BMW S54 WPC Treated Rod Bearing Kit
Installation Instructions - Click HERE to Shop

Skill Level
3 - Advanced

Advanced Skills & Experience Required

INTRODUCTION

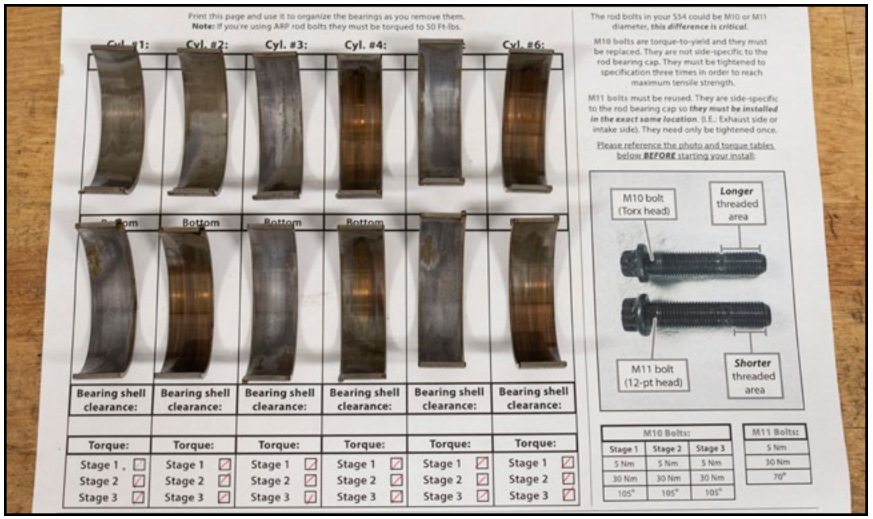
BMW S54 Connecting Rod Bearing Replacement

The S54 engine is a masterpiece of engineering and technology! Unfortunately it is also known to suffer from premature rod bearing wear which, if left untreated, can lead to engine failure. There are several factors which contribute to this issue including the bearing material composition, and lack of routine maintenance.

Our kit includes all of the gaskets and seals you'll need, as well as WPC treated genuine BMW upper and lower bearing shells. What is WPC, you ask? WPC is a surface treatment that reduces friction and adds strength, two improvements which greatly benefit internal engine components. Ultra-fine particles are fired at the bearing surface at very high speeds, like shot-peening, but ***much*** smaller. The parts come out smoother and stronger due to thermal discharge. The two largest enemies of any high-performance engine are heat and friction, and the WPC treatment will help to reduce both of them.

The photo on the right shows the bearings we removed from an E46 M3. Note the wear patterns on the shells, we didn't experience any sort of failure but we were very happy that we decided to replace our rod bearings when we did!

Now let's get to it!



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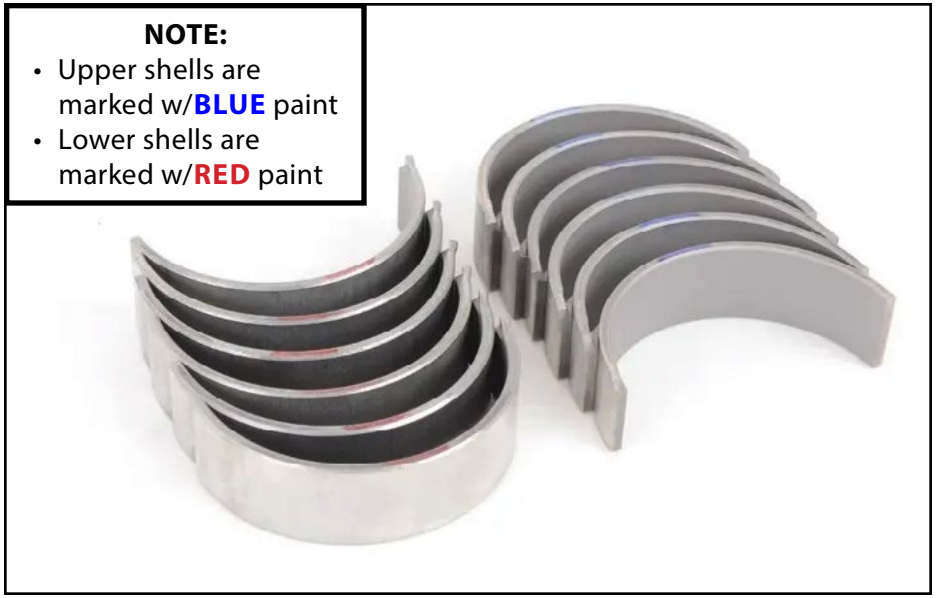
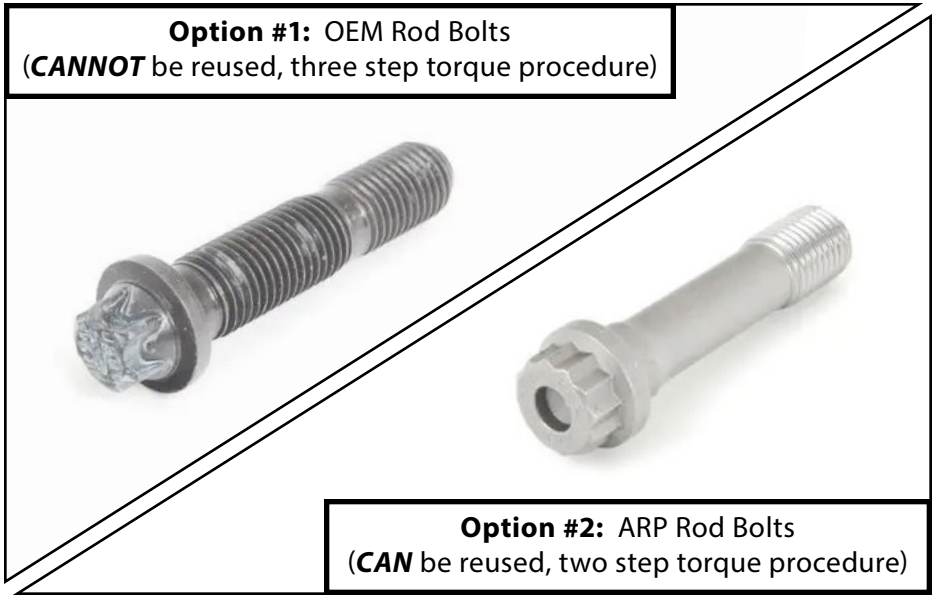
KIT CONTENTS

NOTE:
- Upper shells are marked w/**BLUE** paint
- Lower shells are marked w/**RED** paint



WPC Treated Rod Bearing Shells **(QTY 12)**

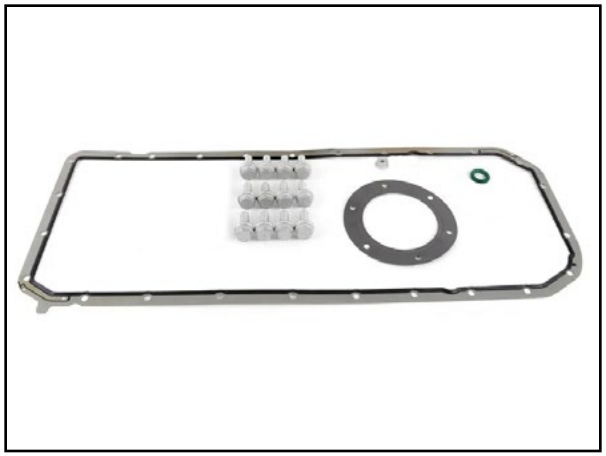
Option #1: OEM Rod Bolts
(***CANNOT*** be reused, three step torque procedure)



Option #2: ARP Rod Bolts
(***CAN*** be reused, two step torque procedure)

Rod Bolts **(QTY 12)**

Oil Service Kit



Oil Sump Gasket, Seals & Hardware

Assembly Lube

INSTALLATION NOTES

- **RH** refers to the ***passenger side*** of the vehicle.
- **LH** refers to the ***driver side*** of the vehicle.
- Always use the proper torque specifications.
- If applicable to this installation, torque specifications will be listed throughout the document and at the end as well.
- Please read all of these instructions and familiarize yourself with the complete process **BEFORE** you begin.

GENERAL PREPARATION AND SAFETY INFORMATION

ECS Tuning cares about your health and safety, please read the following safety information. This information pertains to automotive service in general, and while it may not pertain to every job you do, please remember and share these important safety tips.

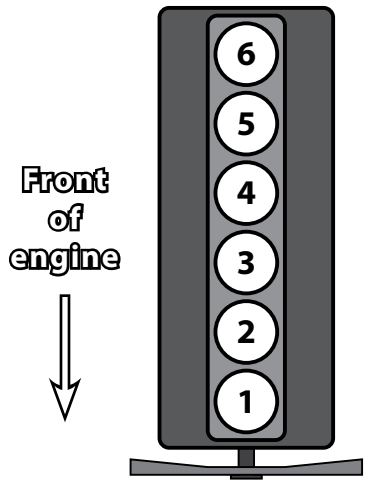
- Park your car in a safe, well lit, level area.
- Shut the engine off and remove the key from the ignition switch.
- Make sure any remote start devices are properly disabled.
- **ALWAYS** wear safety glasses.
- Make sure the parking brake is applied until the vehicle is safely lifted and supported.
- Whether lifting a vehicle using an automotive lift or a hydraulic jack, be sure and utilize the factory specified lift points.
- Lifting a vehicle in an incorrect location can cause damage to the suspension/running gear.
- **ALWAYS** support the vehicle with jack stands.
- **ALWAYS** read and follow all safety information and warnings for the equipment you are using.

NEVER get underneath a vehicle that is supported only by a jack, and ALWAYS make sure that the vehicle is securely supported on jack stands.

PROJECT OVERVIEW

For your convenience we've included a bearing organizer sheet on the next page for you to print off. This will help you to keep track of your bearing shells, observe wear patterns, and you can use the check boxes along the bottom to record your progress as you torque the rod bolts.

We've also included the engine cylinder number illustration below for quick reference.



ECS TUNING | BMW S54 CONNECTING ROD BEARING ORGANIZER

Print this page and use it to organize the bearings as you remove them.
Note: If you're using ARP rod bolts they must be torqued to 50 Ft-lbs.

Cyl. #1:	Cyl. #2:	Cyl. #3:	Cyl. #4:	Cyl. #5:	Cyl. #6:
Top	Top	Top	Top	Top	Top
Bottom	Bottom	Bottom	Bottom	Bottom	Bottom
Bearing shell clearance:	Bearing shell clearance:	Bearing shell clearance:	Bearing shell	Bearing shell nce:	Bearing shell clearance:
					0.25mm
Torque:	Torque:	Torque:	Torque:	Torque:	Torque:
Step/Stage 1 ☐	Step/Stage 1 ☐	Step/Stage 1 ☐	Step/Stage 1 ☐	Step/Stage 1 ☐	Step/Stage 1 ☐
Step/Stage 2 ☐	Step/Stage 2 ☐	Step/Stage 2 ☐	Step/Stage 2 ☐	Step/Stage 2 ☐	Step/Stage 2 ☐
Step/Stage 3 ☐	Step/Stage 3 ☐	Step/Stage 3 ☐	Step/Stage 3 ☐	Step/Stage 3 ☐	Step/Stage 3 ☐

Place your bearing shells **HERE**

Write down your measurements **HERE**

Check off these boxes as you torque the rod bearing cap bolts

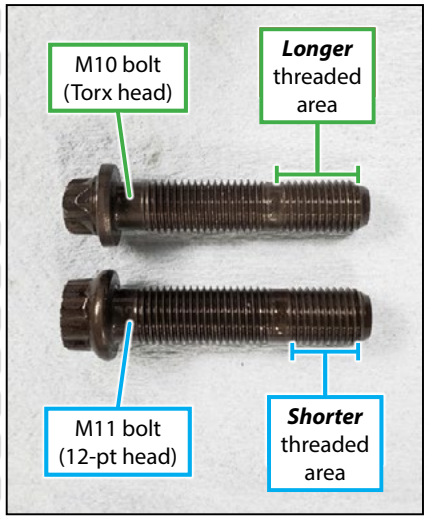
Pay close attention to this section

The rod bolts in your S54 could be M10 or M11 diameter, ***this difference is critical***.

M10 bolts are torque-to-yield and they must be replaced. They are not side-specific to the rod bearing cap. They must be tightened to specification three times in order to reach maximum tensile strength.

