DIY: E46 M3 detailed subframe reinforcement, gear fluid changes, & bushing refresh

Faults, Fixes and DIY Please share your experience and knowledge with other members by contributing your own DIY, or by helping another member find the elusive fix!

Thread Tools

Old Sat, May-

24-2014,
06:29:24 PM

bimmerfan08
Registered User

bimmerfan08's Avatar

Join Date: Jan 2009
Posts: 6,748
In the garage: '02 BMW M3
Reputation: 0
bimmerfan08 is on a distinguished road
Location: Charlotte

United States

Default **DIY: E46 M3 detailed subframe reinforcement, gear fluid changes, & bushing refresh**

This DIY is for the most part, straightforward but time consuming. Depending on what reinforcement method is chosen, plan to have the M3 out of service for 3-5 days. Plan to also inject structural foam into the subframe cavity to increase the stiffness and minimize flexing or use a mechanical fastening method to marry the upper and lower subframe panels.

Tools needed:
3/8" drive ratchet
1/2" drive ratchet
3/8" drive torque wrench
1/2" drive torque wrench
3/8" drive breaker bar
3/8" to 1/2" socket adapter
1/2" to 3/8" socket adapter
3/8" various socket extensions
6mm hex bit socket
7mm hex bit socket
14mm hex bit socket (optional if doing differential fluid change)
8mm hex socket
10mm hex socket
10mm deep well hex socket
12mm deep well hex socket
13mm hex socket
13mm deep well hex socket
17mm hex socket
17mm deep well hex socket
18mm hex socket
18mm deep well hex socket
19mm hex socket
21mm hex socket
E12 socket
E14 socket
12mm open end wrench (for Koch tool)
2 x 13mm open end wrenches
14mm open end wrench
18mm box end wrench
18mm open end wrench
24mm open end wrench (for Koch tool)
30mm open end wrench
3 jaw puller
Chisel
Needle nose pliers
Rubber mallet
Steel hammer
Straight head screwdrivers
2 x jack or lift
4 x jack stands minimum or lift
Angle grinder
Tin snips
Power drill either cordless or corded

Angle grinder or power drill discs & paint removal brushes/wire wheels
Flashlights
C-clamp
Mechanic's work light/lamp
3/8" or 1/2" drive air impact wrench/gun (optional)
3/8" drive air socket wrench (optional)
Air compressor (optional)
Koch BMW E46 rear suspension subframe bushing tool set (highly recommend)

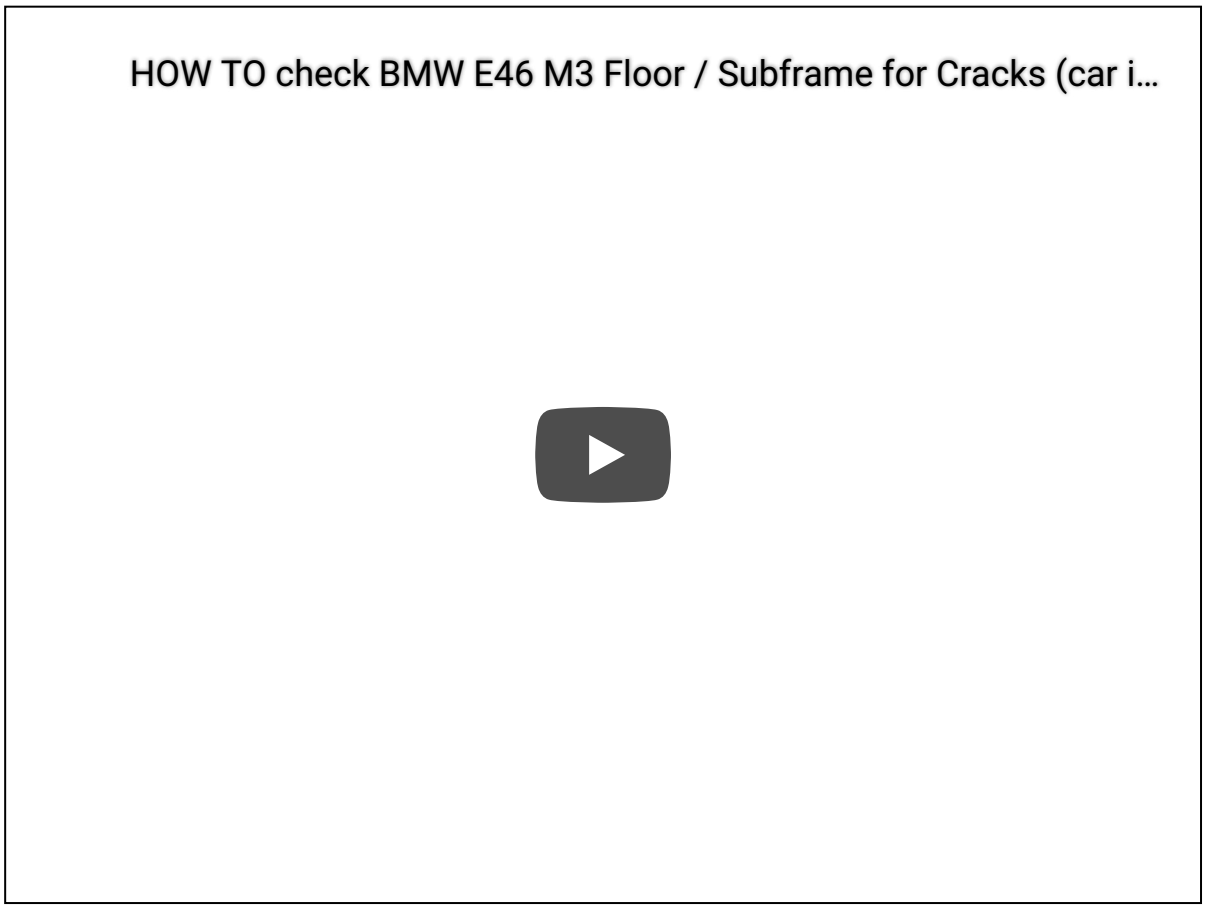
Parts and supplies needed:
1 x center support mount (PN: 26122282495) - includes new bearing
1 x flex disc (PN: 26112226527)
6 x flex disc hex bolt (PN: 26117635643) - optional
6 x flex disc hex lock nut (PN: 26127536563)
2 x header to section 1 exhaust gasket ring (PN: 11627830668)
2 x section 1 to section 2 exhaust flat gasket (PN: 18307830674)
6 x section 1 to section 2 exhaust hex bolt (PN: 07119902901)
6 x section 1 to section 2 exhaust hex nut (PN: 11621744323)
4 x header to section 1 torx bolt (PN: 11621318568)
4 x header to section 1 hex nut (PN: 18301317898)
1 x driveshaft end cover with gasket (PN: 26117540778)
2 x transmission mounts (PN: 22322282340) or aftermarket mounts (Rogue Engineering)
1 x subframe left front bushing (PN: 33312283573) or aftermarket bushings (AKG)
1 x subframe right front bushing (PN: 33312283574) or aftermarket bushings (AKG)
2 x subframe rear bushing (PN: 33312283419) or aftermarket bushings (AKG)
1 x differential front mount bushing (PN: 33172282484) or aftermarket bushings (AKG, Turner)
2 x differential rear mount bushing, requires new differential cover if going with OEM bushings (PN: 33112282482) along with differential cover sealant (PN: 83190404517) or aftermarket bushings (AKG, Turner)
1 x section 2 to rear muffler gasket ring (PN: 18101405737)
4 x section 2 to rear muffler bolt (PN: 07119904533)
2 x rear upper control arm bushing (PN: 33321092247)
2 x rear lower control arm bushing (PN: 33326770824)
2 x subframe reduced shaft bolt (PN: 33326760361)
2 x subframe threaded bolt (PN: 33326760360)
2 x subframe self-locking collar nut (PN: 33326760374)
1 x differential front hex bolt with washer (PN: 33177840535)
2 x differential rear torx bolt (PN: 23001222891)
2 x differential rear bolt washer (PN: 07119931021)
3 x v-brace bolt with washer (PN: 33306760652)
4 x subframe cross member bolt with washer (PN: 33326760345)
3 x BMW differential fluid 0.5 liter (PN: 83222282583) - optional if doing differential fluid change
2 x differential fill/drain plug crush washer (PN: 07119963355) - optional if doing differential fluid change
2 x Pentosin manual transmission fluid 1 liter or 1 x BMW SAE 75W-80 MTF-LT-2 5 liter (PN: 83220309031) - optional if doing transmission fluid change
1 x subframe metal plate reinforcement kit of choice (Turner, Redish Motorsport, VAC, HPF)
1 x 200ml 3M 08115 panel bonding adhesive or 3M DP420 black structural adhesive
1 x 200ml applicator gun
1 x tube blue Loctite (red Loctite can be used, but remember it requires heat)
1 x fluid pump and bottle quart or gallon (optional if doing gear fluid changes)
Various 1/2" inner diameter washers with outer diameters slightly smaller than diameters of

