LS3 Cylinder Heads

Mongoose

Thank you for purchasing the AFR Mongoose 260cc aluminum cylinder heads for the GM LS3 and other LS based engines with a 4.000” or larger bore.

Please follow the steps outlined in this instruction manual to ensure that the installation of your new cylinder heads is done correctly and that they perform as designed.

Please read all of the enclosed information before beginning any work. If you have any questions regarding installation or the written materials supplied with your new heads, please contact our technical support department at 661-257-8124 and follow the prompts. They can be reach Monday through Friday from 7:00 am to 5:00 pm PST.

Project Overview

- Inspect the condition of all components
- Verify the part numbers and quantities of each product received (see Parts Checklist below)
- Locate recommended tools
- Purchase any additional parts needed (See the Additional Parts Required section)
- Purchase the shop manual for your specific application, or take your vehicle to a qualified/certified mechanic
- Install the new cylinder heads
- Test drive and enjoy!

Parts Checklist

You should have received the parts listed here. Please verify the part numbers and quantities of each component received.

- (2) Cylinder heads
- (2) Rocker arm rail (AFR #6040)

If you are missing an item or a part was received in error, please contact AFR at 661-257-8124, Monday through Friday from 7:00 am to 5:00 pm PST.

Recommended Tools

Shop Manual for your vehicle
Basic mechanics tool set (Metric sockets and combination wrenches)
0-100 ft.-lbs. torque wrench
Torque angle meter (for use with OEM bolts)
Dial Calipers 0-8”
Spark plug gauge
Straightedge
Feeler gauge
Modeling clay
Adjustable checking pushrod
Solid setup roller lifter

Additional Parts Required

These components are required to complete the installation of your new AFR 260cc cylinder heads. Please refer to the Recommended Components chart on the Technical Specifications sheet for specific part numbers on page 4.

- Head gaskets
- Intake gaskets
- Exhaust gaskets
- Head bolts
- Intake bolts
- Exhaust bolts
- ~~Moly lube~~ (must be installed on valve tips for proper break-in. **Wear will occur if not done, voiding your warranty!**)
- Spark plugs
- Pushrods
- Rocker arms
- Thread sealer
- Chevrolet Performance Air Bleed Plug #12602540 (required on some model years.)

Installation Instructions

1) Cylinder Head Removal
Consult your shop manual for the proper cylinder head removal procedure for your vehicle. Taking notes, pictures, and even making a video of the disassembly will help you greatly when reinstalling brackets, routing hoses and electrical/sensor connections.

2) Prepping the Block
With the old cylinder heads removed, inspect the cylinder bores for scratches, ridges, and cracks. If everything appears to be OK, put some paper towels in the cylinders to catch loose debris as the old head gaskets are scraped off the engine block's deck surface. Remove all traces of the gaskets and any oil or grease that may be present by wiping the surface with brake cleaner.
Check the deck surfaces for flatness by laying a straightedge across the deck lengthwise and sticking a .003" feeler gauge under it. If the feeler gauge fits anywhere under the straightedge, the block will need to be decked or head gasket failure will result.
Once the block decks have been cleaned and checked, use the correct size tap to chase the threads in the head bolt holes. This will clean out old sealer and debris, which is extremely important for preventing leaks and torquing the heads down evenly on the block. After cleaning the head bolt hole threads, carefully remove the paper towels from the cylinders and discard. Using new paper towels clean the cylinders and coat the cylinder walls with a thin film of engine oil to protect them from corrosion.

3) Checking Exhaust Manifold/Header Clearance
Place one of the AFR 260cc cylinder heads on a suitable work stand and install the recommended spark plugs (refer to page 4 - Recommended Components chart on the Technical Specifications sheet for specific part numbers). Bolt the exhaust manifold/headers to the cylinder head and check for
any interference. Repeat this procedure on the other cylinder head.
NOTE: Cylinder heads with optional 6-bolt mounting pattern do not fit 2010 and later Chevrolet Camaro OEM exhaust manifolds; aftermarket headers are recommended.

