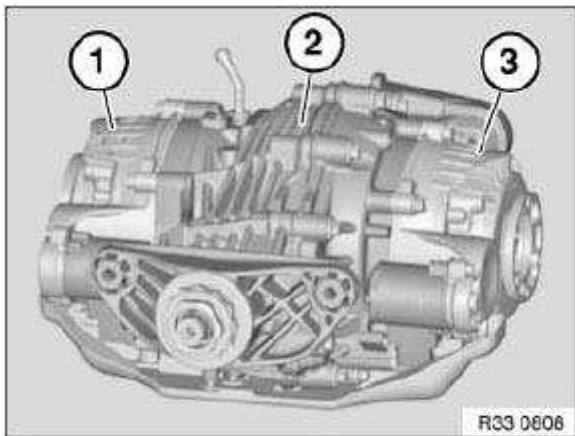


Fig. 10: Identifying Outer And Middle Chambers

Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of burning if exhaust system is touched!

DANGER OF POISONING if oil is ingested/absorbed through the skin!

RISK OF INJURY if oil comes into contact with eyes and skin!

Open oil filler plugs (1).

Check oil level in outer chambers; if necessary, top up "SAF carbon mod" up to lower edge of opening for oil filler plug (1).

Undo oil filler plug (2).

Check oil level in middle chamber; if necessary, top up "SAF XO Burmah Castrol" up to lower edge of opening for oil filler plug (2).

Replace oil filler plugs (1, 2).

Tightening torque **33 11 3AZ** .

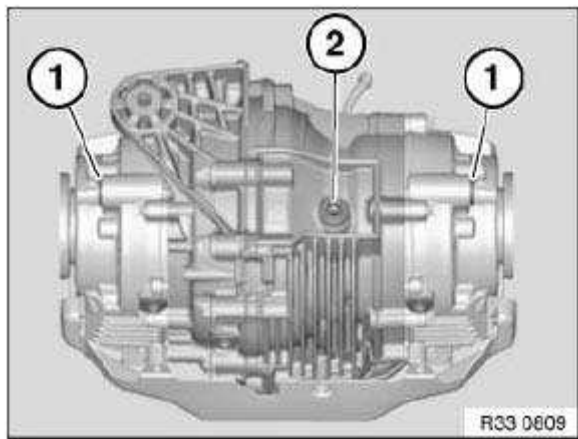


Fig. 11: Identifying Oil Filler Plugs

Courtesy of BMW OF NORTH AMERICA, INC.

33 10 ... REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT SERVOMOTOR

WARNING: Scalding hazard!

This work may only be carried out on an exhaust system which has cooled down.

IMPORTANT: Remove servomotor only after being prompted to do so by diagnosis system.

Necessary preliminary tasks:

- Replacement only: Start **INITIAL OPERATION** and follow instructions on screen

Release screws (1) and remove heat shield (2).

Installation:

Clean thread to remove all remnants of screw securing adhesive.

Make sure wiring harness (3) is correctly seated on rear differential.

Stick in new screws.

Tightening torque **33 11 4AZ** .

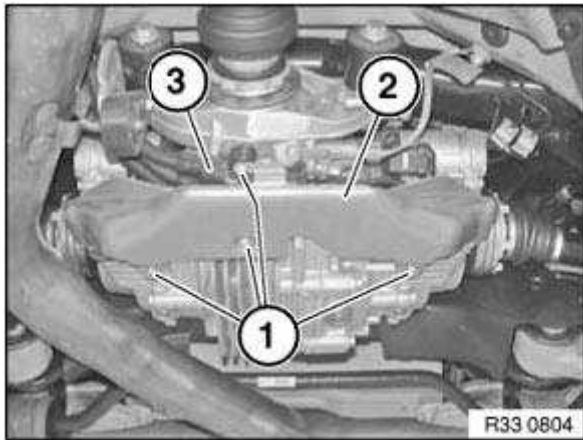


Fig. 12: Identifying Heat Shield Screws With Wiring Harness
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Release screws (2) and remove servomotor (3).

Installation:

Tightening torque **33 11 5AZ** .

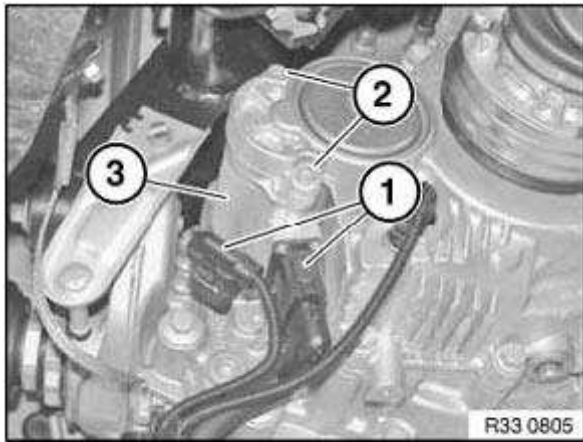


Fig. 13: Identifying Plug Connection, Servomotor With Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: During replacement, only the correct servomotor (left/right) may be fitted!

Installation:

Replace O-ring (1).



Fig. 14: Identifying O-Ring
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Correct **OIL LEVEL**
- Replacement only: Continue **INITIAL OPERATION**

**33 10 010/ 33 10 016 / 17 REMOVING AND INSTALLING/REPLACING REAR DIFFERENTIAL
 (DYNAMIC PERFORMANCE CONTROL)**

Special tools required:

- 23 4 050
- 24 4 050
- 33 0 110
- 33 5 206

WARNING: Risk of injury!

Rear differential must be lashed with tightening strap **33 5 206** to prevent it falling out during removal.

Necessary preliminary tasks:

- Remove exhaust system.
- Remove propeller shaft on rear differential.

Release screws (1) from output shaft (2).

Installation:

- Screws (1) and washers must be replaced!

Tightening torque **33 21 1AZ** .

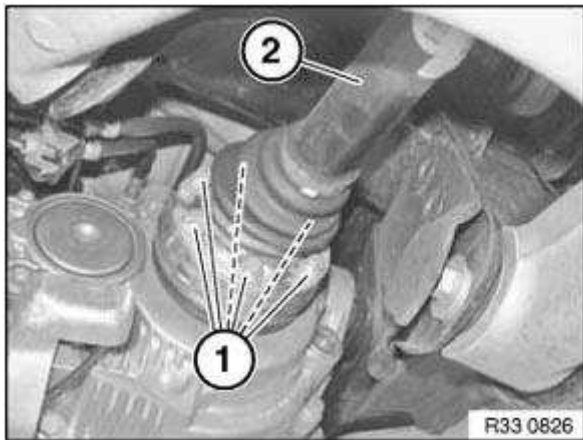


Fig. 15: Identifying Output Shaft Screws

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Output shafts must not under any circumstances rest on swinging arms.

Tape off output shafts or place a cloth on swinging arm.

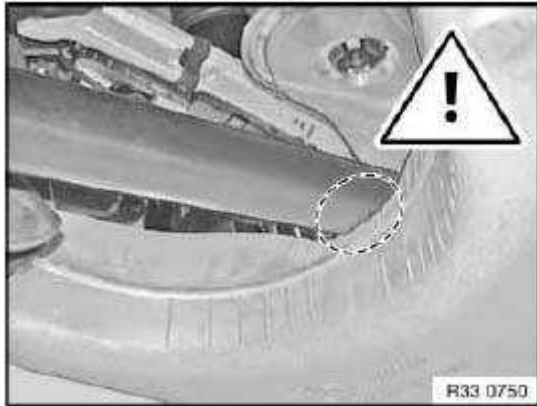


Fig. 16: Identifying Output Shaft Damage Area
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove heat shield (2).

Installation:

Clean screw threads to remove all remnants of screw securing adhesive.

Check threads on rear differential for damage and, if necessary, repair with **HELICOIL THREAD INSERTS**.

Make sure wiring harness (3) is correctly seated on rear differential.

Stick in new screws.

Tightening torque **33 11 4AZ** .

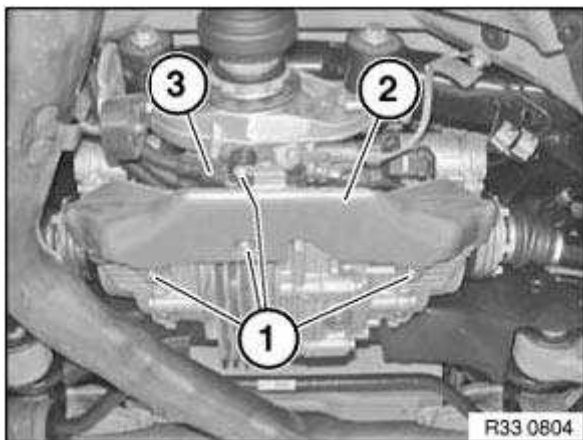


Fig. 17: Identifying Heat Shield Screws With Wiring Harness
Courtesy of BMW OF NORTH AMERICA, INC.

Position special tool **33 0 110** in conjunction with **23 4 050** on workshop lifter (1).

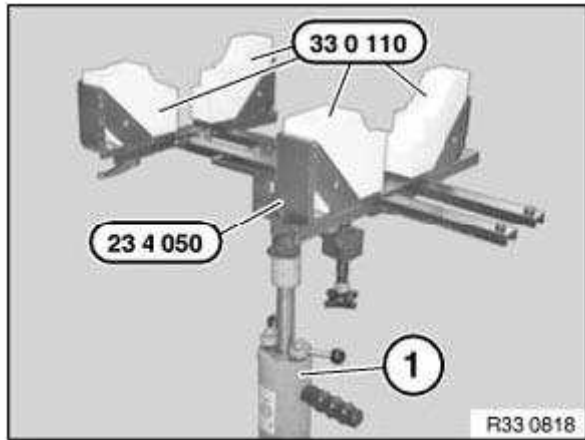


Fig. 18: Positioning Special Tool (33 0 110 And 23 4 050) On Workshop Lifter
Courtesy of BMW OF NORTH AMERICA, INC.

Support rear differential with prepared special tool **24 4 050**.

Lash rear differential with tightening strap **33 5 206**.



Fig. 19: Identifying Special Tool (33 5 206)
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connections (1) on rear differential.

Unfasten ground strap (2).

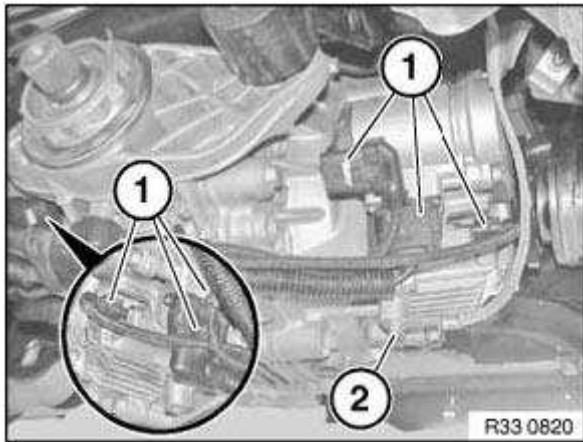


Fig. 20: Disconnecting Plug Connections On Rear Differential
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

To prevent the rubber mounts from overstretching when the bolts are pulled out, ensure the bolts remain in the rubber mounts.

Release screw (1).

Tightening torque 33 17 1AZ .

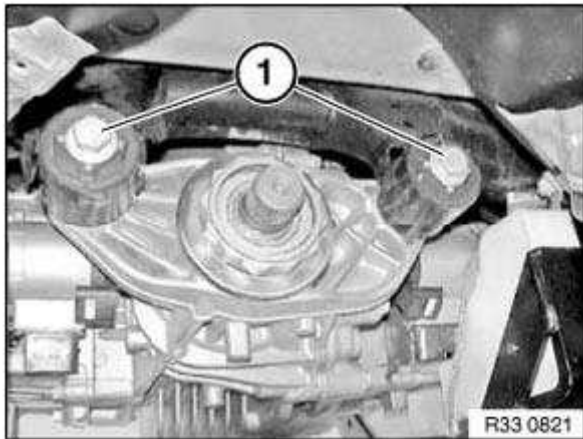


Fig. 21: Identifying Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Adhere to the installation sequence at the end of the document in order to prevent distortion of the rear differential during installation and thereby avoid potential complaints about noise.

Release rear bolt (1).

Tightening torque **33 17 2AZ** .

Slowly lower rear differential using workshop lifter.

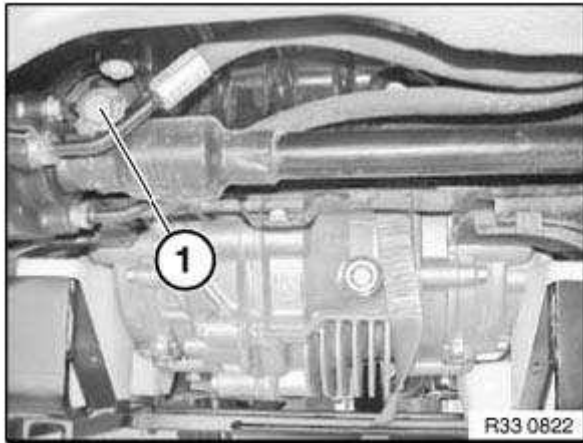


Fig. 22: Identifying Rear Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Inclination when the rear differential is being removed and installed must not exceed 45°!

(Oils may mix via the common ventilation!)

NOTE: Take rear differential down from special tool with assistance of a 2nd person and set down on a suitable surface.

Installation sequence

1. Install rear differential with workshop lifter and special tool **24 4 050** in rear axle carrier
2. Insert bolts (1) (do not tighten down)
3. Insert bolt (2) from rear (do not tighten down)
4. Release tightening strap, lower special tool **24 4 050** and move away
5. Tighten down screws (1)

Tightening torque **33 17 1AZ** .

6. Tighten down screw (2)

Tightening torque **33 17 2AZ** .

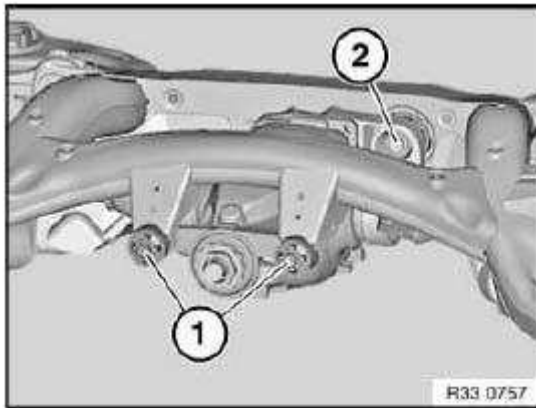


Fig. 23: Identifying Rear Axle Carrier Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Check rear differential oil level, correct if necessary. See **00 11 ... CHECKING/TOPPING UP OIL LEVEL IN REAR DIFFERENTIAL (DYNAMIC PERFORMANCE CONTROL)** and **00 11 259 CHANGING OIL IN REAR DIFFERENTIAL (DYNAMIC PERFORMANCE CONTROL) AND DISPOSING OF USED OIL** .

33 10 021 REPLACING OUTPUT SHAFT SEAL IN REAR DIFFERENTIAL

Special tools required:

- 13 5 251
- 13 5 253
- **33 0 130**

IMPORTANT: The shaft seal is replaced only in conjunction with the **DRIVE FLANGE** and circlip!

Necessary preliminary tasks:

- Remove **REAR DIFFERENTIAL**

Drive out drive flange (1) with special tools 13 5 251 and 13 5 253.

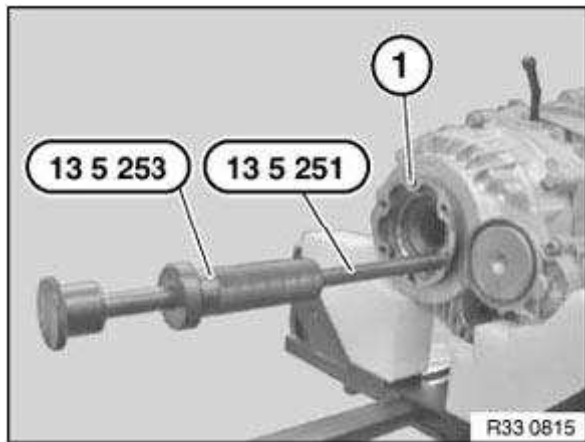


Fig. 24: Removing Drive Flange With Special Tools (13 5 251 And 13 5 253)
 Courtesy of BMW OF NORTH AMERICA, INC.

Lever shaft seal (1) with a suitable fork wrench (2) in direction of arrow out of rear differential.

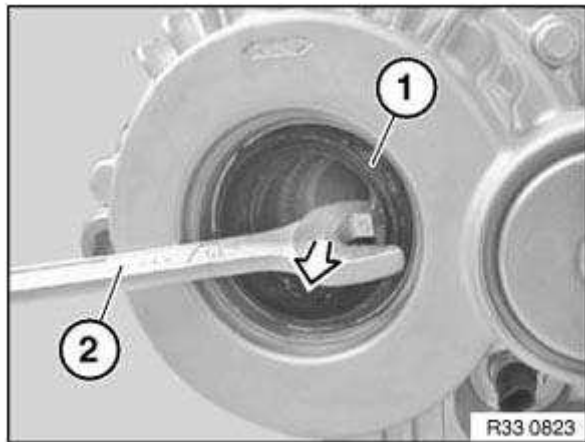


Fig. 25: Levering Shaft Seal With Suitable Fork Wrench
 Courtesy of BMW OF NORTH AMERICA, INC.

Installing new shaft seal

IMPORTANT: Circlip (1) must always be replaced.

Install circlip (1) in sun gear in such a way that opening (2) is positioned at 6 o'clock.

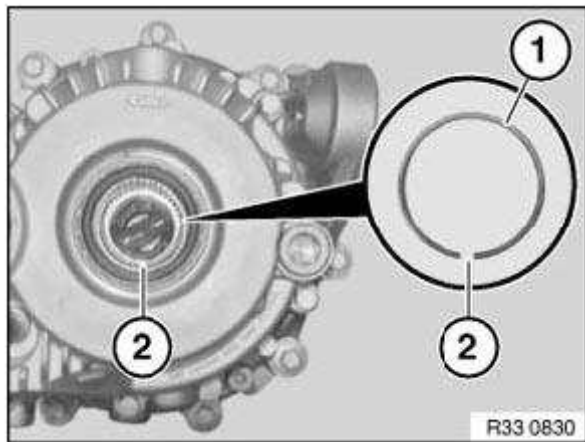


Fig. 26: Identifying Circlip
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Protector (1) serves to protect the sealing lips on shaft seal (2) when the drive flange is being installed!

Coat inner surface of protector (3) with provided grease only.

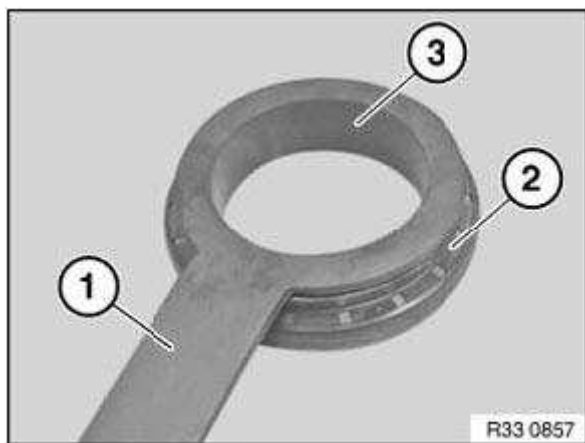


Fig. 27: Identifying Protector Inner Surface With Shaft Seal
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Protector must not slip out of shaft seal!

Drive in shaft seal with special tool **33 0 130** as far as it will go.

Do not remove protector (1).

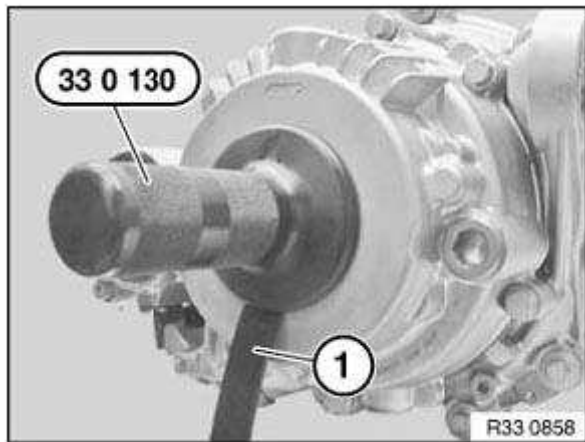


Fig. 28: Identifying Protector With Special Tool (33 0 130)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean shaft seal races on drive flange thoroughly.

Insert drive flange (1) to measurement A = 4.5 cm into rear differential (spline teeth on drive flange not visible).

Pull out protector at tongue (2).

Push drive flange (1) into rear differential as far as it will go and turn. Press in drive flange (1) further until circlip can be heard and felt to snap into place.

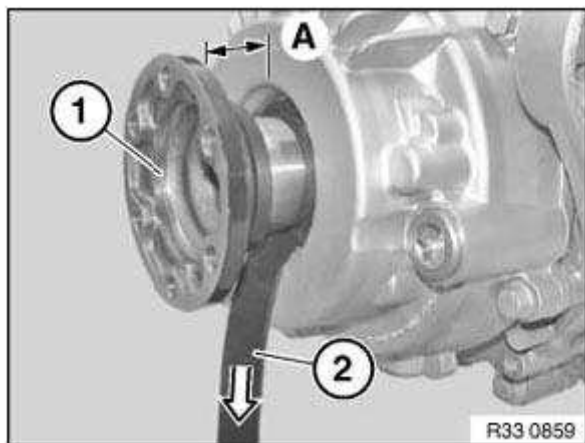


Fig. 29: Pushing Drive Flange Into Rear Differential
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The inner design of the differential causes a small, axial play of the drive flange - this play does not imply any damage.

IMPORTANT: High installation forces indicate that the spline teeth on the drive flange/differential bevel gear are damaged/deformed!

Check spline teeth, replaced damaged parts.

After installation

- Check REAR DIFFERENTIAL OIL LEVEL, correct if necessary

33 10 160 REPLACING LEFT OR RIGHT TEMPERATURE SENSOR

WARNING: Scalding hazard!

This work may only be carried out on an exhaust system which has cooled down.

Release screws (1) and remove heat shield (2).

Installation:

Clean thread to remove all remnants of screw securing adhesive.

Make sure wiring harness (3) is correctly seated on rear differential.

Stick in new screws.

Tightening torque 33 11 4AZ .

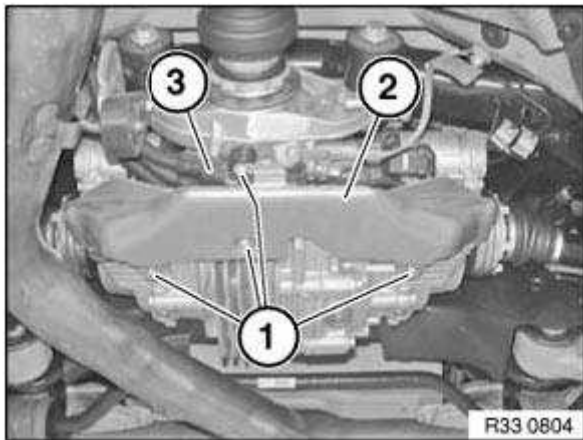


Fig. 30: Identifying Heat Shield Screws With Wiring Harness
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Have new part ready to avoid unnecessary escape of differential oil.

Disconnect plug connection (1) and release temperature sensor (3) on housing (2).

Installation:

Clean rear differential.

Tightening torque **33 11 6AZ** .

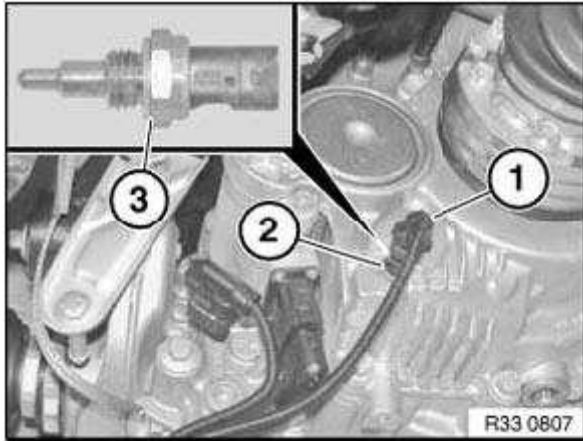


Fig. 31: Disconnecting Plug Connection And Release Temperature Sensor On Housing
Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Check **OIL LEVEL**, topping up if necessary

**33 111400 REMOVING AND INSTALLING/REPLACING VENT LINE ON REAR DIFFERENTIAL
(DYNAMIC PERFORMANCE CONTROL)**

Special tools required:

- 24 4 050
- 33 0 110
- 33 5 206

WARNING: Scalding hazard!

This work may only be carried out on an exhaust system which has cooled down.

Necessary preliminary tasks:

- Remove exhaust system. See **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM (N54)** or **18 00 020 REMOVING AND INSTALLING COMPLETE EXHAUST SYSTEM**

(N63) .

NOTE:

- To remove the vent line, do not remove the rear differential entirely.

Position special tool 33 0 110 in conjunction with 24 4 050 on workshop lifter (1).

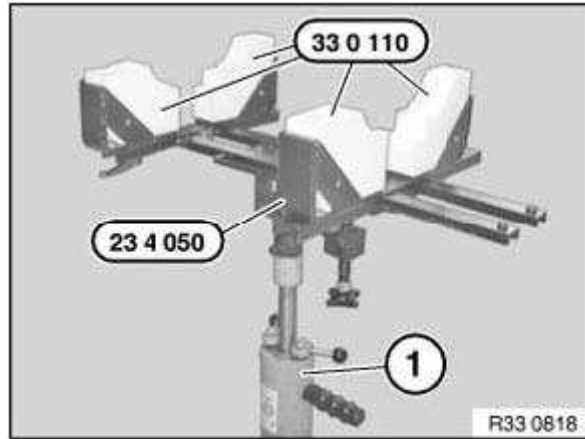


Fig. 32: Positioning Special Tool (33 0 110 And 24 4 050) On Workshop Lifter
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE:

For clearer illustration, shown with propeller shaft removed.

Support rear differential with prepared special tool 24 4 050.

Lash rear differential with tightening strap 33 5 206.



Fig. 33: Identifying Special Tool (33 5 206)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE:

For clearer illustration, shown with propeller shaft removed.

IMPORTANT: Risk of damage!

To prevent the rubber mounts from overstretching when the bolts are pulled out, ensure the bolts remains in the rubber mounts.

Release screw (1).

Tightening torque **33 17 1AZ** .

Installation:

Adhere to the installation sequence at the end of the document in order to prevent distortion of the rear differential during installation and thereby avoid potential complaints about noise.

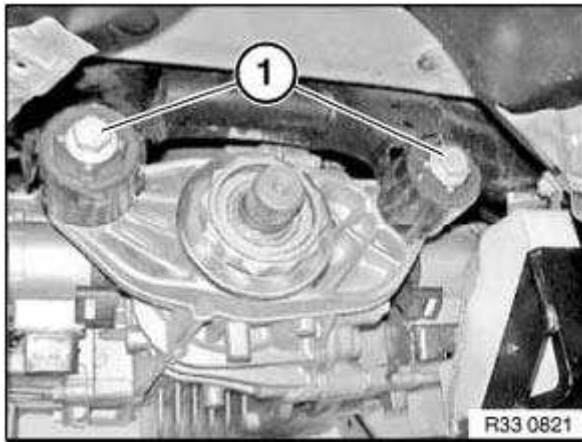


Fig. 34: Identifying Screw

Courtesy of BMW OF NORTH AMERICA, INC.

Release rear bolt (1).

Tightening torque **33 17 2AZ** .

Slowly lower rear differential using workshop lifter.

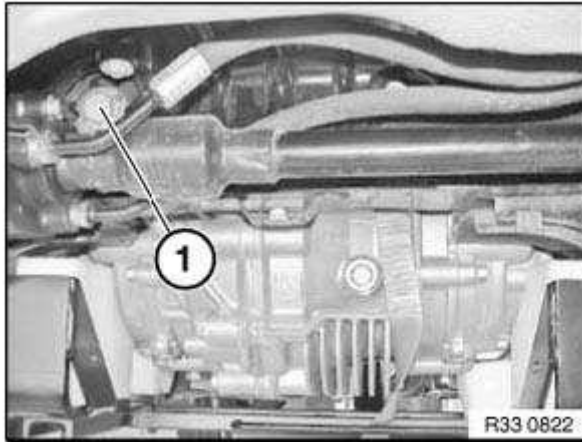


Fig. 35: Identifying Rear Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Remove vent line (1) in direction of arrow.

Installation:

Check sealing ring of vent line (1) for damage and replace if necessary.

When installing vent line (1), make sure markings (2) and (3) line up.

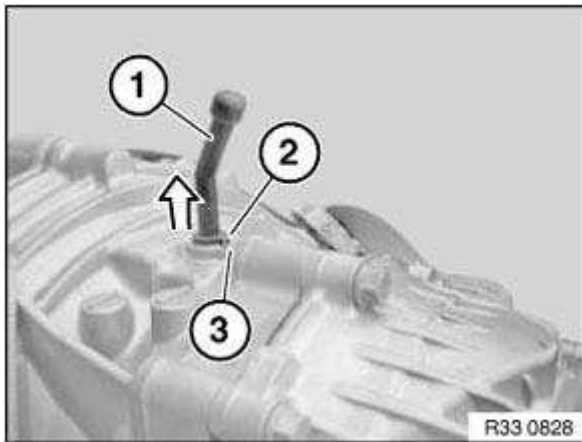


Fig. 36: Removing Vent Line
Courtesy of BMW OF NORTH AMERICA, INC.

Installation sequence

1. Install rear differential with workshop lifter and special tool **24 4 050** in rear axle carrier
2. Insert bolts (1) (do not tighten down)
3. Insert bolt (2) from rear (do not tighten down)
4. Release tightening strap, lower special tool **24 4 050** and move away

5. Tighten down screws (1)

Tightening torque **33 17 1AZ** .

6. Tighten down screw (2)

Tightening torque **33 17 2AZ** .

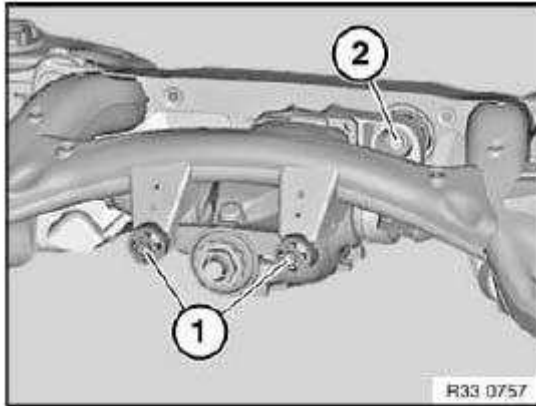


Fig. 37: Identifying Rear Axle Carrier Screw

Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Correct **OIL LEVEL**

33 60 003 REMOVING AND INSTALLING/REPLACING CONTROL UNIT FOR DYNAMIC PERFORMANCE CONTROL

IMPORTANT: Remove control unit only after being prompted to do so by diagnosis system.

Necessary preliminary tasks:

- Replacement only: Start **INITIAL OPERATION** and follow instructions on screen
- Remove **BATTERY COVER**

Disconnect plug connection (1).

Release nuts (2) and remove control unit (3).

Installation:

Tightening torque **33 11 7AZ** .

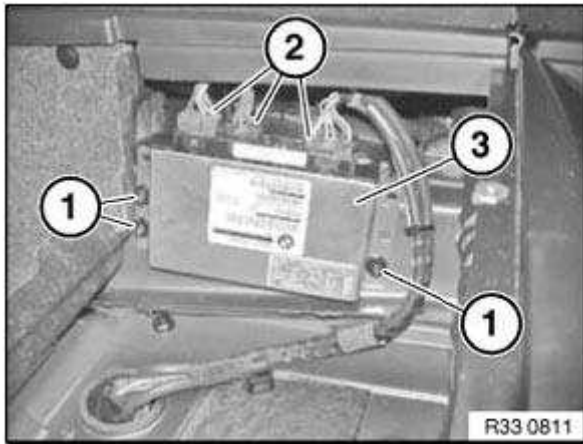


Fig. 38: Identifying Control Unit Nuts With Plug Connection
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement

- Carry out **VEHICLE PROGRAMMING/CODING**
- Replacement only: Continue **INITIAL OPERATION**

FINAL DRIVE WITH COVER

33 11 021 REPLACING SHAFT SEAL FOR DRIVE FLANGE ON REAR DIFFERENTIAL (INSERTED PROPELLER SHAFT)

Special tools required:

- 00 5 010
- **33 0 120**
- 33 5 050
- 33 5 060
- **33 5 070**

IMPORTANT: Use only approved gear oils.

Failure to comply with this instruction will result in serious damage to the rear differential!

Necessary preliminary tasks:

- Remove propeller shaft

Remove retaining clip (1) and insert nut (2) with diaphragm seal.

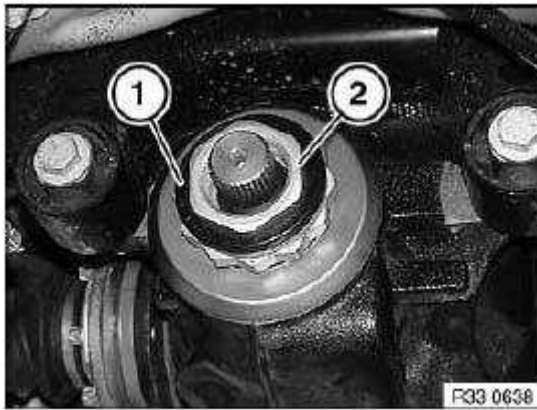


Fig. 39: Identifying Retaining Clip With Nut
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark position of flange nut (1) to bevel pinion (2).

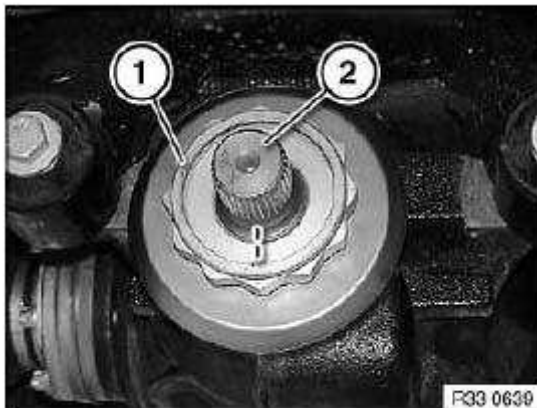


Fig. 40: Identifying Flange Nut With Bevel Pinion
 Courtesy of BMW OF NORTH AMERICA, INC.

Release flange nut with special tools 33 5 050 and 33 5 070 ; to do so, grip bevel pinion with special tools 33 5 060 and 33 5 070.

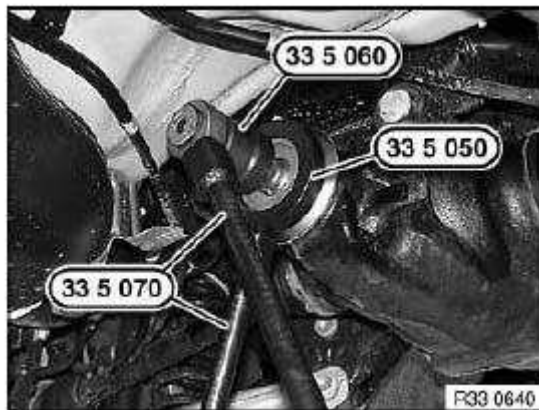


Fig. 41: Removing Flange Nut With Special Tools (33 5 050 And 33 5 070)
 Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw shaft seal with special tool 00 5 010.

