



BMW E36/E46 5 Speed
Lightweight Flywheel
Installation Instructions



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.

Torque Values at Bellhousing

- Clutch hydraulic slave cylinder (nuts) 22 Nm (16 ft-lb)
- Bell housing to engine and starter
 - M8 22Nm (16 ft-lb)
 - M10 42Nm (31 ft-lb)
 - M12 72Nm (53 ft-lb)

Torque Values at Driveshaft/Mounts

- Driveshaft center support to body 22Nm (16 ft-lb)
- Transmission crossmember to chassis
 - M8 22Nm (16 ft-lb)
 - M10 42Nm (31 ft-lb)
- Flex coupler bolt/nut 21Nm (16 ft-lb)
 - M10 (8.8) 48Nm (35 ft-lb)
 - M10 (10.9) 64Nm (47 ft-lb)
 - M12 (8.8) 81Nm (60 ft-lb)
 - M12 (10.9) 100Nm (74 ft-lb)

Flywheel/Clutch

- Flywheel bolts to crankshaft 104Nm (77 ft-lb)
- Pressure plate bolts 25 ft-lb

Miscellaneous

- Reinforcing crossbrace to chassis 42Nm (32 ft-lb)

Kit Contents

- 1-Lightweight Flywheel
- 1-Clutch Kit
- 1-Pilot Bearing
- 8-Flywheel Bolts
- 6-Pressure Plate Bolts

Miscellaneous parts

If you need additional parts for your project, ECS Tuning stocks both original BMW and quality aftermarket repair parts and kits.

This partial list can get you started on many common repairs related to this installation.

ES1503 - Transmission fluid GL-4

ES2598585 - selector rod seal

ES41216 - clutch fork lever pivot pin

ES42238 - throwout bearing guide tube

ES41849 - rear transmission mount

ES2587713 - shifter rebuild kit

ES46745 - shifter support bar rear bushing

Removing the Transmission

Step 1

- Open the hood. Remove the transverse body stiffener bar attached to the strut towers.
- Open the trunk. Lift the trim panel in the rear inner corner of the right quarter panel to expose the battery; disconnect the negative battery cable.

Service Tip: Move the cable end far enough from the negative post that the cable cannot accidentally “spring back” and make contact at the battery terminal. A plastic cap placed over the terminal or cable end is added insurance.



Step 2

Raise and safely support the car.

Disconnect the two round electrical plugs for the downstream oxygen sensors (arrows).

Snap off the black protective cover on the channel that shields the sensor wires against the chassis; let the disconnected wires hang for now.



Step 3

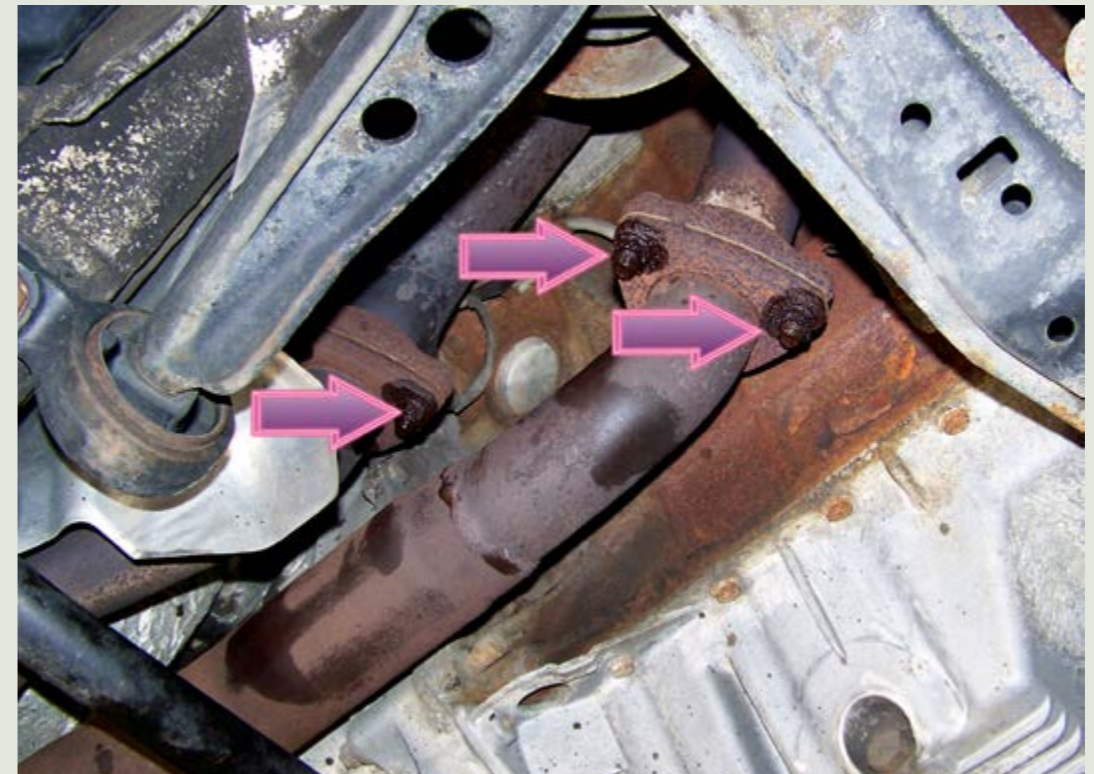
Disconnect and remove the exhaust. We'll remove the main center section between the exhaust manifold and rear muffler.

Service Tip: It is possible to remove the entire exhaust—from exhaust manifold to tailpipe—although the entire exhaust is much heavier and harder to handle than the center section.



Step 4

If you live in the rust belt where roads are salted heavily in winter, bring your can of rust penetrant to soak all exhaust studs and nuts. We ended up heating the nuts on the manifold studs to remove them without breaking something.



Step 5

After the exhaust pipe is unbolted and removed from the exhaust manifold, remove the small 6x1.00 bolt that secures the engine/transmission separator plate to the bell housing.



Step 6

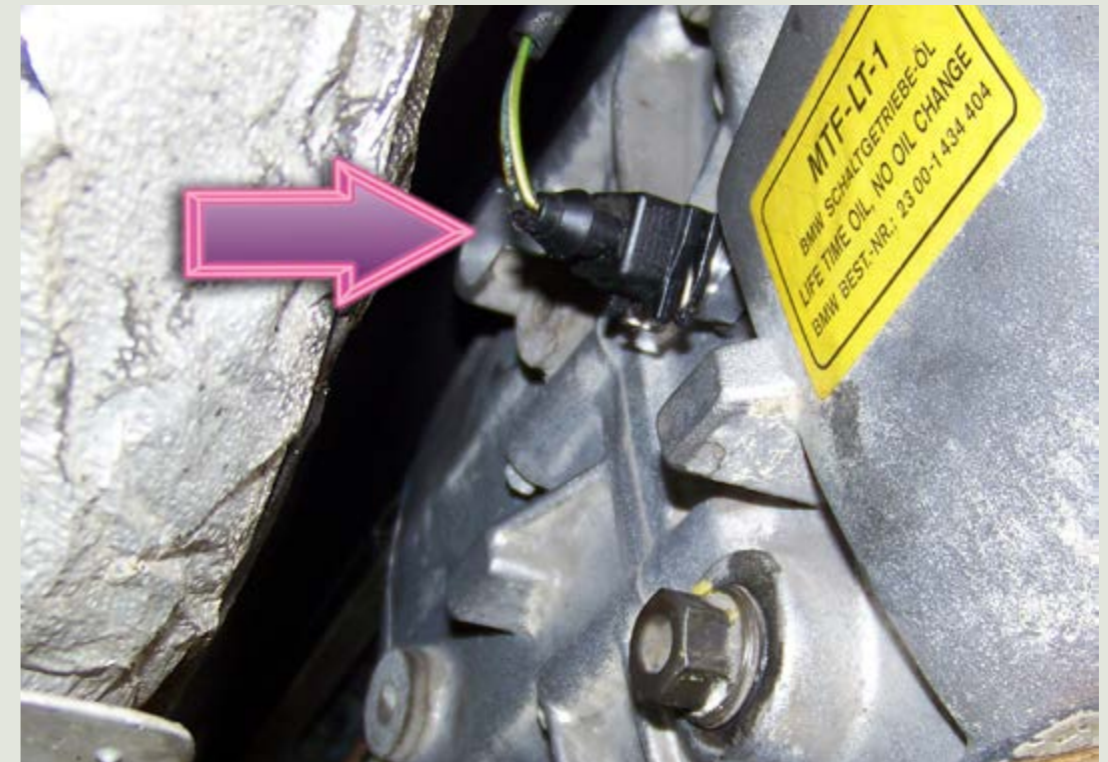
Remove the aluminum heat shield to expose the driveshaft.



