

# INSTRUCTIONS FOR INSTALLING THE *New Improved* MOSS GARAGE T-SERIES OIL SEAL KIT

**IMPORTANT:** Even if you have previously installed one of these Kits, please read all of the following instructions and comments thoroughly and carefully, as much new and vital information is contained therein.

Congratulations! You have just purchased a great item which, properly installed, will eliminate all of the oil leaks from the rear of your T-Series engine. In fact, installed along with the new style front timing cover seal, you can say "Goodbye" to engine leaks and messy floors forever. This Kit uses a proper oil seal to replace the antiquated and grossly inefficient factory rear "seal".

**Please carefully read and follow these instructions for installing the Moss Garage T-Series Oil Seal Kit. Yes, I know they appear wordy, but for the installation to be successful, it is necessary to read and understand and then follow each and every step. (MOST PROBLEMS ENCOUNTERED HAVE BEEN FROM NOT READING AND FOLLOWING THESE INSTRUCTIONS!)** It is suggested that each step be reviewed and checked or lined out when completed. For a satisfactory and successful installation, religiously follow each step, otherwise you will undoubtedly end up with an oil leak!!

It is assumed that your engine is out of your car and is dismantled, at least to the point of having the crankshaft out of the engine and the flywheel removed from the crankshaft. Also, that the engine is in an inverted position.

1) Carefully examine the outer surface of the rear crankshaft flange to ascertain that it is free from any nicks or scratches. This is the surface upon which the new seal will be riding and it must be perfectly smooth. Correct any defects or imperfections before proceeding. See "**SPEEDI SLEEVE**"

2) Remove the three hex bolts, the pot metal upper slinger, and all traces of the old gasket. The two hardened guide pins may be left in place.

3) Place the rear main bearing cap in position and tighten the two nuts enough to seat the cap against the block.

4) Determine that the three new countersunk screws will not bottom in the block. If they do, cut or grind a bit off the ends of the screws as necessary.

5) Make sure that the upper half of the retainer will not touch the three "webs" cast into the block. Relieve if necessary.

6) After smearing a thin coating of the provided Permatex Ultra Black sealer on the block mating surface, install the upper half of the Seal Retainer to the block, using the three 8mm countersunk screws supplied. Tighten these three screws securely. (REFER TO FIGURE 1) (The semicircular gasket is not used).

7) Offer up the lower half of the Seal Retainer Assembly. Determine that it is not touching the rear surface of the rear main bearing cap: there must be a slight gap (.006-.012"). (REFER TO FIGURE 2) The rear face of the rear main cap was never a factory-machined surface and can be quite uneven: some, especially early, main caps are quite thick in this area. It may be necessary to remove some material from this surface to insure a proper gap. This may be done with a file, grinder, disk or belt sander, etc. Don't worry if this surface is a bit rough or uneven: the sealer which you will use in Step 10 will take care of this.

8) With the rear main bearing cap secured, attach the two Seal Retainer halves together, using the two socket screws and hex wrench supplied. There **must** be a slight (.006-.012") gap between the retainer and main bearing cap. (REFER TO FIGURE 2) If not, go back to Step 7. The Permatex sealer will fill to a 1/16" gap. (It is important to use a thread lubricant on the two socket screw threads)

9) At this point it is necessary to drill a 3/16" hole through the web of the rear main cap to allow oil to drain from the cavity around the Seal into the trough in the main cap, down the tube and into the sump. Either drill directly through the 3/16" hole in the Retainer, (REFER TO FIGURE 3) or mark accordingly and drill the hole with a drill press or hand drill. Make certain that the drilled hole goes through the web into the chamber. Be sure to remove all drill chips. (If it is ever decided to no longer use the Seal Retainer, the hole in the main cap may be plugged with JB Weld or a similar product.

10) Remove the lower (thin) half of the Seal Retainer and squeeze a small bead of the Permatex Ultra Black sealer in the two semicircular grooves in the back (forward) surface of the retainer. These beads should protrude at least 1/16" above the surface. (You are really making two "O" rings). (Needless to say, before applying sealer to any surface, the surface must be clean; free of oil or grease)

11) With the main cap still secured, offer the lower half of the Seal Retainer up to the cap, install and tighten the two socket screws.