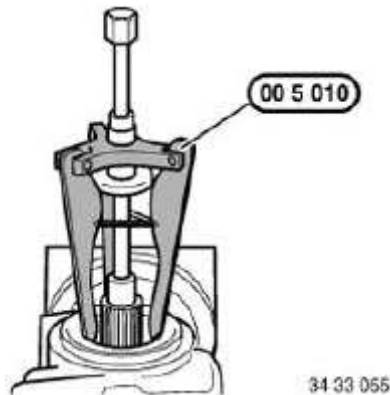


Fig. 42: Removing Shaft Seal With Special Tool (00 5 010)
 Courtesy of BMW OF NORTH AMERICA, INC.

Coat sealing lips of new shaft seal and sealing face of bevel pinion with differential oil.

Drive in shaft seal with special tool 33 0 120 .

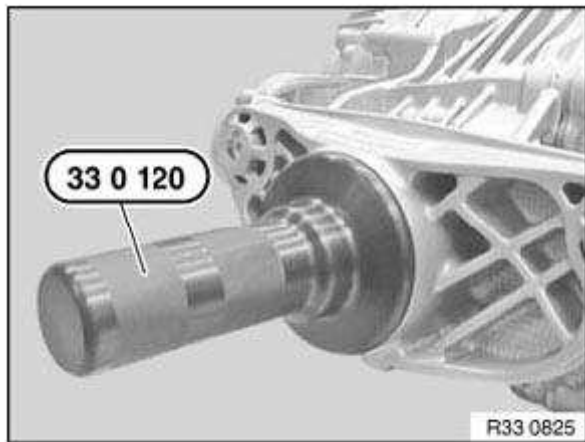


Fig. 43: Identifying Special Tool (33 0 120)
 Courtesy of BMW OF NORTH AMERICA, INC.

Clean bevel pinion thoroughly to remove remnants of screw-locking agent.



Fig. 44: Identifying Bevel Pinion
 Courtesy of BMW OF NORTH AMERICA, INC.

Check dust cover for damage, replace if necessary.

IMPORTANT: Clean flange nut thoroughly to remove remnants of grease and screw-locking agent.

Pack collar insert (1) of flange nut with grease.

Apply a thin coating of grease to shaded area (2) of flange nut.

Coat at least four thread turns of flange nut with "DREI BOND adhesive type 1385".

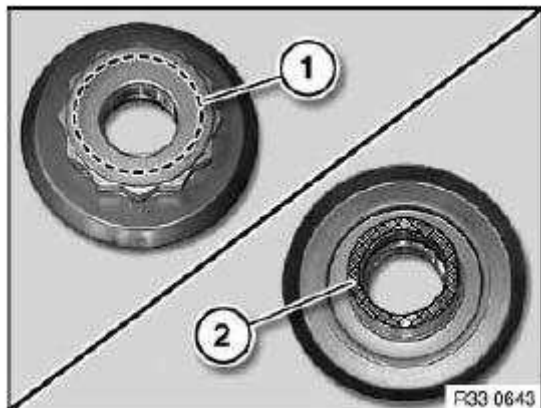


Fig. 45: Applying Thin Coating Of Grease To Shaded Area Of Flange Nut
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: In order to avoid damaging the rear differential, do not under any circumstances tighten down the flange nut (1) beyond the marker point of the bevel pinion (2).

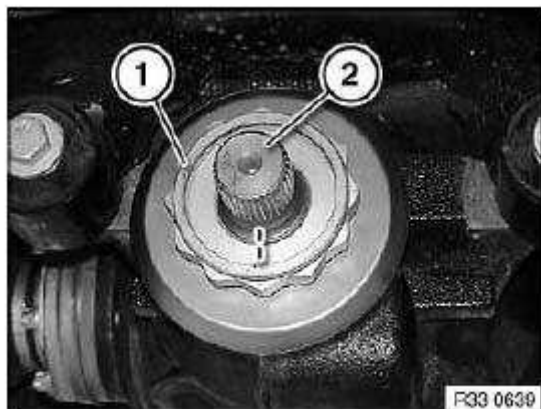


Fig. 46: Identifying Flange Nut With Bevel Pinion
 Courtesy of BMW OF NORTH AMERICA, INC.

Place insert nut (2) with diaphragm seal in flange nut.

Install retaining clip (1).

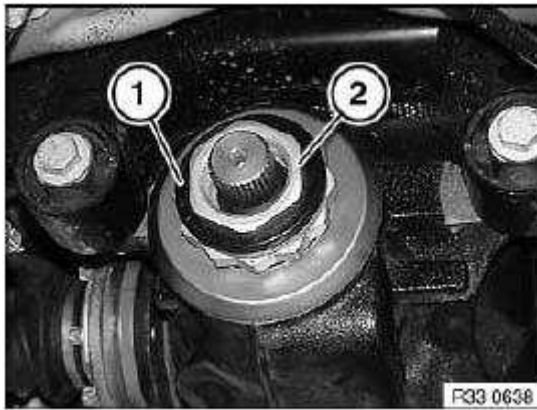


Fig. 47: Identifying Retaining Clip With Nut
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Correct rear differential fluid level. See 00 11 ... CHECKING/TOPPING UP OIL LEVEL IN REAR DIFFERENTIAL (DYNAMIC PERFORMANCE CONTROL) and 00 11 259 CHANGING OIL IN REAR DIFFERENTIAL (DYNAMIC PERFORMANCE CONTROL) AND DISPOSING OF USED OIL .

33 11 091 REPLACING DRIVE FLANGE ON LEFT OR RIGHT OF REAR DIFFERENTIAL

Special tools required:

- 13 5 251
- 13 5 253

NOTE: If a flange has drifted and is loose, it is necessary always to replace both flanges (left as well as right).

IMPORTANT: The drive flange is replaced only in conjunction with the circlip and shaft seal! See 00 11 ... CHECKING/TOPPING UP OIL LEVEL IN REAR DIFFERENTIAL (DYNAMIC PERFORMANCE CONTROL) and 00 11 259 CHANGING OIL IN REAR DIFFERENTIAL (DYNAMIC PERFORMANCE CONTROL) AND DISPOSING OF USED OIL .

Necessary preliminary tasks:

- Remove REAR DIFFERENTIAL

Drive out drive flange (1) with special tools 13 5 251 and 13 5 253.

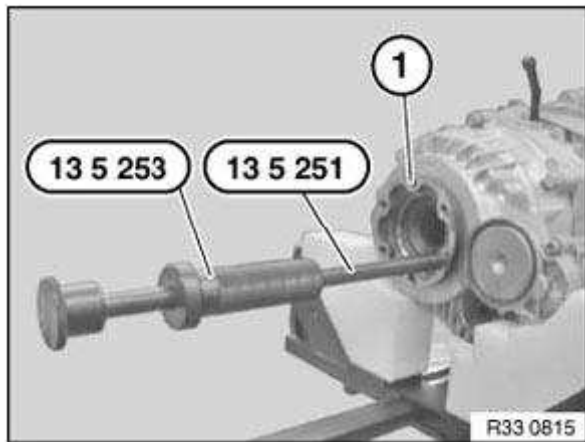


Fig. 48: Removing Drive Flange With Special Tools (13 5 251 And 13 5 253)
 Courtesy of BMW OF NORTH AMERICA, INC.

Installing output flange

Shaft seal and circlip must be replaced!

IMPORTANT: Circlip (1) must always be replaced.

Install circlip (1) in sun gear in such a way that opening (2) is positioned at 6 o'clock.

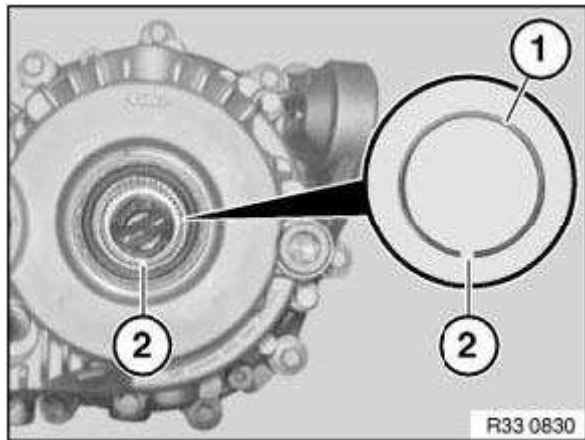


Fig. 49: Identifying Circlip
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean shaft seal race on drive flange thoroughly.

Push drive flange into rear differential as far as it will go and turn. Press in drive flange further until circlip can

be heard and felt to snap into place.

The inner design of the differential causes a small, axial play of the drive flange - this play does not imply any damage.

IMPORTANT: High installation forces indicate that the spline teeth on the drive flange/differential bevel gear are damaged/deformed!

After installation

- **CORRECT GEARBOX OIL LEVEL/CHANGE DIFFERENTIAL OIL**

FINAL DRIVE MOUNTING

33 17 004 REPLACING ALL FRONT RUBBER MOUNTS FOR REAR DIFFERENTIAL MOUNTING

Special tools required:

- **33 4 465**
- **33 4 466**
- **33 5 105**
- **33 5 161**
- **33 5 162**
- **33 5 163**
- **33 5 164**
- **33 5 165**
- **33 5 166**

IMPORTANT: Lower the rear axle carrier to avoid overelongating the new rubber mount when sliding in the screw.

Necessary preliminary tasks:

- Remove **REAR DIFFERENTIAL**
- Lower rear axle carrier. See **33 31 503 LOWERING/RAISING REAR AXLE CARRIER (SPECIAL TOOL SWZ00-2040)** and **33 31 503 LOWERING/RAISING REAR AXLE CARRIER (UNIVERSAL LIFTER).**

Withdraw rubber mount with special tools 33 5 166 , 33 5 163 , 33 5 162 , 33 5 161 , 33 4 466 and 33 4 465.

NOTE: Milled recess of special tool 33 5 162 must point outwards to rear axle carrier.

Use ratchet ring wrench 33 5 105.

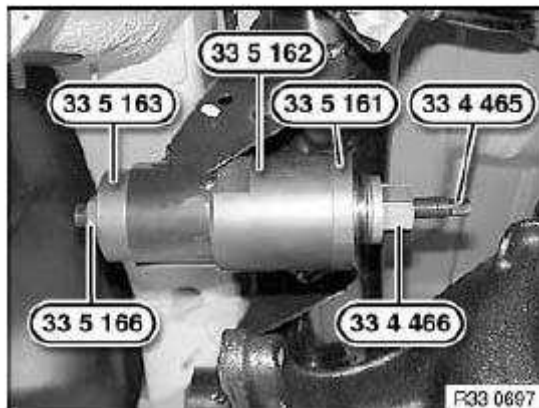


Fig. 50: Identifying Special Tools (33 5 166, 33 5 163, 33 5 162, 33 5 161, 33 4 466 And 33 4 465)
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Coat bearing bushing in rear axle carrier and rubber mount with Circolight .

Align rubber mount horizontally by way of slots (1).

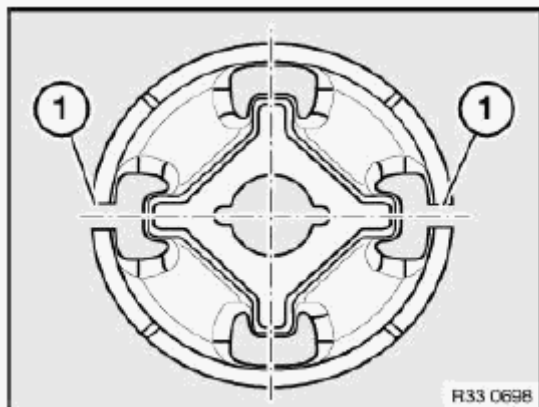


Fig. 51: Aligning Rubber Mount Horizontally By Way Of Slots
 Courtesy of BMW OF NORTH AMERICA, INC.

Insert rubber mount (1) in special tool 33 5 164 .

Draw in rubber mount (1) with special tools 33 5 165 , 33 5 164 , 33 5 163 , 33 4 466 and 33 4 465 as far as it will go.

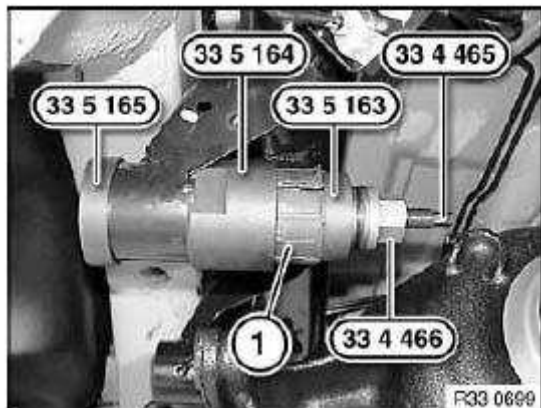


Fig. 52: Identifying Rubber Mount With Special Tools (33 5 165)
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Use ratchet ring wrench 33 5 105.

33 17 005 REPLACING RUBBER MOUNT FOR REAR DIFFERENTIAL MOUNTING AT REAR

Special tools required:

- **33 3 103**
- **33 3 104**
- **33 5 105**
- **33 5 151**
- **33 5 152**
- **33 5 153**
- **33 5 154**
- **33 5 155**
- **33 5 156**

Necessary preliminary tasks:

- Remove **REAR DIFFERENTIAL**

Withdraw rubber mount with special tools 33 5 153 , 33 5 152 , 33 5 151 , 33 3 103 and 33 3 104.

NOTE: Make sure special tool 33 5 152 contacts rear axle carrier correctly.

Use ratchet ring wrench 33 5 105.

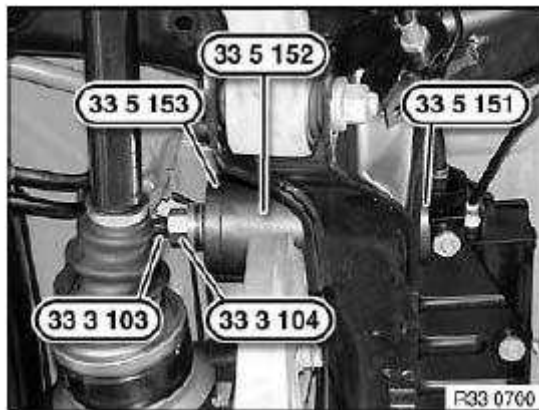


Fig. 53: Identifying Rubber Mount With Special Tools (33 5 153, 33 5 152, 33 5 151, 33 3 103 And 33 3 104)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Coat bearing bushing in rear axle carrier and new rubber mount with Circo Light .

Align rubber mount horizontally by way of elongated hole (1).

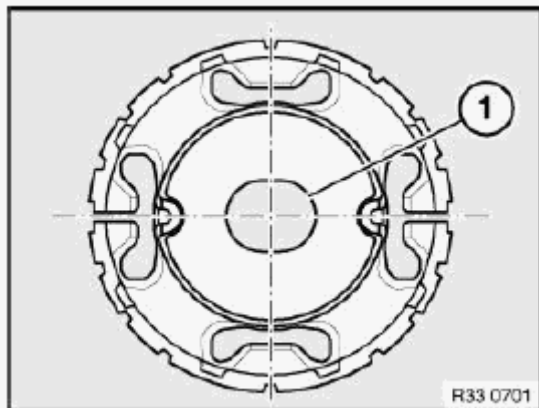


Fig. 54: Aligning Rubber Mount Horizontally By Way Of Elongated Hole
 Courtesy of BMW OF NORTH AMERICA, INC.

Insert rubber mount (1) in special tool 33 5 154 .

Draw in rubber mount (1) with special tools 33 5 155 , 33 5 154 , 33 5 156 , 33 3 103 and 33 3 104 as far as it will go.

NOTE: Make sure special tools 33 5 154 and 33 5 156 contact rear axle carrier correctly.

Use ratchet ring wrench 33 5 105.

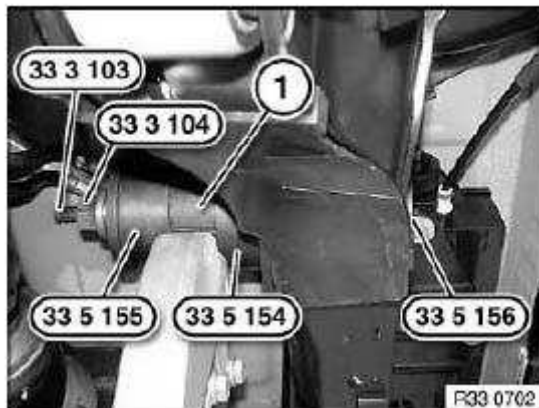


Fig. 55: Identifying Rubber Mount With Special Tools (33 5 155, 33 5 154 And 33 5 156)
 Courtesy of BMW OF NORTH AMERICA, INC.

OUTPUT SHAFTS

33 21 ... PRESSING OUTPUT SHAFT OUT OF DRIVE FLANGE AND DRAWING IN (OUTPUT SHAFT REMOVED FROM REAR DIFFERENTIAL)

Special tools required: See REAR AXLE - SPECIAL TOOLS

- 33 2 111
- 33 2 115
- 33 2 116
- 33 2 117
- 33 2 118
- 33 2 119
- 33 2 160
- 33 2 201
- 33 2 202
- 33 2 203
- 33 2 205
- 33 2 206
- 33 2 207
- 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.

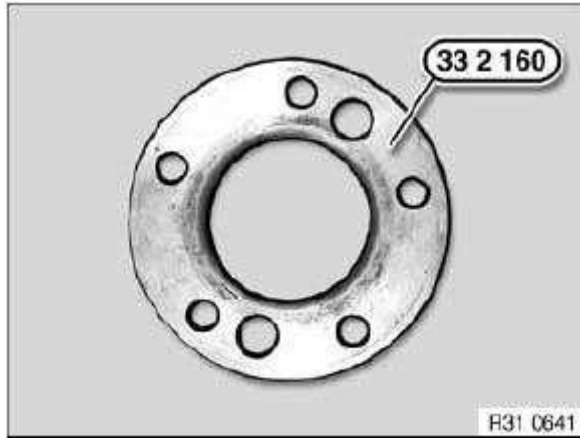


Fig. 56: Identifying Special Tool (33 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 33 2 200:

Secure output shaft against falling out.

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.

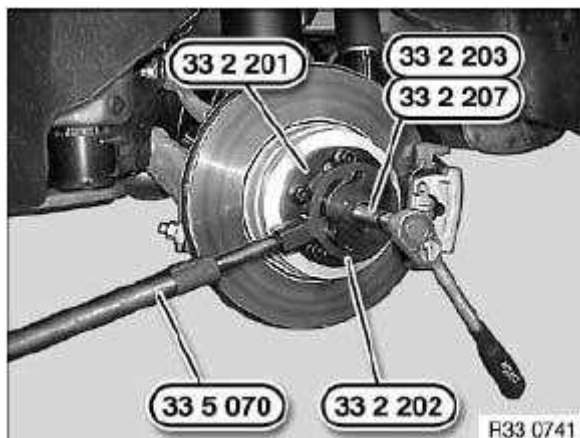


Fig. 57: Pressing Output Shaft Out Of Drive Flange
Courtesy of BMW OF NORTH AMERICA, INC.

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 /33 2 206 onto output shaft.

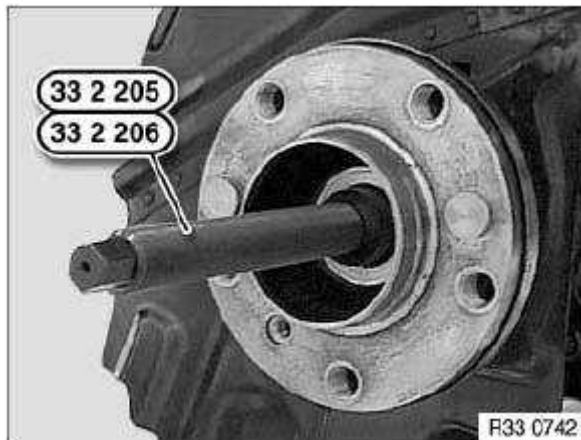


Fig. 58: Identifying Special Tool (33 2 205 And 33 2 206) Onto Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

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

Draw in output shaft with special tool 33 2 205 up to stop; in so doing, grip basic body 33 2 201 with special tools 33 2 202 and 33 5 070.

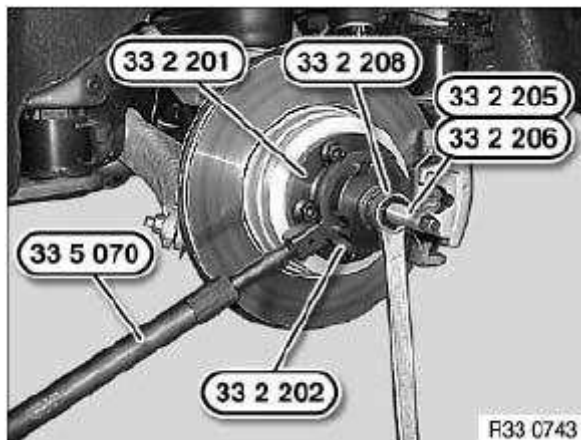


Fig. 59: Drawing Output Shaft With Special Tool (33 2 205)

Courtesy of BMW OF NORTH AMERICA, INC.

Special tool 33 2 100

Secure output shaft against falling out.

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.

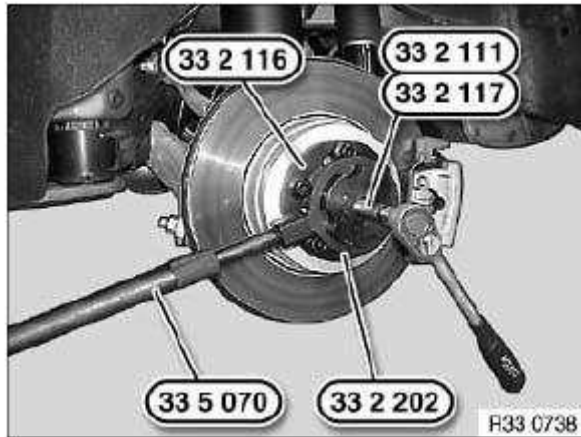


Fig. 60: Pressing Output Shaft Out Of Drive Flange
Courtesy of BMW OF NORTH AMERICA, INC.

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 /33 2 119 onto output shaft.

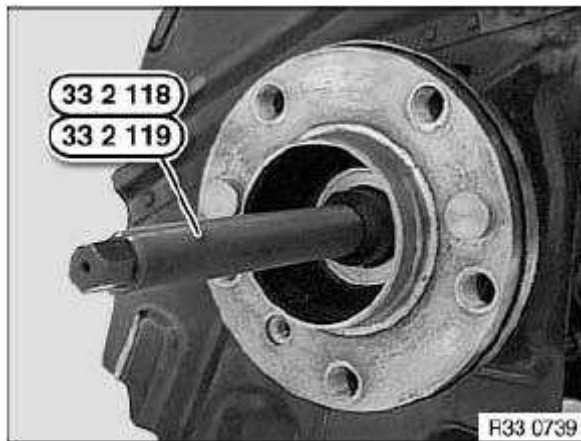


Fig. 61: Identifying Special Tool (33 2 118 And 33 2 119) Onto Output Shaft
 Courtesy of BMW OF NORTH AMERICA, INC.

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.

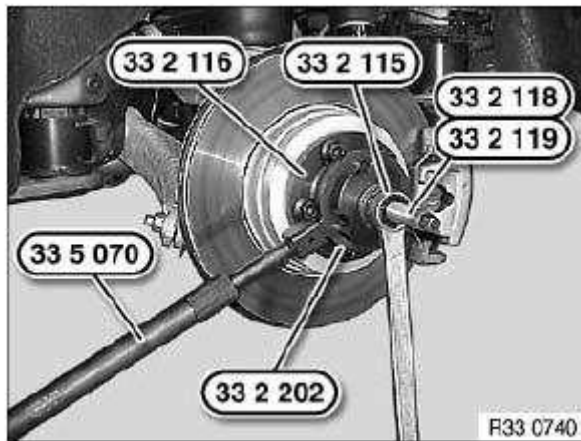


Fig. 62: Drawing Output Shaft With Special Tool (33 2 115)
 Courtesy of BMW OF NORTH AMERICA, INC.

33 21 ... RIBBED TEETH

IMPORTANT: Bolts with ribbed teeth must be replaced after they have been released!

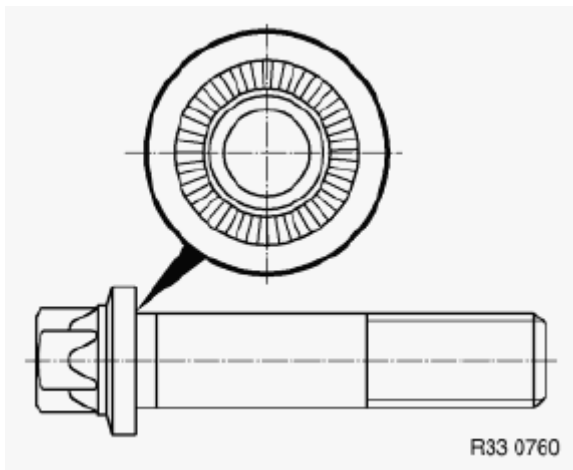


Fig. 63: Identifying Bolts With Ribbed Teeth
Courtesy of BMW OF NORTH AMERICA, INC.

33 21 000 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT OUTPUT SHAFT (SCREWED VERSION)

Necessary preliminary tasks:

- Remove **REAR WHEEL** .
- Remove **REAR DIFFERENTIAL**

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

Release collar nut (1), activate parking brake for this purpose.

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 **33 41 1AZ** .

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

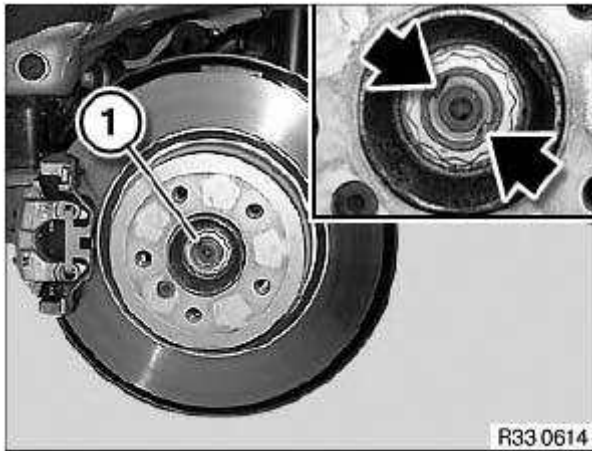


Fig. 64: Locating Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Secure output shaft against falling out.

Press OUTPUT SHAFT OUT OF DRIVE FLANGE and remove towards center of vehicle.

33 21 071 REPLACING BOTH GAITERS ON LEFT AND RIGHT OF OUTPUT SHAFT

Special tools required:

- 21 2 120
- 26 1 110
- 33 2 100

Necessary preliminary tasks:

- Remove OUTPUT SHAFT

Removing inner gaiter

Clean output shaft and clamp with a cloth in vice.

Unfasten hose clip (1).

Using a suitable tool, force gaiter cap (2) off joint or sealing cover.

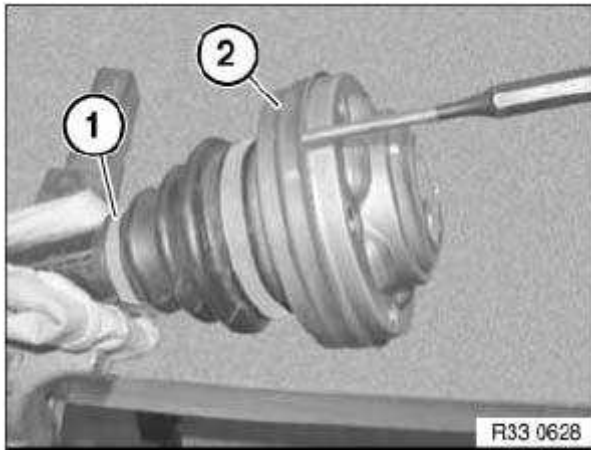


Fig. 65: Cleaning Output Shaft And Clamp With Cloth In Vice
 Courtesy of BMW OF NORTH AMERICA, INC.

Push back gaiter with cap.

IMPORTANT: Risk of damage!

Make sure that joint does not fall apart.

Clamp joint (1) in vice.

Using a suitable tool, force sealing cover (2) off joint (1).

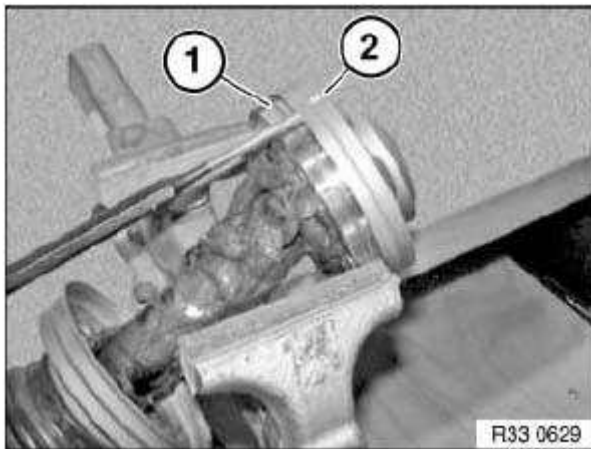


Fig. 66: Clamping Joint In Vice
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Mark positions in relation to each other of ball hub, ball cage and joint at ends.

NOTE: If the joint falls apart, it can only be reassembled correctly with the aid of the

markings.

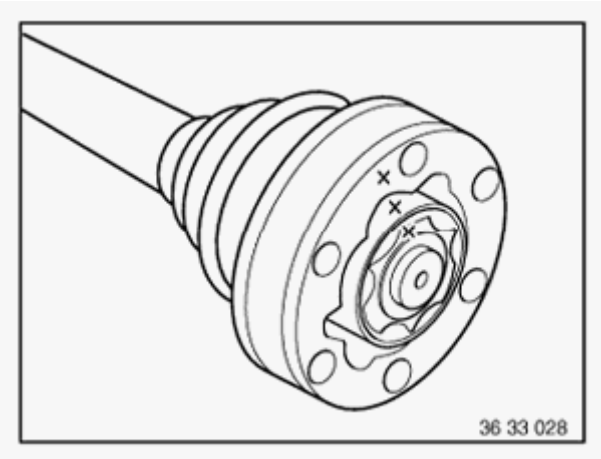


Fig. 67: Identifying Ball Hub

Courtesy of BMW OF NORTH AMERICA, INC.

Remove circlip (1).

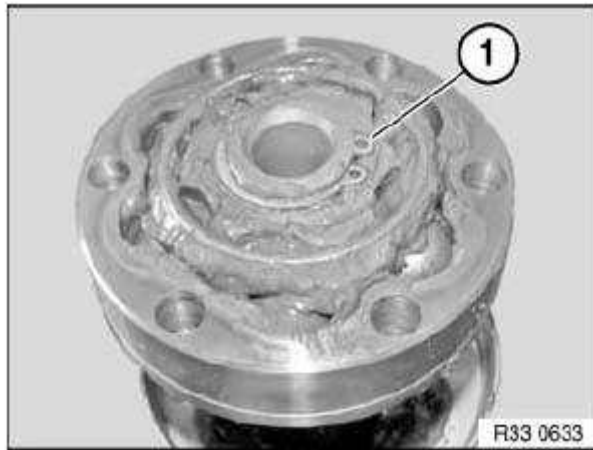


Fig. 68: Identifying Circlip

Courtesy of BMW OF NORTH AMERICA, INC.

Grip output shaft.

Using special tool **26 1 110** and a suitable tool (for hollow shaft **21 2 120**), press output shaft out of joint (1).

Clean joint (1) carefully.

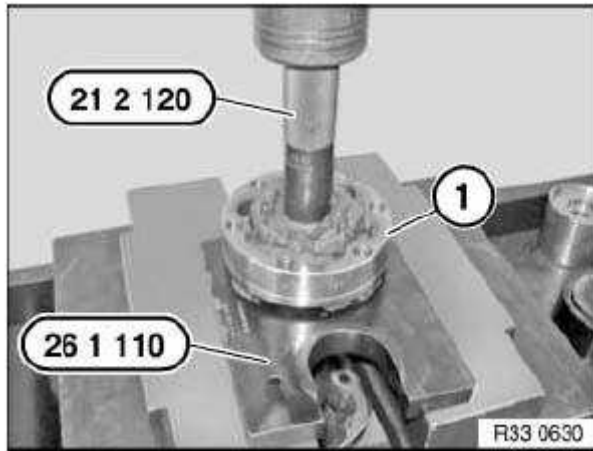


Fig. 69: Pressing Output Shaft Out Of Joint
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: All traces off old grease must be removed.

Detach gaiter from output shaft.

Removing and installing outer gaiter

Release hose clamps (1, 3) and detach gaiter (2) from output shaft.

Clean joint and output shaft carefully.

NOTE: All traces off old grease must be removed.

Check joint for damage; if necessary, replace **OUTPUT SHAFT**.

Fill joint with propeller shaft grease.

Fit gaiter (2) on bellows and secure with hose clamps (1, 3).

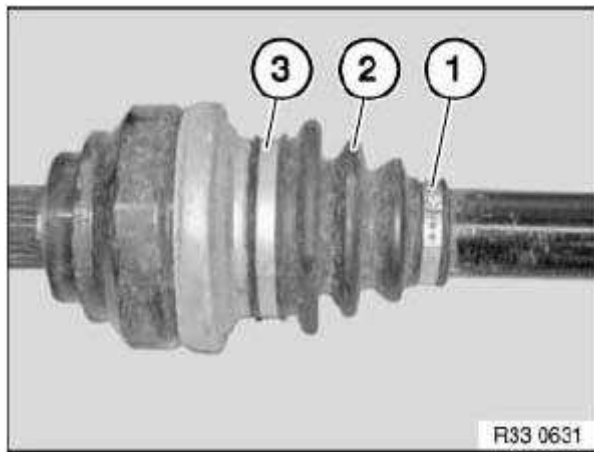


Fig. 70: Identifying Gaiter With Hose Clamps
 Courtesy of BMW OF NORTH AMERICA, INC.

Installing inner gaiter

Push gaiter with cap onto output shaft (1).

Mount special tool 33 2 100 with corresponding shell inserts on output shaft (1).

Press joint (2) over bearing inner race onto output shaft.

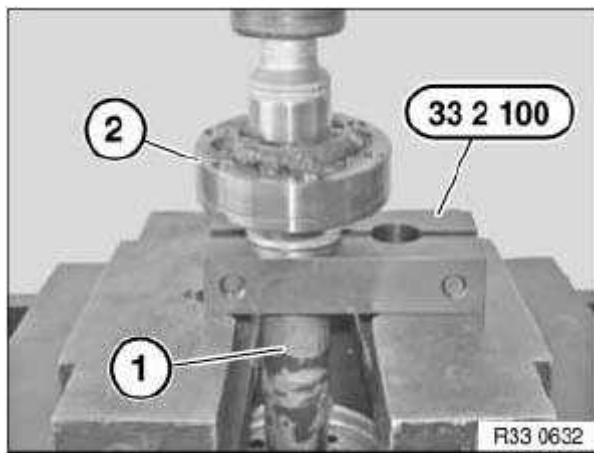


Fig. 71: Pressing Joint Over Bearing Inner Race Onto Output Shaft
 Courtesy of BMW OF NORTH AMERICA, INC.