Step 7

Disconnect the backup light switch electrical connector (arrow), located on the right side of the transmission, above the transmission fill plug. The switch harness wire is draped across the top of the transmission, and attached to the opposite side of the transmission housing by metal clips.

After unplugging the connector, unfasten the wire from the clips and let the harness hang loosely over the transmission.



Step 8

Unbolt and remove the transverse body stiffener bar below the engine pan.



Step 9

The driveshaft is coupled to the transmission output flange through a reinforced rubber coupling called a giubo (commonly misspelled guibo) joint, also referred to as a flex coupler, the term we'll use here.

Before unbolting the flex coupler, use a paint stick or other marker that won't wipe off easily to match mark the driveshaft and three-point drive flange at the rear of the transmission. We'll use these marks to realign the shaft and flange to prevent driveline imbalance and vibration.



Step 10

Use two long-handled 18mm wrenches to loosen the nuts and bolts at the flex coupler. Here, we're using a long ½-inch ratchet with 18mm socket and 18mm box wrench.

Turn the ratchet until the backing wrench stops at the transmission boss as you loosen and remove all six bolts.

Expect these to be tight.



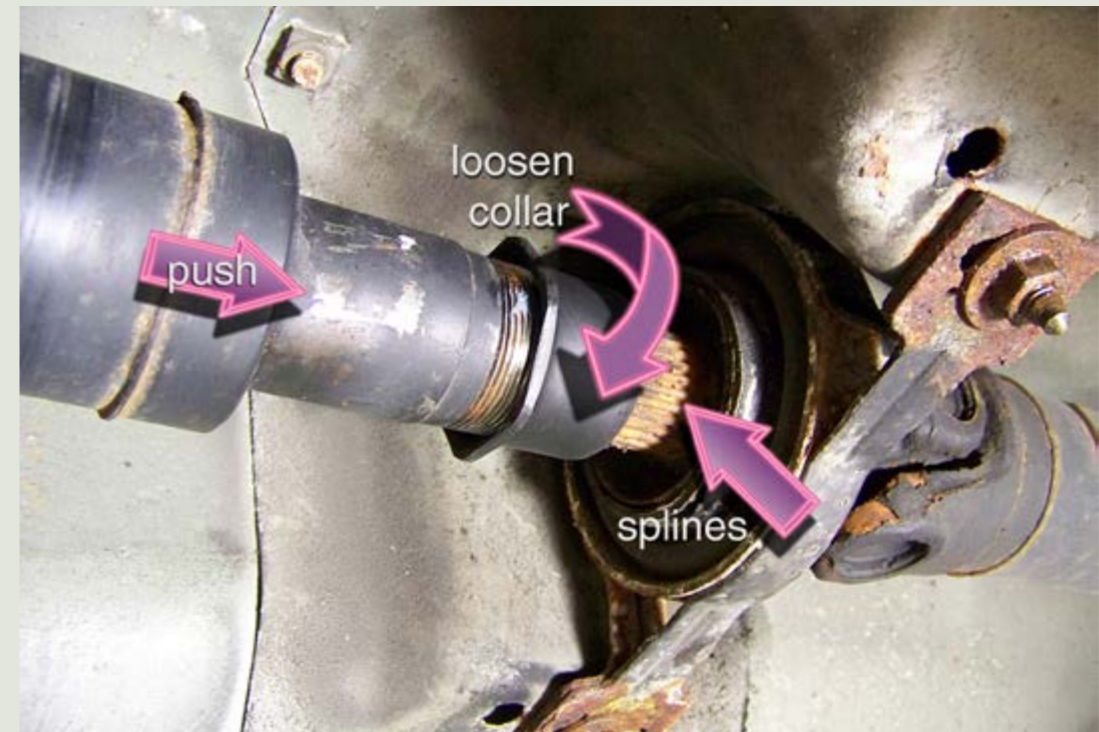
Step 11

The driveshaft is a two-piece design with center universal joint, supported in the middle by a center bearing mount, bolted to the chassis by a support bar.

The front and rear sections of the driveshaft are joined by a splined shaft (right arrow), and secured by a threaded pinch collar.

Loosen the pinch collar using a large adjustable wrench (a pipe wrench works well), turning in the direction indicated by our center arrow.

When the collar is loose, push the front shaft section rearward to compress the shaft. Our splines required several blasts of rust penetrant before the shaft sections would compress.



Step 12

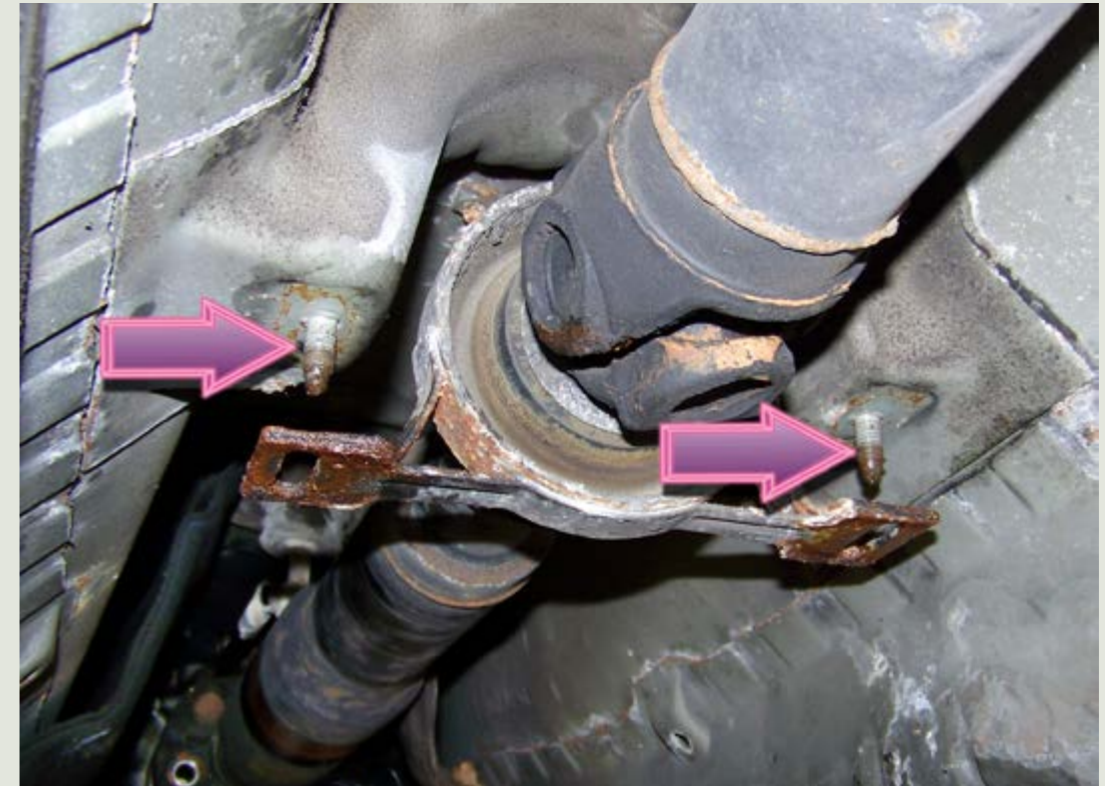
With the extra room between driveshaft and transmission flange, go back and pivot the flex coupler out of the gap between the front of the driveshaft and transmission output flange.