control arm and differential bushings
Undercoating paint and primer (POR-15, Rust-Oleum, Rust Bullet, or Chassis Saver)
Rubberized undercoating paint (POR-15, 3M, or Rust-Oleum)
50 grit sandpaper
Brake parts cleaner or liquid metal acid cleaner
Puddy spreader(s)
2 x zip ties
CV joint grease
Anti-seize
PB Blaster
Propane torch
DOT 4 brake fluid
Latex/rubber gloves
Safety glasses or goggles
Respirator
Small plastic bags to contain hardware or paper and pen to lay out hardware
E46 3 series Bentley manual for reference

Notes/additional information:

Also now is a good time to order any parts that require the underside of the car and drive train to be disassembled. Parts such as rear trailing arm bushings, rear sway bar bushings, fuel filter, new exhaust sections, rear brake lines, rear brake pads, coilovers, shocks, rear ball joints, shift assembly parts/bushings, exhaust hangers/hardware, and differential seals.

This video is a great watch to figure out where to look for cracks under an e46 M3. Check for cracks ahead of time to determine the severity of the sheet metal. If cracks are severe, consider welding them or replacing the trunk floor before proceeding. Credit to Redish Motorsport.



Before performing this DIY, ensure you have all necessary parts, supplies, and tools. I chose to use my old chemistry goggles as they completely sealed to the area around my eyes.

The method I use to organize hardware as I remove it from the car.

This is optional, but I have a log book that I use to jot down notes, torque values, and tips when performing work on my M3.

Procedure:

Step 1: Safely jack the car up and have it supported by jack stands. I recommend the safe highest extension the jack stands can support. If you have a lift, this shouldn't be an issue. For comparison purposes, I had 17.5" of clearance from the bottom of the side skirt to the garage floor. Don't ever substitute jack stands or a lift with anything else to support the weight of the car.

I chose to also put cinder blocks underneath the car to support the weight in case of a jack stand failure. Cinder blocks should be laid horizontal to properly support a load (disregard the two cinder blocks in the rear that are turned vertical). Do not, I repeat, do not use cinder blocks or anything else in place of jack stands or a lift. Cinder blocks are what I had on hand, but a wheel turned sideways or a large piece of wood works very well underneath the car. I recommend safety first and having a fail safe method in place to get out from underneath the car in time in case of collapse. I also taped down the latches on the jack stands once the

height was in final position. Another method I commonly use and highly recommend, is to have a jack at full reach underneath the car in the area of work being peformed.

Step 2: If your exhaust hardware was rusted like mine, soak all hardware in PB Blaster and let sit for a few hours if severely rusted.

Step 3: Remove the plastic guard panels underneath transmission and fuel filter. The screws require an 8mm hex socket.

Step 4: Locate and remove the headers to section 1 bolts and nuts. If in good condition, the

bolts require an E12 socket and the nuts require a 14mm open end wrench. Use a propane torch as necessary to heat up the hardware and break apart rust. Be safe and use appropriate eye wear and gloves. I had to drill through one of the nuts and tap it with a hammer to remove the bolt.

Applying heat.

Section 1 disconnected from headers. Replace one of the old torx bolts through the section 1 flange to the header flange to secure the exhaust up and out of the way until all exhaust hardware has been removed from each section.

Step 5: Locate the 2 section 2 exhaust brackets. Remove the 4 bolts from each bracket as well as the 2 nuts for the section 2 exhaust hanger. All nuts and bolts require a 13mm hex socket.

Step 6: Locate the section 2 to muffler connection. Remove the 2 bolts from each flange (4 bolts total) using a 13mm hex socket. Apply PB Blaster and heat as needed. After removing the bolts, pull section 2 forward towards the front of the car while pulling the muffler gently towards the rear of the car to separate the connection. (My hardware for one of the flanges is different as I broke the flange a year ago and had to compensate with different hardware)

Step 7: Use a jack to take the weight of the muffler off the muffler hangers as well as support

it. Position the jack a few inches towards the drive center from the center of the muffler. Locate and remove the hext nuts on the muffler hangers. There are 3 muffler hangers with 6 hex nuts. 1 hanger is on the passenger side and 2 hangers are on the driver side. Use a 13mm deep well hex socket and socket extension to remove the hex nuts. After the nuts have been removed, gently lower the jack while ensuring the muffler doesn't catch any of the body panels/underbody.

