

SUSPENSION

Integrated Suspension Systems - Operating Fluids

1.0 GENERAL INFORMATION

LHM hydraulic fluid has a favorable viscosity range and permits problem-free operation of the self-leveling rear suspension at very low and very high temperatures. The solidification point is -78°F/-61°C.

2.0 APPROVED HYDRAULIC FLUIDS

E24, E28 produced prior to 9/87

Pentosin CHF 4548 was used for initial factory filling.

For filling up and replacement the following oil is to be used:

Pentosin CHF 7.1 BMW Part No. 81 22 1 468 879

Pentosin CHF 4548 and CHF 7.1 can be mixed in these cars.

For complete system oil replacement:

Reputable brand name LHM oils (green color) can also be used (Shell, Castrol, Exxon, etc.)

NOTE: Mixing of CHF and LHM oils is not permitted.

E24, E28 produced since 9/87

Pentosin CHF 7.1 is used for initial factory filling.

For filling up and replacement use only Pentosin CHF 7.1

BMW Part No. 81 22 1 468 879

For complete oil replacement:

Reputable brand name LHM oils (green color) can also be used.

NOTE: Mixing of CHF 7.1 and LHM oils is not permitted.

E32 produced prior to 9/91

Use only Pentosin CHF 7.1.

Mixing with other oils is not permitted.

E32, E34 produced since 9/91

Use only Pentosin CHF 11S

NOTE: All cars have a label indicating the respective type on the hydraulic fluid reservoir. Since both Pentosin CHF 11S and CHF 7.1 are green in color, the reservoir label must be carefully checked prior to adding fluid.

Mixing CHF 11S and CHF 7.1 is not permitted.

Pentosin CHF 11S BMW Part No. 82 11 1 468 041

E38 produced since 1/94

Use only Pentosin CHF 11S

NOTE: All cars have a label indicating the respective type on the hydraulic fluid reservoir. Since both Pentosin CHF 11S and CHF 7.1 are green in color, the reservoir label must be carefully checked prior to adding fluid.

Mixing CHF 11S and CHF 7.1 is not permitted.

Pentosin CHF 11S BMW Part No. 82 11 1 468 041

3.0 CHECKING HYDRAULIC FLUID LEVELS

The hydraulic fluid level must be checked on an unloaded car and at every Inspection I or, for cars without a Service Indicator, at 10,000 mi/15,000 km intervals.

NOTE: Not required as of 1993 model year vehicles.

Special checking instructions apply to the E32.

NOTE: Never fill above the "max" mark. There are no replacement intervals for hydraulic fluid.

SUSPENSION

Integrated Suspension Systems - Repair Instructions - X6

GENERAL

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

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

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

Protective measures/rules of conduct:

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

First aid measures:

- Do not induce vomiting.

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

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

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

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

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

Protective measures/rules of conduct:

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

First aid measures:

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

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

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

Recycling:

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released:

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

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

00 ... RAISING VEHICLE WITH TROLLEY JACK

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

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

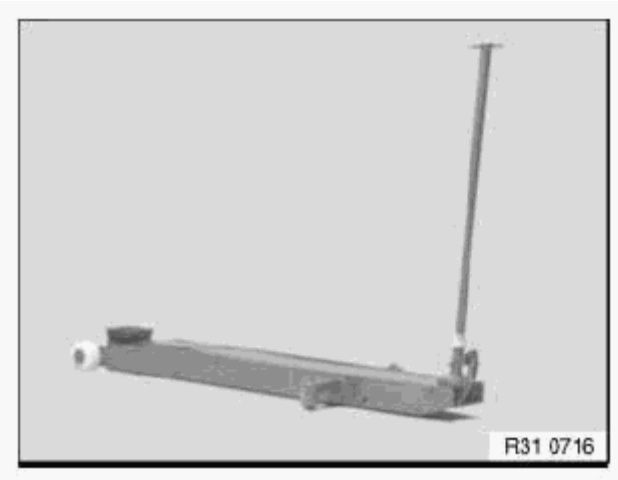


Fig. 1: Identifying Trolley Jack

Courtesy of BMW OF NORTH AMERICA, INC.

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

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

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

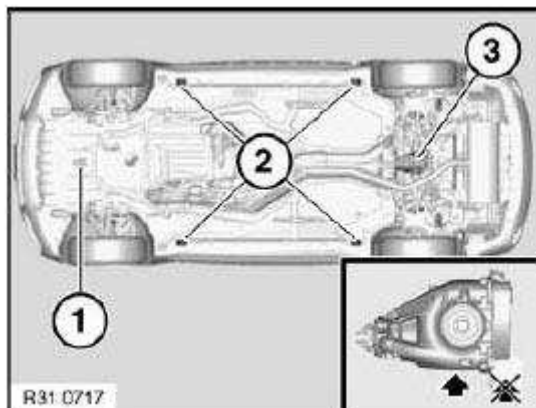
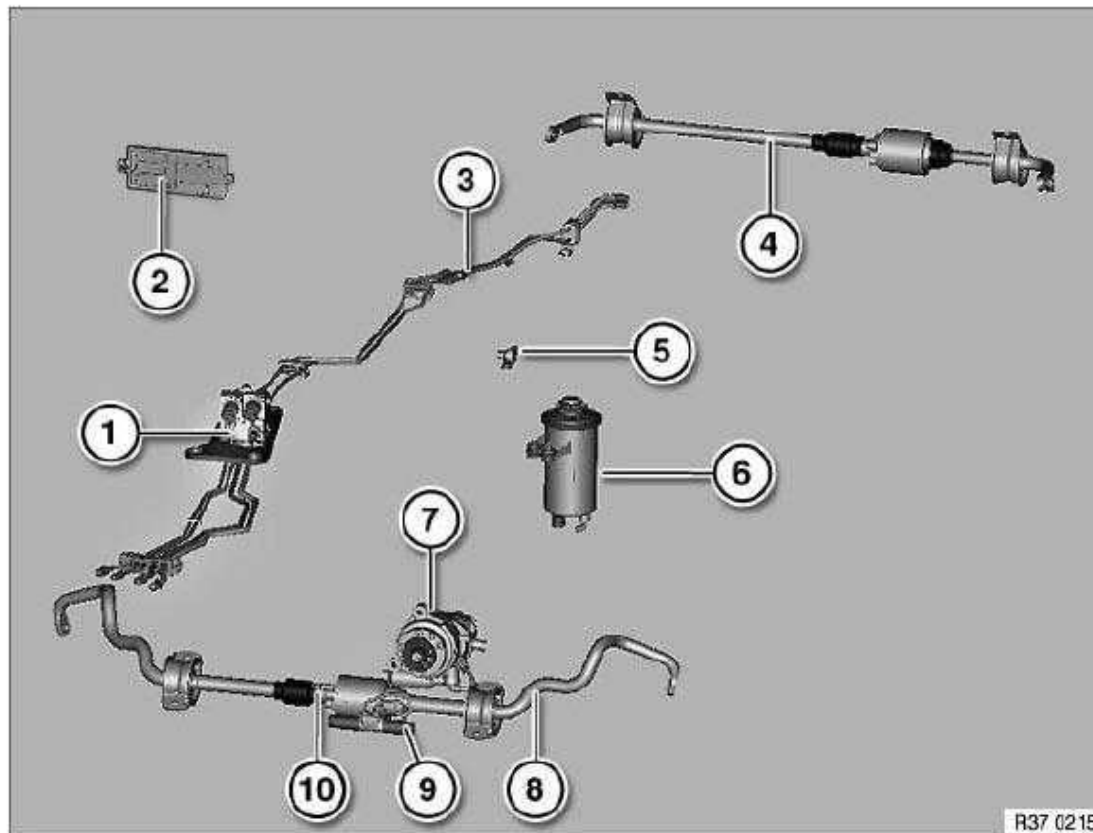


Fig. 2: Identifying Car Jacking Points
 Courtesy of BMW OF NORTH AMERICA, INC.

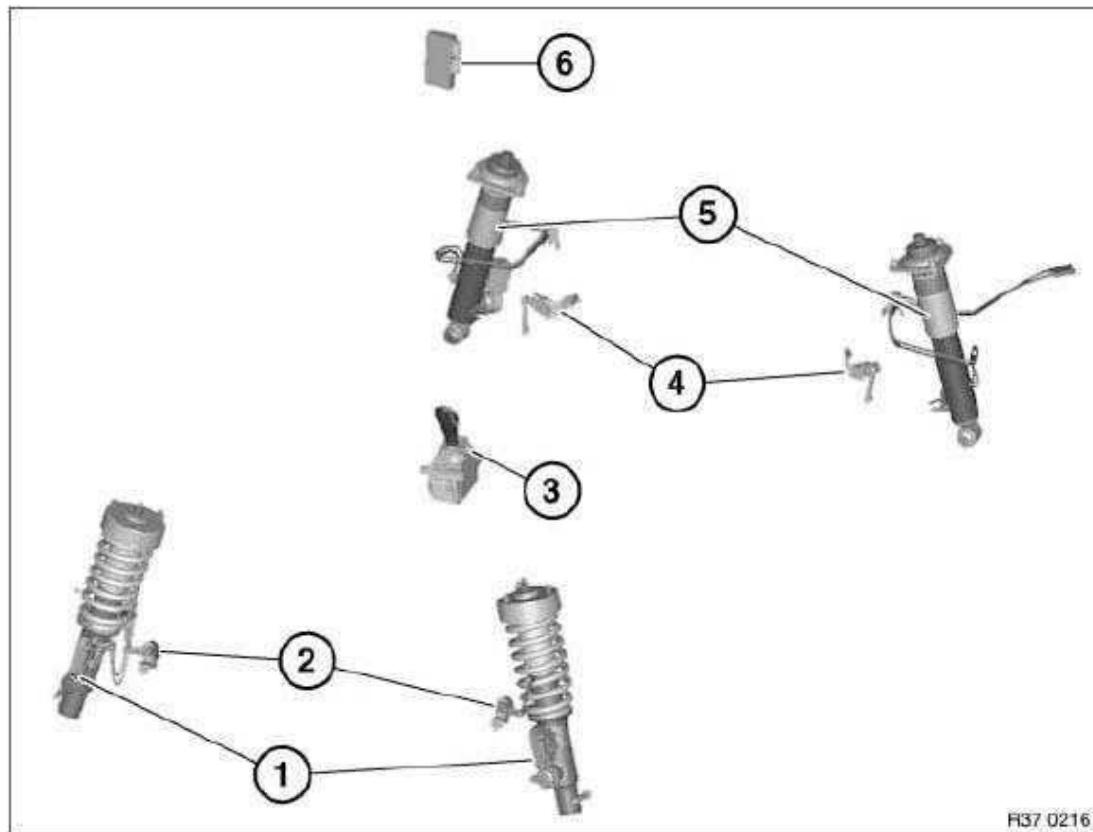
37 ... OVERVIEW OF DYNAMIC DRIVE (ARS)



- | | | | |
|---|--|----|---|
| 1 | <u>Valve block</u> | 8 | <u>Active stabilizer, front</u> |
| 2 | <u>Control unit</u> | 9 | <u>Spring-type actuator (if necessary E70 only)</u> |
| 3 | <u>Pipes</u> | 10 | <u>Pressure relief valve</u> |
| 4 | <u>Active stabilizer, rear</u> | | |
| 5 | <u>Transversal acceleration sensor</u> | | |
| 6 | <u>Level sensor (on fluid reservoir)</u> | | |
| 7 | <u>Auxiliary steering pump</u> | | |

Fig. 3: Overview Of Dynamic Drive (ARS)
 Courtesy of BMW OF NORTH AMERICA, INC.

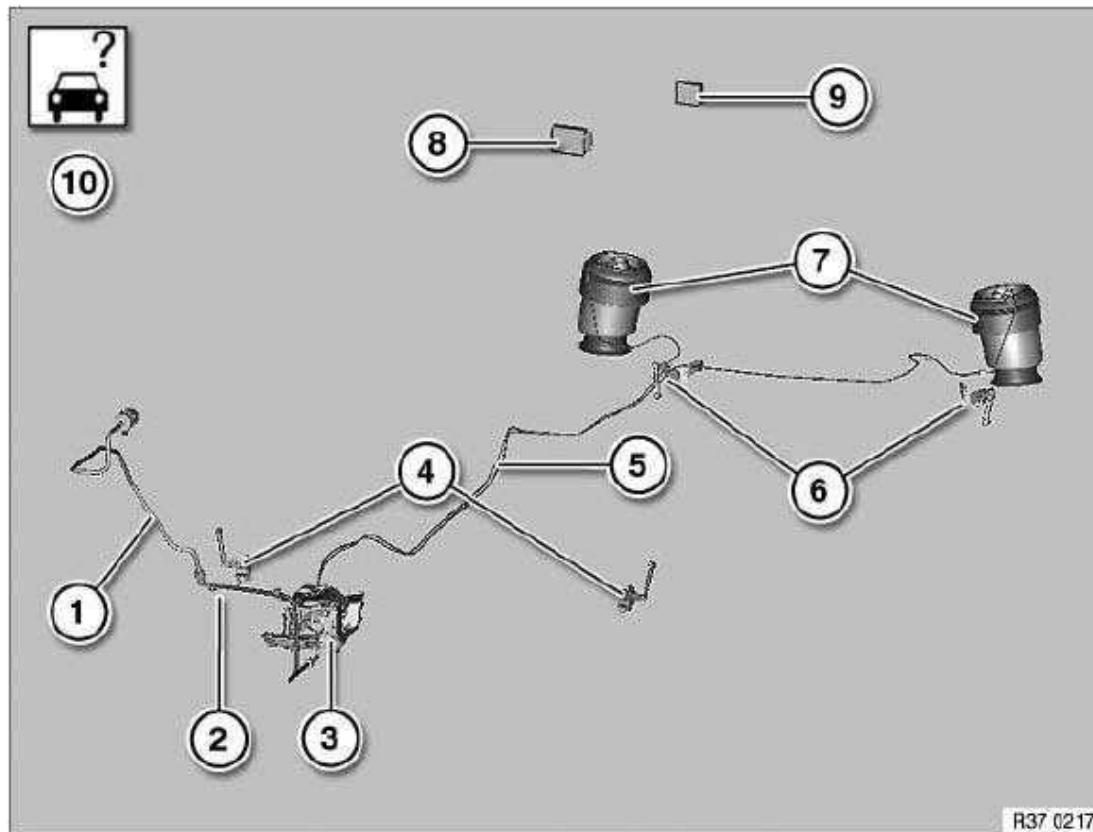
37 ... OVERVIEW OF VERTICAL DYNAMICS MANAGEMENT (VDM)



- | | | | |
|---|---|---|---------------------|
| 1 | <u>Spring strut, front</u> | 6 | <u>Control unit</u> |
| 2 | <u>Ride-height sensors, front</u> | | |
| 3 | <u>Sport button</u> (on gear selector switch) | | |
| 4 | <u>Ride-height sensors, rear</u> | | |
| 5 | <u>Shock absorber, rear</u> | | |

Fig. 4: Overview Of Vertical Dynamics Management (VDM)
 Courtesy of BMW OF NORTH AMERICA, INC.

37 OVERVIEW OF RIDE-HEIGHT CONTROL SYSTEM



- | | | | |
|---|--|----|---------------------------------|
| 1 | Upper vent line | 8 | Control unit |
| 2 | Lower vent line | 9 | Relays |
| 3 | Air supply unit | 10 | Troubleshooting |
| 4 | Ride-height sensors, front | | |
| 5 | Pipes | | |
| 6 | Ride-height sensors, rear | | |
| 7 | Air springs | | |

Fig. 5: Overview Of Ride-Height Control System
 Courtesy of BMW OF NORTH AMERICA, INC.

37 ... PERFORMING VERTICAL ACCELERATION SENSOR ADJUSTMENT (VERTICAL DYNAMICS MANAGEMENT)

NOTE: Vertical acceleration sensor adjustment must be performed after replacement of the spring strut/shock absorber with damper satellites.

Connect vehicle to BMW diagnosis system.

Select and perform vertical acceleration sensor adjustment under Service functions.

37 00 ... NOTES ON AIR SPRING SYSTEM

Components/pipes

IMPORTANT: Maintain the highest possible standards of cleanliness around the pipe connections when dismantling and assembling components/pipes. Even the tiniest dirt particles on the pipe connections or damage to the pipes can result in leaks in the air spring system!
Do not kink, twist or crush lines.

Pipe connections must be sealed off with adhesive tape immediately after they have been removed. The adhesive tape may only be removed shortly before the connection is reinstalled.

Air spring strut/air spring

NOTE: If a vehicle has been driven with a depressurized air spring strut/air spring, the air spring strut/air spring must always be replaced.

Check **AIR SPRING STRUT/AIR SPRING FOR DAMAGE.**

37 00 ... CHECKING AIR SPRINGS FOR DAMAGE

NOTE: If a vehicle has been driven with depressurized air springs, the air springs must always be replaced.

Lift vehicle.

Air spring is OK:

1. when the gaiter cannot be pressed in by hand
2. when no visible damage (e.g. kinks, cracks, porous areas, etc.) is discernible
3. when the rolling fold is uniform



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

NOTE: If one of the above-mentioned points fails the test, then the AIR SPRING must be replaced.

37 00 ... INSPECTION SHEET

Test maneuver for troubleshooting on ARS:

Test maneuver 1:

Drive with slow to medium-speed steering movements about the center position at approx. 20 km/h on a **level** road surface.

Assessment of noise during test maneuver:

-> Clicking noise from area of front passenger footwell or area of right floorpan

Test maneuver 2:

Drive straight ahead on a **bumpy** road surface with one-sided, short-wave excitation (e.g tar spraying) at 30-50 km/h

-> Rattling noise

Test maneuver 3:

Audible when stopped or during constant cornering on a level road surface -> engine speed at over 1000 RPM

-> Hissing in area of front passenger footwell

Check hydraulic lines:

Hydraulic lines installed twisted:

Check whether hydraulic lines are installed in holders twisted (when system is depressurized, hydraulic lines must be guided in holders virtually without elastic distortion of decoupling elements)

Line holders loose:

Check whether line holders are correctly screwed and holder halves are correctly engaged

Line holders on hydraulic lines missing or fitted in incorrect position

Check whether line holders are present in accordance with repair instruction and fitted in correct position

Check minimum distance in case of hydraulic clearance (insufficient clearance):

First check minimum distance (A) = 3 mm between control line (1) and oscillating motor (2).

Then check control line (3) with minimum distance (B) = 8 mm to control line (1).

Refer to repair instruction. See **37 11 010 REMOVING AND INSTALLING/REPLACING FRONT ACTIVE STABILIZER**

Check screw connection:

Check bolts at **SPECIFIED TORQUE** for secure seating. Specified torques are set out in the repair instruction.

Check play:

Check ball joints for play

Check pressure line:

Check Dynamic Drive pressure line between power steering pump and valve block to see if it is crushed or bent.

37 00 100 DRAINING/FILLING AIR SPRING SYSTEM

WARNING: Danger of injury!

Drain the air spring system before carrying out any work on the air supply unit, air pipes and air springs! Danger of injury if this instruction is not complied with!

IMPORTANT: Risk of damage!

To fill the air springs, raise the vehicle until the wheels are freely suspended.

NOTE: Read and comply with **NOTES ON AIR SPRING SYSTEM**.

Deactivating air spring system:

- Fold down **PASSENGER COMPARTMENT FUSE BOX**
- Pull out fuse (F32) for air supply unit



Fig. 7: Identifying Fuse (F32)

Courtesy of BMW OF NORTH AMERICA, INC.

Draining air spring system:

- Connect BMW diagnosis system
- Switch ignition on
- Drain air springs with aid of BMW diagnosis system (Service functions: menu item "Venting procedure")
- Raise vehicle until wheels are freely suspended
- Remove ignition key



Fig. 8: Identifying BMW Diagnosis System

Courtesy of BMW OF NORTH AMERICA, INC.