Step 13

Loosen and remove the two nuts from the center bearing support bracket studs (arrows).

Note: Leave the rear of the driveshaft bolted to the differential flange.



Step 14

Swing the front of the driveshaft off to one side and tie it up with mechanic's wire, out of your way.

CAUTION: Do NOT separate the front and rear driveshaft sections; they are indexed and balanced as a unit when manufactured.

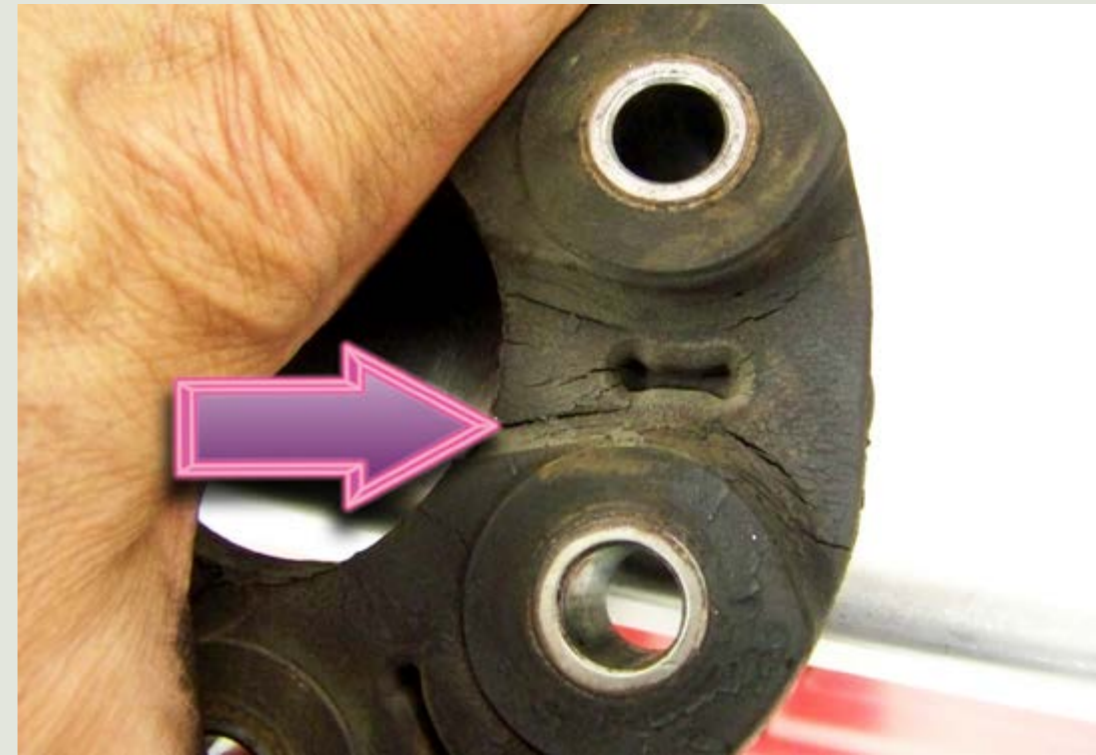


Step 15

Stop here and inspect the flex coupler and center support for signs of wear or damage. Make sure the center support bearing spins freely on the driveshaft, without noise or sticking. Check the rubber donut surrounding the bearing for tears or cracks.

Our flex coupler (photo right) is original, and has developed large cracks (arrow). Since all drive torque is transmitted to the driveshaft through this coupler, we'll install a new one before it gives out completely, a failure that can disable the car.

Service Tip: A fresh flex coupler is a wise investment on high-milers, even if there are no visible signs of cracking.

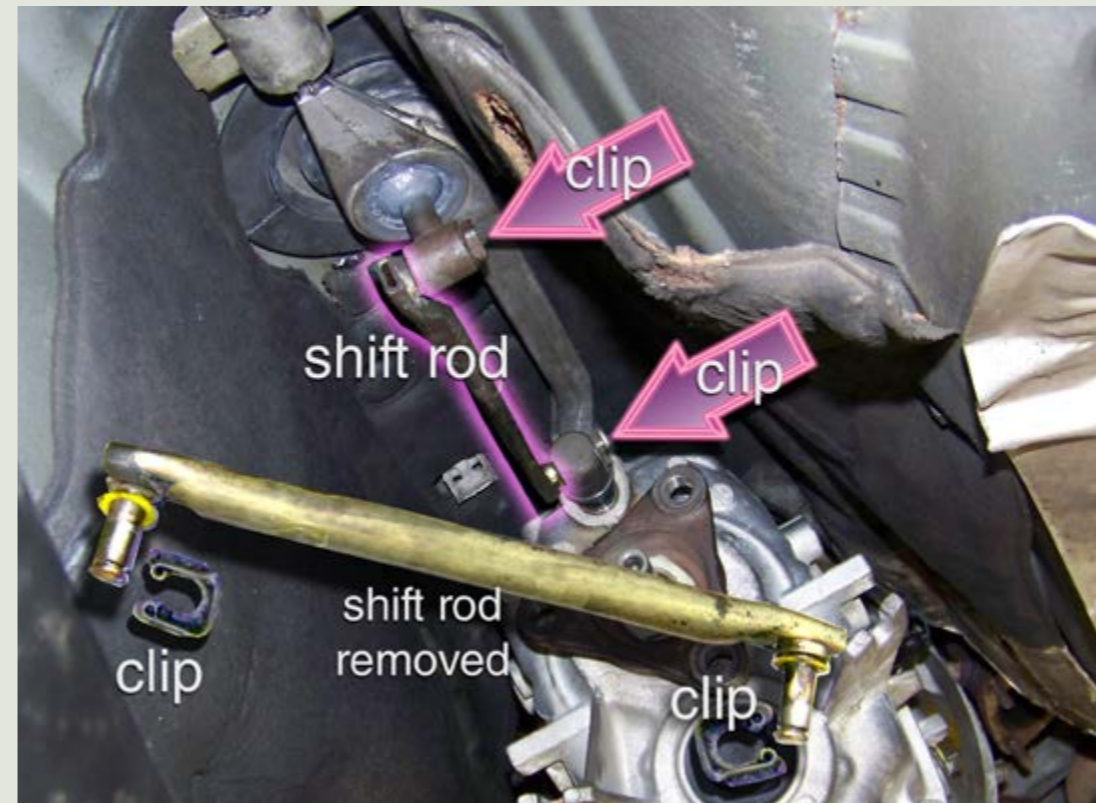


Step 16

Disconnect the shift rod that connects the base of the shift rod to the gear selector rod at the rear of the transmission. The rod is secured at both ends by u-shaped clips; pry them off with a screwdriver.

This image shows the rod installed in the car, with arrows indicating the location of the clips.

Note: The lower part of the image shows the rod and clips removed and enlarged so you can see them better. See the illustration on the next page for a side view of shifter components.



Step 17

The rear of the shift lever support bar is attached to a chassis-mounted bushing (see illustration below). The front of the bar is attached to the rear of the transmission housing by a push pin that locks in place with a snap clip.