M11 bolts must be reused. They are side-specific to the rod bearing cap so ***they must be installed in the exact same location***. (I.E.: Exhaust side or intake side). They need only be tightened once.

Please reference the photo and torque tables below ***BEFORE*** starting your install:



M10 Bolts:		
Stage 1	Stage 2	Stage 3
5 Nm	5 Nm	5 Nm
30 Nm	30 Nm	30 Nm
105°	105°	105°

M11 Bolts:	
Step 1	5 Nm
Step 2	30 Nm
Step 3	70°

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Print this page and use it to organize the bearings as you remove them.
Note: If you're using ARP rod bolts they must be torqued to 50 Ft-lbs.

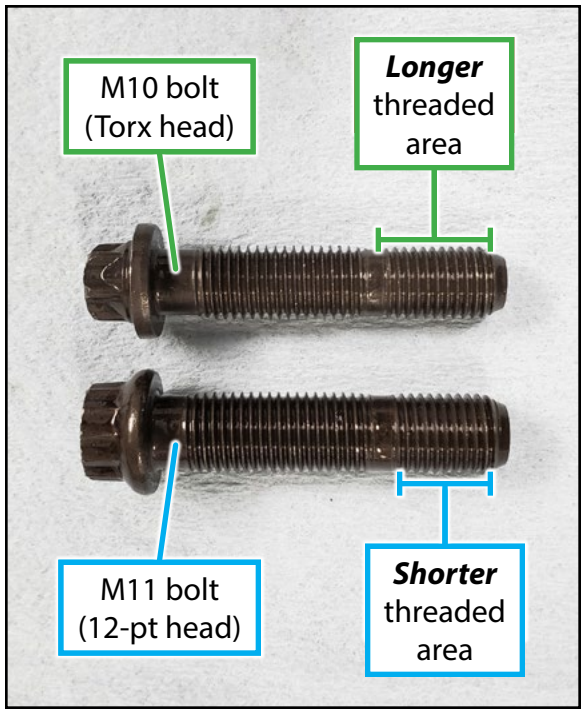
Cyl. #1:	Cyl. #2:	Cyl. #3:	Cyl. #4:	Cyl. #5:	Cyl. #6:
Top	Top	Top	Top	Top	Top
Bottom	Bottom	Bottom	Bottom	Bottom	Bottom
Bearing shell clearance:	Bearing shell clearance:	Bearing shell clearance:	Bearing shell clearance:	Bearing shell clearance:	Bearing shell clearance:
Torque:	Torque:	Torque:	Torque:	Torque:	Torque:
Step/Stage 1 ☐ Step/Stage 2 ☐ Step/Stage 3 ☐	Step/Stage 1 ☐ Step/Stage 2 ☐ Step/Stage 3 ☐	Step/Stage 1 ☐ Step/Stage 2 ☐ Step/Stage 3 ☐	Step/Stage 1 ☐ Step/Stage 2 ☐ Step/Stage 3 ☐	Step/Stage 1 ☐ Step/Stage 2 ☐ Step/Stage 3 ☐	Step/Stage 1 ☐ Step/Stage 2 ☐ Step/Stage 3 ☐

The rod bolts in your S54 could be M10 or M11 diameter, ***this difference is critical***.

M10 bolts are torque-to-yield and they must be replaced. They are not side-specific to the rod bearing cap. They must be tightened to specification three times in order to reach maximum tensile strength.

M11 bolts must be reused. They are side-specific to the rod bearing cap so ***they must be installed in the exact same location***. (I.E.: Exhaust side or intake side). They need only be tightened once.

Please reference the photo and torque tables below ***BEFORE*** starting your install:



M10 Bolts:		
Stage 1	Stage 2	Stage 3
5 Nm	5 Nm	5 Nm
30 Nm	30 Nm	30 Nm
105°	105°	105°

M11 Bolts:	
Step 1	5 Nm
Step 2	30 Nm
Step 3	70°

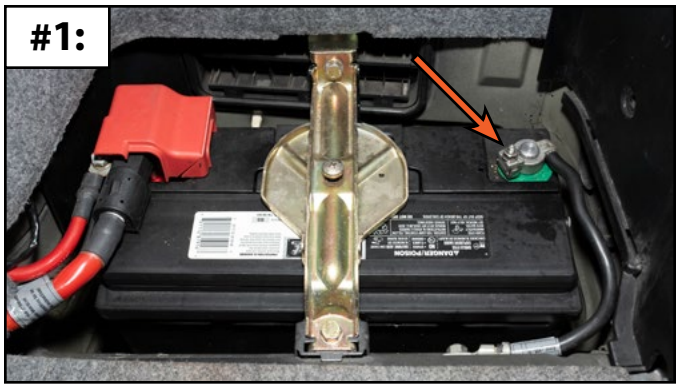
DISASSEMBLY PROCEDURE

Step 1:

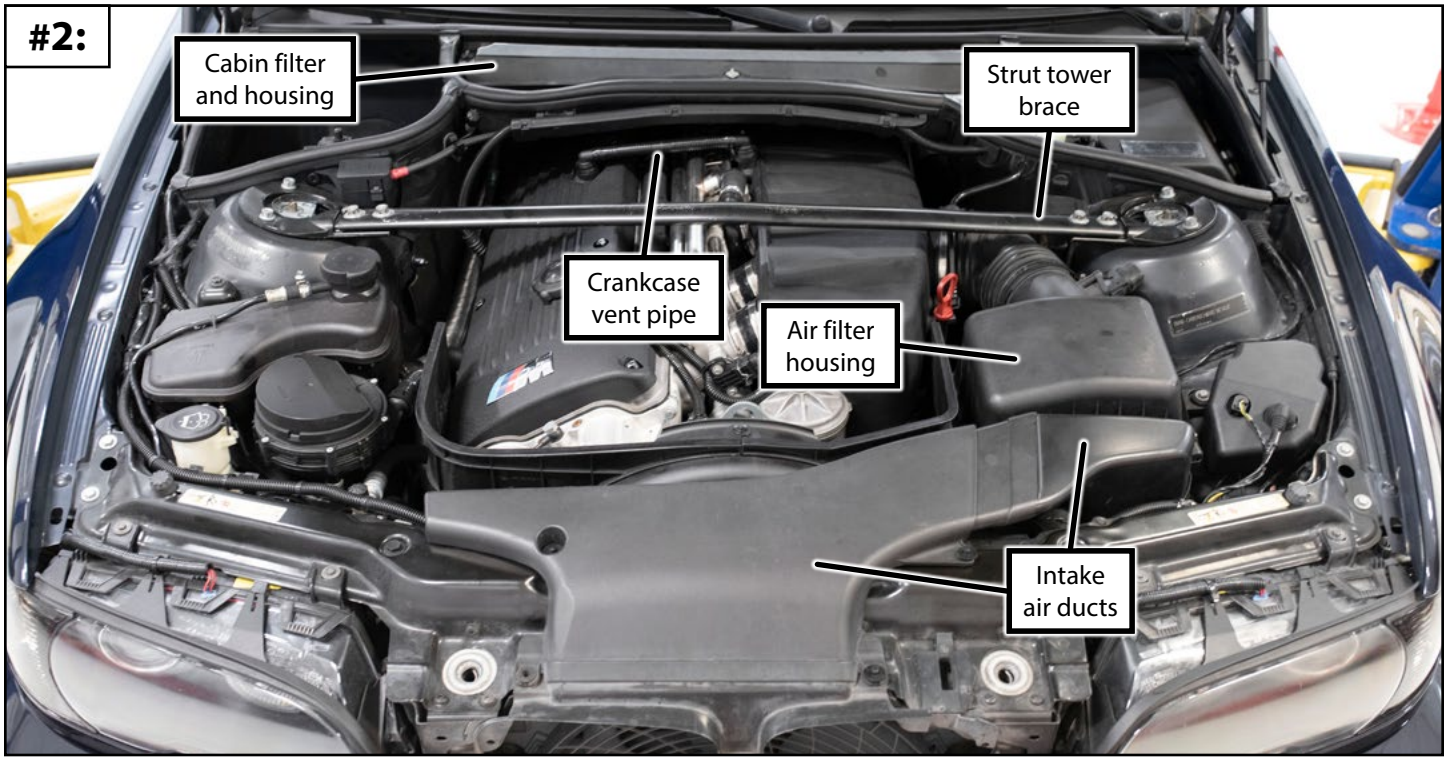
Disconnect the negative (-) battery terminal (**photo #1**).

Remove the strut tower brace, intake air ducts, air filter housing, crankcase vent pipe, cabin filter and housing (**photo #2**).

#1:



#2:



DISASSEMBLY PROCEDURE

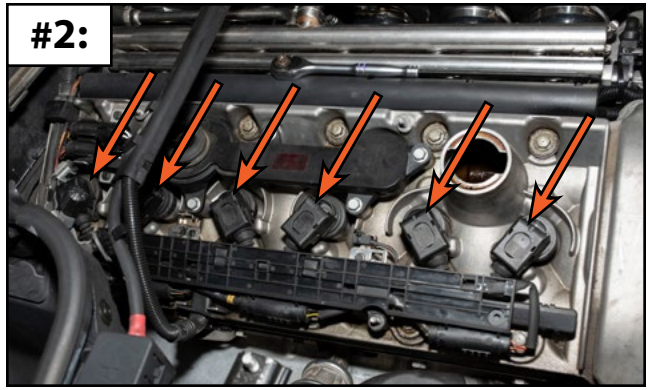
Step 2:

Remove the 10mm nuts which secure the coil cover to the engine (arrows in **photo #1**). Remove the RH fan shroud (highlighted in **GREEN** in **photo #1**).

Disconnect all six ignition coils and remove the spark plugs (arrows in **photo #2**).

#1:

#2:



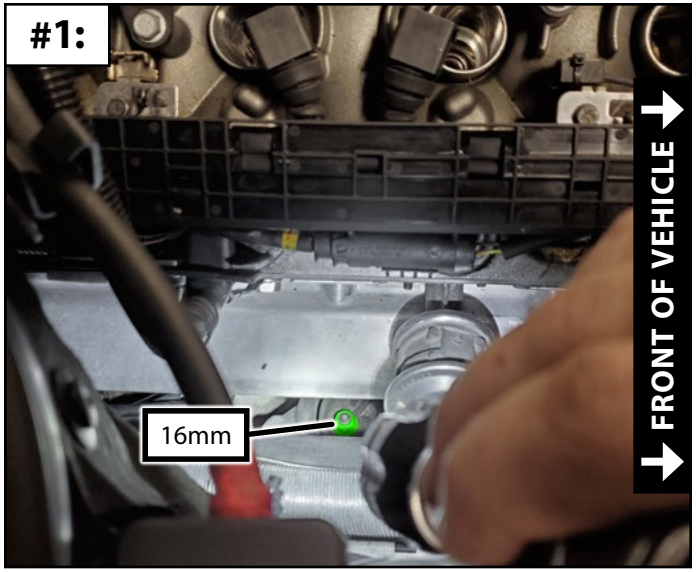
DISASSEMBLY PROCEDURE

Step 3:

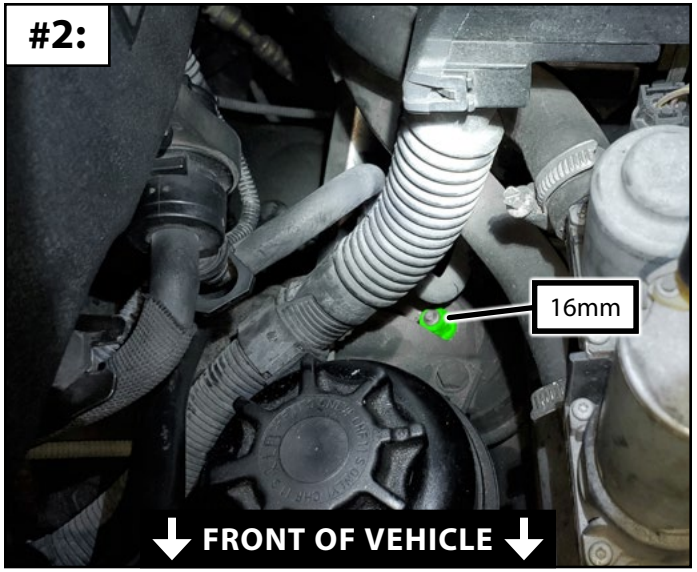
Remove the 16mm nut from the top of each engine mount (highlighted in **GREEN** in **photo #1 & photo #2**). These nuts can be tough to reach, a 16mm socket, swivel joint and several extensions will make this part easier.