Activating and filling air spring system:

- Raise vehicle until wheels are freely suspended
- Check air spring lower section (1) for correct engagement in wheel carrier, correct if necessary

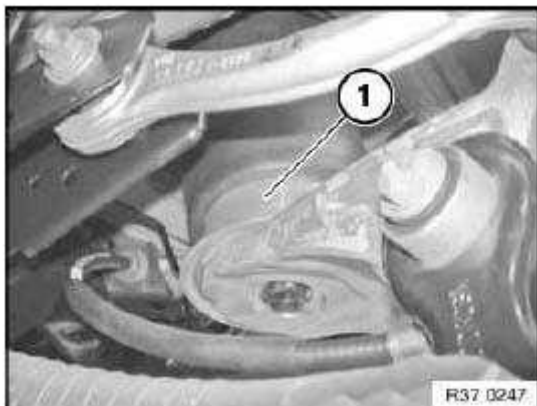


Fig. 9: Identifying Air Spring Lower Section

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

First raise the vehicle (until the wheels are freely suspended) and then activate the air spring system by inserting the fuse. Failure to comply may result in damage to the air springs!

- Insert fuse (F32) in corresponding slot in fuse box
- Connect BMW diagnosis system
- Switch ignition on
- Fill air springs using BMW diagnosis system (control unit functions)
- Lower vehicle
- Clear fault memory

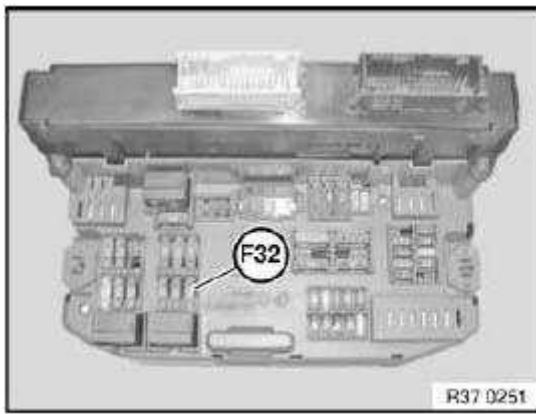


Fig. 10: Identifying Fuse (F32)

Courtesy of BMW OF NORTH AMERICA, INC.

37 10 001 INITIAL OPERATION WITH TEST RUN OF DYNAMIC DRIVE

NOTE: **The Service function Initial operation of Dynamic Drive must be carried out after:**

- Work on the Dynamic Drive system which involved opening hydraulic lines
- Replacement/Programming/Coding Dynamic Drive control unit
- Replacement lateral acceleration sensor
- Parameters and zero point of new sensors have been learned

Bleeding power steering:

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.

CHF Pentosin CHF11S

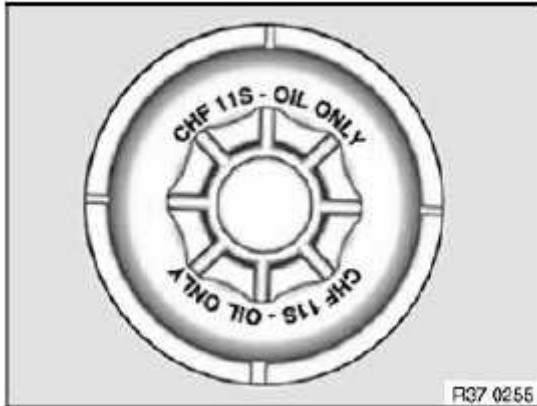


Fig. 11: Identifying Fluid Reservoirs Caps With Identification Marks
Courtesy of BMW OF NORTH AMERICA, INC.

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.

Hydraulic fluid: BMW Service Operating Fluids

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

Performing initial operation with test run:

WARNING: Risk of injury!

Vehicle executes heavy rolling motions during initial operation! Therefore observe the following instructions without fail:

- Do not allow any persons to remain in the vehicle or directly on the vehicle
 - Keep the vehicle doors closed.
 - Maintain a safety distance around the vehicle of 1 m to persons, objects, walls etc.
 - Vehicle must be standing horizontally with all wheels on a firm surface
 - Do not under any circumstances carry out initial operation on a lifting platform, wheel alignment analyzer or similar!
 - Avoid heavy loads
1. Check load; if necessary, remove load from the vehicle
 2. Bring engine up to operating temperature

NOTE: Hydraulic fluid temperature must be between 50°C and 70°C (vehicle at normal operating temperature)

3. Connect vehicle to DIS or MoDiC
4. Start initial operation in SERVICE FUNCTIONS. Follow instructions in DIS.
5. Check and correct fill level with engine stopped

FRONT CONTROL AND SUSPENSION

37 11 010 REMOVING AND INSTALLING/REPLACING FRONT ACTIVE STABILIZER

**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.**

**NOTE: A film of grease on the anti-friction bearing in no way impairs the operational capability of the stabilizer.
In all warranty cases you must always provide a fault memory printout, even where there is no fault memory entry, with the defective part.**

Spring-type actuator only installed on E70!

- When converting the front axle stabilizer with spring-type actuator (1) to front axle stabilizer with dual

piston (2), it is necessary to perform a **RECODING** !

- Do not alter pressure relief valves. Stabilizer with dual piston: No pressure relief valves fitted!

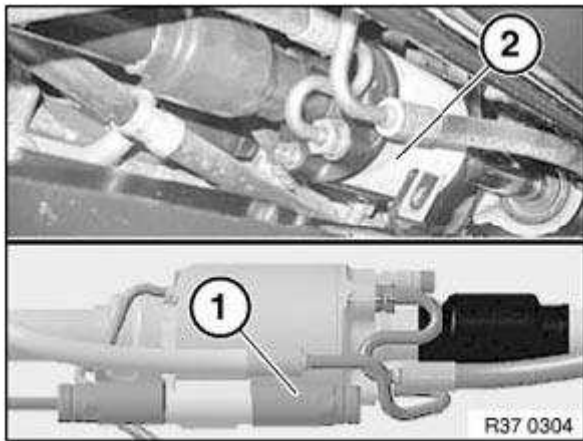


Fig. 12: Identifying Spring-Type Actuator And Dual Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Necessary preliminary tasks:

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

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

Installation:

Check rubber mounting of radiator box for correct seating.

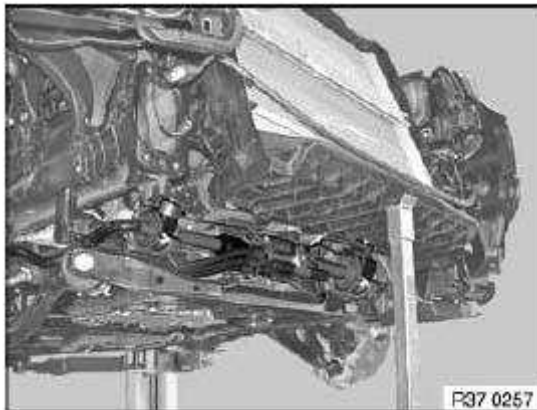


Fig. 13: Supporting Radiator Box With Workshop Jack
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

First adjust minimum distance (A) = 3 mm between control line (1) and oscillating motor (2).

Then adjust control line (3) with minimum distance (B) = 8 mm to control line (1).

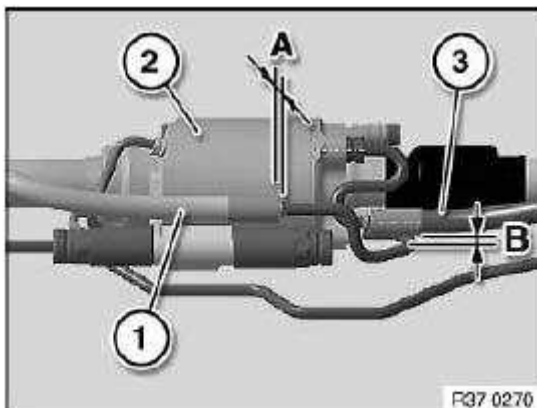


Fig. 14: Identifying Distance Between Control Line And Oscillating Motor
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark installation position of control lines to oscillating motor.

Release banjo nuts (1) and remove control lines (2) from oscillating motor.

Seal control lines (2) and connections of oscillating motor with clean sealing plugs.

Installation:

Carry over marking of installation position to new part.

Control lines are protected against being mixed up by different thread diameters on the oscillating motor connection.

Tightening torque **37 14 18AZ** .

Remove both protective caps (of red rubber with pull band).

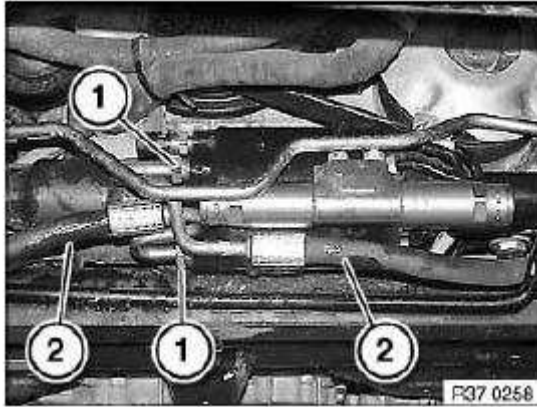


Fig. 15: Identifying Banjo Nuts And Control Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **37 14 20AZ** .

Remove both control lines (2) from upper retaining brackets and tie up.

Remove upper retaining brackets.

Remove stabilizer (3) with rubber mounts from lower retaining brackets.

Replacement: Remove both rubber mounts from stabilizer.

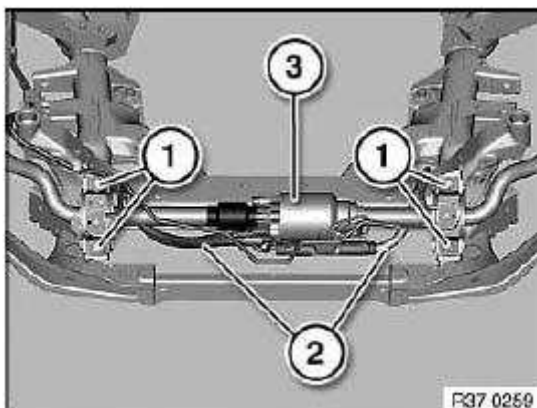


Fig. 16: Identifying Control Lines, Stabilizer And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Rubber lips (1) must be situated as pictured between retaining brackets!

Installation:

Check anti-friction bearing (2) for damage, replace stabilizer if necessary (slight discharge of grease OK).

Keep contact face for rubber mount on anti-friction bearing clean and free from oil and grease.

Check rubber mount for damage, replace if necessary.

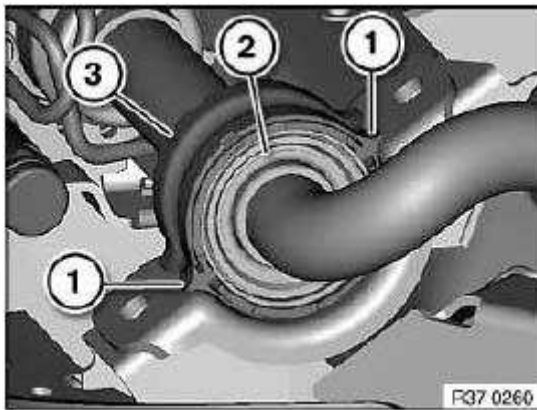


Fig. 17: Identifying Rubber Lips And Anti-Friction Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: To remove the risk of mix-up after removal of the control lines at the holders, observe the following:

- Holder in direction of travel, left: Stud bolt (1) arranged virtually centrally on the holder
- Holder in direction of travel, right: Stud bolt (1) arranged off-centre to the front of the holder
- Align holders as pictured by way of additional lugs (2); both lugs point in direction of travel to right

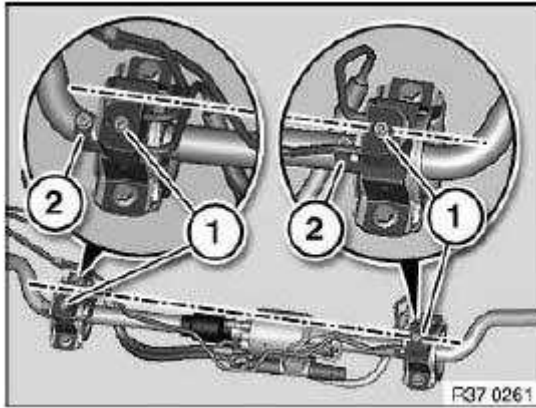


Fig. 18: Identifying Stud Bolts And Lugs
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- When converting the front axle stabilizer with spring-type actuator to front axle stabilizer with dual piston, it is necessary to perform a **RECODING**
- Fill and bleed **HYDRAULIC SYSTEM**
- Check pipe connections for leaks
- Carry out **INITIAL DYNAMIC DRIVE OPERATION**

REAR CONTROL AND SUSPENSION

37 12 ... REPLACING LOWER VENT LINE FOR AIR SUPPLY UNIT

IMPORTANT: Risk of damage!

Extreme cleanliness must be ensured in the connection area of the vent lines during removal and installation. Even the smallest of dirt particles can cause leakage in the air spring system.

Necessary preliminary tasks:

- Remove **FRONT RIGHT WHEEL ARCH COVER (REAR SECTION)** .

Disconnect quick-connect couplings (1, 3).

Seal connections of air supply unit supply line and upper vent line with sealing plugs.

Unclip lower vent line (2) and feed out.

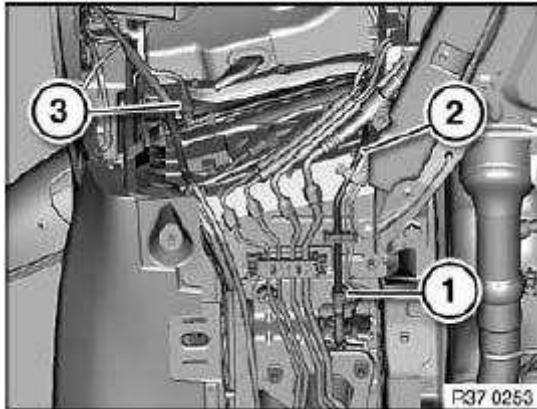


Fig. 19: Identifying Quick-Connect Couplings And Lower Vent Line
 Courtesy of BMW OF NORTH AMERICA, INC.

37 12 ... REPLACING PIPES FOR AIR SPRINGS

WARNING: Risk of injury!

Drain the air spring system before carrying out any work on the air supply unit, air pipes and air springs! Danger of injury if this instruction is not complied with!

Risk of damage!

Extreme cleanliness must be ensured in the connection area of the pipes during removal and installation. Even the smallest of dirt particles can cause leakage in the air spring system.

NOTE: Read and comply with NOTES ON AIR SPRING SYSTEM.

Necessary preliminary tasks:

- Deactivate and empty AIR SPRING SYSTEM
- Remove AIR SPRINGS
- Remove RIGHT UNDERBODY PANELLING
- Remove RIGHT TANK UNDERRIDE PROTECTION

IMPORTANT: Do not kink, twist or crush new pipes.

To avoid leaks in the air spring system, it is essential to avoid scratches on pipes in particular in the connection area!

Line, air spring, left: "Red"

Line, air spring, right: "Blue"

IMPORTANT: It is not permitted to cut open the protective gaiter to feed through the pipe (with banjo bolt)!

Cut through pipe (2) and pull out of protective gaiter (1).

Installation:

Seal pipe (2) with adhesive tape.

Thoroughly clean opening in protective gaiter (1).

Insert pipe (2) through opening in protective gaiter (1).

Install new **SCREWED CONNECTION**.

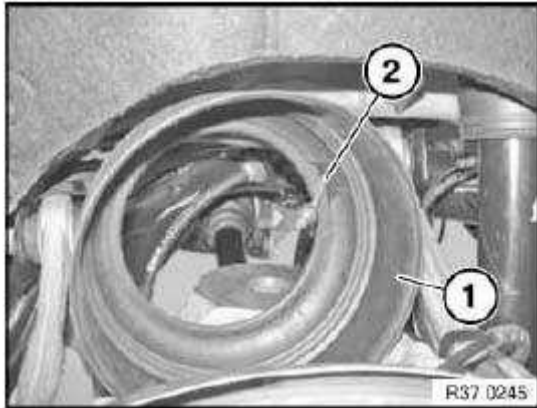


Fig. 20: Identifying Protective Gaiter And Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Adhere to holder positions and bending radii without fail (see following positions).
Pipes must run parallel and have sufficient clearance to adjoining components!

Unclip pipes (1) up to air supply unit from holders.

NOTE: Picture serves to show the routing of the pipes.

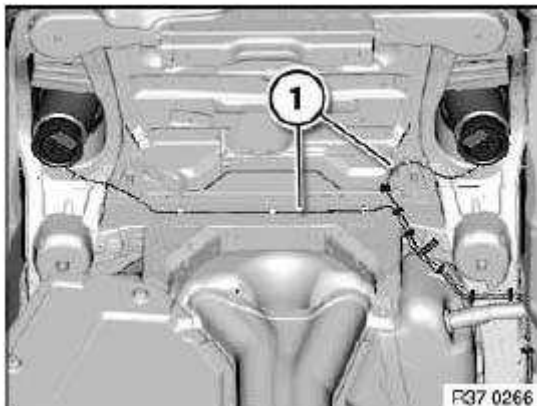


Fig. 21: Identifying Air Supply Unit Pipes

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip pipes (1) up to air supply unit from holders.

Installation:

Make sure slidable holders are correctly positioned. Adhere to following dimensions without fail.

A = 9.5 cm

B = 6.5 cm

C = 7 cm

D = 6.5 cm

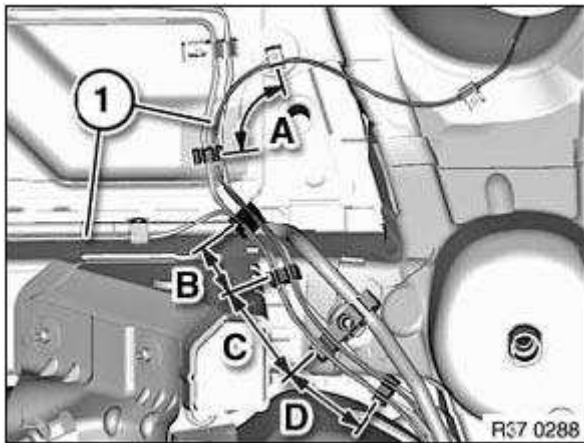


Fig. 22: Identifying Air Supply Unit Pipes And Holder Dimensions
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip pipes (1) up to air supply unit from holders.

Installation:

Make sure slidable holders are correctly positioned. Adhere to following dimensions without fail.

E = 6 cm

F = 10 cm

G = 8 cm

H = 10 cm

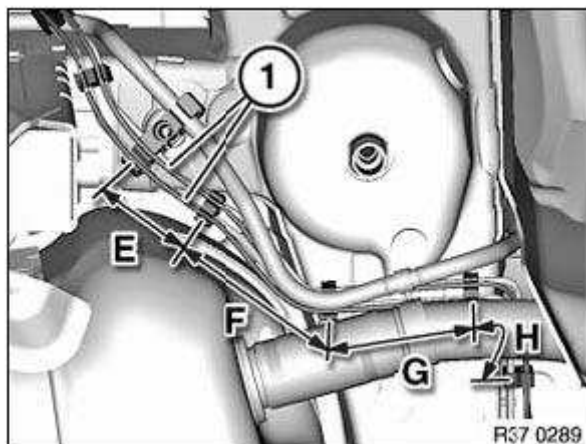


Fig. 23: Identifying Air Supply Unit Pipes And Holder Dimensions
 Courtesy of BMW OF NORTH AMERICA, INC.