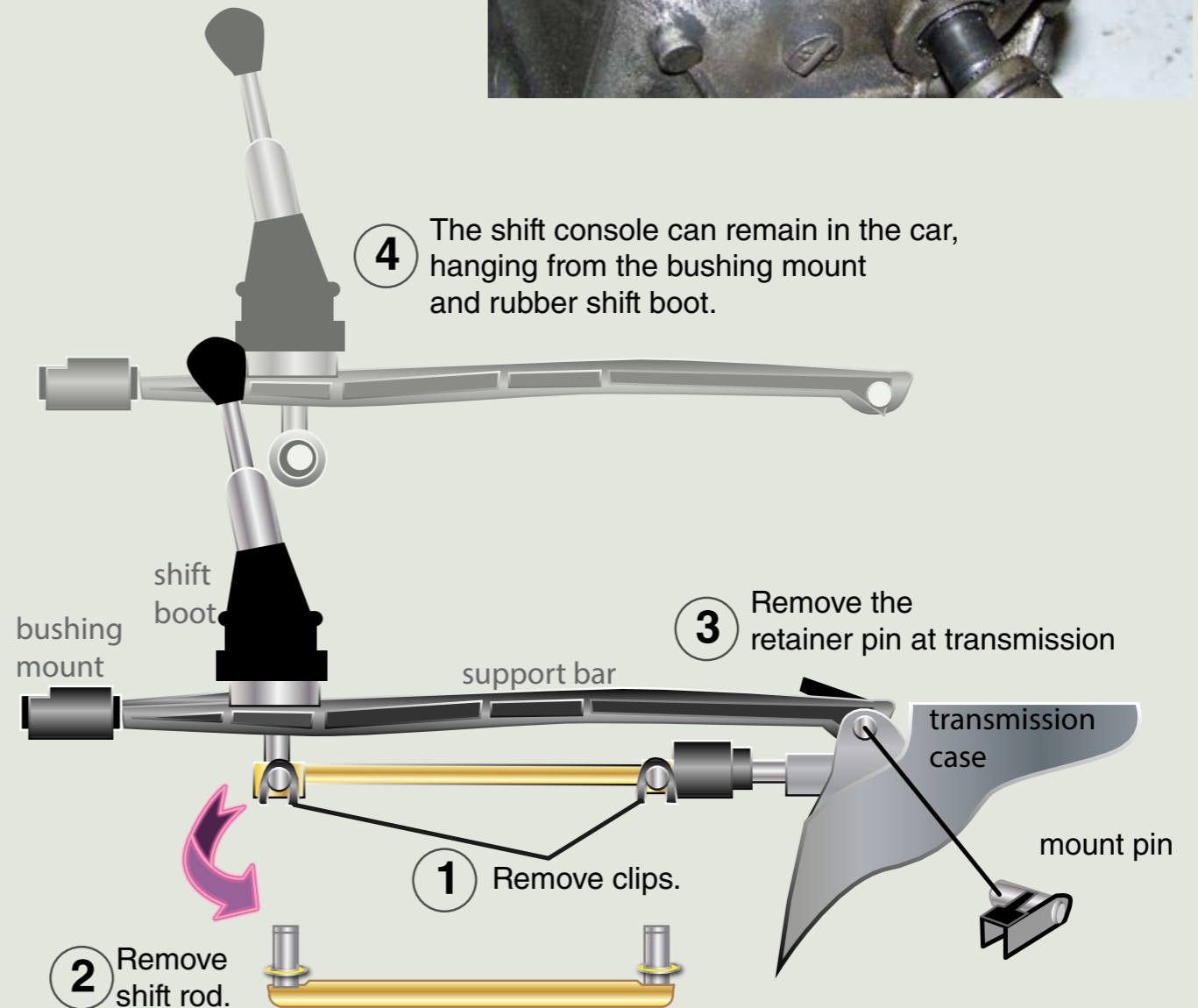
Pry up on the clip as shown in the photo. Pivot the clip upward, then pull the pin out to release the rod from the transmission. You can let the support bar hang from its bushing and rubber shift boot, although this is generally a good time to remove and clean the assembly and apply fresh lube to the shift lever pivot ball.



You can remove the entire shift console to clean and lube or replace worn parts, or you can leave the upper section attached to the chassis as you drop the transmission.

This illustration shows the steps needed to drop the transmission with the upper console still attached to the roof of the chassis tunnel.

ECS Tuning stocks individual repair parts and complete overhaul kits for the shift mechanism.



Step 18

Unbolt the rear transmission mount from the chassis and let the rear of the transmission drop down slightly.

Service Tip: As mentioned earlier, make sure the engine throttle assembly and brake fluid reservoir are not damaged as the engine pivots downward at the rear. Remove any components that may be damaged by engine movement.



Step 19

Lowering the rear of the transmission makes it easier to remove the two nuts securing the clutch slave cylinder to the left side of the bell housing.

After unbolting the slave cylinder, pull it down, hose and all. Tie it off to the side, out of your way.

No need to disconnect the hydraulic line; just don't push on the clutch pedal until the slave is reinstalled later.



Removing the Transmission

BMW E36/E46 Lightweight Flywheel Installation

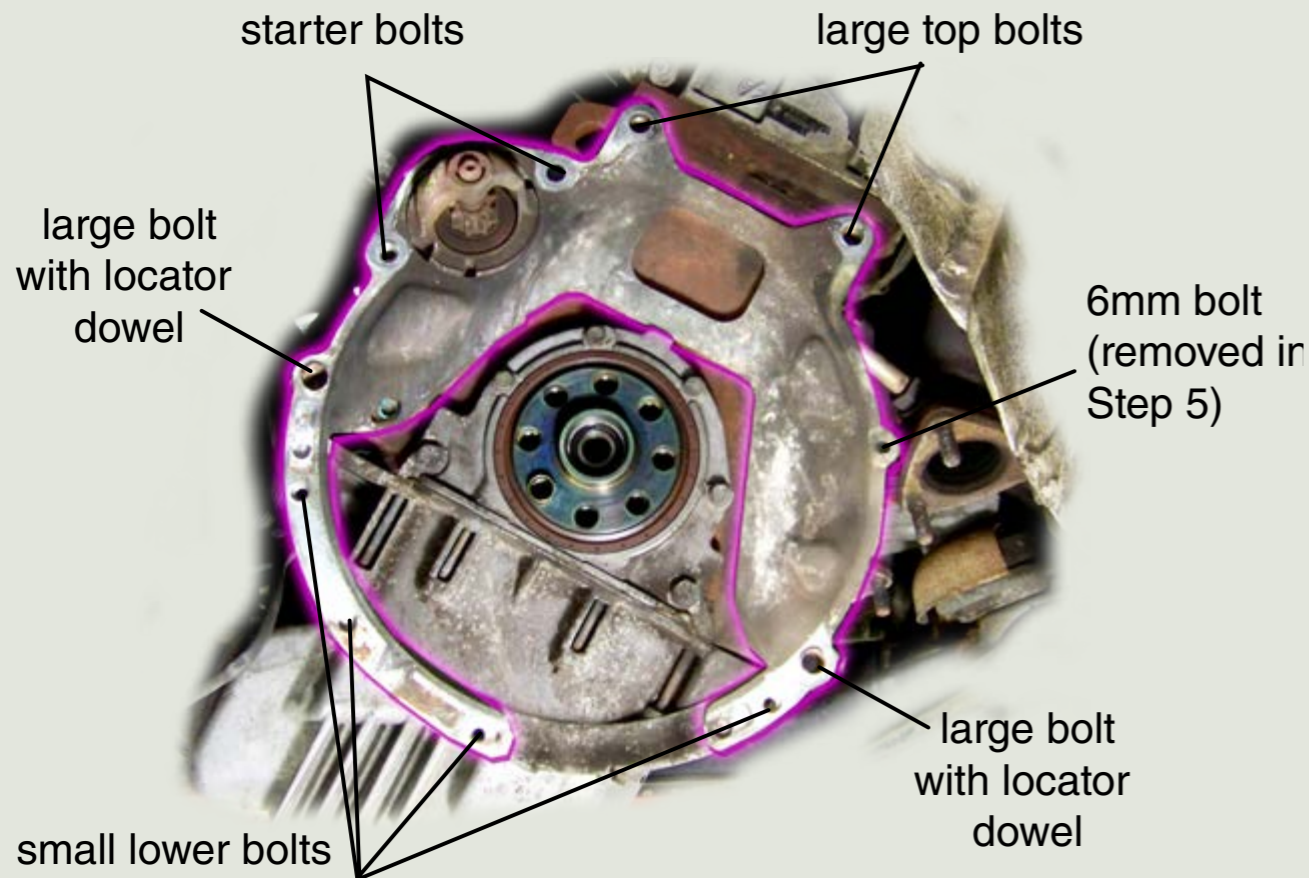
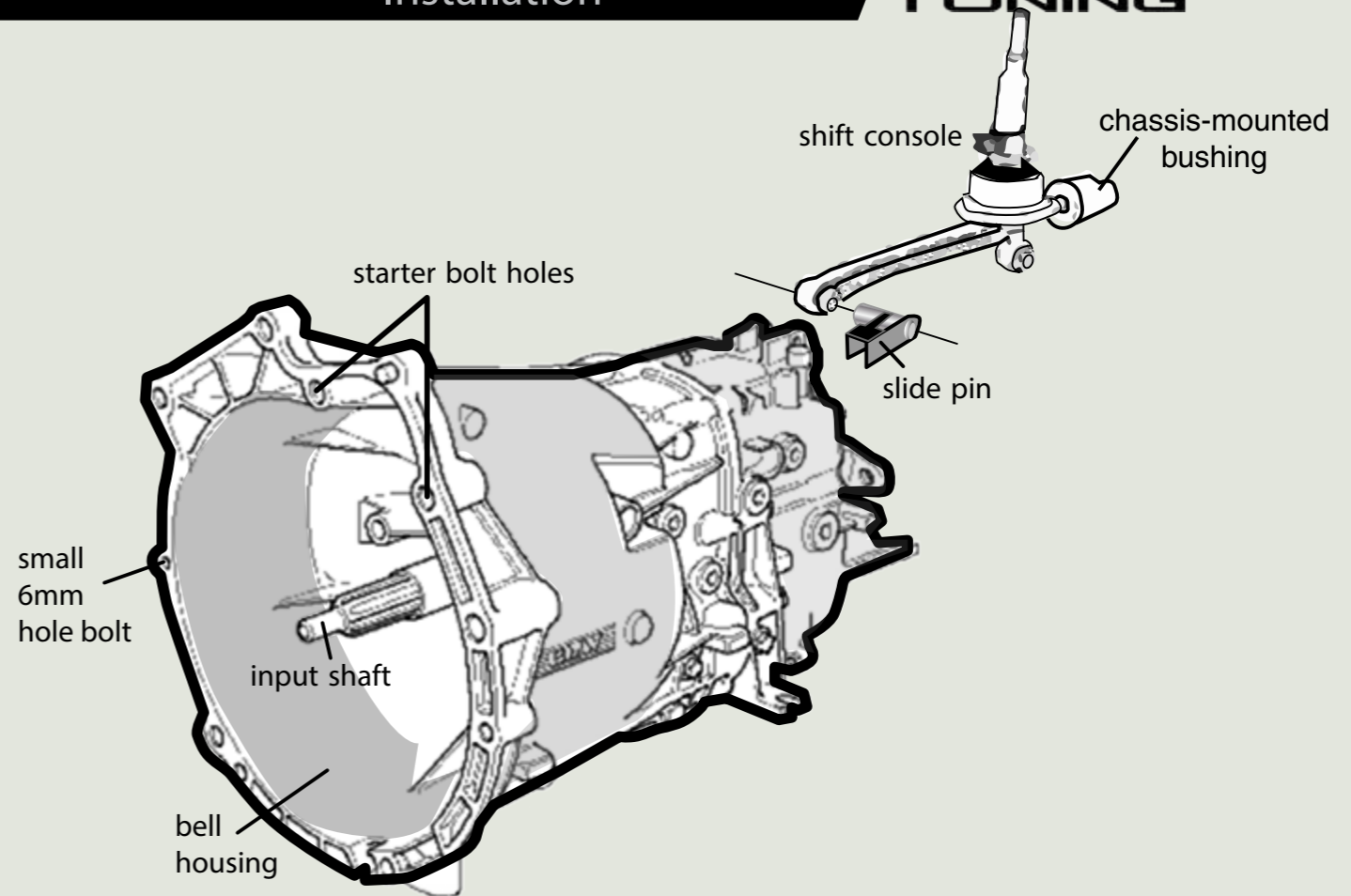


