



Summit 170cc Cylinder Heads

for the Small Block Chevrolet

Thank you for purchasing a set of the Summit 170cc Small Block Chevrolet aluminum cylinder heads.

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 according to design.

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, contact the Summit Racing Equipment technical department at 1-330-630-0240 for assistance, Monday through Friday from 9:00 am to 9:00 pm ET.

Project Overview

- Review all paperwork included in the installation packet
- Inspect the condition of all components
- Verify the part numbers and quantities of each product received (see Parts Checklist below)
- Mail the warranty card to Summit Racing Equipment
- Locate recommended tools
- Purchase any additional parts needed (See Additional Parts Required section-Do not purchase pushrods until the proper length is determined)
- Remove existing cylinder heads
- Clean and inspect the engine block
- Check header fitment to cylinder head on a workbench
- Verify that the temperature sending unit fits; locate an adapter if needed
- Check piston to valve clearance
- Check pushrod length
- Purchase the appropriate pushrods
- Install the new cylinder heads
- Adjust the valvetrain
- Make tuning adjustments
- Perform a proper break-in
- 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) Assembled cylinder heads
- (1) Instruction packet
- (8) 5/16" Guideplates
- (16) 3/8" Rocker studs

If you are missing an item or a part was received in error, please contact Summit Racing Equipment at 1-330-630-0240, Monday through Friday from 9:00 am to 9:00 pm ET.

Recommended Tools

- Shop Manual for your vehicle
- Basic mechanics tool set (SAE / Metric sockets and combination wrenches)
- 0-100 ft.-lbs. torque wrench
- Timing light, vacuum gauge, and spark plug gap tool
- 7/16"-14 tap and tap handle
- Straightedge
- Feeler gauge
- Modeling clay
- Adjustable pushrod (TFS-9000 for hydraulic roller applications; TFS-9001 for flat tappet applications)
- Solid mock up lifter

Additional Parts Required

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

- Head gaskets
- Intake gaskets
- Exhaust gaskets
- Head bolts
- Intake bolts
- Exhaust bolts
- Moly lube
- Spark plugs
- RTV sealer
- Pushrods
- Rocker arms
- Thread locker
- Thread sealer

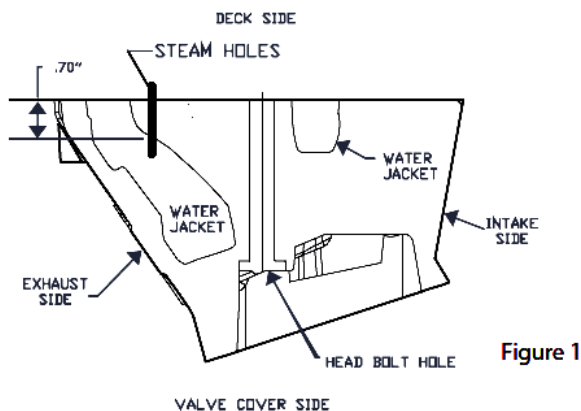
Installation Instructions

1) 400 c.i.d. Drill Note

The Summit 170cc cylinder heads do not come predrilled with the steam holes required for the 400 c.i.d. small block Chevrolet engines. If necessary, the steam holes can be drilled into the cylinder heads by a competent machinist. If you choose to drill the steam holes, follow the instructions below:

- Place a 400 c.i.d. head gasket on the deck surface of the cylinder head and carefully mark the positions of the steam holes.
- Using a 1/8" drill bit, drill the steam holes as shown in Figure 1.

NOTE: Drilling the steam holes will void the warranty.



2) 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 and routing vacuum lines.

NOTE: Be sure cylinder #1 is at TDC on the compression stroke and mark the distributor's rotor position on the firewall before disassembly.

3) 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 .004" 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 a 7/16"-14 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.

4) Checking Header Clearance

Place one of the new cylinder heads on a suitable work stand and install the recommended spark plugs (refer to the Recommended Components chart in the Technical specifications sheet for specific part numbers). Bolt the headers to the cylinder head and check for any interference. Repeat this procedure with the other cylinder head.