Unclip pipes (1) up to air supply unit from holders.

Installation:

Make sure slidable holders are correctly positioned. Adhere to following dimensions without fail.

I = 10 cm

J = 13.5 cm

K = 2.5 cm (stud to holder)

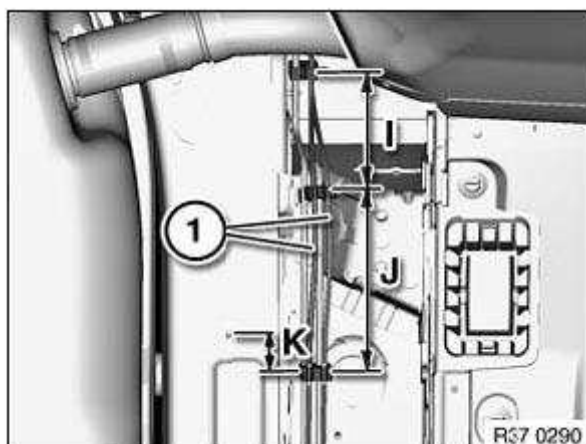


Fig. 24: Identifying Air Supply Unit Pipes And Holder Dimensions
 Courtesy of BMW OF NORTH AMERICA, INC.

Unclip pipes (1) up to air supply unit from holders.

Installation:

Make sure slidable holders are correctly positioned. Adhere to following dimensions without fail.

$L = 21 \text{ cm}$

$M = 25 \text{ cm}$

$N = 7 \text{ cm}$ (opening to holder)

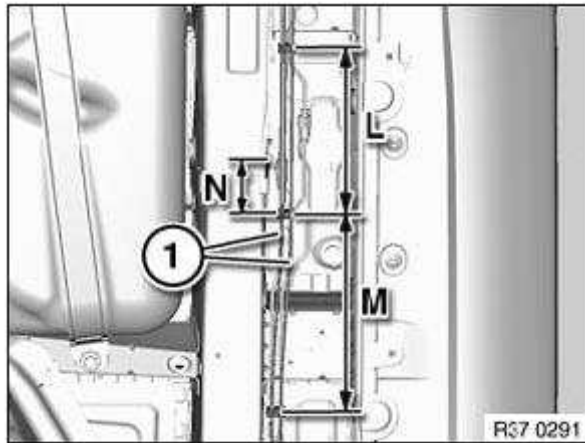


Fig. 25: Identifying Air Supply Unit Pipes And Holder Dimensions
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip pipes (1) up to air supply unit from holders.

Installation:

Make sure slidable holder is correctly positioned. Adhere to following dimension without fail.

$O = 16 \text{ cm}$ (edge to holder)

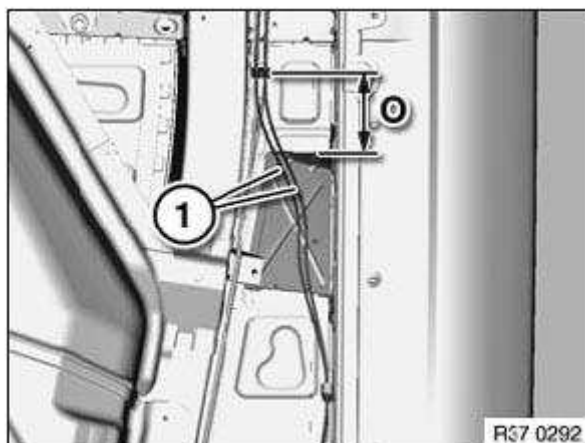


Fig. 26: Identifying Air Supply Unit Pipes And Holder Dimensions
Courtesy of BMW OF NORTH AMERICA, INC.

Release banjo bolts (1, 2).

Seal air supply unit connections with adhesive tape.

Installation:

Install new **SCREWED CONNECTION**.

Carefully screw in banjo bolts by hand to avoid damaging the plastic threads and with it the air supply unit.

Tightening torque **37 12 1AZ** .

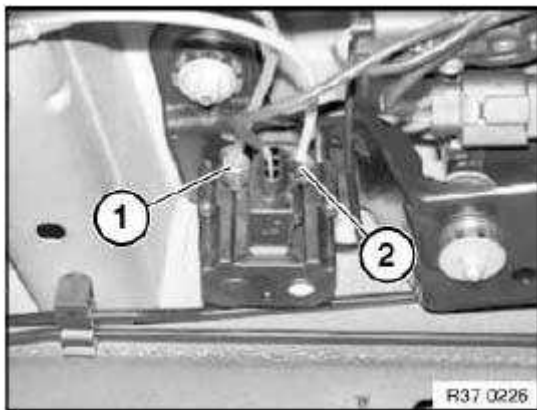


Fig. 27: Identifying Banjo Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Activate and fill **AIR SUSPENSION SYSTEM**

37 12 ... REPLACING UPPER VENT LINE FOR AIR SUPPLY UNIT

IMPORTANT: Risk of damage!

Extreme cleanliness must be ensured in the connection area of the vent lines during removal and installation. Even the smallest of dirt particles can cause leakage in the air spring system.

Necessary preliminary tasks:

- Remove **TRIM PANEL FOR COVER ON FRAME SIDE MEMBER** on right
- Remove **FRONT RIGHT WHEEL ARCH COVER (REAR SECTION)** .
- Remove **FRONT RIGHT AUXILIARY TURN INDICATOR LIGHT**

Release screw (1).

Twist filler duct (2) in direction of arrow out of fluid reservoir for windscreen washer unit (3) and remove.

If necessary, release vent line (4) at mounting points (5) from fluid reservoir for windscreen washer unit (3).

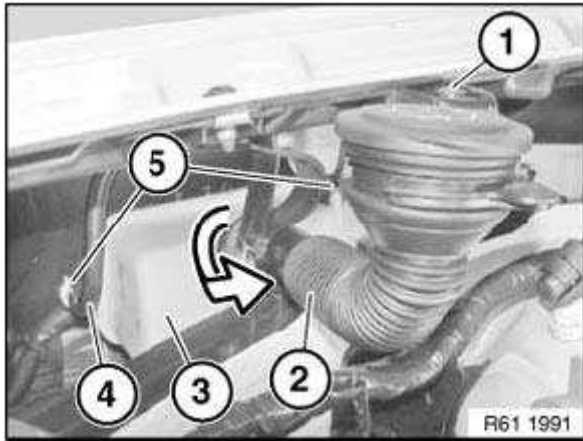


Fig. 28: Twisting Filler Duct Out Of Fluid Reservoir For Windscreen Washer Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws.

Press off side panel slightly.

Installation:

Tightening torque **41 35 7AZ** (A-pillar area).

Tightening torque **41 35 8AZ** (sill area).

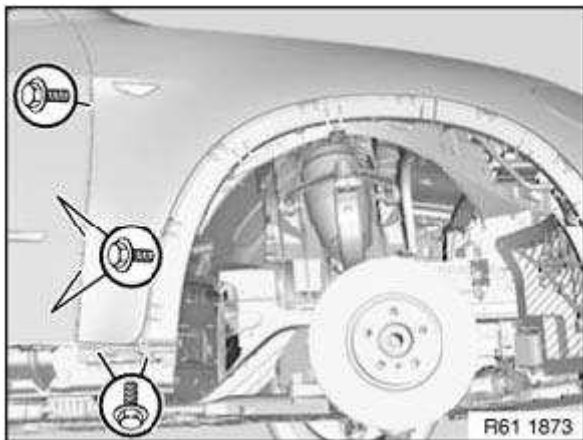


Fig. 29: Identifying Side Panel Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect quick-connect coupling (1) and seal lower vent line connection with sealing plug.

Remove vent line (2) from fluid reservoir for windscreen washer unit.

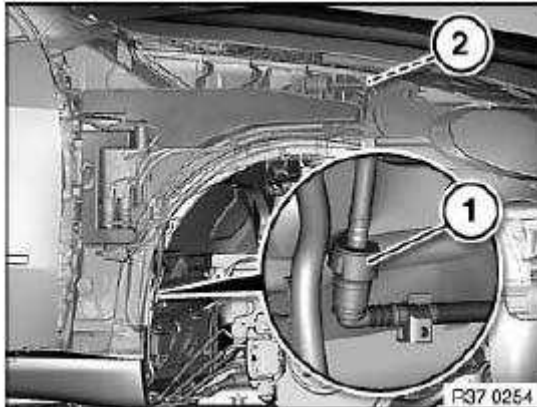


Fig. 30: Identifying Quick-Connect Coupling And Vent Line
Courtesy of BMW OF NORTH AMERICA, INC.

37 12 001 CHECKING FUNCTION OF RIDE-HEIGHT CONTROL SYSTEM

Carry out fault interrogation with BMW diagnosis system; if necessary, refer to Troubleshooting on ride-height control system.

37 12 012 CARRYING OUT RIDE-HEIGHT-CALIBRATION

NOTE: Ride-height-calibration must be carried out after the following work:

- Removal/replacement of ride-height sensor or its control rod
- Replacement of wiring harness
- Replacement of air supply unit control unit
- Replacement of Vertical Dynamics Management control unit

Connect BMW diagnosis system.

Switch on ignition.

Carry out ride-height-calibration (menu item: "Service function").

Version with Run Flat Indicator: initialize **RUN FLAT INDICATOR**

Version with Tyre Pressure Control: carry out **RESETTING**



Fig. 31: Identifying BMW Diagnosis System
Courtesy of BMW OF NORTH AMERICA, INC.

37 12 155 REMOVING AND INSTALLING/REPLACING LEFT OR RIGHT AIR SPRING

WARNING: Danger of injury!

Drain the air spring system before carrying out any work on the air supply unit, air pipes and air springs! Danger of injury if this instruction is not complied with!

Risk of damage!

Extreme cleanliness must be ensured in the connection area of the pipes during removal and installation. Even the smallest of dirt particles can cause leakage in the air spring system.

NOTE: Read and comply with NOTES ON AIR SPRING SYSTEM.
In a warranty case, you must always provide a fault memory printout with the defective part, even where there is no fault memory entry.

Necessary preliminary tasks:

- Deactivate and empty AIR SPRING SYSTEM
- Remove REAR WHEEL

Removal:

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

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

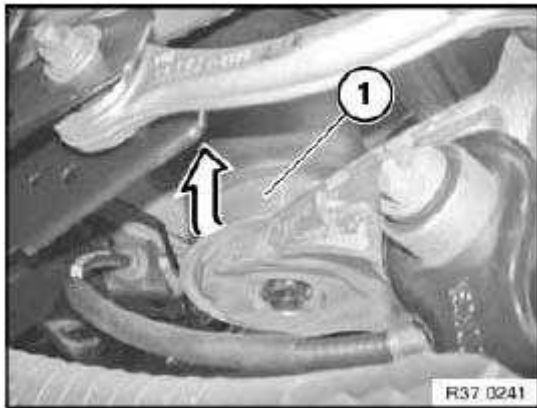


Fig. 32: Tilting Lower Section Of Air Spring
 Courtesy of BMW OF NORTH AMERICA, INC.

Press air spring (1) upwards and turn through $A = 30^\circ$ in counterclockwise direction.

IMPORTANT: Do not kink, twist or crush pipe.

Press air spring (1) together, remove sideways and set down on guide arm.

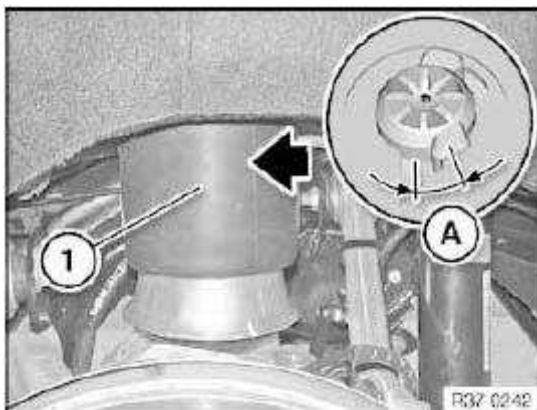


Fig. 33: Pressing Air Spring
 Courtesy of BMW OF NORTH AMERICA, INC.

Release banjo bolt (1).

Seal pipe (2) and connection of air spring with adhesive tape.

NOTE: Banjo bolt (1) remains on pipe (2).

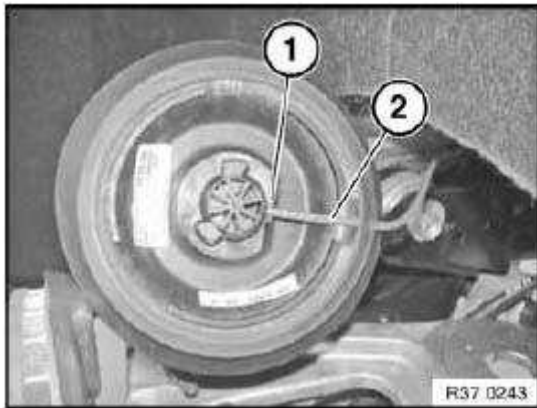


Fig. 34: Identifying Banjo Bolt And Seal Pipe
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: It is not permitted to cut open the protective gaiter to feed through the pipe (with banjo bolt)!

Remove protective gaiter (1) from air spring.

Unclip pipe (2) from groove of air spring upper section and remove air spring.

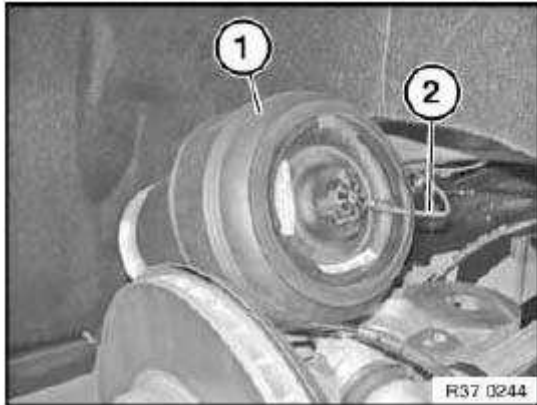


Fig. 35: Identifying Protective Gaiter And Pipe
 Courtesy of BMW OF NORTH AMERICA, INC.

If reusing: check protective gaiter (1) for damage.

NOTE: Protective gaiter (1) may be reinstalled in spite of expanded opening (for pipe with banjo nut).

If protective gaiter is damaged: pull pipe (2) with banjo bolt through opening in protective gaiter (1).

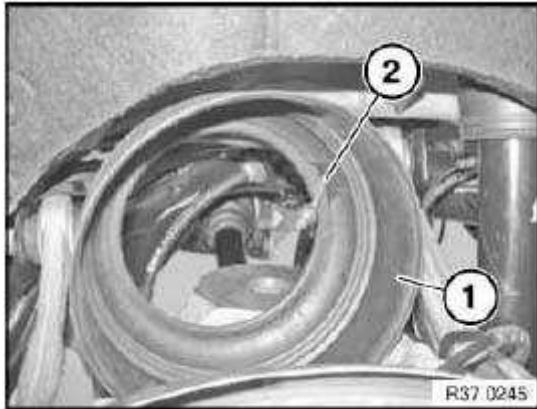


Fig. 36: Identifying Protective Gaiter And Pipe
 Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check air spring for damage, replace if necessary.

Check pipe for damage, replace if necessary.

NOTE: Observe NOTES ON FITTING A NEW PIPE.

When replacing air spring:

IMPORTANT: Replace protective gaiter only if damaged.

It is not permitted to cut open the protective gaiter to feed through the pipe (with banjo bolt)!

Moisten protective gaiter (1) at pipe opening with water/soapy solution.

Insert pipe (2) with banjo bolt through opening in protective gaiter (1).

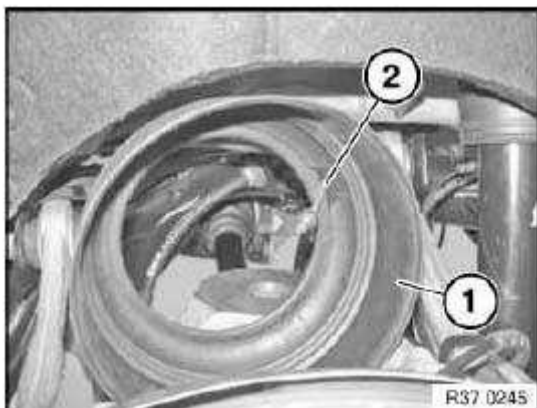


Fig. 37: Identifying Protective Gaiter And Pipe

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Replacement only: Release and dispose of banjo bolt on air spring connection.

Check banjo bolt (1) for dirt, clean if necessary. Then carefully screw in by hand to avoid damaging the plastic thread and with it the air spring.

Tightening torque 37 12 1AZ .

Clip pipe (2) into groove of air spring upper section.

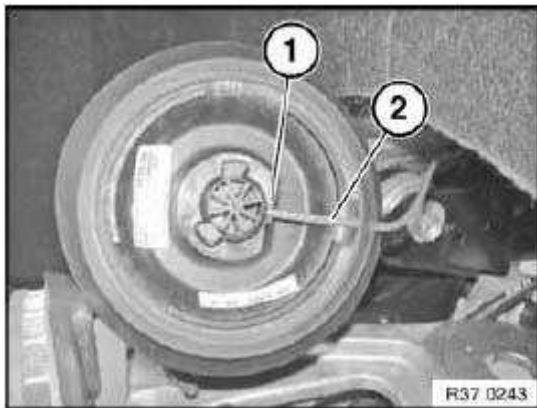


Fig. 38: Identifying Banjo Bolt And Clip Pipe

Courtesy of BMW OF NORTH AMERICA, INC.

Align protective gaiter (1) by way of opening for pipe (2) to upper section of air spring and install.

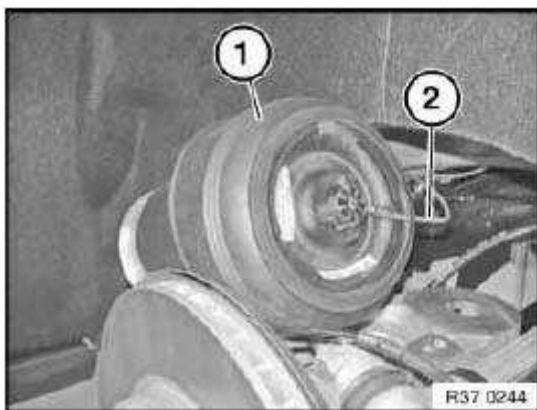


Fig. 39: Identifying Protective Gaiter And Pipe

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not kink, twist or crush pipe.

Insert air spring (1) into locator or frame side member and turn clockwise as far as it will go.

Check air spring (1) for correct installation in locator or frame side member; correct if necessary.

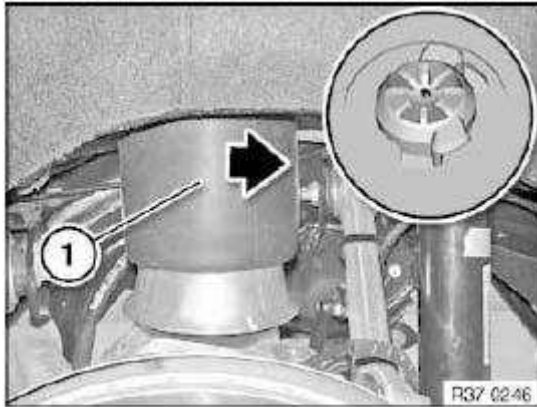


Fig. 40: Inserting Air Spring Into Frame Side Member
Courtesy of BMW OF NORTH AMERICA, INC.

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

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

NOTE: In so doing, make sure that orientation lug is correctly aligned to groove in wheel carrier.