Step 20

It's time to start unbolting the bell housing.

At this point:

- The shift console is disconnected from the transmission. It is hanging from the chassis.
- The clutch slave cylinder is disconnected and hanging off to the side.



All that remains is to remove the main bell housing bolts and starter bolts. For this, you'll need E10 and E14 Torx sockets, a long extension, a swivel attachment between the extension and sockets, and a long handled ratchet or breaker bar to loosen the bolts.

Service Tip: Some starter bolts are threaded into the engine. Others are secured with a nut that requires a backing wrench to remove.

The illustration to the left shows the location of all bolts in the bellhousing. The steel separator plate between the transmission and engine is silhouetted in purple.

Step 21

Service Tip: There is little room between the bell housing and chassis, even when the rear of the transmission is lowered. It is much easier to reach in from the rear of the transmission with socket on a long extension.

Use one hand to guide the socket to the bolt head, then use both hands to turn the wrench for added leverage.



Step 22

Service Tip: The weight of the transmission should never hang from the transmission main shaft alone. In most cases, even with all the bell housing bolts removed, the transmission will still be "stuck" to the engine, especially at the two locator dowels. (See illustration on previous page.)

Play it safe: Have a jack supporting the transmission before you separate it from the engine.

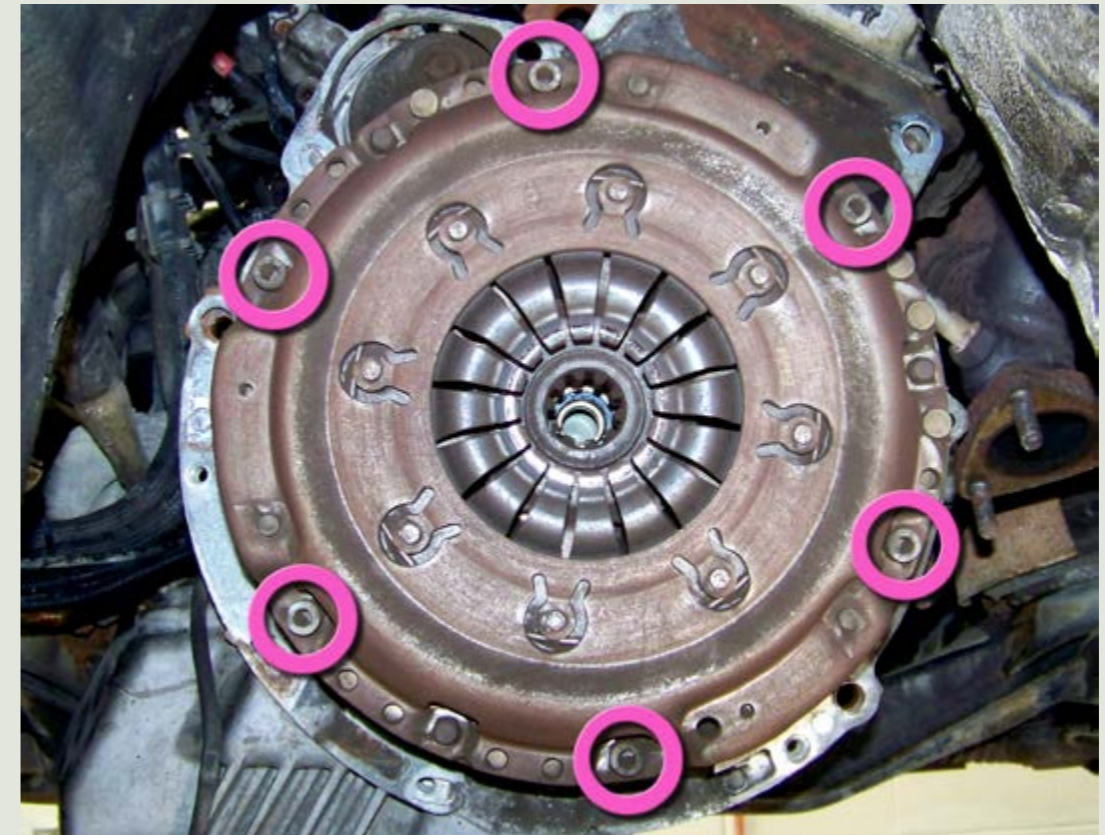
When you do separate the transmission and engine, keep the centerlines of the transmission input shaft and crankshaft aligned until the input shaft clears the rear of the clutch pressure plate. Then drop the transmission down.



