

2007-08 SUSPENSION**Steering And Wheel Alignment - Repair Instructions - X5****00 ELECTRONIC CHASSIS ALIGNMENT****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.

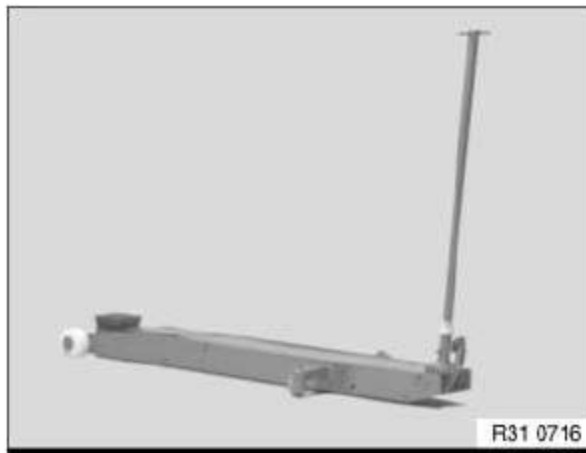


Fig. 1: Identifying Trolley Jack
Courtesy of BMW OF NORTH AMERICA, INC.

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!

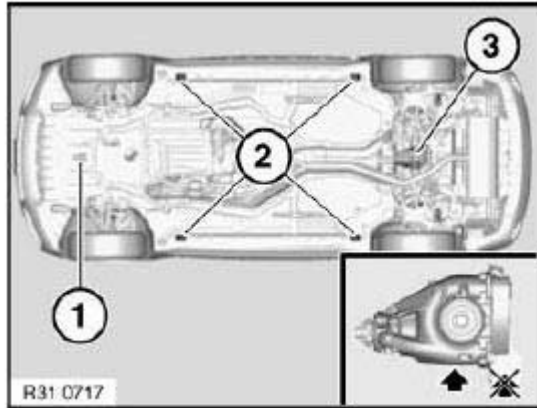


Fig. 2: Identifying Car Jacking Point, Side Car Jacking Points And Rear Differential
Courtesy of BMW OF NORTH AMERICA, INC.

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

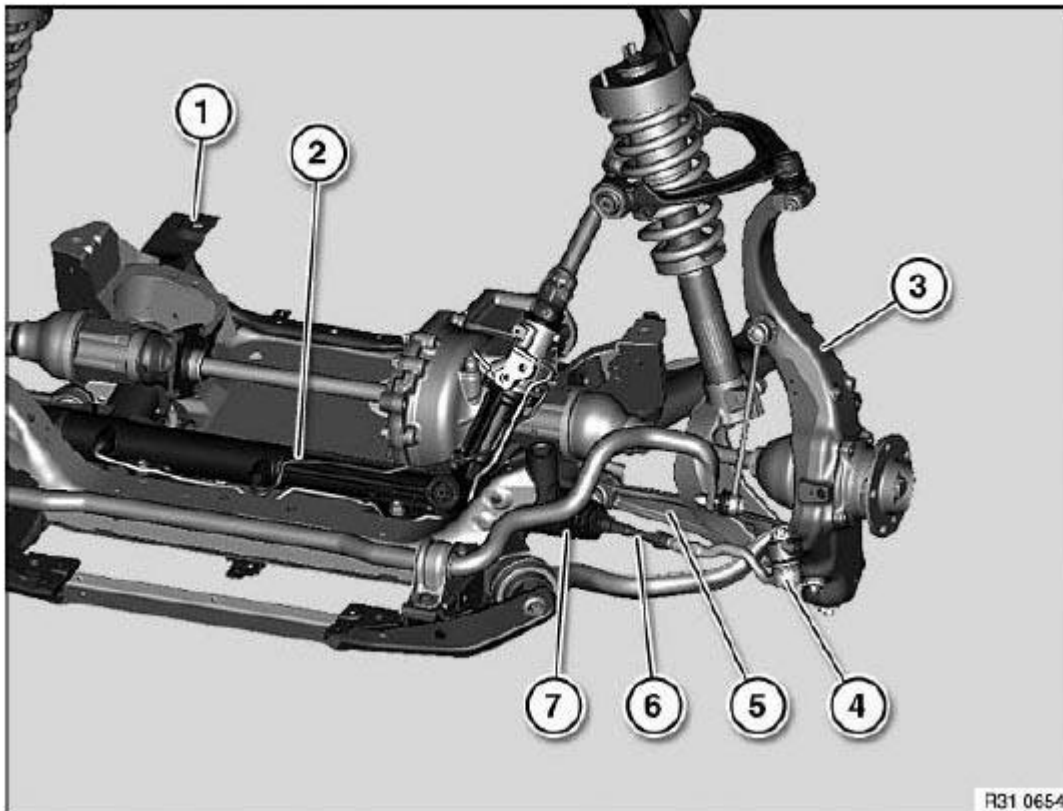
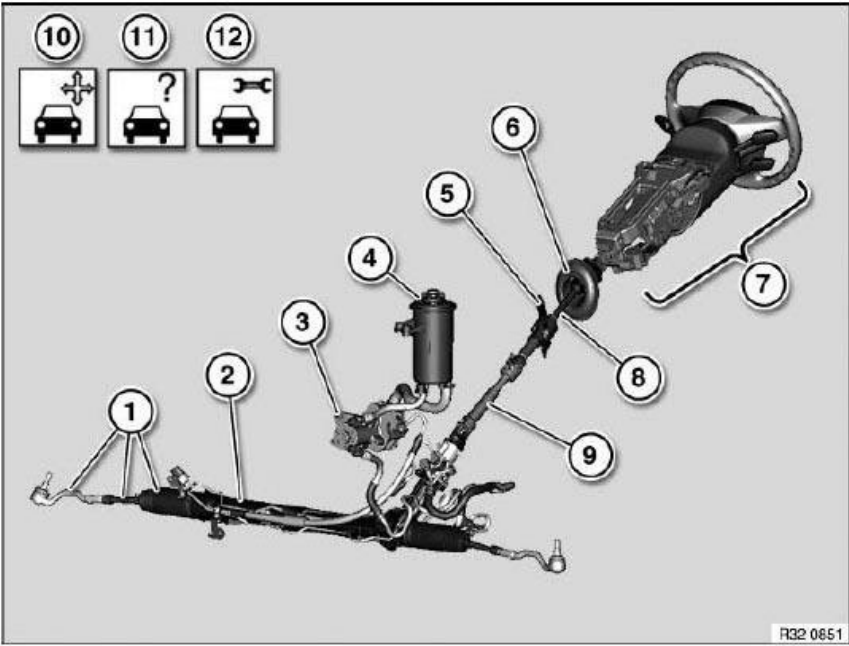


Fig. 3: Identifying Front Axle Components
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

32 OVERVIEW OF STEERING



Safety precautions and general information

- | | | |
|---|--|----|
| 1 | <u>Tie rod end / tie rod / gaiter</u> | 10 |
| 2 | <u>Power steering gear</u> | 11 |
| 3 | <u>Vane pump</u> | 12 |
| 4 | <u>Oil container</u> | |
| 5 | Bearing plate | |
| 6 | Sleeve | |
| 7 | <u>Overview of steering (interior)</u> | |
| 8 | Steering spindle middle section | |
| 9 | <u>Steering spindle lower section</u> | |

Adjustment work

Testing

Troubleshooting

Overview, active front steering

Overview, Dynamic Drive

Bleed power steering unit

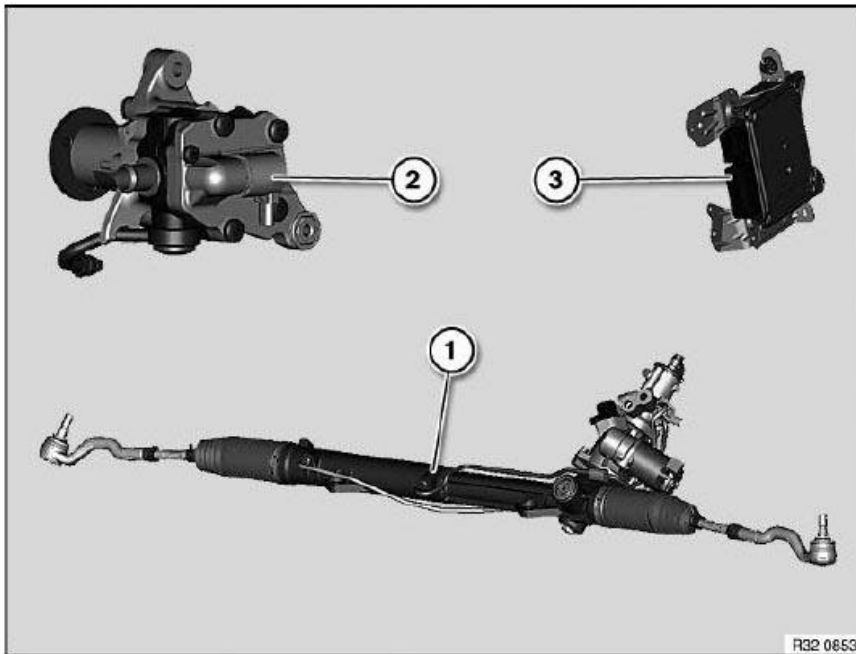
Carry out steering angle sensor adjustment/adjustment for active front steering

Teach in centre position for power steering gear

Fig. 4: Overview Of Steering

Courtesy of BMW OF NORTH AMERICA, INC.

32 ... OVERVIEW OF ACTIVE FRONT STEERING



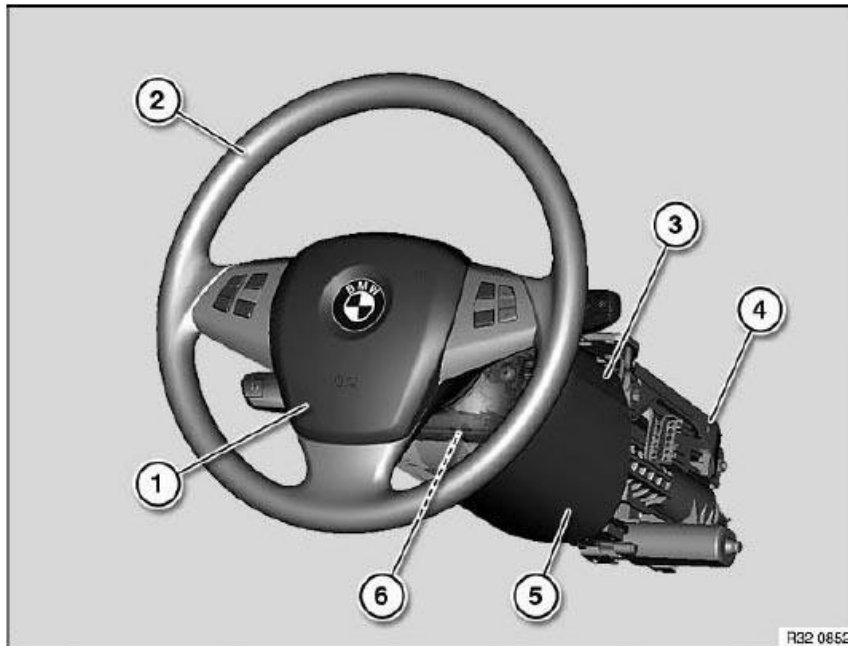
Safety precautions & general information

- 1 Power steering gear
- 2 Eco valve (on power steering pump)
- 3 Control unit

Carry out adjustment for active front steering.
Teach in centre position for power steering gear.

Fig. 5: Overview Of Active Front Steering
Courtesy of BMW OF NORTH AMERICA, INC.

32 ... OVERVIEW OF STEERING (INTERIOR)



Safety precautions & general information

1 Airbag unit

2 Steering wheel

3 Upper steering column casing

4 Steering column

5 Lower steering column casing

6

Steering angle sensor (see steering column switch cluster)

Carry out steering angle sensor adjustment/adjustment for active front steering

Teach in centre position for power steering gear

Fig. 6: Overview Of Steering (Interior)

Courtesy of BMW OF NORTH AMERICA, INC.

32 00 ... ADDITIONAL WORK FOR CAMBER CORRECTION

IMPORTANT: Changes in axle geometry caused by accidents must under no circumstances be rectified by camber adjustment!

NOTE: The upper control arm may only be replaced if the camber is outside the specified tolerance after toe adjustment.

Adjust toe-in. See 32 00 601 ADJUSTING TOE-IN ON FRONT AXLE.

Check camber values; if necessary, replace upper control arm with over- or under dimension variant. See 31 12 002 REMOVING AND INSTALLING/REPLACING TOP LEFT CONTROL ARM or 31 12 003 REMOVING AND INSTALLING/REPLACING TOP RIGHT CONTROL ARM.

NOTE: **Control arms with + or - marking (see Fig. 7) are camber correction arms:**
 - Under dimension variant
 + Over dimension variant

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

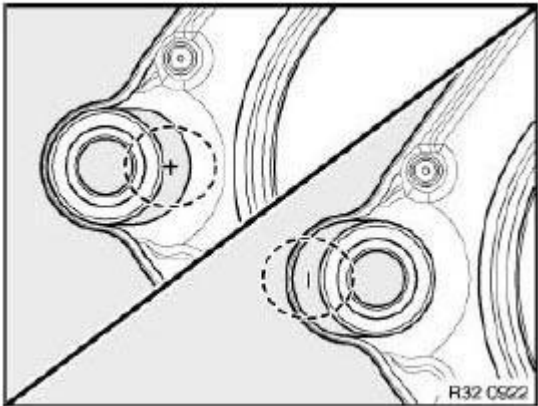


Fig. 7: Identifying Under Dimension And Over Dimension Variant Marking On Control Arms
Courtesy of BMW OF NORTH AMERICA, INC.

An unmarked control arm is a standard part.

After installation:

- Check directional stability of car; if necessary, repeat toe-in adjustment.

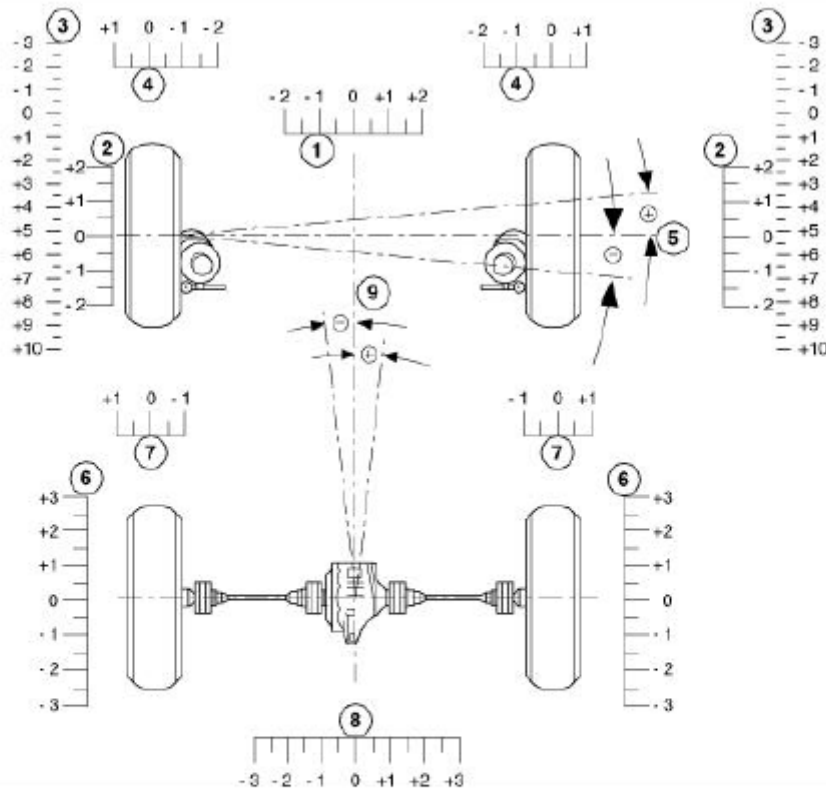
32 00 ... CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE

CHASSIS/WHEEL ALIGNMENT CHECK PROCEDURE STEPS

Check adherence to test conditions . See 32 00 ... TEST CONDITIONS FOR CHASSIS/WHEEL ALIGNMENT CHECK.		
I V		
Position vehicle on measuring stand		
I V		
Measure vehicle ride height . See 31 33 095 MEASURING RIDE-LEVEL HEIGHT OF VEHICLE .	OK -> 2636 of 3160	Carry out chassis/wheel alignment check with ride-height measurement without load. See 32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD.

Read off setpoint value in KDS Tolerance -20 / +40 mm per wheel permissible Difference between left / right max. 10 mm permissible		
Not OK / no data I V		
Move vehicle into normal position . See 32 00 ... MOVING VEHICLE INTO NORMAL POSITION.		
Introduce load and measure ride heights		
Read off setpoint value in KDS Tolerance ± 10 mm per wheel permissible Difference between left / right max. 10 mm permissible	Not OK ->	
OK I V		Check suspension for damage, repair if necessary
Move vehicle into design position . See 32 00 ... MOVING VEHICLE INTO DESIGN POSITION.	<- Not OK	
Add/distribute weights and measure ride heights		
Read off setpoint value in KDS Tolerance ± 2 mm per wheel permissible Difference between left / right max. 2 mm permissible		
I V		
Carry out KDS chassis/wheel alignment check with load up to design position. See 32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION.		

32 00 ... GENERAL CHASSIS AND SUSPENSION DEFINITIONS



31 32 018

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

Fig. 8: Identifying General Chassis And Suspension Definitions
 Courtesy of BMW OF NORTH AMERICA, INC.

32 00 ... GENERAL INFORMATION AND DEFINITIONS

Toe angle difference

a Toe angle difference

D Center point of operating circle

The toe angle difference is the angle adjustment of the inner cornering wheel relative to the outer cornering wheel when negotiating a curve. Steering is designed in such a way that angular position of wheels changes as steering lock progresses.

A correctly adjusted toe angle difference produces equal values for left and right lock with consideration of factory tolerances.

Toe angle difference provides information on corresponding operation of steering trapezoid for left or right steering lock from center position.

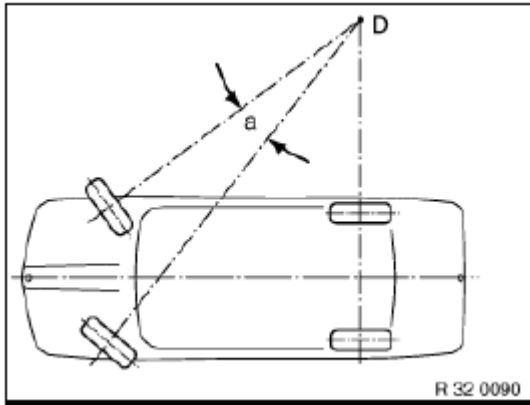


Fig. 9: Identifying Toe Angle Difference
Courtesy of BMW OF NORTH AMERICA, INC.

Camber

Inclination of the wheel from the perpendicular.

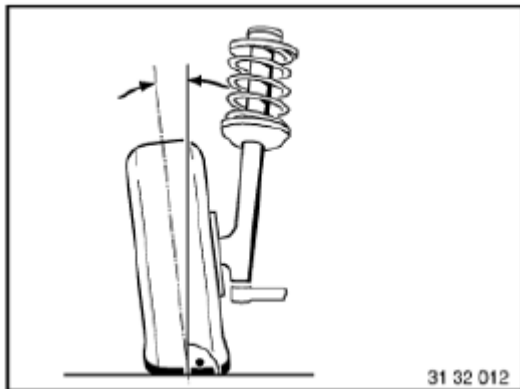


Fig. 10: Identifying Camber Angle
Courtesy of BMW OF NORTH AMERICA, INC.

Toe

Reduction in distance of front of front wheels to rear of front wheels. The toe-in prevents the wheels from moving apart during driving and thus:

- the wheels from vibrating and grinding
- excessive tire wear
- excessive strain on the steering linkage and its joints
- heavy vehicle steering

Measurement is performed in "straight-ahead mode".

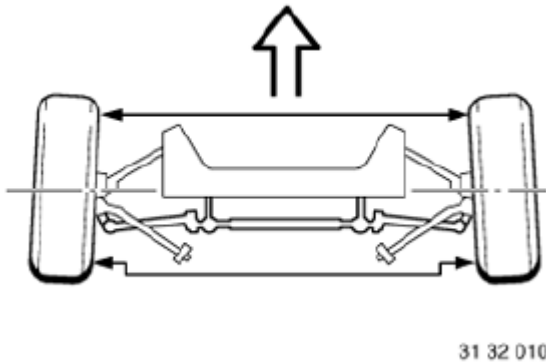


Fig. 11: Identifying Toe Angle

Courtesy of BMW OF NORTH AMERICA, INC.

Caster

Is the inclination of the kingpin in the direction of travel viewed from the side. The line through the center point of the spring strut support bearing and the control arm ball joint corresponds to the "kingpin".

Thanks to caster, wheels are pulled and not pushed. In a similar manner to king pin inclination, when driving in curves or around corners, returning forces are reproduced to help return wheels to straight-ahead position.

