



PowerPort® Cleveland 195 and 225 Cylinder Heads

Thank you for purchasing Trick Flow 351 Cleveland aluminum cylinder heads designed for the Ford 351 Cleveland and 351/400 "M" engines.

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.

NOTE: These heads can be used in hybrid applications such as the mock "Boss 302" and 351 "Clevor". Please consult the "Additional Applications" section for specific details.

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) Guideplates
- (8) Rocker studs
- (2) 3/4" Coolant plugs

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-9001)
- 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.

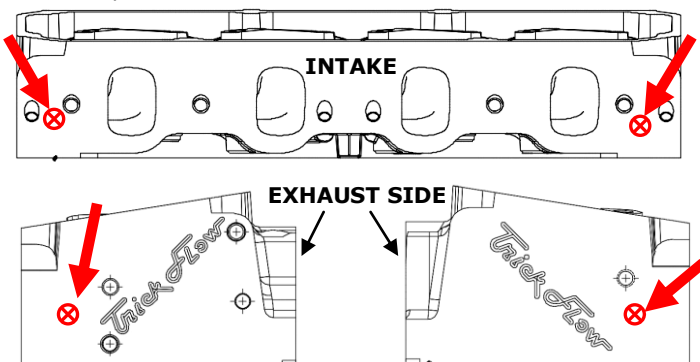
After cleaning the head bolt hole threads, carefully remove the paper towels from the cylinders and discard. Using new paper towels, clean the cylinders and coat the cylinder walls with a thin film of engine oil to protect them from corrosion.

3) Checking Exhaust Manifold/Header Clearance

Place one of the Trick Flow 351 Cleveland cylinder heads on a suitable work stand and install the recommended spark plugs (refer to the 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.

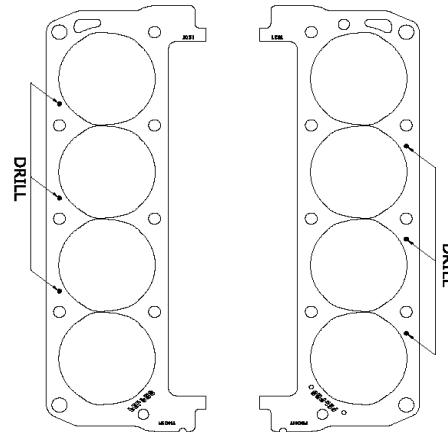
4) Additional Applications

Cleveland heads can be used in hybrid applications such as the mock Boss 302 (302 block with Cleveland cylinder heads) or a 351 Clevor (351 Windsor block with Cleveland heads). In these applications, the coolant passage crossover must be drilled in the intake face or the ends of the cylinder heads to be used with specific wet or dry aftermarket intake manifolds for such hybrid applications. Pilot indicators or tooling holes (see below) are located on the cylinder head to assist you in the completion of your hybrid application. Confirm that you are drilling in the correct location; otherwise you could permanently damage your cylinder head. Please refer to your intake manifold or water crossover manufacturer's instructions on the proper diameter/pitch to be used.



These hybrid applications also require you to plug the 3/4" threaded coolant holes in the deck surface as they will hang over the block and not seal. Install the supplied plugs using a Teflon thread sealer. Do not over-tighten. Please note that after the plugs have been installed, if they protrude through the deck surface, the deck surface must be milled flat. This should only be performed by a competent engine machine shop. Be sure to coat the plugs on the deck surface with a RTV gasket sealer, to ensure that the heads seal against the head gasket.

Additionally, on Clevor applications, coolant holes must be drilled in your **BLOCK**. Please use the following diagram and your recommended head gasket as a template. Trick Flow recommends a 3/16" diameter hole.



FRONT

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.
- Coat the top of the piston with a very thin layer of oil, then place a few 1/4" thick pieces of modeling clay across the upper half of the piston. 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 the adjustable pushrod tool to the proper length for your combination (refer to the How to Optimize Pushrod Length for Better Performance supplement for specific instructions). Tighten the rocker to zero lash, rotate the crankshaft at least twice, remove the cylinder head.
- 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.

- E) When you are done measuring the second valve, reinstall the cylinder head in the same manner as before so you can verify proper pushrod length and valvetrain geometry. The procedure can be found in the bulletin titled "How to Optimize Pushrod Length for Better Performance".
- F) When you have completed these procedures, rotate the crankshaft until the #1 piston is at TDC on the compression stroke.

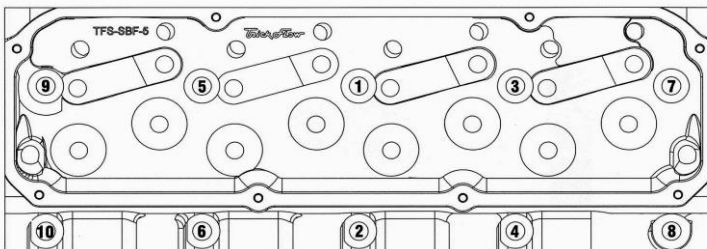
NOTE: Reference the maximum recommended valve lift for the valve springs in the Technical Specifications sheet before purchasing an aftermarket camshaft.

6) Installing the Power Port® 351 Cleveland 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. Place a small amount of ARP moly lube on the tops of your head bolt washers. Washers are required to prevent galling of the aluminum and to get accurate torque readings. Coat the threads of your head bolts with Permatex 3H Aviation Form-A-Gasket (bolts), or blue Loctite (studs), following the manufacturer's directions for set-up time, and then place the bolts in their proper locations. Torque the bolts in the four stages shown, following the sequence shown in Figure 1.



It is not necessary to re-torque the head bolts after initial break-in. For head stud installation, follow the head stud manufacturer's instructions.