Install new circlip (1).

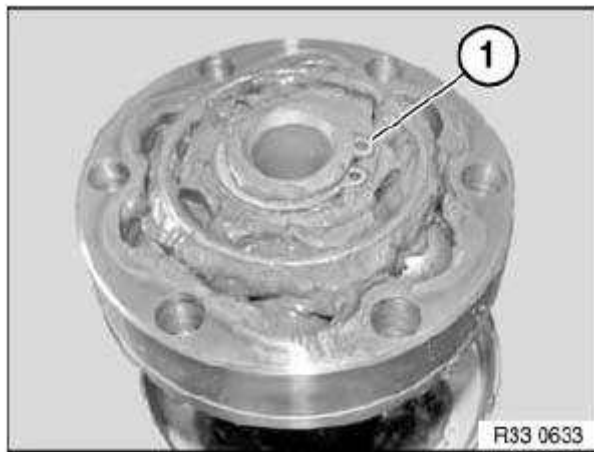


Fig. 72: Identifying Circlip

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Keep sealing faces of cap and joint (on both sides) clean and free from grease.

Fill joint at both ends with high-temperature grease.

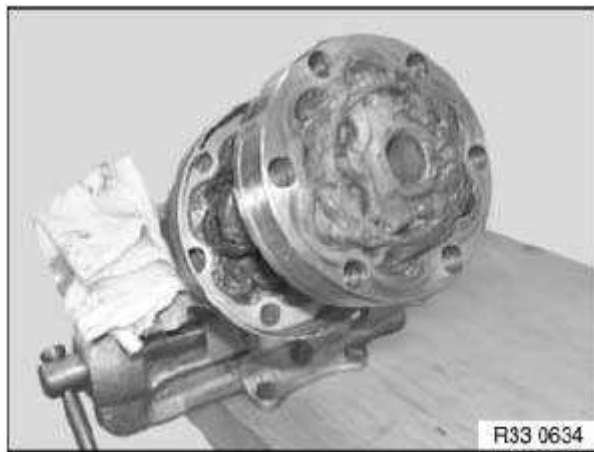


Fig. 73: Identifying High-Temperature Grease Applying Area

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Do not install gaiter with cap and sealing cover on joint without shims.

Apply a thin coating of sealing compound to sealing faces of sealing cover and cap.

Install sealing cover (1) with two bolts, shims and nuts on joint.

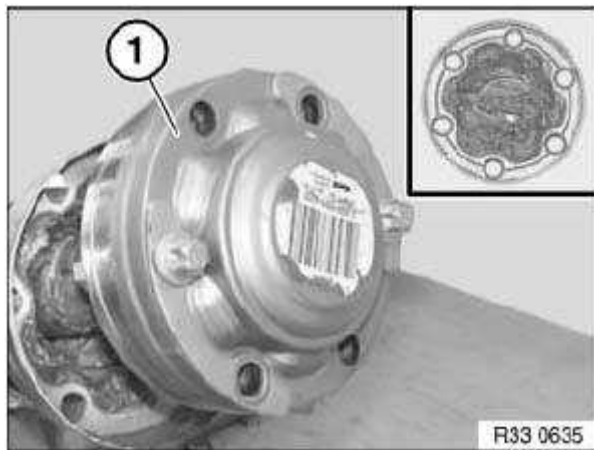


Fig. 74: Identifying Sealing Cover

Courtesy of BMW OF NORTH AMERICA, INC.

Install cap (1) with two bolts, shims and nuts on joint.

Fit hose clamp (2).

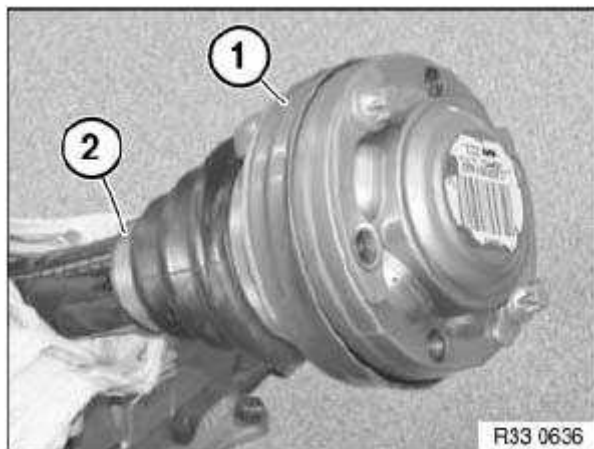


Fig. 75: Identifying Hose Clamp With Cap

Courtesy of BMW OF NORTH AMERICA, INC.

REAR SUB-FRAME

33 31 011 REPLACING REAR AXLE CARRIER

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.

Read and observe the information on permissible load distribution in the Owner's Handbook, lifting platform.

Load the luggage compartment with a minimum of 100 kg before

lowering/removing the rear axle carrier.

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

Necessary preliminary tasks:

- Remove **REAR DIFFERENTIAL**
- Remove rear axle carrier

Remove brake lines.

Remove stabilizer. See **33 55 000 REMOVING AND INSTALLING/REPLACING REAR STABILIZER** and **37 12 220 REMOVING AND INSTALLING/REPLACING REAR ACTIVE STABILIZER** .

Version with Dynamic Drive: Disconnect control lines for oscillating motor of rear axle from rear axle carrier.

Remove **ACTUATING UNIT (EMF)** .

Remove both **BRAKE DISCS** .

Remove **RIDE-HEIGHT SENSOR(S)** .

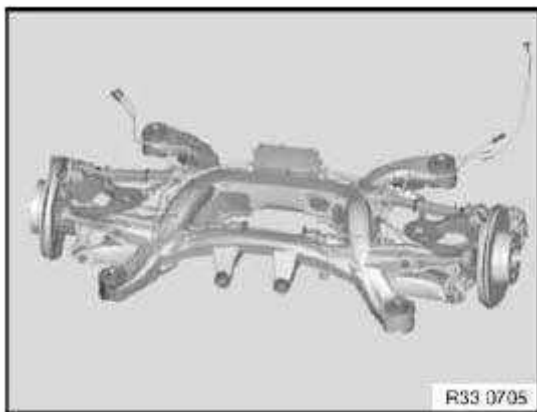


Fig. 76: Identifying Rear Axle Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Remove both **SWINGING ARMS ON REAR AXLE CARRIER**.

Remove both **CONTROL ARMS ON REAR AXLE CARRIER**.

Remove both **GUIDE ARMS ON REAR AXLE CARRIER**.

Remove both wheel carriers with output shaft, swinging arm and suspension arms.

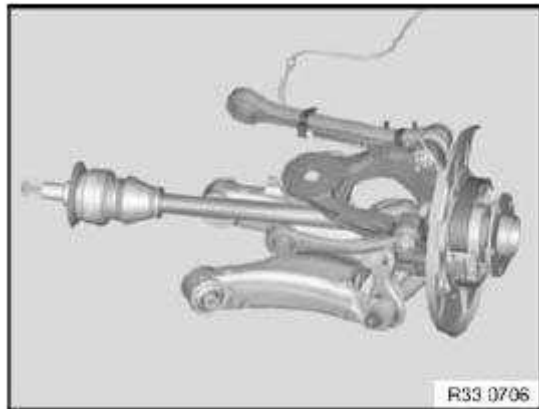


Fig. 77: Identifying Wheel Carriers

Courtesy of BMW OF NORTH AMERICA, INC.

Take rear axle carrier down from special tool with assistance of a 2nd person and set down on a suitable surface.

Installation:

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

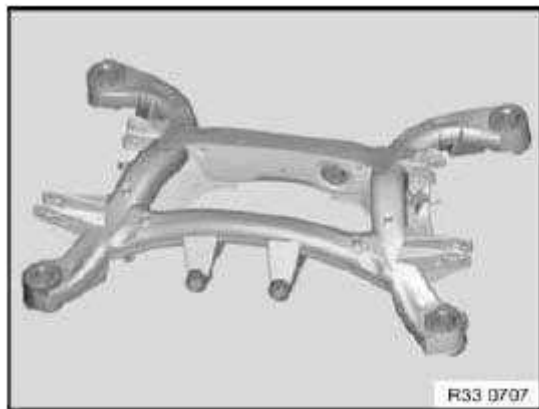


Fig. 78: Identifying Rear Axle Carrier

Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Activate and fill **AIR SUSPENSION SYSTEM**
- Carry out **RIDE-HEIGHT CALIBRATION**
- Bleed **BRAKING SYSTEM**
- 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 .

- If necessary, carry out **INITIAL DYNAMIC DRIVE OPERATION**

33 31 503 LOWERING/RAISING REAR AXLE CARRIER (SPECIAL TOOL SWZ00-2040)

Special tools required:

- **00 2 030**
- **00 2 040**
- **33 5 181**
- **33 5 182**

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.

Read and observe the information on permissible load distribution in the lifting platform operating instructions.

Load the luggage compartment with a minimum of 100 kg before lowering/removing the rear axle carrier.

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

Necessary preliminary tasks:

- Remove **REAR WHEELS**
- Tension **BOTH COIL SPRINGS** (and leave on vehicle)
- Remove complete exhaust system
- Disconnect **PLUG CONNECTION ON ACTUATING UNIT (EMF)**
- Unclip lines for pulse generator, brake pad sensor or shock absorber from holders above rear axle carrier
- Disconnect plug connection at both ride-height sensors

Version with ride-height control:

Deactivate and drain **AIR SPRING/SUSPENSION SYSTEM**

IMPORTANT: Do not use any tools to remove the lower section of the air spring (1).

Tilt lower section of air spring (1) by hand towards front/side.

Installation:

Press lower section of air spring (1) by hand into wheel carrier until it can be seen and heard to snap into place.

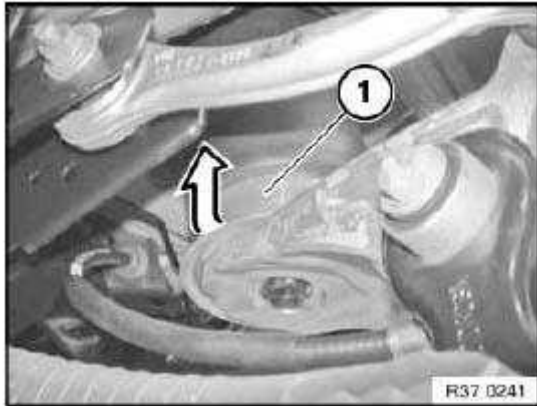


Fig. 79: Pressing Lower Section Of Air Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Press clutch pedal down to floor and secure with pedal support.

NOTE: **The pedal support may only be released when the brake lines are reconnected.**

This prevents brake fluid from emerging from the expansion tank and air from entering the system when the brake lines are opened.

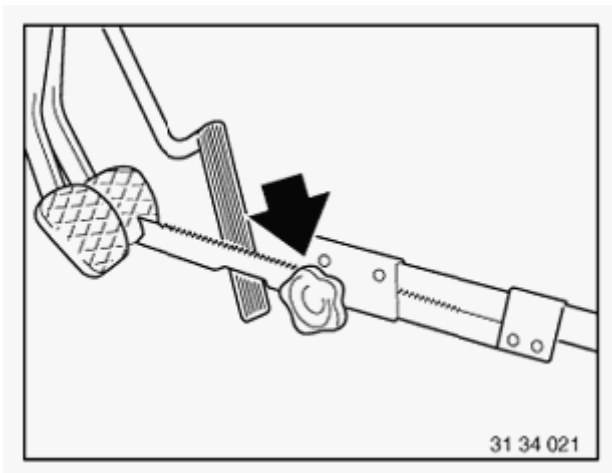


Fig. 80: Pressing Clutch Pedal Down To Floor
Courtesy of BMW OF NORTH AMERICA, INC.

Position an oil sump underneath to catch brake fluid.

Release banjo bolts (1), gripping brake hoses (2) at square head in the process.

Disconnect brake hoses (2) and seal off with plugs.

Installation:

Make sure brake hose is laid without tension and with sufficient spacing to adjoining components.

Tightening torque **34 32 1AZ** .

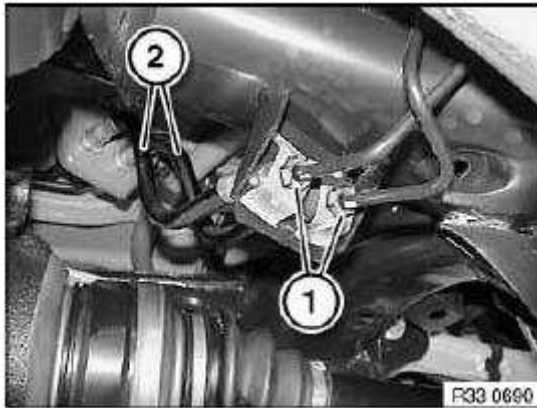


Fig. 81: Identifying Banjo Bolts And Brake Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, position special tool **00 2 040** with a 2nd person helping on workshop jack **00 2 030**.

Insert special tools **33 5 181** and **33 5 182** into corresponding mountings of special tool **00 2 040**.

Lower special tool **33 3 274**.

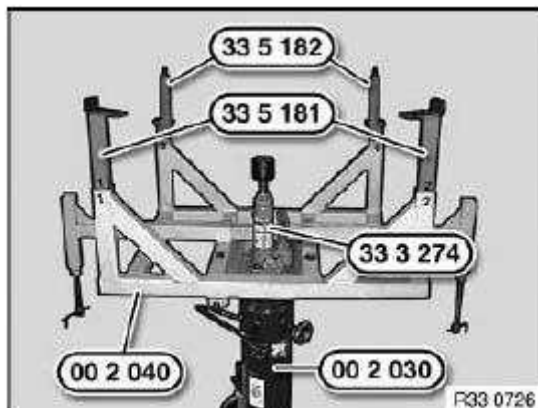


Fig. 82: Identifying Special Tools (33 3 274)
Courtesy of BMW OF NORTH AMERICA, INC.

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

Align special tools **33 5 181** and **33 5 182** to rear axle carrier.

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

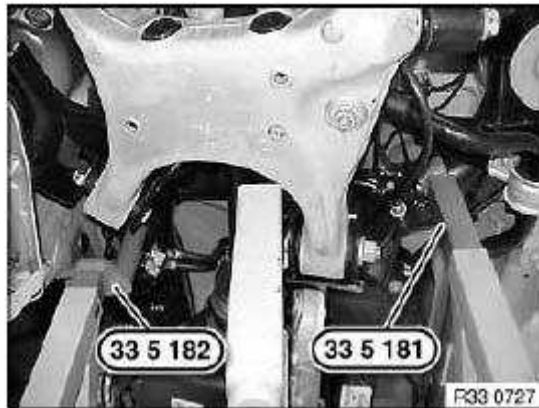


Fig. 83: Aligning Special Tools (33 5 181 And 33 5 182) To Rear Axle Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Version with Dynamic Drive:

Remove **RIGHT UNDERBODY PANELLING (REAR SECTION)** .

IMPORTANT: Pay attention to control lines (2) when lowering and raising. Hydraulic lines must not be kinked/tensioned/bent!

1 = Banjo bolts

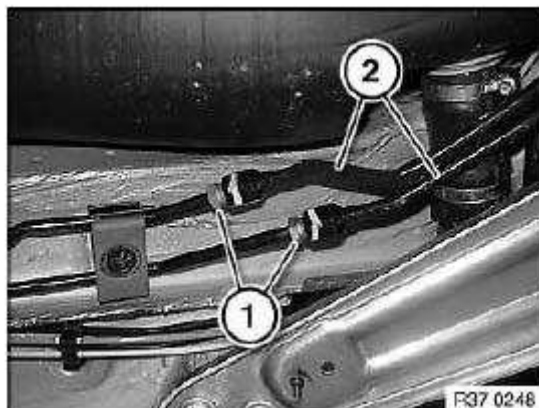


Fig. 84: Identifying Control Lines And Banjo Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Lower rear axle carrier only until such stage that the rubber mounts can be changed.

Remove front and rear compression struts and carefully lower rear axle carrier approx. 50 mm. See **33 32 153 REMOVING AND INSTALLING/REPLACING FRONT COMPRESSION STRUT** and **33 32 155**

REMOVING AND INSTALLING/REPLACING REAR COMPRESSION STRUT.

After installation

- Activate and fill **AIR SUSPENSION SYSTEM**
- Bleed **BRAKING SYSTEM**

33 31 503 LOWERING/RAISING REAR AXLE CARRIER (UNIVERSAL LIFTER)

Special tools required:

- **00 2 030**
- **31 5 250**
- **31 5 253**
- **31 5 256**

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. Read and observe the information on load distribution in the lifting platform operating instructions. Load the luggage compartment with a minimum of 100 kg before lowering/removing the rear axle carrier.

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

Necessary preliminary tasks:

- Remove **REAR WHEELS**
- Tension **BOTH COIL SPRINGS** (and leave on vehicle)
- Remove complete exhaust system
- Disconnect **PLUG CONNECTION ON ACTUATING UNIT (EMF)**
- Unclip lines for pulse generator, brake pad wear sensor or shock absorber from holders above rear axle carrier
- Disconnect plug connection at both ride-height sensors

Version with ride-height control:

Deactivate and drain **AIR SPRING/SUSPENSION SYSTEM**

IMPORTANT: Do not use any tools to remove the lower section of the air spring (1).

Tilt lower section of air spring (1) by hand towards front/side.

Installation:

Press lower section of air spring (1) by hand into wheel carrier until it can be seen and heard to snap into place.

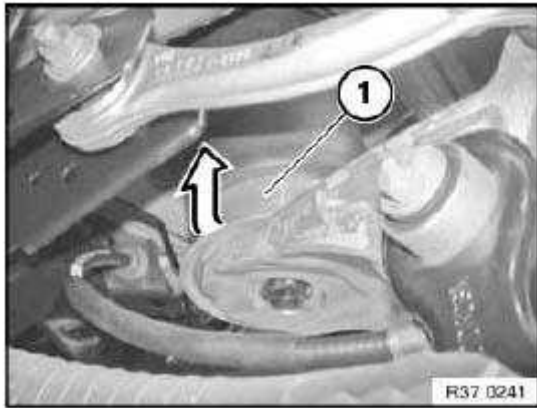


Fig. 85: Pressing Lower Section Of Air Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Press clutch pedal down to floor and secure with pedal support.

NOTE: **The pedal support may only be released when the brake lines are reconnected.**

This prevents brake fluid from emerging from the expansion tank and air from entering the system when the brake lines are opened.

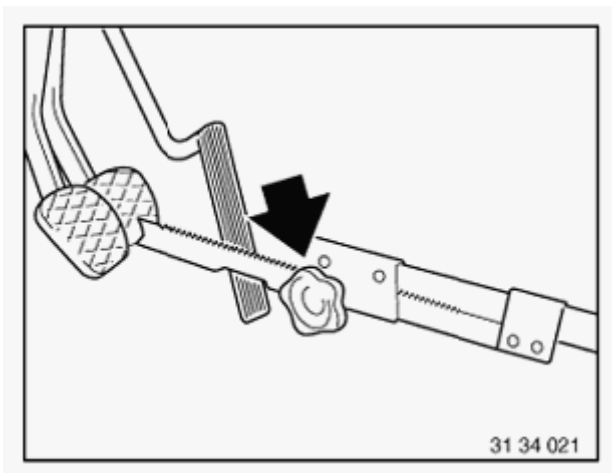


Fig. 86: Pressing Clutch Pedal Down To Floor
Courtesy of BMW OF NORTH AMERICA, INC.

Position an oil sump underneath to catch brake fluid.

Release banjo bolts (1), gripping brake hoses (2) at square head in the process.

Disconnect brake hoses (2) and seal off with plugs.

Installation:

Make sure brake hose is laid without tension and with sufficient spacing to adjoining components.

Tightening torque **34 32 1AZ** .

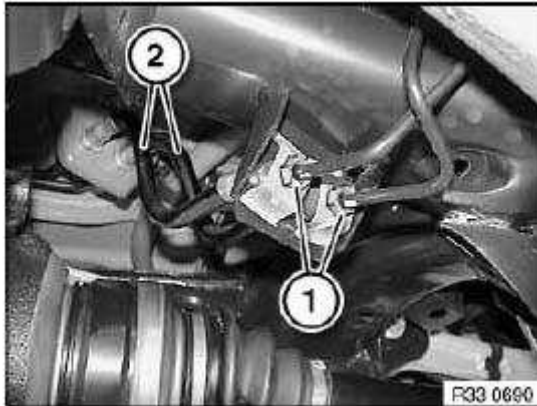


Fig. 87: Identifying Banjo Bolts And Brake Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

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

Insert special tools 31 5 253 in telescopic supports of a profile rail pair.

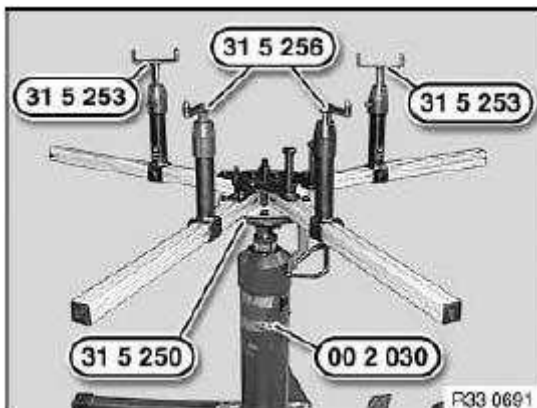


Fig. 88: Identifying Special Tool (31 5 250)
Courtesy of BMW OF NORTH AMERICA, INC.

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.

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

Align special tool **31 5 256** to opening in rear axle carrier.

Align special tools **31 5 253** to cross-member arms on rear axle carrier.

Version with Dynamic Drive:

Remove **RIGHT UNDERBODY PANELLING (REAR SECTION)** ..

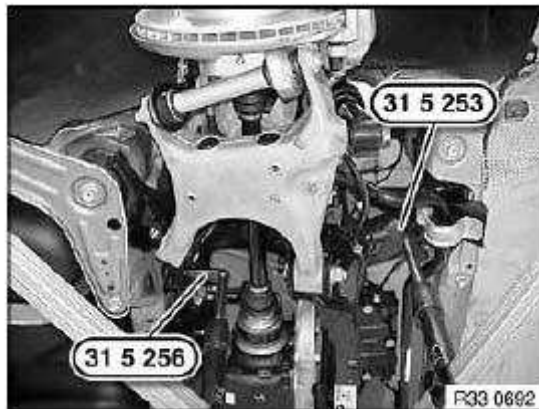


Fig. 89: Aligning Special Tools (31 5 253) To Cross-Member Arms On Rear Axle Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Pay attention to control lines (2) when lowering and raising. Hydraulic lines must not be kinked/tensioned/bent!

1 = Banjo bolts

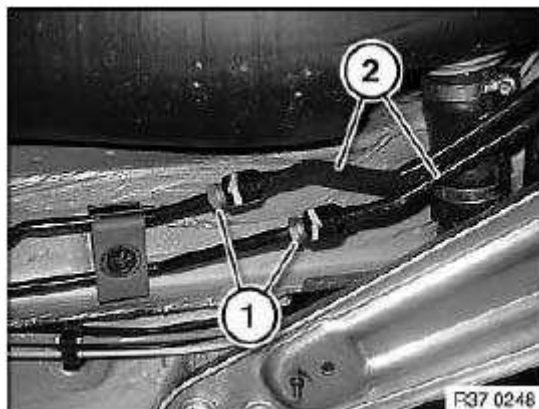


Fig. 90: Identifying Control Lines And Banjo Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Lower rear axle carrier only until such stage that the rubber mounts can be changed.

Remove front and rear compression struts and carefully lower rear axle carrier approx. 50 mm. See **33 32 153 REMOVING AND INSTALLING/REPLACING FRONT COMPRESSION STRUT** and **33 32 155 REMOVING AND INSTALLING/REPLACING REAR COMPRESSION STRUT**.

After installation

- Activate and fill **AIR SUSPENSION SYSTEM**
- Bleed **BRAKING SYSTEM**

CONTROL ARMS AND STRUTS

33 32 051 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT PUSH ROD/INTEGRAL LINK

NOTE: If the integral link is detached from the wheel carrier or swinging arm, it is necessary after reinstallation to carry out a wheel/chassis alignment check.

Necessary preliminary tasks:

- Remove **REAR WHEEL** .
- Tension **COIL SPRING** (and leave on vehicle)
- Version with ride-height control: Deactivate and drain **AIR SPRING** system

Release nut (1) and remove screw.

Release screw (2) and remove integral link (3).

Installation:

Replace self-locking nut.

First install swinging arm hand-tight, then tighten down screw (2).

Tighten screw/bolt connections in **NORMAL POSITION** .

Tightening torque (nut) **33 32 3AZ** .

Tightening torque (bolt) **33 32 4AZ** .

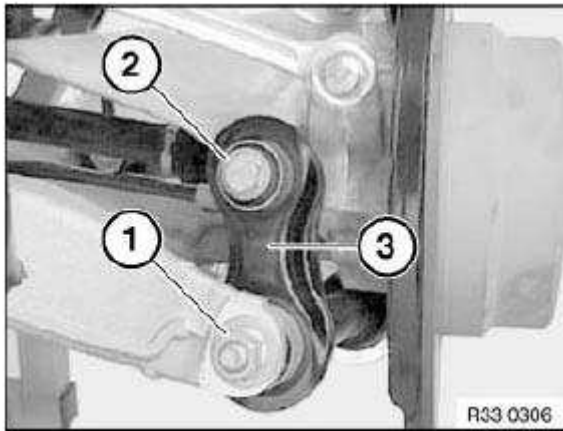


Fig. 91: Identifying Integral Link And Screw With Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Activate and fill **AIR SUSPENSION SYSTEM**
- 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** .

33 32 064 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT SWINGING ARM

NOTE: If the swinging arm is detached from the integral link/wheel carrier or rear axle carrier, it is necessary after reinstallation to carry out a wheel/chassis alignment check.

Necessary preliminary tasks:

- Remove **REAR WHEEL** .
- Deactivate and empty **AIR SPRING SYSTEM**
- Remove **STABILIZER LINK FROM SWINGING ARM.**

Release expansion rivets (1).

Remove cover (2) from rear axle carrier.

Mark position of eccentric screw (3) to rear axle carrier.

Installation:

Replace faulty expander rivets.

Make sure cover is correctly positioned.

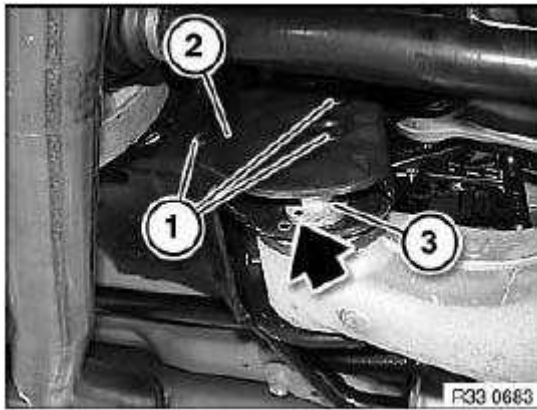


Fig. 92: Identifying Expansion Rivets And Rear Axle Carrier Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1).

Remove jointed rod (2) from swinging arm.

Installation:

Sensor lever (3) must point from ride-height sensor to respective rear wheel.

Replace self-locking nut.

Tightening torque **37 14 6AZ** .

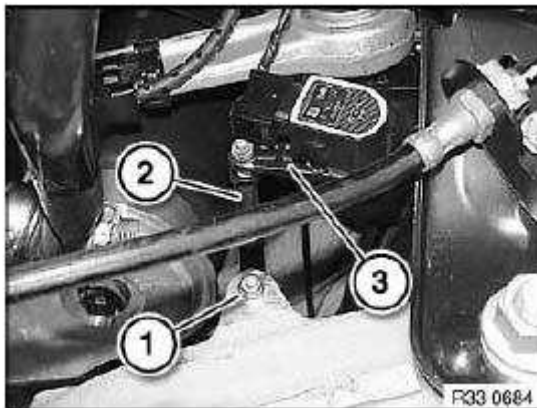


Fig. 93: Identifying Jointed Rod And Sensor Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Support wheel carrier with workshop jack.

Release nuts (1, 2) and remove screw (3).

Remove rear **SHOCK ABSORBER FROM SWINGING ARM.**

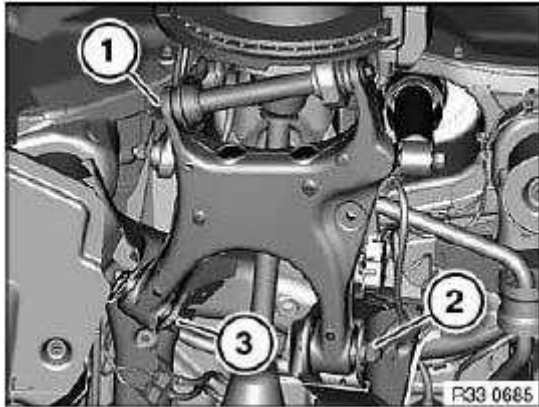


Fig. 94: Identifying Screw And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1).

Remove bolt (2) towards rear.

Installation:

Replace self-locking nut.

Tightening torque **33 32 3AZ** ..

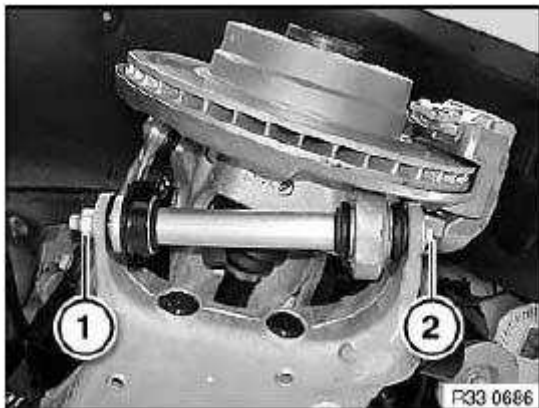


Fig. 95: Identifying Towards Rear Bolt And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1), remove eccentric washer (2) and pull out eccentric screw (3) towards front.

Installation:

Note insertion direction of eccentric screw.

Align eccentric screw by means of marking to rear axle carrier.

Refit eccentric washer.

Replace self-locking nut.

Tighten bolt connection in **NORMAL POSITION** .

Tightening torque **33 32 2AZ** .

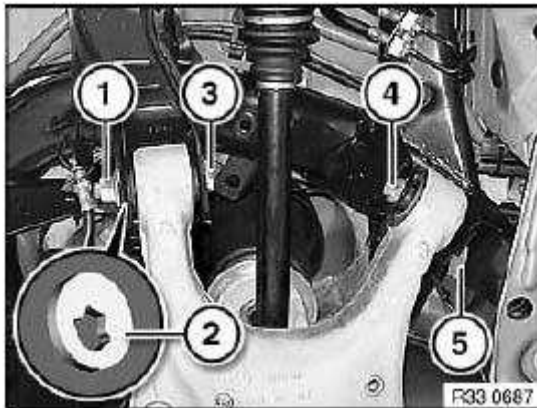


Fig. 96: Identifying Eccentric Washer And Locking Nut
Courtesy of BMW OF NORTH AMERICA, INC.

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

Installation:

Replace locking nut.

Tighten bolt connection in **NORMAL POSITION**

Tightening torque **33 32 1AZ** .

After installation

- Check that output shaft is correctly seated in rear differential.
- Activate and fill **AIR SUSPENSION SYSTEM**
- Carry out **RIDE-HEIGHT-CALIBRATION**
- 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** .

33 32 071 REPLACING ONE UPPER CONTROL ARM

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

Necessary preliminary tasks:

- Remove **REAR WHEEL** .
- Deactivate and empty **AIR SPRING SYSTEM**

Shown on vehicle at rear right:

Remove holders (1) from control arm.

Installation:

Replace faulty holder.

2 = Lead for pulse generator

3 = Only on right side: lead for brake pad sensor

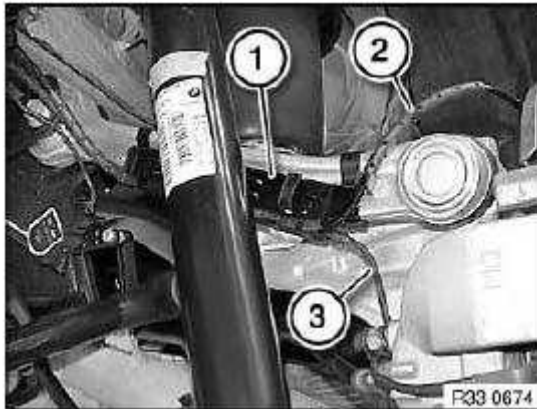


Fig. 97: Removing Holders From Control Arm
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1).

Remove control arm (2) from wheel carrier.

Installation:

Keep control arm to wheel carrier connection clean and free from oil and grease.

Replace self-locking nut.

Tightening torque **33 32 8AZ** .

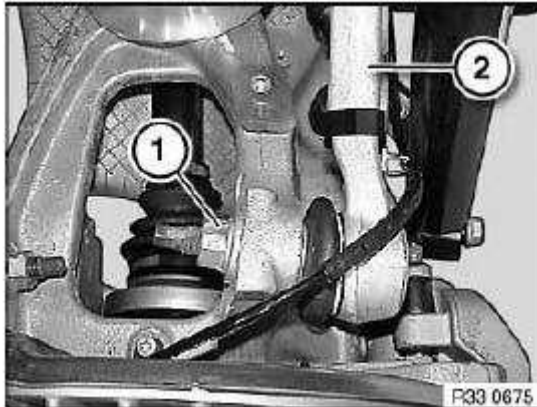


Fig. 98: Removing Control Arm From Wheel Carrier
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nut (1).

Release bolt (2) and remove control arm (3).

Installation:

Note insertion direction of bolt.

Replace self-locking nut.

Tighten bolt connection in **NORMAL POSITION** .

Tightening torque **33 32 7AZ** .

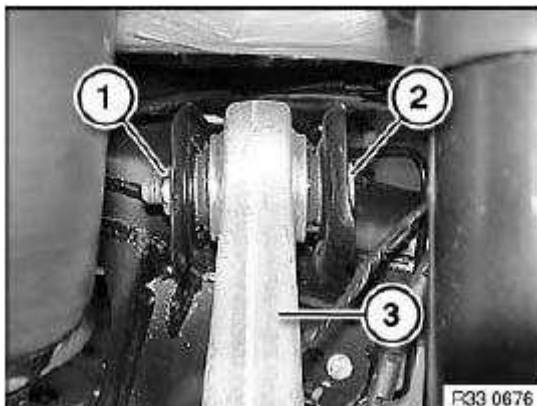


Fig. 99: Identifying Control Arm Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

33 32 091 REPLACING A GUIDE ARM

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

Necessary preliminary tasks:

- Remove **REAR WHEEL** .
- Deactivate and empty **AIR SPRING SYSTEM**

Slacken nut (1).

Remove guide arm (2) from wheel carrier.

Installation:

Keep guide arm to wheel carrier connection clean and free from oil and grease.

Replace self-locking nut.

Tightening torque **33 32 6AZ** .