Muffler removed from car.

Step 8: At this point, section 1 and section 2 are still bolted together and only remain underneath the car by resting on the v-brace and the 1 torx bolt between the headers and section 1. Jack near the center of the section 1 and section 2 to remove the weight off of the v-brace.

Step 9: Locate the v-brace bolts. There are 3 total. The 2 outer bolts are directly behind the rear jack pads. The center bolt is directly in front and below the differential input flange near the rear center jack point. Use PB Blaster and heat as needed. Use a 17mm hex socket to remove them. Caution when removing the center bolt as the bolt threads tend to be very rusted due to the topside of the bolt hole being open and exposed to the elements. I sheared the bolt removing it and had to have a shop drill it out for me.

V-brace removed.

Sheared center v-brace bolt.

Underside of E46 M3.

Step 10: Position 1 jack near the end of section 2 and jack up to support weight. Reposition the second jack closer to the headers to section 1 connection. Jack up to support weight. Remove the torx bolt from the headers to section 1 connection.

Progressively work both jacks to lower sections 1 and 2 evenly towards the floor. A second person working the second jack can make this part go much quicker.

Remove sections 1 and 2 from underneath the car.

Step 11: Locate driveshaft exhaust heat shield underneath car. There are 5 screws securing it to the body underside. 4 screws require a 10mm hex socket and 1 screw requires an 8mm hex socket. Remove all screws and pull the heat shield down gently. If need be, slide the heat shield forward to unhook the slots from the 2 plastic panel hooks in towards the rear.

Step 12: Locate heat resistant plate underneath driver side front subframe bushing. Remove both screws using a 10mm hex socket. Set aside plate and screws.

Step 13: Locate and remove the driver side fuel tank plastic guard panel. Use a 8mm hex socket to remove the screw. Use needle nose pliers or the special tool to remove the plastic fasteners.

Driver side gas tank exposed.

Step 14: Locate and remove the passenger side fuel tank plastic guard panel. Use an 8mm hex socket to remove the screws. Use needle nose pliers or the special tool to remove the plastic fasteners.

Step 15: This step is optional. My M3 was due for a transmission fluid change. Locate the fill plug on the driver's side of the transmission. Place a catch pan or funnel and jug like I have pictured below the fill and drain plug. Use a 17mm hex socket and breaker bar to remove the fill plug first. Using a 17mm hex socket, remove the drain plug on the bottom of the transmission. Allow the old transmission fluid to drain out for several minutes. My fill plug had a green dot on the head of it. I kept the two plugs separate from each other.

Fill plug with green dot.

Both fill and drain plugs removed.

Step 16: Again, this step is optional as it proceeds the previous step. Use a clean plastic quart or gallon sized container and pour new transmission fluid in the container (PN: 83220309031). Replace the pump by screwing the closure onto the container. Replace the transmission drain plug by hand first. Tighten the plug and then using a 17mm hex socket, torque to 37 ft-lbs. Replace catch pan or jug with funnel under the transmission.

Step 17: This step is optional as it proceeds the 2 previous steps. Slide hose into drain hole on the side of the transmission case. Pump fluid into the transmission until fluid begins to drip out from the fill plug hole. The transmission will take 1.8-2 liters of transmission fluid. Be sure to have enough. Replace the fill plug, tighten by hand, and with a 17mm hex socket, torque to 37 ft-lbs. Clean up any spilled fluid with a rag.

Transmission fluid oozing from transmission fill plug hole.

Torquing transmission fill plug.

Step 18: Place one of the jacks under the transmission behind the transmission brace. Jack up lightly until jack stops. Leave jack in place. It will support the transmission for the following steps.

Step 19: Locate the transmission brace near the back of the transmission. On top of the transmission brace are 2 transmission mounts bolted to the brace. Use a 13mm open end wrench to loosen the nut on top of each transmission mount stud.

Step 20: Locate the transmission brace near the back of the transmission. Peel back the heat shield slightly on the passenger side of the brace to expose the 2 passenger side bolts. Remove the 4 bolts securing the brace to the body of the car. They will require a 13mm hex socket.

Passenger side bolts.

Driver side bolts.

Step 21: Remove the old transmission mounts from the transmission bracket. Use a 13mm hex socket and socket extension to remove the two nuts on the underside of the bracket securing the mount studs. The nuts on top of the studs should twist off by hand. Remove the vibration absorber carefully. Set aside hardware if using new OEM transmission mounts.

Old transmission mounts.

Step 22: Install new transmission mounts (PN: 22322282340) or aftermarket mounts (Rogue Engineering). Ensure the notches in the new bushings line up with the small metal protrusions on the transmission bracket. Secure mounts on top and bottom of transmission bracket using 13mm nuts. Insert the vibration absorber back on to the mount studs. Leave top stud nuts loose. Torque bottom nuts to 15 ft-lbs.

Step 23: Locate the constant velocity joint at the end of the drive shaft nearest the differential. Put the car into gear to keep the drive shaft from spinning. Use an E12 socket and a breaker bar to remove the 6 torx bolts. Break the 3 torx bolts that are easily accessible first. Remove the car from gear. Rotate the drive shaft by hand until the unloosened torx bolts are on the bottom side. Put the car back into gear. Break the 3 remaining torx bolts. Remove all 6 torx bolts and 3 torx bolt reinforcements.

Using a breaker bar and E12 socket to break the torx bolts loose.

All 6 torx bolts and 3 bolt reinforcements removed.

Step 24: Locate the center support bearing in the middle of the drive shaft. Directly behind the center support bearing is the universal joint. Inside the universal joint is an 18mm bolt connecting the 2 halves of the drive shaft. Ensure that the transmission is in gear. Use the box end of an 18mm wrench to fit around the bolt end. Loosen the bolt while the drive shaft is still connected in the car.

Step 25: Locate the flex disc at the end of the drive shaft nearest the transmission. Put the car into gear to keep the drive shaft from spinning. Use a 18mm hex socket with a breaker bar to break the 6 flex disc bolts loose. Break the 3 bolts that are easily accessible first. Remove the car from gear. Rotate the drive shaft by hand until the unloosened bolts are on the bottom side. Put the car back into gear. Break the 3 remaining bolts. Use the open or box end of an 18mm wrench to hold the nut still while removing the 6 bolts.

Bottom 3 bolts removed. Rotate the drive shaft to reach the top 3 bolts.