7/16" Head Bolts:

- Stage One: 30 ft.-lbs.
- Stage Two: 40 ft.-lbs.
- Stage Three: 50 ft.-lbs.
- Stage Four: 65-70 ft.-lbs.

1/2" Head Bolts:

- Stage One: 30 ft.-lbs.
- Stage Two: 60 ft.-lbs.
- Stage Three: 90 ft.-lbs.
- Stage Four: 100-110 ft.-lbs.

7) Installing and Adjusting the Valvetrain

Place the proper length, hardened pushrods into the pushrod holes. Use a thread sealer on the threads of the rocker studs, and then put the guideplates on. With everything installed, torque the rocker arm studs to 55 ft.-lbs. Place the rocker arms on the studs and verify that they are centered side to side. See Figure 2.

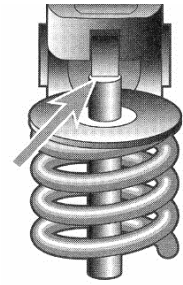


Figure 2

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

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. Be sure to seal your intake manifold bolts with a thread sealer to avoid any coolant seepage.

Exhaust Leak 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. Use an oil pump primer to pre-lube the valvetrain. 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.

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: A356-T61 Aluminum

Combustion Chamber volume:

C00: 62cc, 72cc CNC Profiled

C01: 60cc CNC Profiled

C11: 72cc CNC Profiled

Intake port volume:

C00: 195cc CNC Street Ported

C01/C11: 225cc CNC Competition Ported

Intake port dimensions:

C00: 1.470" x 2.100"

C01/C11: 1.500" x 2.100"

Intake port location: Stock

Intake valve diameter: 2.080" x 5.300" OAL (TFS-52400211) (11/32")

Intake valve angle: 9.5°/4.25°

Exhaust valve diameter: 1.60" x 5.160" OAL (TFS-51700213) (11/32")

Exhaust valve angle: 9.5°/4°

Valve guide length: Intake: 2.00" (TFS-51600251) (Bronze Alloy)

Exhaust: 2.25" (TFS-51600252) (Bronze Alloy)

Valve guide spacing: 4.368"

Valve seal: Viton® .500" I.D. x .700" O.D. x 11/32" stem

Valve seat intake: Ductile Iron (TFS-51700271)

Valve seat exhaust: Ductile Iron (TFS-51700252)

Valve seat angles: 35°x 45°x 60° (Intake & Exhaust)

Valve spring pockets diameter: 1.615"

Valve spring cups: 1.610" OD, 1.480" Spring OD (TFS-51400434)

Valve spring I.D. locator: 1.550" (TFS-21400440)

Valve spring retainers:

Chromoly steel 7° x 1.500" O.D. (TFS-51400423)

Chromoly steel 10° x 1.550" O.D. (TFS-21400425)

Titanium 10° x 1.500" O.D. (TFS-214T0520)

Valve stem locks: 7° machined steel (TFS-51400444)

10° machined steel with lash cap recess (TFS-52400444)

Valve springs: Standard

1.460" O.D. dual spring with damper (TFS-16534)

120 lbs. @ 1.900" installed height

394 lbs. @ 1.175" open

390 lbs. per inch rate

.650" maximum lift

Option 1

1.550" O.D. dual spring with damper (TFS-16094)

155 lbs. @ 1.950" installed height

442 lbs. @ 1.250" open

427 lbs. per inch rate

.680" maximum lift

Option 2 (SOLID ROLLER ONLY)

1.560" O.D. dual spring with damper (TFS-16318)

240 lbs. @ 2.000" installed height

600 lbs. @ 1.280" open

500 lbs. per inch rate

.700" maximum lift

Guide plates: 5/16" (TFS-51600623)

3/8" (TFS-51600624)

Rocker studs: 7/16" (TFS-51400614)

Minimum Bore Diameter: 4.000"

Push rod length: Longer than stock required,
Refer to instructions for recommendations

Weight each bare: 30 lbs.

Replacement Cylinder Heads

TFS-5161B620-C00, Cylinder Head, Aluminum, 62cc CNC Chamber, 195cc Street Ported Intake Port, Bare

TFS-5161B720-C00, Cylinder Head, Aluminum, 72cc CNC Chamber, 195cc Street Ported Intake Port, Bare

TFS-5161B000-C01, Cylinder Head, Aluminum, 60cc CNC Chamber, 225cc Competition Ported Intake Port, Bare

TFS-5161B000-C11, Cylinder Head, Aluminum, 72cc CNC Chamber, 225cc Competition Ported Intake Port, Bare

Recommended Components

Head gasket: Fel Pro #1013 (Cleveland 4.100)
Fel Pro #1021 (Clevor 4.100)
Fel Pro #1022 (Clevor Left 4.160)
Fel Pro #1023 (Clevor Right 4.160)

Intake gasket: Trick Flow #TFS-51600921
Fel Pro #1240

Exhaust gasket: Fel Pro #1430

Head bolts/studs: ARP #154-4004 (6pt. Nuts)
ARP #154-4204 (12pt. Nuts)
ARP #154-3604 (Hex Bolts)

Pistons: O.E.M

Rocker arms: TFS-53400621 (1.73 Ratio)

Stud Girdles: N/A

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

285 West Avenue Tallmadge, Ohio 44278
Sales: (330) 630-1555, Fax: (330)630-5565
www.trickflow.com

Trick Flow Specialties®, Trick Flow®, TFS® and Twisted Wedge® are trademarks of Trick Flow Specialties, registered U.S. Patent Office.

Viton® is a registered trademark of DuPont Performance Elastomers.