4) Determining Pushrod Length
IMPORTANT NOTE: This step must be completed before heads are torqued to block.
AFR 260cc Cylinder Heads for GM LS3 engines have longer than stock valves and require longer than OEM pushrods. Due to the multitude of parts combinations (Blocks, Head Gaskets, Camshafts, Lifters, and Rocker Arms), it is necessary to measure for proper pushrod length for your unique combinations of parts. For applications using hydraulic roller lifters and OEM non- adjustable rocker arms, follow the process ~~at the top of this page~~ to determine pushrod length and lifter preload. For aftermarket adjustable rocker arms follow the manufacturer's instructions.

A) Obtain the recommended adjustable pushrod length checker and a solid setup roller lifter that are identical in pushrod cup height to the fully extended hydraulic roller lifters that are going to be used permanently.
B) Install setup roller lifter into cylinder #1 exhaust lifter bore with plastic lifter retainer, rotate the crankshaft until the roller of the lifter is on the base circle of the exhaust camshaft lobe as viewed through the lifter valley, pay close attention that the lifter is contacting the cam lobe, as the lifters tend to remain at lifted position in the plastic lifter retainer without valve spring force pushing on them.

C) Temporary install 5 or 6 head bolts on (Do not torque!) your AFR 260cc cylinder head onto the engine block with the head gasket to measure for new pushrod length. Install the adjustable pushrod length checker into the exhaust lifter/pushrod hole and install the rocker arm onto the AFR rocker arm mount rail, (part #6040). Adjust the pushrod length checker so that the lifter roller is completely against the cam lobe and the rocker arm tip is in contact with the valve tip with zero lash and no preload in the assembly.

D) Remove the pushrod length checker and measure the overall length. Once the setup length is determined, add 0.050"-0.075" to the overall length to account for lifter preload. The above preload dimensions are the same as 1 to 1.5 turns of a M8 x 1.25 rocker arm bolt.

5) Checking Piston-To-Valve Clearance
A) Once the proper pushrod length has been established, piston-to-valve clearance must be checked. This is an extremely important assembly step if using aftermarket pistons and/or high performance camshafts. Engine failure may occur from the valves contacting the pistons voiding your warranty.

B) Rotate the crankshaft until the engine is on the compression stroke of the #1 cylinder. Place a solid setup lifter in the lifter bore of the valve that you will be measuring. Be sure that the setup lifter is the same height as the lifters that will be installed in the engine permanently.

C) Place a few 1/4" thick pieces of modeling clay across the upper half of the piston. Coat the clay with a very thin layer of new engine oil. Place the head gasket you will be using on the block and temporarily bolt the head on with five or six head bolts, do not torque down.

D) Install the AFR rocker arm rail (part #6040) followed by the adjustable pushrod you previous used and set to determine pushrod length. Tighten the rocker to zero lash, rotate the crankshaft at least twice, remove the cylinder head and gently remove the clay.

E) Carefully cut the clay into slices and look for the thinnest section of the valve impression. The impression is a 3D representation of the clearance between the piston and valve. Carefully measure the thickness of the clay with a machinist's scale or calipers. The intake valve side of the clay should have .080" or more of clearance, and the exhaust should have .100" or more of clearance. AFR recommends checking the front cylinder on one bank and the rear cylinder on the opposite bank. Modify pistons as necessary.
NOTE: Reference the maximum recommended valve lift for the valve springs in the Technical Specifications sheet, on page 4, before purchasing an aftermarket camshaft.

6) Installing the AFR 260cc LS3 Cylinder Heads
With the block deck surfaces and cylinders clean and all checks completed, position the head gaskets on the block per the manufacturer's markings.

NOTE: Blow out the head bolt holes in the block with compressed air before installing the fasteners. Excess fluid at the bottom of the bolt holes can cause the engine block to crack when the bolts are torqued down.

NOTE: Please be aware that pre-2004 blocks require longer head bolts than 2004 and up. Be sure to match your head bolts to the correct year block.

Don't be alarmed if some of the coolant holes in the block are restricted by a smaller hole in the gasket. This is done intentionally to

regulate coolant flow.
New OE type torque-to-yield cylinder head bolts must be installed during reassembly. For 2004 and after short style head bolts, torque the bolts in the four stages shown, following the sequence in Figure 1. For all other types of head bolts, follow service manual or manufacturer's instructions.

NOTE: If using aftermarket head bolts or stud kits for installation, follow the head bolt/stud manufacturer's instructions for torque requirements.