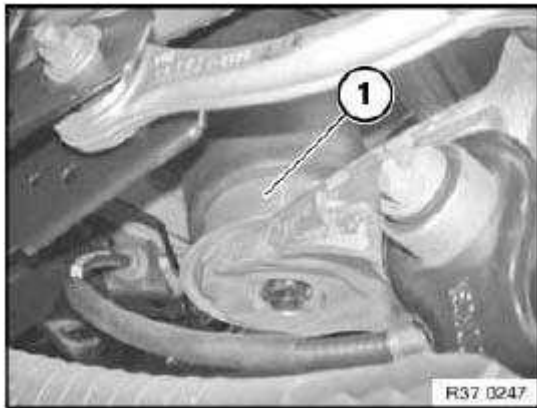


Fig. 41: Identifying Air Spring Lower Section
Courtesy of BMW OF NORTH AMERICA, INC.

Check air spring for uniform formation of rolling lobe (1).

If necessary, slide rolling lobe (1) by hand downwards and shape on lower section of air spring (2).

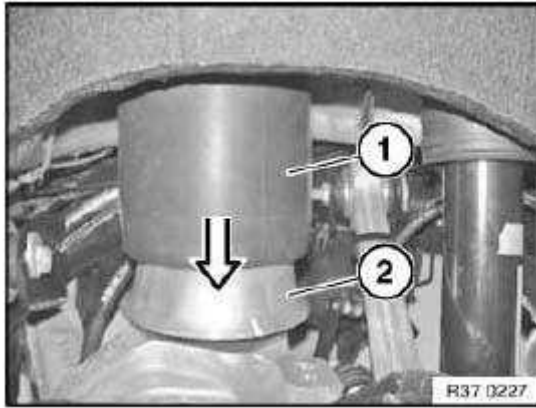


Fig. 42: Sliding Rolling Lobe
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Activate and fill AIR SUSPENSION SYSTEM

37 12 220 REMOVING AND INSTALLING/REPLACING REAR ACTIVE STABILIZER

WARNING: DANGER OF POISONING if oil is ingested/absorbed through the skin!
RISK OF INJURY if oil comes into contact with eyes and skin!
 Scalding hazard!
 This work may only be carried out on an exhaust system which has cooled down.

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

NOTE: A film of grease on the anti-friction bearing in no way impairs the operational capability of the stabilizer.
 In all warranty cases you must always provide a fault memory printout, even where there is no fault memory entry, with the defective part.

Necessary preliminary tasks:

- Remove LEFT REAR WHEEL
- Remove STABILIZER LINK ON BOTH SIDES FROM STABILIZER

Release screws (1) and remove protective plate (2).

Tightening torque 37 14 19AZ .

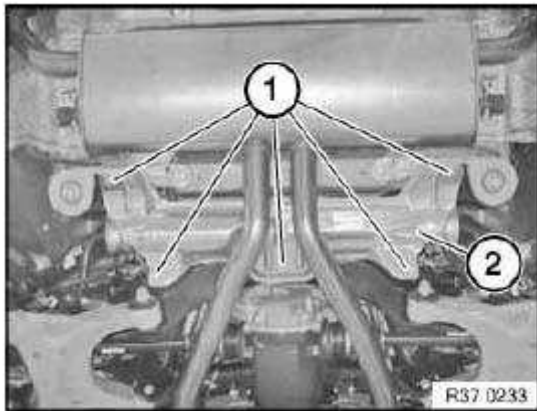


Fig. 43: Identifying Screws And Protective Plate
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark installation position of control lines to oscillating motor.

Release banjo nuts (1) and remove control lines from oscillating motor.

Seal control lines and connections of oscillating motor with clean sealing plugs.

Installation:

Carry over marking of installation position to new part.

Control lines are protected against being mixed up by different thread diameters on the oscillating motor connection.

Tightening torque **37 14 18AZ** .

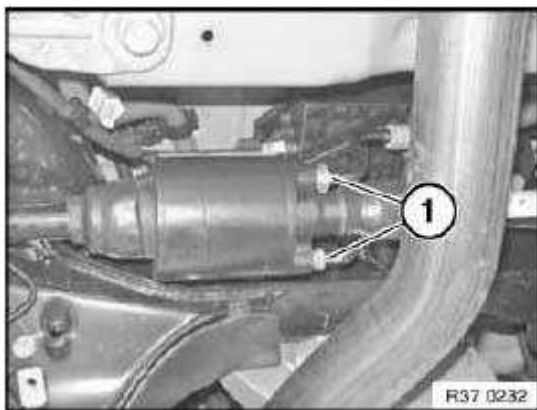


Fig. 44: Identifying Banjo Nuts
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Adjust minimum distance (A) = 2.5 mm between control line and oscillating motor.

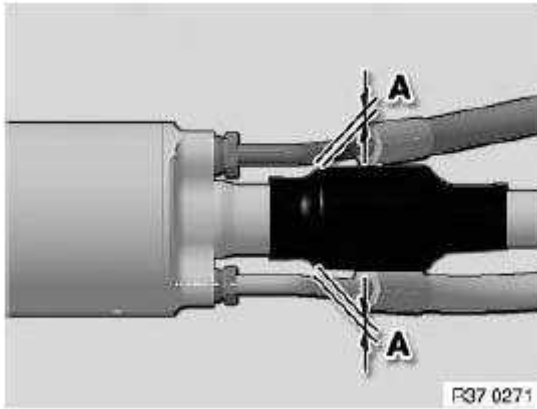


Fig. 45: Identifying Distance Between Control Line And Oscillating Motor
Courtesy of BMW OF NORTH AMERICA, INC.

Release left and right screws (1).

Remove stabilizer from rear axle carrier and feed out at side.

Installation:

Check roller bearing on both sides for damage, replace stabilizer if necessary (slight discharge of grease OK).

Keep contact face for rubber mount on anti-friction bearing clean and free from oil and grease.

Check rubber mount for damage, replace if necessary.

Tightening torque **37 14 21AZ** .

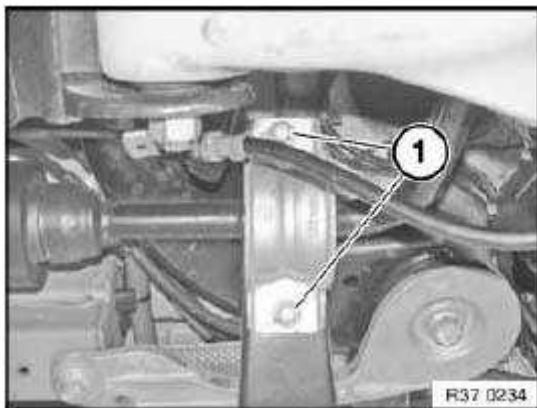


Fig. 46: Identifying Rear Axle Carrier Screws
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed **HYDRAULIC SYSTEM**
- Check pipe connections for leaks
- If necessary, carry out **INITIAL DYNAMIC DRIVE OPERATION**

CONNECTING LINES

37 13 ... NOTES ON FITTING A NEW PIPE OR A SCREW CONNECTION

IMPORTANT: Do not kink, twist or crush lines.
Do not disassemble screw connection!

Fitting new screw connection:

Insert complete new screw connection consisting of toothed ring (1), banjo bolt (2) and assembly plug (3) into air spring/pipe connection of air supply unit.

Tightening torque **37 12 3AZ** .

Remove assembly plug (3).

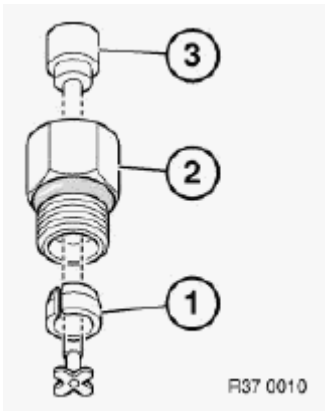


Fig. 47: Identifying Toothed Ring, Banjo Bolt And Assembly Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Slide new pipe (1) into banjo bolt (2) up to marking.

Check installation position of pipe (1) by pulling back slightly.

NOTE: The toothed ring (3) has engaged correctly when the pipe (1) cannot be pulled back.

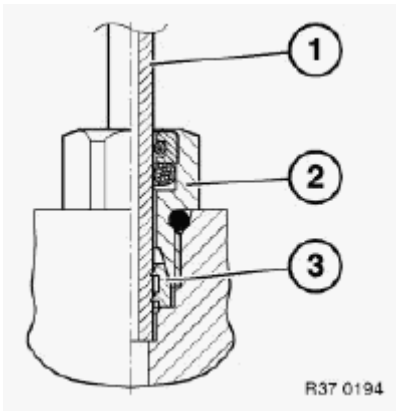


Fig. 48: Identifying Pipe, Banjo Bolt And Toothed Ring
 Courtesy of BMW OF NORTH AMERICA, INC.

Fitting new pipes:

IMPORTANT: To avoid leaks in the air spring system, it is essential to avoid scratches on pipes in particular in the connection area!

37 13 ... REMOVING AND INSTALLING/REPLACING PRESSURE LINE (MIDDLE) FOR OSCILLATING MOTOR/REAR AXLE

WARNING: **DANGER OF POISONING** if oil is ingested/absorbed through the skin!
RISK OF INJURY if oil comes into contact with eyes and skin!
 Scalding hazard!
 This work may only be carried out on an exhaust system which has cooled down.

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

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

- Remove **TANK UNDERRIDE PROTECTION**

Release banjo bolts (1).

Seal pressure lines with suitable sealing plugs.

Installation:

Tightening torque **37 14 15AZ** .

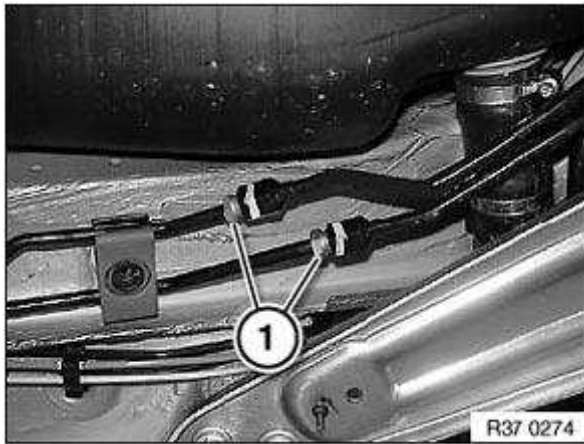


Fig. 49: Identifying Banjo Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Installation:

Tightening torque **37 14 17AZ** .

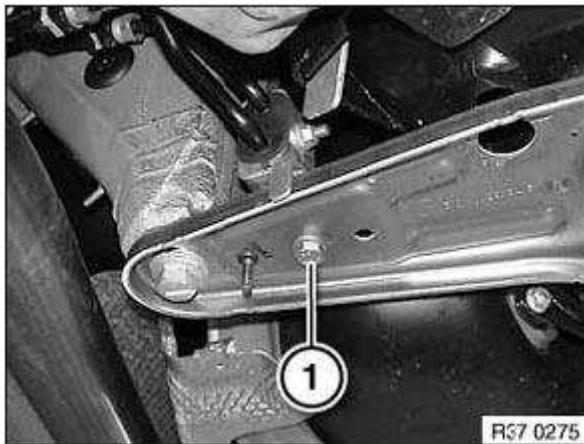


Fig. 50: Identifying Screw
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Adjust minimum distance (A and B) between pressure lines and exhaust system.

PRESSURE LINES AND EXHAUST SYSTEM DISTANCE REFERENCE

Engine	A	B
M57 T2	39 mm	41 mm
M57 Top	45 mm	36 mm

N52	34 mm	37 mm
N54	53 mm	48 mm
N62	48 mm	50 mm
N63	48 mm	39 mm
S63	45 mm	36 mm

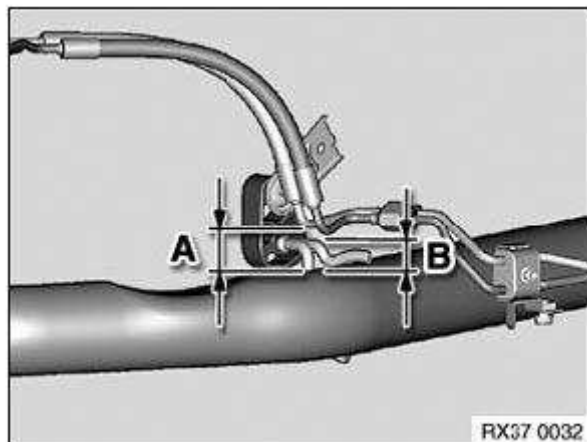


Fig. 51: Identifying Distance Between Pressure Lines And Exhaust System
Courtesy of BMW OF NORTH AMERICA, INC.

Ensure distortion-free installation (see **Fig. 51**).

Release banjo bolts (1).

Seal pressure lines with suitable sealing plugs.

Feed out pressure line towards rear.

Installation:

Pressure lines are protected against being mixed up by different thread diameters.

Tightening torque **37 14 15AZ** .

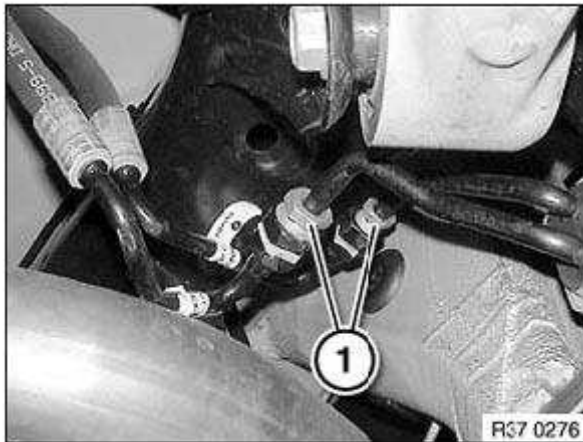


Fig. 52: Identifying Banjo Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed **HYDRAULIC SYSTEM**
- Check pipe connections for leaks
- Carry out **INITIAL DYNAMIC DRIVE OPERATION**.

37 13 ... REMOVING AND INSTALLING/REPLACING PRESSURE LINES (FRONT) FOR OSCILLATING MOTOR/FRONT AXLE

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.

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

- Remove **FRONT WHEELS**
- Remove **FRONT UNDERBODY PROTECTION**
- Remove **RIGHT WHEEL ARCH COVER**
- Remove **STEERING GEAR COVER AT TOP RIGHT**
- Remove **RADIATOR AIR DUCT**
- Remove both brake air ducts with holder
- Remove fan cowl

- Remove heat exchanger from front axle carrier and tie up

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

Installation:

Check rubber mounting of radiator box for correct seating.

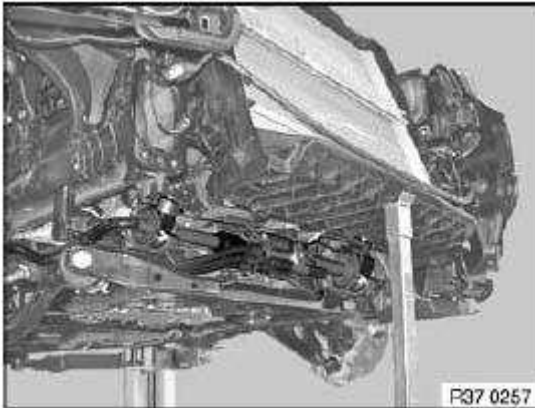


Fig. 53: Supporting Radiator Box With Workshop Jack
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

First adjust minimum distance (A) = 3 mm between pressure line (1) and oscillating motor (2).

-> M57T0p/ N52/ N54/ N62:

Then adjust pressure line (3) with minimum distance (B) = 8 mm to pressure line (1).

-> N63/ S63:

Then adjust pressure line (3) with minimum distance (B) = 5 mm to pressure line (1).

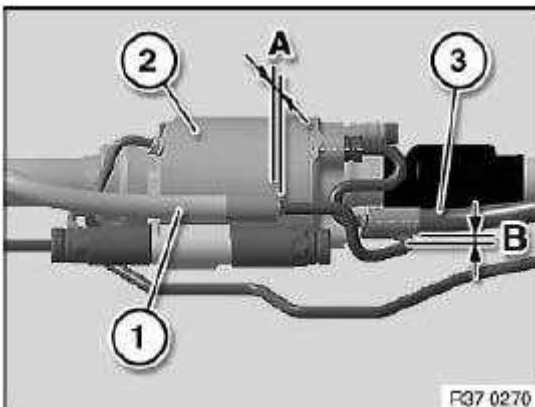


Fig. 54: Identifying Distance Between Control Line And Oscillating Motor

Courtesy of BMW OF NORTH AMERICA, INC.

Mark installation position of pressure lines to oscillating motor.

Release banjo bolts (1) and remove pressure lines (2) from oscillating motor.

Seal pressure lines (2) and connections of oscillating motor with suitable sealing plugs.

Installation:

Carry over identification to new component.

Pressure lines are protected against being mixed up by different thread diameters on the oscillating motor connection.

Tightening torque **37 14 18AZ** .

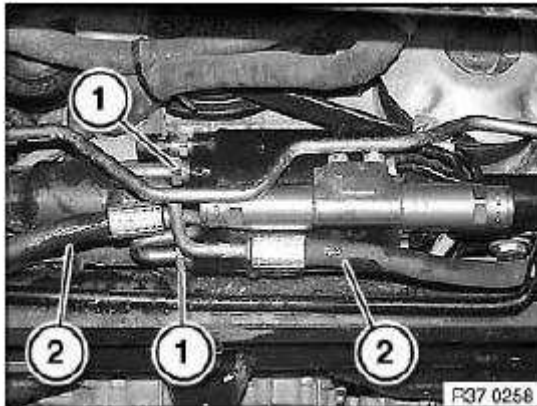


Fig. 55: Identifying Banjo Nuts And Pressure Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque **37 14 20AZ** .

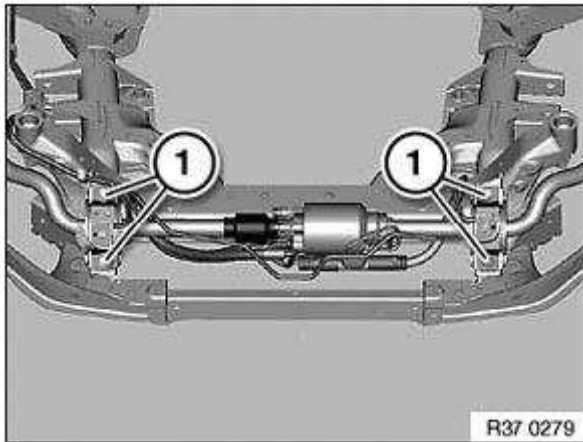


Fig. 56: Identifying Screws

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: To remove the risk of mix-up after removal of the pressure lines at the holders, observe the following:

- Holder, direction of travel, left: Stud bolt (1) arranged virtually centrally on the holder
- Holder, direction of travel, right: Stud bolt (1) arranged off-centre to the front of the holder
- Align holders as pictured by way of additional lugs (2); both lugs point in direction of travel to right

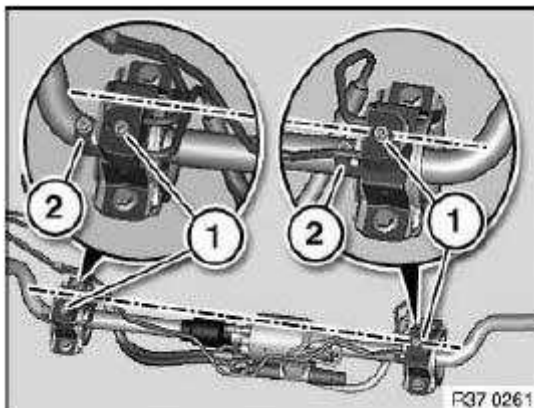


Fig. 57: Identifying Stud Bolts And Lugs

Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove line holder (1).

Installation:

Check seating of line holder, correct if necessary.

