



**INSTALLATION MANUAL**

[IMSRETROFIT.COM](http://IMSRETROFIT.COM)

# WHAT FACTORY BEARING DOES MY ENGINE HAVE?

**1997-1999:** This engine featured a dual row bearing IMS.

**2000-2001:** These engines came from the factory with either a dual row or a single row bearing IMS. A single row flange measures 19.27mm deep and a dual row flange measures 13.34mm deep.

**2002-2005:** This engine featured a single row bearing IMS. Some late production 2005 models will have a non-servicable IMS.

**2006-2008:** These engines were fitted with a larger bearing, readily identifiable by the 22mm center nut, that is not serviceable without a complete teardown of the engine. Removal of the IMS bearing grease seal will ensure proper lubrication of the original bearing.

If the engine in your car has been replaced, it will have whatever IMS bearing was in production for that model year of manufacture for the replacement engine.

**It is important to identify which bearing your engine has before ordering or attempting installation of a replacement IMS bearing. The correct kit must be used for your engine otherwise engine damage or failure may occur.**

# IMS RETROFIT AND IMS SOLUTION PRE-QUALIFICATION PROCEDURE

The following eleven step IMS Retrofit and IMS Solution Pre-qualification procedure was developed by Jake Raby at Flat 6 Innovations. During the initial development of the IMS Retrofit and IMS Solution, and components, some items of concern were noted from the very beginning, and over the years these procedures have been updated to address these, thus increasing the effectiveness of the IMS Retrofit and IMS Solution procedure. This procedure has been employed at Flat 6 Innovations since the very first IMS Retrofit was performed, and to date it has resulted in a 100% success rate for the Flat 6 Innovations Preventative Service program. Having performed the very first IMS Retrofit, and after performing more IMS Retrofit / IMS Solution procedures than any other facility, a perfect record has been maintained by Flat 6 Innovations by employing these procedures verbatim.

This means that today, roughly 20% of all engines that are inspected will fail this pre-qualification, and will require repairs to be made prior to the IMS Retrofit / IMS Solution installation.

**The biggest mistake that can be made is assuming that every vehicle is healthy enough to have the IMS Retrofit / IMS Solution installed. The second biggest mistake that can be made, is not taking the pre-qualification procedure seriously. Please pay attention to each and every engine, and realize that not every engine is a viable candidate for IMS Retrofit / IMS Solution installation.**

- ➔ ☐ Perform controller interrogation (check for any Fault Codes, engine over-revs, Camshaft deviation #'s, etc...)
- ➔ ☐ Five (5) chain M96 engines are known for high camshaft deviation values due to abnormally high wear found on the timing chain adjuster wear pads. This can occur at low mileage points. **Camshaft deviations found over 4 degrees must be addressed prior to performing the IMS Retrofit / IMS Solution installation.** Failure to do this may result in a loss of valve timing during the procedure, or a Check Engine Light illumination immediately following the IMS Retrofit / IMS Solution installation. This will be due to camshaft deviations that are operating out of range.
- ➔ ☐ Perform Crankcase Manometer Test. Engines should read 4-6" of water column at sea level.
- ➔ ☐ Check over car complete, perform vehicle safety inspection, and listen to engine to determine overall condition. Inspect for any engine and/or gearbox oil and/or coolant leaks and document. Driving the car prior to the retrofit is recommended, as issues may be caught prior to the retrofit process.
- ➔ ☐ Drain engine oil and inspect how the oil looks while draining, inspect engine oil drain plug closely. Inspect for ANY debris. **Again, any debris is concerning, and must be taken seriously.** Engines can run perfectly, and exhibit no other symptoms of imminent failure, yet can be slowly dying due to debris laden oil.
- ➔ ☐ Remove engine oil filter, cut open and inspect for ANY debris. Look closely at the bottom of the factory filter canister, where debris often is collected. If ANY debris is present, the retrofit process must be aborted; and the source of the debris must be identified. Action must be taken to address these issues prior to the retrofit process being carried out. **Retrofitting the IMSB of ANY engine that has wear metals, or other debris in the oil, will lead to collateral damages that can destroy the retrofitted IMS Bearing, as well as all other internally lubricated engine components.**

- ➔ ☐ Remove Engine Oil Sump plate, inspect for debris. Removal of the sump plate is highly encouraged, as debris will lurk here that is not notable in the oil, or in the filter. Again, ANY debris of any sort is concerning, and must be investigated.
- ➔ ☐ During all oil, sump and filter inspections, remember that the tiniest particles are just as concerning as larger pieces. This is because they are even more easily mixed into, and suspended from the engine oil, allowing the debris to circulate all throughout the engine with damaging effects.
- ➔ ☐ Perform bore scope inspection of all cylinder bores. Watch closely for scoring and any signs of wear. Wear debris from failing / failed cylinders has been proven to be very damaging to all engine internals, including IMS Bearings.
- ➔ ☐ With the transaxle removed, inspect the Rear Main Seal bore to ensure the engine does not have a factory defect known as "crankshaft sag". If this exists oil leakage at the RMS will be a terminal condition that can't ever be remedied.
- ➔ ☐ Once the IMS Flange is removed, inspect the original IMS Bearing for signs of failure. Also, check for signs that the engine may have already experienced an IMS Bearing failure, and may have had another bearing fitted. Engines that have IMS shaft assemblies that have been through a failure are always damaged, and it is very important that these shafts are not fitted with any IMS Retrofit or IMS Solution product.