Safely support the engine from above (**photo #3**).

#1:



#2:



#3:

DISASSEMBLY PROCEDURE

Step 4:

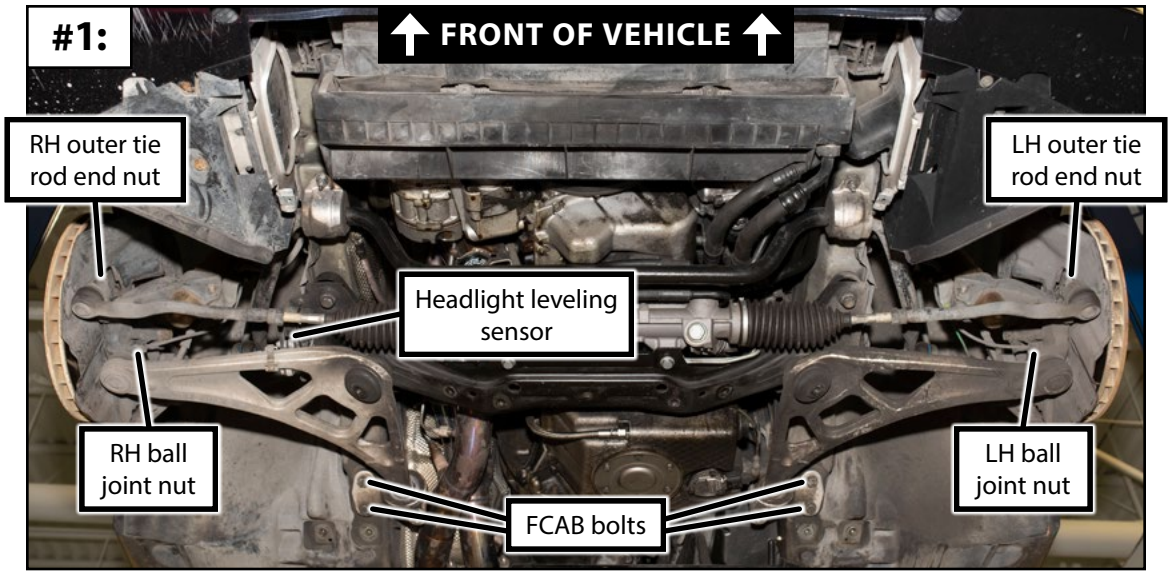
Safely lift and support the vehicle. Remove the front wheels and belly pans. If you haven't done so yet, now is a good time to start draining the oil from the engine.

Disconnect the outer tie rod ends and ball joints from each knuckle. Remove the bolts which secure the FCABs to the chassis. Disconnect the headlight leveling sensor (**photo #1**).

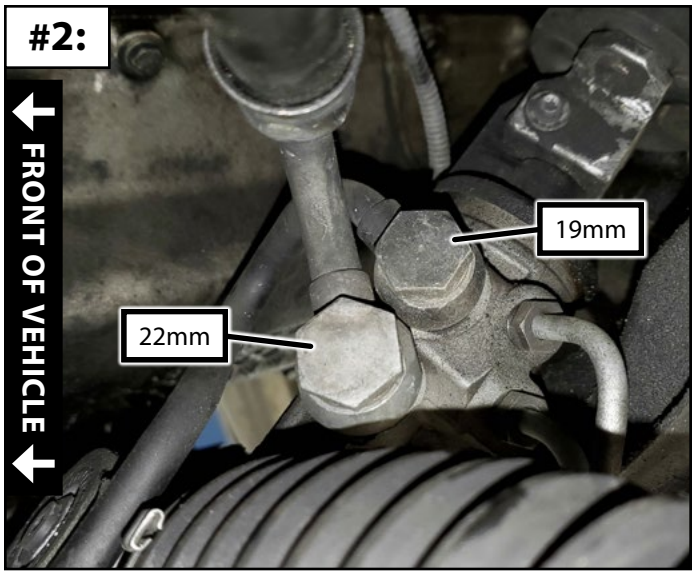
Disconnect the power steering lines from the rack (**photo #2**).

Disconnect the power steering line from the pump (**photo #3**).

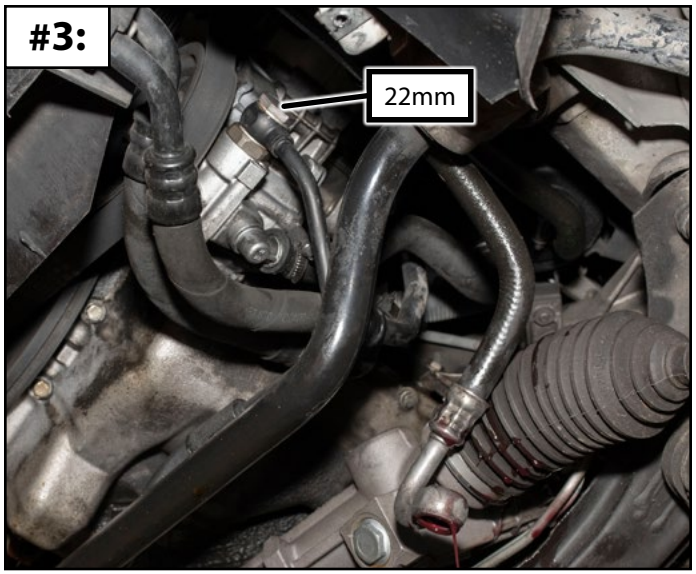
#1:



#2:



#3:



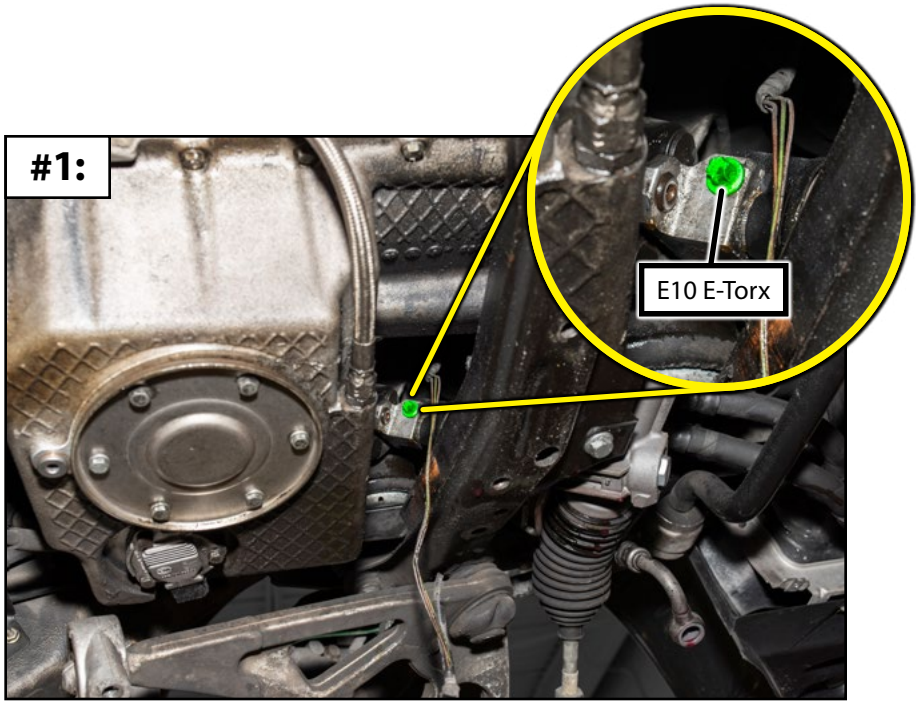
DISASSEMBLY PROCEDURE

Step 5:	E10 E-Torx Socket & Ratchet, Pry Bar

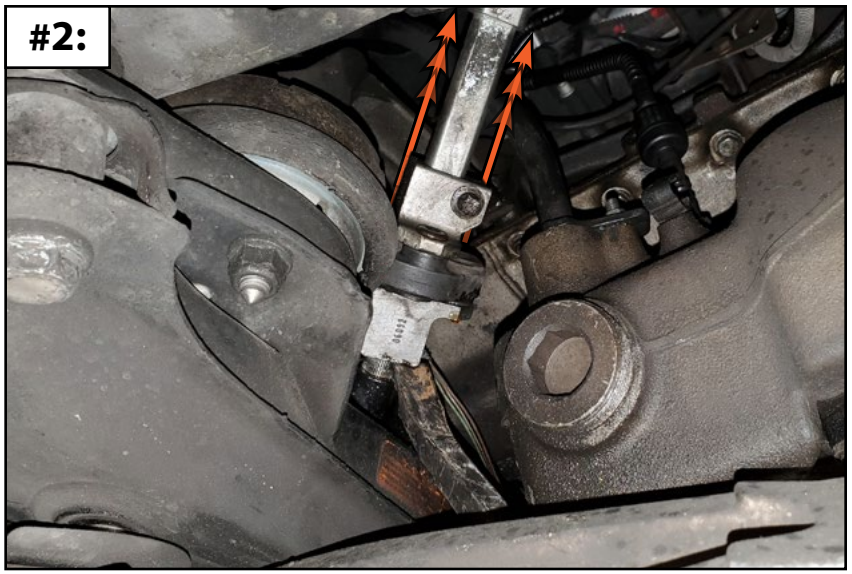
Remove the lower pinch bolt from the steering shaft universal joint (highlighted in **GREEN** in **photo #1**).

Pull the universal joint off of the steering rack (**photo #2**).

#1:



#2:



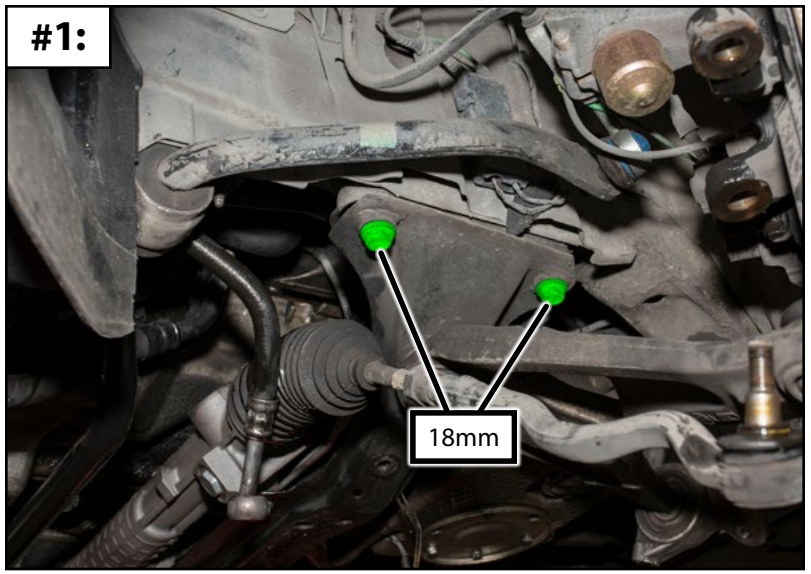
DISASSEMBLY PROCEDURE

Step 6:

Safely support the subframe from below (not shown). Remove the two 18mm bolts from each side of the subframe (highlighted in **GREEN** in **photo #1**).

Remove the subframe and set it aside (**photo #2**). You may need to wiggle it a bit to get the engine mount studs clear of the brackets on the engine block.