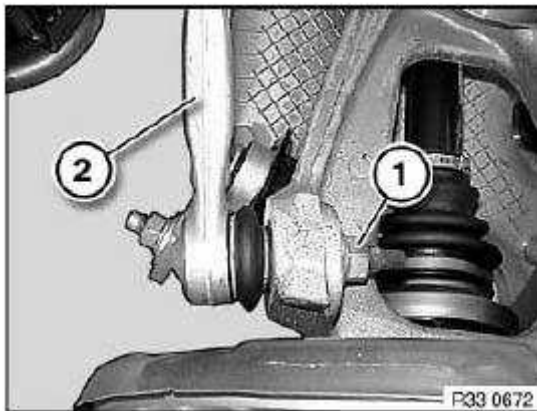


Fig. 100: Identifying Guide Arm Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Mark position of eccentric screw (4) to rear axle carrier.

Release nut (1) and remove eccentric washer (2).

Pull out eccentric screw (4) and remove guide arm (3).

Installation:

Refit eccentric washer.

Replace self-locking nut.

Align eccentric screw by means of marking to rear axle carrier.

Tighten bolt connection in **NORMAL POSITION** .

Tightening torque **33 32 5AZ** .

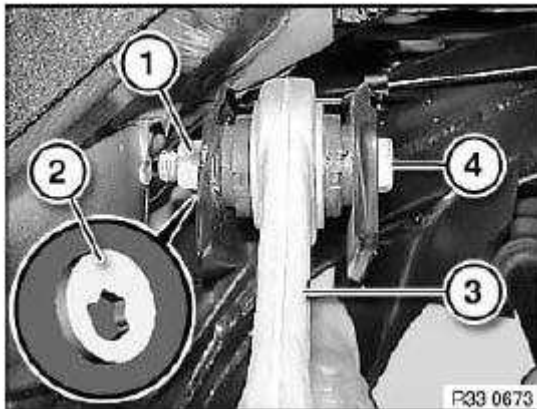


Fig. 101: Identifying Guide Arm And Eccentric Washer
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

33 32 125 REPLACING A BALL JOINT IN LOWER STEERING KNUCKLE/WHEEL CARRIER

Special tools required:

- **33 3 333**
- **33 4 191**
- **33 4 192**
- **33 4 193**
- **33 4 194**

Necessary preliminary tasks:

- Remove **INTEGRAL ARM**

- Remove **STABILIZER LINK FROM SWINGING ARM**
- Remove **SHOCK ABSORBER FROM SWINGING ARM**

Reconditioning special tool:

Cut highlighted area out of special tool **33 4 191** and then deburr.

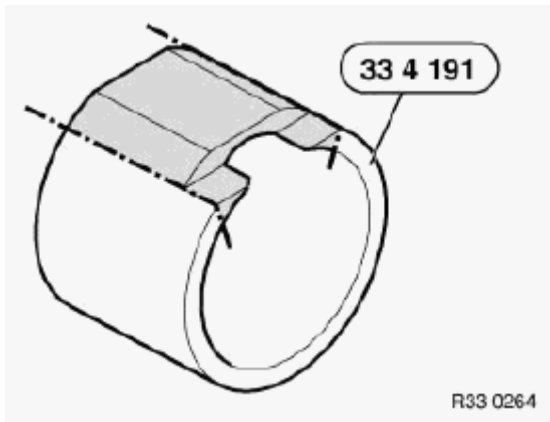


Fig. 102: Cutting Highlighted Area Out Of Special Tool (33 4 191)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove circlip (1).

Pull out ball joint with special tools **33 4 193** , **33 4 191** , **33 4 192** and **33 3 333**. Slotted side of special tool **33 4 191** must point to wheel carrier.

Installation:

Install new circlip (1).

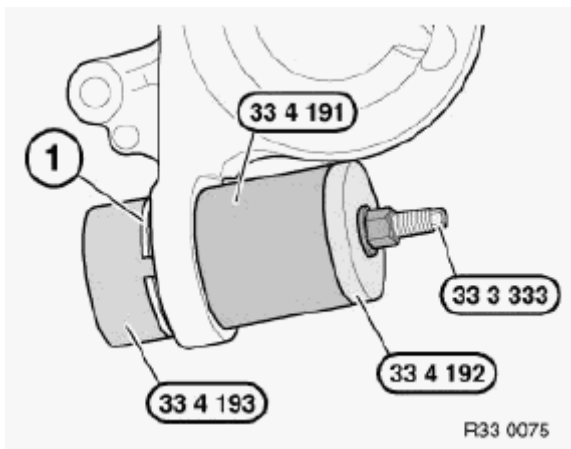


Fig. 103: Identifying Special Tools (33 4 193) With Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

Draw in new ball joint (1) with special tools 33 3 333 , 33 4 192 , 33 4 191 and 33 4 194 as far as it will go.

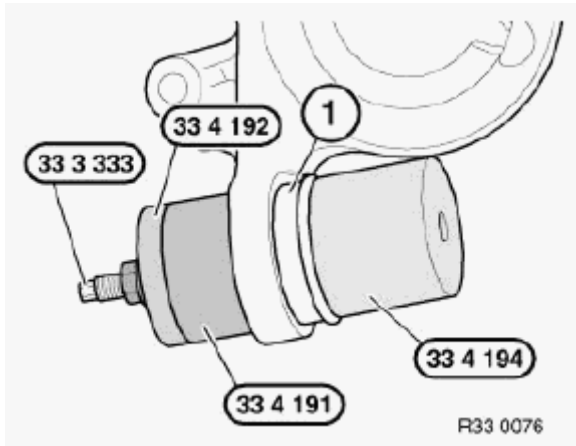


Fig. 104: Identifying Special Tools (33 3 333) With Ball Joint
Courtesy of BMW OF NORTH AMERICA, INC.

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** .

33 32 131 REMOVING AND INSTALLING/REPLACING A STEERING KNUCKLE/WHEEL CARRIER

Remove **REAR WHEEL**

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

Release collar nut (1), activate parking brake for this purpose.

Installation:

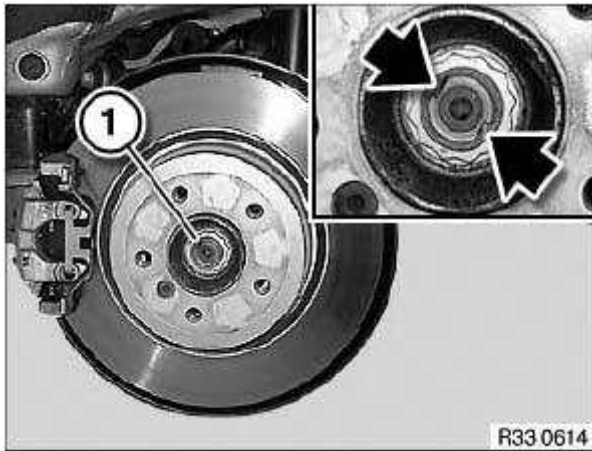


Fig. 105: Locating Collar Nut
Courtesy of BMW OF NORTH AMERICA, INC.

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 **33 41 1AZ** .

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

Remove **EXPANDER LOCK FOR HANDBRAKE SHOES** .

Remove handbrake Bowden cable from wheel carrier (see **ACTUATING UNIT (EMF)**).

Remove **WHEEL BEARING** (do not pull out drive flange).

Remove **PULSE GENERATOR FROM WHEEL CARRIER** .

Tension **REAR COIL SPRING** and leave on vehicle at rear.

IMPORTANT:

- Check sensor head and line from pulse generator prior to installation for external damage, replacing if necessary.

Version with ride-height control:

Deactivate and drain **AIR SPRING/SUSPENSION SYSTEM**

IMPORTANT: Do not use any tools to remove the lower section of the air spring (1).

Tilt lower section of air spring (1) by hand towards front/side.

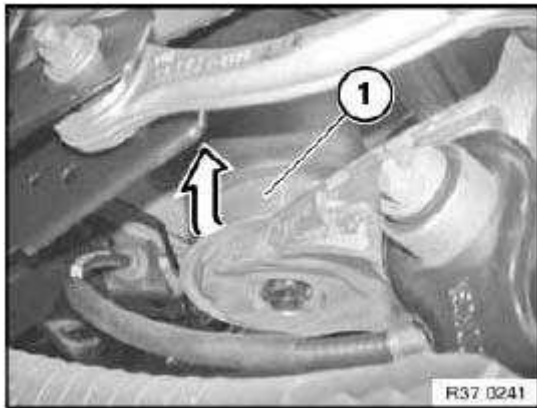


Fig. 106: Pressing Lower Section Of Air Spring
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Press lower section of air spring (1) by hand into wheel carrier until it can be seen and heard to snap into place.

IMPORTANT: Secure wheel carrier against falling out.

Remove INTEGRAL LINK.

Remove GUIDE ARM FROM WHEEL CARRIER.

Remove UPPER CONTROL ARM FROM WHEEL CARRIER.

Remove wheel carrier.

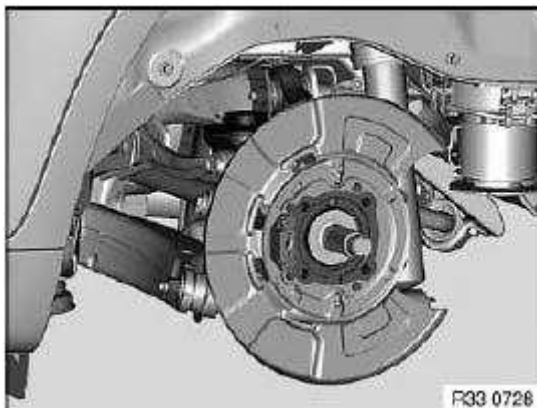


Fig. 107: Identifying Wheel Carrier
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement

Modify **BRAKE CARRIER/BRAKE GUARD PLATE** .

IMPORTANT: Make sure spring pad is correctly installed in order to prevent the coil spring from jumping out.

Modify lower spring pad (1). To do so, lever out upper section (2) with a suitable tool.

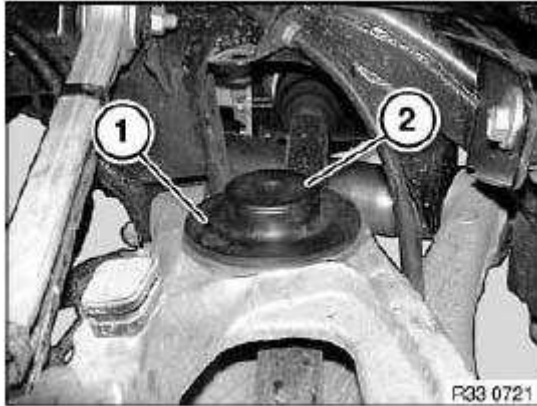


Fig. 108: Identifying Upper Section And Lower Spring Pad
Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Activate and fill **AIR SUSPENSION SYSTEM**
- Adjusting **PARKING BRAKE**
- 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** .

33 32 153 REMOVING AND INSTALLING/REPLACING FRONT COMPRESSION STRUT

IMPORTANT: Observe **SAFETY INSTRUCTIONS** for raising the vehicle

Driving without compression struts is not permitted!

Necessary preliminary tasks:

- Remove **UNDERBODY PANELLING (REAR SECTION)**

Release screws (1).

Tightening torque **33 33 2AZ** .

Release screw (3).

Tightening torque **33 33 2AZ** .

Release screw (2) and remove compression strut (4).

Secure rear axle carrier by inserting screw (2).

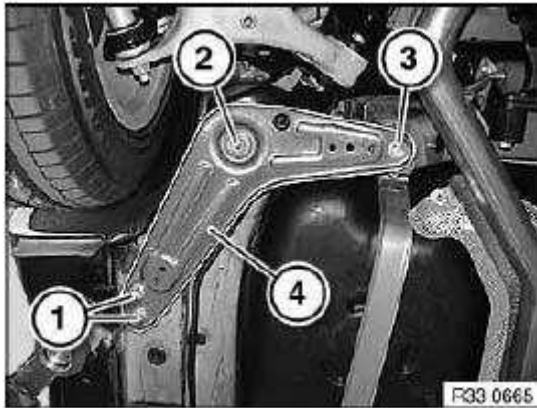


Fig. 109: Identifying Compression Strut With Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Tightening torque **33 33 1AZ** .

33 32 155 REMOVING AND INSTALLING/REPLACING REAR COMPRESSION STRUT

IMPORTANT: Observe SAFETY INSTRUCTIONS for raising the vehicle

Driving without compression struts is not permitted!

Release screw (1).

Tightening torque **33 33 3AZ** .

Release screw (3) and remove compression strut (2).

Secure rear axle carrier by inserting screw (3).

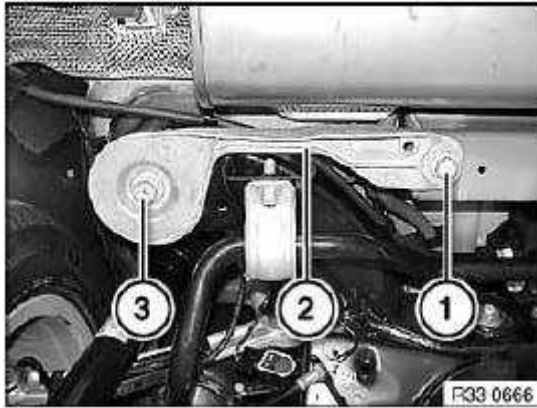


Fig. 110: Identifying Compression Strut And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

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

Tightening torque **33 33 1AZ** .

AXLE MOUNTING

33 33 111 REPLACING ALL RUBBER MOUNTS FOR REAR AXLE CARRIER

Special tools required:

- **33 4 140**
- **33 4 155**
- **33 4 156**
- **33 5 171**
- **33 5 172**
- **33 5 173**

IMPORTANT: Before lowering rear 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 rear axle carrier. See **33 31 503 LOWERING/RAISING REAR AXLE CARRIER (SPECIAL TOOL SWZ00-2040)** and **33 31 503 LOWERING/RAISING REAR AXLE CARRIER (UNIVERSAL LIFTER)**.

WARNING: Danger of explosion!

Do not point air jet from hot air blower at fuel tank!

Withdraw rubber mount using special tools 33 4 140 , 33 4 155 , 33 4 156 and 33 5 171 from rear axle carrier sleeve.

NOTE: **Make sure special tool 33 5 171 is correctly positioned in relation to rubber mount.**
 Make sure special tool 33 4 140 is correctly supported on rear axle carrier sleeve.
 Using a hot air blower, heat bearing bushing at max. 600°C outlet temperature for approx. 2 minutes.

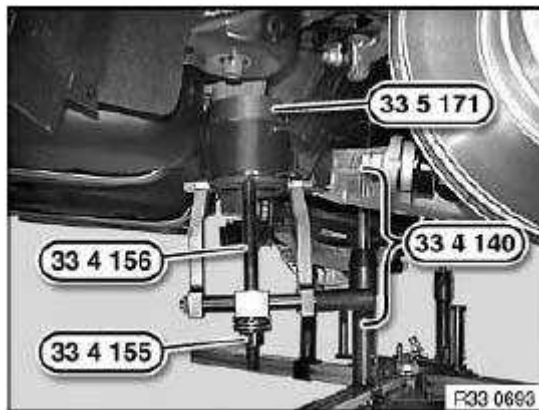


Fig. 111: Identifying Special Tool (33 5 171)
Courtesy of BMW OF NORTH AMERICA, INC.

Applicable to front rubber mount:

IMPORTANT: Notch (1) must point to right and round rubber mount opening (2) must point downwards.

Coat rubber mount (3) with Circo Light.

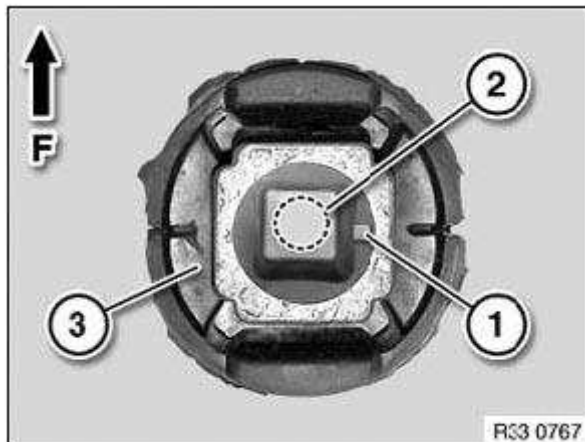


Fig. 112: Identifying Front Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Applicable to rear rubber mount:

IMPORTANT: Notch (1) must point to left and round rubber mount opening (2) must point downwards.

Coat rubber mount (3) with Circo Light.

Draw in rubber mount (1) with special tools 33 5 173 , 33 5 172 , 33 4 155 and 33 4 156 as far as it will go into rear axle carrier sleeve.

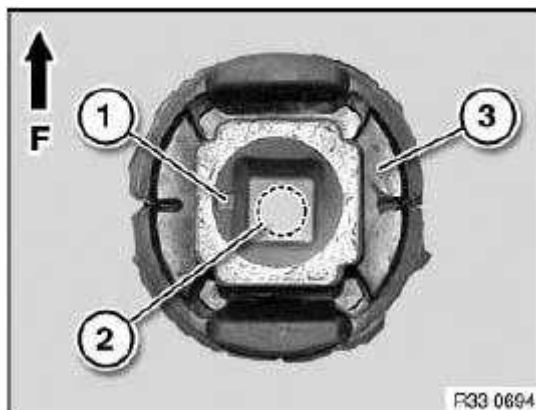


Fig. 113: Identifying Rear Rubber Mount
Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Activate and fill **AIR SUSPENSION SYSTEM**
- Bleed **BRAKING SYSTEM**

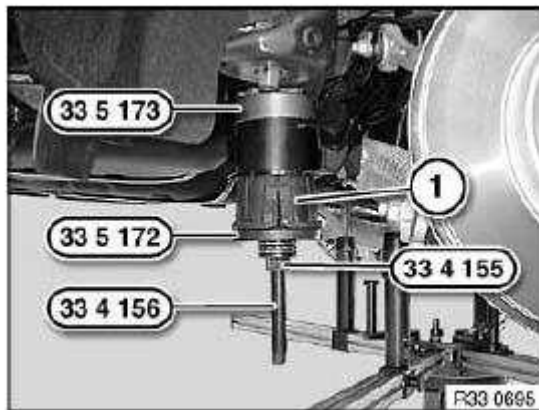


Fig. 114: Identifying Rubber Mount With Special Tools (33 5 173 And 33 5 172)
 Courtesy of BMW OF NORTH AMERICA, INC.

33 33 111 REPLACING ALL RUBBER MOUNTS FOR REAR AXLE SUPPORT

Special tools required:

- 33 0 001
- 33 0 002
- 33 0 011
- 33 0 012
- 33 0 051
- 33 0 052
- 33 0 140

IMPORTANT: Before removing rear axle support: In order to avoid damage to the vehicle hoists, perform weight compensation on vehicle. Load luggage compartment with sand bags.

Necessary preliminary tasks:

- Remove **rear axle support** .

Picture shows F01. Press-out and press-in directions pictured.

- Front rubber mount (1) is pulled out and in a downward direction.
- Rear rubber mount (2) is pulled out and in an upward direction.

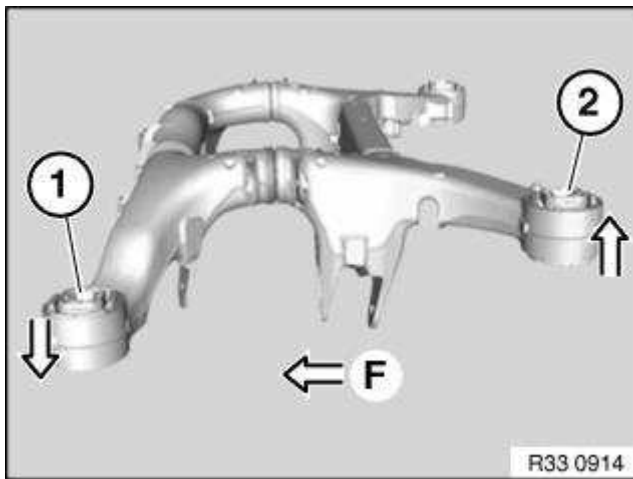


Fig. 115: Removing Front & Rear Rubber Mounts
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Removal and installation are described on the front rubber mount.

NOTE: Edges (2) break off when rubber mount (1) is pulled out in the direction of arrow.

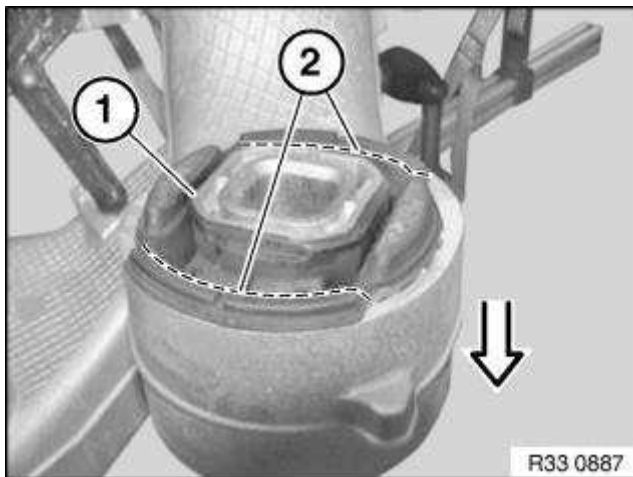


Fig. 116: Edges (2) Break Off When Rubber Mount (1) Is Pulled Out In Direction Of Arrow
 Courtesy of BMW OF NORTH AMERICA, INC.

Assemble special tool 33 4 140 in conjunction with 33 0 011 and 33 0 012.

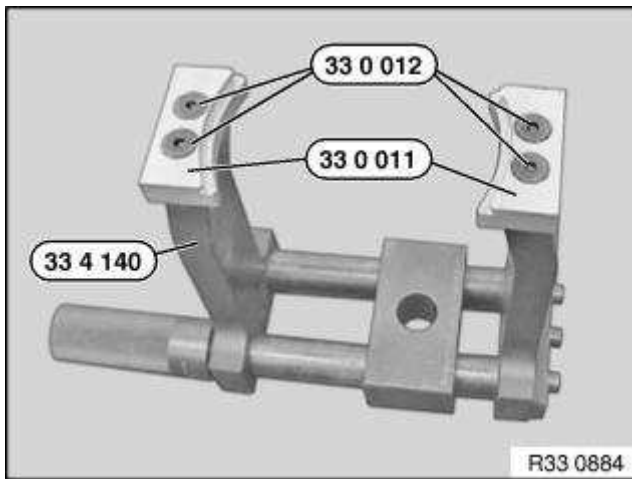


Fig. 117: Assemble Special Tool 33 4 140
 Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw rubber mount using special tools 33 4 140, 33 0 051, 33 0 052 and 33 0 001 from rear axle support bush.

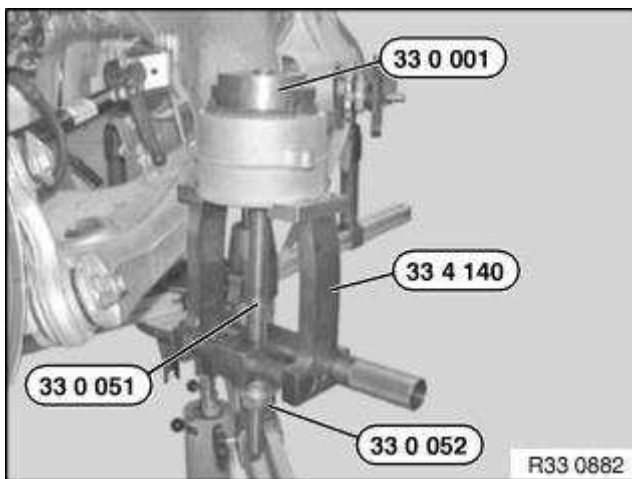


Fig. 118: Withdraw Rubber Mount From Rear Axle Support Bush
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Make sure special tool 33 0 001 is correctly positioned in relation to rubber mount. Make sure special tool 33 4 140 is correctly supported on rear axle support bush.

Applicable to front rubber mount: (View of rear axle support from above)

IMPORTANT: Arrow (1) must point on rubber mount (2) in direction of travel.

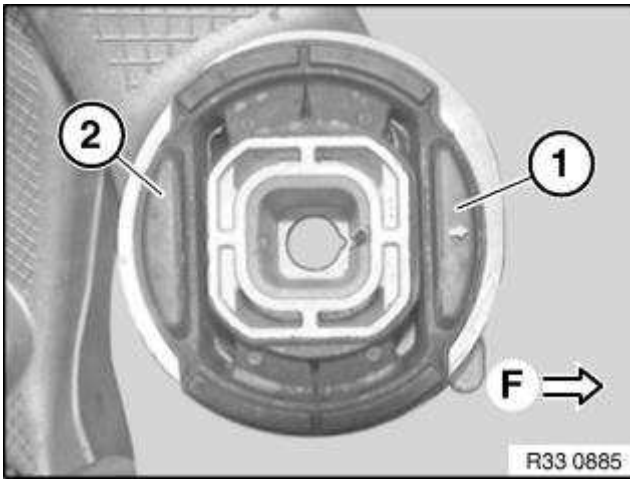


Fig. 119: Arrow (1) Must Point On Rubber Mount (2) In Direction Of Travel
 Courtesy of BMW OF NORTH AMERICA, INC.

Applicable to rear rubber mount: (View of rear axle support from below)

IMPORTANT: Notch (1) and arrow (2) on rubber mount (3) must point in direction of travel.

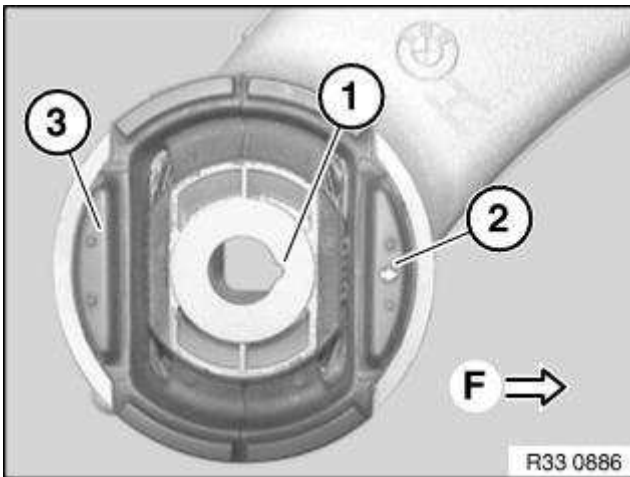


Fig. 120: Notch (1) And Arrow (2) On Rubber Mount (3) Must Point In Direction Of Travel
 Courtesy of BMW OF NORTH AMERICA, INC.

Draw in rubber mount (1) with special tools 33 0 002, 33 4 140, 33 0 052 and 33 0 051 as far as it will go into rear axle support bush.

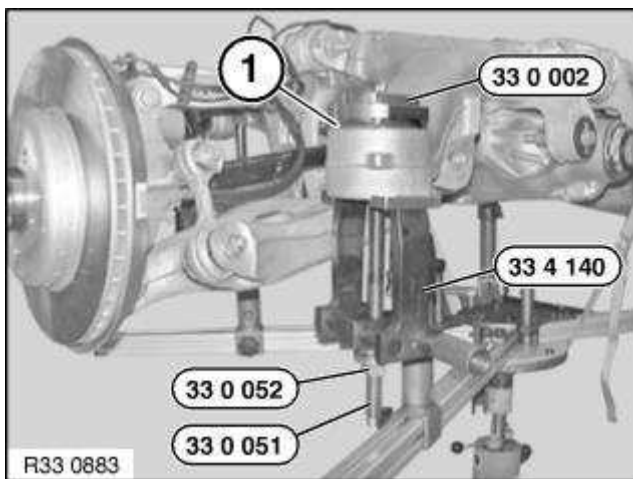


Fig. 121: Draw In Rubber Mount As Far As It Will Go Into Rear Axle Support Bush
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation: For F01/F02/F07 only: Activate and fill air suspension system

WHEEL BEARING

33 41 000 REPLACING DRIVE FLANGE ON LEFT/RIGHT REAR AXLE SHAFT

Special tools required: See **REAR AXLE - SPECIAL TOOLS**

- 33 2 116
- 33 2 160
- 33 2 201
- 33 4 200

Remove **REAR WHEEL** .

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

Release collar nut (1), activate parking brake for this purpose.

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 **33 41 1AZ** .

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

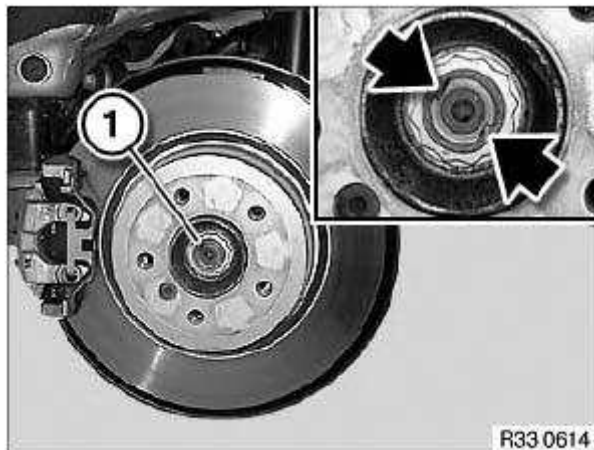


Fig. 122: Locating Collar Nut

Courtesy of BMW OF NORTH AMERICA, INC.

Remove **BRAKE DISC** .

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.**

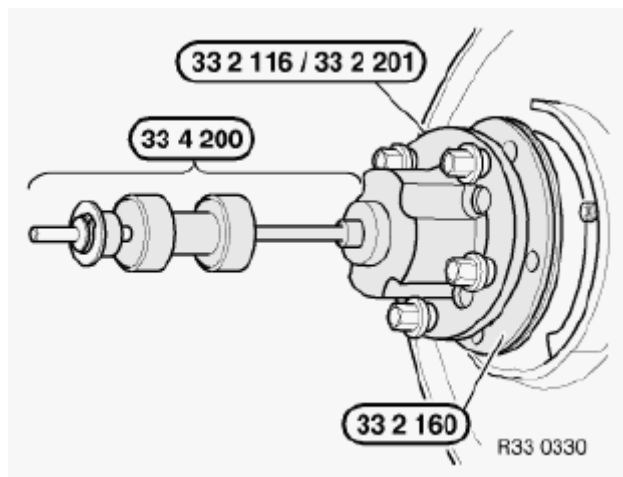


Fig. 123: Pressing Drive Flange With Special Tools (33 2 116)

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The wheel bearing is destroyed when the drive flange is removed and cannot be reused!

Replace **WHEEL BEARING**.

Installation:

Oil drive flange lightly and attach to splines of output shaft.

Draw **DRIVE FLANGE INTO WHEEL BEARING.**

After installation

- Adjusting **PARKING BRAKE**

33 41 151 REPLACING LEFT OR RIGHT WHEEL BEARING ON REAR AXLE SHAFT

IMPORTANT: Do not damage multipole impulse ring.

Necessary preliminary tasks:

- Remove **DRIVE FLANGE FOR REAR AXLE SHAFT**

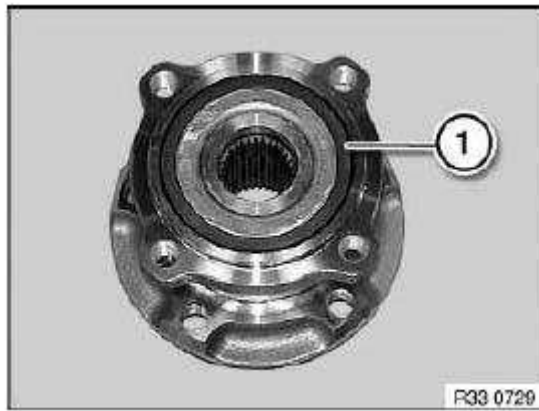


Fig. 124: Identifying Wheel Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws.

Remove wheel bearing.

Installation:

Stick in screws again/replace.

Tightening torque **33 41 2AZ** .

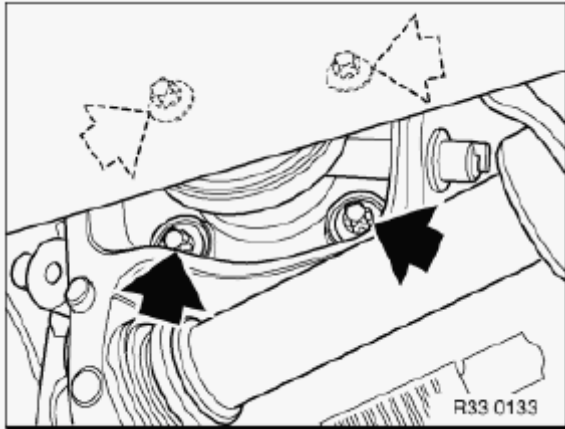


Fig. 125: Locating Screws

Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep contact surface (2) of wheel bearing/wheel carrier clean and free from oil and grease.

Except when replacing: Recondition tapped holes (1).

Install new wheel bearing.

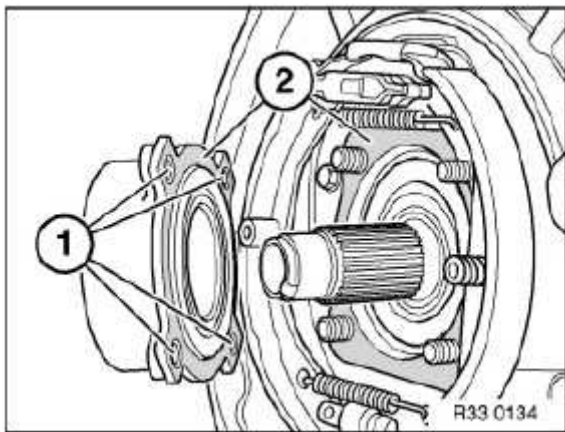


Fig. 126: Identifying Wheel Bearing Contact Surface

Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Adjusting **PARKING BRAKE**

33 41 ... DETACHING WHEEL BEARING INNER RACE FROM DRIVE FLANGE (DRIVE FLANGE REMOVED)

Special tools required:

- 33 1 307
- 33 4 400
- 33 4 401
- 33 4 402
- 33 4 403
- 33 4 404
- 33 4 405
- 33 4 406
- 33 4 407

NOTE: Detach wheel bearing inner race with special tool 33 4 400 through groove in wheel bearing inner race.

Position special tool 33 1 307 on drive flange.

Select one of the following special tools using the wheel bearing inner race and insert into special tool 33 4 401

33 4 405 for dia. 45 - 51 mm

33 4 406 for dia. 50 - 55 mm

33 4 407 for dia. 55 - 61 mm.

Screw in special tool 33 4 402 until tapered attachment of spindle comes into contact with special tool 33 4 401 .

Position special tool 33 4 401 with corresponding insert on groove of wheel bearing inner race.

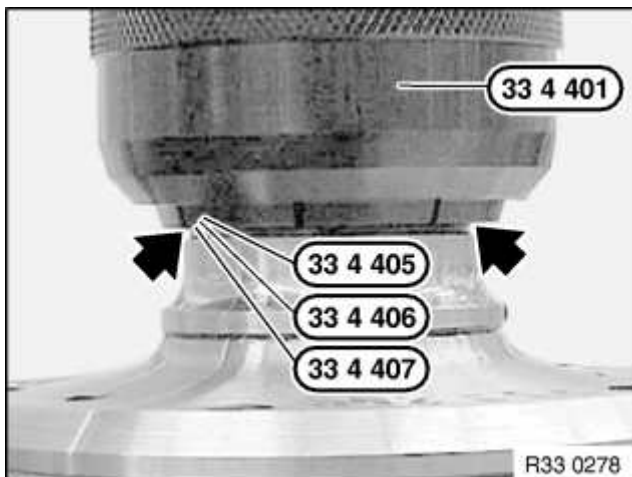


Fig. 127: Positioning Special Tool 33 4 401 With Corresponding Insert On Groove Of Wheel Bearing

Inner Race
Courtesy of BMW OF NORTH AMERICA, INC.