All 6 flex disc bolts removed.

Step 26: Temporarily reinstall the transmission support bracket. Replace all 4 bolts using a 13mm hex socket and tighten. The torquing of the bolts will come towards the end of the DIY. Remove the jack from underneath the transmission.

Step 27: Locate the center support bearing again. Using a highly visible marker, mark both halves of the drive shaft (the drawn lines on either side of the center support bearing to need to align as straight as possible). Also mark the ends of the center support bracket piece that mates up against the car body. Place a jack at the constant velocity joint end to support the drive shaft. Place another jack directly below the center support bearing to support the two halves of the drive shaft.

Step 28: Remove the 2 nuts securing the center support bearing bracket to the car body studs. Use a 13mm hex socket to remove them. Rest the center of the drive shaft gently on the supporting jack. I recommend a piece of wood laid horizontally across the jack platen to ensure the drive shaft doesn't roll off the jack.

Step 29: Locate the constant velocity joint nearest the differential input flange again. On the sides of the joint are two slots slightly protruding out from the differential input flange. Insert a straight head screwdriver into both slots and work back and forth, prying against the input flange until the joint slides out from the input flange.

Step 30: Gently lower the drive shaft down while sliding the drive shaft toward the rear off of the transmission output flange. It's light enough that it can be supported by your hands. Wrap the constant velocity joint in a plastic bag to keep grease from getting on everything and to keep contaminants out of the grease.

Old and cracked flex disc. Not bad for 137k miles.

Manual transmission output flange.

Manual gearbox shift linkage. I went ahead and replaced all shift bushings, clips, and bearings. I also installed a shorter shift rod. There are separate DIYs out there for this procedure as it is optional depending on the condition of the shift linkage components.

Exposed differential input flange.

Step 31: Open car door to gain access to car interior cabin. Locate the parking brake lever boot near the rear of the center console. Pull up near the base of the boot gently to expose the ends of the parking brake lines.

Step 32: Remove the 2 nuts securing the ends of the parking brake cables. Use a 10mm deep well hex socket.

Step 33: Locate the parking brake lines underneath the car protruding from the channel holes near the fuel tank bridge. Pop both lines out of the retaining clips on the fuel tank bridge. Firmly pull on both parking lines toward the rear of the car to remove them.

Step 34: Locate the passenger and driver side junction boxes for the ABS wheel speed sensor

connection. Both junction boxes are inside the wheel wells directly in front of the rear trailing arms. The passenger side junction box will also include the brake pad wear sensor connection. Open the passenger side junction box. Unclip both the gray and black connections. The black connection if the brake pad wear sensor. The gray connection is the ABS wheel speed sensor connection. Repeat disconnecting the ABS wheel speed sensor connection for the driver side.

Driver side ABS wheel speed sensor connection.

Step 35: After removing the ABS wheel speed sensor connection and brake pad wear sensor connections, unclip the wires from the wheel well cable clips to the outer edges of the rear trailing arms. Gently wrap the sensor cable ends around the rear trailing arms.

Step 36: Locate rear passenger side brake caliper. Remove the brake pad wear sensor from the inside brake pad using needle nosed pliers. Pinch the metal ears together and pull the sensor up and out.

Step 37: Locate rear passenger side brake caliper. Remove the anti-rattle clip using a straight head screwdriver. Remove both protective plugs from the guide bolt bushings using a straight head screwdriver. Remove both guide bolts on the backside of brake caliper. Use a 7mm hex bit socket. Repeat on driver side.

Step 38: Slide the caliper off of the rotor by pulling straight back. Wiggle back and forth if need be. The caliper piston can be compressed while still on the rotor with a c-clamp if removal is difficult. Hang the caliper with a piece of wire wrapped around the bottom side of the rear upper strut mount. Repeat on driver side.

Step 39: Locate and remove the brake line bracket attached to the backside of the rear trailing arm. Use a 10mm hex socket. Repeat on driver side.

Step 40: Locate the rear brake line coupler end to the caliper (I've circled the coupler in red). Use a 14mm open end wrench to break the line loose. Be careful not to get any of the brake fluid on painted surfaces. Twist the caliper off the brake line by hand. Quickly reroute the caliper underneath the lower control arm and reconnect the brake line into the caliper. Tighten the coupler. Ensure the caliper and brake line are clear of the entire rear suspension. Hang the caliper with a piece of wire to the fuel tank tension strap. Repeat on driver side.

Step 41: Locate the rear headlight leveling sensor. It is on the passenger side of the subframe connected to the upper control arm, directly above the passenger side axle (I've circled the sensor in red). Pinch the clips on both sides, pull up, and remove.

Step 42: Working from the passenger side of the rear subframe, locate the rear headlight leveling sensor wire. There are 2 black zip ties securing it to the subframe near the rear subframe bushing. Clip both zip ties with pliers or tin snips. The rear headlight leveling sensor should hang free. Tuck it towards the rear of the car out of the way of the subframe.

Step 43: Locate the passenger side rear trailing arm. It is directly in front of the brake rotor, behind the rear end of the side skirt. Use a silver marker or Wite-Out to mark the location of the rear trailing arms. Remove the 3 bolts securing it in place. Use an 18mm hex socket and breaker bar to remove them. Gently pull down on the trailing arm to slip it out of the pocket. Repeat for driver side.

Step 44: Locate passenger side lower control arm to trailing arm connection. Use a jack to jack up gently and contain the weight of the trailing arm assembly. Repeat for driver side.

Step 45: Locate passenger rear shock to trailing arm connection. Remove the bolt at the end portion of the shock tube. Use an 18mm hex socket and breaker bar. Repeat for driver side.

Step 46: At this point, the rear subframe is ready to be removed. Place a jack (I recommend a 2x8 or 2x10 on top of the jack platen) underneath the rear jack point and rear of the differential. Jack up until point of contact is made to support the weight of the differential and subframe only. Do not jack higher, or the differential cooling fins could bend.

Step 47: This step is optional and will provide more clearance for removing the subframe. Locate the active charcoal filter plastic cover panel behind the rear subframe, directly beneath the trunk (I've circled the cover panel in red). There are several nuts and bolts securing it in place. Remove them using an 8mm hex socket. Set the cover aside.

Step 48: Locate the front subframe cross member just above the rear jack point. On both sides of the rear jack point are cavities within the cross member. Inside the cavities are 2 bolts for each side. Remove the bolts using a 13mm hex socket and socket extension. There will be 4 bolts total.