#1:



#2:

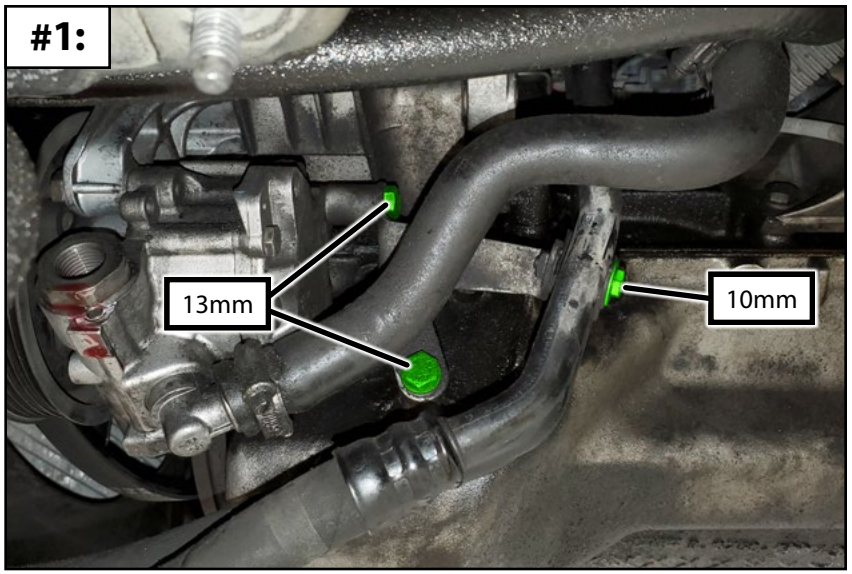
DISASSEMBLY PROCEDURE

Step 7:	10mm & 13mm Sockets, Ratchet

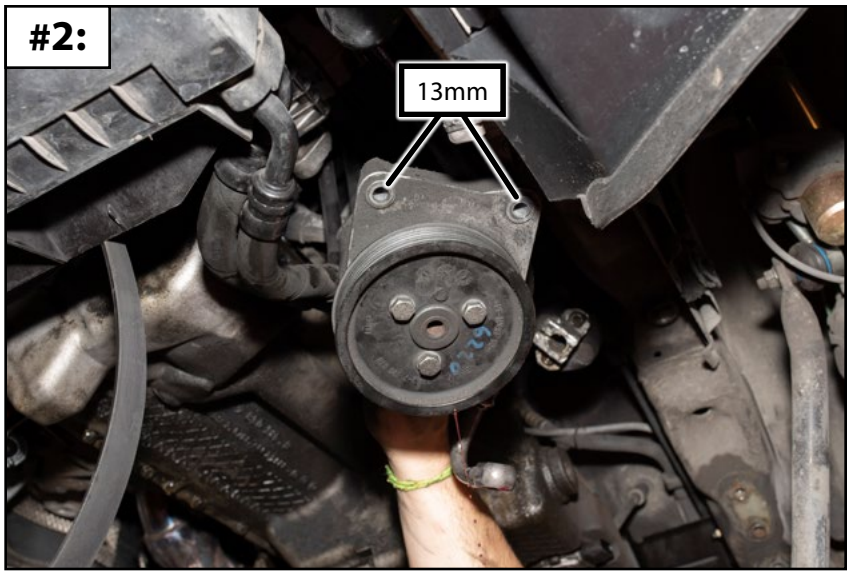
Remove the three bolts (highlighted in **GREEN** in **photo #1**) which secure the bracket to the back side of the power steering pump and the power steering lines.

Remove the two bolts which secure the power steering pump to the engine (**photo #2** shows the bolt locations with the pump removed for better visibility). Safely support the power steering pump out of the way, there is no need to completely remove it.

#1:



#2:



DISASSEMBLY PROCEDURE

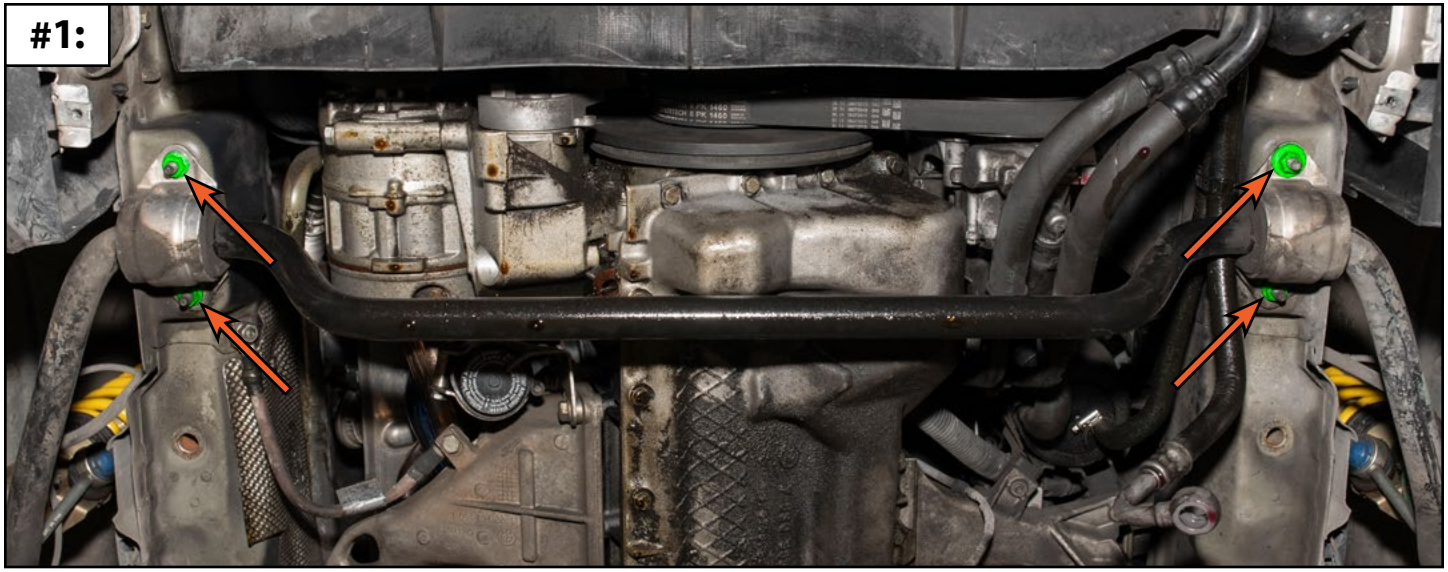
Step 8:

Remove the four 13mm nuts which secure the sway bar to the vehicle (highlighted in **GREEN** in **photo #1**). Let the sway bar hang down underneath the engine, there is no need to disconnect it from the struts.

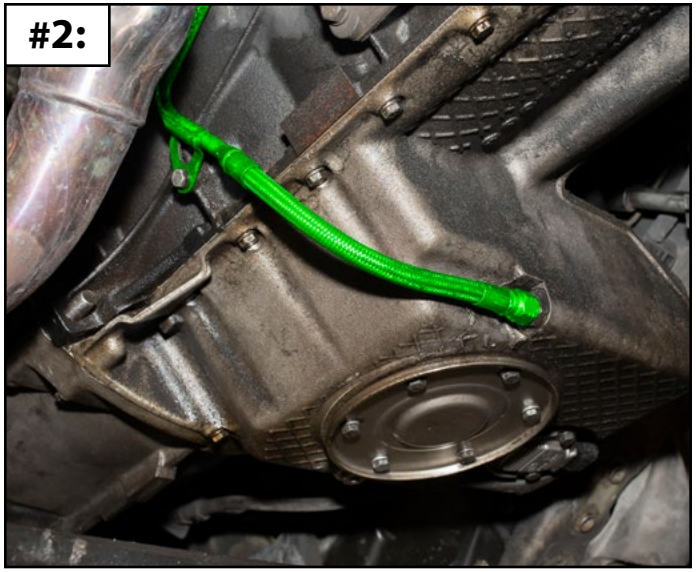
Disconnect the oil return line from the oil sump (highlighted in **GREEN** in **photo #2**).

Remove the 10mm nut which secures the oil dipstick tube to the oil sump, then disconnect the condensate return pipe located next to the dipstick tube (arrows in **photo #3**).

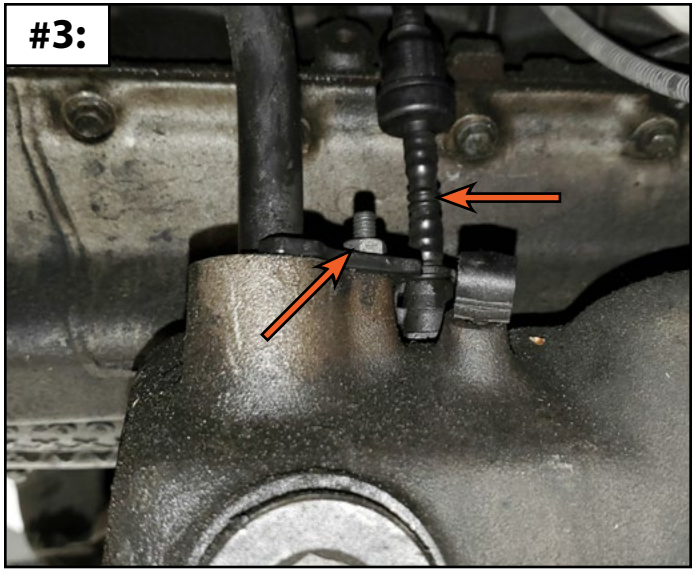
#1:



#2:



#3:



DISASSEMBLY PROCEDURE

Step 9:

There are 28x bolts which secure the oil sump to the engine (**photo #1 & photo #2**). It's extremely important to note that some of them are different lengths.

Please reference the color codes below for the various bolt diameters and lengths:

- M6x20mm
- M6x25mm
- M6x95mm
- M8x50mm

Please continue to the next page ***BEFORE*** removing any of the sump bolts.

#1:

#2:

DISASSEMBLY PROCEDURE

Step 10:

NOTE

Be aware that there will still be some oil left inside the sump.

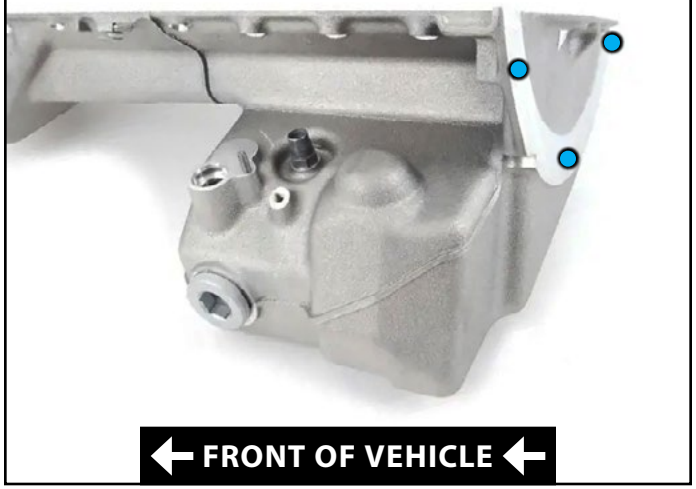
Support the oil sump from below. Remove the 3x E10 E-Torx bolts which secure the rear of the oil sump to the bell housing (**BLUE** dots in **photo #2**). Remove the 25x 10mm bolts (**YELLOW** dots and arrows in **photo #1 & photo #3**).

Please note that the two rearmost 10mm bolts are recessed in the bell housing, but they can easily be reached with an extension (**photo #3**).

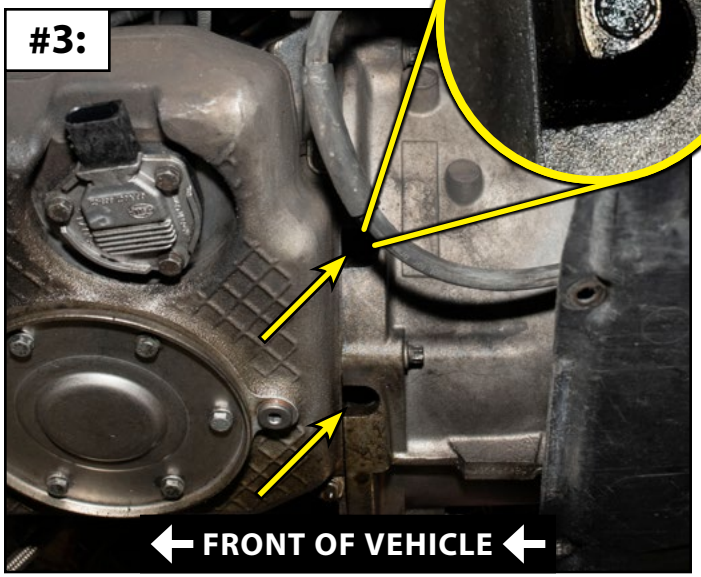
Carefully lower the oil sump once all of the bolts have been removed.