Compress special tool 33 4 401 with wrenches 33 4 403 and 33 4 404 until special tool can still just be turned in groove.

Detach wheel bearing inner race by turning special tool 33 4 402 .

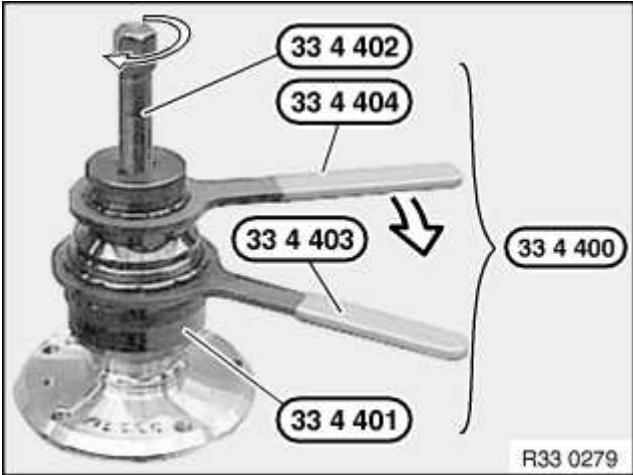


Fig. 128: Compressing Special Tool 33 4 401 With Wrenches 33 4 403 And 33 4 404 Until Special Tool Can Still Just Be Turned In Groove
Courtesy of BMW OF NORTH AMERICA, INC.

SHOCK ABSORBER

33 52 000 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT SHOCK ABSORBER

- NOTE:**
- Read and comply with notes on replacing shock absorbers. See 33 00 ... INFORMATION ON REPLACING SHOCK ABSORBERS and 33 90 ... TROUBLESHOOTING SHOCK ABSORBER.
 - Read and comply with BMW Parts Service notes.

IMPORTANT: Only for vehicles with ride-height control (air suspension).
Ensure correct mating (absorber/support pot) when replacing shock absorbers.

The following mating combinations (absorber/support pot) are permissible.

DIMENSION SPECIFICATION

Damper	Support pot
A 394.5 mm	B 69.2 mm
C 347.5 mm	C 22.0 mm

Absorber/support pot mating must be identical on left/right sides.

Version with Vertical Dynamics Management:

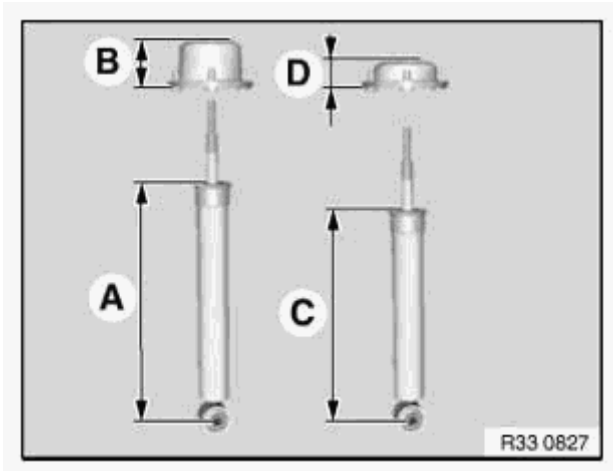


Fig. 129: Identifying Damper And Support Pot Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

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

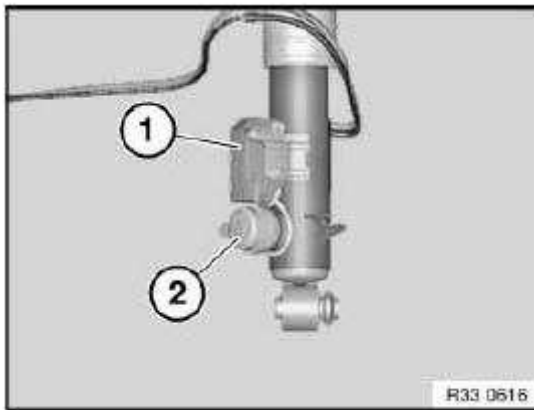


Fig. 130: Identifying Control Unit And Control Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

- Remove **REAR WHEEL**
- Tension both **COIL SPRINGS WITH SPECIAL TOOL** (and leave on vehicle)
- Version with ride-height control: Deactivate and drain **AIR SPRING SYSTEM**
- E70 only: Version with 3rd seat row: Remove lashing rail in luggage compartment.

Version with Vertical Dynamics Management:

NOTE: The plug connections on the right side are shown.

Partially detach **REAR WHEEL ARCH COVER** .

Detach both plug connections (3) and expose lines up to shock absorber.

1. Plug connection for brake pad wear sensor
2. Plug connection for pulse generator

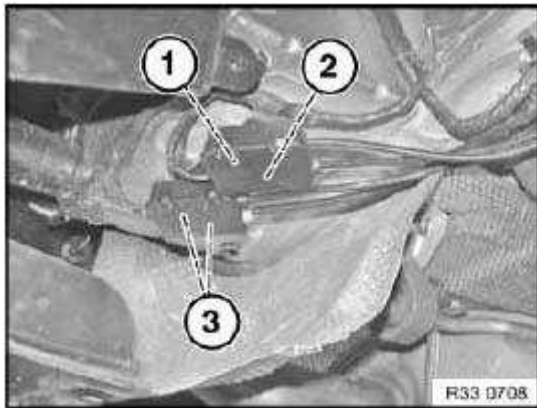


Fig. 131: Identifying Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Release retainer (1) and remove brake hose (2) from shock absorber (4).

Installation:

When installing the shock absorber, ensure that the holder for the brake hose (2) points to the middle of the vehicle.

Ensure correct seating in guide.

Retainer must be felt and heard to snap into place.

Release screw (3).

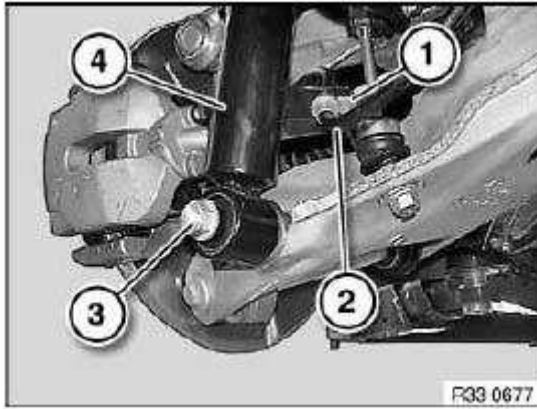


Fig. 132: Identifying Brake Hose And Shock Absorber
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Secure shock absorber against falling out.

Remove shock absorber (4) from swinging arm and tie back.

IMPORTANT: Before tightening screw/bolt connection, check that shock absorber pin is correctly positioned in swinging arm.

Screw must not be used as an aid to installing the shock absorber!

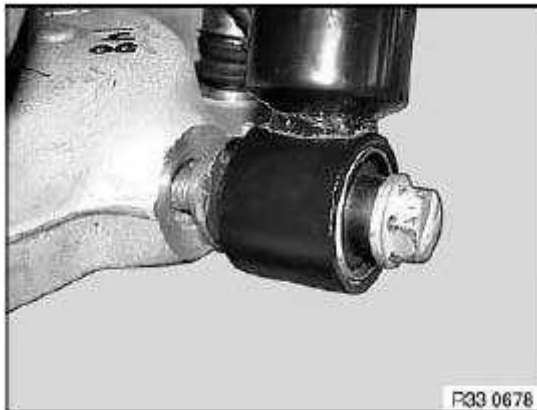


Fig. 133: Identifying Shock Absorber Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace screw.

Tighten bolt in **NORMAL POSITION** .

Tightening torque **33 52 3AZ** .

IMPORTANT: Risk of damage!

Do not pull expanding clips with luggage compartment tray out of lashing rail.

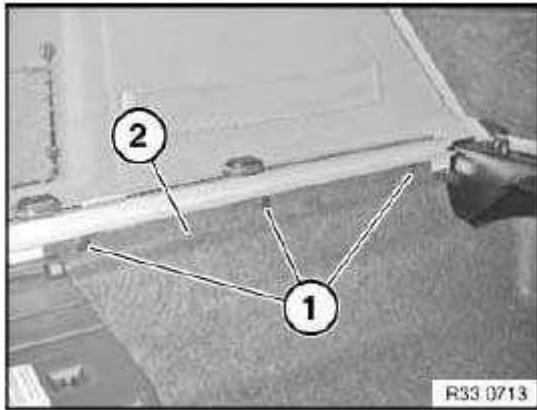


Fig. 134: Identifying Expanding Clips And Compartment Tray
Courtesy of BMW OF NORTH AMERICA, INC.

Release expanding clips (1).

Press luggage compartment tray (2) to one side.

Installation:

Replace damaged expanding clips.

NOTE: **Pictured: the support pot for steel spring suspension or 5-seater with ride-height control up to 09/2007, both for conventional shock absorbers and controlled shock absorbers. From 09/2007 this support pot will only be fitted in vehicles with steel spring suspension.**

Unscrew nuts (1).

Installation:

Replace self-locking nuts.

Tightening torque **33 52 1AZ** .

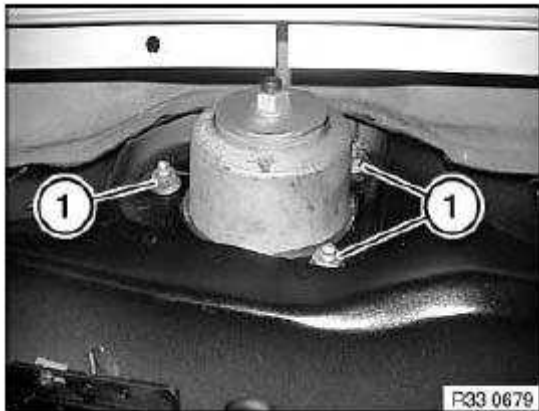


Fig. 135: Identifying Shock Absorbers Nuts
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove shock absorber if necessary with connecting lines in downward direction.

Installation:

Clean body contact surface for support bearing flange all round.



Fig. 136: Identifying Shock Absorber
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Replace faulty sealing washer (1).

Refit sealing washer (1).

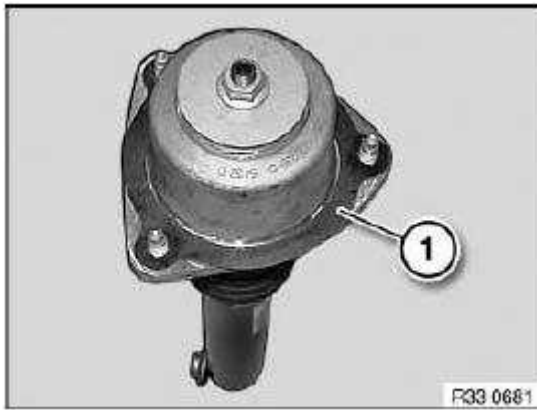


Fig. 137: Identifying Sealing Washer
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement

Modify **SUPPORT BEARING**.

Modify auxiliary damper (1) and protective tube (2) incl. support pot ().

Installation:

Check auxiliary damper (1) and protective tube (2) for damage, replace if necessary.

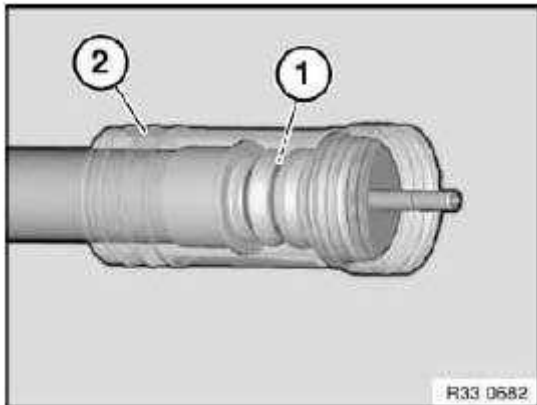


Fig. 138: Identifying Auxiliary Damper And Protective Tube
Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Activate and fill **AIR SUSPENSION SYSTEM**
- Replacement only: Code shock absorber with DIS Tester and check software status
- Replacement only: Carry out **VERTICAL ACCELERATION SENSOR ADJUSTMENT**

33 52 161 REPLACING REAR LEFT OR RIGHT THRUST BEARING FOR SPRING STRUT/SHOCK ABSORBER

- NOTE:
- Read and comply with notes on replacing shock absorbers. See 33 00 ... INFORMATION ON REPLACING SHOCK ABSORBERS and 33 90 ... TROUBLESHOOTING SHOCK ABSORBER.
 - Read and comply with BMW Parts Service notes.

IMPORTANT: Only for vehicles with ride-height control (air suspension).

Ensure correct mating (absorber/support pot) when replacing shock absorbers.

The following mating combinations (absorber/support pot) are permissible.

DIMENSION SPECIFICATION

Damper	Support pot
A 394.5 mm	B 69.2 mm
C 347.5 mm	C 22.0 mm

Absorber/support pot mating must be identical on left/right sides.

Necessary preliminary tasks:

- Remove REAR SHOCK ABSORBER

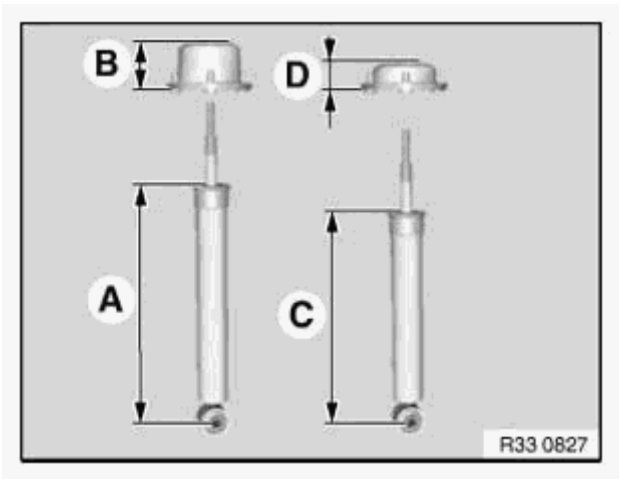


Fig. 139: Identifying Damper And Support Pot Dimension
Courtesy of BMW OF NORTH AMERICA, INC.

Slacken nut (1).

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

Installation:

Insert support bearing upper section (3) correctly in support bearing flange (4).

Replace self-locking nut.

Tightening torque **33 52 2AZ** .

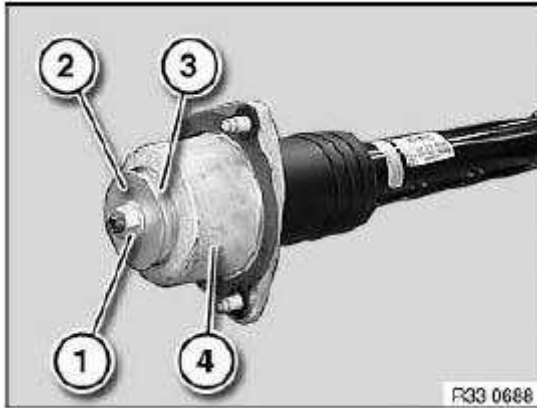


Fig. 140: Identifying Joint Disc And Bearing Upper Section With Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Remove spacer sleeve (1) with support bearing lower section (2).

Check protective tube (3) for damage, replace if necessary.

Installation:

Insert spacer sleeve (1) correctly in support bearing lower section (2).

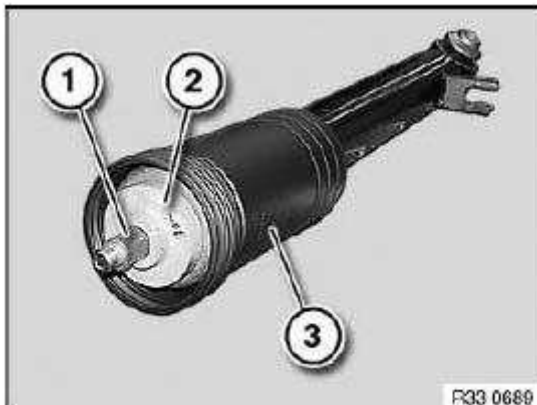


Fig. 141: Identifying Spacer Sleeve And Protective Tube
Courtesy of BMW OF NORTH AMERICA, INC.

SPRINGS WITH SUSPENSION

33 53 ... 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).

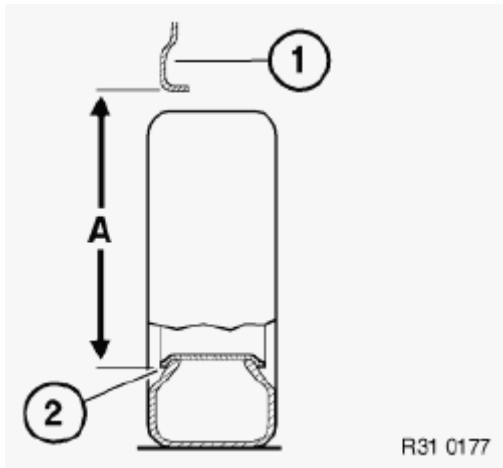


Fig. 142: Measuring Lower Edge Of Wheel Arch
Courtesy of BMW OF NORTH AMERICA, INC.

33 53 000 REMOVING AND INSTALLING/REPLACING REAR LEFT OR RIGHT COIL SPRING

Special tools required:

- **33 5 100**
- **33 5 101**
- **33 5 102**
- **33 5 103**
- **33 5 104**
- **33 5 105**

NOTE: Use spring tensioner 33 5 100 to remove and install the coil spring in order to avoid overelongating the rubber mounts (control arm, guide arm, swinging arm).

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

Avoid damaging the coil spring coating.

WARNING: Prior to each use of the special tool 33 5 100 , 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 **REAR WHEEL** .
- Remove **STABILIZER LINK FROM SWINGING ARM**
- Remove **REAR SHOCK ABSORBER FROM SWINGING ARM** (remove brake hose)
- Lower workshop jack and place to one side

Removal

Lever conical cover (1) with a suitable tool out of lower spring pad.

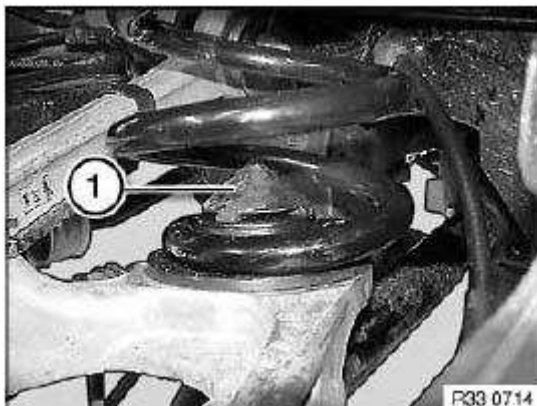


Fig. 143: Identifying Conical Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Feed spindle **33 5 103** into coil spring and turn thrust piece **33 5 104** downwards.

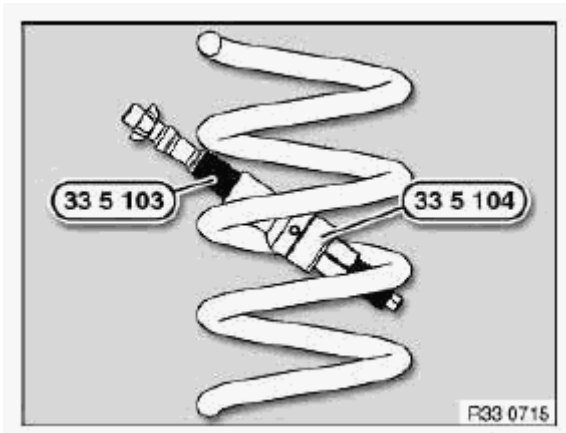


Fig. 144: Feeding Spindle Into Coil Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Insert lower spring retainer **33 5 102** into coil spring and turn downwards over spindle **33 5 103**.

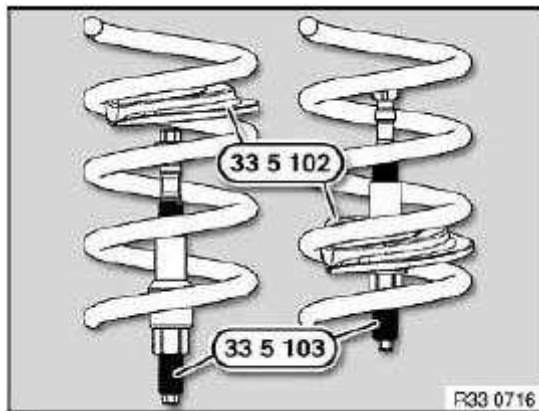


Fig. 145: Inserting Lower Spring Retainer Into Coil Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Insert upper spring retainer **33 5 101** sideways into coil spring and turn fully upwards.

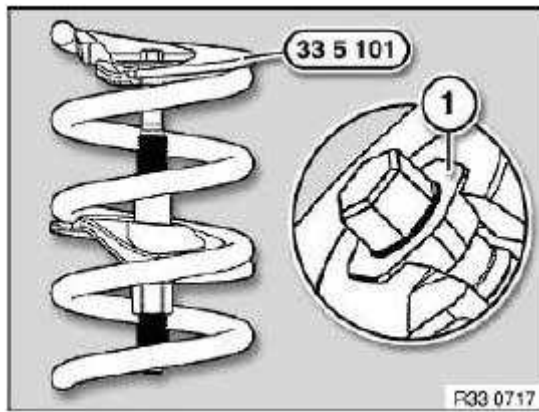


Fig. 146: Inserting Upper Spring Retainer Into Coil Spring
 Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury!

Align spring tensioner 33 5 100 centrally in order to obtain the largest possible contact surface on the coil spring.

Make sure hexagon cap (1) is correctly seated in upper spring retainer 33 5 101.

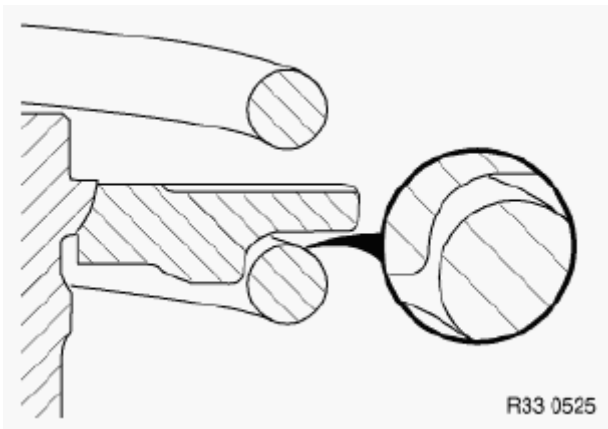


Fig. 147: Identifying Coil Spring Correct Installation Position
 Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Risk of injury!

Make sure coil spring is correctly positioned in spring plates.

WARNING: Risk of injury!

Make sure detent pin (1) is correctly positioned in recesses of lower spring retainer **33 5 102**.

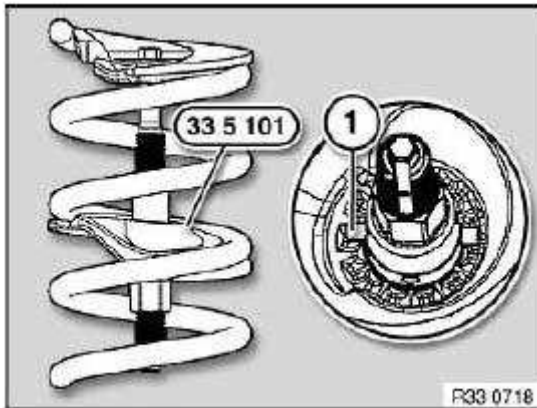


Fig. 148: Identifying Detent Pin With Special Tools (33 5 101)
Courtesy of BMW OF NORTH AMERICA, INC.

Check installation position of spring tensioner (**33 5 100**), correct if necessary.

NOTE: Make sure there is sufficient clearance ($A = 7 \text{ cm}$) between spindle **33 5 103** and lower spring pad.

Tension coil spring using special tool **33 5 105** ; if necessary, grip coil spring.

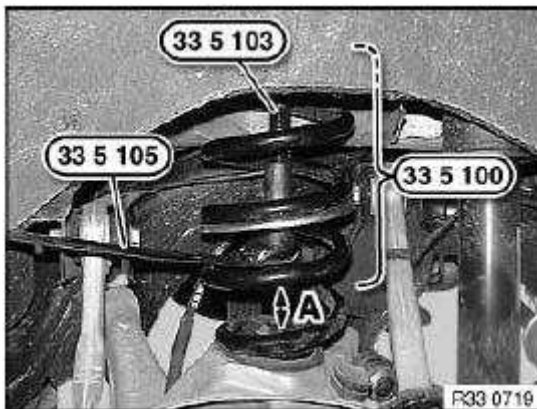


Fig. 149: Identifying Tension Coil Spring Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Turn coil spring through $A = 30^\circ$ in clockwise direction.

Press wheel carrier downwards a little and remove coil spring sideways.

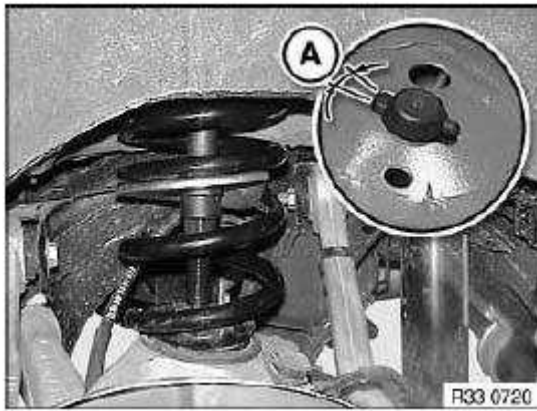


Fig. 150: Turning Coil Spring
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove upper spring pad (1) from coil spring, check for damage and replace if necessary.

If necessary, relieve tension on coil spring.

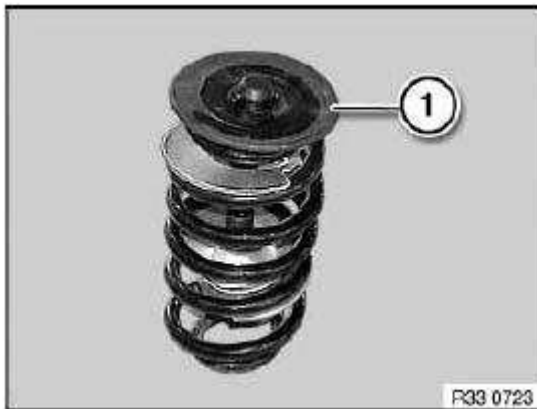


Fig. 151: Identifying Upper Spring Pad
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check lower spring pad (1) for damage.

IMPORTANT: Make sure spring pad is correctly installed in order to prevent the coil spring from jumping out.

If necessary, lever out upper section (2) with a suitable tool and replace spring pad with upper section.

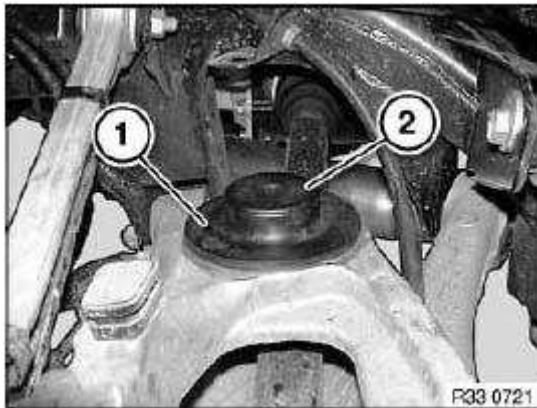


Fig. 152: Identifying Lower Spring Pad And Upper Section
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Make sure spring pad is correctly installed in order to prevent the coil spring from jumping out.

Install upper spring pad (1) in locator or frame side member and turn clockwise as far as it will go.

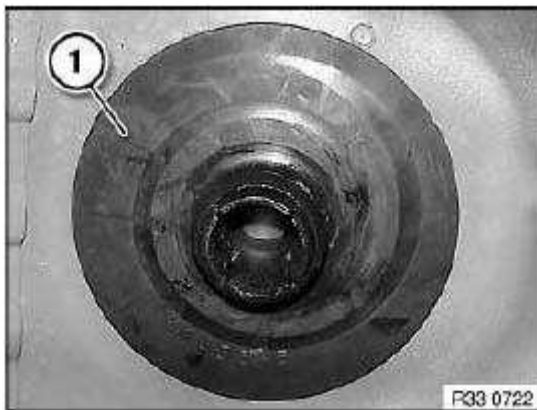


Fig. 153: Identifying Upper Spring Pad
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Make sure coil spring is correctly seated in spring pads.

Insert coil spring with spring tensioner 33 5 100 between upper and lower spring pads and relieve tension.

Relieve tension on spring tensioner 33 5 100 and remove.

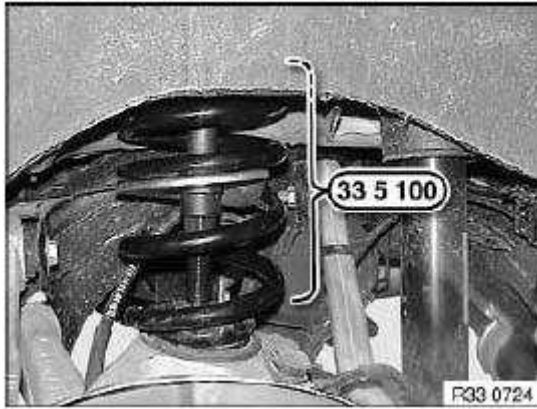


Fig. 154: Inserting Coil Spring With Spring Tensioner (33 5 100) Between Upper And Lower Spring Pads
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation

- Check headlight adjustment, correct if necessary

STABILIZER BAR

33 55 000 REMOVING AND INSTALLING/REPLACING REAR STABILIZER

Necessary preliminary tasks:

- Remove both **STABILIZER LINKS FROM STABILIZER**

Release screws (1).

Replacement only: Remove **BOTH RUBBER MOUNTS FROM STABILIZER.**

Turn stabilizer (2) and remove sideways.

Installation:

Check **BOTH RUBBER MOUNTS FOR DAMAGE**, replace if necessary.

Align stabilizer centrally.

Tightening torque **33 55 1AZ** .

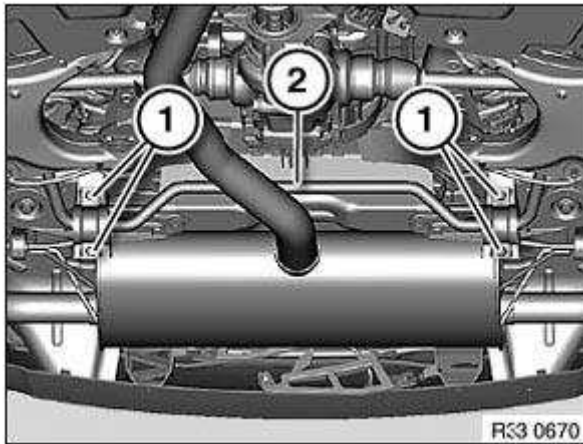


Fig. 155: Identifying Stabilizer With Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

33 55 021 REPLACING BOTH RUBBER MOUNTS FOR STABILIZER MOUNTING

Necessary preliminary tasks:

- Remove **STABILIZER FROM REAR AXLE CARRIER**

IMPORTANT: Circo Light must not be used between stabilizer and rubber mount!

Remove retaining bracket (1) and rubber mount (2) from stabilizer.

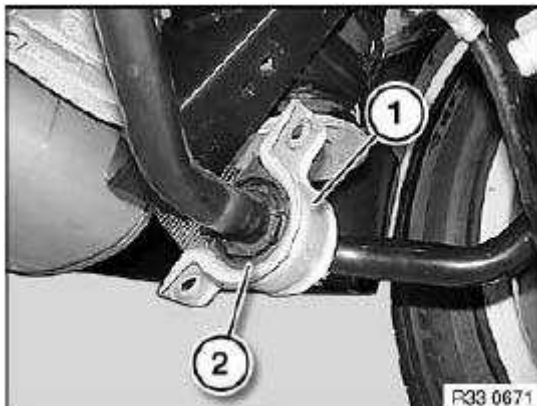


Fig. 156: Identifying Retaining Bracket And Rubber Mount
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Coat rubber mount with Circo Light to install retaining bracket.

Installation:

Keep stabilizer clean and free of oil and grease.

Mount rubber mount (1) by way of slot (2) as pictured on stabilizer.

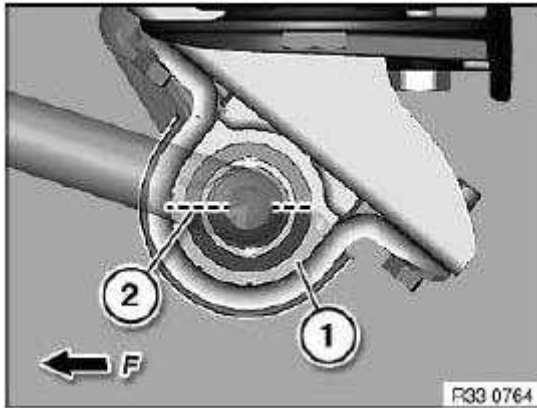


Fig. 157: Identifying Rubber Mount

Courtesy of BMW OF NORTH AMERICA, INC.

33 55 040 REPLACING STABILIZER LINKS FOR STABILIZER

IMPORTANT: Observe SAFETY INSTRUCTIONS for raising the vehicle

Unscrew nuts (1).

Remove stabilizer link (2).

Installation:

Replace self-locking nuts.

Tightening torque 33 55 2AZ .

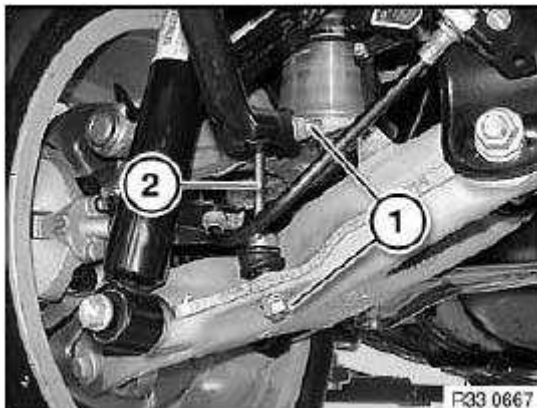


Fig. 158: Identifying Stabilizer Link And Nuts

TROUBLESHOOTING

33 90 ... REAR AXLE TROUBLESHOOTING

Observe TROUBLESHOOTING FOR SHOCK ABSORBERS.