12) After allowing the sealer to set up for a minimum of six hours, remove the two nuts and the two socket screws and carefully remove the main bearing cap/retainer assembly. Determine that the 3/16" hole is still clear and not plugged with Sealer.

13) Carefully apply a thin layer of Permatex Ultra Black sealer in the annular grooves in both halves of the housing where the seal will fit. Smear a light coating of engine oil on the rear crankshaft flange and carefully work the new Oil Seal over the flange with the lip (open part) of the Seal facing forward (toward the engine).

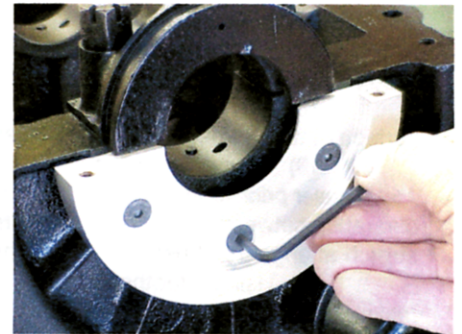


FIGURE 1

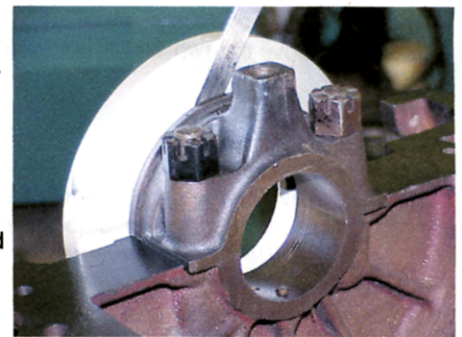


FIGURE 2

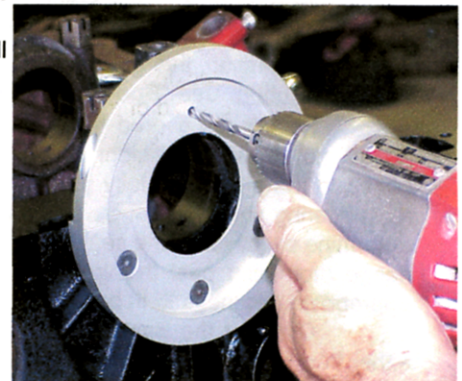


FIGURE 3

14) With the upper main bearing shells in position and properly lubricated, carefully lower the crankshaft into the block, making sure that the Seal fits into the upper Seal Retainer.

15) With the lower main bearing shells in their caps and properly lubricated, place the front and center caps in position.

16) Apply a dab of Permatex Ultra Black sealer to the two mating surfaces of the Seal Retainer (where they bolt together). Place the rear cap with Seal Retainer attached in position. Tighten and torque the six main bearing nuts, all the while determining that the Seal is seated into the Seal Retainer. Install and tighten the two socket screws. Be sure to apply a dab of grease or anti-sieze compound to these 2 screws. The installation at this point should look like FIGURE 4.

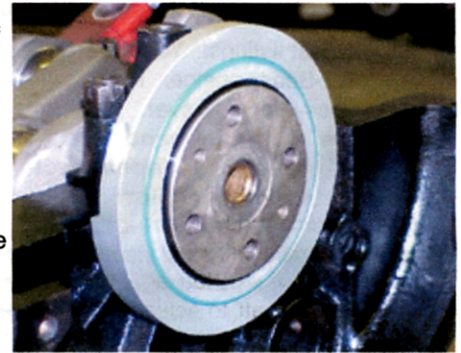


FIGURE 4

17) **VERY IMPORTANT!** Prior to installing the flywheel, it is necessary to determine that the surface of the flywheel which will mate with the rear surface of the crankshaft flange is perfectly flat and smooth and there is no metal protruding around any of the six holes. This may be checked visually or with a razor blade. If any metal is found protruding around any hole, it may be removed with a small grinder. Also, it is imperative to determine that both tapered pins will effect a snug fit in both the flywheel and the crankshaft. We now know that when these engines were originally assembled at the MG factory, both holes were reamed with a proper tapered reamer *after* the flywheel was installed. Replacement shafts have always been supplied with straight holes, and as the metal is too hard to be reamed, this presents a problem. One suggested method is to insert both pins in the flywheel and then measure the diameter where they protrude, then carefully taper the small end to the size of the holes in the crankshaft. After determining that both pins will be a reasonably snug fit in both the flywheel and crankshaft, proceed with instruction 18).