**NOTE: Any and all fault codes, and / or symptoms of rough running, etc. must be addressed prior to IMS Retrofit / IMS Solution installation. It is imperative that ONLY healthy, good running engines be retrofitted.**

**NEVER, UNDER ANY CIRCUMSTANCE, IS IT PERMISSIBLE TO REMOVE A FAILED OR FAILING IMS BEARING AND REPLACE IT WITH AN IMS RETROFIT OR IMS SOLUTION PRODUCT. IMS RETROFIT AND IMS SOLUTION COMPONENTS AND PROCEDURES WERE DESIGNED FOR PREVENTATIVE PURPOSES ONLY.**

## STEP 1

The procedure begins with a vehicle with the engine removed for better illustrative purposes.



### TIP

You do not have to remove the engine to install the IMS Solution. The process can be accomplished by only removing the transaxle, clutch assembly, and flywheel.



### NOTE

Please be advised installation of the Single Row Pro IMS Retrofit has greater difficulty over that of a classic Single Row IMS Retrofit and will take longer to complete. Familiarize yourself with the tools and the process before carrying out any procedure.

## STEP 2

IMS Pro Tool Kit (part# 106-08.13) and Faultless IMS Tool (part# 106-08.22) are **both** required for installation of the Single Row Pro IMS Retrofit (part# 106-08.2.2)

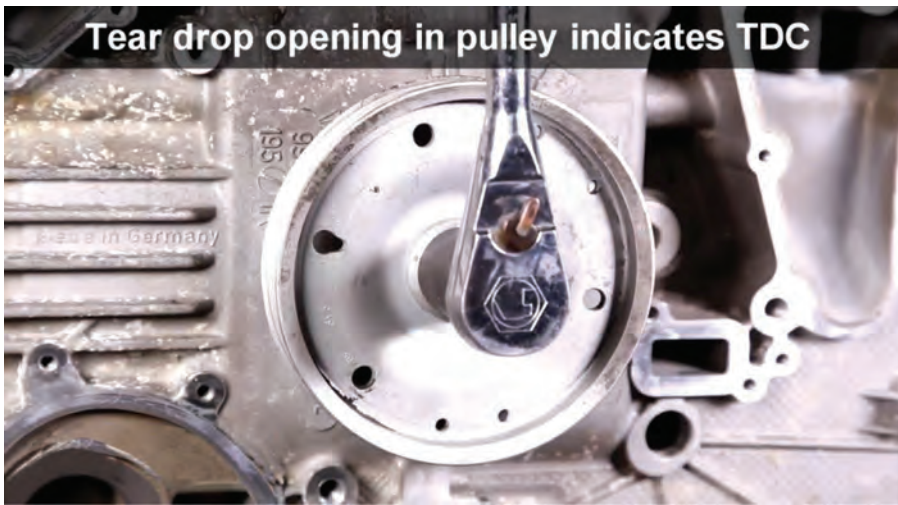


### NOTE

WE DO NOT PROVIDE SUPPORT FOR INSTALLATION! PROFESSIONAL INSTALLATION RECOMMENDED AND **REQUIRED** FOR LIMITED WARRANTY. See warranty for complete details.

STEP  
**3**

Rotate engine clockwise to locate cylinder #1 TDC



STEP  
**4**

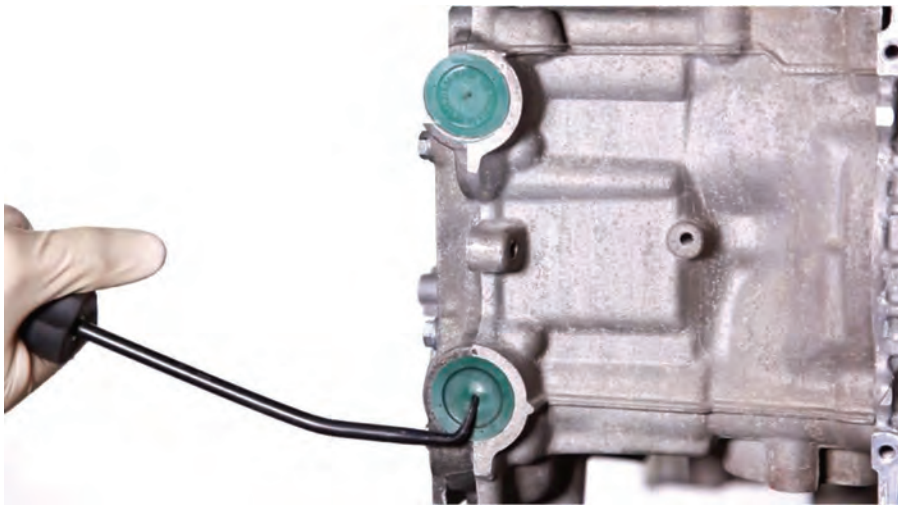
Lock engine in TDC position using crankshaft locking pin supplied with IMS Pro Tool Kit.





STEP  
**5**

Working at right side cylinder head, remove lower camshaft bore plug using a large pick. Remove and discard these bore plugs, and do not attempt to reuse them.

