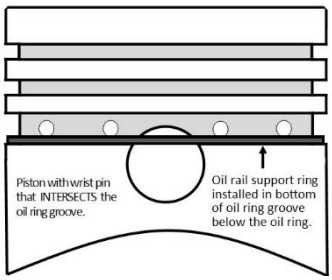
Piston Ring Instructions

Rev 2024A

File Fitting Ring End Gaps: Both std gap and file fit ring sets require setting ring end gaps based on application. This is a critical step in engine building. Ring end gaps must be checked and set based on your application, End gaps should be checked at the tightest part of the bore that the ring will be traveling in while in use. We recommend carefully using an upside-down flat top or dished piston to square the rings in the bore. Then use a precision feeler gauge to check the gap. Rings should be carefully fit with a Ring Filing tool. Special care must be taken to break (chamfer) the edge with a fine file or stone after fitting. **DO NOT PUT A LARGE CHAMFER ON THE RING EDGE OR COMPRESSION AND POWER LOSS WILL RESULT**. **Basic Ring End Gap Guide**

Application	Gas/E85	Top Ring Minimum	Second Ring	Oil Ring Rails
Naturally Aspirated	N/A	Bore X .005	Bore X .0055	Minimum .015"
Mild Power Adder	Up to 15lbs/150hp N2o	Bore X .006	Bore X .0065	Minimum .015"
Medium Power Adder	15-30lbs/150- 350hp N2o	Bore X .007	Bore X .0075	Minimum .015"
High Power Adder	30+lbs/350hp+ N2o	Bore X .008	Bore X .0085	Minimum .015"

NOTES: Every engine combination is different and may require different specs. It is ultimately the Engine Builders knowledge of a particular combination that should determine a perfectly optimized ring end gap. Crankcase ventilation systems or vacuum pumps may be necessary to help relieve the high crankcase pressures that can occur on power adder applications.



Piston with Oil Rail Support

Oil Rail Support Ring: On some piston applications the piston pin bore intersects the oil ring groove. This design requires the use of an oil rail support ring. This ring bridges the gap of the pin bore and supports the oil rings. This style of piston is common on Stroker combinations that require a shorter overall piston design. Some oil rail supports feature an anti-rotation dimple that keeps the support ring from rotating on the piston (locate the dimple in the pin bore area). Others rely on gripping the root diameter of the ring land to restrict rotation. Never orient the gap of the support rail over the piston pin bore. On either design make sure the support ring lays flat in the bottom of the oil ring groove. Verify that your oil rings float freely when installed.

Oil Ring Installation: Place the center oil ring expander in the groove. Then spiral the first oil ring rail into the groove below the expander **(Be careful not to scratch the piston or bend the ring)**. Repeat the process for the top oil ring rail. After completing the installation, inspect to verify that the gaps on the expander are not overlapped and everything is in place.

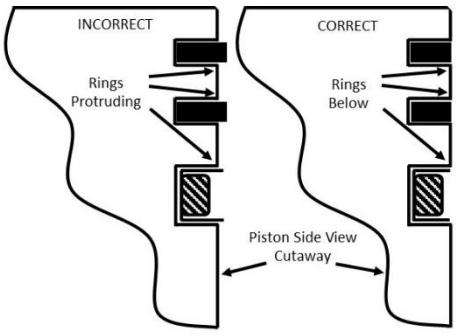
Top & Second Ring Installation on Pistons: The top and second rings are different and must be placed in the proper location. The top rings are typically shiny silver in color and the second rings are darker. Locate the up - orientation mark on the ring **(DOT, Laser Top Mark or None)**. Rings that have no up - orientation mark are bi directional and can be installed either way. (See notes below). Using a proper ring installation tool, open the second ring (orientation mark facing up) just enough to allow the ring to go over the top diameter of the piston. Work the opened ring down from the top of the piston to the second groove, place the ring squarely into the piston groove taking care to keep it flat, release the tension of the ring installer tool **(ring is now installed)**. Repeat this same process for the top rings. **IMPORTANT! Compression rings must never be spiraled on to the piston. IMPORTANT! Extreme care must be taken to assure that the rings are installed and orientated correctly without bending or distorting.**

NOTE: Some Top rings do not have up – orientation marks. Inspect the ID of the ring for a bevel. If ring has both ID edges beveled, the ring can be installed in either direction. Top rings that have one ID side beveled would be installed with the bevel facing up. (NOTE) Only when no other up – orientation markings are found on the rings would you follow these instructions.