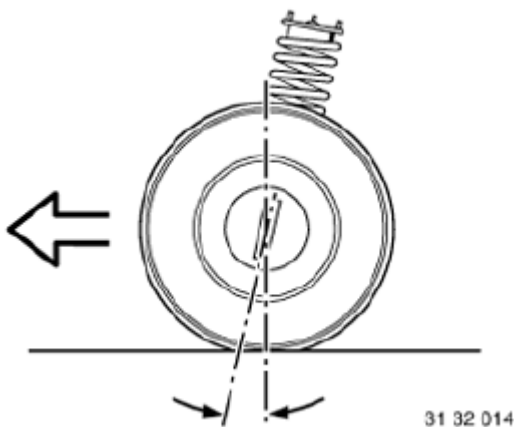


Fig. 12: Identifying Caster Angle

Courtesy of BMW OF NORTH AMERICA, INC.

Geometrical axis 1

Is the angle bisector from the total rear-wheel toe.

Front-wheel measurements are taken in reference to this axis.

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Symmetrical axis 2

Center line running through front and rear axles.

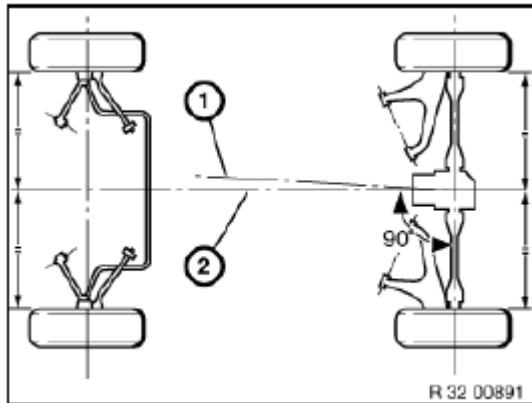


Fig. 13: Identifying Geometrical Axis 1
Courtesy of BMW OF NORTH AMERICA, INC.

Wheel offset

Angle by which one front wheel is displaced more towards front or rear than the other front wheel. The wheel offset angle is positive when the right wheel is displaced towards the front and negative when it is displaced towards the rear.

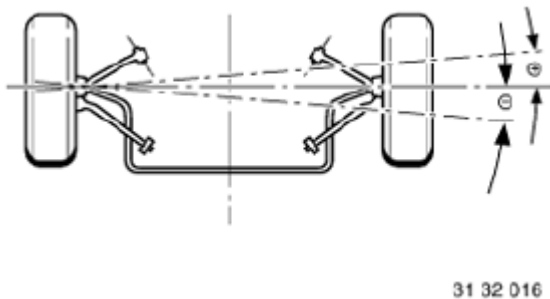


Fig. 14: Identifying Wheel Offset
Courtesy of BMW OF NORTH AMERICA, INC.

Kingpin offset/scrub radius

Is the distance from the center of the wheel contact face to the intersection point of the kingpin extension. The line through the center point of the spring strut support bearing and the control arm ball joint corresponds to the "kingpin".

The scrub radius is influenced by camber, kingpin angle and wheel offset of the wheel rim.

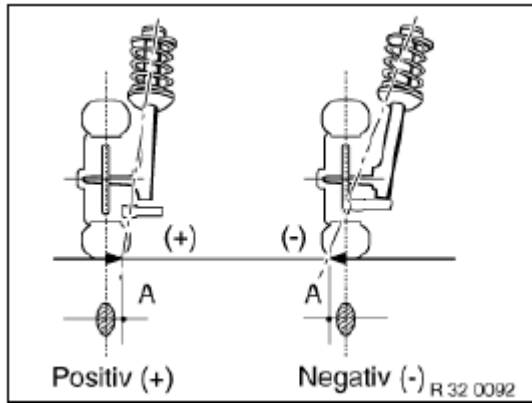


Fig. 15: Identifying Kingpin Offset/Scrub Radius
 Courtesy of BMW OF NORTH AMERICA, INC.

32 00 ... IDENTIFICATION OF SUSPENSION WITHOUT LABEL

NOTE: If the front spring strut does not have a label for suspension identification, the type of suspension can be identified from the part number in the Electronic Parts Catalogue.

32 00 ... INFORMATION ON REPLACING STEERING GEAR AFTER ACCIDENT DAMAGE

Facts:

In the event of accidents or driving conditions similar to accidents, shocklike loads can cause different types of damage to steering gears. When a steering gear is externally undamaged, it is sometimes only possible to identify damage with great difficulty and with great effort. However, damage of this nature poses an unacceptable risk to the vehicle because it can result in failure of the steering system.

Because of the disproportionate amount of effort involved, it is generally not sensible to check thoroughly all the individual components of the steering gear and as an alternative it is necessary to take into account other components which can be checked more easily.

Procedure:

The steering gear must be replaced if one or more of the following points apply:

- A. Visible or noticeable damage to the steering gear
- B. Unacceptable torque increase and jamming when the steering gear is turned from lock to lock (without hydraulic assistance)
- C. Permissible tolerances exceeded during axle/wheel alignment check (if necessary, include alignment record with invoice / report)
- D. Fire damage
- E. Damage, permanent deformation or fractures to:

- Wheel rims in the event of a negative result from the wheel/axle alignment check
- Spring struts, steering knuckles, wheel carriers
- Control arms
- Compression or tension struts or stabilizer bars with this function
- Body-side screwing/bolting points for wheel guide/control components
- Front axle carrier
- Pitman arms
- Tie rods
- Steering gear fixtures
- Steering column

This guideline is binding for all accident repairs to BMW and MINI vehicles.

NOTE: If the steering gear replacement work which is required for safety reasons is refused by the customer or an insurance company for cost reasons, a memorandum to that effect must be drawn up and countersigned by the party bearing the costs of the accident repair.

IMPORTANT: The vehicle's type approval will be invalidated whenever the function of any of its safety components is compromised!

32 00 ... MOVING VEHICLE INTO DESIGN POSITION

Necessary preliminary tasks:

- Move vehicle into normal position . See **32 00 ... MOVING VEHICLE INTO NORMAL POSITION**.
- Version with air spring system:
 - Remove ignition key
 - Pull fuse for air supply unit control unit
- Add/distribute weights in area of spring struts until the vehicle ride height is within the tolerance.

Measure ride-level height of vehicle . See **31 33 095 MEASURING RIDE-LEVEL HEIGHT OF VEHICLE** .

32 00 ... MOVING VEHICLE INTO NORMAL POSITION

Necessary preliminary tasks:

- Check compliance with test conditions , bring vehicle to a stop if necessary. See **32 00 ... TEST CONDITIONS FOR CHASSIS/WHEEL ALIGNMENT CHECK**.
- Version with air spring system: Carry out ride-height calibration . See **37 12 012 CARRYING OUT RIDE-HEIGHT-CALIBRATION** .

- Check vehicle interior and luggage compartment (incl. luggage compartment recess) for load, unload vehicle if necessary
- Introduce DIN load (refer to **STEERING AND WHEEL ALIGNMENT - TECHNICAL DATA**) into vehicle
- Determine vehicle ride height . See **31 33 095 MEASURING RIDE-LEVEL HEIGHT OF VEHICLE** .

NOTE: If the vehicle ride height is not inside the tolerance (refer to **STEERING AND WHEEL ALIGNMENT - TECHNICAL DATA**), the vehicle must be repaired (coil spring/leakage).

32 00 ... PERFORMING RIM RUNOUT COMPENSATION

NOTE: Rim runout compensation involves electronically recording the lateral runout of the rim and the possible clamping error of the quick-clamping unit for one wheel rotation and compensating the toe and camber for measurement/alignment.
Raise body.
Perform rim runout compensation in accordance with equipment manufacturer's instructions.
Compress/deflect car.

32 00 ... TEACHING IN CENTRE POSITION FOR POWER STEERING (ACTIVE FRONT STEERING) (FROM 03/2007)

NOTE: Carry out the following procedure after disconnecting the battery or disconnecting electrical plug connections on the steering column switch cluster.

Turn on ignition, start engine if necessary.

Turn steering wheel twice in both directions to full lock.

IMPORTANT: If the indicator lamp does not go out after the ignition is turned on again, an adjustment of the active front steering must be carried out.

32 00 ... TEST CONDITIONS FOR CHASSIS/WHEEL ALIGNMENT CHECK

Observe the following test conditions prior to the chassis/wheel alignment check:

1. Correct and identical rim and tire sizes.
2. Correct tread depth. The tread depth for each axle may differ from left to right by max. 3-4 mm.
3. Correct tire inflation pressure.
4. Wheel bearing clearance OK

5. Steering backlash OK
6. Condition of suspension and shock absorbers OK
7. Cars with ride level control: Pull fuse of air supply unit so that there is no controlling down or up.

32 00 ... TROUBLESHOOTING AFTER CHASSIS/WHEEL ALIGNMENT CHECK

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

You must also follow the rules and guidelines for accident-related repairs to the steering gear . See **32 00 ... INFORMATION ON REPLACING STEERING GEAR AFTER ACCIDENT DAMAGE.**

Procedure:

- Ride-height problems:
 - I. Check load , correct if necessary (e.g. luggage compartment). See **32 00 ... MOVING VEHICLE INTO NORMAL POSITION.**
 - II. Check coil springs for damage/correct seating, replace if necessary. See .
 - III. Check air springs for damage. See **31 33 105 REMOVING AND INSTALLING/REPLACING COIL SPRING FOR LEFT OR RIGHT FRONT SPRING STRUT** or **33 53 000 REMOVING AND INSTALLING / REPLACING REAR LEFT OR RIGHT COIL SPRING** .
 - IV. Check ride-height sensor for damage, carry out ride-height-calibration if necessary
- Setting problems:
 - I. Tighten all suspension screw/bolt connections to specified torque
 - II. Check all suspension components for deformation/damage or retrofits, replace if necessary

CAUTION: When replacing deformed or damaged suspension components, also check the adjoining components for damage and replace if necessary (comply with repair instructions).

NOTE: If after chassis/suspension components have been replaced adjustment of camber/track alignment is not possible, the vehicle must be placed on the body straightening bench.

32 00 150 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH LOAD UP TO DESIGN POSITION

IMPORTANT: Carry out chassis/wheel alignment with DIN load only:

- A. If the technical preconditions for alignment with ride height input are not in place
- B. If, in spite of repairs having been carried out, the car's ride height between the left and right sides is still outside the tolerance

C. If the vehicles in question have been involved in an accident

NOTE: Calibrate reversing camera after chassis/wheel alignment. See 66 53 010 CALIBRATING REVERSING CAMERA .

NOTE:

- Read and comply with General information and definitions . See 32 00 ... GENERAL INFORMATION AND DEFINITIONS.
- Read and comply with General chassis definition . See 32 00 ... GENERAL CHASSIS AND SUSPENSION DEFINITIONS.

- If necessary, prepare lifting platform.
- Drive vehicle onto lifting platform.

NOTE: The front and rear wheels must be positioned centrally on the rotary and sliding plates.

- Remove locking pins from both rotary and sliding plates.

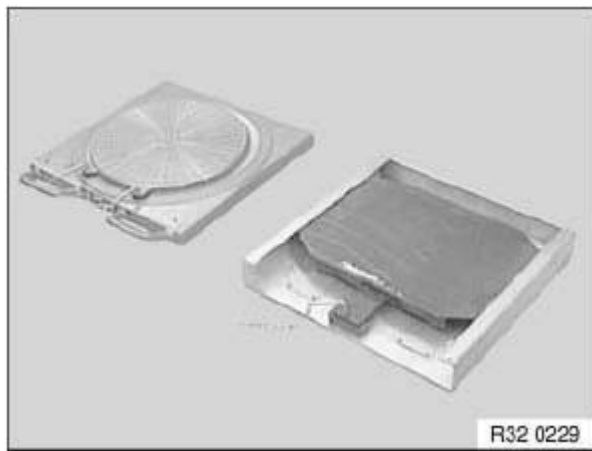


Fig. 16: Identifying Rotary And Sliding Plates
Courtesy of BMW OF NORTH AMERICA, INC.

- Attach quick-clamping holder/quick-clamping unit to vehicle and remove clamping levers in area of front wheels
- Attach pickup to quick-clamping holder/quick-clamping unit, align using bubble level and connect to rotary plates

NOTE: When using quick-clamping units, perform RIM RUNOUT COMPENSATION after installing the pickups.



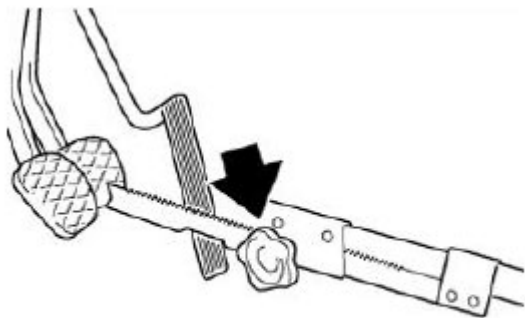
Fig. 17: Attaching Quick-Clamping Holder/Quick-Clamping Unit To Front Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

- If necessary, attach spoiler adapter.



Fig. 18: Identifying Spoiler Adapter
Courtesy of BMW OF NORTH AMERICA, INC.

- Enter customer and vehicle data
- Identify chassis version and select vehicle. See **32 00 ... IDENTIFICATION OF SUSPENSION WITHOUT LABEL**.
- Enter tire pressure and tread depth
- Move vehicle into design position . See **32 00 ... MOVING VEHICLE INTO DESIGN POSITION**.
- Install brake tensioner.



31 34 021

Fig. 19: Locating Brake Tensioner

Courtesy of BMW OF NORTH AMERICA, INC.

- Perform input measurement in accordance with equipment manufacturer's instructions.
- Compare specified values with actual values. See **STEERING AND WHEEL ALIGNMENT - TECHNICAL DATA** .
- If necessary, adjust front axle and rear axle . See **32 00 620 ADJUSTING REAR AXLE**.
- Perform output measurement in accordance with equipment manufacturer's instructions.
- Save and print out test record.
- Carry out steering angle sensor adjustment/adjustment for active front steering . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .
- Insert locking pins into both rotary and sliding plates
- Remove chassis/wheel alignment system

32 00 155 KDS CHASSIS/WHEEL ALIGNMENT CHECK WITH RIDE-HEIGHT MEASUREMENT WITHOUT LOAD

IMPORTANT: Do not carry out chassis/wheel alignment without load:

- A. If the technical preconditions for alignment with ride height input are not in place**
- B. If, in spite of repairs having been carried out, the car's ride height between the left and right sides is still outside the tolerance**
- C. If the vehicles in question have been involved in an accident**

NOTE:

- Read and comply with General information and definitions . See **32 00 ... GENERAL INFORMATION AND DEFINITIONS**.
- Read and comply with General chassis definition . See **32 00 ... GENERAL CHASSIS AND SUSPENSION DEFINITIONS**.

NOTE:

- Check compliance with test conditions , bring vehicle to a stop if necessary. See **32 00 ... TEST CONDITIONS FOR CHASSIS/WHEEL ALIGNMENT CHECK.**
- If the ride height is outside the tolerance range (+40/ -20 mm), the vehicle must be loaded and measured/aligned in the design position . See **32 00 ... MOVING VEHICLE INTO DESIGN POSITION.**
- Calibrate reversing camera (RFK) after chassis/wheel alignment. See **66 53 010 CALIBRATING REVERSING CAMERA .**

- If necessary, prepare lifting platform.
- Drive vehicle onto lifting platform.

NOTE: The front and rear wheels must be positioned centrally on the rotary and sliding plates.

- Remove locking pins from both rotary and sliding plates, align pickup using bubble level and activate

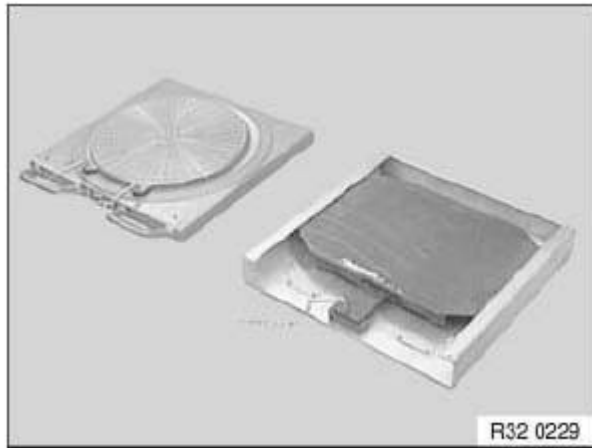


Fig. 20: Identifying Rotary And Sliding Plates
Courtesy of BMW OF NORTH AMERICA, INC.

- Attach quick-clamping holder/quick-clamping unit to vehicle and remove clamping levers in area of front wheels
- Attach pickup to quick-clamping holder/quick-clamping unit, align using bubble level and connect to rotary plates

NOTE: When using quick-clamping units, perform **RIM RUNOUT COMPENSATION** after installing the pickups.



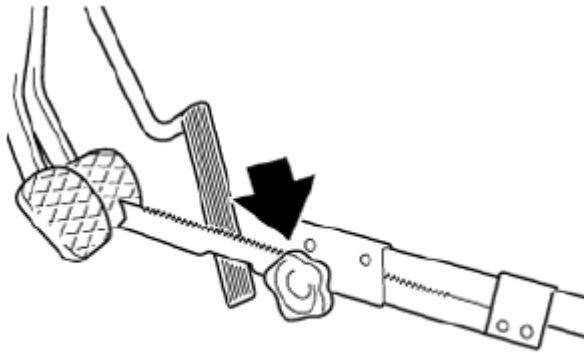
Fig. 21: Attaching Quick-Clamping Holder/Quick-Clamping Unit To Front Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

- If necessary, attach spoiler adapter.



Fig. 22: Identifying Spoiler Adapter
Courtesy of BMW OF NORTH AMERICA, INC.

- Install brake tensioner.



31 34 021

Fig. 23: Locating Brake Tensioner

Courtesy of BMW OF NORTH AMERICA, INC.

- Enter customer and vehicle data
- Identify chassis version and select vehicle. See **32 00 ... IDENTIFICATION OF SUSPENSION WITHOUT LABEL**.
- Enter tire pressure and tread depth
- Measure and enter vehicle ride height . See **31 33 095 MEASURING RIDE-LEVEL HEIGHT OF VEHICLE** .

If the ride height is outside the tolerance range (+40/ - 20 mm), the vehicle must be loaded and measured/aligned in the design position. See **32 00 ... MOVING VEHICLE INTO DESIGN POSITION**.

- Perform input measurement in accordance with equipment manufacturer's instructions.
- Compare specified values with actual values. See **STEERING AND WHEEL ALIGNMENT - TECHNICAL DATA** .
- If necessary, adjust front axle and rear axle. See **32 00 620 ADJUSTING REAR AXLE**.
- Perform output measurement in accordance with equipment manufacturer's instructions.
- Save and print out test record.
- Carry out steering angle sensor adjustment/adjustment for active front steering . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .
- Insert locking pins into both rotary and sliding plates
- Remove chassis/wheel alignment system

32 00 601 ADJUSTING TOE-IN ON FRONT AXLE

NOTE: **Camber and toe-in influence each other. Adjust the toe-in first in order to simplify the adjustment procedure.**

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Version with active front steering:

- Align steering wheel
- Set cumulative steering angle by means of the service function "Carry out initial operation/adjustment for active front steering " to "zero". See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING**.
- If necessary, secure with steering wheel arrester

Version without active front steering:

If necessary, remove steering gear cover at top . See **51 71 ... REMOVING AND INSTALLING/REPLACING TOP LEFT STEERING GEAR COVER** and **51 71 ... REMOVING AND INSTALLING/REPLACING TOP RIGHT STEERING GEAR COVER** .

Move steering into straight-ahead position by means of markings on cap (1) and steering gear (2).

Align steering wheel and secure with steering wheel arrester.

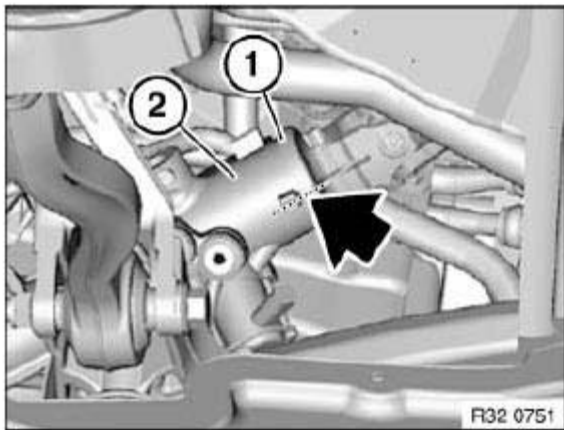


Fig. 24: Identifying Steering Gear And Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Clean thread on tie rod.

Slacken clamping nut (2), gripping tie rod end (1) in the process.

Remove clamp (4).

Turn tie rod (3) to adjust toe-in to specified value.

Version with active front steering: Check cumulative steering angle; if necessary, set to "zero".

Check toe values, repeat adjustment if necessary.

Tighten down clamping nut (2).

Tightening torque 32 21 2AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

Fit clamp (4).

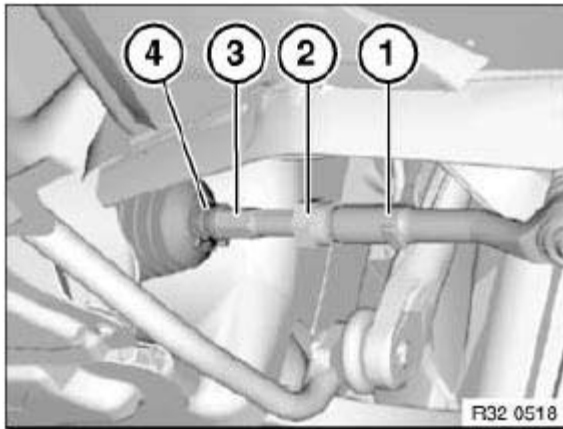


Fig. 25: Identifying Clamping Nut, Gripping Tie Rod End And Clamp
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Check directional stability of car; if necessary, repeat toe-in adjustment

32 00 620 ADJUSTING REAR AXLE

NOTE: A camber change always means a toe change as well. The camber must therefore be adjusted first.