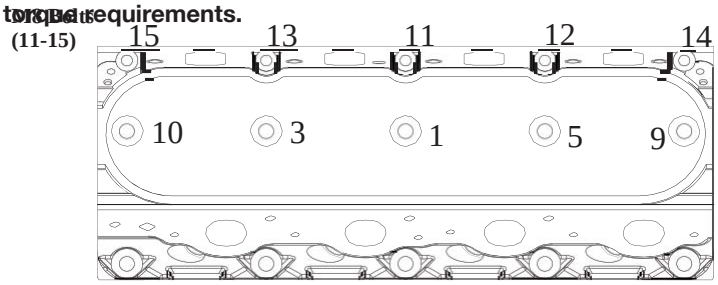

Figure 1

Stage One: Install all M11 bolts at 22 ft.-lbs. in sequence.

Stage Two: Tighten M11 bolts 1-10 an additional 90 degrees in sequence.

Stage Three: Tighten M11 bolts 1-10 an additional 70 degrees in sequence.

Stage Four: Tighten M8 bolts 11-15 in sequence to 22 ft.-lbs.

It is not necessary to re-torque TTY head bolts after initial break-in.

7) Installing the Valvetrain
Consult your shop manual for the proper cylinder head valvetrain assembly procedure for your vehicle. **IMPORTANT:** Apply thread sealer to the threads of the intake rocker arm bolts during reassembly or the intake port vacuum will pull in oil and damage your engine.

IMPORTANT: DO NOT TORQUE YOUR ROCKER ARM BOLTS WHILE THE CAMSHAFT IS AT ANY LIFT. THE VALVE MUST BE ON THE BASE CIRCLE OF THE CAMSHAFT TO PREVENT PULLING THE ROCKER ARM THREADS OUT OF THE CASTING; VOIDING YOUR WARRANTY!

NOTE: AFR recommends using new LS3 rocker arms with upgraded trunion bushing kit. Using OEM rocker arms that do not have the upgraded trunion kit can result in premature wear or engine damage.

Coat the top of the valve tips, the valve contact surface or roller on your rocker arms, and the pushrod cup in your rocker arm with Moly lube.

NOTE: Assembled cylinder heads include new rocker arm rail mounts (AFR #6040) for use with only OEM LS3 1.7 ratio rocker arms with upgraded trunion bushing kit recommended. The OEM LS3 rocker arm rail mounts will not work with the AFR 260cc LS3 heads.

NOTE: If using aftermarket roller rocker arms, please be aware that the intake to exhaust rocker bolt centerlines need to be adjustable or specific to AFR LS3 heads. AFR 260cc LS3 cylinder heads have an intake to exhaust rocker bolt centerline of 2.155". Do not use the included rail mounts.
Your AFR 260cc LS3 cylinder heads were designed to use the OEM length rocker arm bolts (52.5mm). Please be sure to check this length to avoid pulling the threads out of the head.

Aftermarket rocker arms yield the best wipe pattern on the valve tips. The OEM Rockers are notorious for having very poor geometry and leave a wide wipe pattern across the valves!

NOTE: Rocker arm bolt threads protruding into the intake ports will not affect airflow results. However they do require thread sealer, otherwise oil will be pulled into the intake port.

8) Reassembling the Rest of the Engine
Install as many items as you can without putting the valve covers on. This will allow you to pre-lube the valvetrain, which is explained below, in the Pre-lubing the valvetrain section.

9) Pre-lubing the Valvetrain
The valvetrain is now ready to be pre-lubed. Slowly pour a half quart of motor oil (per head) over the rocker arms, valve springs, and valve stems. Use an oil squirt can to get inside the valve spring and lube the valve stem and seal area. Reinstall the valve covers as soon as possible to keep contaminants out of the engine.

DO NOT START THE ENGINE IF THE TOP HALF OF THE ENGINE HAS NOT BEEN PRELUBED!

Finish reassembling all other components, brackets and vacuum lines.

10) Break-In and Tuning
To ensure long life and trouble-free use, allow 2-4 hours of normal driving time before running the engine hard; this will break-in the valvetrain properly.