#1:

#2:



#3:



DISASSEMBLY PROCEDURE

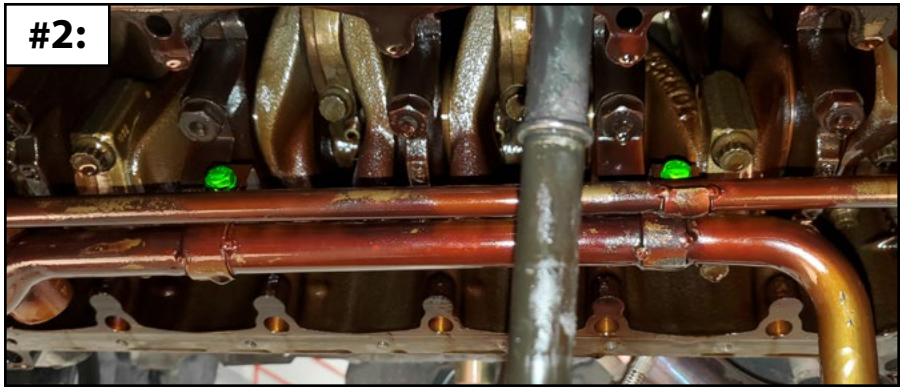
Step 11: 4mm & 6mm Hex (Allen), 10mm Socket & Ratchet

Now it's time to remove the oil pump, pickup and overflow tubes. Remove the two 4mm Hex (Allen) bolts from the overflow tube (**YELLOW** arrows in **photo #1**). Remove the two 10mm bolts from the pickup tube (highlighted in **GREEN** in **photo #2**). Pull the tubes rearward out of the oil pump and remove them.

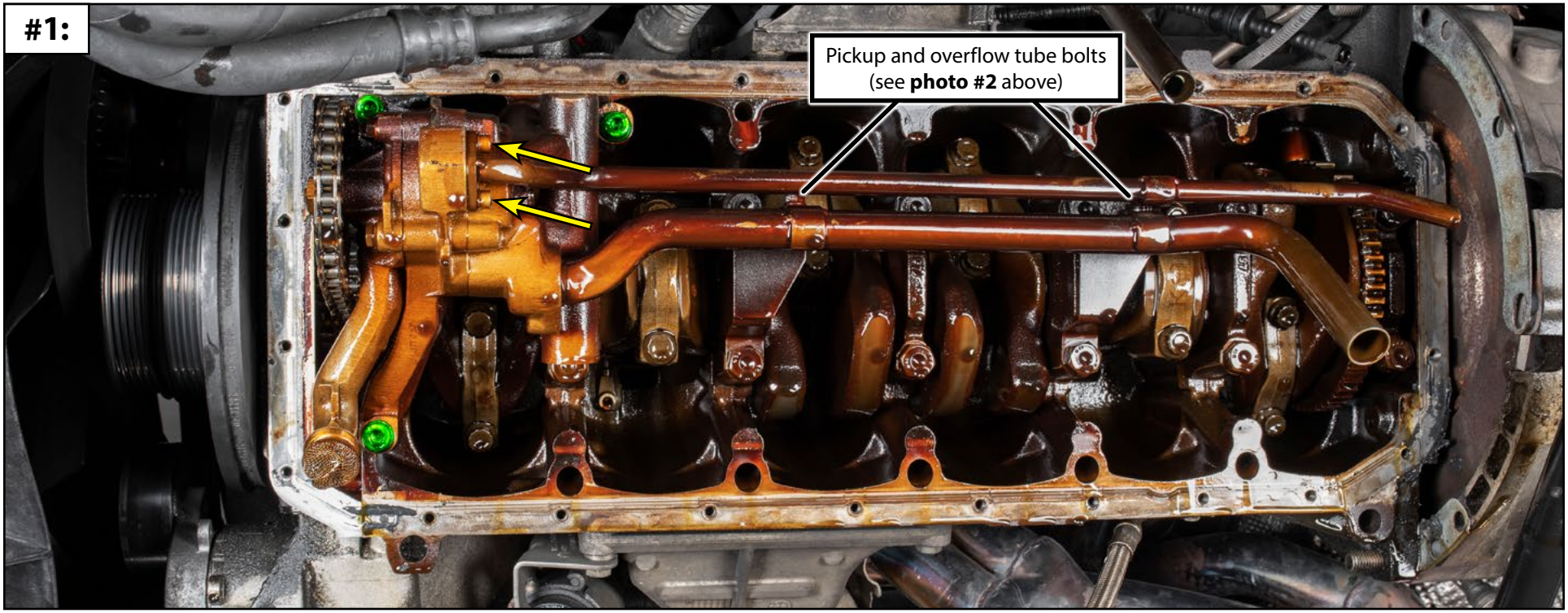
Remove the three 6mm Hex (Allen) bolts from the oil pump.

Continue to the next page.

#2:



#1:

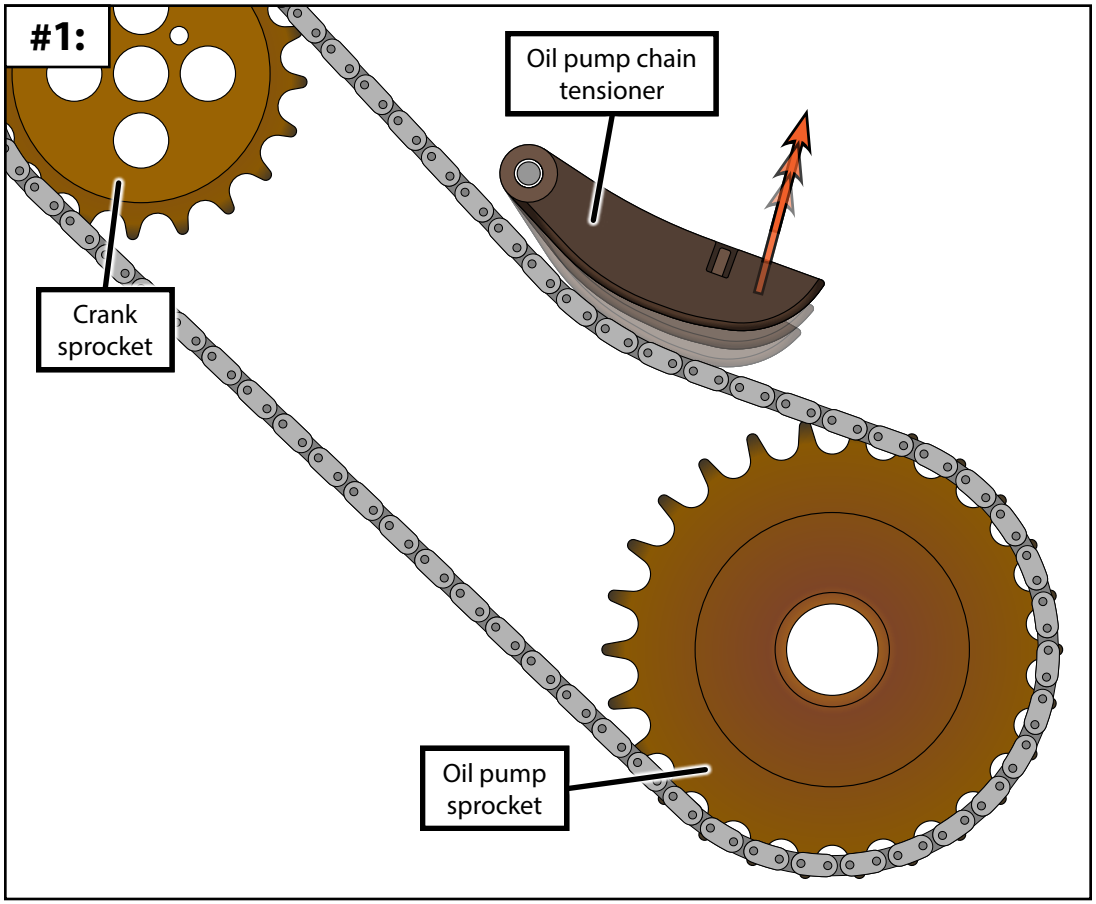


DISASSEMBLY PROCEDURE

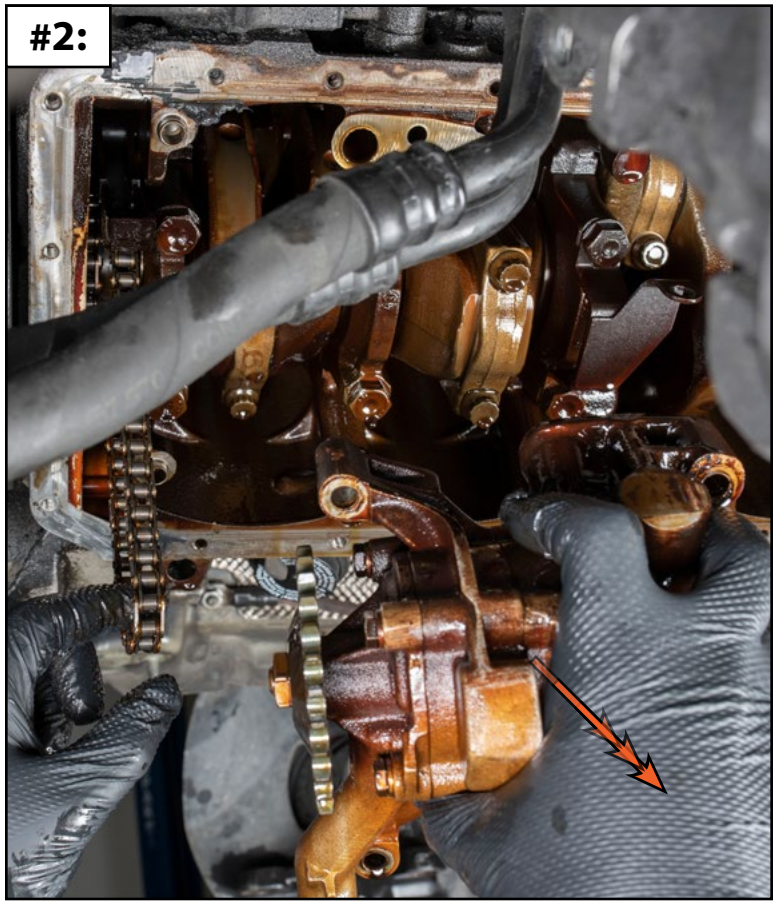
Step 12:

Push the tensioner upward and away from the oil pump chain (**photo #1**), then use the slack in the chain to pull it off of the oil pump sprocket (**photo #2**). Remove the oil pump from the engine.

#1:



#2:

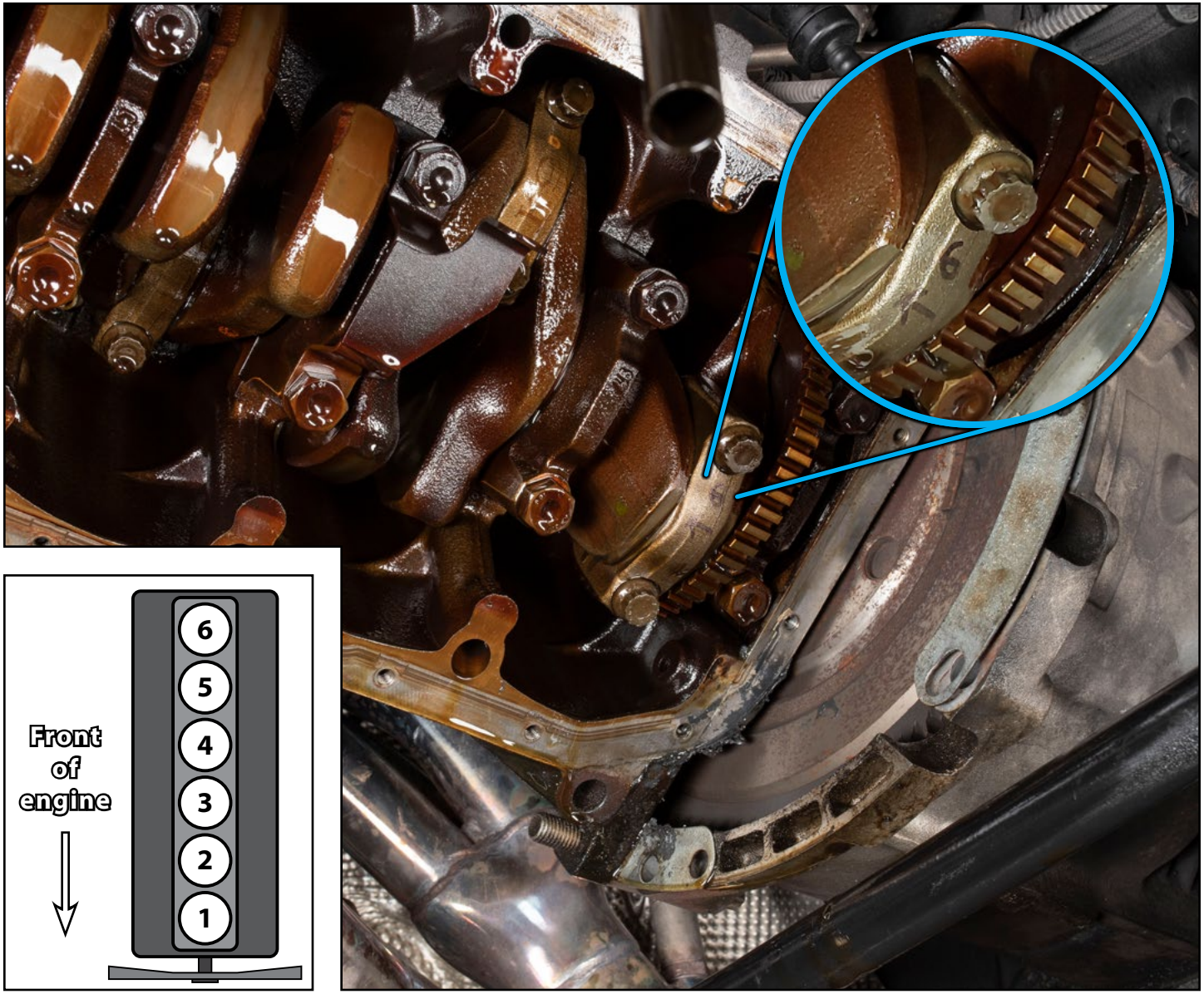


DISASSEMBLY PROCEDURE

Step 13:

It's almost time to start replacing the rod bearings. Now is a good time to wipe the rod bearing caps with a clean rag, then mark the cylinder number and direction on the cap with a marker (inset photo). We also strongly suggest marking each rod bolt against the rod cap so you know exactly where the bolt came from (see notes on Page 6).