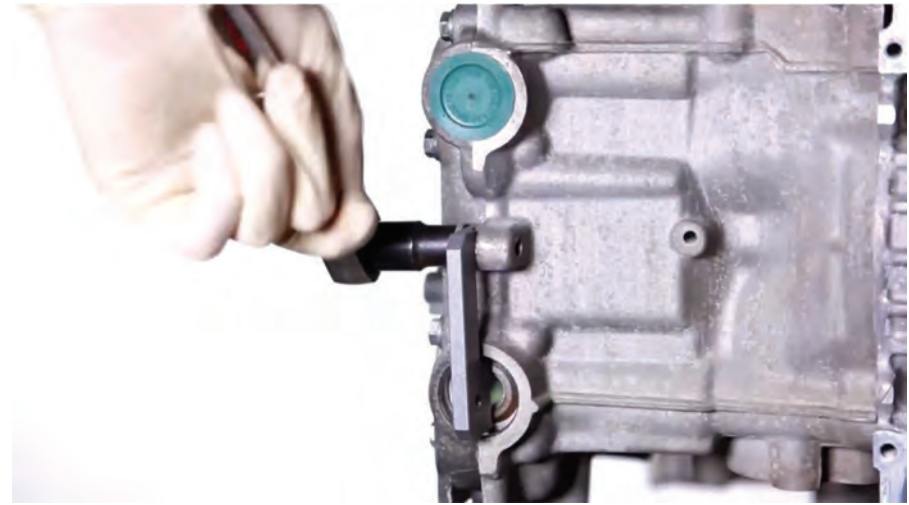


**NOTE**

Right side determined when facing flywheel

STEP  
**6**

Lock right side camshaft in place using IMS Pro Tool Kit camshaft timing jig.



**TIP**

If jig does not fit into camshaft easily, the engine may be out 180°. Remove crankshaft locking pin and rotate engine one full rotation and try to install camshaft jig again

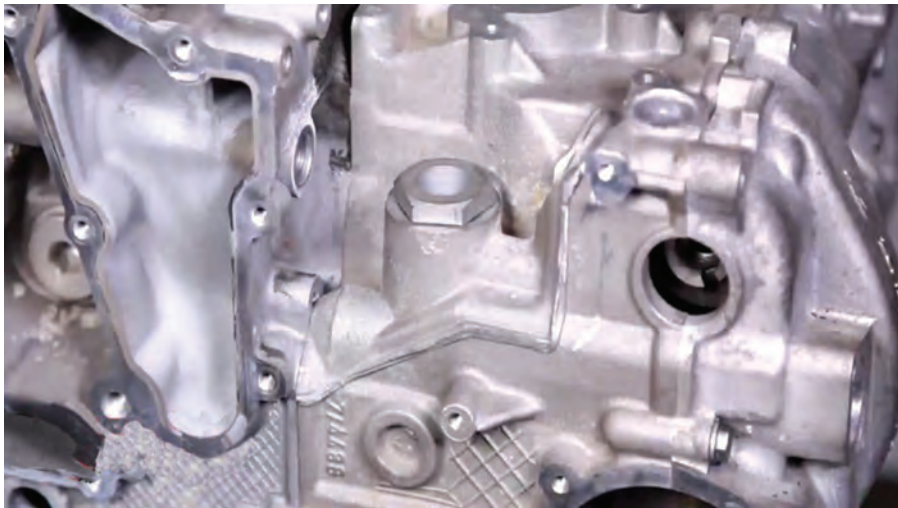


**NOTE**

Some installers prefer to lock camshafts on BOTH banks of the engine. This is a practice that is not required, and is a matter of personal preference. With the crankshaft, and one bank of camshafts locked, all timing chains will be held tightly in the proper position for a successful IMS Retrofit procedure.

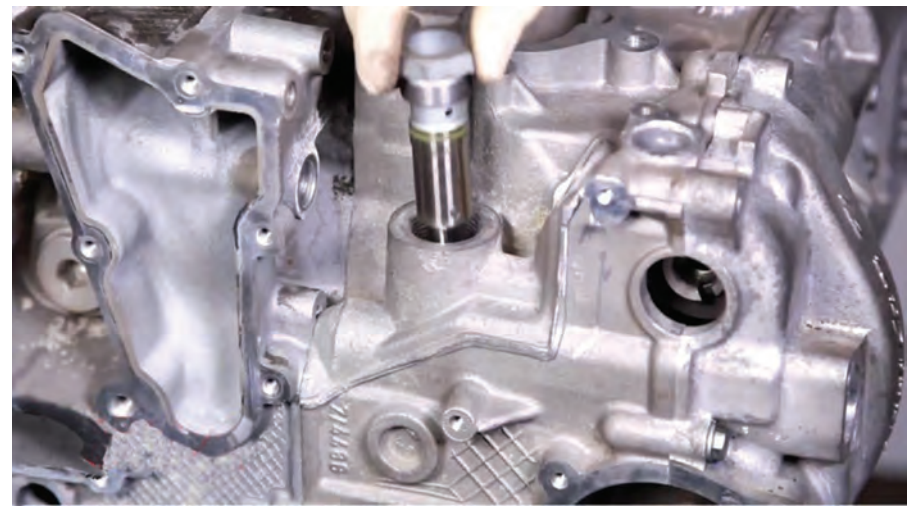
STEP  
**7**

Remember to mark the original location of each timing chain tensioner for reinstallation, and be prepared to catch any dripping oil in a rag.