NOTE: Vehicles with reversing cameras only:

- Calibrate reversing camera (RFK) after chassis/wheel alignment. See **66 53 010 CALIBRATING REVERSING CAMERA** .

Adjusting camber:

Replace nut (2) prior to adjustment and tighten to 5 Nm.

Turn eccentric bolt (1) to adjust camber to setpoint value.

Tighten nut (2).

Tightening torque 33 32 2AZ.

See **REAR AXLE - TIGHTENING TORQUES** .

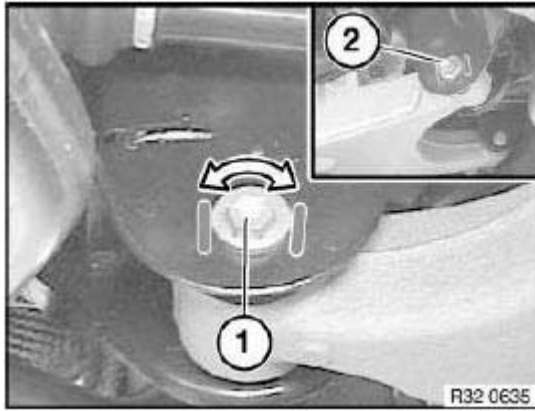


Fig. 26: Turning Eccentric Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Adjusting toe:

Replace nut (2) prior to adjustment and tighten to 5 Nm.

Turn eccentric bolt (1) to adjust toe to specified value.

Tighten nut (2).

Tightening torque 33 32 5AZ.

See **REAR AXLE - TIGHTENING TORQUES** .

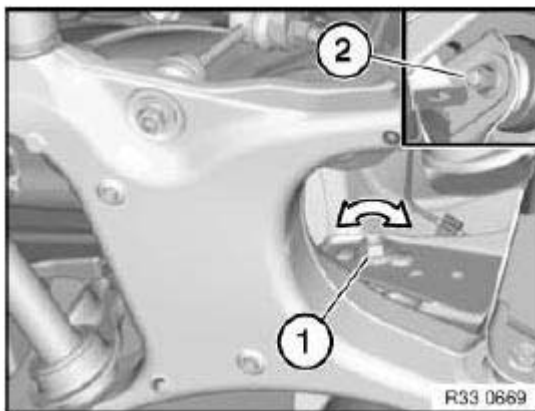


Fig. 27: Turning Eccentric Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Adjustment of the active front steering must be carried out:

- after adjustment work on the front axle/steering
- after all mechanical work on the steering system
- after replacement/programming or coding of the following components:
 - Steering column switch cluster
 - DSC control unit
 - Active front steering control unit
 - ARS control unit

Connect vehicle to BMW diagnosis system.

Select and carry out initial operation/adjustment for active front steering under Service functions.

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

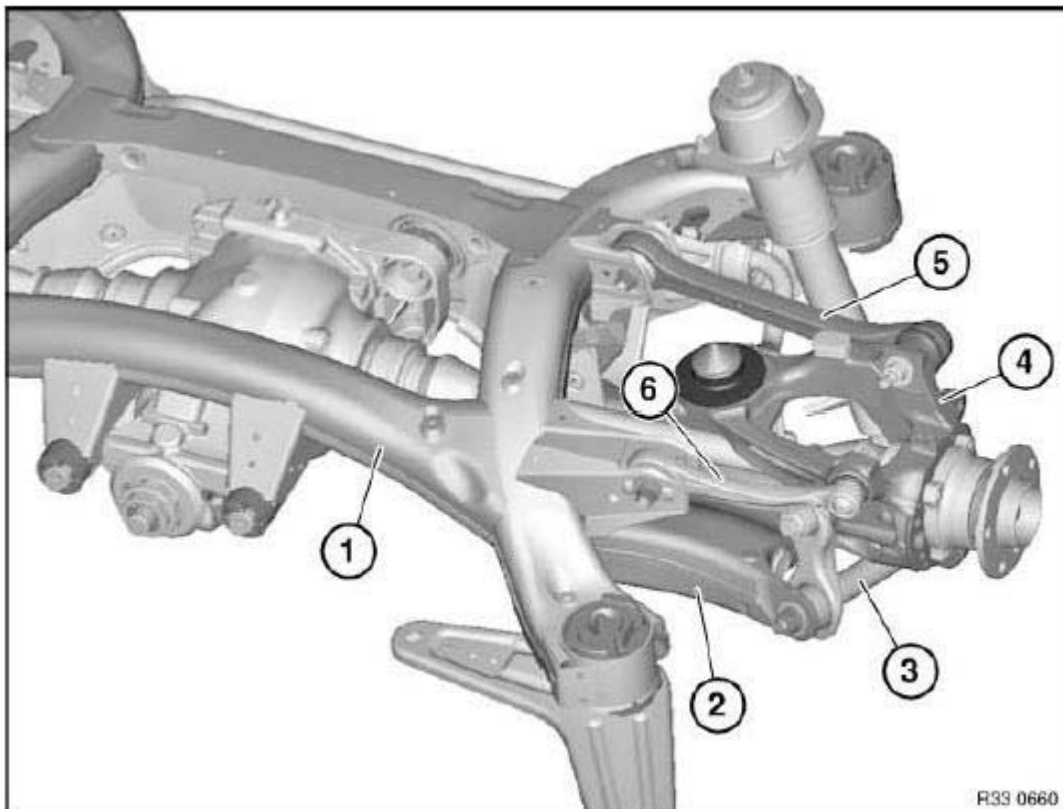


Fig. 28: Identifying Rear Axle Components
Courtesy of BMW OF NORTH AMERICA, INC.

- 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

51 71 505 MOUNT SECURING FIXTURE FOR VEHICLE ON LIFTING PLATFORM**Special tools required:**

- 00 2 261
- 00 2 262

WARNING: Danger to life!

Mount securing fixture for vehicle on lifting platform to prevent the vehicle from slipping off or tilting down.

Observe the following directions and instructions when handling the special tool:

- 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. Keep special tools dry, clean and free of grease.**
- 5. Impact screwdrivers may not be used!**

IMPORTANT: Risk of corrosion!

Touch up paintwork damage.

Re-establish wax layer.

Remove vehicle jack fixture with a suitable tool from side frame.

Installation:

Check fixture for damage, replace if necessary.

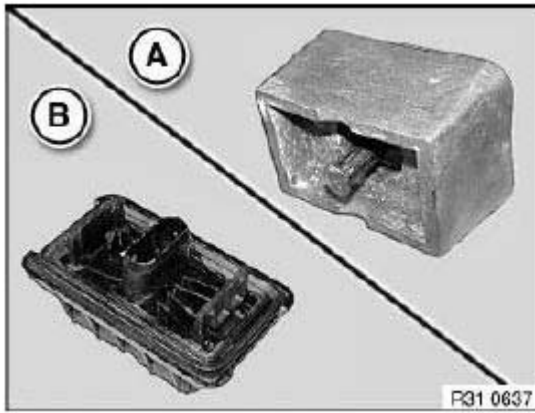


Fig. 29: Identifying Vehicle Jack Fixture
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Following states can be selected on special tool 00 2 261.

- A. Vehicle unsecured
- B. Vehicle secured (after special tool is lashed to lifting platform arm)

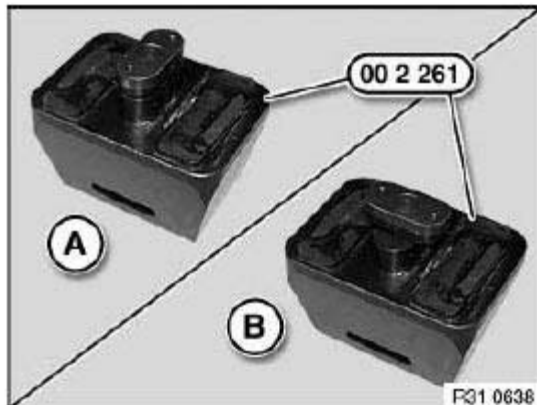


Fig. 30: Identifying Special Tool (00 2 261)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The following procedure must always be carried out on the left and right sides. Insert special tool 00 2 261 into opening in side frame with 3/8" extension and secure ratchet to body. To do so, turn lock through 90° up to stop.

WARNING: Danger to life!

Check stopping of special tool 00 2 261 on side frame, correct attachment if necessary.

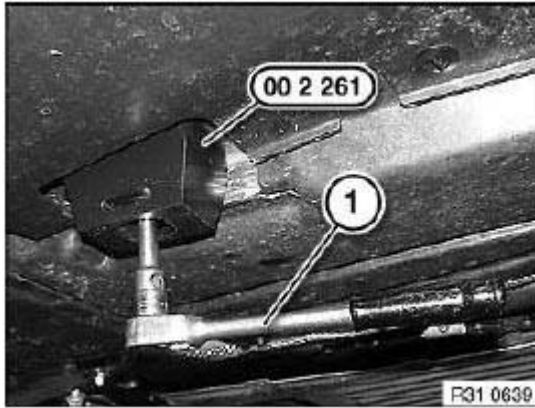


Fig. 31: Identifying Special Tool (00 2 261)

Courtesy of BMW OF NORTH AMERICA, INC.

Lash special tool 00 2 261 with tensioning strap 00 2 262 crosswise (as pictured) to lifting platform arm.

WARNING: Danger to life!

Carry out tensile and visual inspection of tensioning strap 00 2 262 , correct position if necessary.

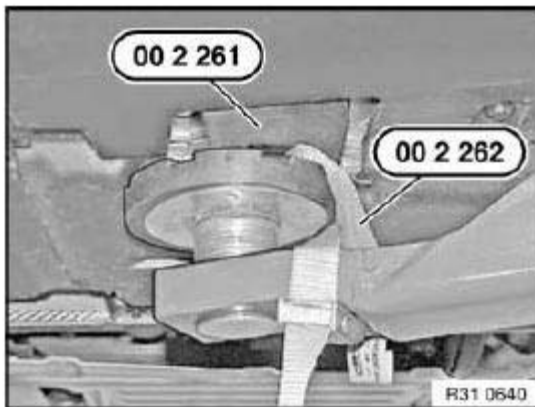


Fig. 32: Identifying Special Tool (00 2 262)

Courtesy of BMW OF NORTH AMERICA, INC.

61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT

IMPORTANT: In vehicles with active front steering, steering angle sensor adjustment is integrated in the service function "Initial operation/adjustment for active front steering " and must not be carried out separately!

NOTE: Steering angle sensor adjustment must be carried out:

- after adjustment work on the front axle/steering

- **after all mechanical work on the steering system**
- **after replacement / coding / programming of the following components:**
 - **Fixture for switches of steering column / switch cluster / steering angle sensor**
 - **Dynamic Stability Control (DSC) control unit**
 - **Control unit active anti-roll stabilization (ARS)**

Connect vehicle to BMW diagnosis system or Software Service Station.

Select and carry out steering angle sensor adjustment under Service functions.

11 MECHANICAL STEERING GEAR

32 00 ... INFORMATION ON REPLACING STEERING GEAR AFTER ACCIDENT DAMAGE

Facts:

In the event of accidents or driving conditions similar to accidents, shocklike loads can cause different types of damage to steering gears. When a steering gear is externally undamaged, it is sometimes only possible to identify damage with great difficulty and with great effort. However, damage of this nature poses an unacceptable risk to the vehicle because it can result in failure of the steering system.

Because of the disproportionate amount of effort involved, it is generally not sensible to check thoroughly all the individual components of the steering gear and as an alternative it is necessary to take into account other components which can be checked more easily.

Procedure:

The steering gear must be replaced if one or more of the following points apply:

- A. Visible or noticeable damage to the steering gear
- B. Unacceptable torque increase and jamming when the steering gear is turned from lock to lock (without hydraulic assistance)
- C. Permissible tolerances exceeded during axle/wheel alignment check (if necessary, include alignment record with invoice / report)
- D. Fire damage
- E. Damage, permanent deformation or fractures to:
 - Wheel rims in the event of a negative result from the wheel/axle alignment check
 - Spring struts, steering knuckles, wheel carriers
 - Control arms
 - Compression or tension struts or stabilizer bars with this function
 - Body-side screwing/bolting points for wheel guide/control components

- Front axle carrier
- Pitman arms
- Tie rods
- Steering gear fixtures
- Steering column

This guideline is binding for all accident repairs to BMW and MINI vehicles.

NOTE: If the steering gear replacement work which is required for safety reasons is refused by the customer or an insurance company for cost reasons, a memorandum to that effect must be drawn up and countersigned by the party bearing the costs of the accident repair.

IMPORTANT: The vehicle's type approval will be invalidated whenever the function of any of its safety components is compromised!

32 11 100 REPLACING GAITER FOR STEERING GEAR ON LEFT OR RIGHT

IMPORTANT: The power steering gear must be replaced if the polished surface of the rack is damaged (e.g. by corrosion)!

Necessary preliminary tasks:

- Remove tie rod end . See **32 21 151 REPLACING LEFT OR RIGHT TIE ROD.**
- Remove lower steering gear cover . See **51 71 ... REMOVING AND INSTALLING/REPLACING BOTTOM LEFT OR RIGHT STEERING GEAR COVER .**

Clean tie rod.

Release band clamp (1) and ear clip (3). See **32 41 ... INSTRUCTIONS FOR REMOVING AND INSTALLING EAR CLIPS.**

Detach gaiter (2) from tie rod.

Installation:

Clean rack and check surface for damage (e.g. by corrosion).

Grease rack.

Clean tie rod and apply grease to taper.

NOTE: This ensures that the gaiter is not rotated when the tie rod is rotated.

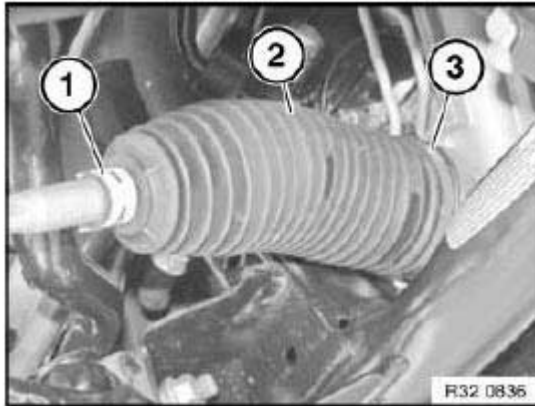


Fig. 33: Identifying Band Clamp, Gaiter And Ear Clip
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform **CHASSIS ALIGNMENT CHECK**
- Carry out steering angle sensor adjustment/adjustment for active front steering . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .

13 STEERING GEAR WITH SER

32 00 ... INFORMATION ON REPLACING STEERING GEAR AFTER ACCIDENT DAMAGE

Facts:

In the event of accidents or driving conditions similar to accidents, shocklike loads can cause different types of damage to steering gears. When a steering gear is externally undamaged, it is sometimes only possible to identify damage with great difficulty and with great effort. However, damage of this nature poses an unacceptable risk to the vehicle because it can result in failure of the steering system.

Because of the disproportionate amount of effort involved, it is generally not sensible to check thoroughly all the individual components of the steering gear and as an alternative it is necessary to take into account other components which can be checked more easily.

Procedure:

The steering gear must be replaced if one or more of the following points apply:

- Visible or noticeable damage to the steering gear
- Unacceptable torque increase and jamming when the steering gear is turned from lock to lock (without hydraulic assistance)
- Permissible tolerances exceeded during axle/wheel alignment check (if necessary, include alignment

record with invoice / report)

D. Fire damage

E. Damage, permanent deformation or fractures to:

- Wheel rims in the event of a negative result from the wheel/axle alignment check
- Spring struts, steering knuckles, wheel carriers
- Control arms
- Compression or tension struts or stabilizer bars with this function
- Body-side screwing/bolting points for wheel guide/control components
- Front axle carrier
- Pitman arms
- Tie rods
- Steering gear fixtures
- Steering column

This guideline is binding for all accident repairs to BMW and MINI vehicles.

NOTE: If the steering gear replacement work which is required for safety reasons is refused by the customer or an insurance company for cost reasons, a memorandum to that effect must be drawn up and countersigned by the party bearing the costs of the accident repair.

IMPORTANT: The vehicle's type approval will be invalidated whenever the function of any of its safety components is compromised!

32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!

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

Using contaminated equipment to add fluid may introduce dirt particles into the fluid reservoir and significantly reduce the service life of the power steering system. Do not use any filler funnels or similar!

Use only Pentosin CHF11S from original containers!

The fill level may only be checked or adjusted when the engine is stopped! The fluid temperature should be approx. 20°C here.

Ensure that the cap is fully screwed in prior to the fill level check.

NOTE: To avoid mix-ups when filling with hydraulic fluid, mark the fluid reservoirs or their caps with identification marks.

ATF Automatic transmission fluid

CHF Pentosin CHF11S

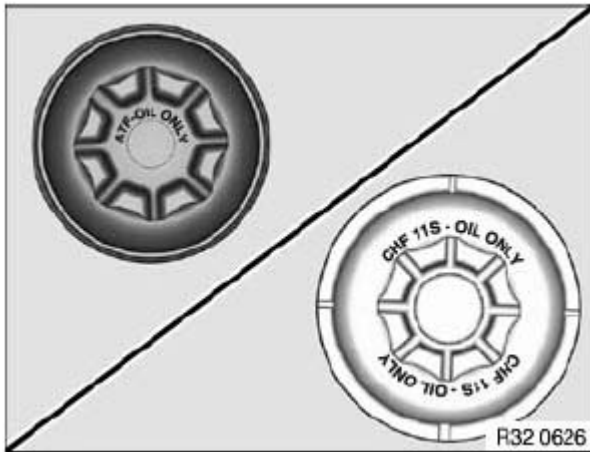


Fig. 34: Identifying Reservoir Cap

Courtesy of BMW OF NORTH AMERICA, INC.

1. Thoroughly clean fluid reservoir and its immediate surroundings
2. Check and correct fill level

NOTE: The fill level can come to rest above the "MAX" mark when the engine is at normal operating temperature. This is dictated by the design in that the marking on the dipstick is referred to a fluid temperature of 20°C. With the engine at normal operating temperature (approx. 50-60°C fluid temperature) adjust a fill height 15 mm above the "MAX" mark. Do not under any circumstances draw off the fluid to the "MAX" mark when the engine is at normal operating temperature.

3. Start engine
4. Turn steering wheel left and right twice in each case up to full lock; if necessary, top up hydraulic fluid (e.g. if hydraulic system is completely drained)
5. Move steering wheel to straight-ahead position and turn off engine
6. Check and correct fill level with engine stopped
7. Check hydraulic system for leaks

After filling:

- If necessary, carry out initial Dynamic Drive operation . See **37 10 001 INITIAL OPERATION WITH TEST RUN OF DYNAMIC DRIVE** .

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Using contaminated equipment to add fluid may introduce dirt particles into the fluid reservoir and significantly reduce the service life of the power steering system. Do not use any filler funnels or similar!
The fill level may only be checked or adjusted when the engine is stopped! The fluid temperature should be approx. 20°C here.
Ensure that the cap is fully screwed in prior to the fill level check.

NOTE: To avoid mix-ups when filling with hydraulic fluid, mark the fluid reservoirs or their caps with identification marks.

ATF Automatic transmission fluid

CHF Pentosin CHF11S

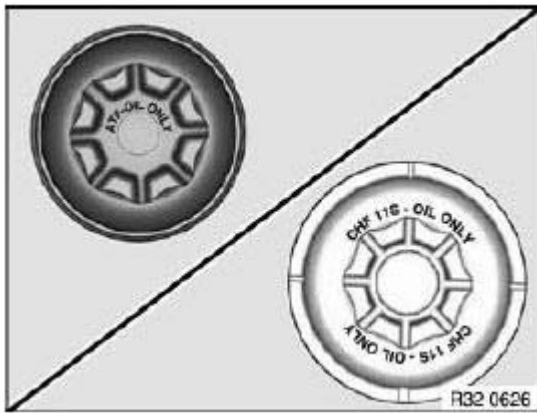


Fig. 35: Identifying Reservoir Cap
Courtesy of BMW OF NORTH AMERICA, INC.

1. Thoroughly clean fluid reservoir and its immediate surroundings
2. Check and correct fill level

NOTE: The fill level can come to rest above the "MAX" mark when the engine is at normal operating temperature. This is dictated by the design in that the marking on the dipstick is referred to a fluid temperature of 20°C. With the engine at normal operating temperature (approx. 50-60°C fluid temperature) adjust a fill height 10 mm above the "MAX" mark. Do not under any circumstances draw off the fluid to the "MAX" mark when the engine is at normal operating temperature.

3. Start engine
4. Turn steering wheel left and right twice in each case up to full lock; if necessary, top up hydraulic fluid (e.g. if hydraulic system is completely drained)
5. Move steering wheel to straight-ahead position and turn off engine
6. Check and correct fill level with engine stopped
7. Check hydraulic system for leaks

32 13 060 REMOVING AND INSTALLING/REPLACING POWER STEERING GEAR

WARNING: Danger to life!

Mount securing fixture for vehicle on lifting platform to prevent the vehicle from slipping off or tilting down. See 51 71 505 MOUNT SECURING FIXTURE FOR VEHICLE ON LIFTING PLATFORM.