Summit Racing Equipment recommends using spark plug wires with 90 degree spark plug boots on header equipped small block Chevy engines. Now is the time to make sure the vehicle's temperature sending unit will work with the 1/2"-14 NPT threaded hole in the cylinder heads. If the vehicle's sender doesn't fit, locate a suitable replacement or use an adapter bushing to make the sending unit work (refer to the Recommended Components chart on the Technical Specifications sheet for specific part numbers).

5) Checking Piston-to-Valve Clearance and Valvetrain Geometry

If you choose to use the stock camshaft in your engine, and it has not been moved from its factory position, you do not have to check piston-to-valve clearance. If you have an aftermarket camshaft or are reinstalling a camshaft (especially with a multi-keyway timing set), you must follow this procedure to assure safe operating clearances between your pistons and valves:

- Rotate the crankshaft until the engine is on the compression stroke of the #1 cylinder. Place a solid mock up lifter in the lifter bore of the valve that you will be measuring. Be sure that the mock up lifter is the same height as the lifters that will be installed in the engine later.
- Place a few 1/4" thick strips of modeling clay across the upper half of the piston. Put a light coat of oil on top of the modeling clay and the valves in the cylinder head to keep the clay and valve from sticking. Place the head gasket you will be using on the block and bolt the head on with five or six head bolts.
- Install the rocker arm studs, guideplate, and the rocker arm for the valve you are checking (intake or exhaust). Next, set your adjustable pushrod tool to the proper length for your combination and tighten the rocker to zero lash, rotate the crankshaft at least twice, remove the cylinder head.
- This is also a good time to verify proper pushrod length and valvetrain geometry. The procedure can be found in the bulletin titled "How to Optimize Pushrod Length for Better Performance".
- Gently 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.
- When you have completed these procedures, rotate the crankshaft until the #1 piston is at TDC on the compression stroke.

NOTE: Reference the maximum recommended valve lift for the valve springs in the Technical Specifications sheet before purchasing an aftermarket camshaft.

6) Installing the New 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.

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

Position each cylinder head evenly on the block's dowel pins so that each head lies flat against the gasket. Next, place hardened head bolt washers over each bolt hole. Head bolt washers are required to prevent galling of the aluminum and to get accurate torque readings. Once they are in place, place a small amount of ARP moly lube on the top of all washers.

Place thread sealer on the head bolts, and torque the head studs in the four stages shown, following the sequence shown in Figure 1 on the following page.

NOTE: For head stud installation, follow the head stud manufacturer's instructions.

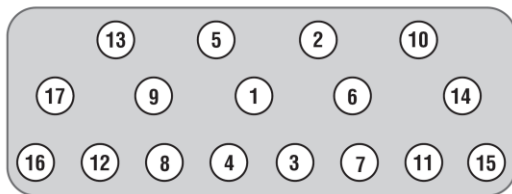


Figure 1

Stage One: 32 ft.-lbs.

Stage Two: 52 ft.-lbs.

Stage Three: 70 ft.-lbs.

A cold re-torque after the initial break in period is not required to maintain head gasket integrity and combustion seal, but can be done if desired.

7) Installing and Adjusting the Valvetrain

Place the proper length, hardened pushrods into the pushrod holes. Use Permatex 3H Aviation Form-a-Gasket to coat the base threads of the rocker studs, and then put the guideplates on. Do not tighten the guideplates down completely and leave the connecting bolt loose. If the rocker studs break into the intake ports, use Teflon tape on the threads.

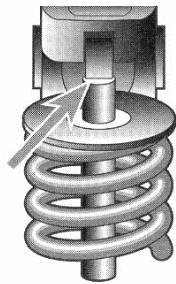


Figure 2

NOTE: Self-aligning rocker arms do not require guideplates. Instead, a rocker arm shim kit will be required for your 170cc cylinder heads in place of guideplates to maintain proper rocker arm stud height.

Place the rocker arms on the studs and verify that they are centered side to side. See Figure 2. Once the rocker arms are centered on the valves, gently remove the rocker arm and torque the rocker arm studs to 55 ft.-lbs. Place the rocker arm back on the stud to make sure that they didn't move during tightening. Now tighten the connecting bolt on the guide plate.