STEP  
**8**

Working at left side cylinder head, remove timing chain tensioner.



Right side determined when facing flywheel

**NOTE**

STEP  
**9**

**Working at right side cylinder head, remove timing chain tensioner.**



Right side determined when facing flywheel

**NOTE**



Be prepared to catch any dripping oil with a rag.

**NOTE**

STEP  
**10**

**Working at flywheel side, remove IMS chain tensioner.**



Right side determined when facing flywheel

**NOTE**



Be prepared to catch any dripping oil with a rag.

**NOTE**



STEP  
**11**

Using a flatblade screwdriver and a wrench, remove IMS center stud mounting nut.



STEP  
**12**

Next, remove IMS flange mounting fasteners.



## STEP 13

Using two flatblade screwdrivers, gently and evenly lever off the IMS bearing flange, then remove from engine.



**You should not have to apply excess force to remove the flange!**

### NOTE



If the flange does not come off easily, either you did not remove all three tensioners or the cam timing is off.

### TIP

## STEP 14

Using a pair of snap ring pliers, remove IMS bearing snap ring.



Dual row bearings do not have an external snap ring.

### NOTE



Placing your finger or a flatblade screwdriver in the center of the snap ring when removing it, will prevent it from falling into the crankcase.

### TIP

## STEP 15

Thread hex bar adapter onto existing bearing support / center stud. The IMS Pro Tool kit includes two hex bar adapters – the one with the notches on circumference of hex is for pulling LN bearings, the other one for stock bearings.



**If the bearing is failing or completely failed, STOP. You should not proceed further.**



106-08.13.4 - stock Hex adapter  
106-08.13.5 - LN Hex Adapter.

### NOTE

The LN Hex Adapter was not included in older IMS Pro Toolkits. It can be purchased separately at [LNEngineering.com](http://LNEngineering.com)

If center stud is broken, knock center stud into shaft and insert ez-out tool (included with IMS Pro Toolkit).

At this point, installer has a choice of the conventional method using the IMS Pro Tool Kit OR the optional method using the Faultless IMS Tool to extract the original bearing. Depending on the method you have chosen, please follow the steps as marked accordingly: **IMS Pro Tool Kit** OR **Faultless IMS Tool**  
STEPS 16.1 through 16.3 STEPS 16.4 through 16.9



**NOTE**

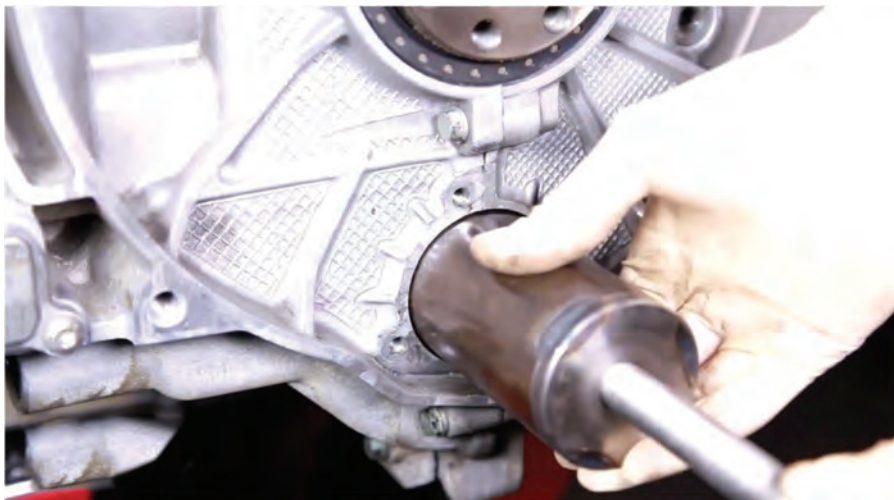
All threaded, thrust, and friction surfaces must be lubricated to ensure long life of your tools.  
The O.D. Threaded tube that screws into the mounting plate of the Faultless IMS Tool will be referred to herein as the bearing puller tube, however it is also used to install the new bearing.



**Bearing extraction - conventional method only! Using IMS Pro Tool Kit.**

STEP  
**16.1**

Slide puller body of threaded rod. Install puller washer and nut onto puller and lubricate.



STEP  
**16.2**

Using IMS Pro Tool Kit puller, extract bearing from intermediate shaft.



**NOTE**

Hold threaded rod still while tightening nut on puller to extract bearing from intermediate shaft. Once bearing is extracted, thoroughly clean the inside of the intermediate shaft using a lint-free cloth.



**TIP**

Watch for an oil release when the IMS Bearing is extracted.



STEP  
**16.3**

Once the bearing is extracted and the inside of the intermediate shaft cleaned, install the Faultless IMS Tool mounting plate and lightly tighten the bolts so the plate can float on the block.



**Bearing extraction using conventional method with IMS Pro Tool Kit is now complete. Proceed to step 17.**

## Bearing extraction - optional method only! Using Faultless IMS Tool.

### STEP 16.4

Bolt the Faultless IMS Tool onto the engine, starting with the mounting plate.



### STEP 16.5

Place tapered sleeve insert into end of bearing puller tube so that the side with the taper face shows.