Secure engine in installation position to prevent it from falling down. See 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52).

**WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!**

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Close off pipe connections with plugs.**

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove tie rod end on both sides from swivel bearing . See 32 21 151 REPLACING LEFT OR RIGHT TIE ROD.
- Replacement only: Remove tie rod end at both ends of tie rod . See 32 21 151 REPLACING LEFT OR RIGHT TIE ROD.
- Remove lower section of steering spindle from steering gear.
- Lower front axle support . See 31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (SPECIAL TOOL SWZ00-2040) or 31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (UNIVERSAL LIFTER) .

Carefully lower power steering gear.

Mark installation positions of pressure and return lines to power steering gear.

Release banjo bolts (1).

Disconnect pressure line (2) and return line (3) from power steering gear.

Installation:

Replace all sealing rings.

Align pressure and return lines by way of markings and tighten down banjo bolts.

Tightening torque 32 41 5AZ (pressure line).

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

Tightening torque 32 41 6AZ (return line).

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

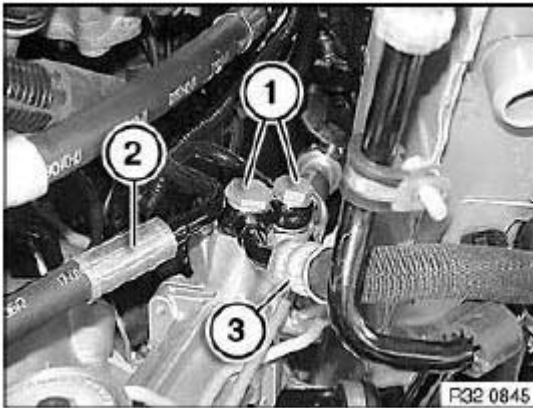


Fig. 36: Identifying Pressure And Return Line And Banjo Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Release power steering gear and remove sideways between engine and front axle carriers.

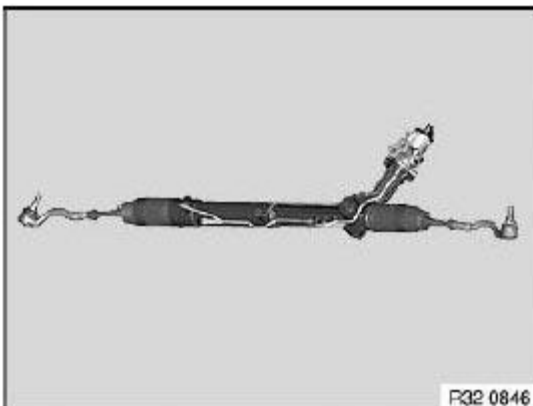


Fig. 37: Identifying Power Steering Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, release screws (1) and remove heat shield (2) from power steering gear.

Installation:

Tightening torque 32 00 2AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

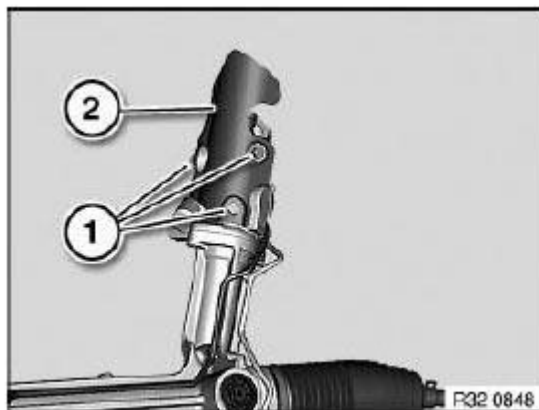


Fig. 38: Identifying Heat Shield And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT** .
- Check pipe connections for leaks
- Perform **CHASSIS ALIGNMENT CHECK**
- Carry out steering angle sensor adjustment . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .
- If necessary, carry out initial Dynamic Drive operation . See **37 10 001 INITIAL OPERATION WITH TEST RUN OF DYNAMIC DRIVE** .

32 13 065 REMOVING AND INSTALLING/REPLACING ACTIVE FRONT STEERING POWER STEERING GEAR

WARNING: Danger to life!

Mount securing fixture for vehicle on lifting platform to prevent the vehicle from slipping off or tilting down. See 51 71 505 MOUNT SECURING FIXTURE FOR VEHICLE ON LIFTING PLATFORM.

Secure engine in installation position to prevent it from falling down. See 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52) .

**WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!**

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Close off pipe connections with plugs.**

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove tie rod end on both sides from swivel bearing . See **32 21 151 REPLACING LEFT OR RIGHT TIE ROD.**
- Replacement only: Remove tie rod end at both ends of tie rod . See **32 21 151 REPLACING LEFT OR RIGHT TIE ROD.**
- Remove lower section of steering spindle from steering gear.
- Lower front axle support . See **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (SPECIAL TOOL SWZ00-2040)** or **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (UNIVERSAL LIFTER)** .
- Disconnect plug connection for ECO valve on back of power steering pump

Carefully lower power steering gear.

Mark installation positions of pressure and return lines to power steering gear.

Release banjo bolts (1).

Disconnect pressure line (2) and return line (3) from power steering gear.

Installation:

Replace all sealing rings.

Align pressure and return lines by way of markings and tighten down banjo bolts.

Tightening torque 32 41 5AZ (pressure line).

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

Tightening torque 32 41 6AZ (return line).

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

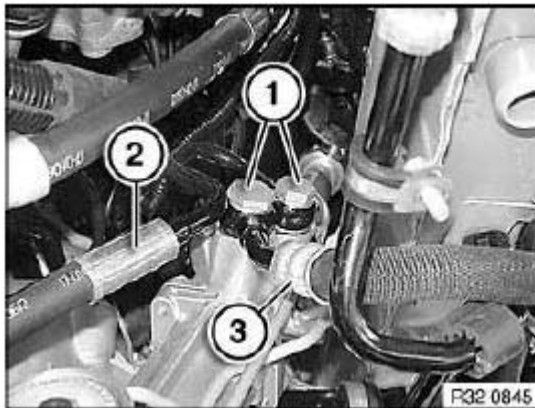


Fig. 39: Identifying Pressure And Return Line And Banjo Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Release power steering gear and remove sideways between engine and front axle carriers.

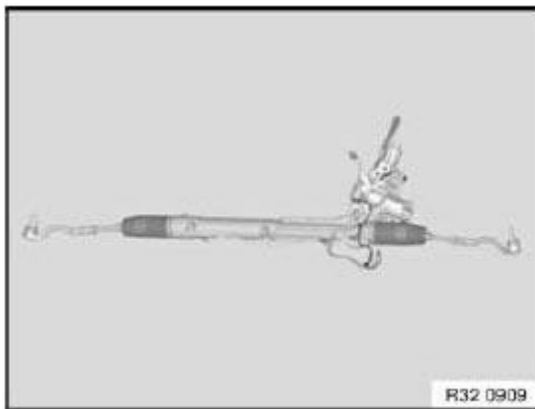


Fig. 40: Identifying Power Steering Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, release screws (1) and remove heat shield (2).

Disconnect plug connections (3) and remove connecting cable (4).

Installation:

Tightening torque 32 00 2AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

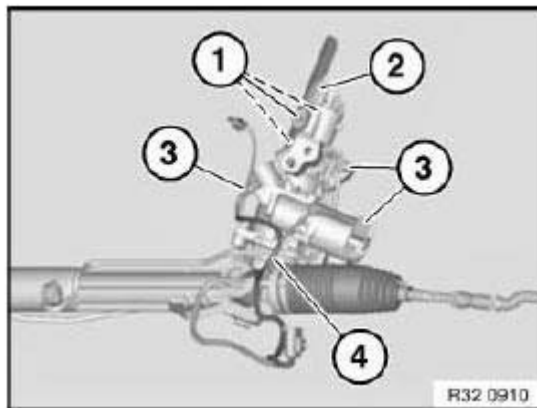


Fig. 41: Identifying Heat Shield, Plug Connection, Connecting Cable And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT**.
- Check pipe connections for leaks
- Perform **CHASSIS ALIGNMENT CHECK**
- Perform adjustment for active steering . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .
- If necessary, carry out initial Dynamic Drive operation . See **37 10 001 INITIAL OPERATION WITH TEST RUN OF DYNAMIC DRIVE** .

21 STEERING ARMS, TIE ROD

32 21 151 REPLACING LEFT OR RIGHT TIE ROD

Special tools required:

- 31 2 240
- 31 2 246

NOTE: If the tie rod end to tie rod screw/bolt connection is released, it is necessary after reinstallation to carry out a wheel/chassis alignment check.

Necessary preliminary tasks:

- Remove front wheel

IMPORTANT: Do not release tie rod end from swivel bearing with impact tool.
 Make sure special tool rests correctly on steel bushing of swivel bearing. The

**swivel bearing must be removed if the steel bushing moves.
Rubber gaiter of tie rod end must not be damaged!
Do not pull stainless steel ring off journal.**

Slacken nut (1) two to three thread turns.

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

Press tie rod end (2) with special tool 31 2 240 off swivel bearing.

Unscrew nut (1) and remove tie rod end (2) from swivel bearing.

Installation:

Keep tie rod end to swivel bearing connection clean and free from oil and grease.

Replace self-locking nut.

Tightening torque 32 21 3AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES**.

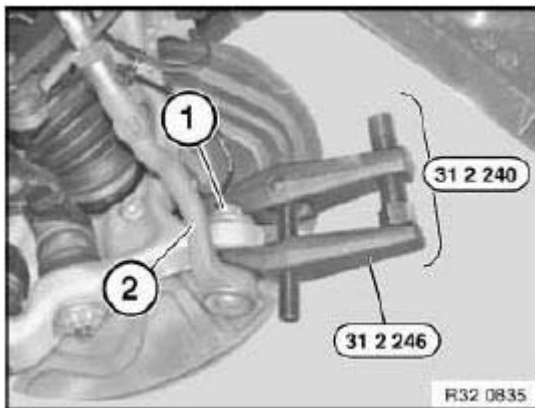


Fig. 42: Identifying Tie Rod End, Nut And Special Tool (31 2 240)
Courtesy of BMW OF NORTH AMERICA, INC.

Determine measurement (A) to simplify following adjustment of front axle.

Slacken nut.

Unscrew tie rod end from tie rod.

Installation:

Check gaiter for damage, replace if necessary.

Refit clamping ring (1).

Screw in tie rod end to measurement (A).

Tightening torque 32 21 2AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

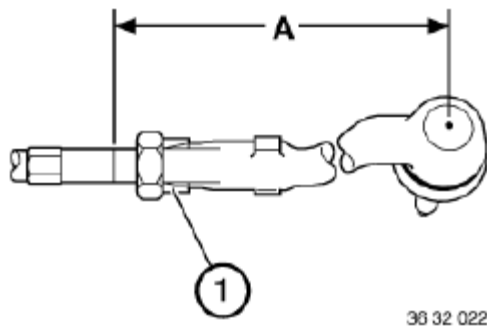


Fig. 43: Identifying Length Between Front Axle And Slacken Nut
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform **CHASSIS ALIGNMENT CHECK**
- Carry out steering angle sensor adjustment/adjustment for active front steering . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .

32 21 231 REPLACING LEFT OR RIGHT TIE ROD

Special tools required:

- 32 3 160

Necessary preliminary tasks:

- Remove tie rod end from swivel bearing . See **32 21 151 REPLACING LEFT OR RIGHT TIE ROD**.
- Remove gaiter from power steering gear and slide back. See **32 11 100 REPLACING GAITER FOR STEERING GEAR ON LEFT OR RIGHT**.

IMPORTANT: To avoid damage to rack and to suspension mounting, move rack in as far as possible.

Unscrew tie rod with special tool 32 3 160 from rack of power steering gear and remove

Installation:

Clean rack and check surface for damage (e.g. by corrosion).

Grease rack.

Tightening torque 32 21 1AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

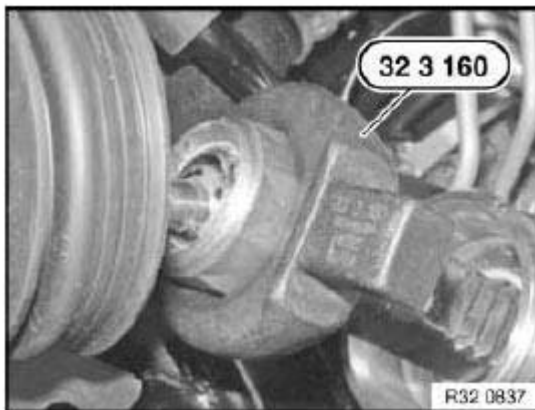


Fig. 44: Identifying Special Tool (32 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

Assembling new component with gaiter:

Slacken clamping nut (2).

Screw off tie rod end; if necessary, grip tie rod with open-end wrench.

Remove clamping ring (1) and screw off clamping nut (2).

Slide gaiter (4) and band clamp (3) onto tie rod.

Screw clamping nut (2) onto tie rod.

Slide clamping ring (1) onto tie rod.

Determine measurement (A) on old part to simplify following adjustment of front axle.

Screw tie rod end onto tie rod to measurement (A).

Tighten down clamping nut (2).

Tightening torque 32 21 2AZ.

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See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

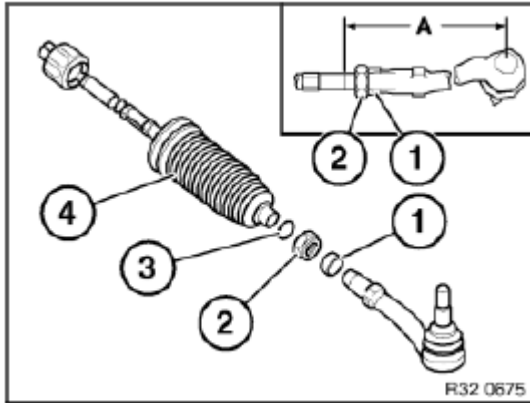


Fig. 45: Identifying Clamping Nut, Ring, Gaiter And Band Clamp
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Perform **CHASSIS ALIGNMENT CHECK**
- Carry out steering angle sensor adjustment/adjustment for active front steering . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .

32 41 ... INSTRUCTIONS FOR REMOVING AND INSTALLING EAR CLIPS

Special tools required:

- 32 1 260

NOTE: The work steps are show on assorted components.
Ear clip must always be replaced.

To remove an ear clip, place special tool 32 1 260 at right angles to ear and cut ear open.

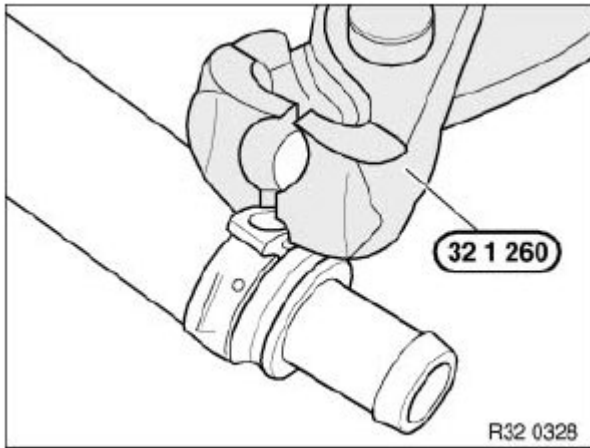


Fig. 46: Identifying Special Tool (32 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

The ear clip can be fitted not only axially but also radially after the hook fastener has been opened.

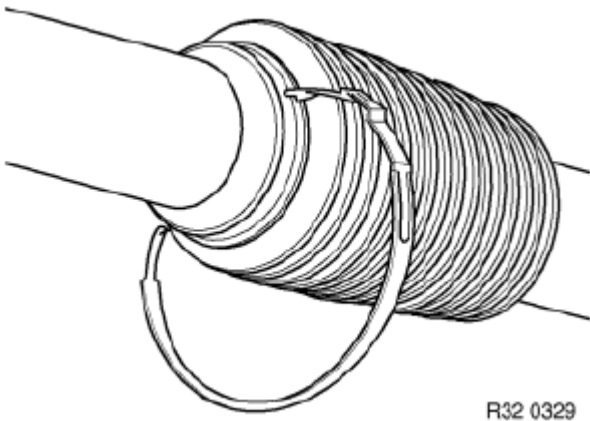


Fig. 47: Identifying Ear Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Attach hook fastener and press ear together with special tool 32 1 260.

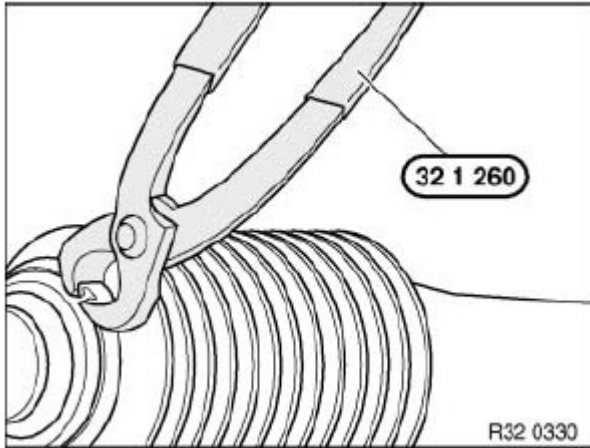


Fig. 48: Identifying Special Tool (32 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

Side cutter of special tool 32 1 260 can be used in areas which are difficult to access.

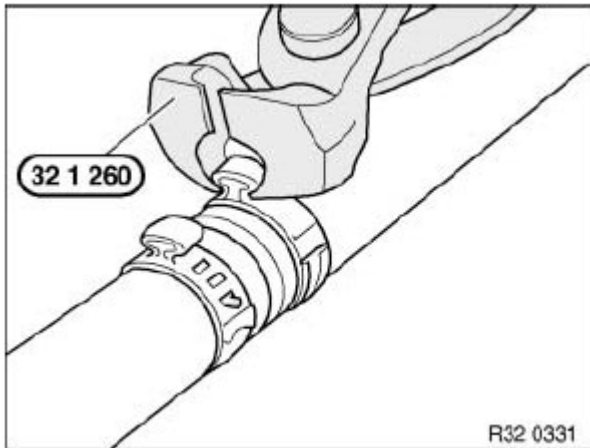


Fig. 49: Identifying Special Tool (32 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Gap (A) max. 1 mm!

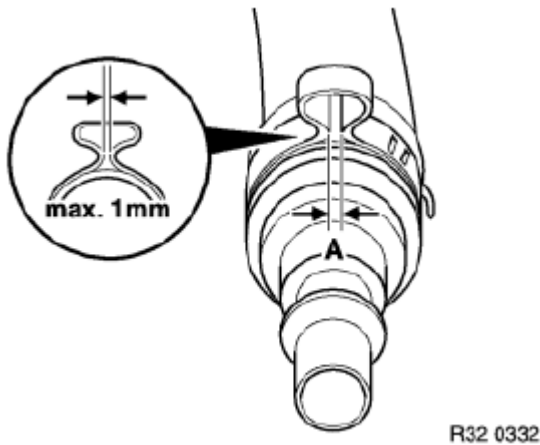


Fig. 50: Identifying Ear Clip Gap

Courtesy of BMW OF NORTH AMERICA, INC.

31 STEERING COLUMN

32 31 003 REMOVING AND INSTALLING/REPLACING UPPER SECTION OF STEERING COLUMN TRIM

Special tools required:

- 00 9 323

Move steering column in "bottom" and "extended" position.

IMPORTANT: Risk of damage!

Unclip steering column trim (1) at side with special tool 00 9 323.



Fig. 51: Identifying Column Trim And Special Tool (00 9 323)

Courtesy of BMW OF NORTH AMERICA, INC.

Tilt steering column trim (1) towards front

Unclip steering column gap cover (2) from steering column trim (1).

Installation:

Tilt steering column trim towards rear, align by way of locks to lower section (of steering column trim) and press down.

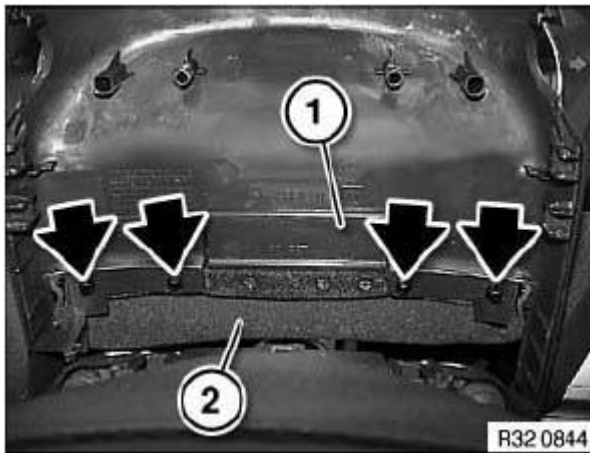


Fig. 52: Identifying Steering Column Gap Cover And Steering Column Trim
Courtesy of BMW OF NORTH AMERICA, INC.

32 31 020 REMOVING AND INSTALLING / REPLACING LOWER SECTION OF STEERING COLUMN TRIM

Necessary preliminary tasks:

- Remove upper section of steering column trim . See **32 31 003 REMOVING AND INSTALLING/REPLACING UPPER SECTION OF STEERING COLUMN TRIM.**
- Move steering column in "top" and "extended" position.

Press detent lugs outwards a little and unclip steering column trim downwards.

Installation:

Align steering column trim by means of detent lugs to steering column and press up as far as it will go.

Press steering column trim on both sides together a little and then press upwards completely until detent lugs snap into place.

Check installation position, correct if necessary.

