Rotating Assembly Installation Tips

These instructions are intended to aid and assist in performing the machine work, prep, and assembly of the shortblock. They are not intended to be complete instructions from start to finish.

The installation of cylinder heads requires knowledge applicable to the engine family you are working on. If you are not familiar with this information we strongly suggest getting a professionals assistance with experience in the engine family you have.

Please read and follow these guidelines closely.

1. Establish a clean work area. Contamination from foreign particles and debris will significantly increase the chance of damage to the engine. This damage may be minor enough to cause only performance loss, however, in some cases, it could cause severe engine damage or failure.

2. When removing the rotating assembly components from their packaging, be sure to remove all shipping and packaging material.

3. It is recommended that you take digital photos of the engine during disassembly. You should also place the parts in a bag and label them as removed. This will make re-assembly much easier.

4. Once the engine is disassembled down to a bare block, it is now ready for machine work. It is also important to note at this point that even if a new block is being used, it will require the same machine work as a used block to make it ready for assembly.

5. We recommend doing extensive research when it comes to finding a good local machine shop. There are a lot of shops that are fine for just doing rebuild work, but it takes a shop that has experience in racing engines to be able to properly machine these engines. These engines require “newer” equipment, and the methods and techniques will need to be geared towards later model engines.

6. The block will require the following machine work and prep to prepare the block for assembly.

Cylinder Honing (Piston Fit) - Sets the clearance between the piston and the cylinder wall. This clearance will vary according to application and builder preference.

Align Hone - Sets the clearance between the main bearings and crankshaft, as well as establishes the correct size and straightness of the main bearing bores. Clearance will vary based on application and builder preference.

Block Prep - Consists of basic deburr work, chasing threaded holes, and oil system prep. This will depend on application and builder preference.

Rod Clearances - Consists of checking the crankshaft rod journal sizes, then installing the rod bearings and torquing the rods to verify that the correct clearance exists. If the clearance is not in the desired range, the rods will need machine work to be correct.

Ring Gapping - Consists of grinding the piston ring gap until the desired clearance is achieved. The rings must be installed in the bore to find the initial size, then ground as necessary to reach the desired clearance. The ring edges must then be deburred.

7. The machine work steps listed above are the minimum necessary for everything to work properly. If even one of these steps or procedures is not performed, the engine may not operate correctly and could fail.

8. After all machine work is finished, the block will require thorough cleaning to ensure that it is absolutely free of any foreign debris and totally clean. This step is critical, as any contamination can cause engine failure.

9. Next, all the rotating assembly parts will need to be cleaned thoroughly. This means all oil passages, bolt threads, part surfaces, etc will need to be scrubbed and cleaned.

10. The block cylinder bores need careful attention during final cleaning. They need to be thoroughly scrubbed and cleaned to ensure that all honing residue has been removed. This step will take some time to do correctly. If the bores are not thoroughly cleaned, the rings may not seat correctly.

11. After all cleaning and prep work is finished, the parts can be laid out in the clean area mentioned in step 2. At this point it's important to ensure that everything is well cleaned and ready for assembly.

12. You are now ready to assemble the shortblock. Assembly is a very intricate procedure, and must be done with exact precision as well as

careful measurements. Failure to follow the correct steps could result in engine damage or failure. It is critical that the assembly be performed by someone knowledgeable in engine building.

Ford Modular Engine Specifics

Modular Ford 4.6/5.4 engines have specific items that should be noted while installing a new rotating assembly.

- Modular 4.6/5.4 engines come in many variations. While the rotating parts are pretty straightforward, the timing components come in numerous configurations. Be extremely careful even when buying new parts from the dealer. There are many different variations of the same part, so it's very easy to mix the wrong components, which as a result, could cause engine failure. If you do not feel competent in doing the installation yourself, seek the assistance of a professional.

- Some early style blocks have no provision for clearance between the extra crankshaft counterweights on the number 3 main and the main web of the block. If you have one of these blocks, you will have to grind the block for clearance. You will also have to mockup the rotating assembly to verify that the correct clearance exists.

- When selecting main bearings for the engine, ensure that you obtain the correct ones. There are 3 different distinct bearings that only fit a certain style of engine. The use of the wrong bearings in the wrong block will result in engine failure.

- The thrust bearing in a modular engine consists of a series of washers placed between the crankshaft and the block register. These bearings have an orientation and need to be inserted in the correct order to work properly.

- The main oil galley in the center of the block is normally sealed with small galley plugs from the factory. These are just a press fit and will sometimes fall out and get trapped between the front or rear cover. This does not tend to cause complete oil pressure loss as much as it may cause pressure fluctuations from the plug moving around.

- Some of the fasteners for the engine are torque-to-yield (TTY) style and must be replaced. It is important to note which factory fasteners are the TTY style so that they are not reused, because this may affect engine durability.

GM LS-Series Engine Specifics

GM LS-Series engines have specific items that should be noted while installing a new rotating assembly.

- GM LS-Series engines come with two different style trigger wheels on the crankshaft. It should have been noted during your purchase what style you had so that the correct wheel could be installed. Verify that the correct trigger wheel is installed.

- Depending on the stroke of the crankshaft in the kit, you may need to clearance the block. This is required so the longer stroke crankshaft doesn't hit the block. It is necessary to do a mock up in order to check and adjust if clearance is needed.

- There are numerous oil pump styles available in the LS-Series engine family. Ensure that the correct pump is used for the application. Some high volume pumps may flow too much and cause oil starvation if the incorrect oil pan is used.

- Camshafts with a lot of lift and duration require camshaft to rod clearance to ensure that there is enough clearance for proper operation.

Warnings

- Livernois Motorsports recommends that only experienced individuals, knowledgeable in Modular and LS-Series engines do the installation.

- Failure to check for piston to valve clearance may result in failure to both the cylinder head and engine. Piston to valve clearance should always be checked.

- It is critical that all the necessary machine work be performed on the block. If the block is not properly machined, the engine may fail. All machine steps must be done in order to ensure proper operation.

- Cleanliness is of utmost importance. Livernois Motorsports takes extreme measures when it comes to keeping parts and components clean. This same standard of cleanliness must be employed when working on any engine, otherwise risk of contamination and failure are possible.

- When installing a rotating assembly, it is important to fully evaluate the performance and durability of the entire engine and its components. The altered displacement, as well as compression ratio will increase power and torque. This increased power and torque may be more than certain stock components can handle. It's important to think of the entire engine as a system so that every component and part is selected to work together and ensure maximum power and durability.

- When altering compression ratio and cubic inch displacement, it is critical that the engine tune be altered to match these modifications. Failure to adjust the tune accordingly can result in engine damage or failure. The air/fuel ratio needs to be monitored and adjusted so the engine does not run too rich or too lean. Excess fuel from improper tune can wash the cylinder rings and damage the engine. Excessive lean condition from improper tune can also damage rings and pistons and cause major engine damage. The timing requirements of the engine will also change and will need to be optimized for the new engine combination.

Livernois Motorsports will provide technical assistance via phone and email, but cannot "build" the entire engine via these means. Please call us at 313-561-5500 with any questions or concerns you may have.