TROUBLESHOOTING CHART

Fault	Cause	Remedy
Grinding noise (only when cornering)	Refer to <u>TROUBLESHOOTING BRAKE SYSTEM</u>	
	Wheel bearings faulty	Replace <u>WHEEL BEARINGS</u>
Vibration (90 - 160 km/h)	Wheel imbalance	Balance <u>WHEELS</u>
	Radial/lateral rim runout	Check rims, replace if necessary. See <u>36 10 715 CHECKING RIM FOR FACE AND RADIAL RUNOUT</u> , <u>36 12 001 REPLACING A TIRE</u> , and <u>36 12 005 REPLACING A RUNFLAT TIRE</u> .
	Radial tire runout	Match or replace tires. See <u>36 10 209 CHECKING FRONT AND REAR WHEEL FOR FACE AND RADIAL RUNOUT</u> , <u>36 10 713 CHECKING ONE ROAD WHEEL ON BALANCING MACHINE FOR FACE AND RADIAL RUNOUT (WHEEL REMOVED)</u> , <u>36 12 001 REPLACING A TIRE</u> , and <u>36 12 005 REPLACING A RUNFLAT TIRE</u> .
	Imbalance in output shaft	Replace output shaft
Drumming	Rubber mount of final drive suspension faulty	Replace rubber mount. See <u>FINAL DRIVE MOUNTING</u>
	Rubber mount of rear axle carrier faulty	Replace <u>RUBBER MOUNT</u>
	Imbalance in propeller shaft	Replace propeller shaft
Rattling noise	Refer to <u>TROUBLESHOOTING FOR SHOCK ABSORBERS</u> .	
	Stabilizer link loose or defective	Check screw connection, replace <u>STABILIZER LINK</u> if necessary
	Rubber mount of rear axle carrier loose or faulty	Check seat, replace <u>RUBBER MOUNT</u> if necessary
Poor straight-running stability (steering wheel inclination)	Refer to BMW diagnosis system "Troubleshooting tree wheel/chassis alignment check"	
Unsteady taking of		

curves due to self-steering or poor rear end track stability
Excessive tire wear

33 90 ... TROUBLESHOOTING REAR DIFFERENTIAL

In order to troubleshoot "Noises/leaks on rear differential", it is necessary to work through the fault diagnosis tree using the BMW Diagnosis and Information System.

See BMW Diagnosis and Information System under:

- Fault pattern selection
 - 331001 Noises rear differential
 - 331002 Leaks rear differential
- Service functions
 - Complete vehicle
 - Drive
 - Mechanics
 - Noises/leaks

33 90 ... TROUBLESHOOTING SHOCK ABSORBER

Read and comply with INFORMATION ON REPLACING SHOCK ABSORBERS.

TROUBLESHOOTING CHART

Fault	Cause	Remedy
Wheel knocking (bottoming)	Auxiliary damper faulty	Visually inspect auxiliary dampers for cracking, replace <u>AUXILIARY DAMPERS</u>
	Shock absorber leaking (oil/gas)	Replace <u>SHOCK ABSORBER</u>
Rattling noise	Shock absorber mounting loose	Tighten <u>SHOCK ABSORBER</u>
	Support bearing loose	Secure <u>SUPPORT BEARING</u>
	Support bearing defective (cracked)	Visually inspect for cracking, replace <u>SUPPORT BEARING</u>
	Protective tube defective/failed	Visually inspect protective tube for cracking, replace <u>PROTECTIVE TUBE</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>

REAR AXLE

KINEMATIC DIAGNOSIS SYSTEM AND ENVIRONMENT : BMW KDS (BEISSBARTH)

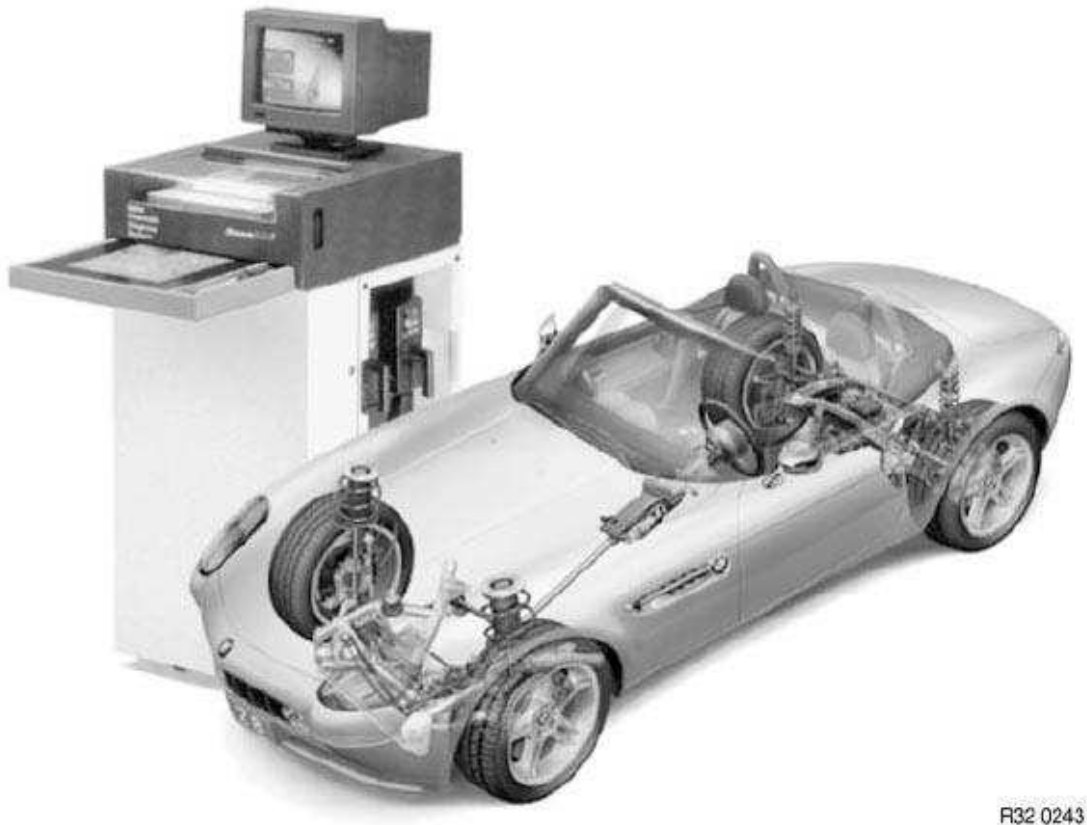


Fig. 1: Identifying Kinematic Diagnosis System And Environment
Courtesy of BMW OF NORTH AMERICA, INC.

1. Foreword

1.1 Objectives

Wheel alignment has become an increasingly complex subject. The aim of this BMW Service Technology bulletin, therefore, is to achieve several objectives:

- Creation of guidelines for working with the BMW Kinematic Diagnosis System (KDS).
- Familiarization with wheel alignment technology for current vehicles and clarifying any questions which arise in this connection.
- Transparency and clarification of different terms.

- Clarification of the causes of errors in the past, such that they can be avoided after reading this document.
- Creation of conditions for dealing safely with the BMW KDS.

1.2 Further development of the BMW Kinematic Diagnosis System

- The BMW Kinematic Diagnosis System is an integrated part of automotive system concepts. It ensures that work is carried out in a particularly rational manner which is appropriate for BMW requirements, such that you can also be certain of being prepared for future technological developments. As far as precision and performance in wheel alignment and tuning is concerned, BMW, together with leading manufacturers, has made the best of what is technically feasible: the BMW Kinematic Diagnosis System.
- The BMW Kinematic Diagnosis System manufactured by Beissbarth is more than just the further development of conventional wheel alignment equipment. It sets new standards in precision, performance, speed and handling. It is a guarantor for the perfection which BMW service customers rely on.
- Ride comfort, road safety and tire wear depend to a large extent on the perfect interplay of the vehicle's kinematic functions. BMW is constantly launching new generations of chassis which are even better than their predecessors. This is why there are fewer kinematics system adjusting points and narrower tolerances when measuring and tuning the chassis.
- With the use of the multi-link rear suspension and the E36, the electronic wheel alignment devices are no longer suitable for BMW wheel alignment purposes. This applies to both the measuring procedure and measuring precision. The generation of equipment which was approved with the E36 series still fulfils all the requirements placed on a modern wheel alignment device, including the use of the latest computer technology.
- Only BMW Kinematic Diagnosis Systems manufactured by Beissarth and Bosch may be used for wheel alignment.

1.3 Technical Data



Fig. 2: Technical Data Screen Display
Courtesy of BMW OF NORTH AMERICA, INC.

1.	Display	17" graphic screen with high-resolution graphics (640 x 480 pixels with 256 colors)
2.	On-screen text	in the appropriate national language
3.	Wheel dimensions	12"...20"
4.	Vehicle memory locations	unlimited
5.	Rotating plates	Load bearing capacity 1000 kg, angle of rotation $\pm 360^\circ$, 450 x 450 x 50 mm (L x W x H), sliding range ± 50 mm, weight 18 kg
6.	Sliding plates	Load bearing capacity 1000 kg, angle of rotation $\pm 10^\circ$, 450 x 450 x 50 mm (L x W x H), sliding range ± 65 mm, weight 17 kg
7.	Electrical connection	100...115 V / 220...240 V 50/60 Hz, 0.5 kW (other connections on request)

1.4 Scope of delivery

- 1 PC display device with graphic screen, graphical tablet, small or large equipment cabinet including automatic charging station, DIN A4 dot matrix printer
- 4 Measuring sensors with CCD camera technology and infrared data transmission with built-in power supply
- 1 Cable set (comprising 4 cables)
- 1 Brake clamping device
- 1 Steering lock device

- 2 Electronic precision rotating plates with integrated sensor without access ramps
- 2 Sliding plates without access ramps
- 4 BMW quick-clamping units, comprising a P8-68 locating bell and P267 01 quick-acting clamp including coated holding claws
- 1 Operating instructions for BMW KDS (8 languages)
- 1 BMW software and the BMW vehicle setpoint data with setting screens as well as text for the measurement preparations

1.5 Accessories required

- 2 Locating rods for positioning the vehicle
- 1 Set of sand bags for the prescribed loading

1.6 Accessories recommended

- 4 Quick-clamping units
- 2 Sets of access ramps
- 1 Remote control/display
- 1 Trolley (for ballast bags, rotating and sliding plates and 4 quick-acting clamps)

2. Measuring options using the BMW Kinematic Diagnosis System

2.1 Front axle

- Toe-in (single and total toe-in in relation to the geometrical drive axis)
- Camber (with steering wheel pointing straight ahead)
- Wheel displacement (in relation to the left-hand front wheel)
- Castor, kingpin inclination and toe-differential angle

2.2 Rear axle

- Toe-in (single and total toe-in in relation to the longitudinal centre plane of the vehicle --> previously called symmetrical axis)
- Geometrical drive axis
- Camber

2.3 Other measuring options

- Rear wheel displacement
- Wheelbase difference
- Lateral displacement on right

- Lateral displacement on left
- Track difference
- Axial displacement

3. System description

3.1 BMW Kinematic Diagnosis System 1, based on the Beissbarth ML4000

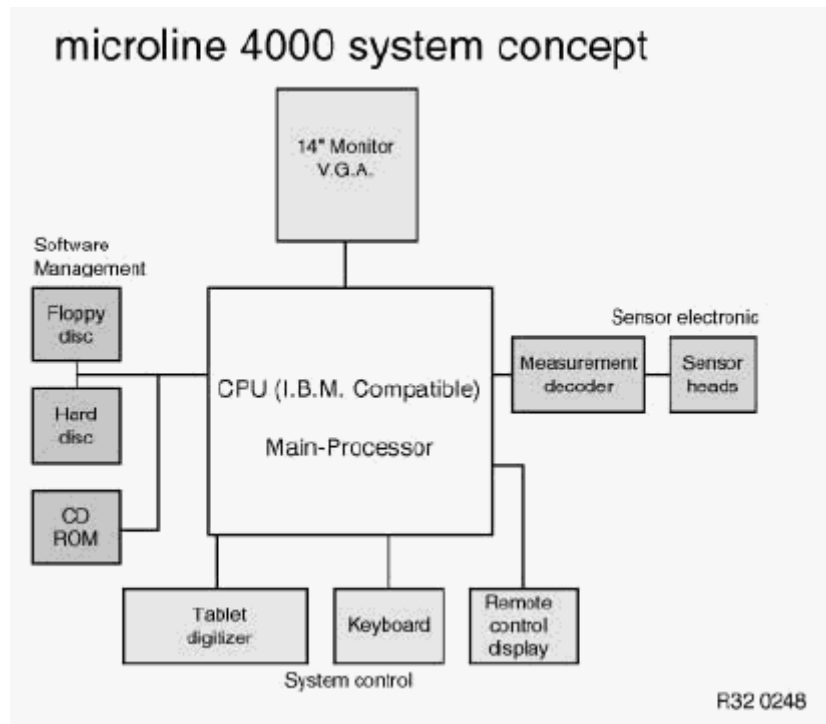


Fig. 3: CPU Communication Diagram

Courtesy of BMW OF NORTH AMERICA, INC.

The KDS 1 is available in two different designs at no extra charge:

1. Mobile workstation



Fig. 4: Identifying Mobile Workstation
Courtesy of BMW OF NORTH AMERICA, INC.

2. Mobile compact cabinet



Fig. 5: Identifying Mobile Compact Cabinet
Courtesy of BMW OF NORTH AMERICA, INC.

The larger workstation offers a small storage area for accessories, whilst the compact cabinet is mobile and ideal for restricted working areas. Both variants can be supplied as a cableless measuring system (infrared). From the point of view of measuring technology, there is only a difference in the handling and equipping of the system. For both designs, the four measuring sensors are stored in integrated inserts with rechargeable battery charging points. When automatically charged over night, the measuring sensor batteries provide enough power for 10 hours of continuous use.

3.2 Computer

- The KDS 1 system comprises tested and reliable industrial components. The computer is an IBM-compatible, 32-bit Intel processor with CD ROM drive to the industry standard.



Fig. 6: Identifying Computer
Courtesy of BMW OF NORTH AMERICA, INC.

3.3 Graphical tablet

- All functions are shown in graphical form on a "pictogram" panel. The panel is protected by a plexiglass cover. It can easily be replaced if more extensive design modifications are necessary. The operator interface has no membrane and is thus protected against damage. The main functions are activated by clicking the icon with the digital pen.

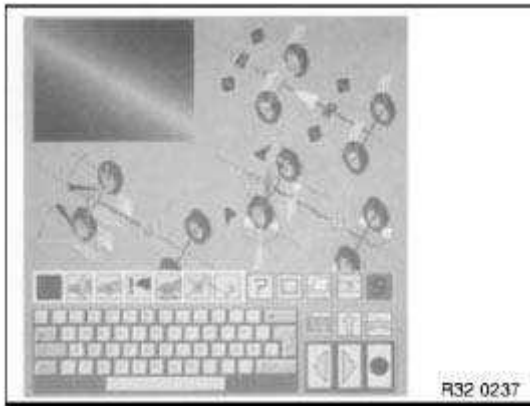


Fig. 7: Identifying Graphical Tablet
Courtesy of BMW OF NORTH AMERICA, INC.

3.4 Equipment cabinet

- The PC with graphic monitor and removable operating panel, supports for the measuring sensors, the remote control and the A4 printer are integrated into the workstation. The charging station is located in the cabinet and can also be connected to the measuring sensors and the remote control using the plug-in cables (operating while simultaneously charging the batteries).

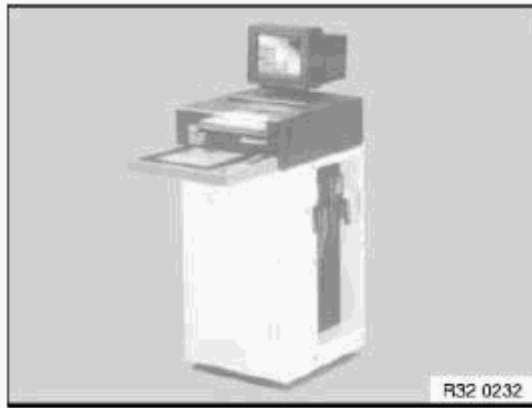


Fig. 8: Identifying Equipment Cabinet
 Courtesy of BMW OF NORTH AMERICA, INC.

3.5 Remote display

A cableless remote display can be supplied on request. The remote control keys are only active during measuring and adjustment (not for customer data input, or if selecting a vehicle or editing the setpoint data etc.). The following displays are supported by the remote control:

- Measured value with setpoint/actual comparison and tolerance bar
- Steering graphics for steering routines
- Live overview of the track/camber values with a setpoint/actual comparison
- Rim run-out compensation



Fig. 9: Identifying Remote Display
 Courtesy of BMW OF NORTH AMERICA, INC.

3.6 Measuring sensors with CCD camera

The measuring sensors are each equipped for automatic measurement with two CCD cameras and their own processor for the cableless infrared transmission of data with integrated batteries.

Benefits:

- No temperature deviation
- Very high measuring resolution (the track could theoretically be measured in angular seconds)
- Single track range of more than ± 9 degrees for the constant display of toe-in when changing the tie-rod ends
- Exact system accuracy, i.e. when carrying out measurements at the vehicle following rim run-out compensation, the toe-in and camber measurements are accurate to 2 angular minutes



Fig. 10: Measuring Sensors With CCD Camera
Courtesy of BMW OF NORTH AMERICA, INC.

3.7 BMW Quick-acting clamp

- BMW quick-acting clamp for holding the measuring sensors precisely in position and measuring without rim run-out compensation.

NOTE: Any existing quick-acting clamps, e.g. from older F1600s or ML-3000s, must not be used on the BMW KDS.

○

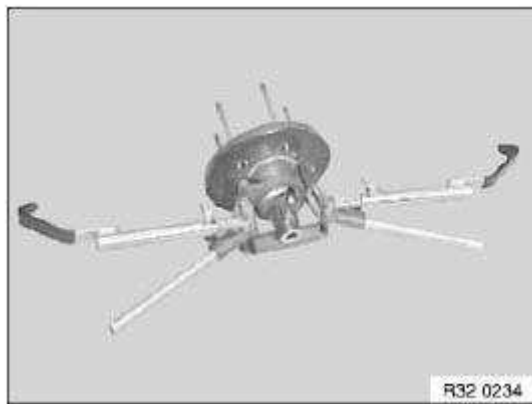


Fig. 11: Identifying BMW Quick-Acting Clamp

Courtesy of BMW OF NORTH AMERICA, INC.

3.8 Rotating/sliding plates

- Electronic precision rotating plates for the front wheels with integrated sensor (360 degree measuring range)
- Stable sliding plates for the rear wheels with a swivelling/rotating top plate
- Accessories: Cover hood for aluminum rotating plates

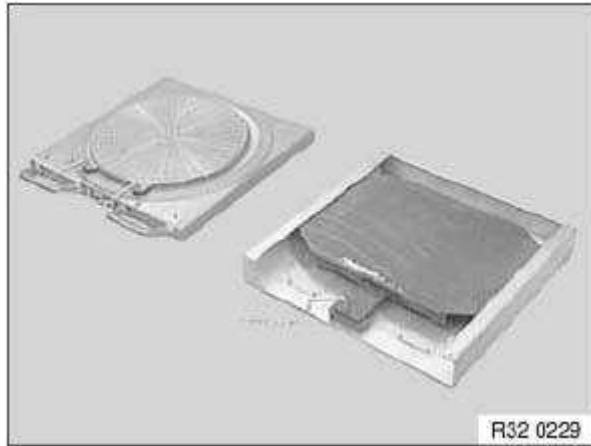


Fig. 12: Identifying Rotating/Sliding Plates
Courtesy of BMW OF NORTH AMERICA, INC.

3.9 Sensor pins

- A new BMW light alloy wheel (styling no. 18) has been available as optional equipment from April 1993. When measurements are being made on vehicles with these wheels, new sensor pins are required for the quick acting clamps of the recommended wheel alignment equipment.
- The new sensor pins are included in the scope of supply for new deliveries of KDS 1 (order number: BS 90 19 11).

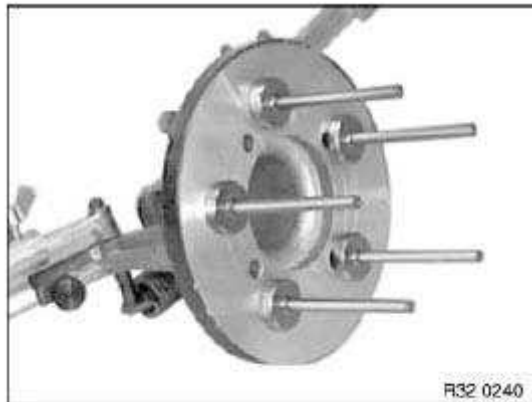


Fig. 13: Identifying Sensor Pins

Courtesy of BMW OF NORTH AMERICA, INC.

3.10 Spoiler adapter

- In the case of vehicles with very low spoilers, the sensor beam may be broken by the spoiler between the measuring sensors. This primarily occurs in front of the front axle.
- The spoiler adapter is used here as a connecting element between the measuring equipment clamp and the measuring sensor. Thanks to the adapter, the sensors are placed 50 mm lower, thus allowing the sensor beam to move freely below the spoiler.



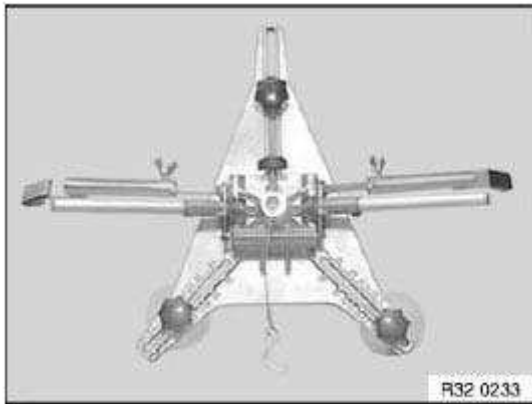
R32 0241

Fig. 14: Identifying Spoiler Adapter

Courtesy of BMW OF NORTH AMERICA, INC.

3.11 Quick-clamping units

- Quick-clamping units for wheel alignment on non-BMW vehicles with rim run-out compensation.
- Rims without sensors boreholes (rims for BMW vehicles from other manufacturers)



R32 0233

Fig. 15: Identifying Quick-Clamping Units

Courtesy of BMW OF NORTH AMERICA, INC.

3.12 Retainers

- The most varied clamping options for the measuring equipment are possible thanks to the versatile retainers and the rubber-coated thrust pieces, even on exotic light-alloy rims.



R32 0242

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

4. Workstation

4.1 Environment

ENVIRONMENT

Description:	Requirements:
All lifting platforms currently recommended by BMW for wheel alignment meet the requirements for the BMW KDS.	○ Wheel alignment pits ○ Pillar-type lifts with set-down device ○ 2 plunger-type lifting platforms with set-down device ○ Repair stands with set-down device
No particular requirements have to be met in respect of the location at which the BMW KDS is used. The measuring device can be installed over working pits or on lifting platforms.	○ One measuring area (approx. 4.5 m x 7.0 m). ○ The rotating plates must be pinned to the platform

The support surfaces for the rotating and sliding plates may only display the following maximum height difference:

- from left to right ± 0.5 mm
- from front to back ± 1.0 mm
- diagonally ± 1.0 mm.

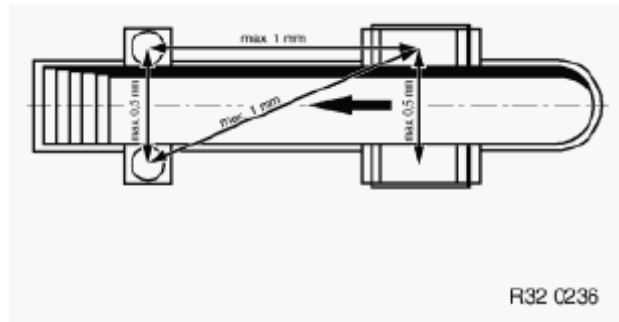


Fig. 17: Identifying Support Surfaces Dimension
 Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: A difference in the height of the rotary plates of ± 2 mm from left to right results in a measuring error of 4.8° in the camber.
 As a comparison: The camber tolerance on the E36 is $\pm 10'$. The tire tread difference or varying tire pressure cause measuring errors of the same magnitude.

4.2 Preconditions for alignment

When carrying out the wheel alignment, the front and rear wheels must be centred on the rotating and sliding plates in order that all wheel suspensions remain free of tension during the steering routine and adjustment work. As a result, the rotating and sliding plates for the relevant wheel bases and track widths of the vehicle to be aligned must be moved.

4.3 Measuring tolerance

All measuring tolerances are system tolerances. This means that the sum of all individual tolerances gives the value shown in the example. Example of camber: Quick-acting clamp + measuring sensor + computer = $1'$ at a measuring range of $\pm 3^\circ$ (all BMW vehicles are within this measuring range).

4.4 Levelling the measuring station

The manufacturers of the BMW KDS (Beissbarth/Bosch) are able to measure the measuring area to the required accuracy using levelling devices. Any "normal" water level is not suitable for this. Lifting platforms must be levelled under load so that the uneven deflection in the travel rails is taken into account.

IMPORTANT: Adjustment work for the lifting platform concerned must be executed by a specialist (manufacturer's after-sales service).

5. Chassis-related terms

5.1 Toe-differential angle

- The toe-differential angle (α) is the angular position of the internal wheel on the curve in relation to the external wheel on the curve when driving round bends. The steering is designed such that the angular position of the wheels in relation to each other changes as the steering angle increases.

- In ideal cases, the wheel axes meet at point D in any steering position (except for straight ahead).

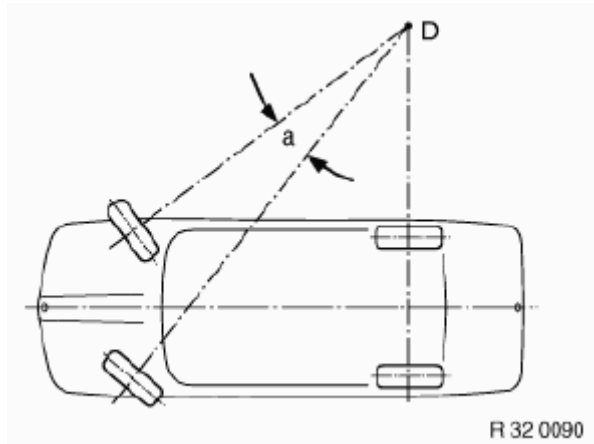


Fig. 18: Identifying Toe-Differential Angle
Courtesy of BMW OF NORTH AMERICA, INC.

5.2 Camber

- The camber is the angle of inclination of the wheel in relation to the vertical.

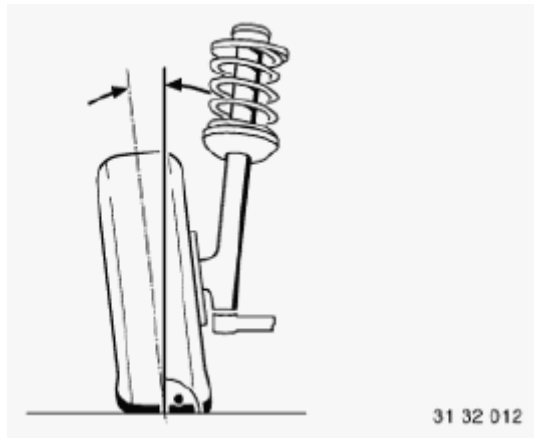


Fig. 19: Identifying Camber
Courtesy of BMW OF NORTH AMERICA, INC.

5.3 Toe-in

- The toe-in is the reduction in the distance between the front of the wheels and the rear. The toe-in prevents the wheels from moving apart whilst driving (wobbling and grinding).

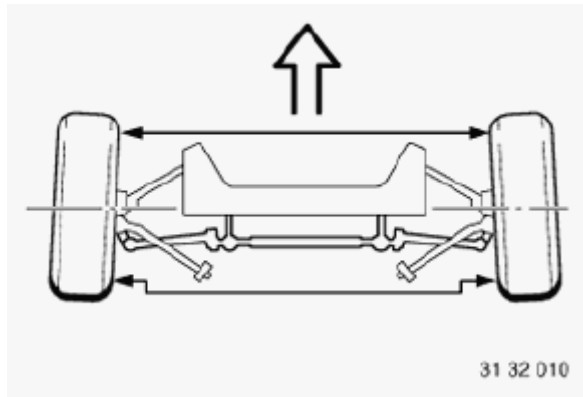


Fig. 20: Identifying Toe-In

Courtesy of BMW OF NORTH AMERICA, INC.

5.4 Castor

- The castor is the kingpin angle seen from the side in the opposite direction of travel. The line through the centre of the spring strut mount and control arm ball joint corresponds to the kingpin.

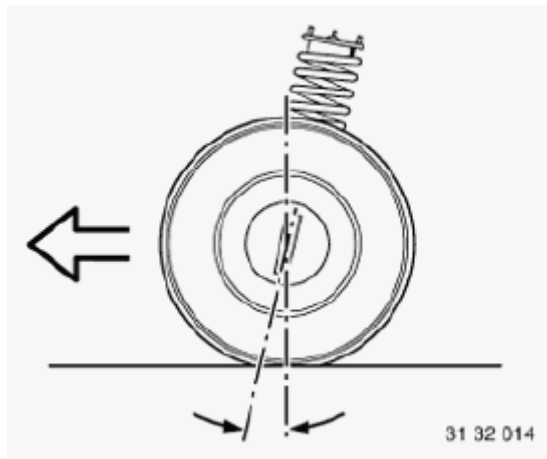


Fig. 21: Identifying Castor

Courtesy of BMW OF NORTH AMERICA, INC.

5.5 Geometrical drive axis/symmetrical axis

- (1) The geometrical drive axis is the line bisecting the angle of the overall rear wheel toe. The measurements of the front wheels relate to this axis.
- (2) The symmetrical axis represents the centre line through the front and rear axes.

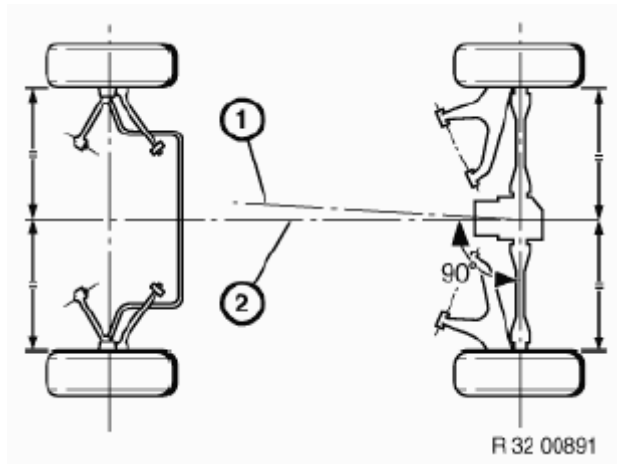


Fig. 22: Identifying Geometrical Drive Axis/Symmetrical Axis
 Courtesy of BMW OF NORTH AMERICA, INC.

5.6 Wheel displacement angle

- The wheel displacement angle is the angular deviation of the connecting line of the wheel contact points in relation to a line running at 90° to the geometrical drive axis. The wheel displacement angle is positive if the right-hand wheel is displaced to the front, and is negative if it is displaced to the rear.

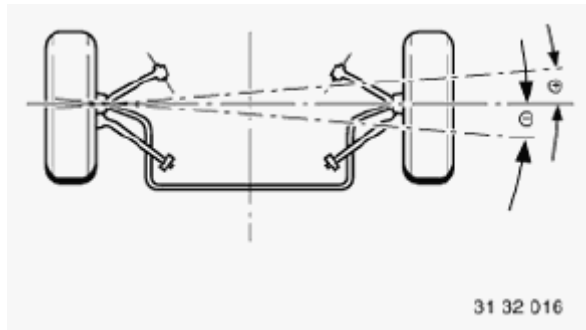


Fig. 23: Identifying Wheel Displacement Angle
 Courtesy of BMW OF NORTH AMERICA, INC.

5.7 Kingpin offset

- The kingpin offset is the distance from the centre of the wheel contact point to the contact point of the kingpin extrapolation.

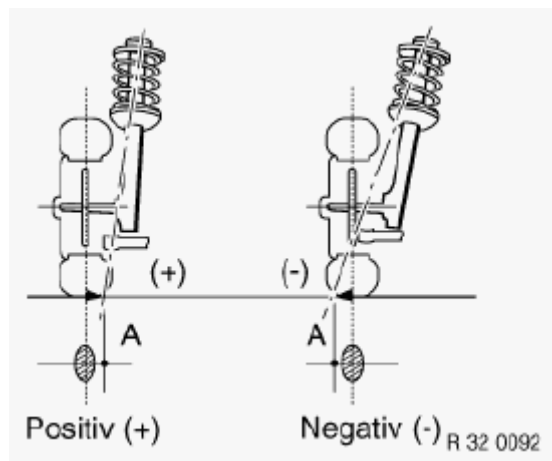


Fig. 24: Identifying Kingpin Offset
 Courtesy of BMW OF NORTH AMERICA, INC.

6. Wheel suspension

Those parts which connect the wheel to the mostly load-bearing floor elements of the bodywork and guide it in the required direction belong to the wheel suspension. They are connected by axles or other comparable structures and guided by the arms. The wheel suspension plays a decisive role in the handling characteristics of a vehicle. Two main groups have to be distinguished: 1. Rigid axle suspension and 2. Independent wheel suspension.

6.1 Rigid axle suspension

RIGID AXLE SUSPENSION DESCRIPTION CHART

Description	Advantages	Disadvantages
The rigid axle suspension has a rigid connection between both wheels or wheel pairs. Any change in one wheel is more or less transferred to the other. It is now only fitted as a rear axle, if at all. However it is frequently used for lorries or busses.	In the event of deflection taking place, there are no changes to the camber or wheel toe. This means: less tire wear and good track stability.	Non-driven rear axles may also acquire negative camber as well as increasing tire lateral guidance, thus increasing tire wear.

6.2 Independent wheel suspension

INDEPENDENT WHEEL SUSPENSION DESCRIPTION CHART

Description	Advantages	Disadvantages
State-of-the-art individual wheel suspension is available on BMW vehicles on the front and rear axles. This development has its cause in mass inertia, as a reduction in the non-suspended mass improves wheel and ground contact, and the wheel stays better on the road. Control arms and trailing arms, which have to absorb high longitudinal and lateral forces to some extent, are required for guiding independently suspended wheels.	Wheels suspended independently from each other have no mutual influence on each other.	Depending on the type, changes may occur in the camber, wheel toe, track width, castor and wheelbase.

7. Wheel alignment/procedure

7.1 Measuring options

An overview of all measuring options and values (VA = front axle, HA = rear axle) is shown below.

WHEEL ALIGNMENT/PROCEDURE

Measuring options	Measuring accuracy	In measuring range	Total measuring range
Total wheel toe (VA + HA)	± 2'	± 2°	± 18°
Single wheel toe (VA + HA)	± 2'	± 2°	± 9°
Camber (VA + HA)	± 1'	± 3°	± 10°
Wheel displacement (VA)	± 2'	± 2°	± 9°
Geometrical drive axis	± 2'	± 2°	± 9°
Castor	± 4'	± 18°	± 22°
Kingpin inclination	± 4'	± 18°	± 22°
Toe-differential angle	± 4'	± 20°	± 20°
Maximum steering angle (VA)	± 4'	± 60°	± 300°
Maximum steering angle (HA)	± 4'	± 9°	± 9°
Castor correction range	± 4'	± 7°	± 10°

NOTE: The measuring accuracy details only apply when using the precision rotating and sliding plates as well as the BMW quick-acting clamps.