#### NOTE

NOTE: Always lubricate the I.D. and O.D. of the tapered sleeve to allow easy installation in and out of the bearing puller tube and also to ensure a minimum level of friction between the bearing and the I.D. of the sleeve. The purpose of the taper is to help center up the intermediate shaft and Faultless IMS Tool once you start to pull the bearing.

**Bearing extraction - optional method only! Using Faultless IMS Tool.**

STEP  
**16.6**

**Thread the puller tube into mounting plate until contact is made with the intermediate shaft..**



STEP  
**16.7**

**Thread locking collar onto bearing puller tube. Check if bearing puller tube is snugged up against the intermediate shaft before tightening down the lock collar using a screwdriver.**



## Bearing extraction - optional method only! Using Faultless IMS Tool.

### STEP 16.8

Begin to extract the bearing, holding the threaded rod still while tightening the nut on the puller to extract the bearing.



#### NOTE

Once you feel the bearing start to move into the bearing puller tube, tighten the bolts that hold the mounting plate to the engine. If the bearing does not want to come out, the puller tube and bearing are not centered up and may need to be re-centered.

### STEP 16.9

Remove puller tube by unscrewing it from the plate. Remove nut off threaded rod to release it along with attached bearing from the puller tube. **Remove tapered sleeve insert from the bearing puller tube.**



#### NOTE

**IMPORTANT:** Slightly loosen the bolts on the Faultless IMS Tool mounting plate at this point, so that it can float on the block.



#### NOTE

Once bearing is extracted, thoroughly clean the inside of the intermediate shaft using a lint-free cloth.

## STEP 17

Place tapered sleeve insert into end of bearing puller tube so that the side with the lip shows. **The side with the tapered face should not be visible).**



### NOTE

Secure into place using a IMS flange nut. Do not over tighten. Finger tighten ONLY.



### NOTE

Some drivers will not allow fitting the 12-pt nut. Fitting of nut not necessary.

## STEP 18

The IMS and bearing puller tube now must be centered to allow for installation of the new bearing.

Thread the puller tube into mounting plate until contact is made with the intermediate shaft. If the mounting plate will not move, loosen the bolts on the mounting plate slightly, allowing the plate to float on the case. You will feel when the lip on the end of the tapered sleeve catches and is centered on the IMS.

With the IMS and bearing puller tube centered, tighten the bolts on the mounting plate firmly, keeping the lip centered on the end of the intermediate shaft.

Remove the bearing puller tube from the mounting plate.



### NOTE

Improper alignment may introduce foreign object debris from the internal wire lock used to retain the bearing if it is damaged.



## STEP 19

Clean and re-lubricate the inside of the tapered sleeve. Insert new Single Row Pro IMS Retrofit bearing and supplied internal wire lock into tapered sleeve simultaneously.

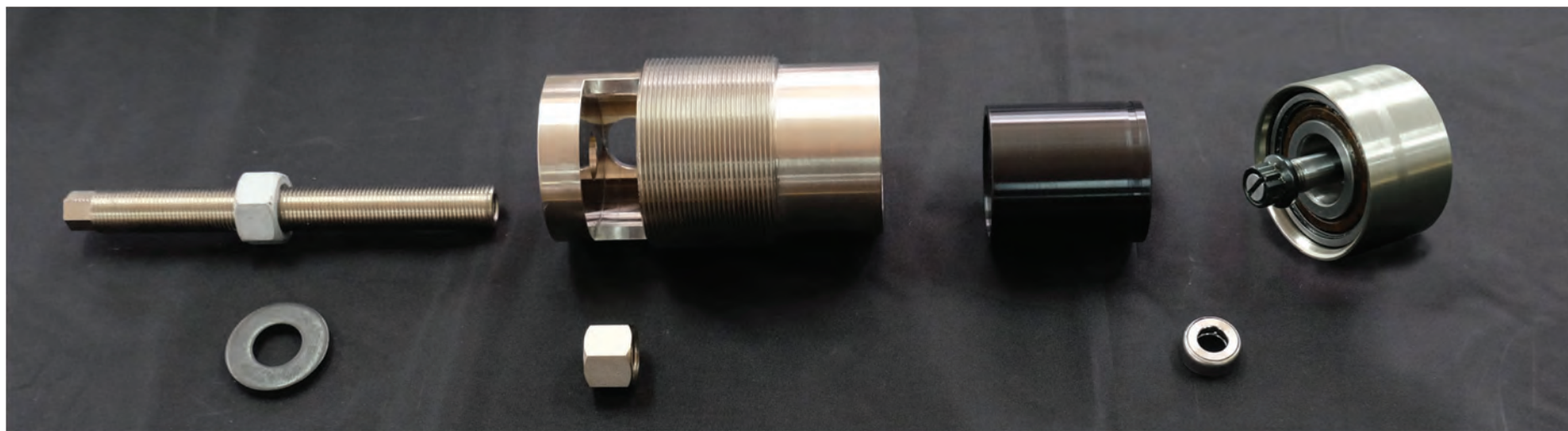


### NOTE

Verify proper orientation of bearing in sleeve. Use a small pick to help guide and compress the internal wire lock into the groove located on the O.D. of the new dual row bearing supplied with the Single Row Pro IMS Retrofit while applying downwards force so as to retain the wire lock in the groove completely with the tapered sleeve.