Quote:

> For those apprehensive about DIYing...
>
> "The most difficult part of figuring out a car, the engineering, has been accomplished. Repairs and maintenance are simply dissembling parts and reassembling them." - bimmerfan08

Last edited by bimmerfan08; Tue, Jun-24-2014 at 06:13:20 AM.

Jump to top

bimmerfan08 is offline

Old Sat, May-24-2014, 06:30:04 PM

bimmerfan08
Registered User

bimmerfan08's Avatar

Join Date: Jan 2009
Posts: 6,748
In the garage:
'02 BMW M3
Reputation: 0
bimmerfan08 is on a distinguished road
Location: Charlotte

United States

Default **Re: DIY: E46 M3 detailed subframe reinforcement, gear fluid changes, & bushing refres**

Step 49: Locate the driver side front subframe bushing. Running through the center of the bushing is a reduced shaft bolt with a hex nut. Ensure that the subframe is still supported by a jack. Remove the nut using an 18mm deep well hex socket.

Step 50: Locate the passenger side front subframe bushing. Running through the center of the bushing is a reduced shaft bolt with a hex nut. Ensure that the subframe is still supported by a jack. Remove the nut using an 18mm deep well hex socket.

Step 51: Locate the driver side rear subframe bushing. Running through the center of the bushing is a threaded bolt. Ensure that the subframe is still supported by a jack. Remove the bolt using an 18mm hex socket and breaker bar. The metal stopper will slide down with the bolt.

Threaded bolt and metal stopper.

Step 52: Locate the passenger side rear subframe bushing. Running through the center of the bushing is a threaded bolt. Ensure that the subframe is still supported by a jack. Remove the bolt using an 18mm hex socket and breaker bar. The metal stopper will slide down with the bolt.

Step 53: The subframe, differential, and rear suspension components are ready to be removed from the car. 2 people can make this part of the procedure more efficient and quicker, but it can be done with 1 person. Slowly lower the jack, while eyeing the stability of the load. Ensure the load remains flat on the end of the jack platen. Do not lower too quickly or make any sudden movements with the jack. If the subframe gets hung up on the 2 front half shaft bolts, gently wiggle the subframe off the bolts. Lower jack until it bottoms out. Be sure to push the parking cables through the rear guide tubes just in front of the rear subframe. Pull the load out slowly from underneath the car rearward. I discovered afterward that placing one jack at the rear of the differential (just in front of the cooling fins) and one jack at the front of the subframe and lowering the jacks progressively ensures a smoother lowering of the load. Only position 2 jacks if the subframe hardware is still securing the subframe to the underside of the car.

The subframe front cross member.

The subframe, differential, axle shafts, and rear suspension components.

Step 54: The subframe cavity should now be empty. Remove any dirt and debris from the underside of the car.

Fuel charcoal filter.

Step 55: Note the 4 locations of the subframe reinforcement areas as well as the locations for the 2 shims. Remove the 2 reduced shaft bolts using a 30mm open end wrench.

Remove using a 30mm open end wrench.

Step 56: Test fit the steel plates against the sheet metal. Use an angle grinder to clean up any plates that don't fit properly. Use a wire wheel or other paint removal tool to remove the paint and undercoating from the reinforcement areas. Follow up with 50 grit sandpaper to remove any remaining paint/undercoating and rough up the sheet metal.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.

Step 57: Use brake parts cleaner or liquid metal acid cleaner to clean the exposed metal. Clean both the stripped sheet metal and steel plates. Wear gloves and protective eyewear when using chemicals. Use a respirator if you're sensitive to chemical fumes. Crack open any windows and doors to allow proper ventilation.

Step 58: Prep the 3M 08115 adhesive by following instructions on the cartridge. Insert the cartridge into the applicator gun and push the epoxy/amine mixture through the static mixing tube. Allow some of the adhesive to squeeze out before applying to the metal.

Step 59: Slip on latex or rubber gloves. Squeeze adhesive onto the prepped sheet metal areas. Cover the areas adequately. Use a puddy spreader to evenly distribute the adhesive and ensure the entire surface areas are covered.

Step 60: Squeeze adhesive onto the backsides of the prepped metal plates. Cover the backsides adequately. Use a puddy spreader to evenly distribute the adhesive. Use the 2 bolts in the subframe reinformcent kit to secure the 2 rear plates. Use a 19mm hex socket to tighten them down. Use the 2 reduced shaft bolts to secure the 2 front plates. Use a 30mm open end wrench to tighten them down. Use the 4 bolts for the front subframe cross member to secure the 2 shim plates. Use a 13mm hex socket to tighten them down. A small amount of anti-seize can be applied to the bolts to prevent any bonding of the adhesive to the bolts. Tighten all bolts snug. Squeeze out of adhesive on the sides of the plates is okay. With a gloved finger, spread adhesive around the plate seams evenly. Spread adhesive across the uncovered plate surfaces. ***Important. The adhesive needs at least 24 hours at a temperature > or = to 73 degrees F to cure. Heat can be applied to speed up the cure time. Allow more time for curing if the temperature is < 73 degrees F.*** More information can be found here: http://multimedia.3m.com/mws/mediawe...6EVs6E666666--

Step 61: Place all new bushings to be pressed into the freezer for a few hours while

performing the other required work of this procedure. Differential, subframe, upper control arm, and lower control arm bushings. The rubber or polyurethane will contract slightly to allow for easier pressing.

Step 62: Disassemble everything on the subframe. Remove the stabilizer bar by removing the 4 screws securing it in place on the backside of the subframe. Use a 6mm hex bit socket to remove the screws. Use 2-13mm open end wrenches to remove the stabilize bar end-links from the upper control arms.

Step 63: Disconnect the rear axle shafts from the differential. Slip several straight head screwdrivers into the rear rotor slots behind the caliper mounting brackets to keep the axle shafts from rotating. There are 6 torx bolts and 3 bolt reinforcements on each output flange (12 torx bolts and 6 bolt reinforcements total). Use an E12 socket to remove them.

Step 64: Disconnect the differential from the rear subframe. Remove the 2 rear bolts and the 1 front bolt. The 2 rear bolts are on the backside of the differential in the upper corners of the differential cover. The front bolt is beneath and behind the front passenger side subframe bushing. The 2 rear bolts require an E14 socket. The 1 front bolt requires a 21mm hex socket.

Front differential bolt location.

Set the differential aside. Bend at the knees before picking the differential up. I placed a hammer underneath the differential to keep the weight of the unit from resting on the input flange.

Step 65: Disconnect the rear headlight leveling sensor bracket from the subframe. There are 2 bolts securing it to the subframe (I've circled the bolts in red). Use a 10mm hex socket to remove them.