7.2 Preparatory work

Before commencing the measurement, preparatory work must be carried out at the measuring area and on the vehicle . Preparatory work includes:

- Easy-running rotating and sliding plates
- Aligning the rotating and sliding plates in relation to the track width and wheelbase
- Centering the vehicle on the plates
- Applying the parking brake
- Removing the lock pins on the plates to prevent tension in the chassis under loading
- Checking the rim and tire size, tread depth, tire pressure, steering wheel play, wheel bearings and condition of suspension and shock absorbers
- Fastening the measuring equipment to the wheels
- Loading the vehicle according to BMW KDS specifications
- Rock the vehicle firmly with the brakes released to ensure a stable centre position
- Lock the service brake using the brake clamping device

7.3 Initial/final measurement

This measurement can be carried out as a program-guided measurement in the same way as any subsequent adjusting work and the final measurement. The sequence of the chassis measuring points to be called up is

specified and controlled by the system software. The individual steps comprise:

- Driving straight ahead to correctly record the wheel toe and camber values for the rear axle
- Steering routine for recording the castor, kingpin inclination and toe-differential angle
- Recording the wheel toe and camber of the front axle (adjust the steering centre point in advance)
- Steering routine for measuring the maximum steering angle on the left/right
- Checking the overview of measured values with the setpoint and actual comparison of all measured values

7.4 Printing out the data



Fig. 25: Printing Data
Courtesy of BMW OF NORTH AMERICA, INC.

The report printout from the integrated DIN A4 printer is subdivided into three sections:

- Header lines with customer and vehicle identification data --> the customer data entered before beginning the measurement as well as vehicle data are printed out here.
- Centre section with vehicle data --> this includes the make, type, model and vehicle model year defined when the setpoint data record was selected. The values previously measured for height level, tire pressure and tread depth are also printed in this section.
- The end section with all vehicle alignment values comprises the 3 columns initial measurement, setpoint values and output measurement. The measured values are recorded separately in these three columns.

8. Special features

8.1 Free wheel alignment

With free wheel alignment the selection and sequence of the measuring points is freely selectable. The following points must be observed for attaining the correct measurement results:

- Carry out all work in the same way as with the program-guided measurement.
- Before measuring the wheel toe and camber values for the rear axle, the steering must be in the "straight ahead" position to ensure that it is perfectly aligned in relation to the longitudinal centre plane of the vehicle.
- Before measuring the single wheel toe values on the front axle, the centre of steering must be established to ensure the correct position of the steering wheel.

8.2 System settings

The following settings must only be entered or set once: language, display format, date/time, advertising text, remote control with display, rotating plate selection and printer settings. They remain stored.

9. BMW Kinematic Diagnosis System comparison (Bosch - Beissbarth)

DIAGNOSIS CHART

	Bosch	Beissbarth
Measured value recording	Infrared	CCD camera
Data transmission	Cable	Infrared/cable
Measuring sensor power supply	Cable	Battery/cable
Remote control	Infrared	Infrared
Remote control with measured value display	Cable	Infrared
Setpoint data memory	Floppy disk	Hard disk
Measured value memory	Always the last vehicle measured	Unlimited vehicle memory
Operating system	-	MS-DOS
Languages	English and one language on request	EN, DE, NI, SV, IT, FR, SP (further languages can be called up)
Update	3.5" floppy disk	3.5" floppy disk using TIS/DIS
Monitor	20"	17"
Computer	-	Pentium
Disk drives	2 x floppy disk	1 x floppy, 1 x CD ROM

10. Control modification (menu)

10.1 Remote control with display

The following steps show how the remote control with display is activated:

1. Call up the "**Service**" menu in special functions ("S" key)
2. Call up the "**Remote control**" sub-menu in the "**Service**" menu.
3. Select the "**Remote control with display**" item in the "**Remote control**" sub-menu - this configuration

is retained.

IMPORTANT: In the case of equipment without remote control, this must be configured to "No remote control ".

10.2 Brief operating instructions

1. Activate the remote control with the **"ON "** button (it may also be switched on during alignment). The title page will appear on the LCD.
2. Select **"Straight ahead "** of the **"Initial measurement "**, **"Adjustment work "** or **"Final measurement "** at the measuring equipment cabinet. The steering graphics for **"Straight ahead "** will appear on the LCD.
3. Use the **"Forward arrow "** to change to the next measurement image. Display blocks will appear on the LCD with the designation of the measured value and tolerance bar with the measured value. If the measured value is within the tolerance range, it is shown in dark figures against a light background. If the measured value is outside the tolerance range, it will be shown in inverse video (light figures against a dark background).
4. By pressing the **"F "** key shortly, you can move alternately between the designation of the measured value and the setpoint value with the tolerance inside the display blocks.
5. You can scroll through the measured values using the **"Forward arrow "**, **"Backward arrow "** and **"Cancel "** (red dot) keys. The function of these keys is identical to that of the keys on the graphics panel.
6. Even with **"Free alignment "**, it is possible to scroll through the measured values in the same way as with **"Programguided alignment "**.
7. During measurement, the report print-out can be initiated using the **"Printer "** key. The remote control keys are only active during measurement and adjustment (not during customer data input, vehicle selection etc.).

10.3 Display support

- Measured values with a setpoint/actual comparison and tolerance bar (setpoint figures can be displayed with the **"F "** key)
- Steering graphics for steering routines
- Overview of measured values with current setpoint/actual comparison
- Rim run-out compensation
- With all other functions (e.g. customer input), the title illustration appears on the LCD display

NOTE: If the data transmission from the remote control to the computer is interrupted, the remote control icon in the bottom right-hand corner of the screen changes color from green to red and the illustration on the LCD display is shown inversely - black turns to white, white to black. This change does not take place in the title illustration. Once the line-of-sight connection has been re-established, the remote control continues to operate from the point of interruption in the program. A continuous visual connection during alignment is therefore not necessary.

- The **"Hour glass "** icon in the LCD display means: **"Please wait "**.

- The "**Battery** " icon in the top right-hand corner of the LCD display means that the battery reserve has been reached.
- To switch off the remote control: press the "**F** " key for 5 seconds, then return it to its charging unit or connect it to a charge cable. The title illustration will again appear as a charging check.
- If, during the measurement, the remote control has been placed back in the charging unit, it must be switched on again using the "**ON** " button.

11. Updating the software/setpoint data

Floppy disks will no longer be sent to BMW partners who have acquired a "**BMW KDS** (Beissbarth/Bosch)". For cost-related reasons, you can create these disks yourself on the "**DIS-tester** " or on the "**TIS/EPC server** ". The data for this is regularly updated on the TIS CD.

11.1 Requirements

- BMW KDS (Beissbarth/Bosch)
- TIS CD program status (Beissbarth): from CD 12/95
- EPC program status: from 12/95
- TIS CD program status (Bosch): from CD 08/97
- DIS program status: from V6.0
- 3.5" diskettes, 1.44 MB (Beissbarth 5 diskettes/Bosch 1 diskette)

11.2 Procedure (Beissbarth)

1. Go to the "**Administration** " screen
2. Select the **KDS button**
3. Select **Beissbarth**
4. Insert "**Diskette 1** " on request and confirm with "**OK** " (program diskette 1 of 2 is created, label it)
5. Insert "**Diskette 2** " on request and confirm with "**OK** " (program diskette 2 of 2 is created, label it)
6. Insert "**Diskette 3** " on request and confirm with "**OK** " (setpoint data diskette 1 of 3 is created, label it)
7. Insert "**Diskette 4** " on request and confirm with "**OK** " (setpoint data diskette 2 of 3 is created, label it)
8. Insert "**Diskette 5** " on request and confirm with "**OK** " (setpoint data diskette 3 of 3 is created, label it)
9. Perform update and/or setpoint data on the KDS in the usual manner with the diskettes which have just been created.

11.3 Procedure (Bosch)

1. Go to the "**Administration** " screen
2. Select the **KDS button**
3. Select **Bosch**
4. Label "**Diskette 3.1** ", insert it into the drive on request and confirm with "**OK** " (2x) --> Setpoint data is copied to the diskettes.

5. Insert setpoint data diskette 3.1 into the 3.1 floppy disk drive, insert operating system diskette 3.0 into the 3.0 drive.
6. Switch on the machine in the usual manner.

IMPORTANT: When creating the KDS diskettes, all data on the diskettes used is overwritten.

NOTE: In the event of an error, a corresponding message is shown and the program is cancelled completely. The procedure must be run from the beginning again and all data on the diskette will be deleted. A new diskette may have to be used.

12. Creating, copying and editing setpoint data

12.1 Copying

- Press the "C " button and select the vehicle to be copied.
- Select the "**Edit setpoint data** " menu item from the special functions. Create a new vehicle in the usual manner. The setpoint values for the last vehicle selected will appear in the data input screen. Enter the data and save the data record.

12.2 Creating

- Press the "C " button and select the "**Edit setpoint data** " menu item from the special functions. Create a new vehicle in the usual manner. An empty data input screen will appear. Enter the data and save the data record.

12.3 Editing

- Factory-programmed setpoint data can neither be deleted nor modified. If this data does need to be modified, a new vehicle with modified setpoint data must be created. New vehicles created by the user are identified by a "+ " in the selection menu. These vehicles can be deleted by the user using the "- " key or modified using the "< > " key. These keys only appear if vehicles have been entered by the user.

13. Special functions

13.1 Customer-specific printer report header

The sub-item "**Customer-specific text** " must be called up in the "**Special functions** " menu. An input screen will appear on the monitor. This input screen must be filled out with the name and address and stored with the "S " screen key. The text entered is inserted into the report header.

13.2 Adjusting options

- Call up the "**Service** " menu in the special functions ("S " key).
- Select the "**Wheel toe adjustment** " item or the "**Camber adjustment** " item from the "**Adjustment** " sub-menu. The toe and camber adjustment program will guide the user step by step through the

adjustment using text and images. The measuring deviation for each measuring sensor will be shown on the screen when the adjustment has been completed.

- You can store the adjustment values in the measuring sensor using the "**Store**" key or you can quit the program with the "**Red dot key**" without saving them (check). The adjustment values can be printed out.

13.3 Rotating plate test

- Call up the "**Service**" menu in the special functions ("S" key).
- Call up the "**Rotating plate**" item in the "**Service**" menu. Turn the left-hand and right-hand rotating plate and check the display on the screen. Important: The measuring range is ± 306 degrees.

13.4 Viewing and deleting customer entries from database

- Call up the menu item "**Delete**" in the "**Database**" menu in the special functions. The data input screen will appear. Fill in the search fields with the data to be deleted.
- Use the "-" button to delete this data record. A new data record can then be highlighted and deleted with the digital pen.
- You can scroll through the entire database with the "**Arrow up**" and "**Arrow down**" keys.
- You can quit the delete function by pressing the cancel key (red dot).

14. Modifications within program

Further modifications were carried out within the program which only slightly change the program sequence but which optimize the alignment in respect of comfort and speed. This is described below:

- Optimization of the rim run-out compensation in respect of speed.
- Optimization of the steering routines: Highlighted values within the gate can still be corrected. The message "**Rotating plates not connected**" no longer causes the steering routine to be cancelled. Further measurements can be carried out after the rotating plates have been connected.
- Standardization of screen colors with the colors on the tablet.
- Addition of texts in several foreign languages.
- Elimination of program-related and cosmetic faults.
- Electronic water level.
- Omission of kingpin inclination measurement.

15. Faults

15.1 Tyre faults

TYRE FAULTS REFERENCE

Fault	Effect
1 Wheel toe, camber, toe-differential angle and castor not correct	1 Severe tire squeaking even at relatively low speeds
2 Excessive toe-in and excessive positive camber	2 Tires are worn down on one outside edge in the longitudinal direction

3 Excessive negative camber	3 Tyre wear on inside edge
4 Worn front-axle suspension on front-wheel-drive vehicles	4 Increased noise/Vehicle pulls on one side when accelerating
5 Incorrect wheel alignment	5 Wheels scrubbing/Tyre surface shows feathering in the tread
6 Play in the suspension due to mechanical parts (suspension, steering)	6 Washout/Wobbling of front wheels
7 Tyre pressure too low	7 Outside tire surface wear

15.2 Front axle faults

FRONT AXLE FAULTS REFERENCE

Fault	Cause	Remedy
1. Toe deviation	a) Vehicle not in normal position	a) Correct height level
	b) Tie rod(s) bent	b) Replace tie rod(s)
	c) Tie rod ball joints worn	c) Replace tie rod(s)
	d) Rubber mount in control arm defective	d) Replace control arm
2. Camber deviation: The camber is fixed during the design stage and cannot be adjusted.	a) Rubber mount in control arm defective	a) Replace control arm
	b) Control arm deformed	b) Replace control arm
	c) Spring strut deformed	c) Replace spring strut
	d) Traction strut worn	d) Replace control arm
	e) Spring deflection too great	e) Replace coil spring, height level
	f) Front axle carrier deformed	f) Replace front axle carrier
	g) Spring strut mount deformed	g) Repair forward structure
	h) Distortion in the floor assembly (engine bracket)	h) Repair body
3. Castor deviation: The castor is fixed during the design stage and cannot be adjusted.	a) Rubber mount for tension/traction strut defective	a) Replace rubber mount
	b) Tension/traction strut deformed	b) Replace tension/traction strut
	c) Control arm deformed	c) Replace control arm
	d) Spring strut deformed	d) Replace spring strut
	e) Wheelhouse deformed (spring strut mount)	e) Repair forward structure
	f) Distortion in the floor assembly (engine bracket)	f) Repair body
4. Toe-differential angle deviation	Requirement: camber and castor are correct	
	a) Tie rods unevenly adjusted	a) Set wheel toe on left and right to identical values
	Requirement: Front wheels have same	

	single toe in relation to the geometrical axis	
5. Wheel displacement deviation	a) Front axle carrier deformed b) Engine bracket deformed c) Control arm deformed d) Tension/traction strut deformed	a) Replace front axle carrier b) Repair body c) Replace control arm d) Replace tension/traction strut

15.3 Rear axle faults

REAR AXLE FAULTS REFERENCE

Fault	Cause	Remedy
1. Camber deviation	a) Vehicle not in normal position: spring deflection too great b) Rubber mount on rear axle carrier defective c) Rear axle carrier deformed d) Control arm deformed e) Traction strut deformed	a) Correct height level b) Replace rubber mount c) Check rear axle carrier and replace, if necessary d) Check control arm and replace, if necessary e) Check traction strut and replace, if necessary
2. Rear wheel position is not correct	f) Distortion in the floor assembly g) Swinging arm deformed a) Rear axle carrier has been shifted laterally b) Distortion in the floor assembly	f) Repair body g) Replace swinging arm a) Check the rubber mounts on the rear axle carrier and replace, if necessary b) Repair body
3. Toe deviation	a) Vehicle not in normal position, i.e. spring deflection too great b) Rubber mount in rear axle carrier defective c) Control arm deformed d) Rubber mount and swinging arm defective e) Rear axle carrier deformed	a) Correct height level b) Replace rubber mount c) Replace control arm d) Replace swinging arm e) Check rear axle carrier and replace if necessary
4. Deviation from the geometrical drive axis	f) Traction strut deformed Requirement: Total wheel toe is correct a) Distortion in the floor assembly	f) Check traction strut and replace, if necessary a) Repair body

SINGLE-AXLE ELECTRONIC HEIGHT CONTROL : E61, E70, E71

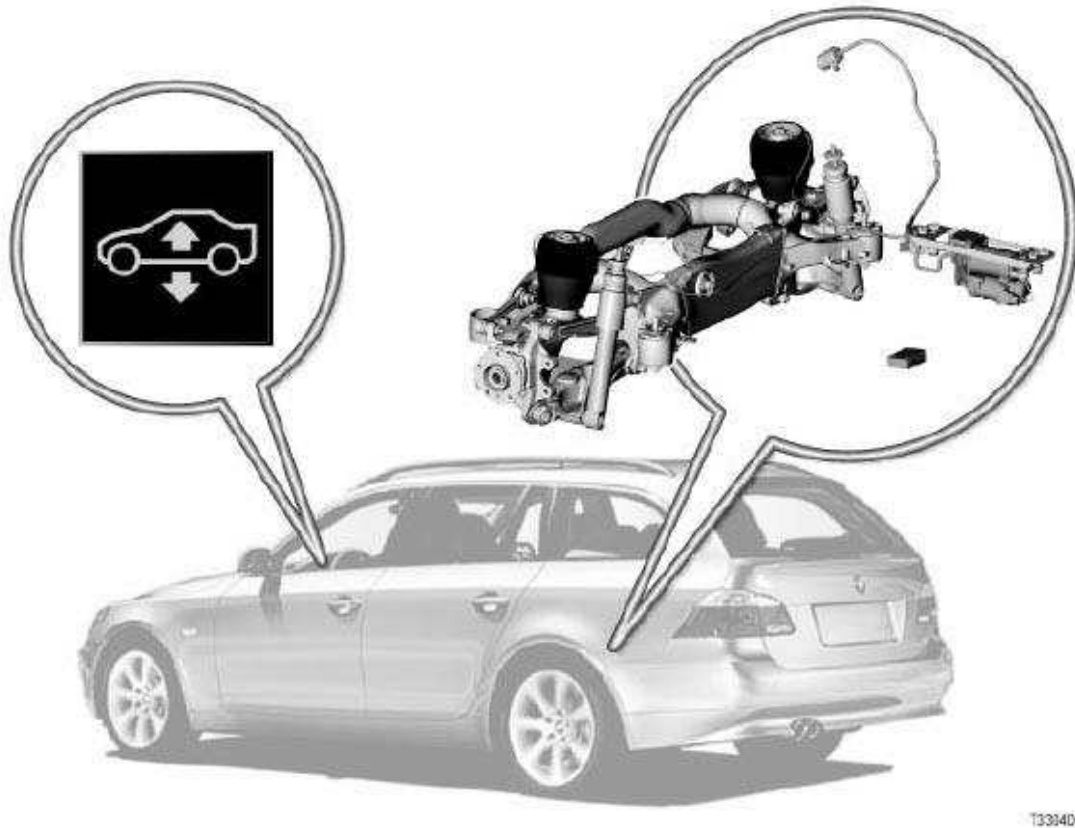


Fig. 26: Identifying Single-Axle Electronic Height Control
 Courtesy of BMW OF NORTH AMERICA, INC.

Introduction

The E61 is equipped as standard with an electronic height control system that uses air suspension on the rear axle.

Electronic height control on the rear axle is special equipment on the E70, E71 (option 220 "electronic height control with air suspension").

This single-axle electronic height control has the task of maintaining the a constant ride at a specified level height at the rear axle, regardless of load.

- E61:
- E70, E71:
 - Overview of component of electronic height control with pneumatic diagram:
- E61

There are 2 versions of the electronic height control system in the E61:

- for vehicles with standard suspension
- for vehicles with sports suspension

New features of single-axle electronic height control:

- Air springs with contoured gaiter and 2 plies

Brief description of components

Single-axle electronic height control largely comprises the following components:

- **Air supply unit**

The air supply unit includes the following components:

- Electric motor for driving compressor
- Compressor with air drier
- Drain valve with pressure-holding and pressure-limitation function
- Electric control valve
- Solenoid valve block with 2 solenoid valves (2/2-way valves)

- **EHC control unit**

The EHC control unit (EHC = electronic height control) decides on a case-by-case basis whether there is a need for intervention to compensate for changes in load.

Besides height control, the EHC control unit also has the task of monitoring system components and of storing and displaying faults.

- **2 air springs**

The air springs are located in place of the steel springs. The air springs form the airtight, moving connection between the body and the wheel carrier. The air pressure in the air spring supports the vehicle's weight. The air springs and the impact absorbers are separate components.

- **2 level sensors**

The EHC control unit receives information about the ride height on the left and right-hand sides of the vehicle from the level sensors. The level sensors are installed on the rear axle.

- **Check Control**

A fault in the single-axle electronic height control is indicated on the LCD display with a Check-Control symbol (yellow). The text for the Check-Control message can be called up in the Central Information Display (CID).

The following control units are involved in the operation of the single-axle electronic height control (in

alphabetical order):

- **CAS: Car Access System**

The CAS (Car Access System) controls the relay for terminal 30g on the rear electrical distributor. This allows the EHC control unit to be activated and deactivated in a defined manner.

The CAS supplies the terminal status (e.g. terminal 15 ON or OFF) to the EHC control unit via the K-CAN.

- **DME or DDE: Digital engine electronics or digital diesel electronics**

The digital engine electronics/digital diesel electronics supplies the EHC control unit with the "engine running" signal.

Signal path: DME or DDE -> PT-CAN -> SGM or KGM or JBE -> EHC control unit

- **DSC: Dynamic Stability Control**

DSC (Dynamic Stability Control) supplies the following signals to the EHC control unit:

- Vehicle road speed
- Lateral acceleration

- **FRM: Footwell module**

- E70, E71

The footwell module evaluates the status of the Hall sensors in the door contacts. The footwell module transmits a message on the K-CAN to the CAS control unit (CAS: Car Access System).

- **HUD: Head-up display**

A fault in the single-axle electronic height control system is shown in abbreviated form in the head-up display.

The Check-Control symbol in the instrument cluster lights up. The related Check-Control message is displayed in abbreviated form.

- **JBE: Junction box electronics**

- E70, E71

The junction box electronics are the gateway between the PT-CAN (powertrain CAN) and the K-CAN (body CAN).

The D-CAN (diagnosis-on CAN) is connected to the junction box electronics.

- **KBM: Body basic module**

- E61

The basic body module emits a signal concerning the status of the tailgate (open or closed) and the rear doors.

Signal path: Boot-lid contact switch, rear door contact -> direct wire -> KBM -> K-CAN -> EHC control unit

- **KGM: Body gateway module from 09/2005**

- E61

From 09/2005, the vehicle electrical system has been modified. The body gateway module supersedes the safety and gateway module (SGM). The body gateway module is the gateway between the PT-CAN (powertrain CAN) and the KCAN (body CAN).

Until 03/2007, the diagnosis wire is connected to the body gateway module.

From 03/2007, the D-CAN (diagnosis-on CAN) supersedes the previous diagnosis interface in all countries.

- **KOMBI: Instrument cluster**

The EHC control unit (EHC = electronic height control) sends a message through the bus communications system to the instrument cluster. The instrument cluster supplies a Check Control via the Check-Control symbol in the LCD display.

- **SGM: Safety and gateway module up to 09/2005**

- E61

The SGM (safety and gateway module) is the gateway between:

- PT-CAN (powertrain CAN)
- K-CAN (body CAN)
- **Byteflight**

The diagnosis wire is connected to the SGM.

- **TMFA and FMBF: Driver's door module and front-passenger door module up to 09/2005**

- E61

The door modules (driver's door module = TMFA, front-passenger door module = TMBF) supply a signal about the status of the front doors (OPEN or CLOSED).

Signal path: Door contact -> TMFA/TMBF -> **byteflight** -> SGM -> K-CAN -> EHC control unit

From 09/2005, the body gateway module (KGM) delivers a signal confirming the status of the front doors

(OPEN or CLOSED).

Signal path: KGM -> K-CAN -> EHC control unit

System functions

The following system functions of the single-axle electronic height control are described:

○ **Electronic height control**

Ride height is controlled by air being fed into or withdrawn from the air springs. The EHC control unit receives information about the ride height on the left and right-hand sides of the vehicle from the level sensors.

If the ride height is outside defined tolerances, the system will automatically activate the air supply unit to regulate to the specified level.

The system is activated and starts to regulate whenever a door or the tailgate is opened. The system is deactivated after a certain time (approx. 20 minutes).

The signals from the level sensors are filtered to distinguish between changes in load and other disturbances such as an uneven road surface. For correct use, two signals filtered at different frequencies are computed for each signal (low-pass filter with fast and slow filtering).

Fast filtering is always employed when regulation is in progress. This prevents the regulated height from exceeding the specified level.

Slow filtering is employed when the vehicle is in motion. This mode of filtering eliminates oscillations induced by the road surface.

Both sides of the vehicle are regulated independently. In other words, the comparison of specification to actual value is performed separately for each side (exception: minimum height check in pre-mode and in "twist" control function. In these control functions, the mean value of the left and right-hand sides of the vehicle are considered).

The EHC control unit recognises the different operating conditions from the incoming signals and messages. Depending on operating conditions, appropriately adapted control functions are activated.

The following control functions of the single-axle electronic height control are described:

- Sleep mode
- Pre-mode (temporary start/run-on)
- Post-mode (readjustment)
- Normal operation
- Drive mode
- Cornering

- Twist
- Level-up function (only E61 All-wheel drive until 09/2006)
- Inclination detection after tire pressure loss (only E70, E71 with 8-cylinder engine or option 4UB "3rd row of seats")
- Lifting platform
- Transport mode
- Production mode

Transport and production modes can be set and cancelled with the BMW diagnosis system.

If transport or production mode is set, "power economy mode active" will be stored in the fault memory.

NOTE: The following times and dimensions all serve as examples.

The actual encoding data depend on the model series and vehicle equipment.

Sleep mode

No regulation is performed in sleep mode. Control functions that were started in other control modes are cancelled when sleep mode is activated.

Pre-mode

In pre-mode (temporary start/run-on), changes in load are equalized even as the vehicle occupants are getting in and then again for a certain time (approx. 20 minutes) after the vehicle is shut down.

In pre-mode, the ride height is only regulated to the specified height if it differs significantly from this height. The tolerance range for regulation is approx. 40 millimetres under the mean value (the tolerance range stipulates when the electronic circuitry in the EHC control unit performs regulation).

This tolerance ensures that regulation is only initiated for large loads, to increase ground clearance before pulling away. Small loads produce smaller amounts of spring travel, which are not equalized until the engine is started.

These control characteristics reduce load on the battery.

In pre-mode, only the mean value of the two level sensor signals is considered.

Post-mode (readjustment)

Post-mode is used to equalize any inclination before sleep mode is initiated (fast filtering).

Control function is time-limited (approx. 1 minute).

In post-mode, regulation is restricted to a defined tolerance range (+7/-10 mm).

Normal mode

Normal mode refers to the normal operating conditions for the vehicle. Normal mode is initiated by the "engine running" signal. Regulation is performed within a defined tolerance range on each side (± 10 mm, fast filtering).

Drive mode

If a roadspeed signal greater than 1 km/h is detected, the EHC control unit will switch to drive mode.

In drive mode, regulation employs slow filtering. For example, in drive mode, changes in ride height caused by the reduction in the vehicle's weight due to fuel consumption are equalized.

Cornering

The "cornering" control function prevents adjustments being made when cornering is detected. Slow filtering is suspended and ongoing regulation sequences suspended. Cornering is detected from an incoming transverse acceleration signal (e.g. cornering greater than 2 m/s^2 , less than 1.4 m/s^2 when leaving bend). The DSC control unit transmits the transverse acceleration signal via the K-CAN.

Twist

"Twist" mode prevents equalization of an inclination caused by driving over an obstacle with one wheel. Equalization would cause a new inclination after the vehicle is driven off the obstacle, making a new regulation sequence necessary.

If the vehicle is driven onto the kerbstone and stopped, the EHC control unit will switch from drive mode to normal mode. In this control function, the signals from the left and right level sensors are evaluated.

"Twist" control function is activated if the difference in height between the left and right-hand sides exceeds a certain value (e.g. 28 mm).

In this control function, the vehicle's ride height in the middle of the axle is evaluated by the EHC control unit.

If the vehicle is loaded or unloaded, the degree of spring deflection is considered. If this value is outside the defined tolerance range (e.g. ± 10 millimetres), regulation is initiated.

The left and right-hand sides of the vehicle are raised or lowered in parallel.

The difference in height between the two sides is maintained.

When the EHC control unit goes into drive mode, control function

"Twist" is terminated. An ongoing regulation sequence will be cancelled. The "Twist" control function is ended if the height differential between the left and right sides of the vehicle drops below a predefined value.

Level-up function (only E61 All-wheel drive until 09/2006)

The level-up function is used to automatically raise the rear of the vehicle after stopping and getting out of the

vehicle.

After stopping, the vehicle is automatically raised as follows:

- Vehicle left

and

vehicle "secured" with central locking.

The height is automatically adjusted after a short delay.

Alternatively

- Vehicle left

and

vehicle **not** "secured" with central locking.

The height is automatically adjusted after a longer delay.

When the EHC control unit goes into drive mode, the level-up function is ended. The vehicle is lowered to its normal height.

Inclination detection after tire pressure loss (only E70, E71 with 8-cylinder engine or option 4UB "3rd row of seats")

If the Run Flat Indicator (RPA) or tire pressure control (RDC) detects a loss of pressure at one wheel, the control function will relieve the load on the affected tire.

When the tire pressure loss has been rectified and the Run Flat Indicator/tire pressure control no longer indicates a pressure loss, this control function will automatically be ended after about 5 minutes with the engine running.

Lifting platform

In the "Lifting platform" control function, any adjustment is prevented during a wheel change or other work carried out on the lifting platform.

The following conditions trigger the "Lifting platform" control function:

- Permissible spring extension exceeded (e.g. more than 50 millimetres, recorded by left and/or right-hand level sensor)
- Vehicle raised slightly (spring extension e.g. less than 55 millimetres), regulation starts but vehicle is not lowered

The height is stored in the EHC control unit.

A reset is performed when the vehicle is again e.g. 10 millimetres under this stored height or when drive mode is detected.

Transport mode

The specified height is raised in transport mode (e.g. 30 mm). The increased ground clearance guarantees risk-free transportation of the vehicle.

Production mode

Production mode is employed for assembly on the production line and prevents regulation sequences from being initiated.

New EHC control units are delivered with production mode set. Production mode must be cancelled after the new EHC control unit has been installed.

SUSPENSION

Rear Axle - Special Tools - X6

33 0 110 SHAPED SECTIONS (SET)

In conjunction with: 23 4 050, 00 2 030

NOTE: For accommodating rear differential. Rear differential: Dynamic Performance Control.

Series: E71

SI number: 01 03 08 (434)

Order number: 33 0 110

Shaped sections (set)

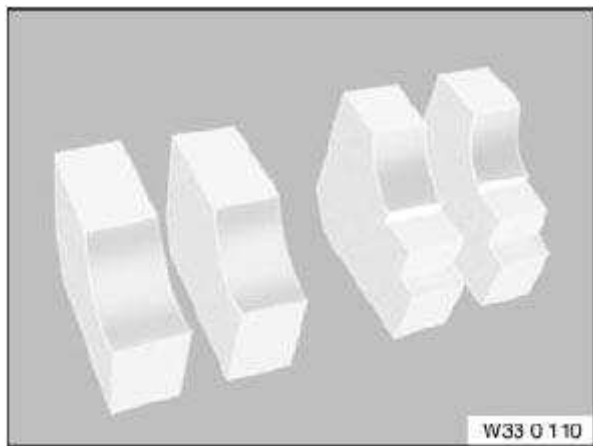


Fig. 1: Identify Special Tool (33 0 110)
Courtesy of BMW OF NORTH AMERICA, INC.

33 0 120 DRIFT

Minimum set: Mechanical tools

NOTE: For driving shaft drive shaft seal into rear differential. Rear differential: Dynamic Performance Control.

Series: E71

SI number: 01 03 08 (434)

Order number: 33 0 120

Drift



Fig. 2: Identify Special Tool (33 0 120)
Courtesy of BMW OF NORTH AMERICA, INC.

33 0 130 DRIFT

Minimum set: Mechanical tools

NOTE: For driving shaft output shaft seal into rear differential. Rear differential:
Dynamic Performance Control.

Series: E71

SI number: 01 03 08 (434)

Order number: 33 0 130

Drift



Fig. 3: Identify Special Tool (33 0 130)
Courtesy of BMW OF NORTH AMERICA, INC.

33 2 160 SPACER RING

Minimum set: Mechanical tools

In conjunction with: 33 2 110

NOTE: For removing and installing output shaft in drive flange, front and rear, as well as for removing front wheel bearing unit

Series: E46, E53, E60, E61, E63, E64, E65, E66, E67, E70, E71, E81, E82, E83, E85, E86, E87, E88, E90, E91, E92, E93, F01, F02, RR1, RR2

Storage location: B8, C8

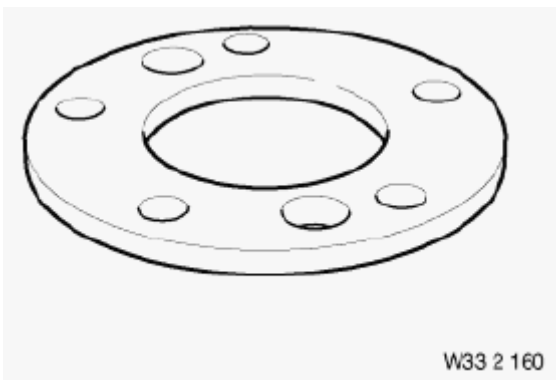


Fig. 4: Identify Special Tool (33 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

SI number: 1 17 03 (012)

Order number: 33 2 160

Spacer ring

33 2 200 FIXTURE

Minimum set: Mechanical tools

In conjunction with: 33 4 200, 33 5 070

NOTE: For removing and installing output shaft in drive flange as well as for removing front wheel bearing unit.

Series: E30, E31, E32, E34, E36, E36/2, E36/3, E36/5, E36/7, E36/C, E36tou, E38, E38/3, E39, E39PL, E39tou, 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, RR1, RR2

Order number: 33 2 200

Fixture

Consisting of:

1 = 33 2 201 Basic body

2 = 33 2 202 Counterholder

In conjunction with: 33 5 070

3 = 33 2 203 Spindle M20 x 1.5 / length 150 mm

NOTE: For pressing out. Model series: E30, E31, E32, E36, E38, E39, E46, E53, E65, E66, E67, E83, E85

4 = 33 2 204 Spindle M20 x 1.5 / length 180 mm

NOTE: For drawing in. Model series: E30

5 = 33 2 205 Spindle M20 x 1.5 / length 190 mm

NOTE: For drawing in. Connection: M27 x 1.5 Model series: E31, E52, E53, E60, E61, E65, E66, E67, E83

6 = 33 2 206 Spindle M20 x 1.5 / length 190 mm

NOTE: For drawing in. Connection: M24 x 1.5 Model series: E36, E46

7 = 33 2 207 Threaded piece

8 = 33 2 208 Nut with thrust bearing

NOTE: **Model series: E30, E31, E32, E36, E38, E39, E46, E52, E53, E60, E61, E65, E66, E67, E83, E85, RR1**

33 3 010 SPINDLE TR12 WITH NUT

Minimum set: Mechanical tools

In conjunction with: 33 3 140, 33 3 310, 33 3 330

NOTE: **For installing and removing rubber mounts, see "In conjunction with".**

SI number: 01 16 08 (476)

Order number: 33 3 010

Spindle TR12 with nut

Consisting of:

1 = 33 3 011 Spindle TR12

2 = 33 3 012 Nut TR12 with thrust bearing

3 = 33 3 013 Nut M12 x 1.5 (high shape)

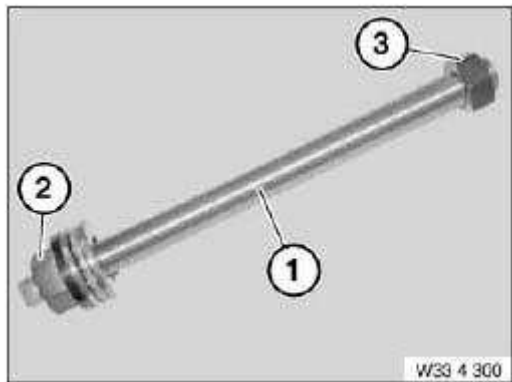


Fig. 5: Identify Special Tool (33 3 010)
Courtesy of BMW OF NORTH AMERICA, INC.