18) Smear a very small amount of Permatex Ultra Blacksealer on the end of the crankshaft flange and on the surface of the flywheel where it will seat on the shaft. This must be a very thin, even coat.

19) After determining that the crankshaft still rotates freely, install the flywheel. Coat the four bolts with the Loctite #587 sealer prior to installing. It is most important that when the flywheel bolts are finally torqued up (or down), there is ample clearance between the ends of the bolts and the Seal Retainer. These bolts originally varied slightly in length and are prone to stretch after years of use. If there is insufficient clearance, grind or file the ends of the bolts as necessary.

20) Using a toothpick or similar object, carefully place a small quantity of carefully mixed JB Weld in both small holes, making sure it reaches into the crankshaft holes. Smear a small amount of JB Weld on both tapered pins and drive them securely home using a medium-sized hammer and suitable drift punch. Determine that the pins do not contact the Retainer. Safety-wire the 4 flywheel bolts.

21) The "curing" time of the Permatex Ultra Blacksealer is 24 hours. After this time, in order to remove the crankshaft, merely remove the two 1/4" socket screws and the lower half of the Seal Retainer will remain affixed to the main cap if handled carefully.

After over twelve years of production (over 2500 units) and, with very few exceptions, all successfully installed, we have naturally encountered some unforeseen Seal Kit installation problems, a few of which are as follows:

A) We have encountered two cases where there was too much clearance between the crankshaft flange and the rear of the cylinder block, causing the lip of the seal to ride too far forward on the crankshaft flange and possibly cause leakage. As there is virtually no possibility of more than a few thousandths variance in the machining of the crankshafts, We can only assume that the factory machined more off the rear of some engine blocks. On all of the engines we have encountered there is approximately 0.046" gap between the forward surface of the crankshaft flange and the inner face of the aluminum seal retainer, allowing a gap of .006-.020" between the seal/seal retainer and the forward face of the installed flywheel. On the two engines in question, this gap was about 0.086", or 0.040" too much, allowing the seal to ride too far forward on the crankshaft flange. Solution: See "Speedi Sleeve".

B) We discovered that some older factory crankshafts have a radius, or chamfer, on the front edge of the crank flange, not allowing sufficient surface area for good seal contact. During assembly, with the upper half of the seal retainer bolted to the block, carefully place the lubricated seal on the crank flange and lower the crank into position with the upper main bearing shells in place. Then push the seal all the way home into the seal retainer half. You can then look down and determine exactly how the seal is riding on the crank flange. It should be far enough back on the flange to see the edge of the flange protruding past the lip of the seal. If this is not the case, see 'Speedi Sleeve', or make a metal shim of the appropriate thickness to fit between the seal housing and the block.

C) Over the past few years there have been many reported cases of leakage from the rear camshaft 'soft plug', either from being improperly installed or from fitting replacement plugs which are not made to the exact original specifications. I suggest placing a small amount of JB Weld, or similar, around the plug prior to installation and also around the edge of the plug after installation. Never pound directly on the plug to flatten it. Rather, place a piece of 1" or larger round steel with a slightly convex end, or the flat end of a large ball peen hammer, directly on the plug and strike sharply with a brass hammer. The plug should not end up completely flat or "reversed" but must be securely tight.