Starting on the next page we will walk you through how to replace your rod bearings. We strongly recommend that you start by working on whichever rod is located closest to BDC (bottom dead center). Then, once that bearing has been replaced and the bolts have been torqued, rotate the engine clockwise (as viewed from the front of the engine looking at the crank pulley), and work on that rod bearing next. Doing so will allow you to replace all of the bearings while only rotating the engine over one full rotation.



INSTALLING THE NEW CONNECTING ROD BEARINGS

Step 1:

STOP

We strongly recommend that you read this entire section (Pages 20-24) ***before*** starting to replace any of the bearings. We're going to review how to replace the bearing shells, use Plastigage® to check bearing clearance, proper application of assembly lube to the bearing surfaces, then proper torque procedures and reassembly.

STOP

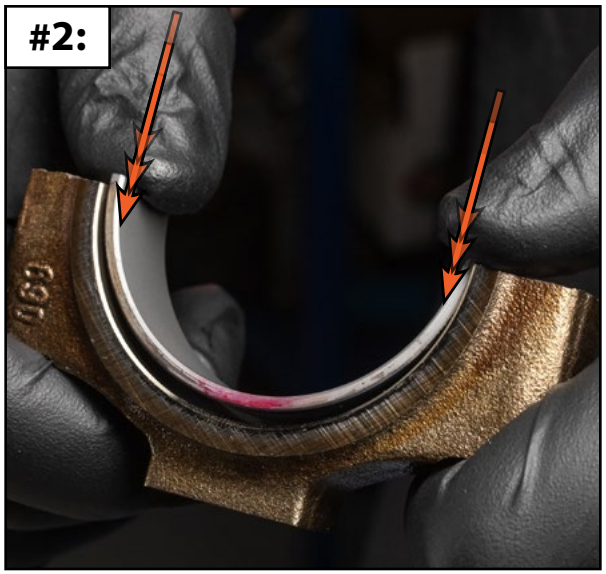
Remove the rod bearing cap from the rod, then remove and inspect the bearing shells. Thoroughly clean the insides of the rods and caps before installing the new bearing shells, then clean the crankshaft journal. These surfaces must all be dry and free of oil before proceeding.

Place the new lower bearing shell (marked w/**RED** paint) into the cap, and place the new upper bearing shell (marked w/**BLUE** paint) into the connecting rod. Be sure to align the locating tang (highlighted in **GREEN** in **photo #1**) with the grooves in the cap and the connecting rod. Push the bearing shells until they are fully seated, and are sitting flush on each side (**photo #2 & photo #3**).

Repeat this procedure on all of the rod bearings, and use our S54 bearing organizer sheet to keep everything in order.

#1:

#2:



#3:

INSTALLING THE NEW CONNECTING ROD BEARINGS

Step 2:

Now it's time to check the bearing clearance. The easiest way to do this at home is with Plastigage®.

Cut a short length (¼"-½") of **GREEN** Plastigage® and place it inside the bearing cap (**photo #1**). It's important to note that the bearing shells and crankshaft must be completely dry and free of any oil for accurate Plastigage® readings.

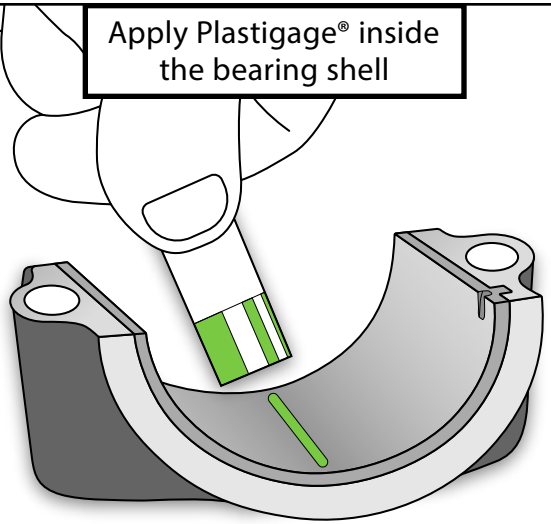
If you are using OE rod bolts:

- Reuse the original rod bolts to install the connecting rod cap into place (**photo #2**).
  - If your vehicle has a production date ***UP TO*** 12/12/2002 w/M11 rod bolts, you ***MUST*** install the original rod bolts back into the exact same rod cap holes as when they were removed.
- Be careful to install the bearing cap into place without sliding it around on the crank journal, this could smear the Plastigage® and throw off your bearing clearance measurement.

If you are using ARP rod bolts:

- Use the ***NEW*** ARP rod bolts to install the connecting rod cap into place (not shown).
- Be careful to install the bearing cap into place without sliding it around on the crank journal, this could smear the Plastigage® and throw off your bearing clearance measurement.

#1: Apply Plastigage® inside the bearing shell



#2: Thread in the ***OLD*** bolts by hand

INSTALLING THE NEW CONNECTING ROD BEARINGS

Step 3:

Please reference the rod bolt torque specs listed below. Take your time in this step, work on one rod at a time, and use the check boxes on our bearing organizer sheet (Page 6) to mark down each rod bolt as you torque them to spec.

I. Vehicles produced *UP TO* 12/12/2002 w/M11 rod bolts:

1. Initial torque — 5 Nm
2. Setting torque — 30 Nm
3. Additional turn — 70° (in one single stroke)

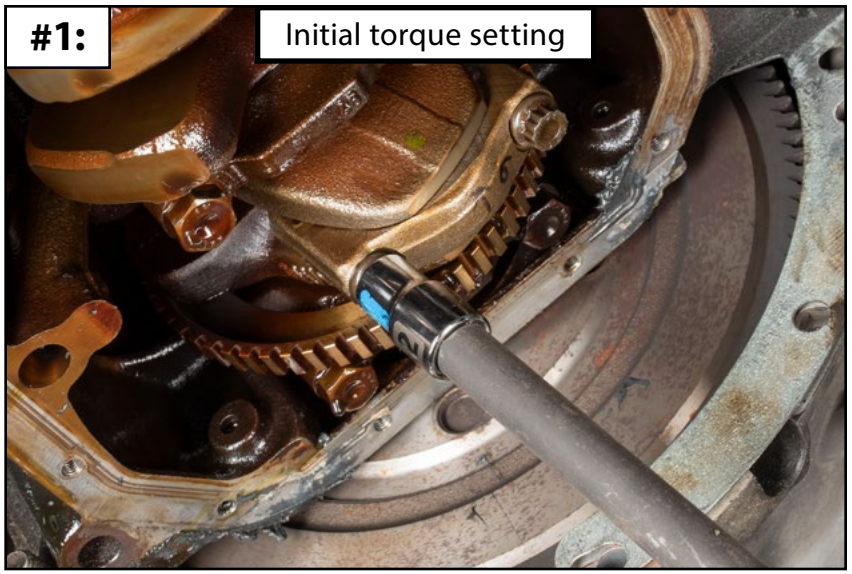
II. Vehicles produced *FROM* 12/13/2002 with M10 rod bolts:

- **Stage 1**
  1. Initial torque — 5 Nm
  2. Setting torque — 30 Nm
  3. Additional turn — 105° (in one single stroke)
  4. **IMPORTANT** — Loosen rod bolt one full turn
- **Stage 2**
  1. Initial torque — 5 Nm
  2. Setting torque — 30 Nm
  3. Additional turn — 105° (in one single stroke)
  4. **IMPORTANT** — Loosen rod bolt one full turn
- **Stage 3**
  1. Initial torque — 5 Nm
  2. Setting torque — 30 Nm
  3. Additional turn — 70° (in one single stroke)
- **Complete all three stages on ALL rod bolts**

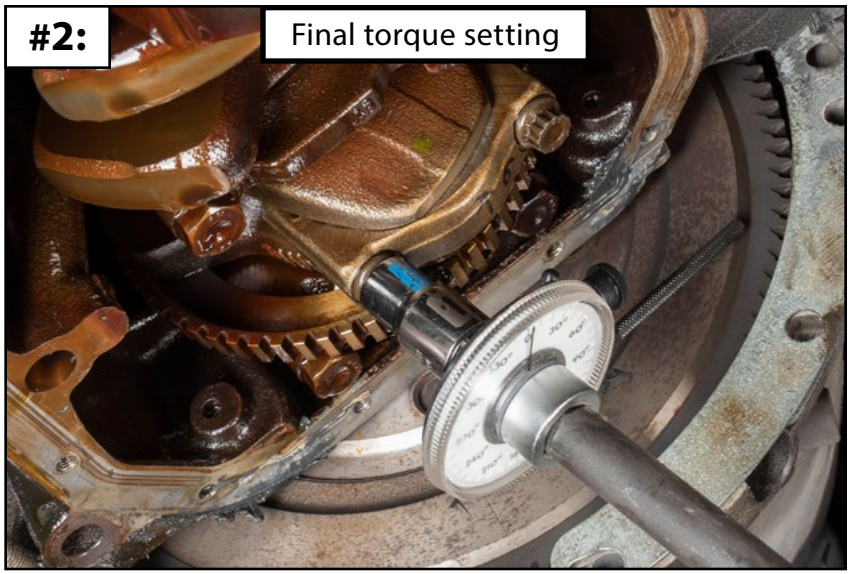
III. If you are using ARP rod bolts:

1. Follow the instructions supplied with the ARP rod bolt kit.
2. Final torque — 70 Ft-lbs

#1: Initial torque setting



#2: Final torque setting



INSTALLING THE NEW CONNECTING ROD BEARINGS

Step 4:

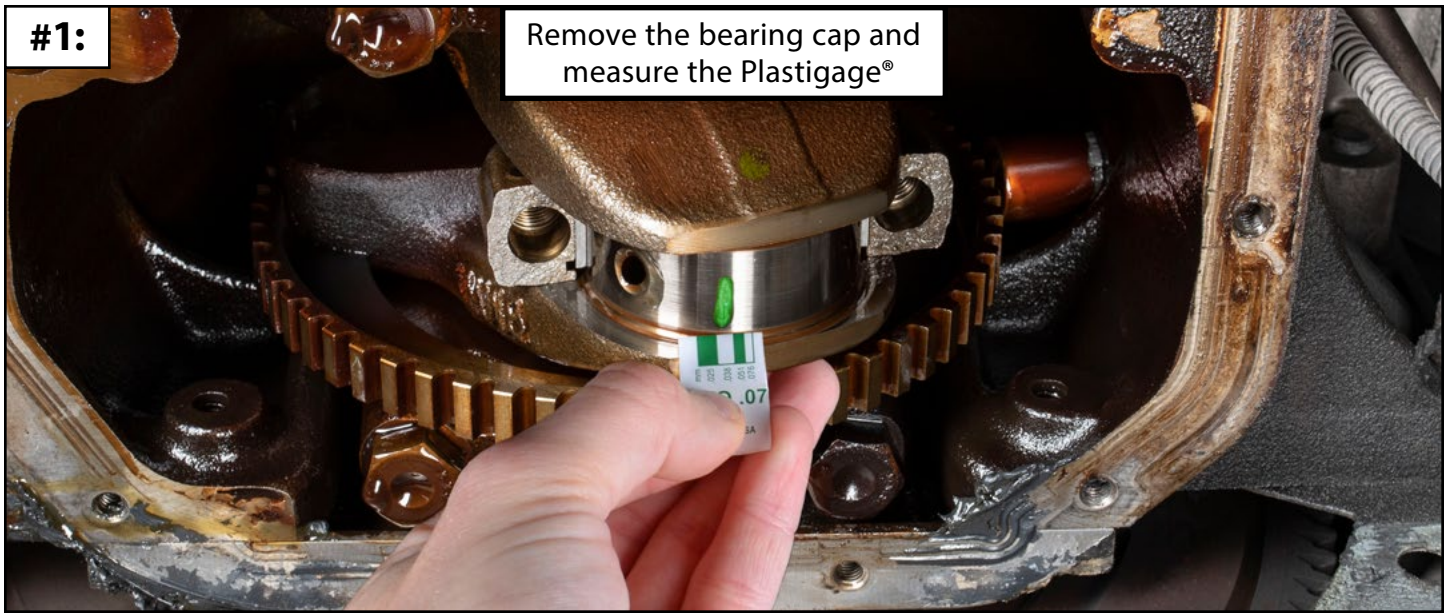
Remove the bearing cap and inspect the now compressed Plastigage® on the crank journal (**photo #1**). Use the ruler on the Plastigage® packet to measure the width, this will tell you what the bearing clearance is (**photo #2**).

The rod bearing clearance specification for S54 engines with WPC treated rod bearings (***part #'s 11247835439WPC or 11247835440WPC***) is:

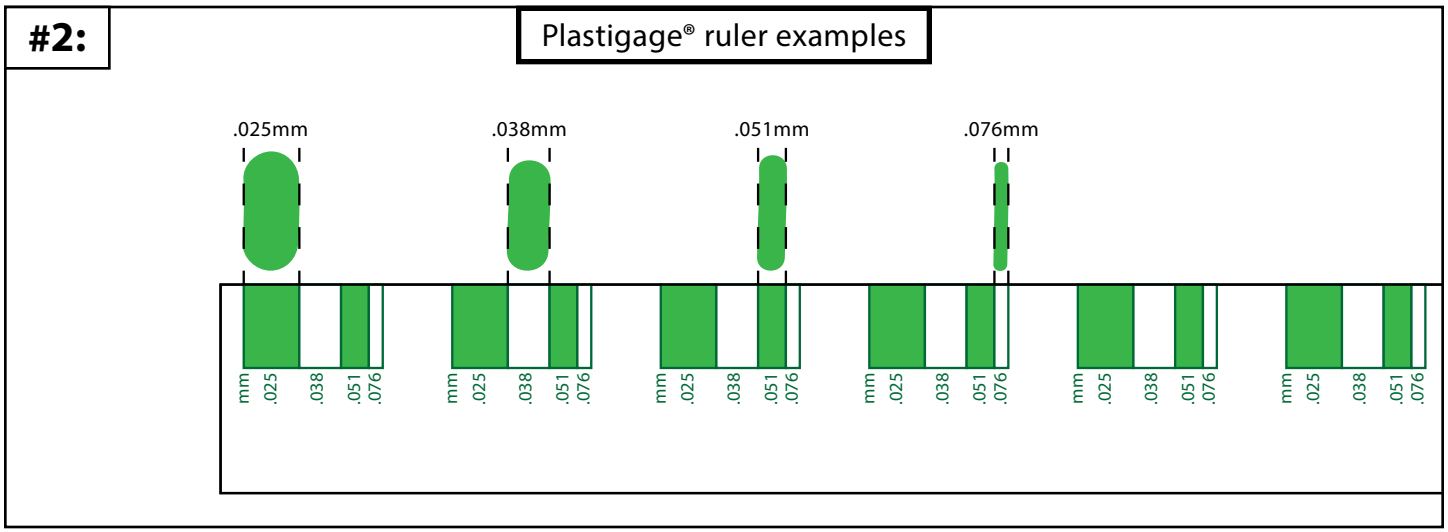
- ***0.0361 - 0.0660mm***

If your bearing clearance does not fall within that specification, we would strongly recommend that you ***STOP*** now and take your engine to a machine shop for evaluation.

#1:



#2:



INSTALLING THE NEW CONNECTING ROD BEARINGS

Step 5:

All Plastigage® should now be gently removed from the bearing and crank journal. Coat the inside of the bearing shells with assembly lube (we're referring to the surfaces which ride up against the crank journal, not the surfaces which sit inside the connecting rod or the connecting rod cap).

I. Vehicles produced *UP TO* 12/12/2002 w/M11 rod bolts:

- Install the original rod bolts back into the exact same rod cap holes as when they were removed (**photo #1**).
- Torque the rod bolts to spec (reference Page 22).
- Repeat this procedure on all rod bearings (**photo #2**).

II. Vehicles produced *FROM* 12/13/2002 with M10 rod bolts:

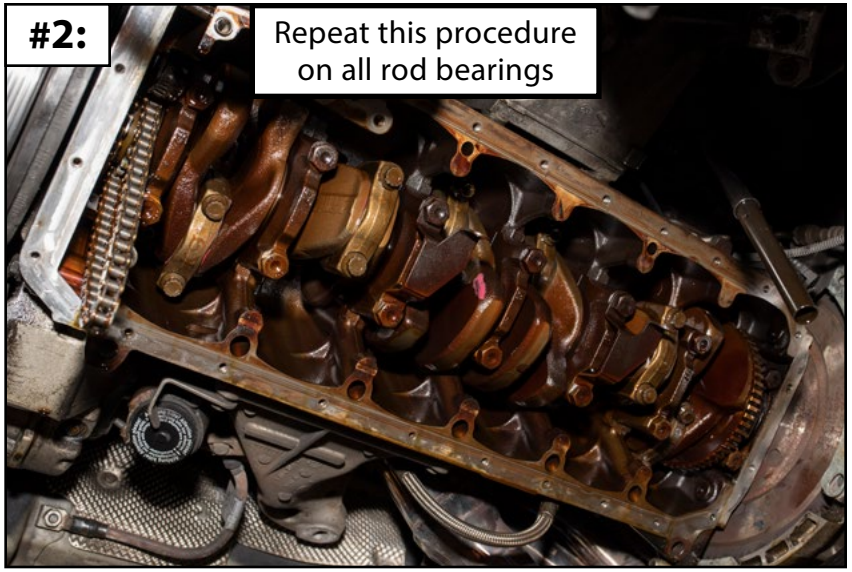
- Discard the old rod bolts.
- Install the bearing caps with the ***NEW*** bolts (**photo #1**).
- Torque the rod bolts to spec (reference Page 22).
- Repeat this procedure on all rod bearings (**photo #2**).

If you are using ARP rod bolts:

- DO NOT discard the ARP rod bolts, they are reusable.
- Install the bearing caps with the ***NEW*** ARP rod bolts (not shown).
- Torque the rod bolts to spec (reference Page 22).

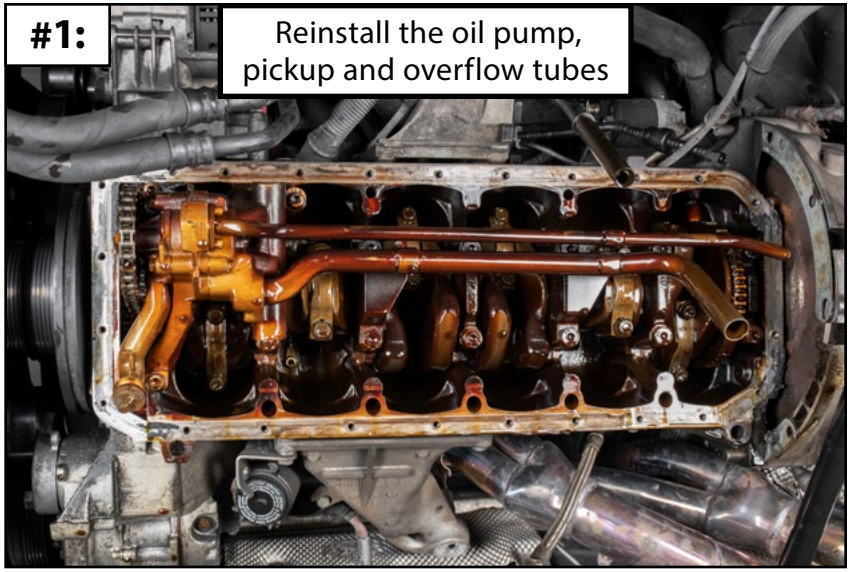
#1: Coat the bearings with assembly lube, install the caps, torque to spec

#2: Repeat this procedure on all rod bearings

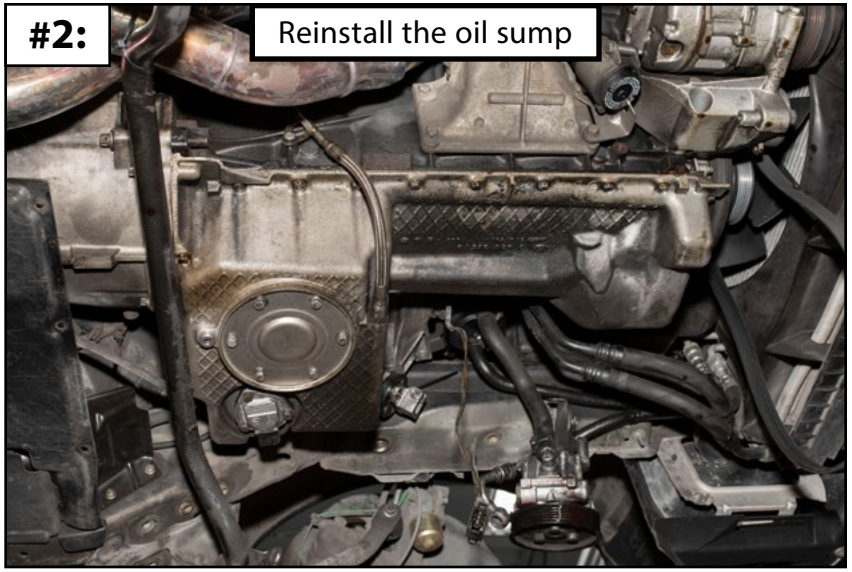


- [ ] Reinstall the oil pump (**photo #1**).
- [ ] Reinstall the oil pickup and overflow tubes (**photo #1**).
- [ ] Reinstall the oil sump (**photo #2**).
  - M6 8.8 bolts: **10 Nm**
  - M6 10.9 bolts: **12 Nm**
  - M8 8.8 bolts: **22 Nm**
- [ ] Reinstall the oil dipstick tube and condensate return pipe.
- [ ] Reinstall the oil return line into the oil sump.
- [ ] Reinstall the front sway bar.
  - Bracket nuts: **22 Nm**
- [ ] Reinstall the power steering pump and support bracket.