33 3 100 SET OF TOOLS

In conjunction with: 00 8 550

NOTE: For removing and installing rubber mount in rear axle carrier

Series: E23, E24, E28, E30, E31, E32, E34, E36, E70, E71, RR1

Storage location: B10

Order number: 33 3 100

Set of tools

Consisting of:

2 = 33 3 102 Moulded disk

NOTE: For extracting - Model series: E28

3 = 33 3 103 Spindle for installing

NOTE: Model series: E28, E30, E31, E36, RR1

4 = 33 3 104 Nut with bearing

NOTE: Model series: E28, E30, E31, E34, E36, RR1

5 = 33 3 105 Moulded disk

NOTE: For installing - Model series: E28

6 = 33 3 106 Moulded disk

NOTE: For gripping during installation - Model series: E28

7 = 33 3 107 Spindle

NOTE: For extracting - Model series: E28, E30, E31, E36

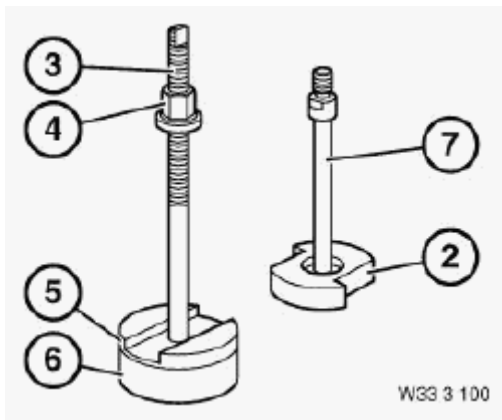


Fig. 6: Identify Special Tool (33 3 100)

Courtesy of BMW OF NORTH AMERICA, INC.

33 3 330 REMOVAL AND INSTALLATION TOOL

Minimum set: Mechanical tools

NOTE: For removing and installing ball joint and rubber mount in semi-trailing arm

Series: E31, E36, E38, E39, E46, E52, E60, E61, E63, E64, E65, E66, E67, E70, E71, E83, E85, E86, RR1

Storage location: B14

SI number: 01 10 90 (288)

Order number: 33 3 330

Removal and installation tool

Consisting of:

1 = 33 3 331 Spacer sleeve

NOTE: For removing / model series: E36, E46

2 = 33 3 332 Extractor sleeve

NOTE: Model series: E36, E46

4 = 33 3 334 Spacer sleeve

NOTE: For installing ball joint Model series: E31, E36, E38, E39, E46, E65, E66, E85

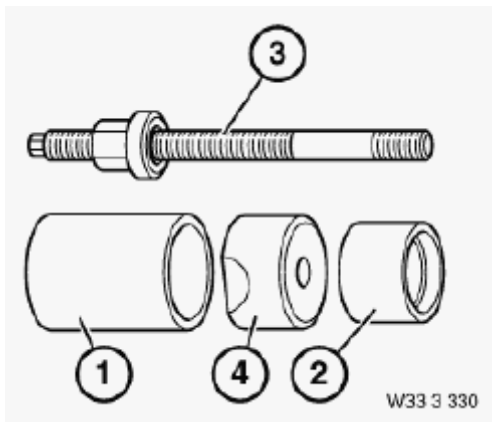


Fig. 7: Identify Special Tool (33 3 330)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 140 UNIVERSAL SUPPORT

Minimum set: Mechanical tools

NOTE: For removing rubber mount in rear axle carrier

Series: E36, E38, E39, E39tou, E46, E52, E61, E65, E66, E67, E70, E71, E81, E82, E83, E85, E86, E87, E88, E90, E91, E92, E93, R53, RR1, RR2

Storage location: A8, B8

SI number: 1 02 99 (417)

Order number: 33 4 140

Universal support

Consisting of:

1 = 33 4 141 Threaded pipe

2 = 33 4 142 Support foot (2 x)

NOTE: Model series: E38, E39, E46

3 = 33 4 143 Sliding piece

4 = 33 4 144 Guide rod

5 = 33 4 145 Guide rod

NOTE: With threaded lug

6 = 33 4 146 Locating plate

NOTE: With screws

7 = 33 4 147 Thrust piece (2 x)

NOTE: With screws - Model series: E38, E39, E46

8 = 33 4 148 Support foot, long (2 x)

NOTE: Model series: E39/2, E65, E67, RR1

9 = 33 4 149 Thrust piece (2 x)

NOTE: With countersunk head screw - Model series: E39/2, E65, E67, E87

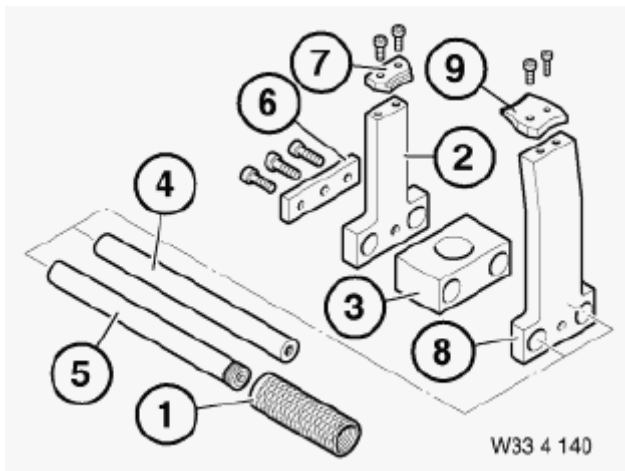


Fig. 8: Identify Special Tool (33 4 140)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 150 REMOVAL AND INSTALLATION TOOL

Minimum set: Mechanical tools

In conjunction with: 33 4 140, 33 3 371

NOTE: For removing and installing rubber mount on rear axle carrier

Series: E38, E39, E39tou, E46, E52, E53, E60, E61, E63, E64, E65, E66, E67, E70, E71, E83, E85, E86, RR1, RR2

Storage location: B38, B8, C7, C8

SI number: 1 06 94 (801)

Order number: 33 4 150

Removal and installation tool

Consisting of:

1 = 33 4 151 Pressure plate

NOTE: For removal / model series: E38, E39, E46, E52

2 = 33 4 152 Pressure plate

NOTE: For installation Model series: E38, E39, E46, E52, RR1

3 = 33 4 153 Support plate

NOTE: For installation / model series: E38, E39, E46, E52

4 = 33 4 154 Spindle with lock nut

NOTE: Model series: E38, E39, E46, E52, E60, E61, E63, E64

5 = 33 4 155 Nut with bearing

In conjunction with: 33 3 371 (E46)

6 = 33 4 156 Spindle, long

NOTE: Model series: E39/2, E65, E66, E67, RR1

7 = 33 4 157 Pressure plate

NOTE: For installation - model series: E39/2, E65, E66, E67, RR1

8 = 33 4 158 Pressure plate

NOTE: For removal - model series: E53, E65, E66, E67, RR1

9 = 33 4 159 Support disk

NOTE: For installation - model series: E53, E65, E66, E67, RR1

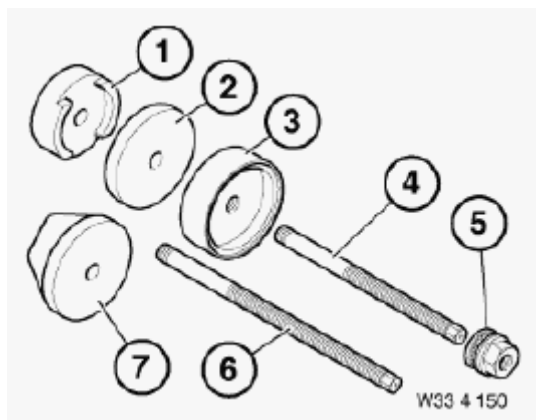


Fig. 9: Identify Special Tool (33 4 150)
Courtesy of BMW OF NORTH AMERICA, INC.

33 4 190 REMOVAL/INSTALLATION THRUST PIECES

Minimum set: Mechanical tools

In conjunction with: 33 3 333

NOTE: For removing and installing ball joint on rear wheel carrier

Series: E38, E39, E52, E60, E61, E63, E64, E65, E66, E67, E70, E71, F01, F02

Storage location: B33

SI number: 1 06 94 (801)

Order number: 33 4 190

Removal/installation thrust pieces

Consisting of:

1 = 33 4 191 Support tube

NOTE: For removal and installation

2 = 33 4 192 Support plate

NOTE: For removal and installation

3 = 33 4 193 Thrust piece

NOTE: For removal

4 = 33 4 194 Thrust piece

NOTE: For installation

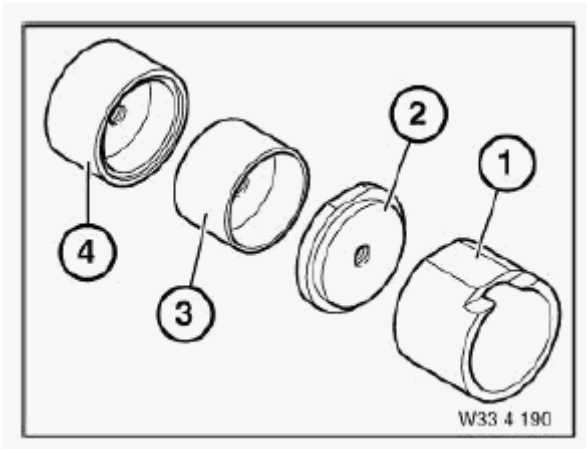


Fig. 10: Identify Special Tool (33 4 190)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 200 TOOL KIT / STRIKER FIXTURE

Minimum set: Mechanical tools

In conjunction with: 33 2 116

NOTE: For removing rear wheel flange when replacing wheel bearings

Series: E12, E21, E23, E24, E28, E30, E31, E32, E34, E36, 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, RR1

SI number: 1 06 94 (801)

Order number: 33 4 200

Tool kit / striker fixture

Consisting of:

1 = 33 4 201 Impact rod with handle section

3 = 33 4 203 Impact piece

5 = 33 4 205 Adapter

NOTE: For removing wheel guide joint from E53, E83.

In conjunction with: Impact tool 33 4 200

33 4 204 M20 nut and M20 flat nut

NOTE: Nuts 33 4 204 are integrated in 33 4 201. 33 4 204 is only continued as a spare part number.

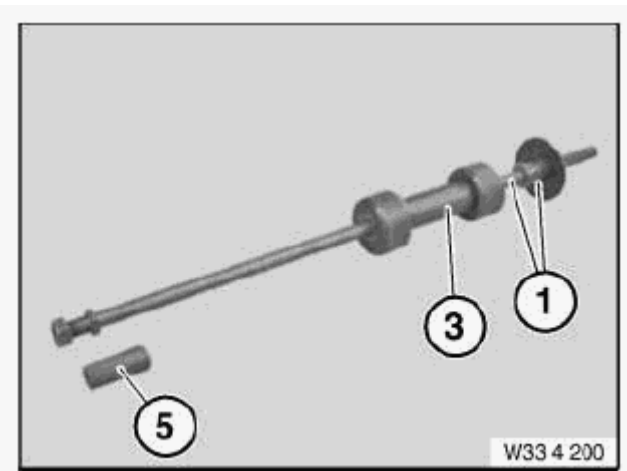


Fig. 11: Identify Special Tool (33 4 200)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 300 SPINDLE TR20 WITH NUT

Minimum set: Mechanical tools

In conjunction with: 33 3 260, 33 4 030, 33 4 040

NOTE: For installing and removing rubber mounts, see "In conjunction with".

SI number: 01 16 08 (476)

Order number: 33 4 300

Spindle TR20 with nut

Consisting of:

1 = 33 4 301 Spindle TR20 (length 200 mm)

2 = 33 4 302 Nut TR20 with thrust bearing

3 = 33 4 303 Nut TR20

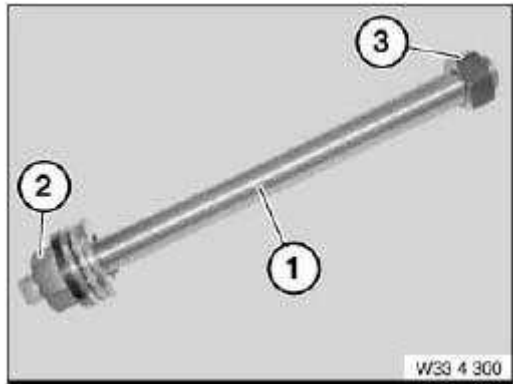


Fig. 12: Identify Special Tool (33 4 300)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 400 PULLER FIXTURE

NOTE: For removing inner wheel bearing races on rear axle

Series: E12, E21, E23, E24, E28, E30, E30/C, E30tou, E31, E32, E32/3, E34, E34tou, 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, RR1

SI number: 1 05 99(426)

Order number: 33 4 400

Puller fixture

Consisting of:

1 = 33 4 401 Basic body

2 = 33 4 402 Spindle

3 = 33 4 403 Wrench, large

4 = 33 4 404 Wrench, small

5 = 33 4 405 Clamping ring (45...51 mm)

6 = 33 4 406 Clamping ring (50...55 mm)

7 = 33 4 407 Clamping ring (55...61 mm)

NOTE: **Model series: E67**

8 = 33 4 408 Clamping ring

NOTE: **Model series: F01, F02 See SI: 01 18 08 (482)**

9 = 33 4 409 Thrust piece

NOTE: **Model series: F01, F02 See SI: 01 18 08 (482)**

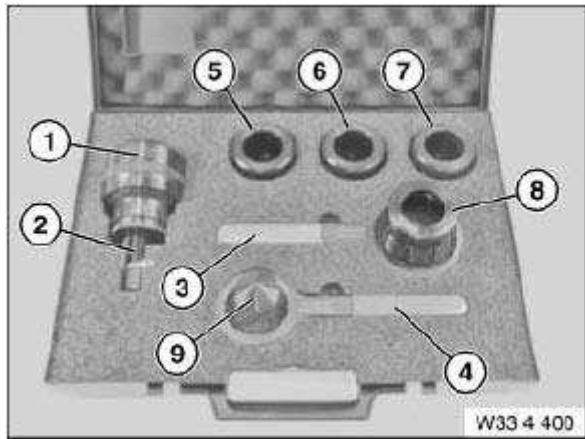


Fig. 13: Identify Special Tool (33 4 400)
Courtesy of BMW OF NORTH AMERICA, INC.

33 4 426 MOUNTING ADAPTER

NOTE: **Locator for E85 Z4 M. SI 01 10 06 (264)**

SI number: 01 10 06 264

Order number: 33 4 426

Mounting adapter

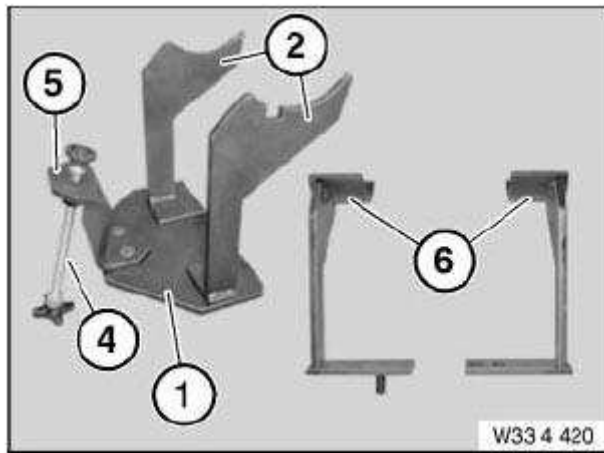


Fig. 14: Identify Special Tool (33 4 426)

Courtesy of BMW OF NORTH AMERICA, INC.

33 4 460 SET OF TOOLS

Minimum set: Mechanical tools

In conjunction with: 33 4 450

NOTE: For removing and installing camber arm rubber mount on rear axle carrier.

Series: E60, E61, E63, E64, E65, E66, E67, E70, E71, E81, E82, E83, E85, E86, E87, E88, E90, E91, E92, E93, RR1, RR2

Storage location: B49, C49

SI number: 1 15 04 (117)

Order number: 33 4 460

Set of tools

Consisting of:

1 = 33 4 461 Draw-in disk

2 = 33 4 462 Pull-out disk

3 = 33 4 463 Counter support

4 = 33 4 464 Support sleeve

5 = 33 4 465 Spindle 205 mm, M12

6 = 33 4 466 Pressure nut

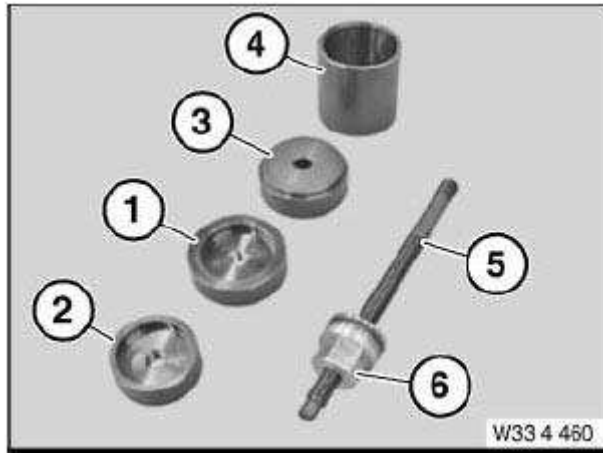


Fig. 15: Identify Special Tool (33 4 460)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 014 THRUST PIECE WITH SPLINED KEY

Order number: 33 5 014

Thrust piece with splined key

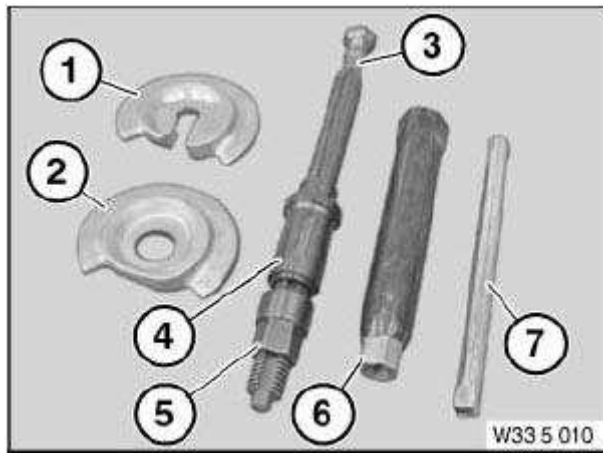


Fig. 16: Identify Special Tool (33 5 014)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 070 EXTENSION PIECE (2)

Minimum set: Mechanical tools

In conjunction with: 33 5 040, 33 5 050, 33 5 060

NOTE: Pull-out extension for 33 5 040, 33 5 050, 33 5 060.

Series: E36, 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, RR1, RR2

Storage location: A18, B18

SI number: 01 21 06 (300)

Order number: 33 5 070

Extension piece (2)

Consisting of:

1 = 33 5 071 Extension (1 x)



Fig. 17: Identify Special Tool (33 5 070)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 100 SPRING TENSIONER

Minimum set: Mechanical tools

NOTE: For tensioning or removing and installing barrel spring on rear axle.

Series: E70, E71

SI number: 01 22 06 (307)

Order number: 33 5 100

Spring tensioner

Consisting of:

1 = 33 5 101 Spring plate

2 = 33 5 102 Spring plate

3 = 33 5 103 Spindle

4 = 33 5 104 Nut with thrust member

5 = 33 5 105 Ratchet ring wrench WAF 24

6 = 33 5 109 Case with insert

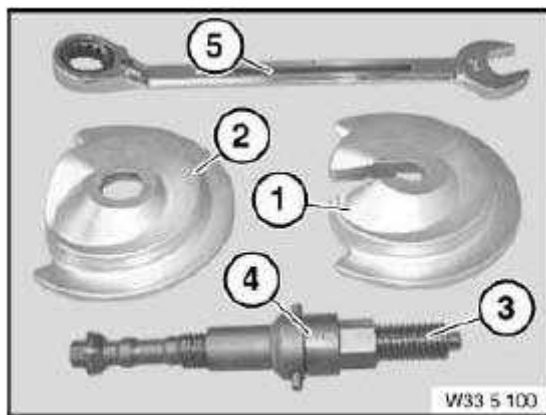


Fig. 18: Identify Special Tool (33 5 100)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 150 FIXTURE

Minimum set: Mechanical tools

NOTE: For removing and installing rubber mount in rear differential at rear.

Series: E70, E71

SI number: 01 22 06 (307)

Order number: 33 5 150

Fixture



Fig. 19: Identify Special Tool (33 5 150)
 Courtesy of BMW OF NORTH AMERICA, INC.

33 5 151 DISC

SI number: 01 22 06 (307)

Order number: 33 5 151

Disc

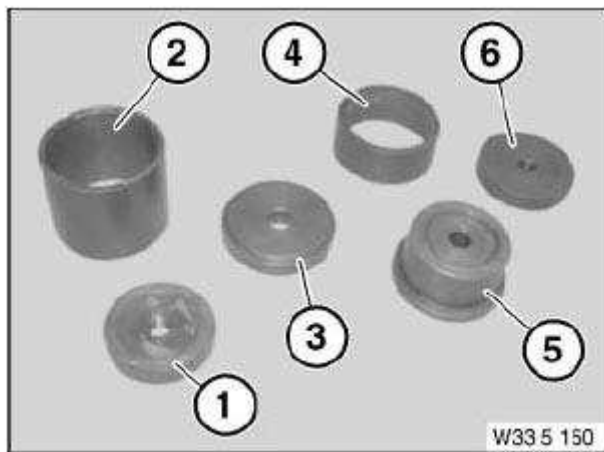


Fig. 20: Identify Special Tool (33 5 151)
 Courtesy of BMW OF NORTH AMERICA, INC.

33 5 152 HOLDING SLEEVE

SI number: 01 22 06 (307)

Order number: 33 5 152

Holding sleeve



Fig. 21: Identify Special Tool (33 5 152)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 153 DISC

SI number: 01 22 06 (307)

Order number: 33 5 153

Disc

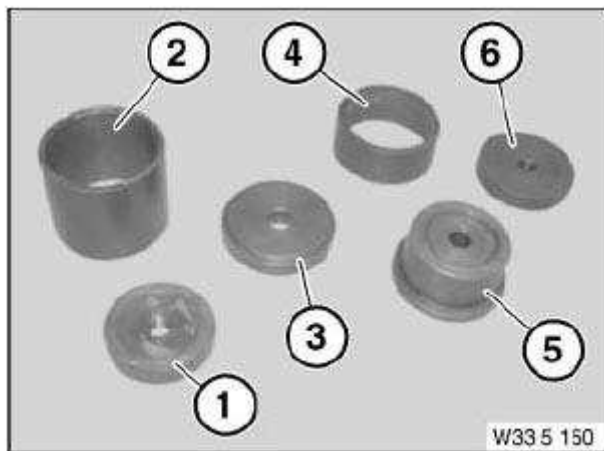


Fig. 22: Identify Special Tool (33 5 153)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 154 HOLDING SLEEVE

SI number: 01 22 06 (307)

Order number: 33 5 154

Holding sleeve

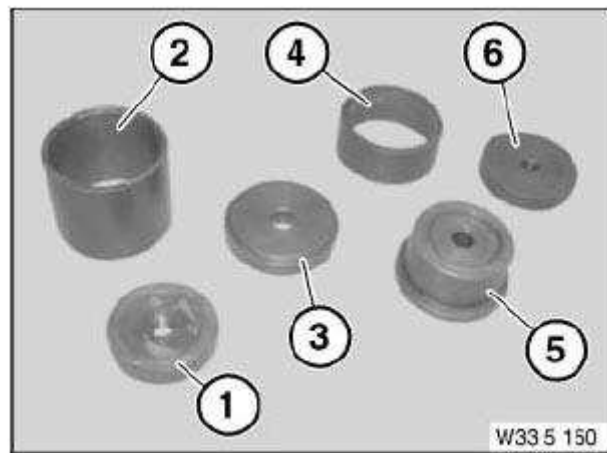


Fig. 23: Identify Special Tool (33 5 154)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 155 DISC

SI number: 01 22 06 (307)

Order number: 33 5 155

Disc

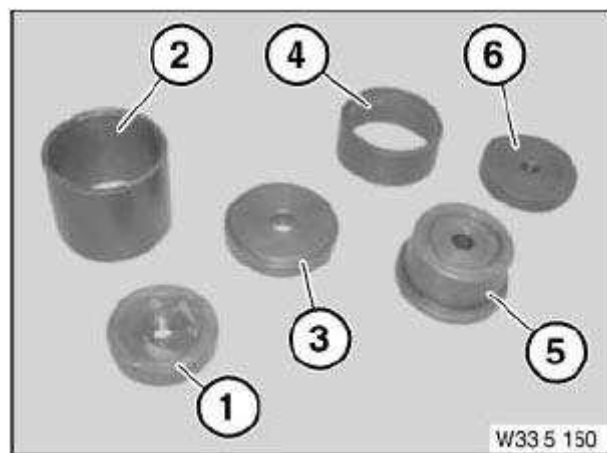


Fig. 24: Identify Special Tool (33 5 155)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 156 DISC

SI number: 01 22 06 (307)

Order number: 33 5 156

Disc

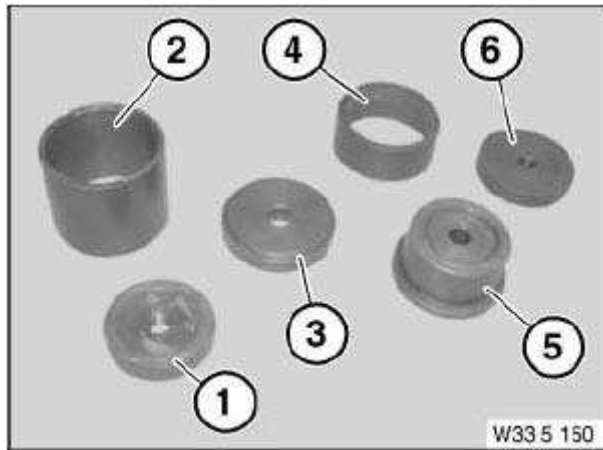


Fig. 25: Identify Special Tool (33 5 156)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 160 FIXTURE

Minimum set: Mechanical tools

NOTE: For removing and installing rubber mount in rear differential at front.

Series: E70, E71

SI number: 01 22 06 (307)

Order number: 33 5 160

Fixture

Consisting of:

1 = 33 5 161 Washer

2 = 33 5 162 Sleeve

3 = 33 5 163 Washer

4 = 33 5 164 Sleeve

5 = 33 5 165 Washer

6 = 33 5 166 Nut M12 x 1.5

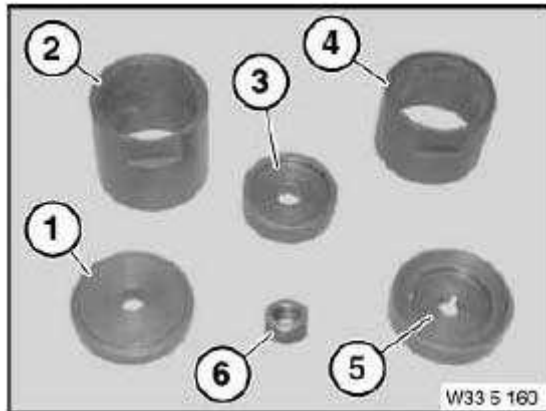


Fig. 26: Identify Special Tool (33 5 160)
Courtesy of BMW OF NORTH AMERICA, INC.

33 5 170 FIXTURE

Minimum set: Mechanical tools

NOTE: For removing and installing rubber mount in rear axle carrier.

Series: E70, E71

SI number: 01 22 06 (307)

Order number: 33 5 170

Fixture

Consisting of:

1 = 33 5 171 Shaped washer

2 = 33 5 172 Shaped washer

3 = 33 5 173 Shaped washer

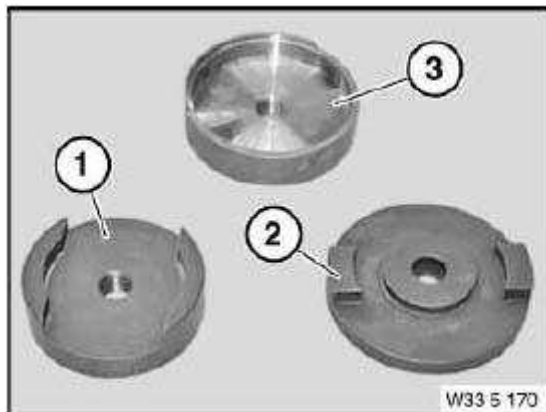


Fig. 27: Identify Special Tool (33 5 170)
Courtesy of BMW OF NORTH AMERICA, INC.

SUSPENSION

Rear Axle - Technical Data

GENERAL

33 00 GENERAL - TRACK WIDTH E71 1-AXLE AIR SUSPENSION

GENERAL - TRACK WIDTH E71 1-AXLE AIR SUSPENSION - SPECIFICATION

Track width for normal position and offset (ET)		
○ ET18	mm	1707
○ ET21	mm	1701
○ ET37	mm	1669

33 00 GENERAL - TRACK WIDTH E71 STANDARD SUSPENSION

GENERAL - TRACK WIDTH E71 STANDARD SUSPENSION - SPECIFICATION

Track width for normal position and offset (ET)		
○ ET18	mm	1707
○ ET21	mm	1701
○ ET37	mm	1669

33 00 GENERAL - TRACK WIDTH E71 STANDARD/ 1-AXLE AIR SPRING WITH ADAPTIVE DRIVE

GENERAL - TRACK WIDTH E71 STANDARD/ 1-AXLE AIR SPRING WITH ADAPTIVE DRIVE - SPECIFICATION

Track width for normal position and offset (ET)		
○ ET18	mm	1707
○ ET21	mm	1701
○ ET37	mm	1669

33 00 REAR AXLE - RIDE HEIGHT E71

REAR 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	
○ <u>NORMAL POSITION</u> max. $\pm$ 10 mm	
○ <u>DESIGN POSITION</u> max. $\pm$ 2 mm	

Difference ride height between left/right in		
○ <u>NORMAL POSITION</u> 10 mm		
○ <u>DESIGN POSITION</u> 2 mm		
Series steel spring		
19" rim	mm	700
20" rim	mm	712
21" rim	mm	724
Steel spring with Adaptive Drive		
19" rim	mm	710
20" rim	mm	722
21" rim	mm	734
1-axle air spring		
19" rim	mm	710
20" rim	mm	722
21" rim	mm	734
1-axle air spring with Adaptive Drive		
19" rim	mm	720
20" rim	mm	732
21" rim	mm	744

FINAL DRIVE

33 10 REAR AXLE DIFFERENTIAL E71 QMVH

REAR AXLE DIFFERENTIAL E71 QMVH - SPECIFICATION

Use only approved rear differential oils .		
Replenishment quantity, middle	ltr.	1.0 ± 0.2
Replenishment quantity, left	ltr.	0.54 ± 0.02
Replenishment quantity, right	ltr.	0.58 ± 0.02

WHEEL BEARINGS

33 41 WHEEL BEARINGS

WHEEL BEARINGS - SPECIFICATION

Double-row, angular ball bearing lubricated for service life and not to be disassembled		
Max. axial wheel bearing play	max. mm	0.06 ... 0.08

SUSPENSION

Rear Axle - Tightening Torques - X6

FINAL DRIVE WITH COVER

33 11 REAR DIFFERENTIAL CASE WITH COVER

REAR DIFFERENTIAL CASE WITH COVER - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Case Covers	E70	M10 10.9	188L 188LW	55 Nm
	E70	M10 10.9	215L 215LW	90 Nm
2AZ Oil filler plug with O-ring	E70	M22	Replace oil filler plug with O-ring	60 Nm
3AZ Oil filler and drain plugs with O-ring	E71	M22	225QMV Replace oil filler and drain plugs with O-ring	50 Nm
4AZ Heat shield to rear differential	E71	M6		8 Nm
5AZ Servomotor to rear differential	E71	M6		8 Nm
6AZ Temperature sensor to rear differential	E71	M12		14 Nm
7AZ Control unit to body	E71	Plastic nut		3 Nm

FINAL DRIVE MOUNTING

33 17 REAR AXLE DIFFERENTIAL MOUNTINGS

REAR AXLE DIFFERENTIAL MOUNTINGS - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Rear differential to rear axle carrier, front	E70, E71	M12	Observe repair instruction.	100 Nm
2AZ Rear differential to rear axle carrier, rear	E70, E71	M14	Observe repair instruction. Replace nut	165 Nm

OUTPUT SHAFTS

33 21 OUTPUT SHAFT

OUTPUT SHAFT - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Output shaft to drive flange, rear differential (Torx screw with RIBBED TEETH)	E71	M10	Replace screws and washers	70 Nm

CONTROL ARMS AND STRUTS

33 32 CONTROL ARMS AND STRUTS

CONTROL ARMS AND STRUTS - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Swinging arm to rear axle carrier, front	E70, E71	M12	Replace locking nut <u>TIGHTEN IN NORMAL POSITION</u>	
			Jointing torque	100 Nm
			Torque angle	90°
2AZ Swinging arm to rear axle carrier, rear	E70, E71	M16	Replace nut <u>TIGHTEN IN NORMAL POSITION</u>	250 Nm
3AZ Swinging arm to wheel carrier/integral link	E70, E71	M16	Replace nut	
			Jointing torque	130 Nm
			Torque angle	180 °
4AZ Integral link to wheel carrier	E70, E71	M12		100 Nm
5AZ Control arm to rear axle support	E70, E71	M12	Replace nut <u>TIGHTEN IN NORMAL POSITION</u>	100 Nm
6AZ Traction strut to wheel carrier	E70, E71	M12	Replace nut	100 Nm
7AZ Control arm to rear axle carrier	E70, E71	M12	Replace nut <u>TIGHTEN IN NORMAL POSITION</u>	
			Jointing torque	100 Nm
			Torque angle	90 °
8AZ Control arm to wheel carrier	E70, E71	M14	Replace nut	165 Nm

AXLE MOUNTING

33 33 REAR AXLE SUSPENSION

REAR AXLE SUSPENSION - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Rear axle carrier with rubber mounts to body	E70, E71	M14		165 Nm
2AZ Front compression strut to body	E70, E71	M10		56 Nm

	E70, E71	M12		100 Nm
3AZ Rear compression strut to body	E70, E71	M12		100 Nm
4AZ Electromechanical parking brake to rear axle carrier	E70, E71	M8		19 Nm

WHEEL BEARINGS

33 41 WHEEL BEARINGS

WHEEL BEARINGS - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Output shaft to wheel bearing	E70, E71	M27	Replacing collar nut, lightly oil contact face	420 Nm
2AZ Wheel bearing to wheel carrier	E70, E71	M12	Stick in screws again/replace	100 Nm

SHOCK ABSORBER

33 52 SHOCK ABSORBERS

SHOCK ABSORBERS - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Nut and locknut/self-locking nut	E70, E71	M10	Replace nuts	56 Nm
2AZ Support bearing flange to shock absorber	E70, E71	M12	Replace nut	48 Nm
3AZ Shock absorber to swinging arm	E70, E71	M14	Replace screw <u>TIGHTEN IN NORMAL POSITION</u>	165 Nm

STABILIZER BAR

33 55 STABILIZER BAR

STABILIZER BAR - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Retaining bracket, stabilizer bar to rear axle support	E70, E71	M10		56 Nm
2AZ Stabilizer link on anti-roll bar/swinging arm	E70, E71	M12	Replace nut	100 Nm