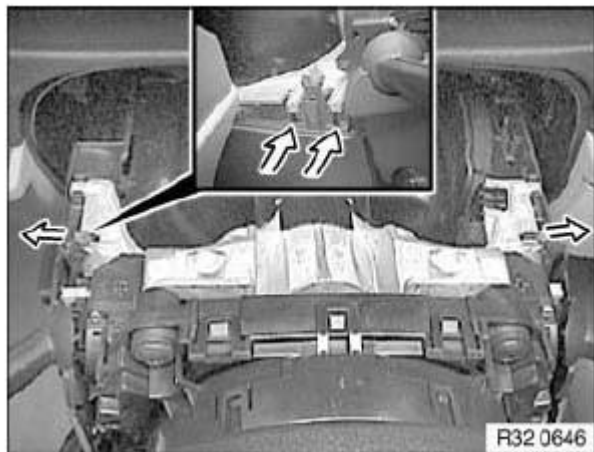


Fig. 53: Unclipping Steering Column Trim
Courtesy of BMW OF NORTH AMERICA, INC.

32 31 082 REMOVING AND INSTALLING/REPLACING STEERING ANGLE SENSOR

NOTE: Steering angle sensor is integrated in steering column switch cluster . See **61 31 008 REMOVING AND INSTALLING OR REPLACING STEERING COLUMN SWITCH CLUSTER** .

After installation:

- Replacement only: Carry out programming/coding . See **VEHICLE PROGRAMMING AND CODING** .
- Only when replacing / programming / coding: Carry out steering angle sensor adjustment/adjustment for active front steering . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .

32 31 090 REMOVING AND INSTALLING/REPLACING STEERING COLUMN

IMPORTANT: To avoid damaging the coil spring cassette, it is necessary to remove the steering wheel because of the absence of a steering column lock!

Necessary preliminary tasks:

- Disconnect battery negative lead . See **12 00... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .
- Remove steering wheel . See **32 33 000 REMOVING AND INSTALLING/REPLACING STEERING WHEEL** or **32 33 010 REMOVING AND INSTALLING/REPLACING SPORT STEERING WHEEL** .
- Remove steering column trims . See **32 31 003 REMOVING AND INSTALLING/REPLACING UPPER SECTION OF STEERING COLUMN TRIM** and **32 31 020 REMOVING AND INSTALLING / REPLACING LOWER SECTION OF STEERING COLUMN TRIM** .

- Move steering column into "extended" position
- Replacement only: Remove steering column switch cluster . See **61 31 008 REMOVING AND INSTALLING OR REPLACING STEERING COLUMN SWITCH CLUSTER** .
- Remove trim panel for pedal assembly . See **51 45 185 REMOVING AND INSTALLING/REPLACING PANEL FOR PEDALS** .

Disconnect plug connection (1).

Unclip wiring harness (2) from steering column.

Installation:

Replace damaged wiring harness holder.

Make sure wiring harness is in correct position.



Fig. 54: Identifying Plug Connection And Wiring Harness
Courtesy of BMW OF NORTH AMERICA, INC.

Remove air duct in footwell.

Release clamping screw (1) and slide splined shaft (2) into steering column.

Installation:

Do not damage splined shaft (2).

Make sure shim (3) is in correct position.

Recut thread.

Replace clamping screw.

Clamping screw must rest in groove of upper steering spindle.

No kinking permitted!

Tightening torque 32 31 3AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

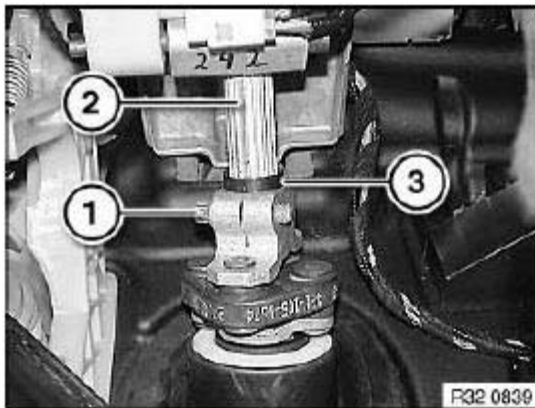


Fig. 55: Identifying Clamping Screw, Splined Shaft And Shim
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Release screws (2).

Tightening torque 32 31 1AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

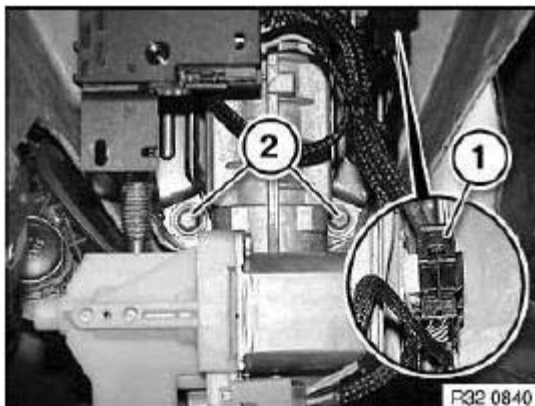


Fig. 56: Identifying Plug Connection And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Secure steering column against falling out.

Release bolts (1).

Tightening torque 32 31 1AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

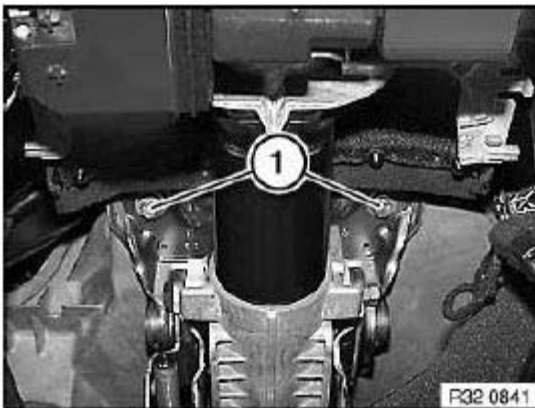


Fig. 57: Identifying Steering Column Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove steering column towards rear.

Installation:

When inserting steering column, make sure guide (1) is correctly fitted in instrument panel carrier.

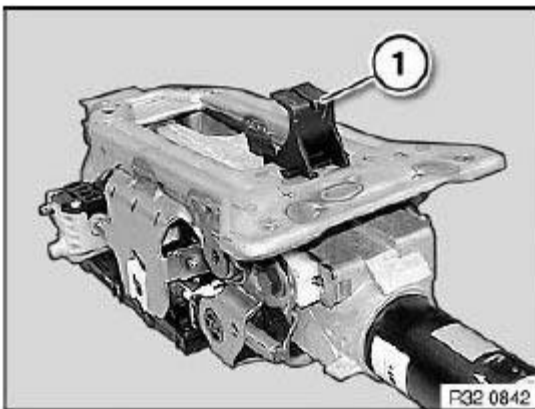


Fig. 58: Identifying Instrument Panel Carrier Guide
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out steering angle sensor adjustment/adjustment for active front steering . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .
- Carry out normalization of electric steering column adjustment
- Replacement only: Turn steering wheel in both directions to full lock. The airbag warning lamp must not light up in the process.
- Check directional stability of car

33 STEERING WHEEL

32 33 ... REPLACING DESIGN COVER/ACCENT TRIM FOR SPORT STEERING WHEEL

Necessary preliminary tasks:

- Remove both switches from sport steering wheel . See **61 31 229 REMOVING AND INSTALLING/REPLACING BOTH SWITCHES ON SPORT STEERING WHEEL** .

Release screws (1).

Remove accent rim (2) from design cover (3).

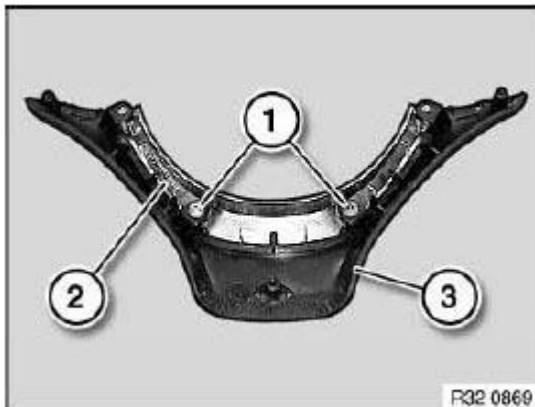


Fig. 59: Identifying Accent Rim, Design Cover And Screws
 Courtesy of BMW OF NORTH AMERICA, INC.

32 33 000 REMOVING AND INSTALLING/REPLACING STEERING WHEEL

Necessary preliminary tasks:

- Disconnect battery negative lead . See **12 00... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .
- Remove airbag unit . See **32 34 020 REMOVING AND INSTALLING/REPLACING AIRBAG UNIT** .

Move wheels/steering wheel into straight-ahead position.

Disconnect plug connection (1).

If necessary, disconnect plug connection (2) for steering wheel heating.

Release screw (3) and remove steering wheel (4).

Tightening torque. See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES**.

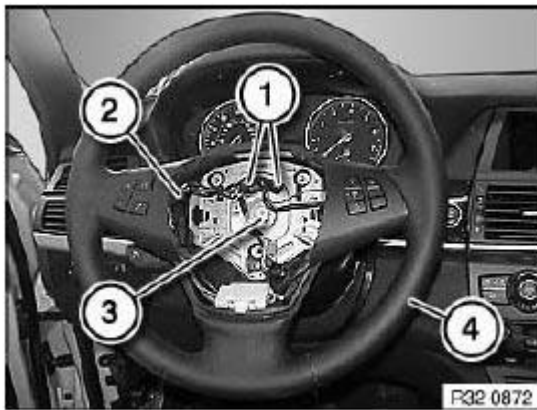


Fig. 60: Identifying Plug Connection, Steering Wheel And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Version with steering wheel heating: Before fitting steering wheel on steering column, ensure correct cable routing.

Align steering wheel by way of marking (1) to steering column marking (2) and attach.

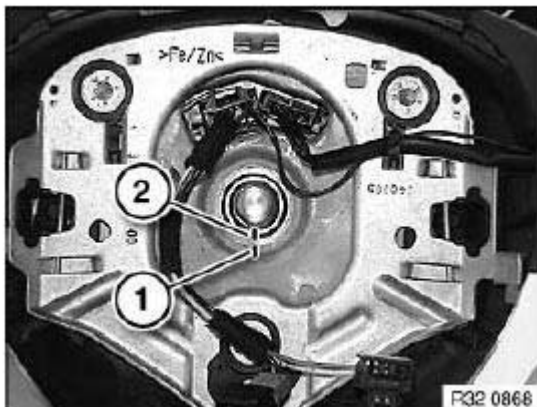


Fig. 61: Identifying Steering Column Marking 2684 of 3160
Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- Modify multifunction steering wheel switch . See **61 31 221 REMOVING AND INSTALLING/REPLACING BOTH MULTIFUNCTION STEERING WHEEL SWITCHES** .

32 33 010 REMOVING AND INSTALLING/REPLACING SPORT STEERING WHEEL*Necessary preliminary tasks:*

- Disconnect battery negative lead . See **12 00... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .
- Remove airbag unit . See **32 34 020 REMOVING AND INSTALLING/REPLACING AIRBAG UNIT** .

Move wheels/steering wheel into straight-ahead position.

Disconnect plug connection (1).

If necessary, disconnect plug connection (2) for steering wheel heating.

Release screw (3) and remove sport steering wheel (4).

Tightening torque. See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .



Fig. 62: Identifying Plug Connection, Steering Wheel And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Version with steering wheel heating: Before fitting sport steering wheel on steering column, ensure correct cable routing.

Align sport steering wheel by way of marking (1) to steering column marking (2) and attach.

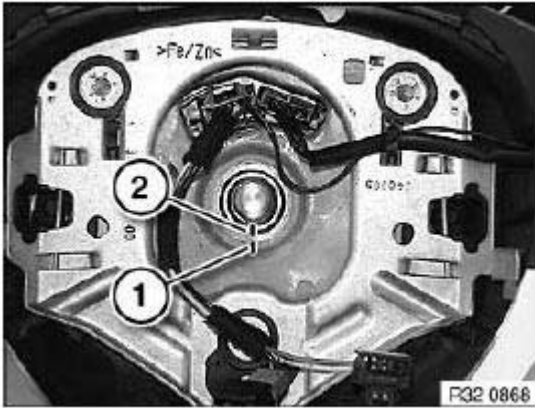


Fig. 63: Identifying Steering Column Marking
 Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

- Modify both switches on sport steering wheel . See **61 31 229 REMOVING AND INSTALLING/REPLACING BOTH SWITCHES ON SPORT STEERING WHEEL** .
- Modify design cover/accent trim . See **32 33 ... REPLACING DESIGN COVER/ACCENT TRIM FOR SPORT STEERING WHEEL**.

34 STEERING WHEEL FOR AIRBAG UNIT

32 34 020 REMOVING AND INSTALLING/REPLACING AIRBAG UNIT

WARNING: Observe the following instructions to avoid any risk of injury by the airbag unit.

- Comply with safety regulations for handling components with gas generators.
- Do not exert any force on the airbag unit.
- Use only specified tools for releasing the airbag unit.

NOTE: Incorrect handling may result in triggering of the airbag unit and thereby cause serious injury.

IMPORTANT: Steering wheel must be replaced if airbag unit has been triggered!
 Follow procedure after airbag triggering.

Necessary preliminary tasks:

- Disconnect battery negative lead . See **12 00... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .

Insert Torx screwdriver T30 (1) at an angle into concealed opening on reverse side of steering wheel until a spring resistance is felt (approx. 2 cm).

Increase pressure with Torx screwdriver T30 (1) on spring leg until airbag unit is unlocked.

Repeat procedure on other side.

Installation:

Make sure electrical leads are correctly positioned.

Snap airbag unit with uniform pressing force plane-parallel in direction of steering column shaft into steering wheel.

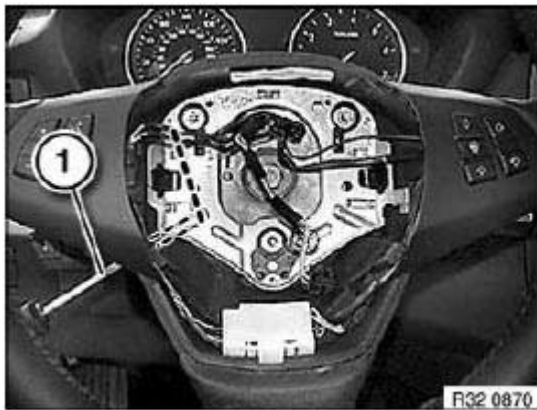


Fig. 64: Identifying Torx Screwdriver T30
Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Airbag unit may only be set down with the airbag itself facing upwards.

Tilt airbag unit (1) towards rear.

Disconnect plug connections (2) and remove airbag unit (1). See **72 12 ... OVERVIEW OF AIRBAG MODULES, AIRBAG CONTROL UNIT, BELT TENSIONERS** .

Installation:

Connect plugs to connections of same color on airbag unit.

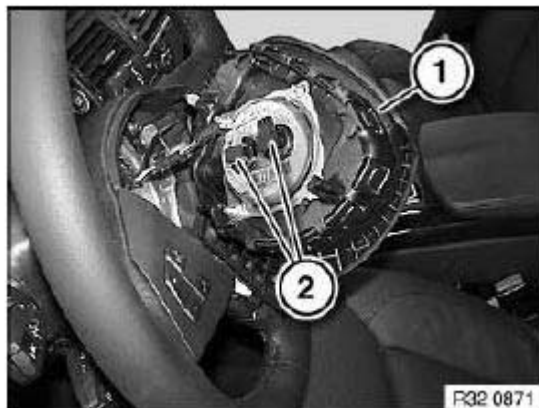


Fig. 65: Identifying Airbag Unit And Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

32 34 030 REMOVING AND INSTALLING/REPLACING AIRBAG UNIT (SPORT STEERING WHEEL)

WARNING: Observe the following instructions to avoid any risk of injury by the airbag unit.

- Comply with safety regulations for handling components with gas generators.
- Do not exert any force on the airbag unit.
- Use only specified tools for releasing the airbag unit.

NOTE: Incorrect handling may result in triggering of the airbag unit and thereby cause serious injury.

IMPORTANT: Steering wheel must be replaced if airbag unit has been triggered!
Follow procedure after airbag triggering . See 72 12 ... PROCEDURE AFTER AIRBAG TRIGGERING AS RESULT OF AN ACCIDENT .

Necessary preliminary tasks:

- Disconnect battery negative lead . See 12 00... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY .

Insert Torx screwdriver T30 (1) at an angle into concealed opening on reverse side of steering wheel until a spring resistance is felt (approx. 2 cm).

Increase pressure with Torx screwdriver T30 (1) on spring leg until airbag unit is unlocked.

Repeat procedure on other side.

Installation:

Make sure electrical leads are correctly positioned.

Snap airbag unit with uniform pressing force plane-parallel in direction of steering column shaft into steering wheel.

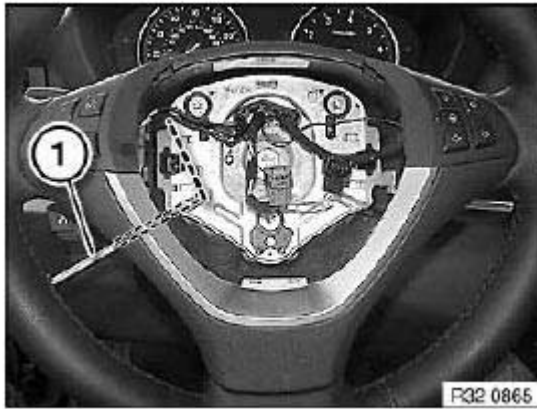


Fig. 66: Identifying Torx Screwdriver T30

Courtesy of BMW OF NORTH AMERICA, INC.

WARNING: Danger of injury!

Airbag unit may only be set down with the airbag itself facing upwards.

Tilt airbag unit (1) towards rear.

Disconnect plug connections (2) and remove airbag unit (1). See **72 12 ... OVERVIEW OF AIRBAG MODULES, AIRBAG CONTROL UNIT, BELT TENSIONERS** .

Installation:

Connect plugs to connections of same color on airbag unit.

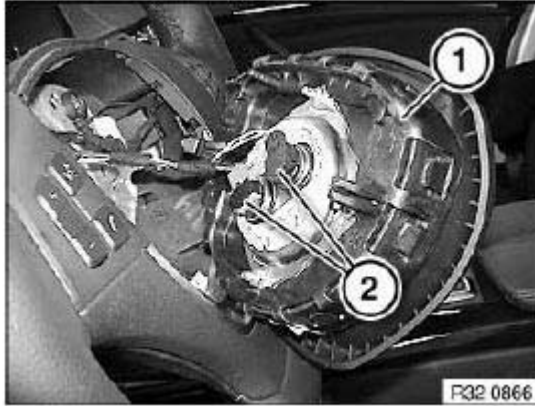


Fig. 67: Identifying Airbag Unit And Plug Connection

Courtesy of BMW OF NORTH AMERICA, INC.

65 77 ... NOTES ON SCRAPPING BMW VEHICLES WITH GAS GENERATORS (CENTRAL AIRBAG CONTROL UNIT, AIRBAG SYSTEM)

The gas generator is a pyrotechnic component of:

- Airbag module
 - Driver's/passenger airbag
 - Side airbags
 - Head airbag
 - Knee airbag
- Belt pretensioner
- Belt buckle tensioner
- Safety battery terminal

1 Series: E81, E87

3 Series: E46, E90, E91, E92, E93

5 Series: E60, E61 from build date 09/2005

6 Series: E63, E64 from build date 09/2005

X3: E83

X5: E53, E70

Z4: E85, E86

Gas generators that have not fired constitute a hazard (also to the environment)! 2690 of 3160

In accordance with accident prevention regulations and specific national regulations, gas generators must be rendered unusable before they are scrapped. This is necessary because pyrotechnical objects can cause injury if improperly activated (e.g. scrapping with flame cutters).

With above-mentioned vehicles which are scheduled for scrapping, it is always essential prior to draining and further stripping work to ensure that all the gas generators in the vehicle are fired. The fired gas generators can then be scrapped together with the vehicle.

Triggering failure

If correct triggering is not possible, the relevant components must (while observing the safety regulations for handling airbag system components) be removed and disposed of by special disposal companies!

If a triggering operation has failed:

- Disconnect the triggering device from the battery and
- only approach the vehicle after a few minutes have elapsed

The components of an airbag system must always be disposed of. Such components must not be sold on as used parts.

Triggering

Triggering of the gas generators may only be carried out by expert personnel and under the supervision of a responsible person. Other standard accident prevention regulations (safety goggles, ear defenders etc.) must also be observed.

The gas generators must be fired from the outside in the vehicle scheduled for scrapping with the doors closed but with the tailgate, door windows and sunroof open. To fire the gas generators, use the BMW-developed triggering device with the corresponding cables.

WARNING: Once gas generators have been fired, observe a ventilation period of 10 minutes with the doors opened. Only then is it permitted to continue work inside the vehicle.

Wear protective goggles and protective gloves when handling a fired gas generator!

The burning of solid fuel will heat up airbag unit - danger of burning hands!

Wash skin with water after contact with fired gas generators!

1. Vehicles with central airbag control unit (all airbags, seat belt pretensioners, safety battery terminal)

1.1 Expose airbag control unit . See **65 77 016 REMOVING AND INSTALLING/REPLACING AIRBAG CONTROL UNIT** .

1.2 Connect "Airbagmaster". For subsequent procedure, refer to SEDA operating instructions.

72 00 ... SAFETY REGULATIONS FOR HANDLING COMPONENTS WITH GAS GENERATORS

It is essential to comply with the regulations as specified in the law relating to the use of explosives when working on airbag units and seat belt tensioners.