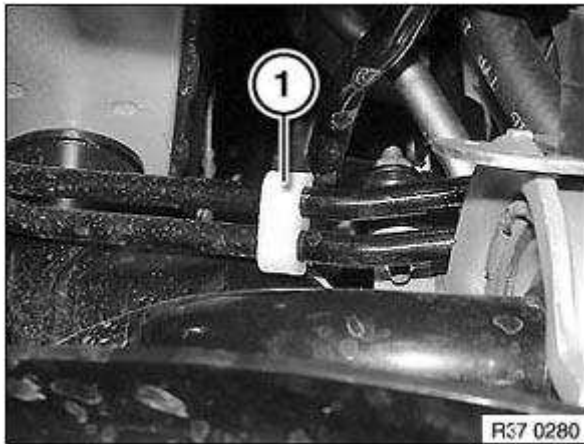


Fig. 58: Identifying Line Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) and unclip holder lower section (2) with decoupler.

Installation:

Replace damaged lower section.

Tightening torque **37 14 25AZ** .

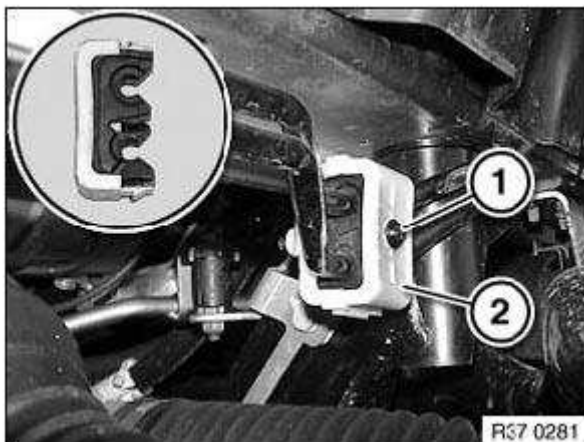


Fig. 59: Identifying Screw And Holder Lower Section
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1) and unclip holder lower section (2) with decoupler.

Installation:

Replace damaged lower section.

Tightening torque **37 14 25AZ** .

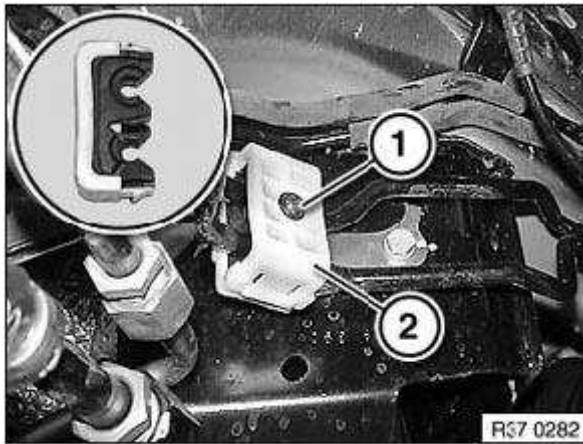


Fig. 60: Identifying Screw And Holder Lower Section
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with production date up to 10/2008:

Release banjo bolts (1).

Seal pressure lines with suitable sealing plugs.

Remove pressure lines.

Installation:

Pressure lines are protected against being mixed up by different thread diameters.

Hydraulic lines are not permitted to contact each other or adjoining components.

Tightening torque **37 14 15AZ** .

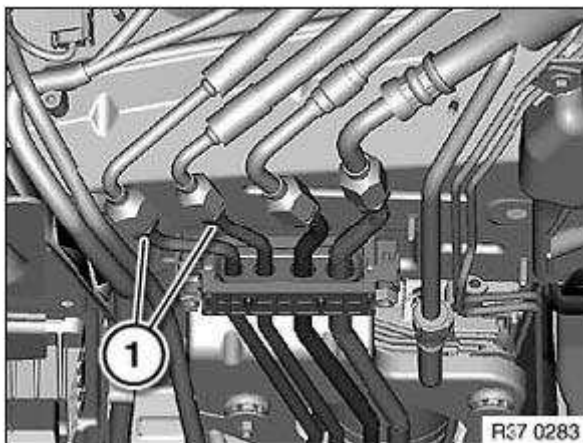


Fig. 61: Identifying Banjo Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with production date from 10/2008:

Release screws (1) and (2) of block screw connections.

Seal pressure lines with suitable sealing plugs.

Remove pressure lines.

Tightening torque **37 14 27AZ** .

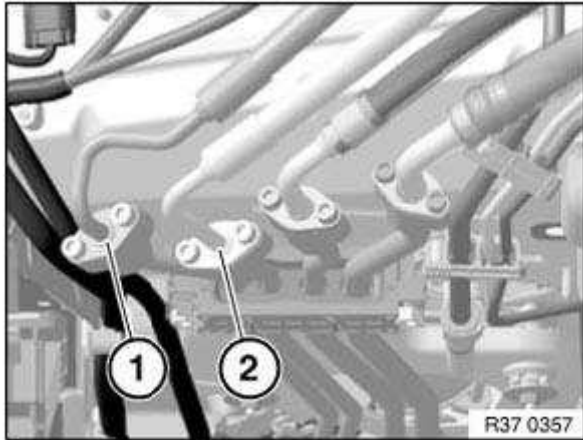


Fig. 62: Identifying Block Screw Connections Screws
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed **HYDRAULIC SYSTEM**
- Check pipe connections for leaks
- Carry out **INITIAL DYNAMIC DRIVE OPERATION**.

37 13 ... REMOVING AND INSTALLING/REPLACING PRESSURE LINES (FRONT) FOR OSCILLATING MOTOR/REAR AXLE

Special tools required:

- 37 1 151

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.

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

- Remove **TANK UNDERRIDE PROTECTION**
- Remove **RIGHT UNDERBODY PANELLING**

IMPORTANT: Pressure line and connection on valve block must be fitted with suitable sealing plugs immediately after removal!

Release banjo bolts of pressure lines (1, 2) to front axle oscillating motor with special tool **37 1 151** .

Release banjo bolts of pressure lines (3, 4) to rear axle oscillating motor with special tool **37 1 151** .

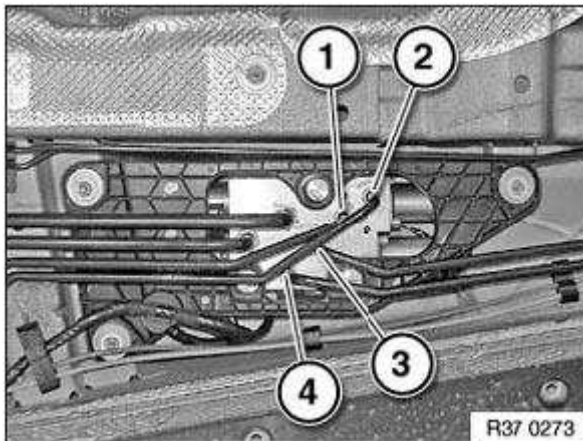


Fig. 63: Identifying Pressure Lines Banjo Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: When assembling, make sure that only the sealing plugs of the pressure line to be fitted are removed.
Do not damage sealing surfaces of pressure lines.

NOTE: Make sure pressure lines are laid without tension and with sufficient spacing to adjoining components.

Installation sequence for pressure lines:

1. Install pressure lines (3, 4)

Tightening torque **37 14 14AZ** .

2. Install pressure lines (1, 2)

Tightening torque **37 14 13AZ** .

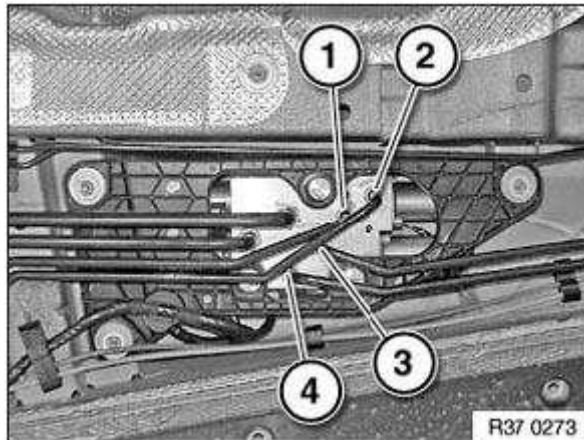


Fig. 64: Identifying Pressure Lines Banjo Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check seating and position of line holders (1), correct if necessary.

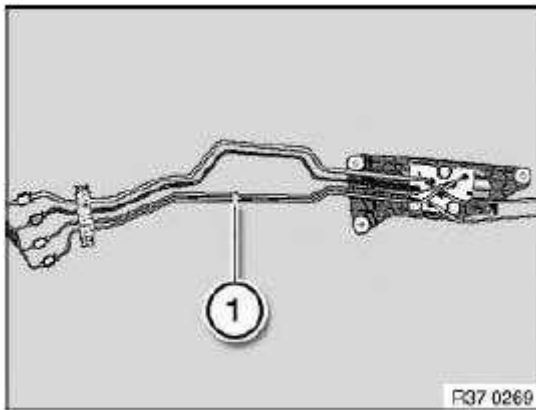


Fig. 65: Identifying Line Holders
Courtesy of BMW OF NORTH AMERICA, INC.

Release banjo bolts (1).

Seal pressure lines with suitable sealing plugs.

Installation:

Tightening torque **37 14 15AZ** .

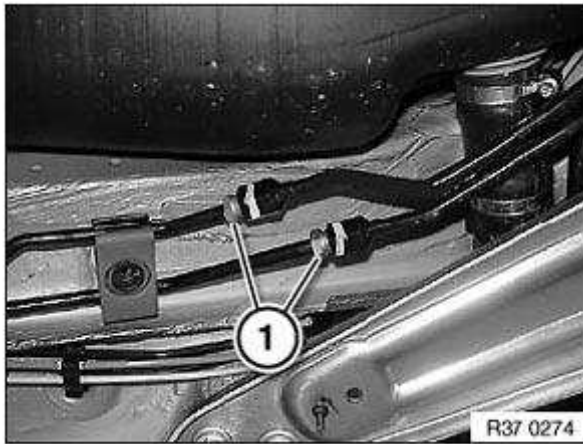


Fig. 66: Identifying Banjo Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

Open holder (1) and remove pressure lines.

Installation:

Replace damaged holder.

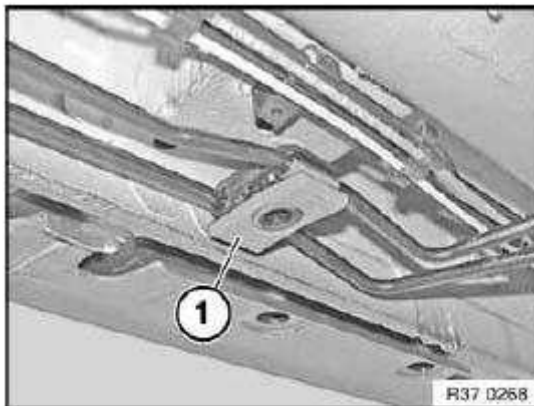


Fig. 67: Identifying Holder

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed **HYDRAULIC SYSTEM**
- Check pipe connections for leaks
- Carry out **INITIAL DYNAMIC DRIVE OPERATION**.

37 13 ... REMOVING AND INSTALLING/REPLACING PRESSURE LINES (REAR) FOR OSCILLATING MOTOR/FRONT AXLE

Special tools required:

- 37 1 151

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.

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

Necessary preliminary tasks:

- Partially remove **FRONT RIGHT WHEEL ARCH COVER (REAR SECTION)**
- Remove **RIGHT UNDERBODY PANELLING**

IMPORTANT: Pressure line and connection on valve block must be fitted with suitable sealing plugs immediately after removal!
When assembling, make sure that only the sealing plugs of the pressure line to be fitted are removed.
Do not damage sealing surfaces of pressure lines.

NOTE: Make sure pressure lines are laid without tension and with sufficient spacing to adjoining components.

Release banjo bolts of pressure lines (1, 2) to front axle oscillating motor with special tool **37 1 151** .

Installation:

Tightening torque **37 14 13AZ** .

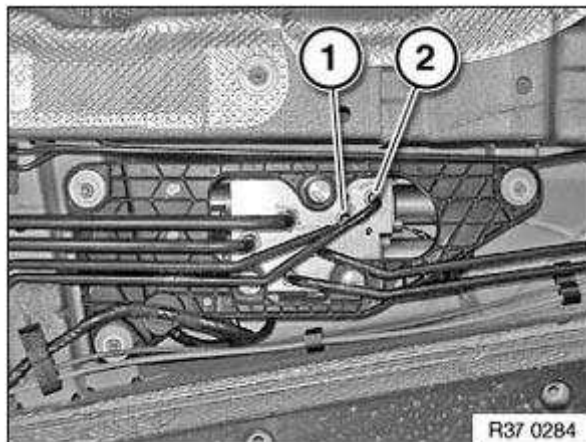


Fig. 68: Identifying Pressure Lines Banjo Bolts
 Courtesy of BMW OF NORTH AMERICA, INC.

Remove lead holder (1).

Installation:

Check seating and position of line holders, correct if necessary.

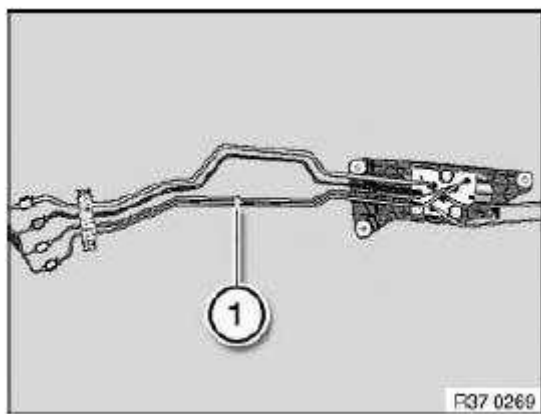


Fig. 69: Identifying Lead Holders
 Courtesy of BMW OF NORTH AMERICA, INC.

For vehicles with production date up to 10/2008:

Release banjo bolts (1).

Seal pressure lines with suitable sealing plugs.

Installation:

Pressure lines are protected against being mixed up by different thread diameters.

Hydraulic lines are not permitted to contact each other or adjoining components.

Tightening torque **37 14 15AZ** .

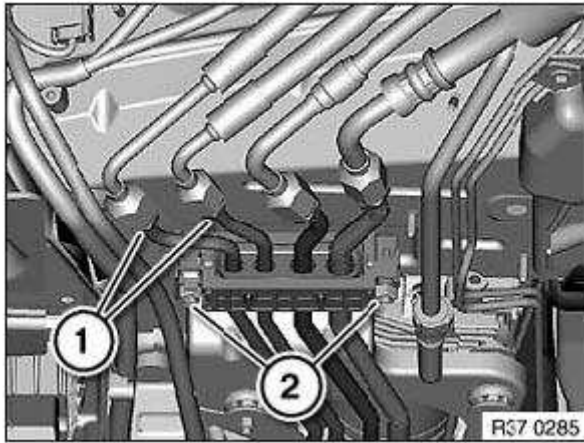


Fig. 70: Identifying Banjo Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

Release screw pins (2), open holder and remove pressure lines.

Installation:

Replace screw pins.

Tightening torque **37 14 22AZ** .

For vehicles with production date up to 10/2008:

Release screws (1) and (2) of block screw connections.

Seal pressure lines with suitable sealing plugs.

Installation:

Hydraulic lines are not permitted to contact each other or adjoining components.

Tightening torque **37 14 27AZ** .

Release screw pins (3), open holder and remove pressure lines.

Installation:

Replace screw pins.

Tightening torque **37 14 22AZ** .

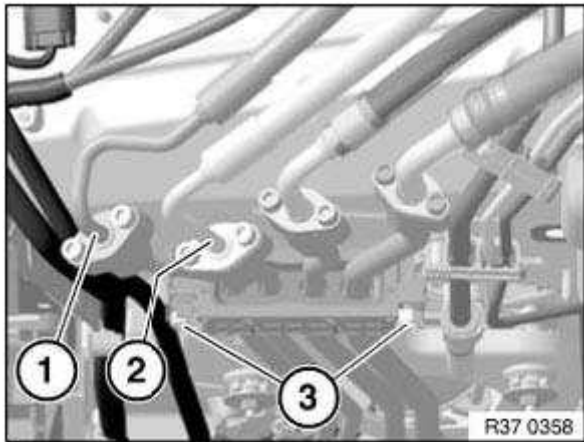


Fig. 71: Identifying Block Screw Connections Screws And Screw Pins
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed **HYDRAULIC SYSTEM**
- Check pipe connections for leaks
- Carry out **INITIAL DYNAMIC DRIVE OPERATION**.

37 13 ... REMOVING AND INSTALLING/REPLACING PRESSURE LINES (REAR) FOR OSCILLATING MOTOR/REAR AXLE

WARNING: **DANGER OF POISONING** if oil is ingested/absorbed through the skin!
RISK OF INJURY if oil comes into contact with eyes and skin!
 Scalding hazard!
 This work may only be carried out on an exhaust system which has cooled down.

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

Recycling:

Catch and dispose of hydraulic fluid in a suitable container.

IMPORTANT: Risk of damage!
 Adjust minimum distance (A and B) between pressure lines and exhaust system.

PRESSURE LINES AND EXHAUST SYSTEM DISTANCE REFERENCE

Engine	A	B
M57 T2	39 mm	41 mm

M57 Top	45 mm	36 mm
N52	34 mm	37 mm
N54	53 mm	48 mm
N62	48 mm	50 mm
N63	48 mm	39 mm
S63	45 mm	36 mm

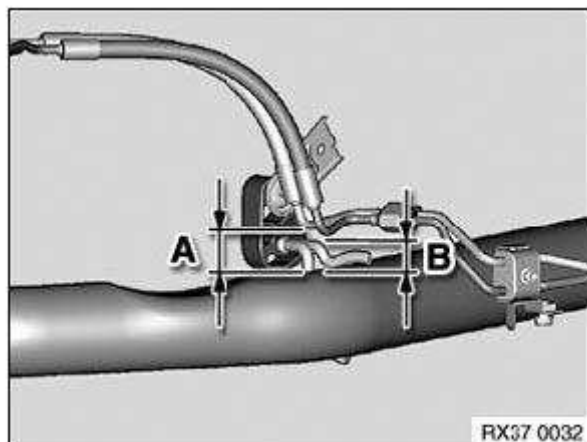


Fig. 72: Identifying Distance Between Pressure Lines And Exhaust System
Courtesy of BMW OF NORTH AMERICA, INC.

Ensure distortion-free installation (see **Fig. 72**).

Release banjo bolts (1).

Seal pressure lines with suitable sealing plugs.

Installation:

Pressure lines are protected against being mixed up by different thread diameters.

Tightening torque **37 14 15AZ** .

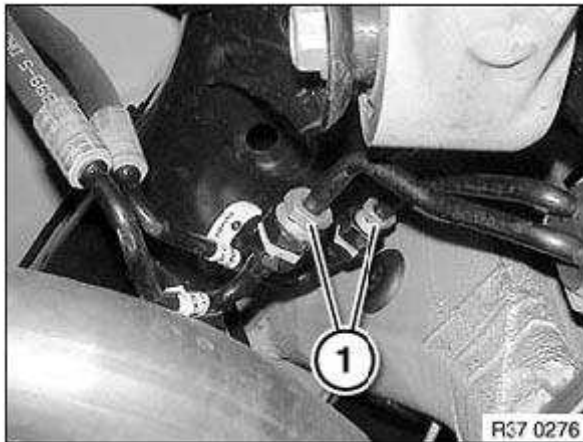


Fig. 73: Identifying Banjo Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1) and feed out guard plate (2) sideways.

Tightening torque 37 14 19AZ .

