



## 188mm 3-Clutch BMW Differential Upgrade Kit

Working on automobiles and/or automobile parts is very dangerous. It is important to understand one's ability and skillset. If in any doubt, let a professional handle the job. Thayer Motorsports, Inc. (including, but not limited to, all members, owners, employees and associated parties) will not be held responsible for any injuries or damages as a result of product purchase, installation and/or ownership.

This guide assumes you have removed the differential from the vehicle, removed the rear cover, and removed the output flanges.

Looking at the rear of the differential with the mounting points upward, you will notice that the left side of the differential has the ring gear and the right side of the differential has the speed sensor impulse wheel. These sides will be referred to in this guide as "ring side" and "speed sensor side" respectively.

### Step One: Remove Ring Side Retainer

Needed:

13mm Socket / Ratchet

Straight Screw Driver / Small Pry Bar

Small Hammer

Using a 13mm socket, remove the six M8 retaining bolts in the ring side retainer. Notice the orientation of the retainer and the upward tab on it. It is critical to observe the orientation of all parts for correct orientation during reassembly. Once the bolts have been removed, you can proceed on working the retainer out of the case. This may take some persuasion to remove as, most likely, the last time it was serviced was at the

BMW factory. You may want to use the small hammer to start rotating the carrier to break free and use the pry bar to pull it out. It also helps to hold up the limited slip unit in the case to remove weight when trying to remove. The retainer has a specially machined spacer behind it with sets gear tolerances. It is CRITICAL that these not be mixed up. Place this retainer and the associated spacer in a bag clearly labeled "ring side".

#### Step Two: Remove Speed Sensor Side Retainer

Needed:

13mm Socket / Ratchet

Straight Screw Driver / Small Pry Bar

Small Hammer

This should be slightly easier than the first as the bearing preload has been removed. For ease and to protect the speed sensor wheel, roll the differential onto the ring gear side. The limited slip unit will now be loose inside the case. Remove the six bolts and wiggle the retainer out. Again, this may require a bit of persuasion. The retainer has a specially machined spacer behind it with sets gear tolerances. It is CRITICAL that these not be mixed up. Place this retainer and the associated spacer in a bag clearly labeled "speed side".

#### Step Three: Gently Remove The LSD Unit

Needed:

None

Gently remove the limited slip unit from the case. Pay careful attention not to bend the speed sensor wheel. The unit is rather heavy, so grip it appropriately.

#### (Optional) Step Four: Paint The Differential Case

Needed:

Spray Paint

Wire Brush (or equivalent)

Now is the perfect time to repaint that aging differential case. Mask all machined surfaces. Using a wire brush, clean all loose particulate from the case. Paint as necessary.

### Step Five: Remove Limited Slip Carrier Cover

Needed:

6mm Allen Socket w/ Ratchet

Working in a star pattern, or similar, remove the eight set head bolts from carrier cover. These are a very soft metal, so ensure the allen is completed seated before removing. No worries if they strip, just remove with a pair of pliers, or by hammering in a torx bit into the top. These eight bolts are not reused as your kit includes upgraded hardware.

### Step Six: Disassemble Limited Slip Components

Needed:

None

As a preface, pay CLOSE attention to all parts and their orientation. Set up an organized workspace where you can lay out all the components in the order they are removed. The following will describe the parts removed, in order, from the limited slip assembly.

- Carrier cover - this is the item that you removed the eight bolts out of in the previous step. It may require patience to remove as the tolerances are very tight. If it does not pull out easily, use a screwdriver or similar to wiggle it back and forth.
- Small diameter spacer - this is sometimes stuck in the carrier cover due to the tension of the differential fluid. It may, or may not, have oiling grooves. It will stay in the same position during reassembly, so don't stress over removing.
- Small diameter belleville spring - this is a conical spring the same diameter as the spacer above.
- Small diameter diamond pattern oiling disc - this is a tabbed disc that is smooth on one side and has a diamond traction pattern on the other.
- Large diameter belleville spring - this is a conical spring the full diameter of the case interior.
- Dog ear plate - this is a flat disc with four lugs the full diameter of the case.
- Clutch plate - this is a flat abrasive disc the full diameter of the case.
- Spider gear assembly - this consists of eight individual parts. Two pressure ramp plates, two spider gear rods, and four spider gears. It is a simple device, just note how it assembles.

- Clutch plate - this is a flat abrasive disc the full diameter of the case.
- Dog ear plate - this is a flat disc with four lugs the full diameter of the case.
- Large diameter belleville spring - this is a conical spring the full diameter of the case interior.
- Large diameter spacer - this is a spacer that sits in the bottom of the case. It is the full diameter of the case.
- Small diameter diamond pattern oiling disc - this is a tabbed disc that is smooth on one side and has a diamond traction pattern on the other.
- Small diameter belleville spring - this is a conical spring the same diameter as the spacer above.
- Small diameter spacer - this is sometimes stuck in the bottom of the case due to the tension of the differential fluid. It may, or may not, have oiling grooves. It will stay in the same position during reassembly, so don't stress over removing.