STEP  
**20**

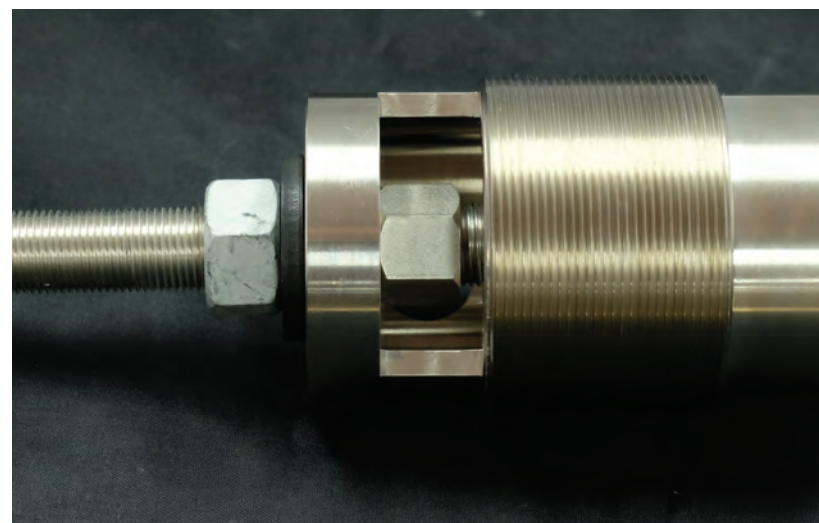
You are now ready to assemble the bearing pusher along with the pre-loaded IMS bearing into the bearing puller tube in the order shown.



## STEP 21

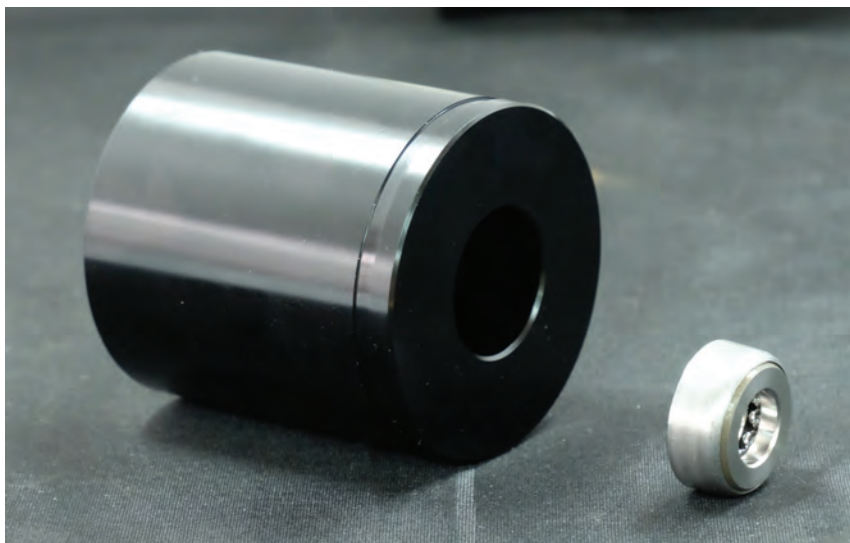
Start the larger of the two nuts on the threaded rod closest to the end as shown above. Hold the smaller of the two nuts on the inside of the bearing puller tube cap while threading in the threaded rod until larger nut is flush with top of bearing puller tube cap.

Do not forget to include the thrust washer between the large nut and the top of the bearing puller tube.



## STEP 22

The small thrust bearing has a spacer bonded to it, which you then insert into the ID of the bearing driver tool (from your IMS Pro Tool Kit). This ensures that as you push the new bearing into the intermediate shaft, the bearing and driver do not spin.





STEP  
**23**

**Slide bearing driver tool - ensuring thrust bearing remains captive inside - into bearing puller tube**  
**Observe proper orientation. Insert pre-assembled tapered sleeve with bearing/wire lock assembly into the bearing puller tube.**





STEP  
**24**

**Adjust threaded rod so to ensure it is making contact with the thrust bearing/bearing driver and that the bearing driver is also in contact with the outer race of the new bearing so everything in the assembly is pre-loaded.**



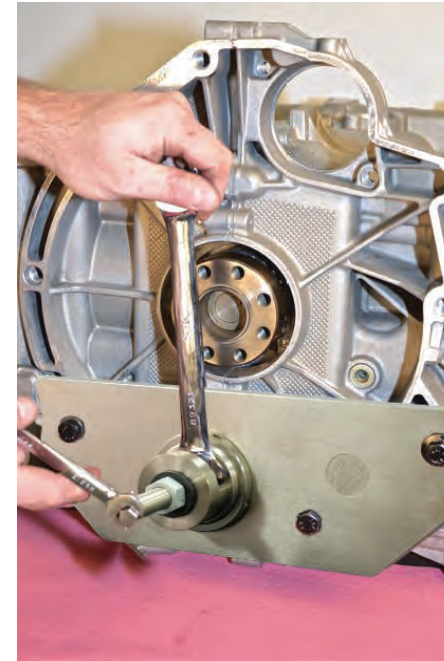
## STEP 25

Screw bearing puller tube assembly onto mounting plate firmly until contact is made with the shaft. Check if bearing puller tube is snugged up against the intermediate shaft before tightening the lock collar using a screwdriver.