D) A few problems have occurred due to the block/ main caps assembly having been line bored at one time. Unfortunately, there is no easy way to determine this. It would be a good idea, especially if there is the slightest suspicion that the block may have been line bored previously, to install the Seal Housing without the seal in place, and install the crankshaft. Then, accurately measure the gap between the crank flange and the Seal Housing bore: it should be consistent throughout 360 degrees. If not, this would indicate that the block assembly has been line bored, causing the crankshaft to be off center within the seal. If this proves to be the case, drill the three countersunk holes in the upper Seal Housing 1/32" oversize and counterbore the three holes and replace the three countersunk screws with three 6mm x 16mm BHCS screws (Button Head Cap Screws). (Refer to FIGURE 4) This will allow sufficient movement to accurately center the assembly prior to final tightening. If you find this operation necessary, feel free to mail the aluminum half to me and I will perform the necessary machine work and return it promptly along with 3 new screws. All for free!

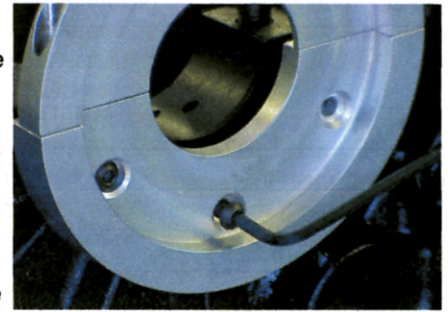


FIGURE 4

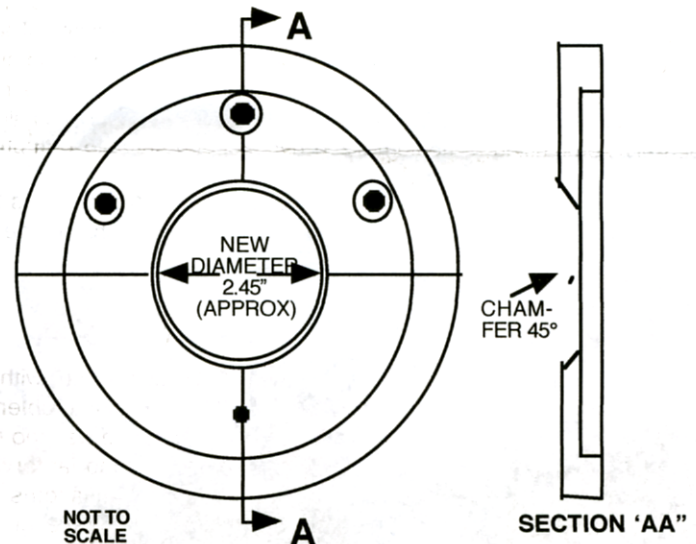
E) One severe leakage problem was caused by the cylinder block not being fitted with the original main bearing caps, allowing the crankshaft to actually set crooked in the block! This mess was solved by line boring the block and main caps, fitting a Speedi Sleeve, and relocating the Seal Housing as described in D) above.

F) Yet another problem cropped up on a racing engine which had been fitted with a lightweight "racing" flywheel which had been manufactured with a flange which was longer (deeper) than the original. This flange projected too far forward and destroyed the seal. This was solved by machining a small amount off the forward part of the flywheel flange. On this same engine, improper dowel pins had been fitted which protruded into the Seal Retainer.

G) Do not use any other sealer for this installation than the Permatex Ultra Black provided in the Kit. This product was selected after consultation with engineers and is not the same as other sealers (other than Loctite #587), believe me!

#### MODIFICATION TO SEAL KITS SOLD PRIOR TO 1998

The Seal Kit adapter was originally designed with the same inside diameter as the original factory seal so as to provide a "double seal". This proved, in some cases, to not allow sufficient oil to lubricate the new seal. Retainers manufactured since 1997 had this diameter increased by 0.100", as well as putting a 45° chamfer on the inside surface. (See drawing at right). The purpose of this chamfer is to direct oil onto the seal surface. This simple modification can be easily made to older housings, either in a lathe or by hand with a half-round file, die grinder, etc. The dimensions are not critical. If you care to return your old housing to me, I will be happy to perform the operation and return the part promptly, at no cost.