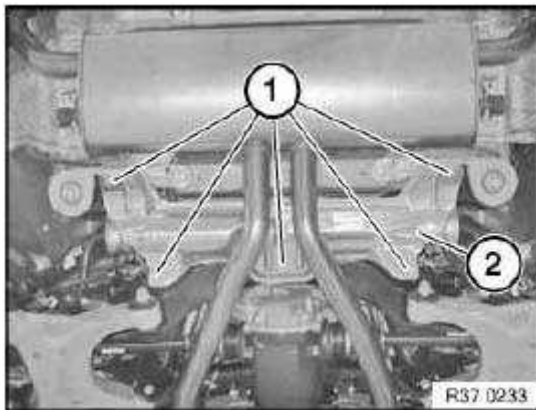


Fig. 74: Identifying Bolts And Guard Plate

Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1) and remove bracket (2) from rear axle carrier.

Tightening torque 37 14 17AZ .

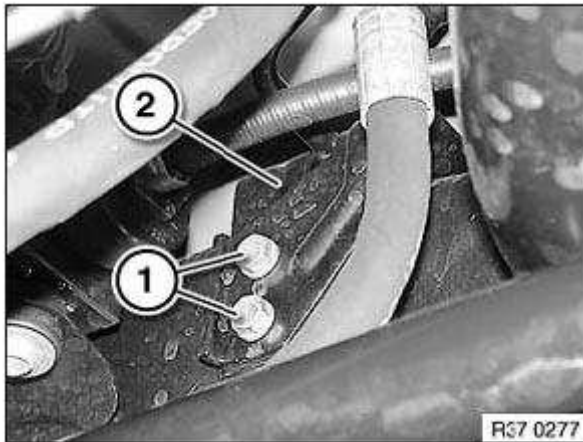


Fig. 75: Identifying Rear Axle Carrier Bolts And Bracket
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Risk of damage!

Adjust minimum distance (A) = 2.5 mm between pressure lines and oscillating motor.

Pressure lines must not be kinked/tensioned/bent!

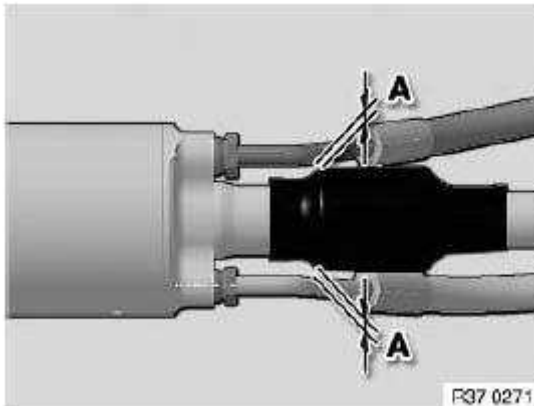


Fig. 76: Identifying Distance Between Control Line And Oscillating Motor
 Courtesy of BMW OF NORTH AMERICA, INC.

Mark installation position of pressure lines to oscillating motor.

Release banjo bolts (1).

Seal pressure lines and connections of oscillating motor with sealing plugs.

Feed out pressure lines towards rear.

Installation:

Carry over identification to new component.

Pressure lines are protected against being mixed up by different thread diameters on the oscillating motor connection.

Tightening torque **37 14 18AZ** .

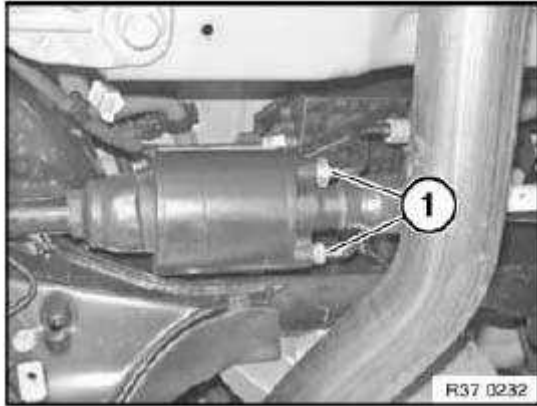


Fig. 77: Identifying Banjo Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed **HYDRAULIC SYSTEM**
- Check pipe connections for leaks
- Carry out **INITIAL DYNAMIC DRIVE OPERATION**.

37 13 100 REMOVING AND INSTALLING/REPLACING PRESSURE LINES FOR OSCILLATING MOTOR/FRONT AXLE

Remove **FRONT PRESSURE LINES (1)** (from oscillating motor to junction I at side in wheel arch)

Remove **REAR PRESSURE LINES (2)** (from junction I to valve block)

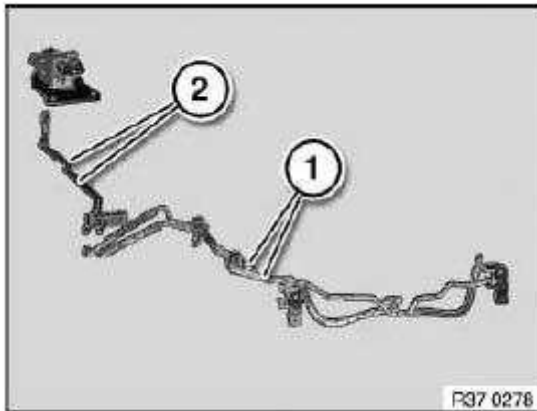


Fig. 78: Identifying Front Pressure Lines And Rear Pressure Lines
 Courtesy of BMW OF NORTH AMERICA, INC.

37 13 110 REMOVING AND INSTALLING/REPLACING PRESSURE LINES FOR OSCILLATING MOTOR/REAR AXLE

Remove **FRONT PRESSURE LINES (1)** (from valve block to junction I on vehicle underbody)

Remove **MIDDLE PRESSURE LINE (2)** (from junction I to junction III on vehicle underbody)

Remove **REAR PRESSURE LINES (3)** (from junction II on vehicle underbody to oscillating motor)

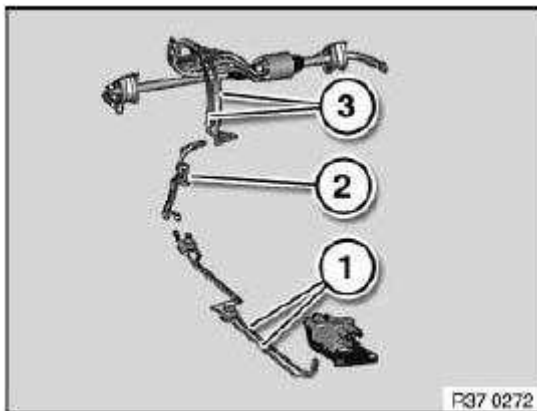


Fig. 79: Identifying Front Pressure Lines, Rear Pressure Lines And Middle Pressure Lines
 Courtesy of BMW OF NORTH AMERICA, INC.

ELECTRICAL COMPONENTS

37 14 055 REMOVING AND INSTALLING/REPLACING DYNAMIC DRIVE CONTROL UNIT

IMPORTANT: Read and comply with notes on **PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION)** .

Necessary preliminary tasks:

- Disconnect **BATTERY NEGATIVE LEAD**
- Remove **SIDE COVER ON INSTRUMENT PANEL**

Disconnect plug connection (1).

Release screw (2).

Tightening torque **37 14 8AZ** .

Remove Dynamic Drive control unit (3) from side.

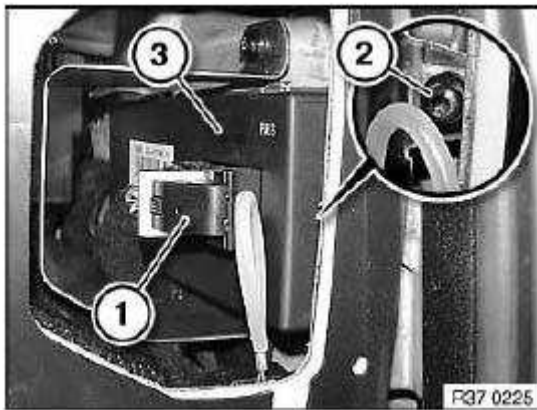


Fig. 80: Identifying Plug Connection, Screw And Dynamic Drive Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert control unit (1) with lug (2) into corresponding opening in support tube. Engagement stud (3) must rest correctly in opening of lug (2).

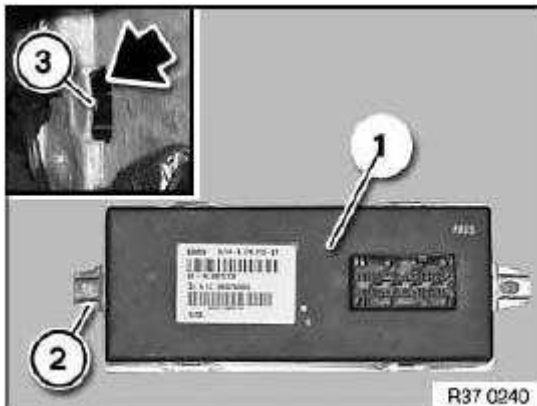


Fig. 81: Identifying Control Unit, Lug And Stud

Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Replacement only: Carry out **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 CARRYING OUT STEERING ANGLE SENSOR ADJUSTMENT** .
- Only when replacing/programming/coding: Carry out **INITIAL DYNAMIC DRIVE OPERATION**.

37 14 511 REPLACING FRONT RIGHT RIDE-HEIGHT SENSOR

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

NOTE: Jointed rod on upper control arm **37 14 5AZ** .

IMPORTANT: Read and comply with notes on **PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION)** .

Necessary preliminary tasks:

- Remove front right **WHEEL ARCH TRIM**

Disconnect plug connection (1).

Release nut (2) and disconnect jointed rod.

Installation:

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

Replace self-locking nut.

Tightening torque **37 14 4AZ** .

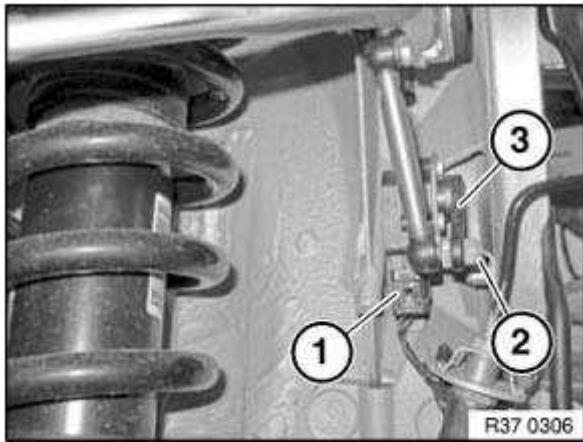


Fig. 82: Identifying Plug Connection, Nut And Sensor Lever
 Courtesy of BMW OF NORTH AMERICA, INC.

Release bolt (1) and remove ride-height sensor with bracket.

Installation:

Align ride-height sensor holder by means of lug (2) to opening under screw (1).

Tightening torque **37 14 1AZ** .

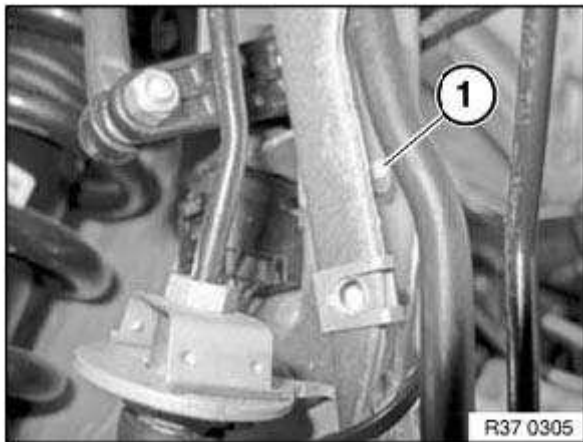


Fig. 83: Identifying Ride-Height Sensor With Bracket Bolt
 Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **37 14 3AZ** .

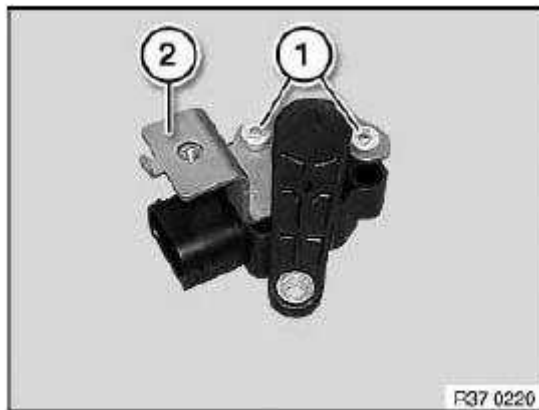


Fig. 84: Identifying Screws And Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out **RIDE-HEIGHT-CALIBRATION**
- Check **HEADLIGHT ADJUSTMENT** , correct if necessary

37 14 515 REPLACING REAR LEFT OR RIGHT RIDE-HEIGHT SENSOR

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

NOTE: Ride-height sensor holder on rear axle carrier **37 14 2AZ** .
 Jointed rod on swinging arm **37 14 6AZ** .

IMPORTANT: Read and comply with notes on **PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION)** .

Disconnect plug connection (1).

Release nut (2) and disconnect jointed rod.

Installation:

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

Replace self-locking nut.

Tightening torque **37 14 4AZ** .

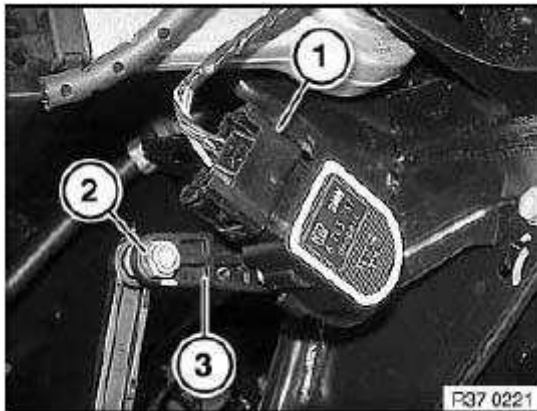


Fig. 85: Identifying Plug Connection, Nut And Sensor Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and remove ride-height sensor (2).

Tightening torque 37 14 3AZ .

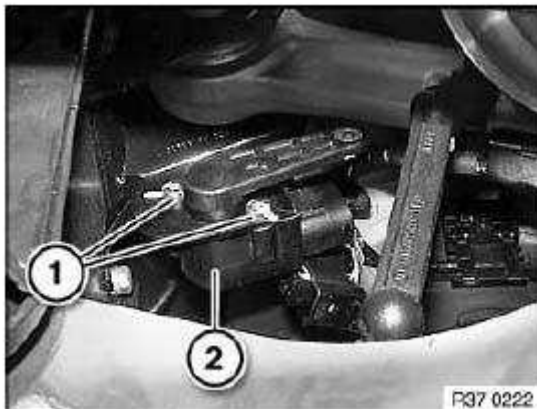


Fig. 86: Identifying Ride-Height Sensor Screws
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out RIDE-HEIGHT-CALIBRATION
- Check headlight adjustment, correct if necessary (E70)

37 14 521 REPLACING FRONT LEFT RIDE-HEIGHT SENSOR

IMPORTANT: Observe SAFETY INSTRUCTIONS for raising the vehicle

NOTE: Jointed rod on upper control arm 37 14 5AZ .

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION) .

Necessary preliminary tasks:

- Release coolant expansion tank and place to one side. See **17 11 100 REMOVING AND INSTALLING/REPLACING COOLANT EXPANSION TANK (N62TU/N52K/N54)** or **17 11 100 REMOVING AND INSTALLING/REPLACING COOLANT EXPANSION TANK (N63)** .

NOTE: Level switch can slip out when coolant expansion tank is removed.

Release screw (1).

Installation:

Align ride-height sensor holder by means of lug (2) to opening under screw (1).

Tightening torque **37 14 1AZ** .

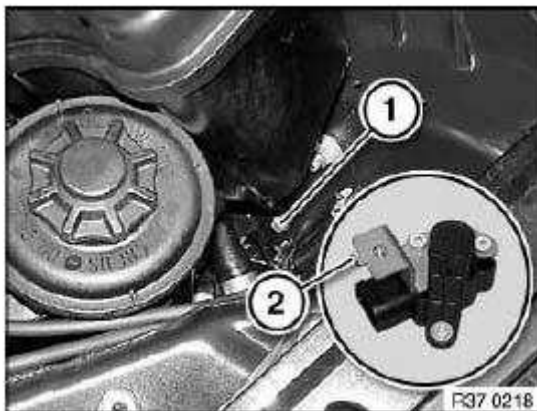


Fig. 87: Identifying Ride-Height Sensor Holder Lug And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Release nut (2) and disconnect jointed rod.

Installation:

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

Replace self-locking nut.

Tightening torque **37 14 4AZ** .

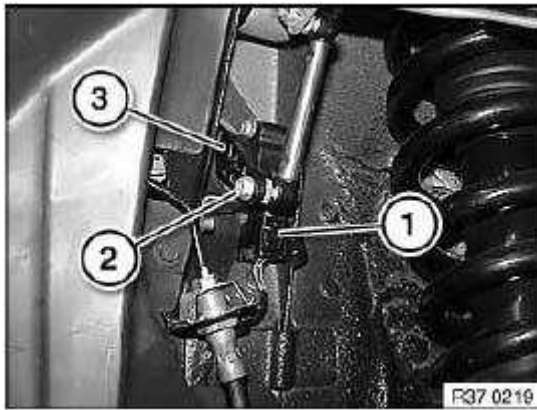


Fig. 88: Identifying Plug Connection, Nut And Sensor Lever
 Courtesy of BMW OF NORTH AMERICA, INC.

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

Tightening torque **37 14 3AZ** .

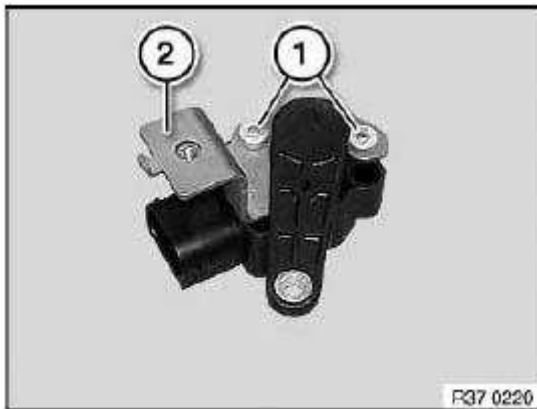


Fig. 89: Identifying Screws And Holder
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Carry out **RIDE-HEIGHT-CALIBRATION**
- Check **HEADLIGHT ADJUSTMENT** , correct if necessary

37 14 525 REMOVING AND INSTALLING/REPLACING CONTROL UNIT FOR AIR SUPPLY UNIT

IMPORTANT: Read and comply with notes on **PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION)** .

Necessary preliminary tasks:

- Remove ignition key
- Disconnect **BATTERY NEGATIVE LEAD**
- Remove **FLAP IN LUGGAGE COMPARTMENT PANEL ON RIGHT**

Lift back insulating mat (1).

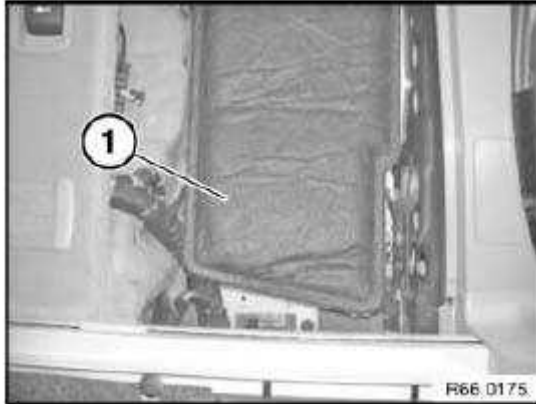


Fig. 90: Identifying Insulating Mat
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Unlock catch (2) and remove control unit (3).