Airbags, seat belt tensioners etc. are pyrotechnical objects. Pyrotechnical objects are assigned to different danger classes on the basis of the quantity of propellant that they contain. The assignment can be ascertained from the identification marking on the product:

IMPORTANT: Failure to comply with the warning notices and repair instructions for gas generator components can cause accidental deployment and result in injury and vehicle damage!

This applies in particular to the following components:

- Airbag modules (driver's/front passenger airbags, side airbags)
- Buckle/belt tensioner
- Head airbag (ITS, AHPS)
- Active knee protection
- Active head restraint
- Safety battery terminal (SBK)

1. Regulations

The regulations quoted in the following refer to the Federal Republic of Germany.

In all other countries, the relevant legislation and regulations must be observed in each case. Country-specific legal regulations that go beyond this information or court decisions based thereon must be followed in each case or given precedence over these regulations.

The following components used by BMW:

- Pyrotechnical restraint systems are subject to danger class PT1
- Gas generators are pyrotechnical objects belonging to danger class T1.

Handling, transporting and storing non-fired gas generators are subject to the "Explosive Materials Act" (law relating to the use of explosives dated 13/09/1976).

The relevant trade supervisory authority must be notified at least 2 weeks before pyrotechnical objects are handled for the first time. Here the relevant authority must be notified in writing of the person responsible (e.g. dealership owner, holder of general power of attorney or if necessary workshop supervisor). A certificate of qualification, i.e. specific training, is not required for the person responsible.

2. Disassembly and assembly

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- Inspection, testing and installation work may only be carried out by expert trained personnel in

BMW Service.

- Work on components of the airbag system should only ever be carried out with the battery disconnected, the negative terminal post covered and the plug connection of the cable leading to the gas generator disconnected. If only the battery is disconnected, the following prescribed waiting period must be observed without fail:
 - 30 minutes for vehicles up to 9/93;
 - 1 minute for vehicles from 9/93
- In the event of breaks in work, a component with a gas generator that has been removed must be secured against access by other persons.
- Individual components must never be repaired. Instead, always replace them.
- Do not treat airbag system components with cleaning agents or grease.
- Components of the airbag system must not be exposed to temperatures in excess of 75°C.
- Airbag system components, including electronic diagnostic components, which have been dropped from heights in excess of 0.5 m must not be reinstalled in the vehicles.
- Before installing, subject airbag system components (including electronic diagnostic components) to a visual inspection for damage and replace if necessary.
- Airbag system components may only be electrically tested while they are installed and only with the BMW diagnostic system / DIS.
- **Danger of injury:** The airbag module may only be set down with the airbag itself facing upwards . Otherwise the generator will be thrown upwards if it is fired.
- Do not point the firing pellet of a gas generator at other persons.
- Components with gas generators must not be fired while they are removed. They must be disposed of by special disposal companies or returned to BMW in the packaging of the new components.
- When carrying out straightening and welding work with an electric welder:
 - Disconnect battery
 - Cover negative terminal (post)
- Avoid all contact with the skin when removing a fired airbag module - wear gloves. Wash with water after contact with the skin.

3. Transport

- Components with gas generators must be sent off in the packaging of the new components.

4. Storage

- Observe the regulations of the relevant trade supervisory authority and the applicable national regulations.

72 12 ... PROCEDURE AFTER AIRBAG TRIGGERING AS RESULT OF AN ACCIDENT

Check and/or replace following components after airbag triggering:

Satellites (control unit + sensor)

- Components

- Satellite, A-/B-pillar, left/right
- Satellite, front door
- Satellite, rear seat
- Satellite, driver's/front passenger seat
- Satellite, vehicle center
- Procedure
 - Read out fault memory
 - Disconnect battery and observe waiting period
 - Rectify faults
 - Reconnect battery and observe waiting period
 - Clear fault memory
 - Turn off ignition and wait at least 2 minutes (no consumers may be switched on during this period such as e.g. inside lights, radio, etc.)
 - Switch ignition on.
 - Clear fault memory and if necessary rectify faults

Cables and plugs

- Components and procedure
 - Check cables and plugs for damage, replace if necessary.

Belt system

- Components
 - Automatic safety belt tensioner
 - Belt buckle tensioner
 - Seatbelt height adjustment
- Procedure
 - Check components, replace if necessary

Seats

- Components
 - Seat
 - Airbag module
 - Active head restraint
- Procedure
 - Check seats (function check of seat mechanism), replace if necessary
 - Check seat screw/bolt connections 2694 of 3160
 - Replace gas generator of active head restraint system

If the severity of the impact has not caused any other damage to the seat, only the triggered gas generator needs to be replaced.

External feature: The triggered head restraint is folded forwards and engaged.

The repair work can be carried out in the car with the rear panel removed. The entire system can be pushed back into its original position and the new gas generator installed.

The gas generator can be replaced up to 5 times.

- Replace airbag module and seat cover with padding

Driver's airbag

- Components
 - Airbag module
 - Steering wheel
 - Steering column (if damaged)
- Procedure
 - Check components, replace if necessary
 - Replace steering wheel

Passenger airbag

- Components
 - Airbag module
 - Instrument panel trim
 - Supporting tube (if damaged)
- Procedure
 - Check components, replace if necessary

Side airbag, front/rear

- Components
 - Airbag module
 - Door trim panel
 - Door in white
 - Seat
- Procedure
 - Check components, replace if necessary

Head airbag (AHPS)

- Components
 - Airbag module
 - Trim, A-pillar
 - Roofliner
 - Trim, B-pillar (if damaged)
 - Trim, C-pillar (if damaged)
 - Bodyshell
- Procedure
 - Check components, replace if necessary

Knee airbag

- Components
 - Panel (driver's side)
 - Lower section of glovebox
 - Active knee protector (driver's and passenger sides)
- Procedure
 - Check components, replace if necessary

Passive knee protector

- Components
 - Panel (driver's side)
 - Glovebox incl. knee protector (passenger side)
- Procedure
 - Check components for damage, replace if necessary
 - Check fastening elements

41 PUMP AND OIL SUPPLY

32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!

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

Using contaminated equipment to add fluid may introduce dirt particles into the fluid reservoir and significantly reduce the service life of the power steering system. Do not use any filler funnels or similar!

Use only Pentosin CHF11S from original containers!

The fill level may only be checked or adjusted when the engine is stopped! The fluid temperature should be approx. 20°C here.
Ensure that the cap is fully screwed in prior to the fill level check.

NOTE: To avoid mix-ups when filling with hydraulic fluid, mark the fluid reservoirs or their caps with identification marks.

ATF Automatic transmission fluid

CHF Pentosin CHF11S

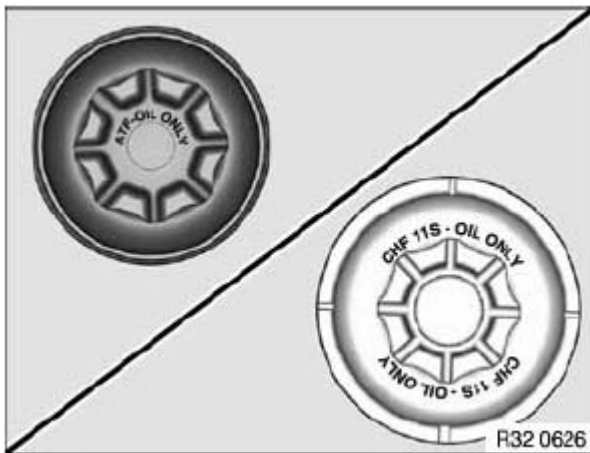


Fig. 68: Identifying Reservoir Cap
Courtesy of BMW OF NORTH AMERICA, INC.

1. Thoroughly clean fluid reservoir and its immediate surroundings
2. Check and correct fill level

NOTE: The fill level can come to rest above the "MAX" mark when the engine is at normal operating temperature. This is dictated by the design in that the marking on the dipstick is referred to a fluid temperature of 20°C. With the engine at normal operating temperature (approx. 50-60°C fluid temperature) adjust a fill height 15 mm above the "MAX" mark. Do not under any circumstances draw off the fluid to the "MAX" mark when the engine is at normal operating temperature.

3. Start engine
4. Turn steering wheel left and right twice in each case up to full lock; if necessary, top up hydraulic fluid (e.g. if hydraulic system is completely drained)
5. Move steering wheel to straight-ahead position and turn off engine
6. Check and correct fill level with engine stopped
7. Check hydraulic system for leaks

After filling:

- If necessary, carry out initial Dynamic Drive operation . See **37 10 001 INITIAL OPERATION WITH TEST RUN OF DYNAMIC DRIVE** .

32 13 006 BLEEDING POWER STEERING UNIT

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!

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

Using contaminated equipment to add fluid may introduce dirt particles into the fluid reservoir and significantly reduce the service life of the power steering system. Do not use any filler funnels or similar!

The fill level may only be checked or adjusted when the engine is stopped! The fluid temperature should be approx. 20°C here.

Ensure that the cap is fully screwed in prior to the fill level check.

NOTE: To avoid mix-ups when filling with hydraulic fluid, mark the fluid reservoirs or their caps with identification marks.

ATF Automatic transmission fluid

CHF Pentosin CHF11S

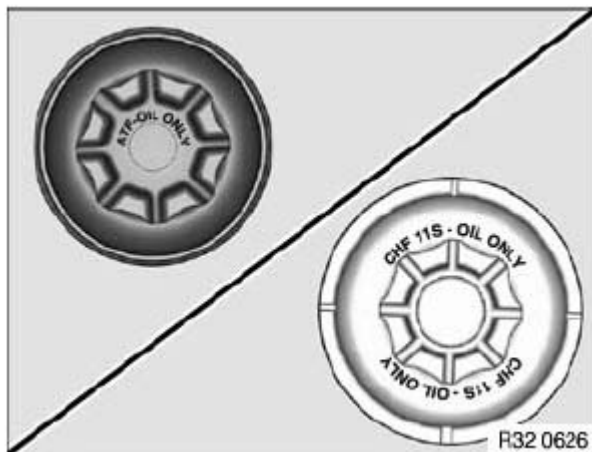


Fig. 69: Identifying Reservoir Cap

Courtesy of BMW OF NORTH AMERICA, INC.

1. Thoroughly clean fluid reservoir and its immediate surroundings
2. Check and correct fill level

NOTE: The fill level can come to rest above the "MAX" mark when the engine is at normal operating temperature. This is dictated by the design in that the marking on the dipstick is referred to a fluid temperature of 20°C. With the engine at normal operating temperature (approx. 50-60°C fluid temperature) adjust a fill height 10 mm above the "MAX" mark. Do not under any circumstances draw off the fluid to the "MAX" mark when the engine is at normal operating temperature.

3. Start engine
4. Turn steering wheel left and right twice in each case up to full lock; if necessary, top up hydraulic fluid (e.g. if hydraulic system is completely drained)
5. Move steering wheel to straight-ahead position and turn off engine
6. Check and correct fill level with engine stopped
7. Check hydraulic system for leaks

32 41 ... INSTRUCTIONS FOR REMOVING AND INSTALLING EAR CLIPS

Special tools required:

- 32 1 260

NOTE: The work steps are show on assorted components. Ear clip must always be replaced.

To remove an ear clip, place special tool 32 1 260 at right angles to ear and cut ear open.

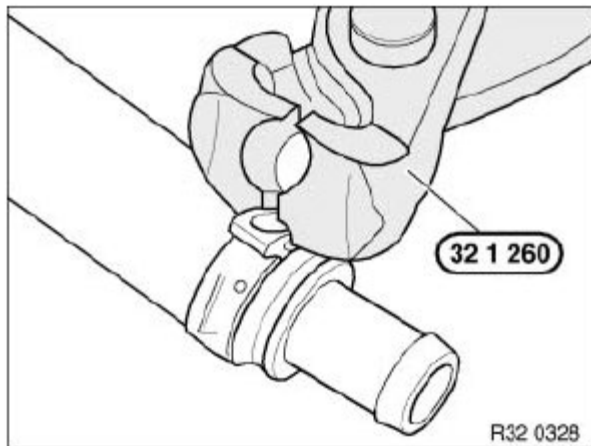


Fig. 70: Identifying Special Tool (32 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

The ear clip can be fitted not only axially but also radially after the hook fastener has been opened.

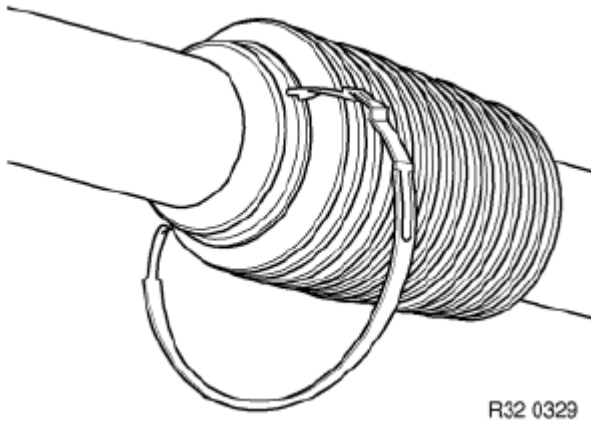


Fig. 71: Identifying Ear Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Attach hook fastener and press ear together with special tool 32 1 260.

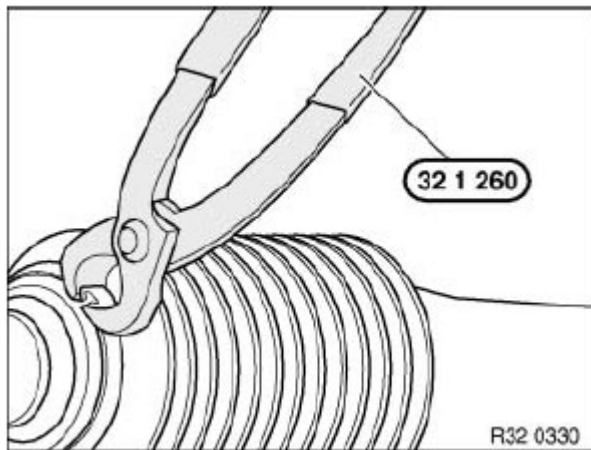


Fig. 72: Identifying Special Tool (32 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

Side cutter of special tool 32 1 260 can be used in areas which are difficult to access.

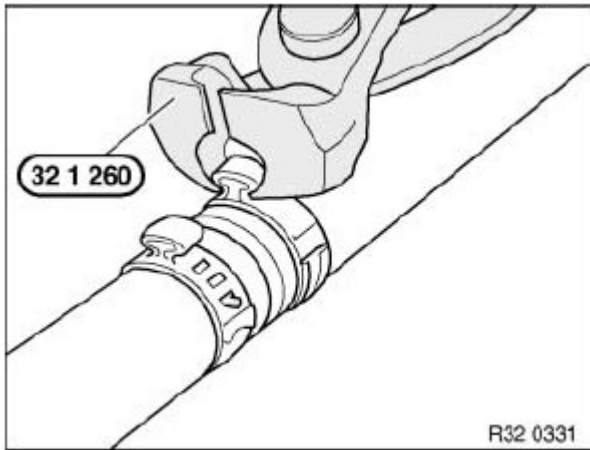


Fig. 73: Identifying Special Tool (32 2 160)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Gap (A) max. 1 mm!

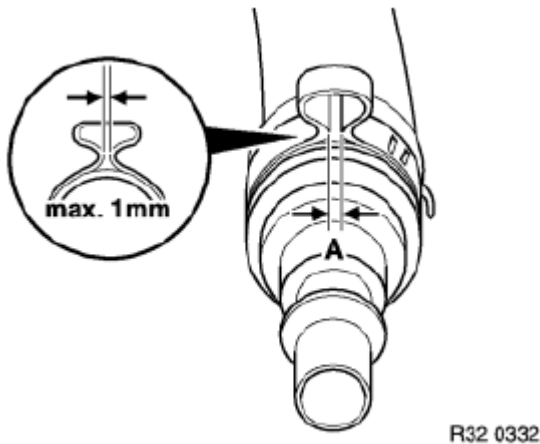


Fig. 74: Identifying Ear Clip Gap
Courtesy of BMW OF NORTH AMERICA, INC.

32 41 ... INSTRUCTIONS FOR USING SPECIAL TOOL 32 4 000

Special tools required:

- 32 4 000
- 32 4 004
- 32 4 005
- 32 4 006
- 32 4 011
- 32 4 012

Depending on the pressure hose connection on the pump, the special tool 32 4 000 must be assembled.

1 = Connection, pump

2 = Connection, steering gear

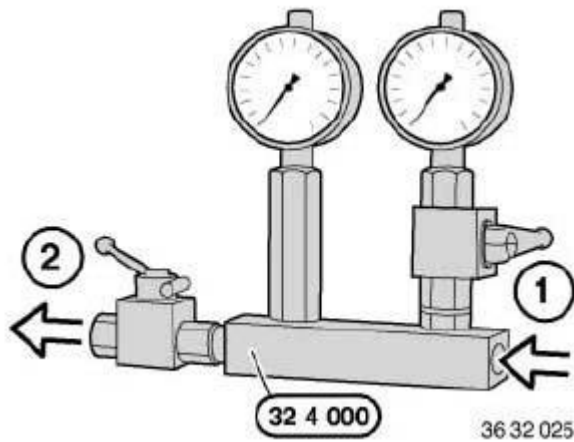


Fig. 75: Identifying Special Tool (32 4 000)

Courtesy of BMW OF NORTH AMERICA, INC.

< EMPHASIZE > Pressure hose connection to pump with M14 x 1.5 banjo bolt:

Screw special tool 32 4 004 with M14 x 1.5 banjo bolt (1) and 2 sealing rings to special tool 32 4 000.

Screw special tool 32 4 011 onto pump and connect special tool 32 4 004.

Screw special tools 32 4 006 / 32 4 012 onto special tool 32 4 000 and connect pressure hose with M14 x 1.5 banjo bolts and 2 sealing rings.

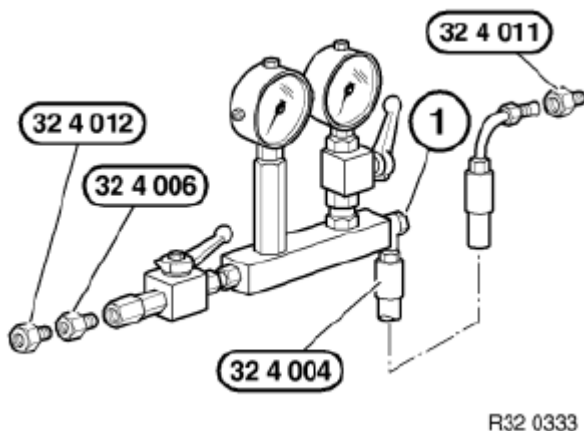


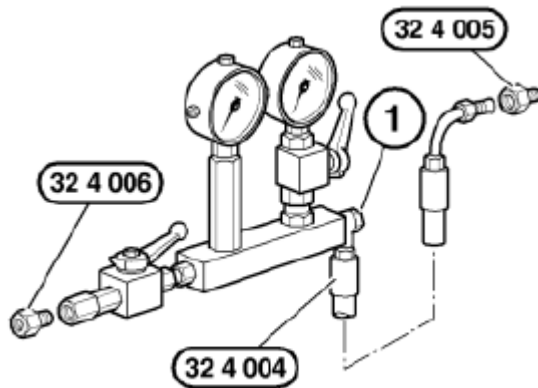
Fig. 76: Identifying Special Tool (32 4 012) (32 4 011)

Courtesy of BMW OF NORTH AMERICA, INC.

Pressure hose connection to pump with M16 x 1.5 banjo bolt:

Screw special tool 32 4 004 with M14 x 1.5 banjo bolt (1) and 2 sealing rings to special tool 32 4 000.

Screw special tool 32 4 005 onto pump and connect special tool 32 4 004.



R32 0334

Fig. 77: Identifying Special Tool (32 4 006) (32 4 005)

Courtesy of BMW OF NORTH AMERICA, INC.

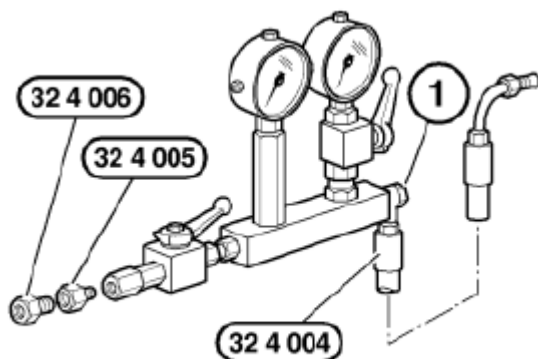
Screw special tool 32 4 006 onto special tool 32 4 000 and connect pressure hose with M16 x 1.5 banjo bolt and 2 sealing rings.

Pressure hose connection to pump with M16 x 1.5 union screw:

Screw special tool 32 4 004 with M14 x 1.5 banjo bolt (1) and 2 sealing rings to special tool 32 4 000.

Connect special tool 32 4 004 to pump.

Screw special tools 32 4 006 / 32 4 005 onto special tool 32 4 000 and connect pressure hose.