Specifications

Head Material: A-356 Aluminum
Chamber volume: 69cc (CNC profiled)
Intake port volume: 260cc
Intake port dimensions: 2.610" x 1.300" LS3 rectangle port
Intake port location: Stock LS3
Intake valve diameter: 2.165" (AFR #7214)
Intake valve angle: 12°
Intake valve length: 5.200" O.A.L.
Intake valve stem diameter: 8mm
Exhaust valve diameter: 1.600" (AFR #7212)
Exhaust valve angle: 12°
Exhaust valve length: 5.205" O.A.L. Valve stem diameter: 8mm
Valve guide material: Bronze Silicone with Nickel (AFR #9053)
Valve guide length: .502' O.D. X 2.550" O.A.L.
Valve guide spacing: 4.400"
Valve seal: Viton Fluoroelastomer canister (AFR #6612)
Valve seat intake: Ductile Iron (AFR #9060)
Valve seat exhaust: Ductile Iron (AFR #9069)
Valve seat angles: 45° seats with multiple angles
Valve spring pockets: 1.490"
Valve spring cups: 1.380" OD x 0.570" ID, AFR #8042
Valve spring retainers: Titanium 7° x 1.245" OD, (AFR #8512)
Valve stem locks: 7° machined steel (AFR #9007)
Valve springs: Standard 1.270" O.D. dual spring (AFR #8019)
155 lbs. @ 1.810" installed height
448 lbs. @ 1.160" open
450 lbs. per inch rate
1.080" coil bind
.650" maximum lift
(OE rockers with upgraded bushings max. recommended lift .625)

Push rod length: Longer than stock required
Rocker arm type: OEM LS3 with upgraded bushings or Aftermarket Roller Rockers with 2.155 intake/exhaust rocker bolt centers. AFR strongly recommends the use of aftermarket rocker arms, since the OEM rockers have very poor geometry and a wide wipe patterns across the valve.

CARB E.O Number: D-250-5
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Recommended Components

Head gasket: Cometic MLS 4.160" bore AFR #6848
Intake gasket: OEM
Exhaust gasket: GM 12558573
Head bolts/studs: Pre-2004 blocks TTY OEM style bolts
ARP 234-4316, 12 pt. stud kit
2004+ blocks TTY OEM style bolts
ARP 234-4317, 12 pt. stud kit AFR #6335
Intake bolts: OEM
Exhaust Bolts: OEM
Pistons: OEM
Rocker arms: OEM LS3 with upgraded bearings (.625" recommended maximum lift)
Air bleed plug: Chevrolet Performance #12602540
Spark plugs: NGK TR55
Rocker Arm Bushing Upgrade Kit:

Replacement Cylinder Heads Part Numbers

AFR #1840 - AFR LS3 Head 260cc, fully CNC ported, 69cc chambers, 6 BOLT, Assembled (Pair)
AFR #1841 - AFR LS3 Head 260cc, fully CNC ported, 69cc chambers, 6- BOLT, NO PARTS (Pair)
AFR #1845 - AFR LS3 Head 260cc, fully CNC ported, 69cc chambers, Assembled (Pair)
AFR #1846 - AFR LS3 Head 260cc, fully CNC ported, 69cc chamber, NO PARTS (Pair)

Lifetime Warranty

AFR cylinder head castings are backed by a lifetime warranty. If a cylinder head casting fails to provide the original purchaser with complete satisfaction, AFR will repair or replace it free of charge — guaranteed!
Moreover, the valves, valve guides, valve seats, valve job, valve springs, valve spring retainers, valve locks, rocker arm studs, ~~guide plates~~, and valve stem seals included on assembled AFR cylinder heads are warranted to the original purchaser to be free from defects in materials and workmanship for a period of two years from the date of purchase.
All other AFR products are warranted to be free from defects in materials and workmanship for a period of 90 days. There are no mileage limitations. Please see website for complete details.

Extent of Warranty

Customers who believe they have a defective product should ~~return it to the dealer from which they purchased or ship it freight prepaid to AFR along with proof of purchase and a complete description of the problem.~~ If a thorough inspection indicates defects in materials or workmanship, our sole obligation is to repair or replace the product.
This warranty is only if the product is properly installed, subjected to normal use and service, did not fail due to owner negligence or misuse, and has not been altered or modified.
Air Flow Research warranties does not cover any installation or removal costs.
Air Flow Research is not liable for consequential damages for breach of contract of any warranty in excess of the purchase price of the product sold.

PROPOSITION 65 WARNING

This product may contain one or more substances or chemicals known to
the state of California to cause cancer, birth defects or other reproductive harm.

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