Step 23

Unbolt the six hex-head pressure plate bolts and remove the pressure plate and clutch friction disc.

Service Tip: Install the clutch pilot tool into the clutch disc before removing the bolts. It will hold the clutch in place as you remove the bolts, and keep it from falling out.



Step 24

Unbolt the six flywheel bolts. An impact gun and impact socket are recommended for this task.

Service Tip: CAUTION: This dual mass flywheel is very heavy. Don't let it fall and hit you when it comes off. If necessary, have a friend help you steady and support the flywheel as you remove the bolts.



Installing the New Clutch

BMW E36/E46 Lightweight Flywheel Installation



Step 25

Replace the pilot bearing. The old bearing may pull out easily by hand, although some (like this one!) will stick. A puller with expandable jaws and slide hammer removes it quickly.

Service Tip: No puller? Pack the blind hole behind the bearing with grease. then insert a rod slightly smaller than the bearing hole and hit it with a hammer. The grease will push the the old bearing out.

Clean the bearing cavity and tap in the new bearing.



Step 26

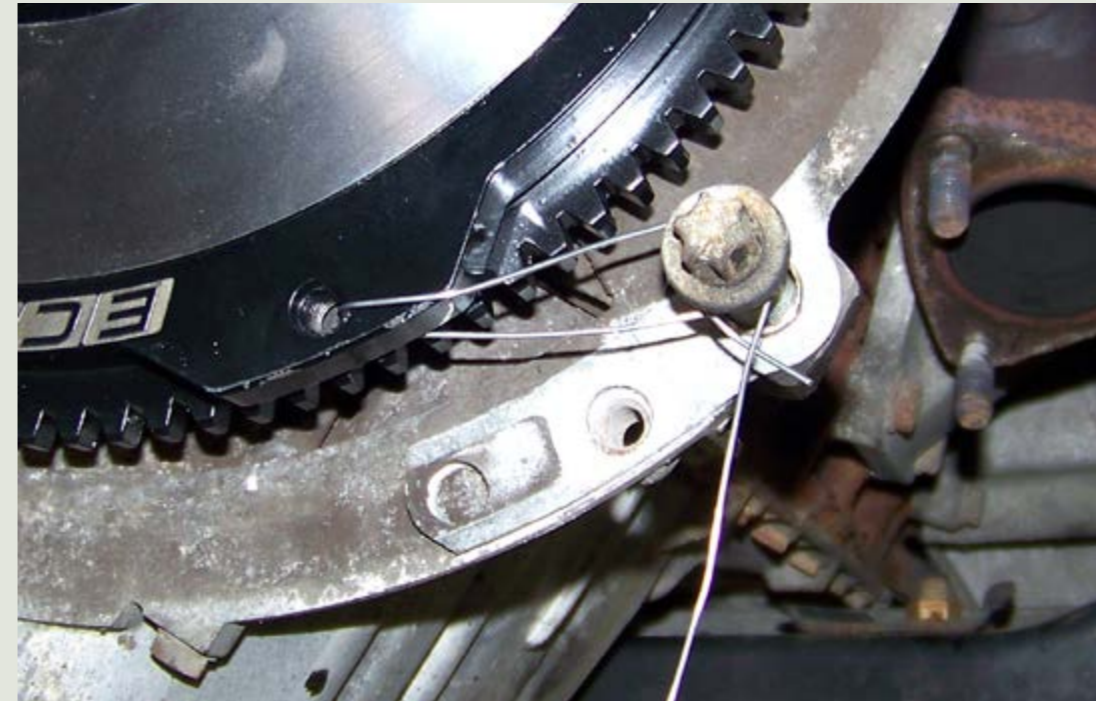
Install your new single mass flywheel. The new flywheel bolts in the kit come with encapsulated thread locker already applied.



Step 27

Need to hold the flywheel steady while torquing the bolts? If you don't have the correct flywheel lock, a simple workaround is to loop a length of strong mechanic's wire through one flywheel hole, and then wrap it around a bell housing bolt, threaded in place temporarily. (Multiple strand picture wire is also very strong, and flexible.)

With the flywheel locked in place, hand snug the flywheel bolts. Working in a star, criss-cross pattern, pre-tighten the bolts to 50Nm, then repeat the process, final tightening the bolts to 120Nm (89 ft-lb).



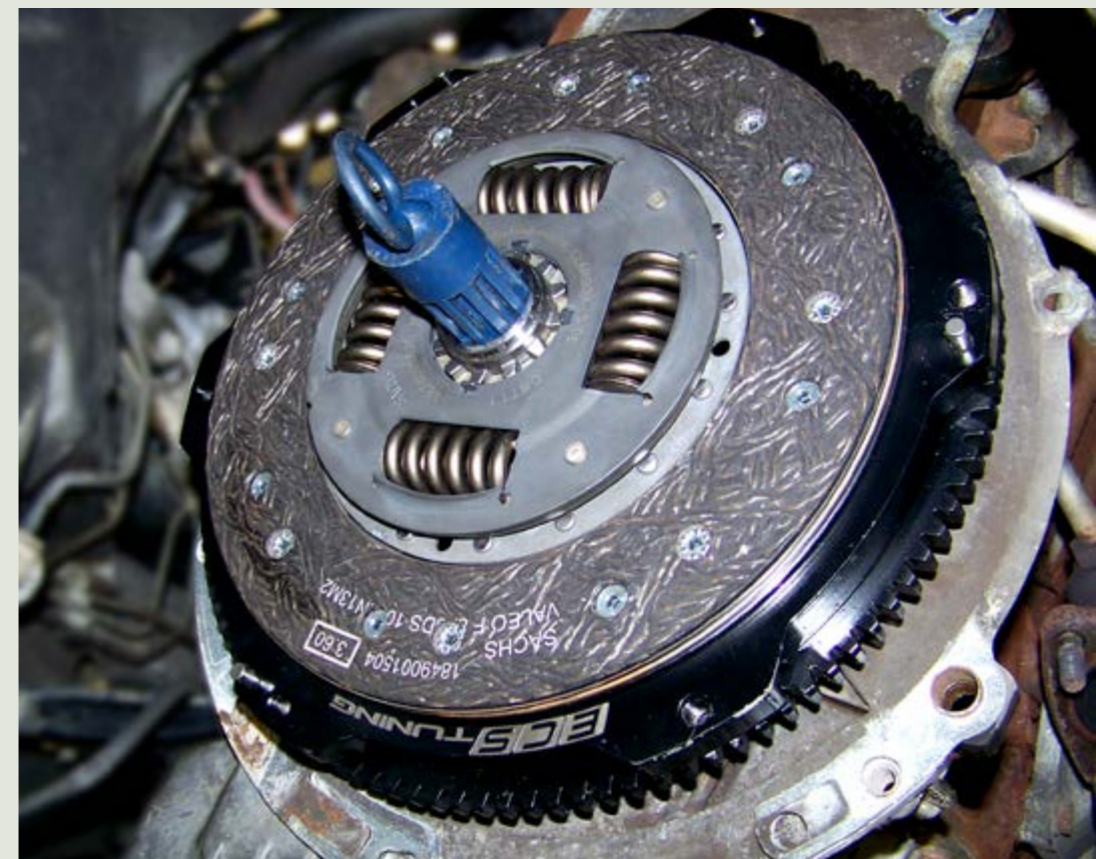
Step 28

Wipe the friction face of the flywheel with a clean rag, moistened with brake cleaner (NOT carb cleaner) to remove any oil residue.

Place the clutch friction disc onto the flywheel with one hand as you insert the clutch pilot tool through the center of the disc, into the pilot bearing.

The pilot tool centers the disc on the flywheel, and will also hold it in place while you install the clutch pressure plate.

Note: The raised center disc containing the four damping springs faces away from the flywheel.