## STEP 26

You are now ready to push the new bearing into the intermediate shaft. Holding the smaller inner nut with an open-ended box wrench, turn the outer nut clockwise to press the new bearing into the intermediate shaft housing.



### NOTE

There might be an audible indicator that the wire lock has seated in the intermediate shaft, however it is up to the installer to judge whether the bearing is fully seated without applying excessive torque.

STEP  
**27**

After the bearing has been fully seated, remove locking collar and bearing puller tube to verify bearing has been installed.



STEP  
**28**

Remove Faultless Tool mounting plate from engine. New bearing should be fully seated and recessed slightly below the face of the intermediate shaft.





STEP  
**29**

Lubricate the IMS flange o-rings. Make sure o-ring is installed at base of center shoulder bolt! Install IMS flange by hand. Using a soft face hammer, lightly tap the IMS flange until it is flush with crank case.



**NOTE**

**IMPORTANT:** If IMS is not centered and flange won't install, IMS must first be re-centered using OE tool.

STEP  
**30**

Install new microencapsulated bolts. Do not overtighten. You will torque them all once the flange is fully seated against the case.



STEP  
**31**

With the flange fully seated against the case and bolts installed, torque fasteners to 10Nm (7.5ft-lb).



**NOTE**

Run a magnet around the opening to make sure no piece of internal wire lock was sheared in the installation process as this can occur if the mounting plate was not properly centered with the IMS.

STEP  
**32**

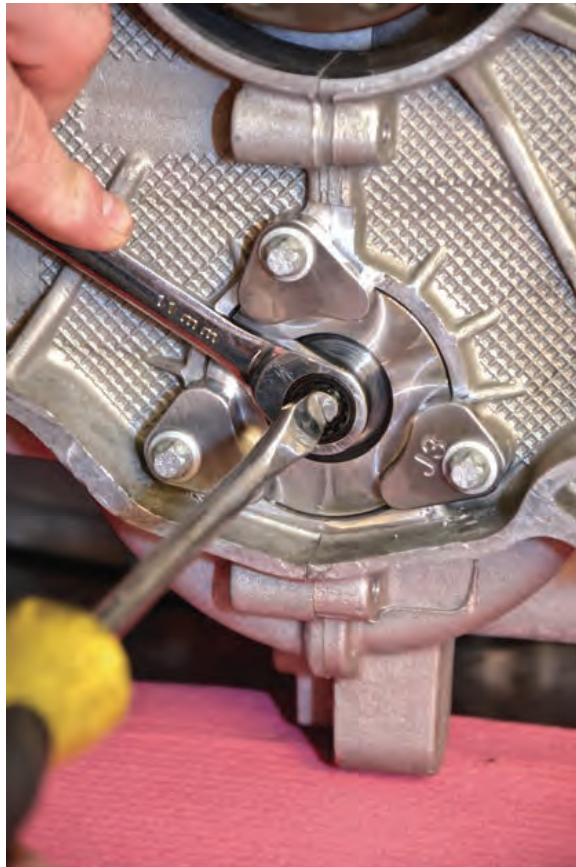
Put Curil-T on sealing flange of center 12-pt nut and install finger tight.





STEP  
**33**

Using a wrench and a flat-blade screwdriver, install IMS flange center stud nut. Do not over-tighten.



STEP  
**34**

Torque the IMS flange center nut to 10Nm (7.5ft-lb) and apply wicking grade Loctite to exposed threads.



STEP  
**35**

Reinstall chain tensioners with new sealing rings and torque to the factory spec of 59 ft/lb. Replace if noisy or worn.

Remove cam locks and TDC pin. Rotate engine by hand until you return to cylinder #1 TDC. Verify cam timing.

Install new cam plugs in cylinder heads.



**NOTE**

If cam locks do not fit, reset engine cam timing using factory tools and procedures.

STEP  
**36**

You are now complete with installation of the Single Row Pro IMS Retrofit. Carry out any other required procedures as required.

**36.1.** Replace rear case perimeter bolts with new micro-encapsulated bolts.

**36.2.** Install new genuine Porsche PTFE rear main seal using only the genuine Porsche rear main seal tool.

**36.3.** Install LN Engineering magnetic drain plug with new sealing ring and 19 lb/ft torque.

**36.4.** Fill engine with appropriate Joe Gibbs oil.

**36.5.** Re-install dual-mass flywheel (replace if defective only with genuine Porsche DMF) using new bolts and also consider a new clutch and pressure plate if worn.

STEP  
**37**

If installing recommended LN Engineering Spin-On Oil Filter Adapter (not included), lubricate o-rings on spin-on oil filter adapter using clean engine oil and install onto engine by hand before torquing.



Spin-on oil filter adapter torque: 24Nm (18ft-lb)

**NOTE**

STEP  
**38**

Install Napa Gold or Platinum 1042 oil filter onto spin-on oil filter adapter.



In track cars use LN Engineering Billet Aluminum Oil Filter for best performance



Pre-fill oil filter with clean engine oil before installing. Tighten by hand per filter manufacturer's instructions.

**NOTE**

## INSTALLATION **COMPLETE**

Installation is now complete. Once the engine is reassembled and other components have been reinstalled, start engine and run until oil light is no longer illuminated. Run engine with break-in oil for 200-400 miles then change oil using Joe Gibbs HR40, DT40, or XP9.