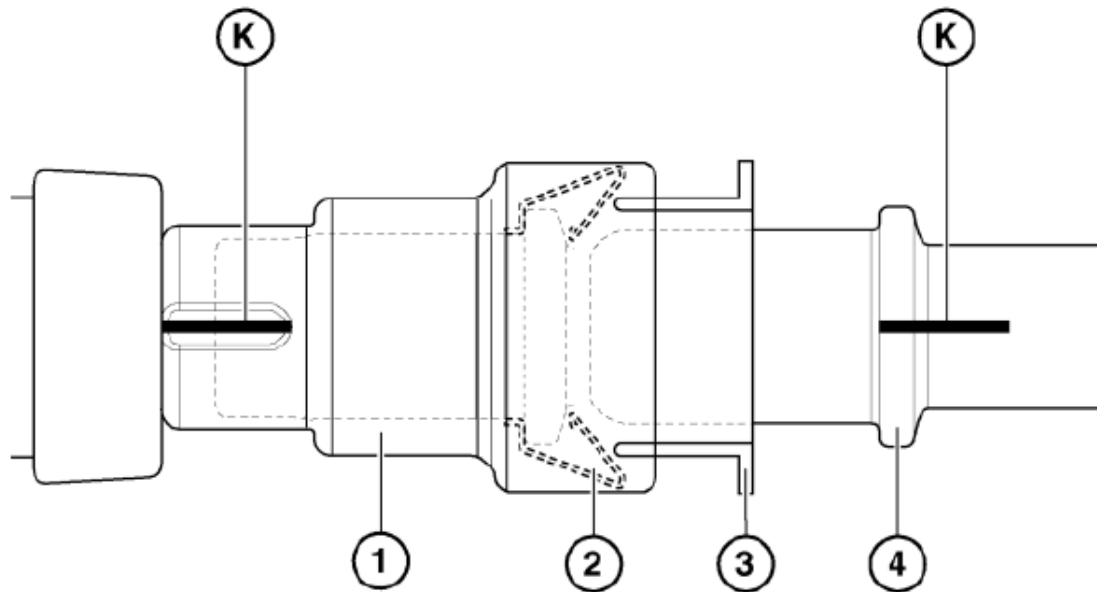


R32 0335

Fig. 78: Identifying Special Tool (32 4 004)

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Courtesy of BMW OF NORTH AMERICA, INC.

32 41 ... NOTES ON HYDRAULIC LINE WITH QUICK-CONNECT COUPLING**1. Quick-connect coupling with ID marking**

R32 0183

Fig. 79: Identifying Quick-Connect Coupling With ID Marking Components
 Courtesy of BMW OF NORTH AMERICA, INC.

Removing:

Push quick-connect coupling (1) against pipe (4) (thereby relieving strain on spring (2)).

Press plastic ring (3) into quick-connect coupling (1) and remove coupling (1).

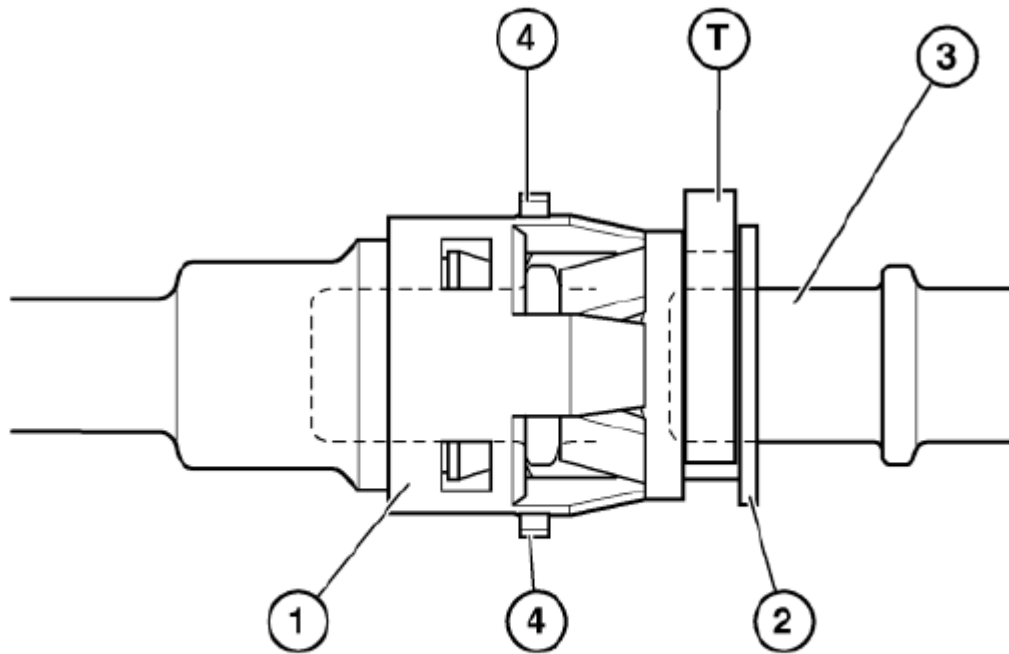
Assembly:

Markings (K) on coupling (1) and pipe (4) must be flush.

Push quick-connect coupling (1) onto pipe (4) until a "click" can clearly be heard.

To check that quick-connect coupling (1) has been installed correctly, pull it back forcefully.

2. Quick-connect coupling with indication pins



R32 0372

Fig. 80: Identifying Quick-Connect Coupling With Indication Pins Components
 Courtesy of BMW OF NORTH AMERICA, INC.

Removing:

Press plastic ring (2) into quick-connect coupling (1) and remove coupling (1).

Assembly:

When replacing hydraulic line: remove transportation lock (T).

Push quick-connect coupling (1) onto pipe (3) until both indication pins (4) can be seen and felt to point outwards at outside diameter of housing.

To check that quick-connect coupling (1) has been correctly fitted, feel indication pins (4) at outside diameter of housing. When correctly seated, indication pins (4) cannot be pressed into housing.

IMPORTANT: Coupling is not correctly engaged if both indication pins (4) fail to protrude from housing. Leakage is thus unavoidable.

Remove shims.

Installation:

Replace self-locking nuts.

Tightening torque. See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES**.

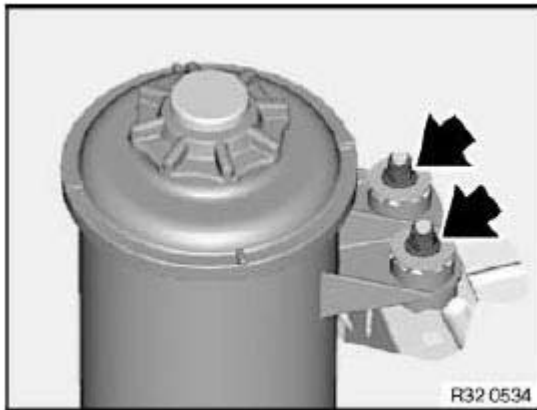


Fig. 81: Locating Dynamic Drive Fluid Reservoir Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Raise and/or turn fluid reservoir in order to gain better access to plug connection.

Disconnect plug connection (1).

Turn level switch (2) through approx. 45° and remove towards bottom.

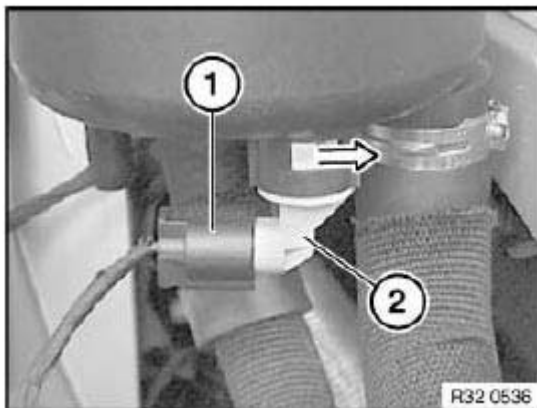


Fig. 82: Disconnecting Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Remove pressure line part 1 (1) (from power steering pump to junction I on engine carrier).

Remove pressure line part 2 (2) (from junction I to junction II on vehicle underbody on right). See .

Remove rear pressure line (part 3) (from junction II to valve block)

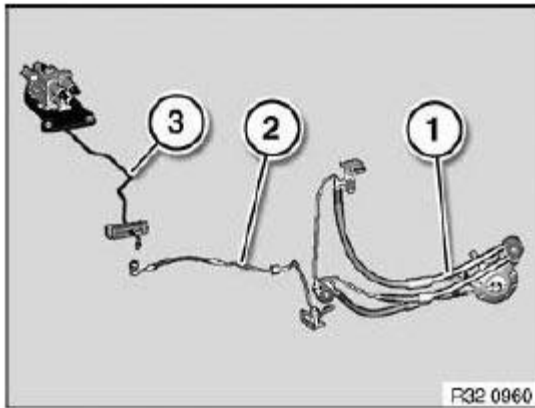


Fig. 83: Identifying Rear Pressure Line And Pressure Line Part 1 And 2
Courtesy of BMW OF NORTH AMERICA, INC.

32 41 ... REPLACING RETURN LINE FOR DYNAMIC DRIVE (N62TU, N52)

Remove front return line (1) (from steering gear or junction I to power steering cooler). See **Fig. 84**.

Remove rear return line (2) (from junction I to valve block). See **Fig. 84**.

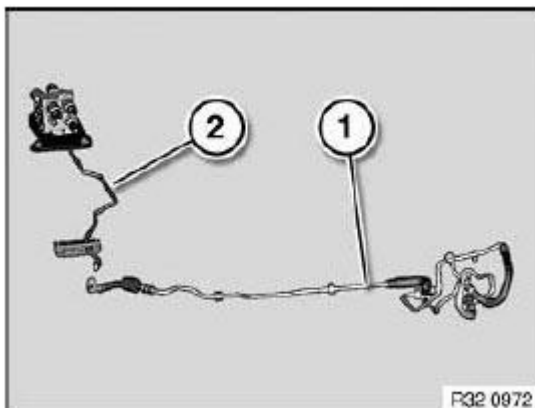


Fig. 84: Identifying Rear And Front Return Line
Courtesy of BMW OF NORTH AMERICA, INC.

32 41 009 CHECKING FUNCTION OF POWER STEERING VANE PUMP

Special tools required:

- 32 4 000

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!

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

Prior to this check, first check all hose connections, the vane pump and the power steering gear for leaks.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove front assembly underside protection . See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION** .
- Disconnect pressure line from vane pump . See **32 41 033 REMOVING AND INSTALLING POWER STEERING PUMP FOR POWER STEERING GEAR WITH ACTIVE FRONT STEERING (N62TU)** or **32 41 037 REMOVING AND INSTALLING/REPLACING POWER STEERING PUMP FOR POWER STEERING GEAR WITH DYNAMIC DRIVE (N62, N62TU)**.

Connecting special tool:

Connect special tool 32 4 000 with new sealing rings to vane pump and pressure line.

1. Connection, vane pump
2. Connection, power steering gear

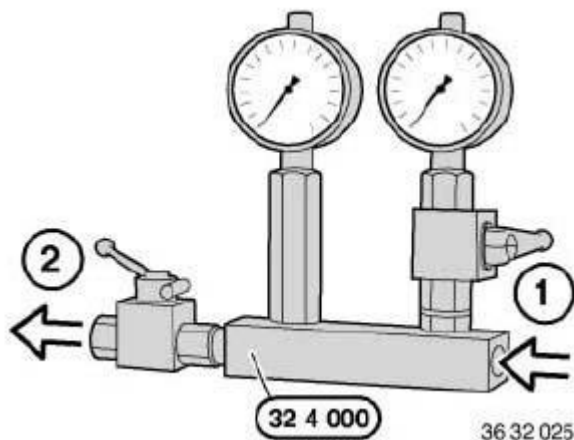


Fig. 85: Identifying Special Tool (32 4 000)
Courtesy of BMW OF NORTH AMERICA, INC.

Checking pump pressure:

1. Close valve (A).
2. Open valve (B).
3. Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT**.
4. Start engine
5. Heat hydraulic fluid to approx. 50°C by moving steering wheel at increased engine speed.
6. Close valve (B) for max. 10 secs. and read off pressure.
7. Compare measured pressure with specified nominal pressure . See **STEERING AND WHEEL ALIGNMENT - TECHNICAL DATA** .

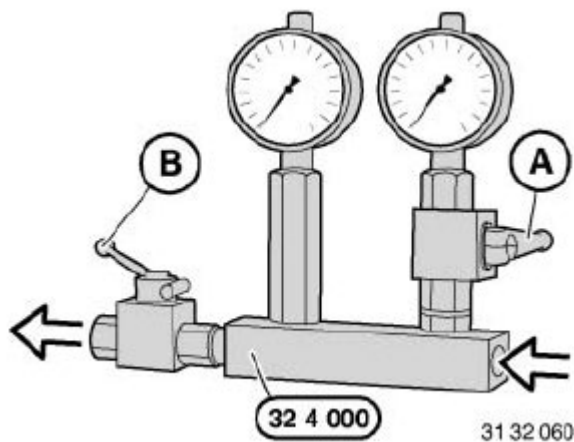


Fig. 86: Identifying Special Tool (32 4 000)
 Courtesy of BMW OF NORTH AMERICA, INC.

Replace vane pump if the nominal pressure is exceeded by more than 10 %. See **32 41 033 REMOVING AND INSTALLING POWER STEERING PUMP FOR POWER STEERING GEAR WITH ACTIVE FRONT STEERING (N62TU)** or **32 41 037 REMOVING AND INSTALLING/REPLACING POWER STEERING PUMP FOR POWER STEERING GEAR WITH DYNAMIC DRIVE (N62, N62TU)**.

Check belt tension if the nominal pressure is undershot by more than 10 %. Replace vane pump if belt tension is OK. See **32 41 033 REMOVING AND INSTALLING POWER STEERING PUMP FOR POWER STEERING GEAR WITH ACTIVE FRONT STEERING (N62TU)** or **32 41 037 REMOVING AND INSTALLING/REPLACING POWER STEERING PUMP FOR POWER STEERING GEAR WITH DYNAMIC DRIVE (N62, N62TU)**.

After installation:

- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT**.
- Check pipe connections for leaks

GEAR WITH ACTIVE FRONT STEERING (N62TU)

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Seal off hydraulic lines with plugs.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove belt pulley . See **32 41 100 REMOVING AND INSTALLING/REPLACING BELT PULLEY ON VANE PUMP FOR POWER STEERING**.
- Remove fan cowl . See **17 11 035 REMOVING AND INSTALLING/REPLACING FAN COWL WITH ELECTRIC FAN (N52K)** .
- Remove front assembly underside protection . See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION** .

Release union nut (2) and detach pressure line from power steering pump.

Release hose clamp (1) and detach suction line from power steering pump.

Disconnect plug connection on rear side of power steering pump.

Installation:

Make sure hydraulic lines are laid without tension and with sufficient spacing to adjoining components.

Align suction line by way of marking to connection on power steering pump.

Tightening torque 32 41 4AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

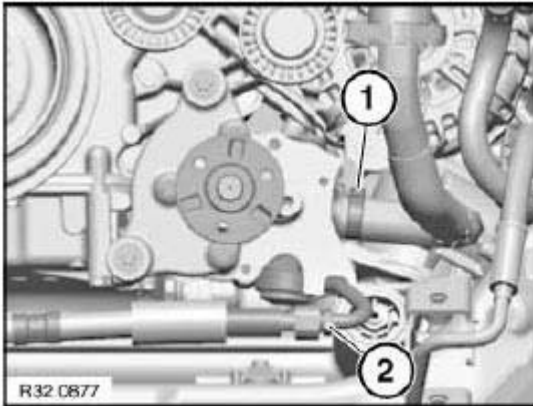


Fig. 87: Identifying Union Nut And Hose Clamp
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1, 2) and remove power steering pump.

Installation:

Make sure screws are installed in correct positions.

- Screw (1) M10x50
- Screw (2) M10x130

Tightening torque 32 41 3AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

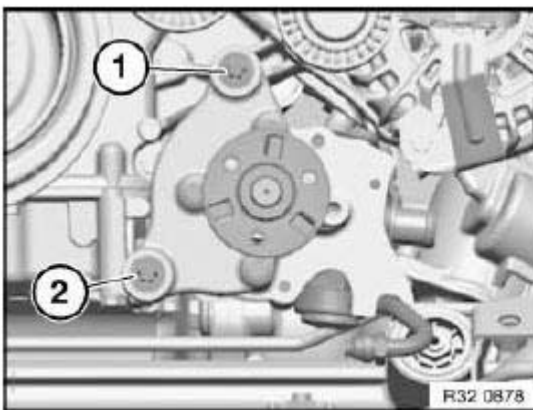


Fig. 88: Identifying Power Steering Pump And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

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- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH**

DYNAMIC DRIVE) or 32 13 006 BLEEDING POWER STEERING UNIT.

- Check pipe connections for leaks

32 41 037 REMOVING AND INSTALLING/REPLACING POWER STEERING PUMP FOR POWER STEERING GEAR WITH DYNAMIC DRIVE (N62, N62TU)

WARNING: Danger to life!

Mount securing fixture for vehicle on lifting platform to prevent the vehicle from slipping off or tilting down. See 51 71 505 MOUNT SECURING FIXTURE FOR VEHICLE ON LIFTING PLATFORM.

Secure engine in installation position to prevent it from falling down. See 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52) .

**WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!**

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Seal off hydraulic lines with plugs.**

**NOTE: When replacing power steering pump:
Fluid reservoir must be replaced in event of metal abrasion, sluggish pump shaft or increased wear!
The filter integrated in the fluid reservoir can only absorb a limited amount of foreign particles. If the filter clogs, the hydraulic system can no longer be sufficiently protected.
Metal abrasion is perceived in the fluid reservoir as metallically glittering hydraulic fluid.
It is only necessary to replace the fluid reservoir because of leaks (e.g. at hose connections) only in the event of the unavoidably high ingress of dirt.**

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove belt pulley . See **32 41 100 REMOVING AND INSTALLING/REPLACING BELT PULLEY ON VANE PUMP FOR POWER STEERING.**
- Lower front axle carrier . See **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (SPECIAL TOOL SWZ00-2040) or 31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (UNIVERSAL LIFTER) .**

Version with active front steering: Disconnect plug connection (1).

Release hose clamp (4) and detach suction line from power steering pump.

Release banjo bolt (3) and disconnect pressure line for power steering from power steering pump.

Release banjo bolt (2) and detach pressure line for Dynamic Drive from power steering pump.

Installation:

Replace all sealing rings.

Make sure hydraulic lines are laid without tension and with sufficient spacing to adjoining components.

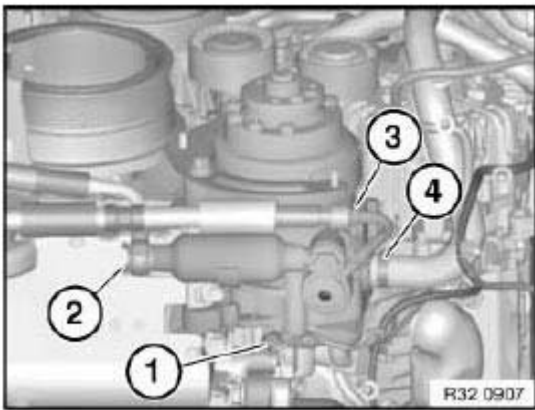


Fig. 89: Identifying Hose Clamp, Banjo Bolt And Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Align suction line by way of marking to connection on power steering pump.

Tightening torque 32 41 4AZ (for power steering).

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

Tightening torque 32 41 10AZ (for Dynamic Drive).

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

Release screws (1) and remove holder (2) and power steering pump towards bottom.

Tightening torque 32 41 3AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

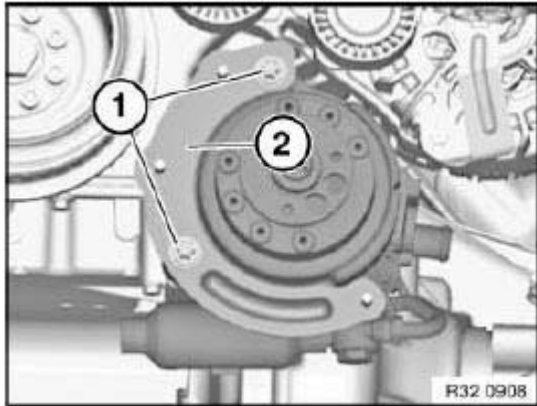


Fig. 90: Identifying Power Steering Pump Holder And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT**.
- Check pipe connections for leaks
- Perform **CHASSIS ALIGNMENT CHECK**
- Carry out steering angle sensor adjustment/adjustment for active front steering . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .
- If necessary, carry out initial Dynamic Drive operation . See **37 10 001 INITIAL OPERATION WITH TEST RUN OF DYNAMIC DRIVE** .

32 41 060 REMOVING AND INSTALLING VANE PUMP FOR POWER STEERING UNIT

NOTE: Procedure is described in the document "**POWER STEERING PUMP FOR POWER STEERING GEAR WITH ACTIVE FRONT STEERING...**"

32 41 100 REMOVING AND INSTALLING/REPLACING BELT PULLEY ON VANE PUMP FOR POWER STEERING

NOTE: Carry out preliminary work as described in **11 28 010 REPLACING ALTERNATOR DRIVE BELT (N62/N62TU)** .

Slacken screws (1)

Relieve tension on drive belt and remove from belt pulley (2).

Unscrew bolts (1) and remove belt pulley (2).

Installation:

Lettering on belt pulley (2) must point forwards.

Replace microencapsulated screws.