Step 29

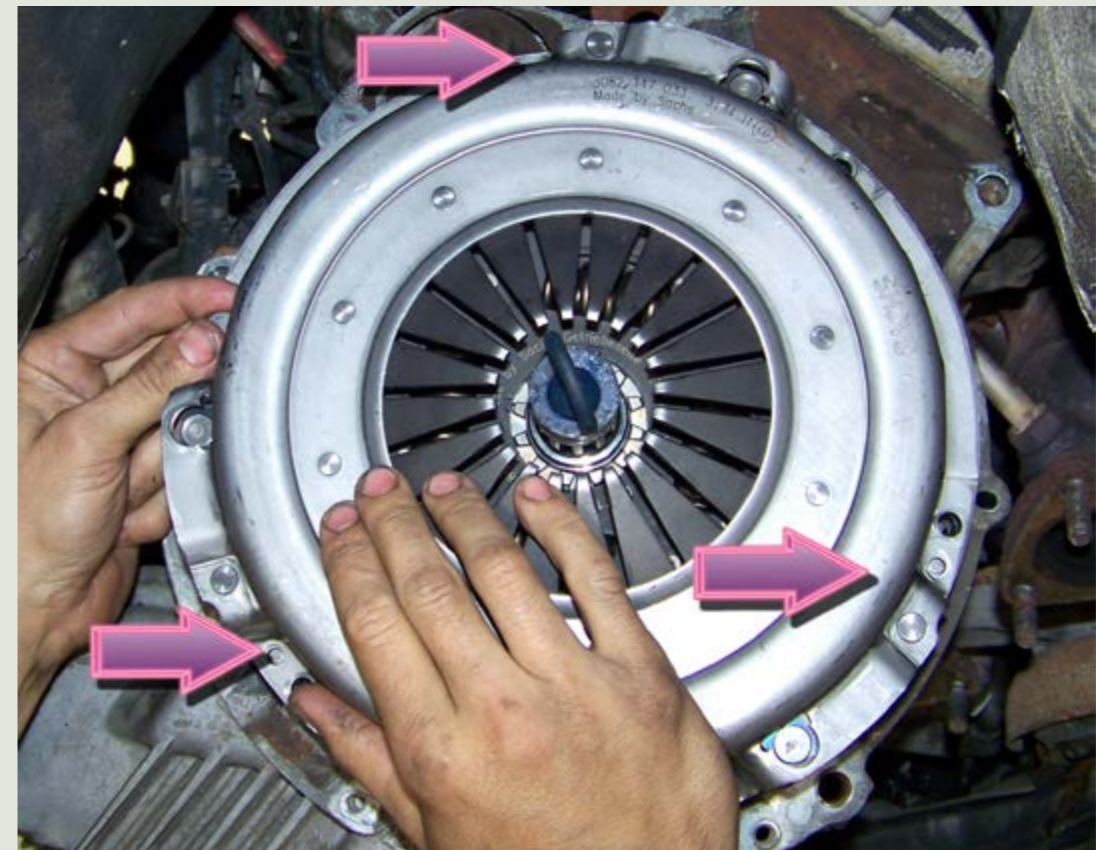
Wipe the friction face of the clutch pressure plate with a clean cloth, moistened with brake cleaner (NOT carb cleaner) to remove any oil residue.



Step 30

- Install the pressure plate onto the flywheel. Align the locator dowels pressed into the flywheel with the mating holes in the pressure plate (arrows).
- Install all pressure plate bolts finger tight. Then snug the bolts, tightening in star, criss-cross pattern to draw the pressure plate down evenly. Final-tighten the bolts to 34Nm (25 ft-lb).
- Remove the pilot shaft.

Service Tip: Do not over-tighten the pressure plate bolts. The correct torque spec is tight enough.



Step 31

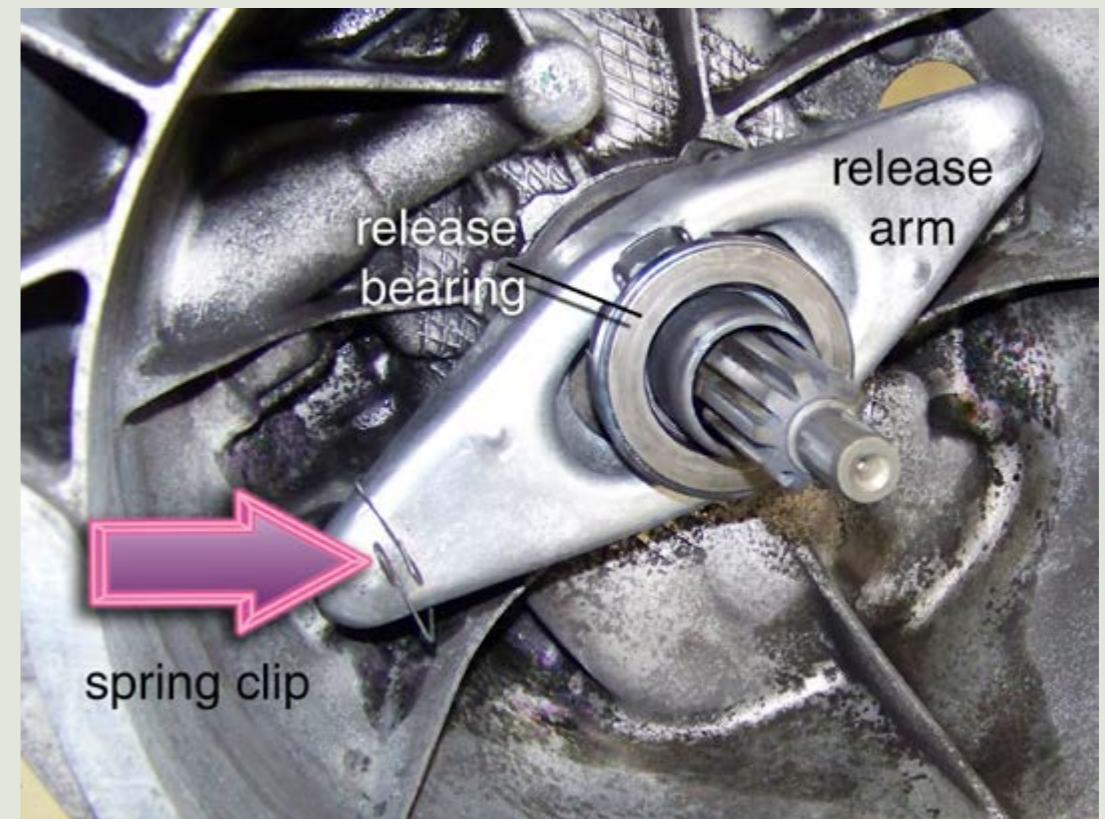
At 200,000 miles, our transmission needs a thorough cleaning to remove oil film, dirt, and a serious accumulation of clutch dust inside the bell housing. Hot soapy water and a pressure rinse leave it looking much cleaner.



Step 32

Inside the bell housing, remove the release arm and release bearing. The arm pivots on a plastic ball stud, and is held in place by a spring clip (arrow) that engages a groove in the stud and then wraps around the arm to hold it in place.

Spread the spring clip enough to free the arm, then pull the arm and bearing forward to remove them.



Step 33

Check the guide sleeve surrounding the main shaft for signs of wear that might prevent the new release bearing from sliding smoothly. If the sleeve is damaged, it can be replaced separately (ES42238).

Apply a thin film of MoS2 lubricating paste (ES261605) to the sleeve, input shaft splines, ball stud, and shaft snout.



Step 34

Apply a thin film of the MoS2 paste at the contact points where the release bearing rides on release arm. This will ensure smooth operation and reduce noise and wear.



Step 35

Our transmission is ready to reinstall.

Service Tip: Insert each of the top and side bell housing bolts into its correct hole. This is much easier than trying to reach up later in tight quarters and insert each bolt individually.

Service Tip: This is also a good time to change transmission fluid; the fill hole on the side of the case is easier to reach with a funnel while the transmission is out of the car. ECS tuning has several approved fluids for this and other BMW transmissions.



Step 36

Use the jack to raise the transmission in place.