#### SPEEDI SLEEVE

A Speedi Sleeve is an ultra-thin, precision ground, stainless steel sleeve, designed to provide an ideal seating surface for any oil seal. We have found one that is a perfect fit on the crankshaft flange that will not only solve many of the above seal problems, but should really be used with every installation. While I would liked to have been able to provide one with every kit, the cost makes this prohibitive, and I did not want to raise the price of the Kit accordingly. Therefore, you can either obtain a Speedi Sleeve locally (Chicago Rawhide part number 99374), or order directly from Moss Garage for \$40. Install the Speedi Sleeve per the supplied directions, after applying a light coating of Loctite sleeve locking compound (available from Moss Garage: \$10 for a small tube). After placing the Speedi Sleeve onto the crankshaft flange, immediately install the flywheel and allow it to push the sleeve forward to its proper position before the Loctite sets up. It will almost contact the aluminum seal housing. You will now have a properly positioned and perfect surface for the oil seal, free of any imperfections. (Prior to final installation of the Speedi Sleeve, determine by measurement that there is clearance between the edge of the sleeve and the aluminum housing, otherwise the flow of oil will be cut off, causing failure of the oil seal. Some of the advantages of the Speedi Sleeve are as follows:

The surface of the crankshaft flange that the seal rides on was never finished to the quality and smoothness required for a seal to operate properly. Some late factory crankshafts have a chamfer on the forward edge of the flange, not allowing sufficient surface for the seal to operate properly. Due to variations in the machining of the block surface, the seal may ride too far forward on the flange. The Speedi Sleeve will accommodate this variance.

P.S.. I recently found an easier way to install the SpeediSleeve. Backwards!! Forget the installation cup, smear a light coating of Sleeve/Bushing Loctite #64000 on the crank flange, press the sleeve on with the flange toward the rear. It may be necessary to use a wood block and small hammer. When the leading edge protrudes past the flange, carefully remove the thin flange, quickly install the flywheel to push the sleeve all the way forward and then remove the flywheel. Either place the seal in front of the crankshaft flange prior to installing the SpeediSleeve, or very carefully place the seal over the crank flange horizontally all the way forward, then back onto the sleeve and resume with Instruction #13.

## OIL SEALS

Always use extreme caution when handling or installing ANY oil seal. The contact surface is extremely fragile and is easily damaged. ANY irregularities, no matter how slight, on the rubbing surface, must be corrected before installing the seal. Also, prior to installing a seal, smear a light coating of the lubricant to be sealed on both rubbing surfaces, then very carefully ease the seal over the shaft. NEVER use a hammer directly on a seal. Whenever possible, use a press with an appropriate mandrel to insure the seal being installed perfectly square. When installing any seal, particularly this rear main oil seal, smear a light coating of Loctite #587 Sealer around the outside of the seal. It is recommended practice to always replace an oil seal when it is made accessible after use.

## IMPORTANT! IMPORTANT! IMPORTANT! IMPORTANT! IMPORTANT!

Effective April, 2003, a totally new seal will be supplied with the Kit. The seals supplied for the past seven years were not designed for the speeds and temperatures encountered in some T-Series engines. This notwithstanding, they did the job, even in some racing engines.

After considerable research and development, Chicago Rawhide developed a new seal for our Kit. This seal is made of graphite-impregnated Teflon, the finest material available. It is rated to 12,000 RPM and will withstand temperatures to 600 degrees F. The lip of the seal has been relocated to insure better contact on the surface of the crankshaft flange and the lip has a reverse spiral to control the flow of oil.

You will note that this new seal is supplied with an insert which must be left in position until you are ready to install the seal. This is important to allow the seal to retain its proper shape. Be sure to lubricate the contact surface before final installation.

(REVISED 01/06)

New, Improved Oil Seal: \$26.00.

Speedi Sleeve: \$40.00.

Sleeve/Bushing Loctite: \$10.00.

(Please add \$4.00 per order for shipping & handling)

Order from.....

Moss Garage 1015 Soldier Pass . Sedona, Arizona 86336 RacerMoss@mac.com