Step 66: Disconnect the upper and lower control arms from the subframe. There are 4 bolts total, 1 for each end of each control arm. Use an 18mm hex socket to remove the bolts. Use an 18mm open end wrench to hold the hex nuts steady while reverse threading the upper control arm bolts. The lower control arms have lock plates.

Step 67: Use the Koch rear suspension subframe bushing tool to remove the subframe bushings. There are 4 large subframe bushings total. The tool should come with instructions on how to use it. Test fit several plates and/or washers to find the appropriate size for the bushings. Use a 12mm open end wrench on the hex end of the threaded shaft. Use a 24mm open end wrench to turn the hex nut against the bearing to pull the bushings out.

Step 68: Use the Koch rear suspension subframe bushing tool to remove the front

differential bushing from the subframe. Configure the tool in such a way that the bushing is removed towards the outer direction of the subframe.

Subframe bushings completely removed.

Step 69: Use the Koch rear suspension subframe bushing tool to remove the 2 rear differential bushings from the rear cover. Gently configure the tool in such a way that the bushings are removed rearward and in the outer direction of the differential. Be careful not to bend or apply to much pressure to the differential cover. If you chose to use new OEM differential bushings (PN: 33112282482) along with differential cover sealant (PN: 83190404517), you'll need to research the procedure for applying a new differential cover as the 2 rear differential bushings come pre-inserted into a new differential cover.

Step 70: Clean and prep the rear subframe for painting. Remove the 2 plastic caps from the rear differential bolt holes on the subframe. Clean the rear subframe using soap, water, and a non-abrasive scrubbing pad. I used a power washer to aid in the process of cleaning. Don't forget the front subframe cross member. After rear subframe has dried, use a wire wheel or sandpaper to remove all surface rust. If the majority of paint is in great condition, leave it on the subframe. Wipe clean.

Step 71: Clean and prep the differential if there is any rust, for painting. Clean the differential using a wet rag. Let dry. Use a wire wheel or sandpaper to remove all small areas of rust. Wipe clean. The differential cover should not have any rust, but can be wiped clean.

Step 72: Move the subframe and differential to a well ventilated area, outside is best. Block off a small area for painting. Slip on latex/rubber gloves. Coat a high heat primer onto the subframe (one that can stick to existing paint). Any rust areas that were cleaned up on the differential need a small layer of primer as well. Do not paint the differential cover. Paint interferes with the cover's ability to dissipate heat. Follow instructions on the paint container and let dry for a few hours. Another option if time permits, is to have the subframe and front subframe cross member powder coated.

Step 73: After the primer has dried, apply a thin coat of high heat, subframe/chassis enamel to the subframe and front subframe cross member. Apply thin areas of enamel only to the cleaned rust locations on the differential. Let dry according to the instructions on the paint container.

Step 74. At this point, I had allowed the adhesive to cure for 48 hours. Don't cut the curing time short. Prep the areas around the steel plates for painting. Apply a coat of rust-proof, high heat primer. I decided to do most of the subframe cavity since it's the underside of the car and will never be seen from above. Wipe up any runs or spills. Let dry according to the instructions on the paint container.

Step 75: While the paint is drying, remove the old flex disc and center support bearing from the drive shaft. Use an 18mm box end wrench to finish removing the bolt in the universal joint. Ensure the two halves of the drive shaft are properly marked. Separate the two halves of the drive shaft by pulling in opposite directions on a flat level surface. You may need to gently tap the transmission flange at the end of the drive shaft with a hammer if the two halves won't budge. Do not tap the constant velocity joint. Doing so could damage the joint and throw off the balance of the drive shaft.

Step 76: Use a hammer and chisel to split the rubber between the center support mount and old bearing. Remove the CSB bracket from the drive shaft. Remove the bearing dust cap. Use a 3 jaw puller to remove the bearing from the drive shaft. Be careful not to disfigure the threads in the center of the drive shaft for the 18mm bolt. If having difficulty, very carefully and gently tap the outer diameter of the bearing with a hammer and chisel. The bearing does not require much force to remove, so be light with the hammer taps. Do not hit the splines of the drive shaft. The bearing should slide off the splines.

Step 77: Install new center support mount (PN: 26122282495) onto the drive shaft. Mate the old bearing against the face of the new bearing and gently tap with a hammer. Work around the circumference of the drive shaft, tapping the bearing on evenly. Replace the dust cap.

Step 78: Line up the two halves of the drive shaft by the markings made before splitting the drive shaft. Ensure the splines are lined up identically and push in straight. Push two halves of drive shaft back together. Thread the 18mm bolt in the universal joint by hand. Apply a small amount of blue Loctite to the threads. Tighten down the bolt until snug with an 18mm box end wrench. The bolt only requires 16 ft-lbs of torque.

Step 79: Affix a new flex disc (PN: 26112226527) on the end of the drive shaft. Install 3 flex disc bolts (PN: 26117635643) through the flex disc to the drive shaft/transmission flange. Thread new flex disc lock nuts (PN: 26127536563) by hand onto the bolts. Tighten until snug using an 18mm hex socket for the bolts and an 18mm open/box end wrench for the hex nuts. Torque to 74 ft-lbs.

Step 80: After the enamel on the subframe and cross member has dried, flip both the

subframe and cross member over to coat the unpainted sections. Let dry according to the instructions on the paint container.

Step 81: After the rust-proof primer on the underside of the car has dried, apply a coat of rust-proof, high heat enamel to the steel plates and subframe cavity. Let dry according to the instructions on the paint container. Allow the enamel to dry fully. Apply a coat of rubberized, corrosion-resistant paint. Let dry according to the instructions on the paint container.

Step 82: This step outlines the instructions for installing differential bushings other than OEM. Remove the 2 rear differential bushings from the freezer. Spread a small amount of anti-seize around the bushing. Try pushing both bushings in by hand first. If there is any resistance, use a rubber mallet to gently tap the bushings in. Note the orientation of the bushings before installing them. The flanges of the bushings need to mate to the backside of the differential cover for proper fitment.

Backside of the differential. Note orientation and proper installation.

Front side of the differential. Note orientation and proper installation.

Step 83: After the enamel on the subframe cavity, subframe front cross member, and subframe have dried, apply a coat or rubberized, corrosion-resistant paint. Limit the amount of rubberized paint that is applied to the subframe bushing cavities. Too much won't allow the bushing to be installed properly. Do not apply rubberized paint to the differential. Let dry according to the instructions on the paint container.