#1: Reinstall the oil pump, pickup and overflow tubes



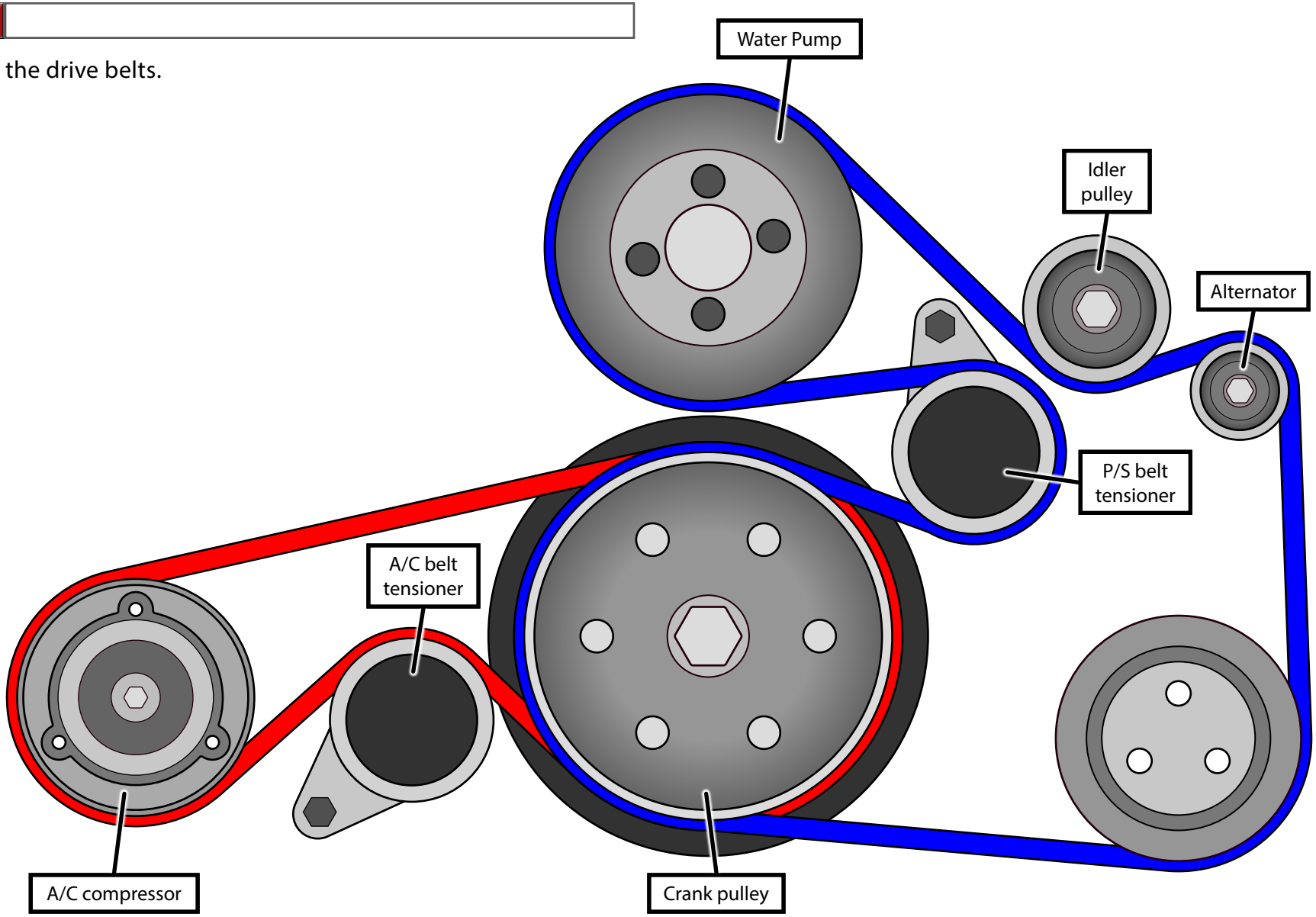
#2: Reinstall the oil sump

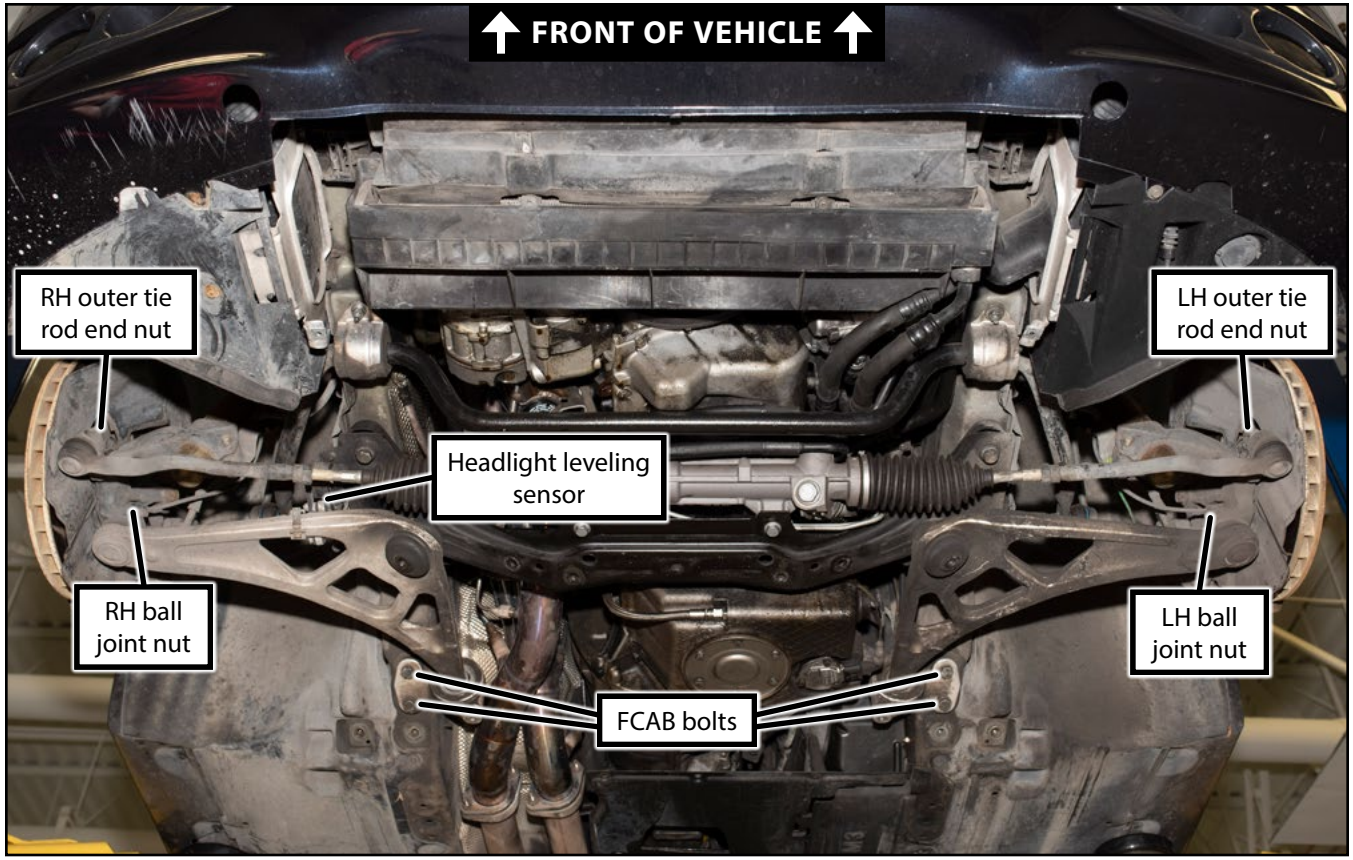


REASSEMBLY PROCEDURE

Step 2:

Reinstall the drive belts.





- [ ] Reinstall the front subframe.
  - M12 (8.8): **77 Nm**
  - M12 (10.9): **110 Nm**
  - M12 (12.9): **105 Nm**

- [ ] Replace the steering shaft u-joint bolt and reconnect the shaft to the steering rack.
  - M8 bolt: **22 Nm**

- [ ] Reconnect the power steering lines to the rack and the pump.
  - M14 banjo bolt: **35 Nm**
  - M16 banjo bolt: **40 Nm**
  - M18 banjo bolt: **45 Nm**

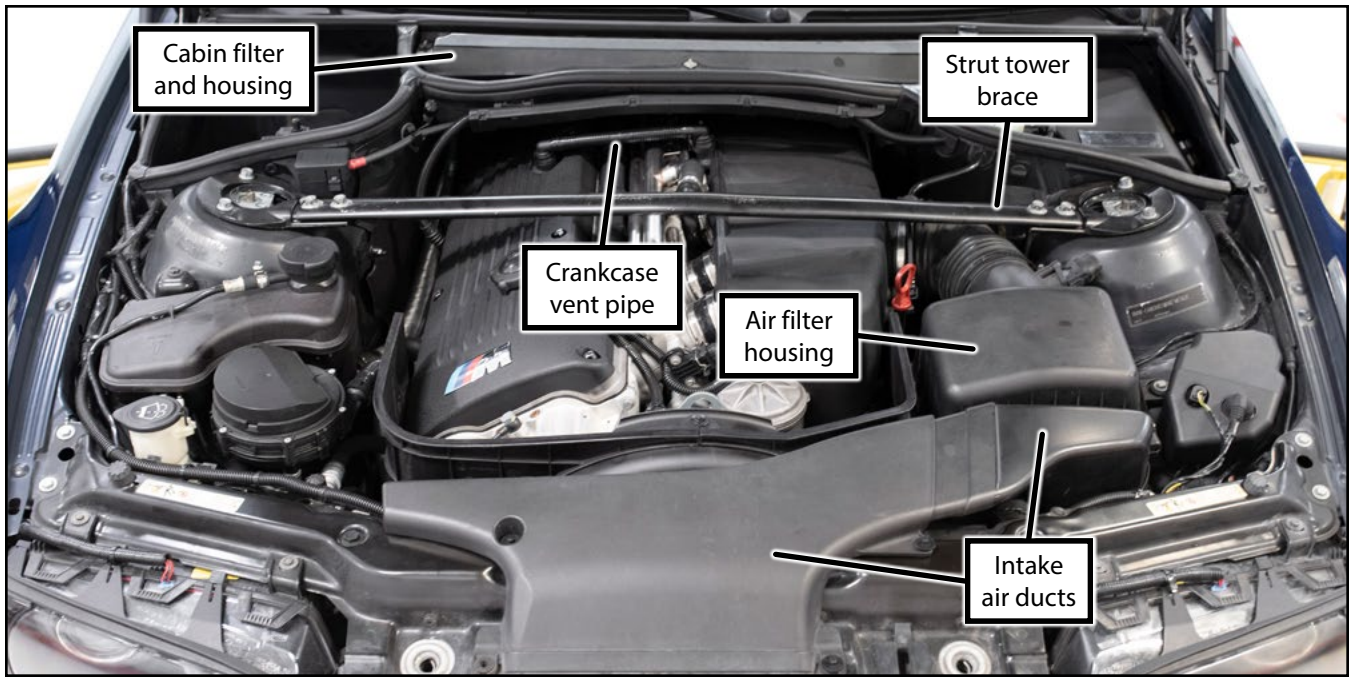
- [ ] Reconnect the headlight leveling sensor.

- [ ] Reinstall the outer tie rod ends.
  - Replace nuts: **65 Nm**

- [ ] Reinstall the lower ball joints.
  - Replace nuts: **90 Nm**

- [ ] Reinstall the FCAB housings.
  - Replace bolts: **59 Nm**

- [ ] Replace the bolts for the subframe reinforcement panel, then tighten them to:
  - Stage 1: **59 Nm**
  - Stage 2: **90°**
  - Stage 3: **30°**



- [ ] Lower the engine down until the engine mounts are fully seated.

- [ ] Reinstall the engine mounts.
  - M8 nuts: **22 Nm**
  - M10 nuts: **47 Nm**

- [ ] Remove the engine support bar.

- [ ] Reinstall the spark plugs.
  - M12: **23 Nm +/- 3 Nm**
  - M14: **31 Nm +/- 2 Nm**

- [ ] Reinstall the coil packs, **but leave the electrical connectors detached for now**.

- [ ] Reinstall the fan shroud, air filter housing, intake air ducts, crankcase vent pipe, strut tower brace, cabin filter and housing.

- [ ] Remove the fuel pump fuse, then reconnect the negative (-) battery terminal.

- [ ] Replace the engine oil filter, then fill the engine oil to capacity.

- [ ] Turn the ignition switch to “Crank” and let the engine turn over for 5-10 seconds. This will allow the oil pressure to build without the engine needing to run.

- [ ] Reconnect the coil pack electrical connectors, reinstall the coil cover, reinstall the fuel pump fuse.

- [ ] Start the engine, let it idle and listen for knocks. Run the engine like this for 5-10 minutes (provided you don't hear any knocks).

- [ ] Turn off the engine and change the oil and filter again. Change the oil one last time after 1,000 miles.

Your S54 WPC Treated Rod Bearing Kit installation is complete!

These instructions are provided as a courtesy by ECS Tuning

Proper service and repair procedures are vital to the safe, reliable operation of all motor vehicles as well as the personal safety of those performing the repairs. Standard safety procedures and precautions (including use of safety goggles and proper tools and equipment) should be followed at all times to eliminate the possibility of personal injury or improper service which could damage the vehicle or compromise its safety.

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