Adjust the valvetrain according to the camshaft manufacturer's recommendations. If you are using a hydraulic camshaft and no specifications are available, turn the rocker arm adjusting nuts $\frac{1}{2}$ to $\frac{3}{4}$ of a turn past zero lash. For mechanical camshafts, you must use the correct lash specification determined by the camshaft manufacturer.

Use the following adjustment order for all types of camshafts. This is the easiest method to use since it requires only one turn of the crankshaft.

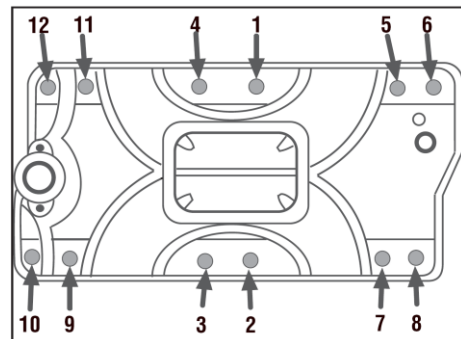
- With the #1 piston at TDC on the exhaust stroke, adjust the exhaust rockers of cylinders #2, #5, #6 and #7, then the intake rockers of cylinders #3, #4, #6 and #8.
- Turn the crankshaft 360 degrees (One full turn) until the #1 piston is at TDC on the compression stroke. Adjust the exhaust rockers of cylinders #1, #3, #4, and #8, then the intake rockers of cylinders #1, #2, #5 and #7.
- Leave the #1 piston at TDC on the compression stroke for the rest of the assembly.

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 in the Pre-lubing the Valvetrain section.

Intake Manifold Tips

Apply $\frac{1}{4}$ " bead of Permatex Ultra Black RTV sealer to the intake manifold end rail surfaces. Do not use a gasket on the end rails, only the RTV sealer. Outline the water openings at the ends of the head with Ultra Black to help prevent water leaks. Apply a small amount of motor oil to the intake bolts and torque to factory specifications in the sequence shown below.



Exhaust Manifold/Header Tips

Lay your straightedge across the mating flange of the exhaust manifolds/headers to make sure they are flat. Put a small amount of motor oil on the exhaust bolts and tighten them down from the center out to the ends. This will permit the flange to be tightened evenly. After you run the engine a few times, retighten the exhaust bolts. If the bolts loosen up, the leaking exhaust gas will ruin the gasket.

NOTE: What may sound like a lifter tick is often an exhaust gas leak. Rule out exhaust leaks before tearing the intake off to replace the lifters.

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. The valve cover rails on the Summit 170cc cylinder heads have been raised approximately $.300$ " to provide clearance for roller rocker arm polylocks. Adjustments to accessories that mount on or cross over the valve covers may be necessary.

If you are installing centerbolt-type valve covers with standard type roller rocker arms, you will have to reduce the width of the oil control baffles by squeezing them in the center until they clear.

After the valve covers are installed, reinstall the rest of the top end and accessories.

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

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. If you installed a new camshaft, change the oil after 30 minutes of run time. This will help remove particles that are shorn off during the break-in process.

NOTE: Summit Racing Equipment recommends the total timing be set between 36 to 38 degrees for maximum power. However, the optimal timing may vary.

NOTE: For specific state emission inspection compliance, please affix the included label on or near the cylinder heads.

Recommended Components

Head gasket: Fel Pro 7733PT-2, 4.125" bore
Fel Pro 1003, 4.166" bore
Fel Pro 1010, 4.166" bore
Fel-Pro 1014, 400ci w/ steam holes

Intake gasket: Fel Pro 1204, .060" thick
Fel Pro 1266, .125" thick

Exhaust gasket: Fel Pro 1404

Head bolts/studs: ARP 134-3601, (6pt. bolts)
ARP 234-4301 (12pt. studs)