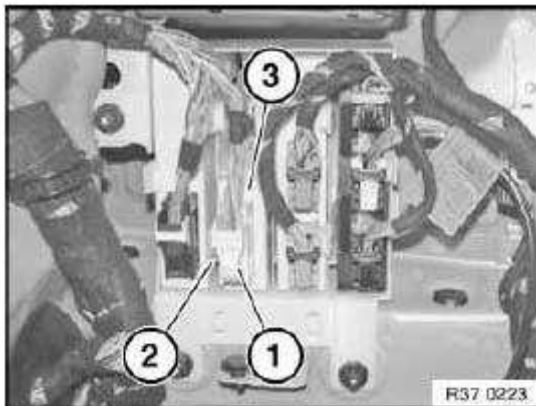


Fig. 91: Identifying Plug Connection, Catch And Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Replacement only: Carry out **PROGRAMMING/CODING**
- Replacement only: Carry out **RIDE-HEIGHT-CALIBRATION**

37 14 610 REMOVING AND INSTALLING/REPLACING TRANSVERSAL-ACCELERATION SENSOR

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION) .

IMPORTANT: Do not kink floor panelling under any circumstances!

Necessary preliminary tasks:

- Remove RIGHT FRONT SEAT
- Lift carpet and fold back to one side
- Remove floor inlay

Release nuts (1), disconnect plug connection (2) and remove lateral acceleration sensor (3).

Installation:

Replace self-locking nuts.

Tightening torque 37 14 7AZ .

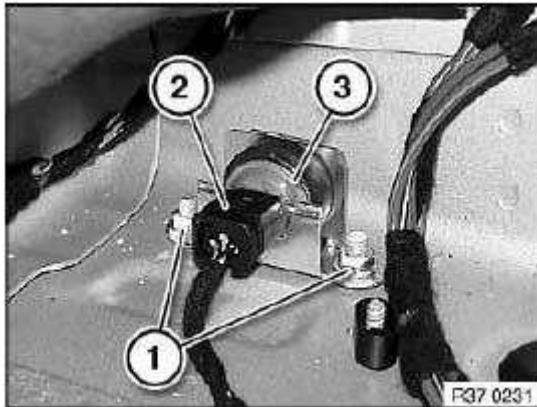


Fig. 92: Identifying Nuts, Plug Connection And Lateral Acceleration Sensor
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- If necessary, carry out INITIAL DYNAMIC DRIVE OPERATION

ELECTRONIC DAMPING

37 15 ... REMOVING AND INSTALLING/REPLACING CONTROL UNIT FOR VERTICAL DYNAMICS MANAGEMENT

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DAMAGE (ESD PROTECTION) .

Necessary preliminary tasks:

- Remove ignition key
- Disconnect **BATTERY NEGATIVE LEAD**
- Remove **FLAP IN LUGGAGE COMPARTMENT PANEL ON RIGHT**

Lift back insulating mat (1).

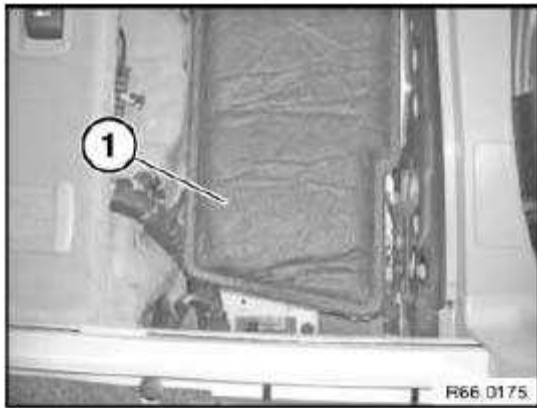


Fig. 93: Identifying Insulating Mat
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1).

Unlock catches (2) and remove control unit (3).

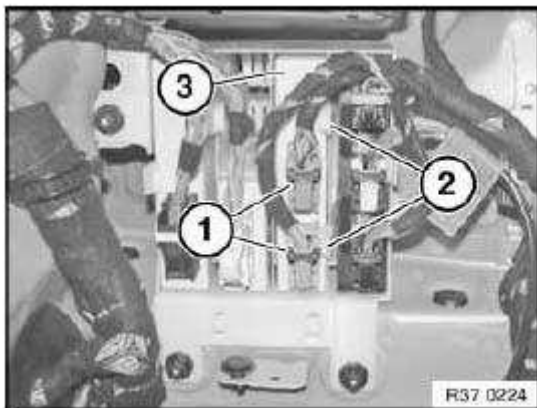


Fig. 94: Identifying Plug Connection, Catches And Control Unit
Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Replacement only: Carry out **PROGRAMMING/CODING**
- Replacement only: Carry out **RIDE-HEIGHT-CALIBRATION**

PUMP ASSEMBLY WITH CONDENSER

37 20 001 REMOVING AND INSTALLING/REPLACING DYNAMIC DRIVE VALVE BLOCK

Special tools required:

- **13 5 020**
- **37 1 151**
- **37 1 152**

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.

NOTE: In all warranty cases you must always provide a fault memory printout, even where there is no fault memory entry, with the defective part. In addition, the valve block openings must be sealed with the protective caps (of the new part).

Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Partially remove **FRONT RIGHT WHEEL ARCH COVER (REAR SECTION)**
- Remove **RIGHT UNDERBODY PANELLING**

Removing valve block:

Disconnect plug connections (1) and expose wiring harness up to valve block.

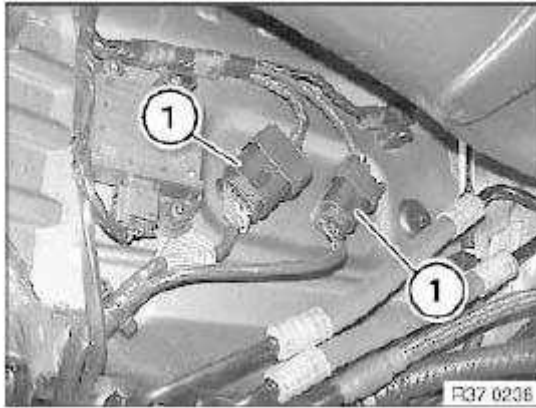


Fig. 95: Identifying Plug Connections
 Courtesy of BMW OF NORTH AMERICA, INC.

Release screw pins (1), open holder and suspend hydraulic lines to one side.

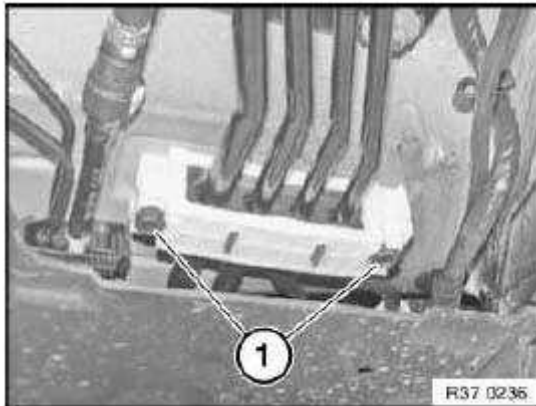


Fig. 96: Identifying Screw Pins
 Courtesy of BMW OF NORTH AMERICA, INC.

Open holder (1) and remove control lines to rear axle oscillating motor.

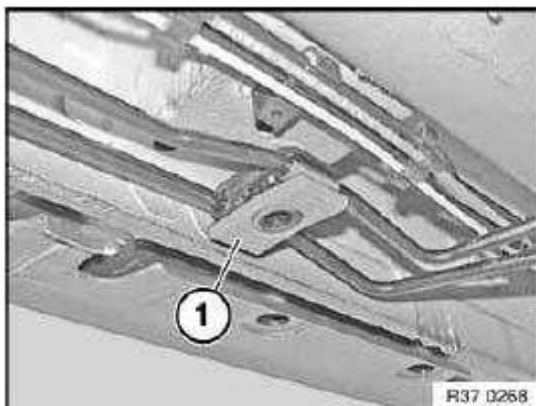


Fig. 97: Identifying Holder

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Hydraulic line and connection on valve block must be fitted with suitable sealing plugs immediately after removal!

Release hollow nuts of control lines (1, 2) to front axle

oscillating motor with special tool **37 1 151** .

Release hollow nuts of control lines (3, 4) to rear axle oscillating motor with special tool **37 1 151** .

Release hollow nut of pressure line (5) with special tool **13 5 020** .

Release hollow nut of return line (6) with special tool **37 1 152** .

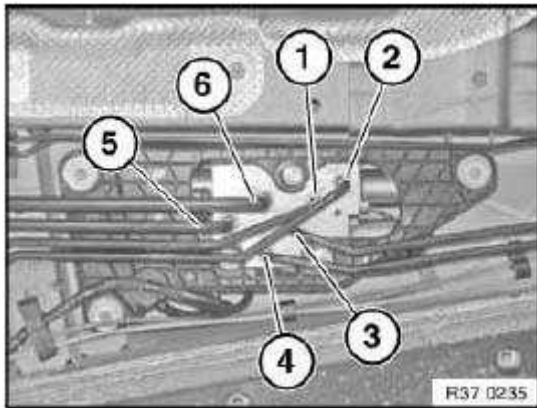


Fig. 98: Identifying Control Lines Hollow Nuts, Return Line Hollow Nuts And Pressure Line Hollow Nuts

Courtesy of BMW OF NORTH AMERICA, INC.

Unclip wiring harness (1).

Release nuts (2) and remove valve block.

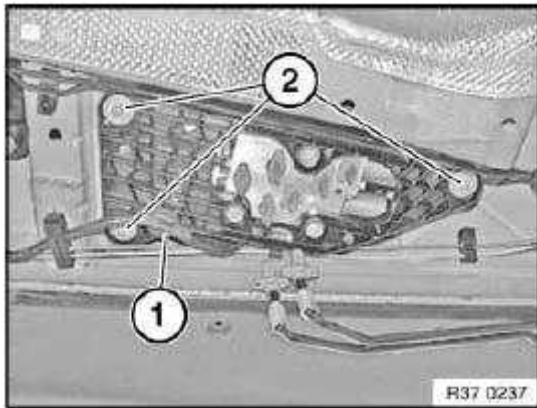


Fig. 99: Identifying Wiring Harness And Nut
 Courtesy of BMW OF NORTH AMERICA, INC.

Installing valve block:

Replace self-locking nuts.

Mount valve block with new nuts (2) on body.

Tightening torque **37 14 10AZ** .

Secure wiring harness (1) to floor plate.

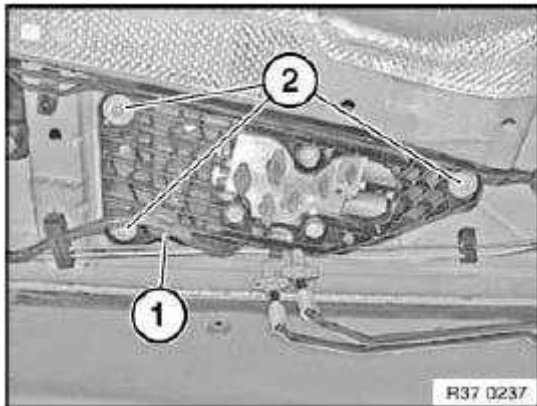


Fig. 100: Identifying Floor Plate Wiring Harness
 Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: When assembling, make sure that only the sealing plugs of the line to be fitted are removed.
 Do not damage sealing surfaces of hydraulic lines.

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

Installation sequence for hydraulic lines:

1. Install control lines (3, 4)

Tightening torque **37 14 14AZ** .

2. Install pressure line (5)

Tightening torque **37 14 11AZ** .

3. Install return line (6)

Tightening torque **37 14 12AZ** .

4. Install control lines (1, 2)

Tightening torque **37 14 13AZ** .

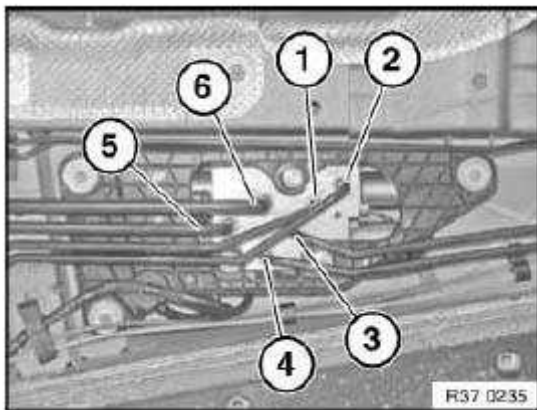


Fig. 101: Identifying Installation Sequence Of Hydraulic Lines
Courtesy of BMW OF NORTH AMERICA, INC.

Check seating and position of line clip (1), correct if necessary.

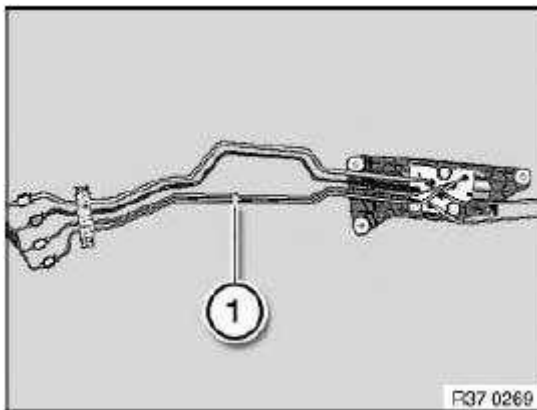


Fig. 102: Identifying Line Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Replace screw pins (1).

Insert hydraulic lines in holder and seal holder with screw pins (1).

Tightening torque **37 14 22AZ** .

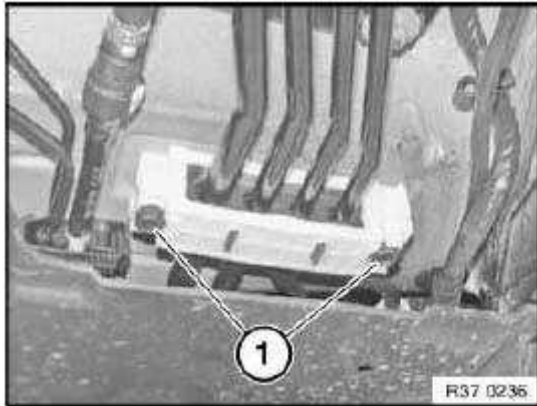


Fig. 103: Identifying Screw Pins
Courtesy of BMW OF NORTH AMERICA, INC.

Insert control lines in holder (1) and seal holder.

NOTE: Replace damaged holder.

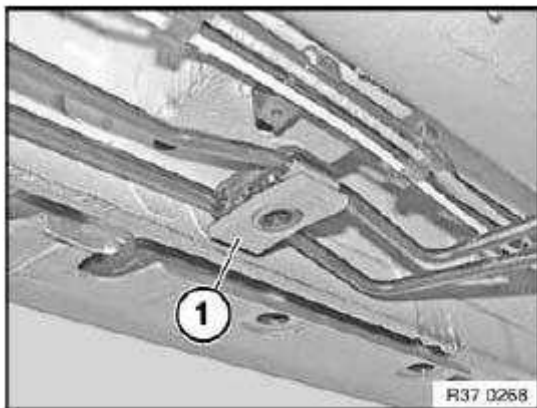


Fig. 104: Identifying Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Connect plug connections (1) and lay wiring harness up to valve block.

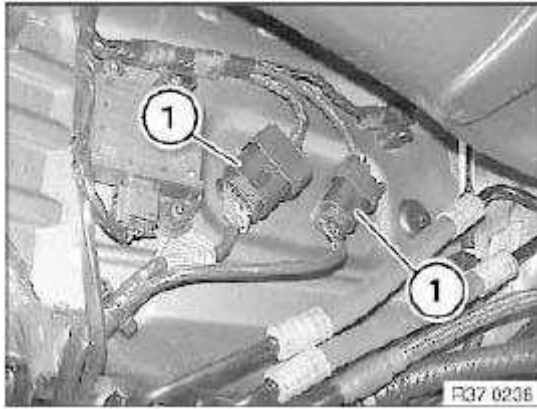


Fig. 105: Identifying Plug Connections
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Fill and bleed **HYDRAULIC SYSTEM**
- Check pipe connections for leaks
- Carry out **INITIAL DYNAMIC DRIVE OPERATION**

37 22 ... REPLACING AIR SUPPLY UNIT (VERSION WITH DYNAMIC DRIVE)

WARNING: Danger of injury!

Drain the air spring system before carrying out any work on the air supply unit, air pipes and air springs! Danger of injury if this instruction is not complied with!

Risk of damage!

Extreme cleanliness must be ensured in the connection area of the pipes during removal and installation. Even the smallest of dirt particles can cause leakage in the air spring system.

NOTE: Read and comply with NOTES ON AIR SPRING SYSTEM.

Necessary preliminary tasks:

- Deactivate and empty **AIR SPRING SYSTEM**
- Remove **RIGHT UNDERBODY PANELLING**
- Remove **RIGHT TANK UNDERRIDE PROTECTION**

Release screw pins (1) and open holder.

Installation:

Replace screw pins.

Tightening torque **37 14 22AZ** .

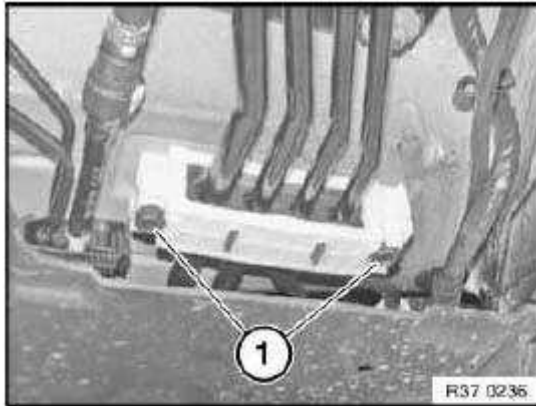


Fig. 106: Identifying Screw Pins

Courtesy of BMW OF NORTH AMERICA, INC.

Expose control lines (1) up to front tension strut.

Remove connecting line for valve block from holder (3).

Release nuts (2) and remove valve block from body.

Installation:

Replace self-locking nuts.

Tightening torque **37 14 10AZ** .

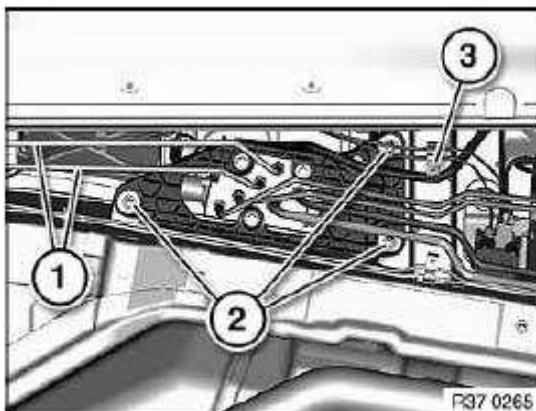


Fig. 107: Identifying Control Lines, Nuts And Holder

Courtesy of BMW OF NORTH AMERICA, INC.

Further procedure is identical to:

- Replacing AIR SUPPLY UNIT

After installation:

- Activate and fill AIR SUSPENSION SYSTEM

37 22 540 REPLACING AIR SUPPLY UNIT

WARNING: Danger of injury!

Drain the air spring system before carrying out any work on the air supply unit, air pipes and air springs! Danger of injury if this instruction is not complied with!

Risk of damage!

Extreme cleanliness must be ensured in the connection area of the pipes during removal and installation. Even the smallest of dirt particles can cause leakage in the air spring system.

NOTE: Read and comply with NOTES ON AIR SPRING SYSTEM.

Necessary preliminary tasks:

- Deactivate and empty AIR SPRING SYSTEM
- Remove RIGHT UNDERBODY PANELLING

IMPORTANT: Do not kink, twist or crush lines.

Disconnect plug connections (1-3).

Disconnect quick-connect coupling (4) and seal both lines with adhesive tape.