***If for any reason the parts above do not match the parts removed from your differential, contact [support@thayermotorsports.com](mailto:support@thayermotorsports.com) before proceeding!***

#### Step Seven: Measure Carrier

Needed:

Device to measure in mm

This step is a quick check to make sure that your differential has not been modified before your ownership.

The case depth should measure 96.8 mm and the cover inset should measure 14.1 mm.

#### Step Eight: Reassemble Limited Slip Components

Needed:

BimmerDiffs 3-Clutch Upgrade Kit

6mm Allen Socket w/ Ratchet

Torque Wrench (w/ Resolution at 30 ft.lb.)

Medium Threadlocker

Before starting, take the three new friction discs included with the kit and soak in differential fluid. This is essential to prevent burnout during the break-in cycle.

Starting with an empty case, add these parts in this specific order. If you have any doubt, refer to how you disassembled it.

- Small diameter spacer - this may still be stuck in the case. If it has oiling grooves, the grooves go downward.
- Small diameter belleville spring - install this with the small spring radius down and the large spring radius upward.
- Small diameter diamond pattern oiling disc - install this with the diamond pattern surface up. The tab falls into the recess in the differential..
- Large diameter belleville spring - install this with the small spring radius down and the large spring radius upward touching the next dog ear plate.
- NEW dog ear plate (thinnest provided) - this is non-directional.
- NEW clutch disc - this is non-directional.
- NEW dog ear plate - this is non-directional.
- NEW clutch disc - this is non-directional.
- Spider gear assembly - install just as removed. Since the differential now has two clutches on the speed sensor side, it will take some work to get the splines on the spider gears to push in correctly. Patience is key.
- NEW clutch disc - this is non-directional.
- NEW dog ear plate - this is non-directional.
- Large diameter belleville spring - install this with the large spring radius down and the small spring radius upward. The large radius should be pushing towards the dog ear plate.
- Small diameter diamond pattern oiling disc - install this with the diamond pattern surface down towards the spider gears. The tab needs to line up with the recess in the carrier cover.
- Small diameter belleville spring - install this with the small spring radius up towards the carrier cover and the large spring radius downward to the spider gears.
- Small diameter spacer - this may still be stuck in the case. If it has oiling grooves, the grooves go upward into the carrier cover

Now, the tricky part is to get the carrier cover on the differential while seating the oil disc appropriately. Make sure the tab lines up and fits into the cover.

At this point, the cover will be resting in the limited slip unit but not bottomed out. This is normal and due to the belleville springs, which will be compressed.

Using the supplied eight cover allen head bolts, apply medium threadlocker to the

threads and start installing. First, install all eight bolts just finger tight. After, using a star pattern, slowly turn down the cover. Take your time and alternate between all the bolts frequently to tighten the cover down evenly. With patience and a standard ratchet, the cover will easily bottom out.

Now, using a torque wrench, tighten all eight bolts to 30 ft.lb. in a star pattern.

Congratulations, your upgraded limited slip unit is reassembled. You should have five old parts left outside the case: two old friction discs, two old dog ears, and one thick spacer.

#### Step Nine: Gently Return Limited Slip Unit To Case

Needed:

None

With the differential case sitting on a solid surface, gently slide in the limited slip assembly into the case. The ring gear should be on the left side. Position accordingly to reinstall the retention plates.

#### Step Ten: Reinstall Speed Sensor Side Retainer

Needed:

13mm Socket w/ Ratchet

Remove retaining plate and spacer from “speed sensor side” bag. Gently arrange retainer into position with external tab upwards. Once pushed into place, rotate limited slip unit slightly to ensure that gears are properly aligning. Using a 13mm socket, tighten the six retaining bolts. Torque specification is roughly 15 ft.lb. - tight with a standard  $\frac{3}{8}$ ” ratchet is normally sufficient.

#### Step Eleven: Reinstall Ring Side Retainer

Needed:

13mm Socket w/ Ratchet

Remove retaining plate and spacer from “ring side” bag. Gently arrange retainer into position with external tab upwards. Once pushed into place, rotate limited slip unit slightly to ensure that gears are properly aligning. Using a 13mm socket, tighten the six

retaining bolts. Torque specification is roughly 15 ft.lb. - tight with a standard  $\frac{3}{8}$ " ratchet is normally sufficient. You may want to take this opportunity to check tightness of all retaining plate bolts.

Differential should now spin just as disassembled. No gear clearances have been altered.

### Closing Notes

Make sure to use a synthetic gear oil specifically designed for use in limited slip differentials without the need for a friction modifier. Feel free to contact us for a recommendation. Break-in differential by driving approximately 25 miles. Avoid rapid acceleration and excessively tight turns during this period. Following the 25 mile break-in, re-check differential fluid level to ensure proper fill.

**This guide is property of Thayer Motorsports, Inc. and cannot be reproduced without written authority.**