### TIP

Quickly starting and shutting off the engine 4-5 times will help to achieve oil pressure faster. Repeat this step two additional times. Check and top up engine oil as needed.



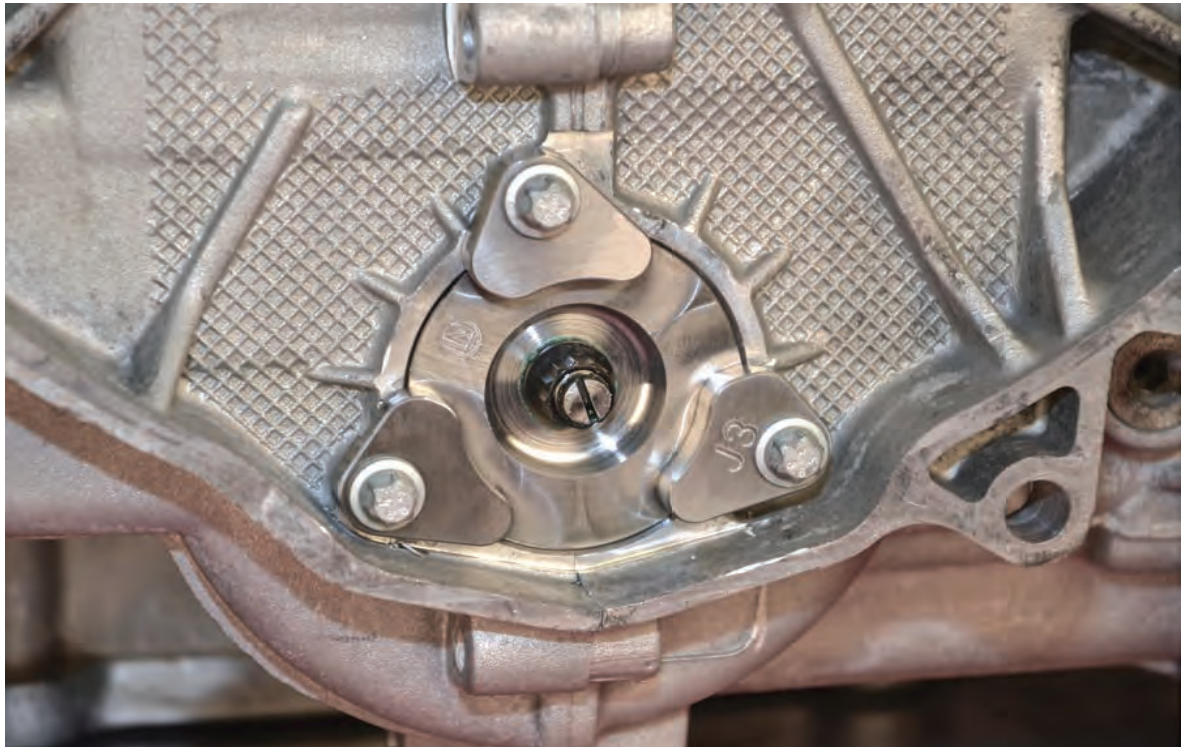
### TIP

Do not pull the DME or Fuel Pump relays in hope of achieving oil pressure without the engine starting, the M96 engine will seldom achieve oil pressure in this manner.



### NOTE

Single Row Pro IMS Retrofit is designed for 6 month / 5,000 miles oil change intervals using Joe Gibbs Racing DRIVEN DT40 motor oil and the LN Engineering Spin-on Oil Filter Adapter.



**PLEASE READ AND UNDERSTAND CRITICAL POST PROCEDURE NOTES. SEE NEXT PAGE.**

**It is required that the installer completes the registration process including returning original bearing and completed warranty form to IMS Solution LLC to validate the warranty.**



# CRITICAL POST PROCEDURE NOTES

**NEVER, UNDER ANY CIRCUMSTANCE, RETROFIT AN ENGINE THAT HAS SUFFERED AN IMS BEARING FAILURE!**

**ALWAYS** use the eleven step IMS Retrofit Pre-Procedure checklist when qualifying any vehicle for an IMS Retrofit.

**ALWAYS** perform an oil service when carrying out any IMS Retrofit procedure. Never reuse old oil, no matter how clean you believe it may be.

When sealing up crankcase sump plates, following the pre-procedure inspection, use a nominal amount of sealant. Liberal amounts of sealant will mix into the oil and find their way to the oil pick up tube, blocking oil flow, and killing the engine.

After initial start up of the engine that has been retrofitted, check all flange surfaces, and oil lines for signs of oil leakage.

With the vehicle back on the ground completely, check the IMS Solution oil feed line for contact with all its surroundings, especially the rear sway bar.

Extreme caution must be given to vehicles with aftermarket rear sway bars. These are larger in outside diameter and therefore are more probable to have conflicts with the IMS Solution oil feed line.

Use common sense, take your time, and pay attention! You can't rush success, but you can rush failure!

Ensure the proper registration documents, to include photos; oil samples and registration forms are filed with IMS Solution LLC.

IMS Solution LLC strongly recommends using a magnetic oil drain plug in all IMS Solution / Retrofit equipped engines. Visit [LNengineering.com](http://LNengineering.com) for more info.