Spark plugs: Autolite # 3924
Champion # RC9YC

Specifications

Head Material: A-356-T61 Aluminum
Comb. Chamber volume: 62cc
Intake port volume: 170cc
Intake port location: Stock; **Exhaust:** Stock
Intake valve diameter: 2.020"
Valve angles: Intake: 23°, **Exhaust:** 23°
Intake valve seat: Ductile Iron
Intake valve length: 4.960"
Intake valve stem diameter: 11/32"
Exhaust port volume: 69cc
Exhaust valve diameter: 1.600"
Exhaust valve length: 4.960"
Exhaust valve stem diameter: 11/32"
Valve guide material: Bronze Alloy
Valve guide length: 2.000" intake; 2.250" exhaust
Valve guide spacing: 1.910"
Valve seal: Viton® .500" I.D. x .700" O.D. x 11/32" stem
Valve spring retainers: Chromoly 7° x 1.250" O.D.
Valve stem locks: 7° stamped steel
Valve springs: Option 1
1.250" O.D. single spring with damper
110 lbs. @ 1.780" installed height
300 lbs. @ 1.280" open
360 lbs. per inch rate
.480" maximum lift

Guide plates: For use with 5/16" pushrods
Push rod length: Longer than stock required,
Rocker studs: ARP 3/8"-24NF x 7/16"-14 NC x 1.895"
Weight each bare: 22 lbs. each
CARB E.O Number: D-369-13

How to Optimize Pushrod Length For Better Performance

Instruction Manual

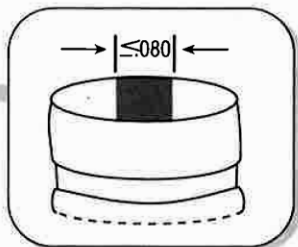


Figure 1

In an overhead valve V8 engine, the valvetrain multiplies and transfers the motion of the camshaft and lifters to the valves. The pushrods play a critical role in this transfer of motion.

Pushrod length greatly affects the efficiency of the motion transfer to the valves by altering the tip travel of the rocker arms. To provide maximum valvetrain efficiency with minimum side thrust against the valve guide, rocker arm tip travel on the valve stem should be .080" or less, as shown in **Figure 1**.

Measuring Pushrod Length

To determine the proper length pushrods for your application, you will need an adjustable checking pushrod, a machinist's rule, and the rocker arms to be used on the engine. If you are using roller rocker arms, a dial indicator will also be required.

As a general rule, longer pushrods will decrease rocker arm tip travel. This can be checked by marking one of the valve stem tips with bluing or a marker, then turning the engine over by hand a few times. This lets the rocker arm tip simulate a wear pattern on the valve stem tip. Next, take the rocker arm off; the amount of rocker arm tip travel will show up as a brightly colored stripe on the valve stem tip. Measure this stripe with the machinist's rule and make and test necessary pushrod length changes with the adjustable checking

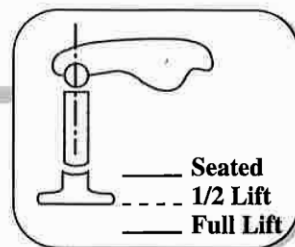


Figure 2

pushrod. If you can't get a tip travel measurement of .080" or less after trying several pushrod lengths, you will have to switch to another brand of rocker arms and start over.

When checking pushrod length with roller tip rocker arms, note the position of the roller tip on the valve stem when the valve is at one-half of its net lift. This is called half-lift centering; a dial indicator must be used to make this measurement. Ideally, the centerline of the rocker arm's roller tip should coincide with the centerline of the valve at one-half of its net lift—providing an equal amount of rocker arm tip travel on each half of the valve stem tip. A slightly off-center rocker arm tip position at half-lift is OK as long as tip travel is minimized. Refer to **Figure 2**.

It must be noted that using a different brand of rocker arms from those originally measured, even if they have the same ratio, could change the rocker arm tip travel (even if the same length pushrods are used). If either the rocker arms or pushrod length are changed, you must redetermine and reset pushrod length.

Summit Racing Limited Warranty

Summit Racing Equipment warrants this product for 90 days from date of purchase. If used for racing or competition, this warranty is limited to manufacturer defects only—wear and breakage are not covered under any circumstances. If the product shows, in our opinion, evidence of being used or installed contrary to the instructions and/or subjected to improper handling, packaging, or shipping by the customer, it will not be covered by our limited warranty. Summit Racing Equipment's liability for losses or damages, arising out of any cause whatsoever, is limited to full refund of the purchase price or, at our option, repair or replacement of the product(s). Summit Racing Equipment shall not be liable for any consequential or incidental damages. Some states do not allow exclusion or limitation of consequential or incidental damages, so the above limitation or exclusion may not apply to you.

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