



PowerOval® 280 and PowerPort® 320 and 365 Big Block Chevy Cylinder Heads

Thank you for purchasing Trick Flow PowerOval® and PowerPort® Big 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 Trick Flow technical department at 1-330-630-1555 for assistance, Monday through Friday from 9:00 am to 5:00 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 Trick Flow
- Locate recommended tools
- Purchase the shop manual for your specific application, or take your vehicle to a qualified/certified mechanic
- Remove existing cylinder heads
- Clean and inspect the engine block
- Check header fitment
- Install new cylinder head locating dowels
- Modify and plug coolant holes (hybrid applications)
- Verify the head bolt size for your application
- 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.

- (1) Assembled cylinder head
- (1) Instruction packet
- (4) Adjustable Guideplates
- (8) Rocker studs

If you are missing an item or a part was received in error, please contact Trick Flow at 1-330-630-1555, Monday through Friday from 9:00 am to 5:00 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
- Vacuum gauge, and spark plug gap tool
- Straightedge
- Feeler gauge
- Modeling clay
- Adjustable pushrod (TFS-9002)
- 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 sealer



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 and routing vacuum lines.

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 .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.

After cleaning the head bolt 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 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 stud guideplate and the rocker arm for the valve you are checking (intake or exhaust). Next, set your pushrods in 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.

4) Installing the PowerOval® or PowerPort® Big Block Chevrolet 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 tops 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.

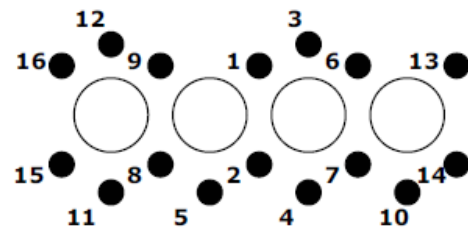


Figure 1

Stage One: 32 ft.-lbs.

Stage Two: 52 ft.-lbs.

Stage Three: 65 ft.-lbs.

Stage Four: 75 ft.-lbs. Long bolts only
(1, 2, 3, 6, 7, 8, 9, 12, 13, 14, 15, 16)

A cold re-torque after the initial break in period is required to maintain head gasket integrity and combustion seal.

5) Installing and Adjusting the Valvetrain

Place the proper length, hardened pushrods into the pushrod holes. Use oil 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.

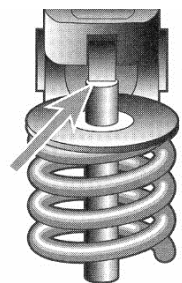


Figure 2

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:

- A) Following the proper firing order for your engine, turn the crankshaft until the first cylinder listed in the firing order is at TDC on the compression stroke. Both valves will be in the closed position.
- B) Adjust the valves as described, then rotate the crank exactly $\frac{1}{4}$ turn and repeat for the next cylinder in the firing order.
- C) After the valvetrain for all the cylinders has been adjusted, set the #1 piston at TDC on the compression stroke for the rest of the reassembly.

Firing Order: 1-8-4-3-6-5-7-2

6) Pre-lubing the Valvetrain

The valvetrain is now ready to be pre-lubed. Use an oil pump primer to prelube the valvetrain, spin the oil pump until oil seeps out of the rocker arms. Next, 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.

Now, reinstall the rest of the top end and accessories. Be sure to seal your intake manifold bolts with a thread sealer to avoid any coolant seepage.

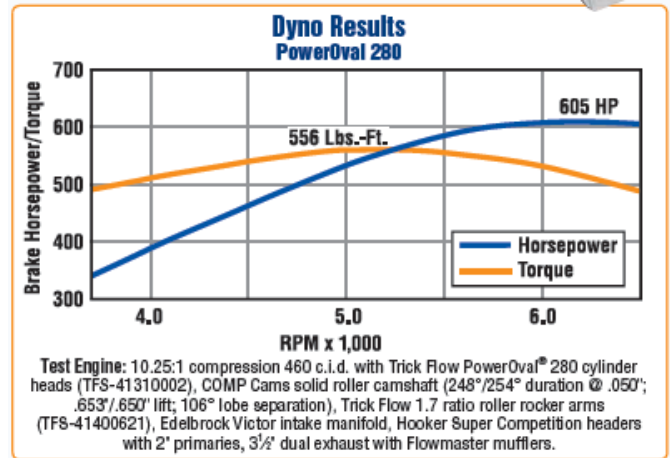
DO NOT START THE ENGINE IF THE TOP HALF OF THE ENGINE HAS NOT BEEN PRELUBED!

Finish reassembling all other components, brackets and vacuum lines.

8) 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.

After the engine has cooled down, remove your valve covers. Now you can cold re-torque your head studs as explained at the end of Step 4.



Trick Flow PowerOval® Heads Make 20 More Horsepower Than the Competition!

At Trick Flow, the proof is in the dyno sheet.

As tested on a Chevy 454 (10.25:1 CR, .653"/.650" lift solid roller cam, 850 cfm carburetor and Edelbrock Air-Gap intake), Trick Flow PowerOval 280 Cylinder Heads for Big Block Chevrolet made 601 HP—20 more horsepower than the closest competing head.

That's Horsepower by Design!