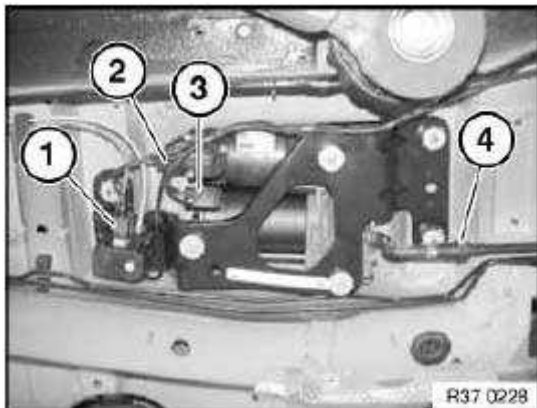


Fig. 108: Identifying Plug Connections And Quick-Connect Coupling
Courtesy of BMW OF NORTH AMERICA, INC.

Release banjo bolts (1, 2).

Lay pipes to one side and seal off with adhesive tape.

Installation:

Check banjo bolts for dirt, clean if necessary. Then carefully screw in banjo bolts by hand to avoid damaging the plastic threads and with it the air supply unit.

Tightening torque **37 12 1AZ** .

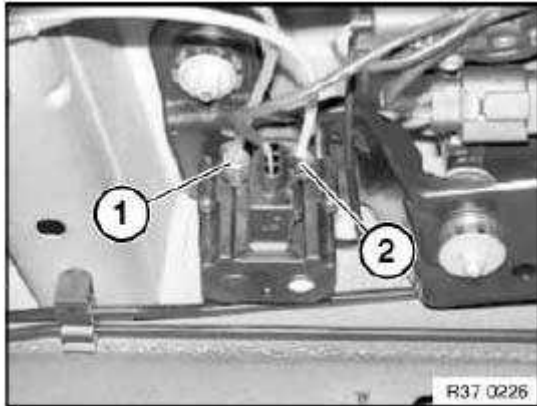


Fig. 109: Identifying Banjo Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts (1).

Remove air supply unit (2).

Installation:

Replace self-locking nuts.

Tightening torque **37 22 1AZ** .

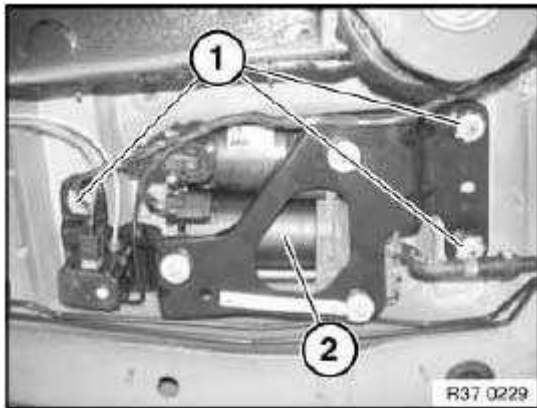


Fig. 110: Identifying Air Supply Unit And Nuts
 Courtesy of BMW OF NORTH AMERICA, INC.

After installation:

- Activate and fill AIR SUSPENSION SYSTEM

37 60 002 INITIAL OPERATION FOR DYNAMIC PERFORMANCE CONTROL

NOTE: The Service function Initial operation of Dynamic Performance Control must be carried out after:

- Replacement of REAR DIFFERENTIAL
- Replacement of SERVOMOTOR
- Replacement of CONTROL UNIT
- PROGRAMMING/CODING

TROUBLESHOOTING

37 90 ... TROUBLESHOOTING ON DYNAMIC DRIVE (ARS)

-> Pull ARS fuse and run through TEST MANEUVER/continue

- a. if no more noise
- b. if noise still present
 - a. No more noise with fuse pulled -> for further checking insert fuse and assess noise when running through test maneuver

-> Noise (rattling) during test maneuver 2

TROUBLESHOOTING CHART

1. Fitting of		
---------------	--	--

cooler return line with two installed restrictors (M57 only)	Check whether correct line (see picture repair instruction) is fitted	In event of cooler return hose with raised areas (restrictors), replace cooler line as specified in repair instruction
2. Hydraulic line installed twisted	Visually check whether hydraulic lines are twisted (when system is depressurized, hydraulic lines must be guided in holders virtually without elastic distortion of decoupling elements) (see INSPECTION SHEET)	Align all hydraulic lines according to specification repair instruction. See specific hydraulic line information in <u>CONNECTING LINES</u> and Replacing return line for Dynamic Drive, Replacing pressure line for Dynamic Drive (line part 1), Replacing pressure line for Dynamic Drive (line part 2) in <u>PUMP AND OIL SUPPLY</u> for either N54 or N63 engines. Ensure distortion-free installation
3. Hydraulic lines are fitted too closely or have insufficient clearance	Check minimum clearance (see <u>INSPECTION SHEET</u>)	Align all hydraulic lines according to specification repair instruction. See specific hydraulic line information in <u>CONNECTING LINES</u> .
4. Decoupling elements of hydraulic lines damaged or missing	Check whether decoupling elements (rubber) are present, correctly fitted or damaged	Replace/fit decoupling elements. See specific hydraulic line information in <u>CONNECTING LINES</u> .
5. Decoupling elements of valve block holder damaged or missing	Check whether decoupling elements (rubber) on valve block are present, correctly fitted or damaged	Replace <u>VALVE BLOCK</u>
6. Line holders loose	1. Check whether line holders are correctly screwed down and holder halves are correctly engaged (see <u>INSPECTION SHEET</u>) 2. Fit all line holders as specified in repair instruction	Tighten all line holders as specified in repair instruction. See specific hydraulic line information in <u>CONNECTING LINES</u> .
7. Stabilizer bar screw connection	Check screw connection (see <u>INSPECTION SHEET</u>)	Tighten screw connections as specified in repair instruction. See <u>37 11 010 REMOVING AND INSTALLING/REPLACING FRONT ACTIVE STABILIZER</u> and <u>37 12 220 REMOVING AND INSTALLING/REPLACING REAR ACTIVE STABILIZER</u> .
-> Noise (clicking) during test maneuver 1		
	Visually check whether hydraulic	

1. Hydraulic line installed twisted	lines are twisted (when system is depressurized, hydraulic lines must be guided in holders virtually without elastic distortion of decoupling elements) (see <u>INSPECTION SHEET</u>)	Align all hydraulic lines according to specification (repair instruction) Ensure distortion-free installation
2. Hydraulic lines are fitted too closely or have insufficient clearance	Check minimum clearance (see <u>INSPECTION SHEET</u>)	Align all hydraulic lines according to specification repair instruction. See specific hydraulic line information in <u>CONNECTING LINES</u> and Replacing pressure line for Dynamic Drive, Replacing return line for Dynamic Drive, Replacing pressure line for Dynamic Drive (line part 1), Replacing pressure line for Dynamic Drive (line part 2) in <u>PUMP AND OIL SUPPLY</u> for either N54 or N63 engines.
3. Line holders loose	1. Check whether line holders are correctly screwed down and holder halves are correctly engaged (see <u>INSPECTION SHEET</u>) 2. Fit all line holders as specified in repair instruction	Tighten all line holders as specified in repair instruction. See specific hydraulic line information in <u>CONNECTING LINES</u> and Replacing pressure line for Dynamic Drive, Replacing return line for Dynamic Drive, Replacing pressure line for Dynamic Drive (line part 1), Replacing pressure line for Dynamic Drive (line part 2) in <u>PUMP AND OIL SUPPLY</u> for either N54 or N63 engines.
4. Valve block does not conform to specification	Carry out <u>INITIAL DYNAMIC DRIVE OPERATION</u> .	If other causes are ruled out or if diagnosis faults are detected, replace <u>VALVE BLOCK</u>

b) Noise can be heard (with ARS fuse pulled)/Note: Reinsert fuse prior to further operations

1. Hydraulic lines are fitted too closely or have insufficient clearance	Check minimum clearance (see <u>INSPECTION SHEET</u>)	Align all hydraulic lines for Dynamic Drive as specified in repair instruction. See specific hydraulic line information in <u>CONNECTING LINES</u> and Replacing pressure line for Dynamic Drive, Replacing return line for Dynamic Drive, Replacing pressure line for Dynamic Drive (line part 1), Replacing pressure line for Dynamic Drive (line part 2) in <u>PUMP AND OIL SUPPLY</u> for either N54 or N63 engines.
2. Stabilizer link slack/loose	1. Check screw connection (see <u>INSPECTION SHEET</u>)	Replace screw connections as specified in repair instruction. See <u>31 35 005 REMOVING AND INSTALLING/REPLACING PUSH ROD (STABILIZER LINK) FOR LEFT/RIGHT STABILIZER</u> and <u>33 55 040 REPLACING STABILIZER LINKS FOR STABILIZER</u> .
3. Stabilizer link faulty	1. Visually inspect for damage (see <u>INSPECTION SHEET</u>)	If necessary, replace stabilizer link. See <u>31 35 005 REMOVING AND INSTALLING/REPLACING PUSH ROD (STABILIZER LINK) FOR LEFT/RIGHT STABILIZER</u> and <u>33 55 040</u>

	2. Check play (see <u>INSPECTION SHEET</u>)	<u>REPLACING STABILIZER LINKS FOR STABILIZER</u> .
4. Fault on front axle	Refer to <u>31 90 ... FRONT AXLE TROUBLESHOOTING</u>	
5. Stabilizer link screw connection loose	Check screw connection (see <u>INSPECTION SHEET</u>)	Tighten screw connections as specified in <u>REPAIR INSTRUCTION</u>
6. Decoupling elements of hydraulic lines damaged or missing	Check whether decoupling elements (rubber) are present and correctly fitted or damaged	Replace/fit decoupling elements
7. Decoupling elements of valve block holder damaged or missing	Check whether decoupling elements (rubber) are present and correctly fitted or damaged	Replace <u>VALVE BLOCK</u>

-> **Hissing during test maneuver 3**

TROUBLESHOOTING CHART

1. Flow noise of hydraulic fluid in damaged hydraulic lines	Visually inspect hydraulic lines to ascertain whether crushed or bent	Rectify identified defects on hydraulic lines or replace lines. See specific hydraulic line information in <u>CONNECTING LINES</u>
2. Flow noise of hydraulic fluid in valve block not conforming to specifications	Carry out <u>DYNAMIC DRIVE INITIAL OPERATION</u>	If a fault on valve block was diagnosed during initial operation, replace <u>VALVE BLOCK</u>

-> **Pump noise can be permanently heard from engine compartment while engine is running**

TROUBLESHOOTING CHART

1. Dynamic Drive has impaired function or is damaged	Visually inspect pressure line (see <u>INSPECTION SHEET</u>)	Replace Dynamic Drive pressure line. See specific hydraulic line information in <u>CONNECTING LINES</u> and Replacing return line for Dynamic Drive, Replacing pressure line for Dynamic Drive (line part 1), Replacing pressure line for Dynamic Drive (line part 2) in <u>PUMP AND OIL SUPPLY</u> for either N54 or N63 engines.
2. Power steering pump faulty	Check whether power steering pump and pump drive are damaged	If other causes are ruled out, replace power steering pump. See <u>32 41 037 REMOVING AND INSTALLING/REPLACING POWER STEERING PUMP FOR POWER STEERING GEAR WITH DYNAMIC DRIVE (N54)</u> or <u>32 41 037 REMOVING AND INSTALLING/REPLACING POWER STEERING PUMP FOR POWER STEERING GEAR WITH DYNAMIC DRIVE (N63)</u> .

SUSPENSION

Integrated Suspension Systems - Service Techniques - X6

INTEGRATED SUSPENSION SYSTEM

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

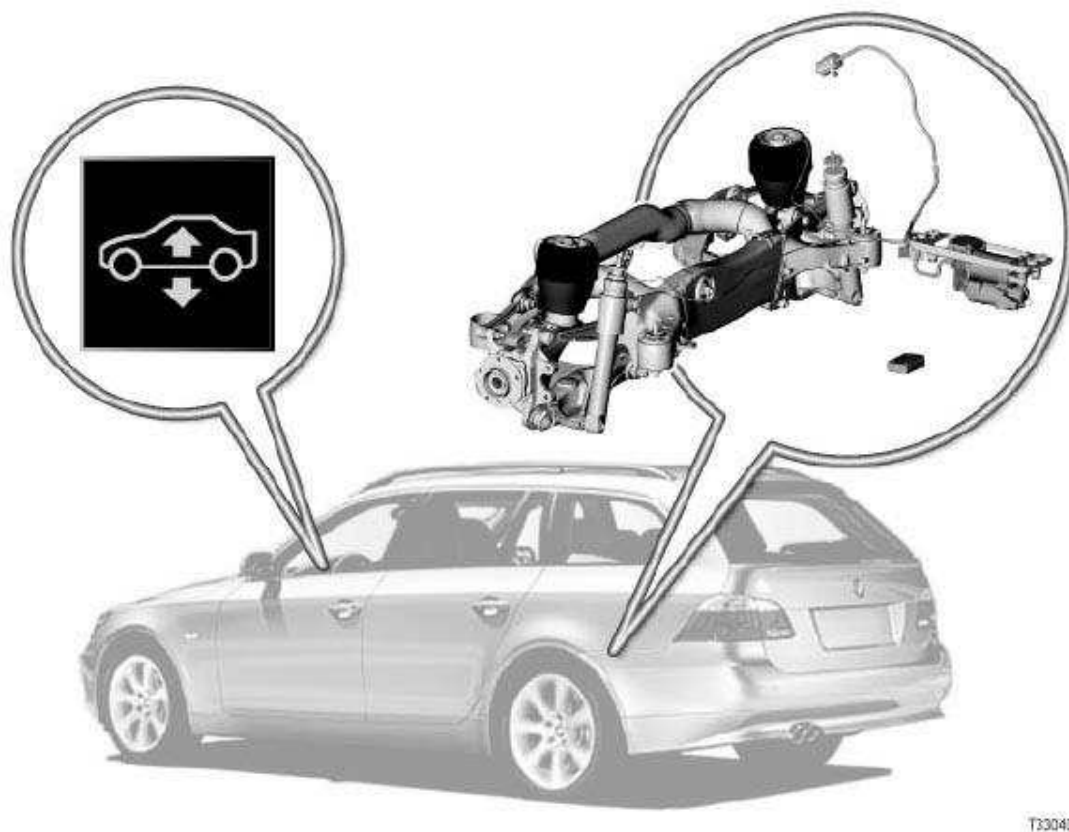


Fig. 1: Identifying Single-Axle Electronic Height Control
Courtesy of BMW OF NORTH AMERICA, INC.

Introduction

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

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

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

- E61:

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

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

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

New features of single-axle electronic height control:

- Air springs with contoured gaiter and 2 plies

Brief description of components

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

- **Air supply unit**

The air supply unit includes the following components:

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

- **EHC control unit**

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

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

- **2 air springs**

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

- **2 level sensors**

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

○ **Check Control**

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

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

○ **CAS: Car Access System**

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

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

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

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

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

○ **DSC: Dynamic Stability Control**

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

- Vehicle road speed
- Lateral acceleration

○ **FRM: Footwell module**

- E70, E71

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

○ **HUD: Head-up display**

A fault in the single-axle electronic height control system is shown in abbreviated form in the head-up display. The Check-Control symbol in the instrument cluster lights up. The related Check-Control message is displayed in abbreviated form.

○ **JBE: Junction box electronics**

- E70, E71

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

(body CAN).

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

- **KBM: Body basic module**

- E61

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

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

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

- E61

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

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

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

- **KOMBI: Instrument cluster**

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

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

- E61

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

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

The diagnosis wire is connected to the SGM.

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

- E61

The door modules (driver's door module = TMFA, front-passenger door module = TMBF) supply a signal

about the status of the front doors (OPEN or CLOSED).

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

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

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

System functions

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

○ **Electronic height control**

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

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

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

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

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

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

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

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

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

- Sleep mode
- Pre-mode (temporary start/run-on)

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

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

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

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

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

Sleep mode

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

Pre-mode

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

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

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

These control characteristics reduce load on the battery.

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

Post-mode (readjustment)

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

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

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

Normal mode

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

Drive mode

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

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

Cornering

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

Twist

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

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

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

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

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

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

The difference in height between the two sides is maintained.

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

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

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

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

After stopping, the vehicle is automatically raised as follows:

- Vehicle left

and

vehicle "secured" with central locking.

The height is automatically adjusted after a short delay.

Alternatively

- Vehicle left

and

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

The height is automatically adjusted after a longer delay.

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

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

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

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

Lifting platform

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

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

- Permissible spring extension exceeded (e.g. more than 50 millimetres, recorded by left and/or right-hand

level sensor)

- Vehicle raised slightly (spring extension e.g. less than 55 millimetres), regulation starts but vehicle is not lowered

The height is stored in the EHC control unit.

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

Transport mode

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

SUSPENSION

Integrated Suspension Systems - Tightening Torques - X6

REAR CONTROL AND SUSPENSION

37 12 CONTROL AND SUSPENSION SYSTEMS, REAR

CONTROL AND SUSPENSION SYSTEMS, REAR - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Screwed connection, air line	E70/E71	Dia. = 4 mm		2 Nm

ELECTRICAL COMPONENTS

37 14 ELECTRIC COMPONENTS

ELECTRIC COMPONENTS - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Bracket, ride-height sensor, to body	E70, E71	M6		8 Nm
2AZ Bracket ride level sensor to rear axle carrier	E70, E71	M6		8 Nm
3AZ Ride level sensor to holder	E70, E71	M5		4.6 Nm
4AZ Sensor lever, ride-height sensor to jointed rod	E70, E71	M6	Replace nut	8 Nm
5AZ Jointed rod to upper control arm	E70, E71	M6	Replace nut	8 Nm
6AZ Jointed rod to swinging arm	E70, E71	M6	Replace nut	8 Nm
7AZ Lateral acceleration sensor to body	E70, E71	M6	Replace nuts	8 Nm
8AZ Control unit Dynamic Drive ECU to cockpit support structure	E70, E71	M5 x 15		6 Nm
9AZ Valve block to holder	E70, E71	M6		8 Nm
10AZ Holder, valve block, to body	E70, E71	M6	Replace nuts	8 Nm
11AZ Dynamic Drive pressure line to valve block	E70, E71			35 Nm
12AZ Return line to valve block	E70, E71			40 Nm
13AZ Control lines for oscillating motor, front,	E70,	M14		35 Nm

to valve block	E71			
14AZ Control lines for oscillating motor, rear, to valve block	E70, E71	M14		35 Nm
15AZ Connecting nuts, hydraulic lines (pressure line/control lines)	E70, E71			30 Nm
16AZ Connecting nuts, hydraulic lines (return)	E70			35 Nm
17AZ Line holder/pipe holder/holder	E70, E71	M6		8 Nm
	E70, E71	M8		20.5 Nm
18AZ Control lines to oscillating motor	E70, E71			30 Nm
19AZ Protective plate to rear axle carrier	E70, E71	M10		38 Nm
	E70, E71	M6		8 Nm
20AZ Retaining bar, stabilizer, to front axle carrier	E70, E71	M10		60 Nm
21AZ Retaining bracket, stabilizer bar to rear axle support	E70, E71	M10		56 Nm
22AZ Screw pins for pipe holder	E70	Replace screw pins		1.5 Nm
23AZ Spring-type actuator to oscillating motor, front	E70			30 Nm
24AZ Pressure relief valve to oscillating motor, front	E70, E71			14 + 4 Nm
25AZ Line holder for control lines to front axle oscillating motor	E70, E71			3 Nm
26AZ Lines to spring-type actuator	E70/E71			14 Nm
27AZ Block screw connection, hydraulic lines	E70/E71			12 Nm

PUMP CONDENSER ASSEMBLY

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PUMP UNIT WITH RESERVOIR - TIGHTENING TORQUE SPECIFICATIONS

	Type	Thread	Tightening specification	Measure
1AZ Air supply unit to body	E70, E71			8 Nm