Step 84: Remove the rear upper and lower control arm bushings. I used the Koch subframe suspension bushing tool to remove the bushings using a stack of small washers that had an outer diameter slightly smaller than the outer diameter of the bushings. Other bushing pull tools can be used in place of the Koch tool. Slip small washers or bolts (the 2 19mm bolts from the subframe reinforcement kit work well) in the gaps of the lower control arms to prevent the control arms from bending in during bushing removal. The operation of the Koch subframe suspension bushing tool is the same operation used to pull the subframe bushings. Remove all 4 bushings.

Small washers I gathered from Lowe's.

Old rear upper and lower control arm bushings.

Step 85: Install new rear upper and lower control arm bushings (PN: 33326770824 and PN: 33321092247). Use the Koch subframe suspension bushing tool to press in the 4 new bushings.

Step 86: Install the front differential bushing into the subframe (PN: 33172282484 or aftermarket bushing). Rub a small amount of anti-seize around the bushing. Insert by hand first, and use a c-clamp to press the bushing until it is fully seated.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.

Step 87: Install all 4 subrame bushings into the subframe. Subframe left front bushing (PN: 33312283573), subframe right front bushing (PN: 33312283574), subframe rear bushing (PN: 33312283419), or aftermarket bushings. Rub a small amount of anti-seize around the bushings. Install by hand first and press. If resistance is encountered, lightly tap around the diameter of the bushings with a rubber mallet to seat them.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.

Step 88: Remove the old constant velocity joint to differential gasket. Peel off or scrape with a straight head screwdriver. Repack with CV grease. Place a new end cover with gasket (PN: 26117540778) on the end of the drive shaft. Ensure proper alignment of the cover so as not to block the bolt holes.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.

Step 89: Remove the old hardware from section 1 and section 2. Use PB Blaster, heat, wrenches, and a hammer. I soaked the hardware with PB blaster first, heated up the nuts, and smashed the bolts through the flanges with a hammer.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.

Step 90: At this point, the procedure is reinstallation of removed parts. Squeeze a small amount of blue Loctite on all bolt threads.Install 2 new subframe reduced shaft bolts (PN: 33326760361) into the front 2 subframe holes. Use a 30mm open end wrench to tighten them down. Reinstall the subframe and use the 2 front reduced shaft bolts as guides to position the subframe in place. Install 2 new subframe threaded bolts (PN: 33326760360) through the 2 rear subframe bushings using an 18mm hex socket. Install the 4 bolts through the subframe front cross member using a 13mm hex socket. Install 2 new subframe self-locking collar nuts (PN: 33326760374) onto the 2 front subframe reduced shaft bolts using an 18mm deep well hex socket. Torque the 2 front subframe reduced shaft bolts to 66 ft-lbs. Torque the 2 rear subframe threaded bolts to 57 ft-lbs. Torque the 4 subframe front cross member bolts to 22 ft-lbs.

Step 91: Reinstall both driver and passenger side axle assemblies. Use a jack to lift and maneuver the axle assemblies into place. Connect the upper controls arms to the subframe first using an 18mm hex socket and 18mm open end wrench. Torque to 57 ft-lbs. Connect the lower control arms to the subframe next using an 18mm hex socket. Torque to 81 ft-lbs. Loosely thread the 18mm bolts back into both shocks to help redistribute some of the rear axle assembly weight.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.


tinypic
This image is no longer available.
Visit tinypic.com for more information.

Step 92: Reroute both parking brake cables through the subframe guide channels first. Then reroute through the guide channels attached to the car body.

Step 93: This step is optional, but highly recommended. Either buy or construct a plug to plug the top of the center v-brace bolt hole to keep water and other contaminants from entering.

Step 94: Position the differential's weight across 2 jacks. Slide the differential under the car and into place. Having a second person assist with this step makes it much easier. Jack up the jack platens progressively. The front of the differential needs to go up and through the front of the subframe. Again it's easiest having a second pair of hands to position the differential. When the differential is in place, install the differential hardware. Squeeze a small amount of blue Loctite onto all bolts threads. Install 2 new differential rear torx bolts (PN: 23001222891) using an E14 socket along with 2 differential rear bolt washers (PN: 07119931021). Torque to 74 ft-lbs. Install 1 new differential front hex bolt with washer (PN: 33177840535)using a 21mm hex socket. Torque to 128 ft-lbs.

Step 95: Reconnect both rear axle shafts to the differential output flanges. Place several straight head screwdrivers in the rotor slots behind the caliper brackets to keep the axle shafts from rotating. Thread the torx bolts along with the bolt reinforcements in by hand first. Tighten down the bolts with an E12 socket in a star pattern. Torque the bolts to 61 ft-lbs.

Step 96: Reinstall the rear headlight leveling sensor bracket to the subframe. Use a 10mm hex socket for the 2 bolts.

Step 97: Install 2 new zip ties into the rear headlight leveling sensor wire clips. Zip tie the rear headlight leveling sensor wire tight. Clip off the excess portions of the zip ties.

Step 98: Reinstall the rear stabilizer bar. Connect the end-links to both upper control arms first using 2 - 13mm open end wrenches. Use a 6mm hex bit socket to reinstall the 4 screws into the subframe.

Step 99: Reinstall the active charcoal filter plastic cover panel. Use an 8mm hex socket to secure the nuts and bolts.

Step 100: Reinstall both the driver and passenger side rear trailing arms. Align the trailing arm ends against the silver or white alignment marks. Use an 18mm hex socket to tighten the bolts down. Torque to 57 ft-lbs.

Step 101: Install a new flex disc (PN: 26112226527) onto the transmission end of the drive shaft. Thread three new hex lock nuts (PN: 26127536563) onto the three bolts. Tighten down with an 18mm socket and the open or box end of an 18mm wrench. Ensure the transmission is supported by a jack. Remove the transmission cross brace again. Slide the drive shaft onto the transmission output shaft. Support the constant velocity end of the drive shaft so it does not hang freely. Thread the three bolts with new hex lock nuts (PN: 26127536563). Tighten down with an 18mm socket and the open or box end of an 18mm wrench. Put the transmission in gear and torque each bolt to 84 ft-lbs. The drive shaft will have to be rotated to reach all bolts using the method described in earlier steps.

Step 102: Position the drive shaft center support bracket onto the center studs. Loosely screw on the two nuts used to secure the bracket.

Step 103: Align the drive shaft so that the rear of it mates up to the differential input flange. Use a jack to support the other end. Push the constant velocity joint into the flange. Ensure that the gasket and cover stay aligned with the bolt holes. Replace each of the 6 torx bolts back into the flange. Tighten down in a star pattern using an E12 socket. Torque each bolt to 61 ft-lbs. The drive shaft will have to be rotated to reach all bolts using the method described in earlier steps.