Specifications

Head Material: A-356-T61 Aluminum

Comb. Chamber volume: 113cc CNC Profiled (280cc)
122cc CNC Profiled (320cc)
119cc CNC Profiled (365cc)

Intake port volume: 280cc Fast-As-Cast
320cc Fast-As-Cast
365cc CNC Competition Ported

Intake port location: Stock; **Exhaust:** Raised .300" from stock

Intake valve diameter: 2.190" (TFS-41300211) (280cc)
2.250" (TFS-41400210) (320cc 01/02)
2.300" (TFS-41400211) (320cc 03)
2.350" (TFS-414C0211) (365cc)

Valve angles: Intake: 24°/4°, Exhaust: 15°/4°

Exhaust port volume: 129cc Fast-As-Cast (280cc)
137cc Fast-As-Cast (320cc)
135cc CNC Competition Ported (365cc)

Exhaust valve diameter: 1.880" (TFS-41300212) (280cc, 320cc)
1.880" (TFS-414C0212) (365cc)

Valve guide material: Manganese Bronze Alloy
Intake (TFS-41400251) (280cc, 320cc)
Exhaust (TFS-41400252) (280cc, 320cc)
Intake and Exhaust (TFS-51600251) (365cc)

Valve seal: Viton® fluoroelastomer (TFS-51400454) (280cc, 320cc)
Viton® fluoroelastomer (TFS-54500455) (365cc)

Valve seats: Interlocking Ductile Iron: Intake (TFS-41400271)
| Exhaust (TFS-41400272)

Valve seat angles: 45° x multi-angle

Valve spring pocket diameters: 1.760"

Valve spring cups: 1.640" (TFS-41400434)

Valve spring ID locators: 1.550" (TFS-21400440)

Valve spring retainers:

Chromoly 10° x 1.550" O.D. +.050" (TFS-41400423)
Titanium 10° x 1.550" O.D. +.050" (TFS-214T0525)
Titanium 10° x 1.625" O.D. (TFS-214T0620)
Titanium 10° x 1.625" O.D. (TFS-214T0650) (365cc)

Valve stem locks:

10° machined steel (TFS-52400444) (280cc, 320cc)
10° machined steel (TFS-52400445) (365cc)

Valve springs: Standard (TFS-16094) (Mech. Flat Tappet/ Hyd. Roller)

1.550" O.D. dual spring with damper
138 lbs. @ 1.950" installed height
430 lbs. @ 1.250" open
420 lbs. per inch rate; .700" maximum lift

Option 1 (TFS-16318) (Mech. Roller Cam)

1.560" O.D. dual spring with damper
240 lbs. @ 2.000" installed height
600 lbs. @ 1.280" open
500 lbs. per inch rate; .700" maximum lift

Option 2 (TFS-16414) (Mech. Roller Cam)

1.640" O.D. dual spring with damper
250 lbs. @ 2.000" installed height
800 lbs. @ 1.150" open
600 lbs. per inch rate; .850" maximum lift

PowerPort 365 (TFS-16948)

1.645" O.D. triple spring with damper
332 lbs. @ 2.100" installed height
950 lbs. @ 1.200" open
688 lbs. per inch rate; .900" maximum lift

Guide plates: 3/8" Two piece adjustable (TFS-41400623)

Push rod length: Longer than stock required,

Rocker studs: ARP 7/16" Intake (TFS-41400613)
ARP 7/16" Exhaust (TFS-41400614)

Minimum bore diameter: 4.094" (280cc), 4.250" (320cc, 365cc)

Replacement Cylinder Heads

TFS-4131B001, Bare, 280cc Intake Port, each

TFS-4141B320, Bare, 320cc Intake Port, each

TFS-4141B804-C02, Bare, 365cc Intake Port, each

Recommended Components

Head gasket: TFS-41394375-040 (MLS 4.375" Bore)
TFS-41394540-040 (MLS 4.540" Bore)

Intake gasket: Fel-Pro 1212 (280cc)
Mr. Gasket 121 (320cc)
SCE Gaskets 213105 (365cc)

Exhaust gasket: Fel Pro 1412
TFS-41490931 (MLS)

Head bolts: TFS-92002

Pistons: OEM equivalent

Rocker arms: TFS-41400621 (1.7 ratio, 7/16" studs)
Jesel 248080 (1.8 ratio, shaft style)

Spark plugs: Autolite # 3924

Ultimate Bolt-On Performance® Lifetime Warranty

Trick Flow Specialties cylinder head castings are backed by a lifetime warranty. If a cylinder head casting fails to provide the original purchaser with complete satisfaction, Trick Flow Specialties 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, guideplates, and valve stem seals included on assembled Trick Flow Specialties 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 Trick Flow Specialties products are warranted to be free from defects in materials and workmanship for a period of 90 days. There are no mileage limitations.

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 Trick Flow Specialties 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.

Trick Flow Specialties warranties do not cover any installation or removal costs.

Trick Flow Specialties 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.

Trick Flow Specialties®, Trick Flow®, TFS® PowerOval® and PowerPort® are registered trademarks of Trick Flow Specialties.

Trick Flow PowerOval® and PowerPort® heads for the big block Chevrolet are not a product of Chevrolet Motor Division, General Motors, nor are they endorsed by Chevrolet. Trick Flow Specialties is not affiliated with Chevrolet in any manner whatsoever.

Viton® is a registered trademark of DuPont Performance Elastomers.

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