NOTE: Some second rings do not have up – orientation marks. Inspect the ID of the ring for a bevel. If ring has both ID edges beveled, the ring can be installed in either direction. Second rings that have one ID side beveled would be installed with the bevel facing down. (NOTE) Only when no other up – orientation markings are found on the rings would you follow these instructions.

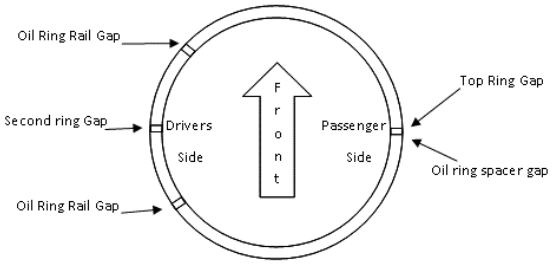
Piston Ring Back Clearance: Verify that your rings have back clearance. With the piston held horizontally and the rings sitting in the bottom of the grooves verify that the rings are below the outer ring land of the piston. WARNING: Severe engine damage will occur if engine is assembled with rings protruding.

Ring Back Clearance



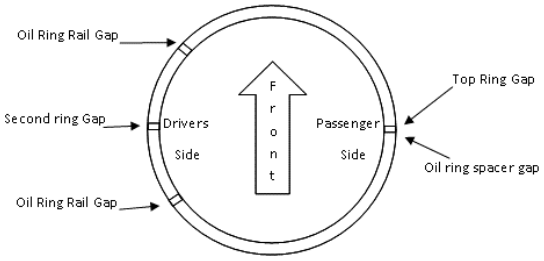
Ring End Gap Positioning: To maximize ring performance rings should be installed with the end gaps as shown in the diagram below.

Left bank on typical V type or inline engine



Front of Engine

Right bank on typical V type engine



Break In: During ring break-in, use petroleum-based motor oils only **(synthetic oils may be used after break-in is complete)**. We recommend breaking in rings at slightly elevated and varying RPM with a low to moderate load applied. The first half hour of run time is most critical. Avoid high RPM and high loads until rings are fully seated. Amount of time required to seat rings will vary because of honing methods and type of cylinder finish achieved. Seating times can be as quick as a few hrs. of run time to a few 1000 miles. Do not be in a hurry to use synthetic oil. When you are satisfied with ring seal and you want to use synthetic go right ahead.

Boring and Honing: Proper Cylinder finishing is critical for the performance and longevity of rings. Below are some guidelines to help with the job.

General Iron Cylinder Finishing Technique:

- Hone to .003 off of the final bore size with 70 to 100 grit stones.
- Hone to .001 to .0005 off of the final bore size with 220 grit stones.
- Final finish to bore size with 280 to 320 grit stones. NOTE: On this step, deglaze stones between each cylinder to prevent cylinder glazing. This can be done by rubbing the stones together. Cylinders must appear silvery in color, if they are dark in appearance the cylinders are most likely glazed. This condition needs to be corrected or ring performance will be negatively affected.
- Hone cross hatch angle should be 22 to 24 degrees off horizontal axis.

If using a profilometer the recommend values for generic performance applications is as follows:	**For Competition, Racing, big boost applications:**
▪ Reduced Peak Height (Rpk): 10 – 15 µ”	▪ Reduced Peak Height (Rpk): 10 – 20 µ”
▪ Core Roughness Depth (Rk): 35 – 45 µ”	▪ Core Roughness Depth (Rk): 50 – 60 µ”
▪ Reduced Valley Depth (Rvk): 45 – 55 µ”	▪ Reduced Valley Depth (Rvk): 60 – 70 µ
▪ Roughness Average (Ra): 15 – 20 µ”	