Step 104: Preload the center support bearing by pulling the bracket forward (towards the transmission) 4-6 cm from the center of the oval slots in the bracket. Tighten down both nuts with a 13mm hex socket. Torque to 15 ft-lbs.

Step 105: Reinstall the transmission brace. Torque the four transmission brace bolts to 16 ft-lbs.

Step 106: Replace the exhaust system gaskets, hardware, and rings with new parts. Reinstall the heat shields. Reinstall the exhaust system back into the car. Reinstall the plastic guards.

Step 107: Bleed the two rear calipers with new fluid to get any air out of the lines that may have entered when they were opened.

Step 108: Reinstall the rear v-brace. Torque each of the 3 bolts to 44 ft-lbs.

Step 109: This step is optional. Place a drip pan or jug underneath the differential fill and drain plugs. They are located on the passenger side of the differential. Remove both plugs and crush washers. Use a 14mm hex bit socket to remove them.

Step 110: After the differential has finished draining, replace the drain plug along with a new crush washer (PN: 07119963355). The drain plug is the plug closest to the bottom of the differential.

Step 111: Refill the differential with 3 bottles of BMW differential fluid 0.5 liter (PN: 83222282583). Fluid will begin to flow out of the fill plug when the differential is full.

Step 112: Replace the fill plug back into the differential along with a new crush washer (PN: 07119963355). Torque both the fill and drain plugs to 48 ft-lbs each.

Step 113: Double-check everything underneath the car and ensure all parts have been replaced back on the car. Resinstall the wheels and torque the lug bolts/nuts to 88 ft-lbs. Lower the car and go for a short drive to check everything out. If you changed the fluids, remember to do a few figure 8's and U-turns to properly coat the internals of the differential.

_____

Quote:

> For those apprehensive about DIYing...
>
> "The most difficult part of figuring out a car, the engineering, has been accomplished. Repairs and maintenance are simply dissembling parts and reassembling them." - bimmerfan08

Jump to top
bimmerfan08 is offline

Old Sat, May-24-2014, 07:33:18 PM

0-60Motorsports
Established 1998....

0-60Motorsports's Avatar

Join Date: Mar 2004
Posts: 14,999
In the garage:
'12 VOLKSWAGEN GOLF
'04 BMW M3
Reputation: 0
0-60Motorsports is on a distinguished road
Location: Al Manama, Bahrain

Bahrain

Default **Re: DIY: E46 M3 detailed subframe reinforcement, gear fluid changes, & bushing refres**

Awesome DIY. Thank you for taking the time to post this. Great work.

_____

EURO 04 M3 **Mods:** *GC DA's / Eibach Sways / PF RTABs / RE RCAs / INTRAVEE II / ///MFEST Badges / M5 SMG Knob / VCSL: Bumper + Race Lip, CF Trunk, CF Diffusor / DIETZ TV in Motion / SuperSprint: Stepped Headers, Cat Deletes, Res X-pipe, Sport Muffler / Z8 Starter Button / Lamin-X / STM Paddles / OEM CSL: Steering, Interior, Intake, CF Roof / Terra MSS54HP CSL Clone + TTFS Tune / BBS CH's, LIGHTWERKZ / ST40's / DINAN RSB / RE Race Brace / BW Oil Cooler / 3.91 gears / Radium OCC*

Jump to top
0-60Motorsports is online now

Old Mon, May-26-2014, 09:30:00 PM

ThunderMoose
Registered User

Join Date: Dec 2011
Posts: 3,063
In the garage:
'03 BMW E46 M3
'03 BMW M3
Reputation: 0
ThunderMoose is on a distinguished road
Location: Gonzales

United States

Default **Re: DIY: E46 M3 detailed subframe reinforcement, gear fluid changes, & bushing refres**

You are a DIY master.

I just replaced the subframe bushings on both of my E46 M3's.

I found it easier the second time to remove the half shaft to diff with subframe in place and then remove the wheel assemblies independent of the subframe. My little HF transmission jack struggled with supporting the entire rear suspension. You also get to use the parking brake to hold shaft in place when breaking the torx bolts on the half shaft. Having a helper is nice; instead, I had to keep getting up to release brake, rotate shaft, engage brake, loosen bolt, etc.

I like the tool for the subframe bushings. I ended up using a gear puller which sort of works but tended to bend the lip of the subframe.

_____

#67 2019 NASA National TT3 Champion; 2017 NASA TX TT3 Champion

FLMS Half Cage, RaceTech 4009HR drivers seat, Schroth 6-Pt Harness, E.S.S. Fire System, AIM SOLO DL with ECU Harness, SmartyCam, Angle Aluminum with VAC dead pedal, Sparco Steering Wheel on MOMO hub, MCS 2W NR, Hyperco 700F 800R springs, Hotchkis Front and Rear Sway bars, Vorshlag Camber Plates, Turner ARCA, AJ Hartman Front Splitter, BW V2 Wing, BW CF Rear Diffuser, APEX ARC-8 wheels, Brembo BBK Front, Carbon Fiber Roof, CF Headlight Blanks, Door Windows and Cards Delete, TMS rear and front subframe reinforcement, Zionsville Competition Cooler, BW Oil Cooler, Oil Diverter Valve, Motorsports Thermostat, Evolve CF Intake, Epic Stepped Headers, Turner Pulleys, BW 3.5" Race Exhaust, EPIC Alpha N Tune, Beisan Oil Disk and Vanos Seals, ZF 5MT, CAE Ultra Shifter

My track journal: http://www.m3forum.net/m3forum/showthread.php?t=509148

Jump to top
ThunderMoose is offline

Bookmarks

Facebook | Myspace | StumbleUpon | Google
My Yahoo | Digg | del.icio.us

Thread Tools

Posting Rules

You **may not** post new threads
You **may not** post replies
You **may not** post attachments
You **may not** edit your posts

BB code is **On**
Smilies are **On**
[IMG] code is **On**
HTML code is **Off**

Forum Rules

Forum Jump

Faults, Fixes and DIY Go

All times are GMT. The time now is 08:54:27 AM.

-- M3Forum Original (Updated)

Home - **Archive** - **Privacy Statement** - **Top**

Discussing DIY: E46 M3 detailed subframe reinforcement, gear fluid changes, & bushing refresh in the Faults, Fixes and DIY Forum - Please share your experience and knowledge with other members by contributing your own DIY, or by helping another member find the elusive fix! at BMW M3 Forum.com (E30 M3 | E36 M3 | E46 M3 | E92 M3 | F80/X)