Service Tip: You may need to place a second jack at the front of the engine pan and rock it back a few degrees on its mounts until the engine and trans are properly aligned.

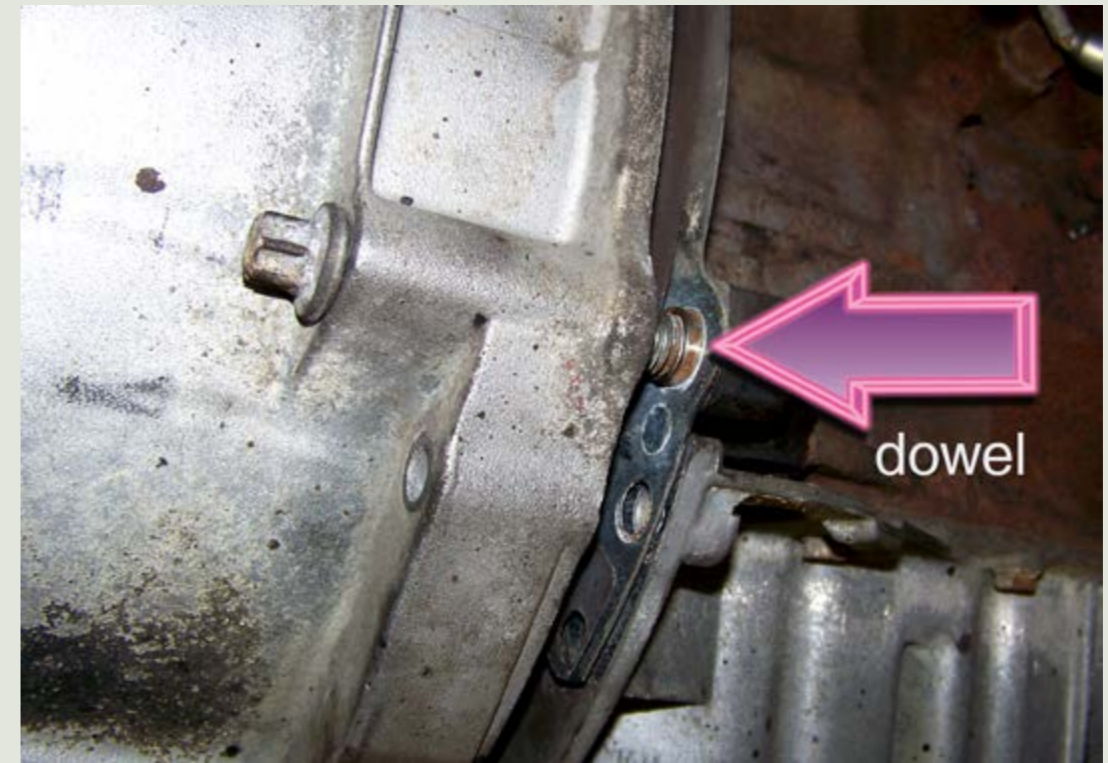
With the input shaft centered in the pressure plate opening, push the transmission forward carefully.



Step 37

Use the two raised dowels on either side of the engine to align the transmission and engine; that's what they're there for!

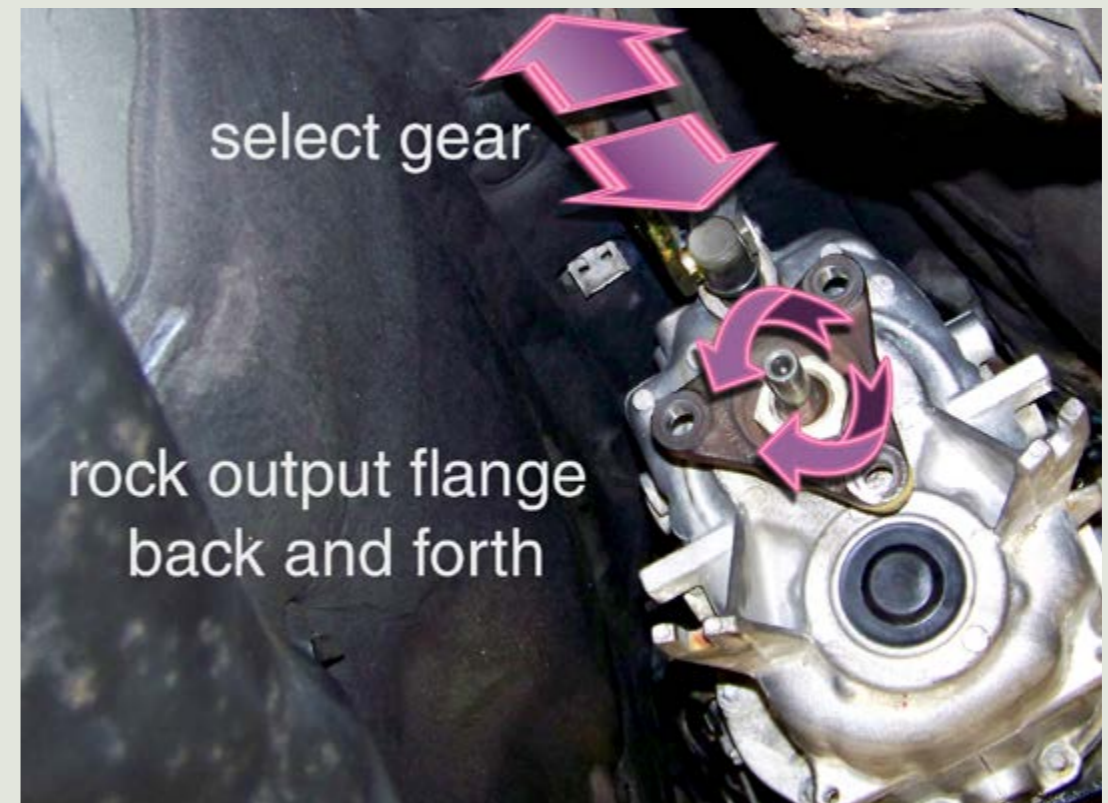
As you push the transmission forward, the splines on the transmission input shaft should engage the mating splines on the clutch friction disc. When they do, the transmission will slide forward, toward the engine. Then start the bolts in their holes and tighten them evenly around the bell housing circumference to draw the transmission in evenly.



Step 38

Service Tip: If you have trouble getting the splines to align, reach up and shift the transmission into gear using the selector shaft at the rear of the transmission.

Then rock the output flange at the rear of the transmission by hand, turning it back and forth a few degrees in either direction. This will rotate the input shaft until the splines align with those in the clutch.



Step 39

Torque all bell housing bolts to specifications and reinstall the small 6mm bolt at the front of the engine (removed in Step 5 of this pdf).

Route the backup light switch wiring over the top of the transmission and connect it to the switch. Secure the wiring in the clips on the left side of the transmission.

Bolt the clutch slave cylinder to the transmission.



Step 40

Reattach the shift support bar to the rear of the transmission.

Reinstall the shift linkage. (See component location diagram on Page 12.)



Step 41

Jack up the rear of the transaxle and reinstall the rear crossmember with mounts.

ECS Tuning stocks replacement mounts if yours are sagging, cracked, or broken.

Reinstall the heat shield removed in Step 6.

Service Tip: If you're replacing the rear mounts, this is a great time to upgrade to performance polyurethane, tougher and longer lasting than stock rubber mounts.



Step 42

Slide the flex coupler in place and slide all coupler bolts in place. Torque the fasteners to spec. Use the chart on page 2 to find the correct torque, based on bolt diameter and hardness.



Step 43

- Bolt up the driveshaft center support and tighten the collar at the splined slip joint. No need to get physical, the torque spec for the collar is only 10 Nm (7.5 ft-lb).
- Reinstall the heat shield removed in Step 6.
Reinstall the exhaust.
- Reconnect the battery.
- Test drive.

This completes the installation of the BMW Lightweight Flywheel and clutch.



Thanks for purchasing
your Lightweight Flywheel
Kit from ECS Tuning.

We appreciate your business, and
hope this tutorial has been helpful.

ES#2770848