



## Trick Flow High Port® Cylinder Head

Thank you for purchasing Trick Flow High Port® aluminum cylinder heads designed for the Ford 289/302 and 351W.

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
- 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
- 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 High Port cylinder head
- (1) Instruction packet
- (4) 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-9000)
- 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 High Port 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.

### 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:

- A) 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.
- B) 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.
- C) 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.

- D) 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 High Port 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. Trick Flow High Port heads are designed for 1/2" head bolts/studs; if your block is machined for 7/16" head bolts/studs, head bolt adapters (TFS-51400419) will be required. Torque the bolts in the four stages shown, working from inside-out.

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:

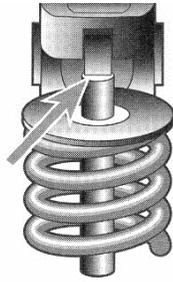
Stage One:	30 ft.-lbs.
Stage Two:	40 ft.-lbs.
Stage Three:	50 ft.-lbs.
Stage Four:	65-70 ft.-lbs.

#### 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: 289/302: 1-5-4-2-6-3-7-8**  
**351W/5.0L HO: 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 prelube 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.

### *Recommended Components*

<b>Head gasket:</b>	TFS-51494060-040 (4.060" Bore, .040" thick) TFS-51494080-040 (4.080" Bore, .040" thick) TFS-51494155-040 (4.155" Bore, .040" thick)
<b>Intake gasket:</b>	Fel-Pro #1250 (M64) Fel-Pro #1262R (C01, C02)
<b>Exhaust gasket:</b>	Fel-Pro #1415 (OEM bolt pattern) (M64) Hooker #10861 (Diagonal bolt pattern) (M64) Fel-Pro #1487 (OEM bolt pattern) (C01, C02) TFS-51700931 (Diagonal bolt pattern) (C01, C02)
<b>Head studs:</b>	ARP #154-4001* (289/302) ARP #154-4003 (302 Race/351W)
<b>Head bolts:</b>	TFS-92005* (289/302) ARP #154-3601* (289/302) ARP #154-3603 (302 Race/351W)
<b>Adapter Bushings:</b>	TFS-51400419 (1/2" to 7/16")
<b>Rocker arms:</b>	TFS-51400520 (1.6 Ratio) TFS-51400521 (1.7 Ratio)
<b>Stud Girdles:</b>	TFS-51700700 (3/8" Rocker studs) TFS-51700701 (7/16" Rocker studs)
<b>Spark plugs:</b>	Autolite # 3924
<b>Misc. notes:</b>	* Head bolt/stud adapter bushings required. (TFS-51400419)

## Specifications

**Head Material:** A-356-T61 Aluminum

**Comb. Chamber volume (CNC):** 58cc, 64cc, 67cc, 70cc, 76cc

**Intake port volume:** 192cc Fast-As-Cast  
225cc Competition CNC Ported  
240cc Competition CNC Ported

**Intake port shape:** Rectangle

**Intake Valve:** 2.020" x 5.160" (TFS-51700211) (64cc)  
2.080" x 5.160" (TFS-51700217) (70/76cc)  
2.100" x 5.300" (TFS-52400218) (58/67cc)

**Intake Valve Angle:** 20°

**Exhaust port volume:** 87cc, 95cc Competition CNC Ported

**Exhaust Port location:** Raised .750" over stock

**Exhaust Valve:** 1.600" x 5.160" (TFS-51700212) (64cc)  
1.600" x 5.160" (TFS-51700213) (70/76cc)  
1.600" x 5.300" (TFS-52400212) (58/67cc)

**Exhaust Valve Angle:** 20°

**Exhaust Flange Pattern:** Stock and Hooker subflange

**Valve Cover Rail:** Raised .400" over stock

**Valve guide material:** Bronze Alloy

**Valve seal:** Viton® Fluoroelastomer (TFS-51400454)

**Valve seat intake:** Interlocking Ductile Iron

**Valve seat exhaust:** Interlocking Ductile Iron

**Valve spring pockets:** 1.615"

**Valve spring ID locator:** 1.550" (TFS-51400434)

**Valve spring cups:** 1.480" (TFS-21400440) (1.460" springs)

**Valve spring retainers:**

7° x 1.500" O.D. chromoly steel (TFS-51400424) (M64)  
10° x 1.500" O.D. chromoly steel (TFS-21400424) (12-C01)  
10° x 1.500" O.D. titanium (TFS-214T0420) (T12-C01)  
10° x 1.500" O.D. titanium (TFS-214T0525) (T10-C01,  
T13-C01, T15-C01, T16-C02, T17-C01, T18-C02)

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

10° machined steel (TFS-52400444)

10° machined steel (+.050") (TFS-52400XXX)

**Valve springs: M64, 12-C01** (TFS-16315)

1.46" O.D. dual spring with damper  
125 lbs. @ 1.800" installed height  
376 lbs. @ 1.180" open  
420 lbs. per inch rate  
.600" maximum lift

**Valve springs: 10-C01** (TFS-16318)

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

**Valve springs: 13-C01, 14-C01, 16-C02, and 18-C02**

1.550" O.D. dual spring with damper (TFS-16324)  
240 lbs. @ 1.920" installed height  
550 lbs. @ 1.270" open  
460 lbs. per inch rate  
.680" maximum lift

**Milling specifications:** NA

**Guide plates:** 5/16" (TFS-51700623)

3/8" (TFS-51700624)

**Push rod length:** Longer than stock required,

**Rocker studs:** ARP 3/8" (TFS-51400613)

ARP 7/16" (TFS-51400614)

**Rocker arm type:** Stud Mount

## Replacement Cylinder Heads

**TFS-5171B001-M64**, Cylinder Head, Aluminum, 64cc CNC Chamber, 192cc Fast-As-Cast Intake Runner, single

**TFS-5171B010-C01**, Cylinder Head, Aluminum, 58cc CNC Chamber, 225cc CNC Intake Runner, single

**TFS-5171B012-C01**, Cylinder Head, Aluminum, 70cc CNC Chamber, 225cc CNC Intake Runner, single

**TFS-5171B016-C02**, Cylinder Head, Aluminum, 67cc CNC Chamber, 240cc CNC Intake Runner, single

**TFS-5171B018-C02**, Cylinder Head, Aluminum, 76cc CNC Chamber, 240cc CNC Intake Runner, single

## 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® and Twisted Wedge® are trademarks of Trick Flow Specialties, registered U.S. Pat. Off.

Trick Flow Twisted Wedge heads for small block Ford are not a product of Ford Motor Company, nor are they endorsed by Ford. Trick Flow Specialties is not affiliated with Ford in any manner whatsoever.

### Trick Flow Specialties

285 West Avenue Tallmadge, Ohio 44278

Sales: (330) 630-1555, Fax: (330) 630-5565

Trickflow.com

Viton® is a registered trademark of DuPont Performance Elastomers.