Tightening torque 32 41 2AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

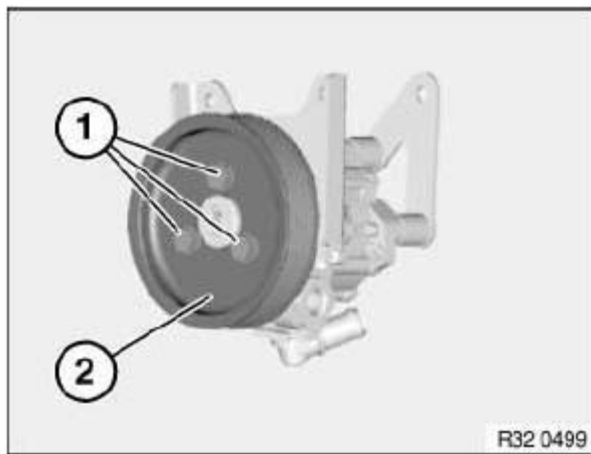


Fig. 91: Identifying Belt Pulley And Screws

Courtesy of BMW OF NORTH AMERICA, INC.

32 41 250 REMOVING AND INSTALLING/REPLACING FLUID RESERVOIR FOR POWER STEERING

Special tools required:

- 32 1 260

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Seal off hydraulic lines with plugs.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir

Unscrew nuts.

Remove shims.

Installation:

Replace self-locking nuts.

Tightening torque 32 41 1AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

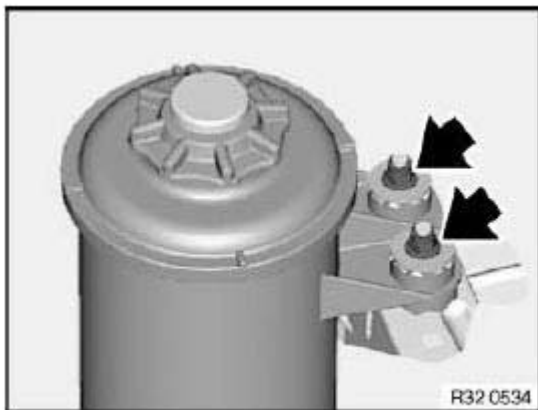


Fig. 92: Locating Dynamic Drive Fluid Reservoir Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **Raise and/or turn fluid reservoir in order to gain better access to plug connection and hose clamps.**

If necessary, disconnect plug connection at level switch.

Unfasten hose clips.

Disconnect suction line and radiator return line from fluid reservoir.

Lift out fluid reservoir.

Installation:

Fit hose clamps with special tool 32 1 260.



Fig. 93: Identifying Fluid Reservoir

Courtesy of BMW OF NORTH AMERICA, INC.

Replacement:

If necessary, remove level switch . See **32 41 ... REPLACING LEVEL SWITCH FOR DYNAMIC DRIVE FLUID RESERVOIR**.

After installation:

- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT**.
- Check pipe connections for leaks

Version with Dynamic Drive:

- If necessary, carry out initial Dynamic Drive operation . See **37 10 001 INITIAL OPERATION WITH TEST RUN OF DYNAMIC DRIVE** .

32 41 311 REPLACING SUCTION LINE FOR POWER STEERING (N62)

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Seal off pipe connections with plugs.

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

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Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove front underbody protection . See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION** .

Remove fluid reservoir from mounting bracket/body . See **32 41 250 REMOVING AND INSTALLING/REPLACING FLUID RESERVOIR FOR POWER STEERING**.

Unfasten hose clip (1).

Disconnect suction line (2) from fluid reservoir.

Installation:

Markings (3) on fluid reservoir and suction line must match up.

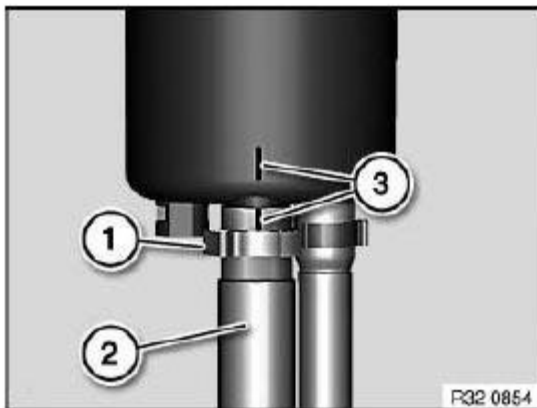


Fig. 94: Identifying Suction Line, Hose Clip And Marking On Fluid Reservoir
Courtesy of BMW OF NORTH AMERICA, INC.

Expose suction line up to connection on vane pump.

Unfasten hose clip (1).

Detach suction line (2) from vane pump.

Installation:

Identification (P) of suction line (2) and rib (3) of vane pump must match up.

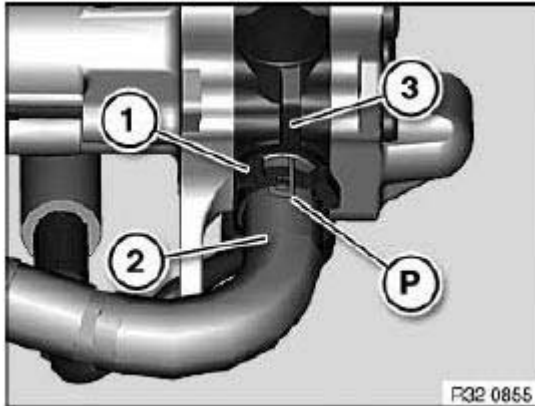


Fig. 95: Identifying Suction Line, Rib And Hose Clip
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT**.
- Check pipe connections for leaks

32 41 331 REPLACING PRESSURE LINE FOR POWER STEERING (FROM VANE PUMP TO CUTTING LINE) (N62)

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Close off pipe connections with plugs.

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove right front wheel
- Remove front underbody protection . See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION** .
- Remove steering gear cover at top right . See **51 71 ... REMOVING AND INSTALLING/REPLACING TOP RIGHT STEERING GEAR COVER** .

Release banjo bolt (1) and detach pressure line (2) from vane pump.

Installation:

Align pressure line connection by way of flattened sides vertically to front axle carrier.

Tightening torque 32 41 4AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

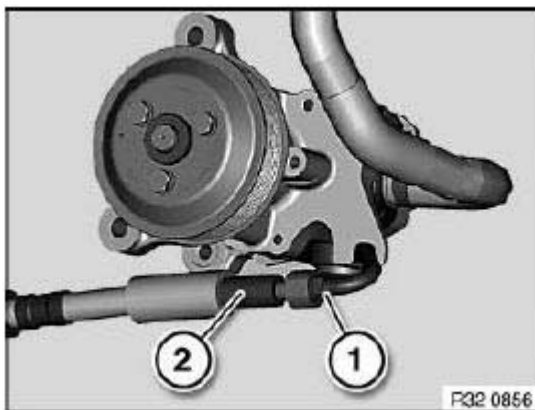


Fig. 96: Identifying Banjo Bolt And Pressure Line
Courtesy of BMW OF NORTH AMERICA, INC.

Expose pressure line up to cutting line on front axle carrier.

Release nut (1) and remove pressure line (2).

Installation:

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

Tightening torque 32 41 11AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

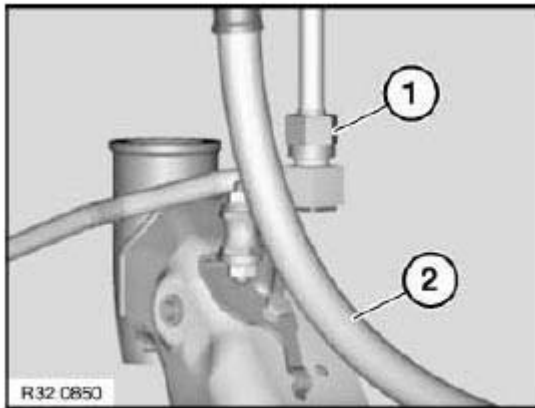


Fig. 97: Identifying Pressure Line And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT**.
- Check pipe connections for leaks

32 41 332 REPLACING PRESSURE LINE FOR POWER STEERING (FROM CUTTING LINE TO STEERING GEAR) (N62)

WARNING: Danger to life!

Mount securing fixture for vehicle on lifting platform to prevent the vehicle from slipping off or tilting down. See 51 71 505 MOUNT SECURING FIXTURE FOR VEHICLE ON LIFTING PLATFORM.

Secure engine in installation position to prevent it from falling down. See 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52) .

**WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!**

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Close off pipe connections with plugs.**

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

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- Draw off and dispose of hydraulic fluid from fluid reservoir

- Lower front axle support . See **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (SPECIAL TOOL SWZ00-2040)** or **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (UNIVERSAL LIFTER)** .

Release banjo bolt (1) and remove pressure line (2) from power steering gear.

Installation:

Replace all sealing rings.

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

Tightening torque 32 41 5AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

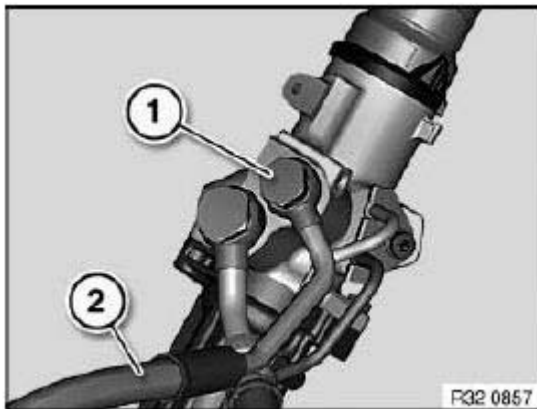


Fig. 98: Identifying Banjo Bolts And Pressure Line
Courtesy of BMW OF NORTH AMERICA, INC.

Expose pressure line up to cutting line on front axle carrier.

Release nut (1) and remove pressure line (2).

Installation:

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

Tightening torque 32 41 11AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

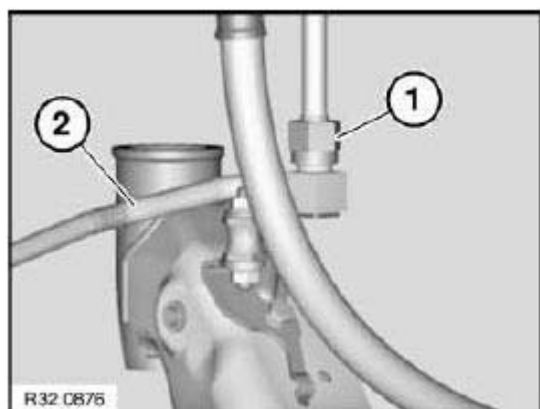


Fig. 99: Identifying Nut And Pressure Line
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT**.
- Check pipe connections for leaks
- Perform **CHASSIS ALIGNMENT CHECK**
- Carry out steering angle sensor adjustment/adjustment for active front steering . See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT** .

32 41 341 REPLACING COOLER RETURN LINE FOR POWER STEERING (N52, N62)

WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
 Risk of injury if oil comes into contact with eyes and skin!

IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
 Seal off pipe connections with plugs.

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove front underbody protection . See **51 47 490 REMOVING AND INSTALLING / REPLACING FRONT ASSEMBLY UNDERSIDE PROTECTION** .

Remove fluid reservoir from mounting bracket/body . See **32 41 250 REMOVING AND INSTALLING/REPLACING FLUID RESERVOIR FOR POWER STEERING.**

Release hose clamp (1) and detach cooler return line (2) from fluid reservoir.

Installation:

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

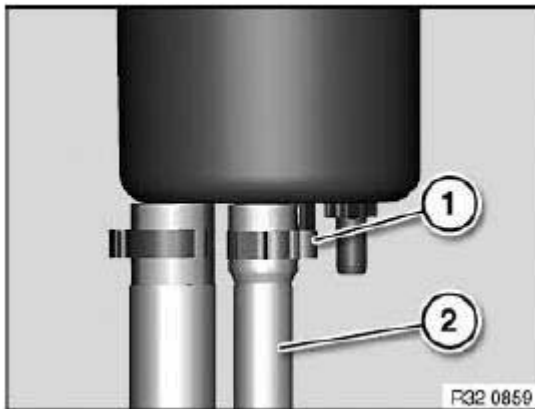


Fig. 100: Identifying Hose Clamp And Cooler Return Line
Courtesy of BMW OF NORTH AMERICA, INC.

Expose cooler return line up to connection on power steering cooler.

Release quick-connect coupling and seal power steering cooler connection with a suitable plug.

Installation:

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

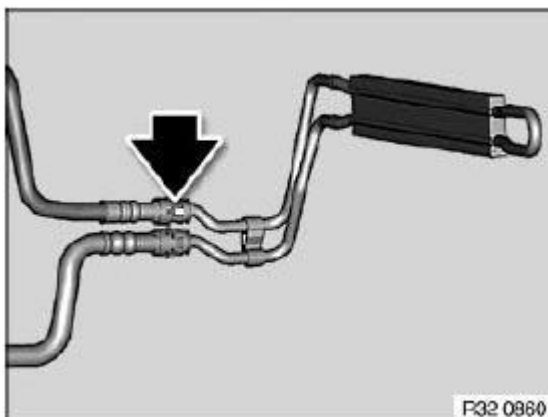


Fig. 101: Locating Seal Power Steering Cooler Connection Plug
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT**.
- Check pipe connections for leaks

32 41 351 REPLACING RETURN LINE FOR POWER STEERING**WARNING: Danger to life!**

Mount securing fixture for vehicle on lifting platform to prevent the vehicle from slipping off or tilting down. See 51 71 505 MOUNT SECURING FIXTURE FOR VEHICLE ON LIFTING PLATFORM.

Secure engine in installation position to prevent it from falling down. See 11 00 670 SECURING ENGINE IN INSTALLATION POSITION (N52) .

**WARNING: Danger of poisoning if oil is ingested/absorbed through the skin!
Risk of injury if oil comes into contact with eyes and skin!**

**IMPORTANT: Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.
Close off pipe connections with plugs.**

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Lower front axle support . See **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (SPECIAL TOOL SWZ00-2040)** or **31 11 506 LOWERING/RAISING FRONT AXLE CARRIER (UNIVERSAL LIFTER)** .
- M57T2: Remove left charge air line

Release banjo bolt (1) and remove return line (2) from power steering gear.

Installation:

Replace all sealing rings.

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

Tightening torque, 32 41 6AZ.

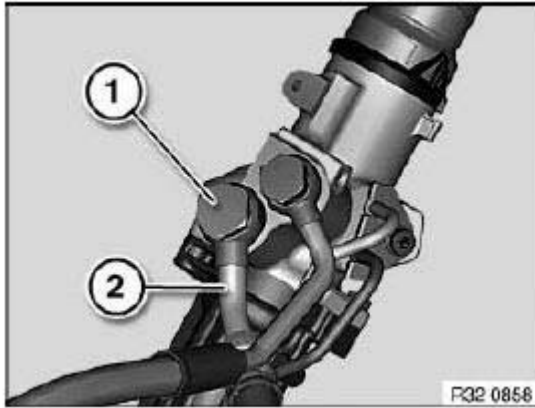


Fig. 102: Identifying Return Line And Banjo Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Expose return line up to connection on power steering cooler.

Release quick-connect coupling and seal power steering cooler connection with a suitable plug.

Remove return line.

Installation:

Make sure hydraulic line is laid without tension and with sufficient spacing to adjoining components.

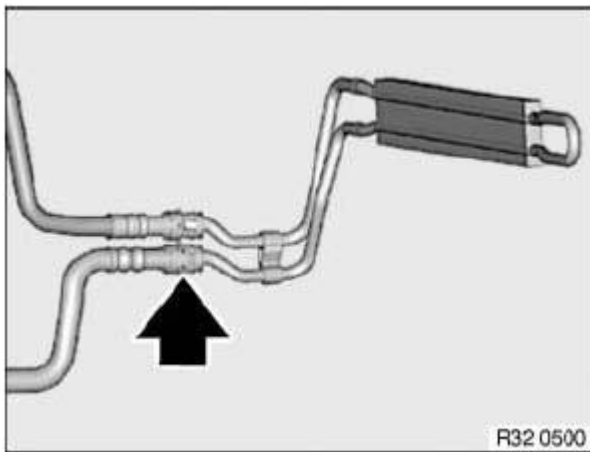


Fig. 103: Locating Seal Power Steering Cooler Connection Plug
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed hydraulic system . See **32 13 006 BLEEDING POWER STEERING (VERSION WITH DYNAMIC DRIVE)** or **32 13 006 BLEEDING POWER STEERING UNIT**.

- Check pipe connections for leaks
- Perform **CHASSIS ALIGNMENT CHECK**
- Carry out steering angle sensor adjustment/adjustment for active front steering. See **32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING** and **61 31 996 CARRY OUT STEERING ANGLE SENSOR ADJUSTMENT**.

43 ELECTRONIC POWER STEERING

32 00 ... TEACHING IN CENTRE POSITION FOR POWER STEERING (ACTIVE FRONT STEERING) (FROM 03/2007)

NOTE: Carry out the following procedure after disconnecting the battery or disconnecting electrical plug connections on the steering column switch cluster.

Turn on ignition, start engine if necessary.

Turn steering wheel twice in both directions to full lock.

IMPORTANT: If the indicator lamp does not go out after the ignition is turned on again, an adjustment of the active front steering must be carried out.

32 10 005 ADJUSTMENT FOR ACTIVE FRONT STEERING

NOTE: Adjustment of the active front steering must be carried out:

- after adjustment work on the front axle/steering
- after all mechanical work on the steering system
- after replacement/programming or coding of the following components:
 - Steering column switch cluster
 - DSC control unit
 - Active front steering control unit
 - ARS control unit

Connect vehicle to BMW diagnosis system.

Select and carry out initial operation/adjustment for active front steering under Service functions.

32 43 010 REMOVING AND INSTALLING/REPLACING CONTROL UNIT FOR ACTIVE FRONT STEERING

IMPORTANT: Read and comply with notes on protection against electrostatic damage (ESD protection).

Necessary preliminary tasks:

- Disconnect battery negative lead . See **12 00... INSTRUCTIONS FOR DISCONNECTING AND CONNECTING BATTERY** .
- Remove front left wheel arch cover (rear section)

Release nut (1) and disconnect ground cable.

Disconnect plug connections (2).

Unclip cable holder (3).

Installation:

Replace damaged cable holder.

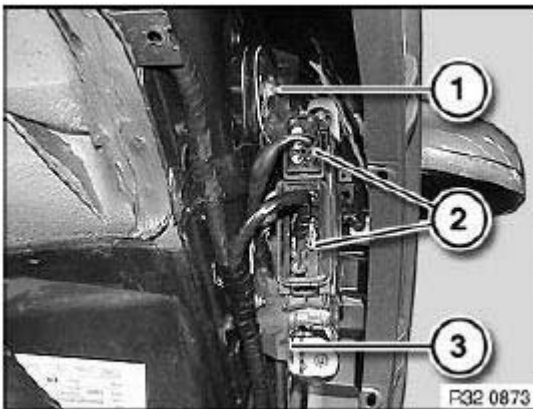


Fig. 104: Identifying Plug Connection, Cable Holder And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (1, 2).

Tightening torque 32 43 1AZ.

See **STEERING AND WHEEL ALIGNMENT - TIGHTENING TORQUES** .

Remove active front steering control unit (3).

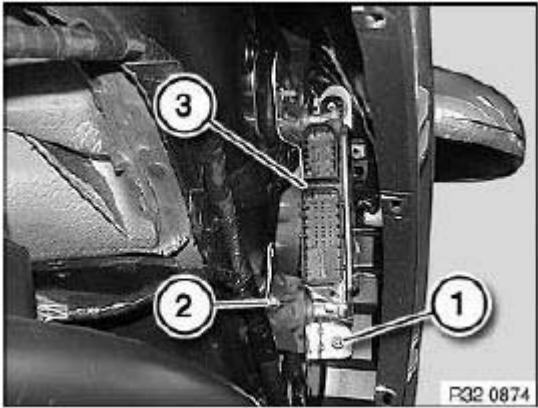


Fig. 105: Identifying Front Steering Control Unit And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Replacement only: Carry out coding
- Only when replacing / programming / coding: Carry out adjustment for active front steering
- Teach in center position for power steering gear

90 TROUBLESHOOTING

32 90 ... TROUBLESHOOTING ON STEERING

Observe troubleshooting on front axle and diagnosis help for steering (SI).

TROUBLESHOOTING CHART

Fault	Cause	Remedy
Excessive steering wheel play/steering wheel shake	Screws at lower section of steering spindle to steering gear/steering spindle middle section loose	Replace screws and tighten down (refer to REMOVING AND INSTALLING/REPLACING LOWER SECTION OF STEERING SPINDLE)
	Screws at steering spindle middle section to steering spindle lower section/steering column loose	Replace screws and tighten down (refer to REMOVING AND INSTALLING/REPLACING STEERING SPINDLE MIDDLE SECTION)
	Journal of tie rod end deformed	Replace steering gear and tie rod ends
	Tie rod end worn	Check steering gear rack; if necessary, replace steering gear
		Check tie rods , replace if necessary
		Replace tie rod end
	Steering gear rack damaged	Replace steering gear

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	Refer to <u>TROUBLESHOOTING ON FRONT AXLE</u>	
Steering wheel inclination	Tie rod end worn	Replace tie rod end
	Front axle alignment incorrectly adjusted	Carry out chassis/wheel alignment check , adjust toe/track if necessary
	Refer to <u>TROUBLESHOOTING ON FRONT AXLE</u>	