Trick Flow® PowerPort® 190 Cylinder Heads

Small Block Mopar

Thank you for purchasing "Trick Flow PowerPort 190" aluminum cylinder heads that have been specially designed to perform on both the LA and Magnum Small Block Mopar!

Please follow the steps that are outlined within this instruction manual to ensure that the installation of your new cylinder heads is done correctly and that they perform according to their design.

Please read all of the enclosed information ***before*** beginning any work. If you have any questions or concerns regarding installation or written materials with your new heads, please contact the Trick Flow technical department at **1-330-630-1555** for assistance Monday through Friday between 9:00am and 5:00pm EST.

Important Information

These cylinder heads are able to be used on both Magnum and LA blocks, but the oiling to the valvetrain differs between the two. Magnum blocks are going to feed oil to the valvetrain through the pushrods, whereas the LA blocks are going to feed oil through the head, into the rocker shaft, and then to the rockers. Both oiling systems will work fine, but knowing the difference is important to troubleshooting any issues that you may occur later.

Another important thing to note is that these heads ***require*** certain components and others are highly recommended. These parts are listed below:

1. **Required:** Trick Flow Specialties Head Bolt Kit (*TFS-92030*) or Trick Flow Specialties Head Stud Kit (*TFS-61404304*)
2. **Required:** Harland Sharp Rocker Shaft System for Magnum applications. (*S72025K or S72026K*)
3. **Recommended:** Trick Flow Specialties Rocker Shaft Stud Kit (*TFS-61400613*)
4. **Recommended:** Harland Sharp Rocker Shaft System for LA applications. (*S70025K or S70026K*)

These cylinder heads also require you to use a different length pushrod from stock. This difference can vary between .100" and .300" depending on your application. Consult your pushrod manufacturer for instructions on how to obtain the proper pushrod for your application. Your pushrod length is very critical to the proper operation of your engine. We recommend using a pushrod length checker. If you're using a ball-ball pushrod, you will use part number TFS-9000 or TFS-9001 and if you're using a ball-cup pushrod, you will use TFS-9005.

We recommend using a tall valve cover with an LA bolt pattern. You must check for clearance and be sure that your baffles and/or valve cover are clearing the valvetrain.

Project Overview

- Review all paperwork included in the installation packet.
- Inspect the condition of all components.
- Verify that the part numbers and quantities of each product are correct. (See *"Parts Checklist"*)
- Fill out and mail the warranty card to Trick Flow
- Gather tools from *"Recommended Tools"* section.
- Purchase any necessary additional parts. (See *"Additional Parts Required."* **Do not purchase pushrods** until the proper length has been determined.)
- Remove existing cylinder heads.
- Clean and inspect the engine block thoroughly.
- If necessary, install new cylinder head locating dowels.
- Check piston to valve clearance.
- Check pushrod length and purchase new ones accordingly.
  - Length checker for ball-ball pushrod: TFS-9000/TFS-9001
  - Length checker for ball-cup pushrod: TFS-9005
- Install the new cylinder heads and adjust valvetrain.
- Make necessary tuning adjustments.
- Perform a proper break-in.
- Test drive and enjoy your new cylinder heads!

Parts Checklist

You should have received the parts listed below in your cylinder head package. Please verify the part numbers and quantities of each component received.

- (1) Cylinder Head
- (1) Instruction Packet

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 between 9:00am and 5:00am EST.

Recommended Tools

- Shop manual for your vehicle.
- Basic mechanics tool set.
- Torque Wrench (**0 – 150 ft.-lbs**)
- Timing light, vacuum gauge, and spark plug gapping tool.
- **½"-13** Tap and Handle
- Straight-Edge
- Feeler Gauges
- Modeling Clay
- Calipers
- Adjustable Pushrod
- **Solid** mock-up lifter

Additional Parts Required

These components are a requirement to have in order 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/Studs *(TFS-92030 or TFS-61404304)*
- Intake Bolts
- Exhaust Bolts
- Moly Lube
- Spark Plugs
- RTV Sealant
- Pushrods *(Longer than stock may be required)*
- Rocker Arms *(Harland Sharp; part numbers at the end of these instructions)*
- Rocker Arm Stud Kit *(TFS-61400613)*
- Cylinder Head Locating Dowels

Installation Instructions

1) Old Cylinder Head Removal

- Consult your shop manual for the proper cylinder head removal procedure for your specific vehicle. As you perform disassembly, it is highly recommended to take notes, pictures, and videos. Doing this will greatly increase the ease of installing your new cylinder heads.

NOTE: Be sure that #1 cylinder is at Top Dead Center (TDC) on the compression stroke and mark the distributor's rotor position before disassembly.

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 clean shop rags in the cylinders to catch any loose debris when the old head gaskets are scraped off of the engine's deck surface.
- Remove all traces of the gaskets and any oil/grease that may be present by wiping the surface with brake cleaner.
- Check the deck surfaces for flatness by laying a straight-edge 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 the correct size tap to chase the threads in the bolt holes. This will clean out old sealer and debris, which is extremely important for preventing leaks and achieving the proper torque on your new cylinder heads.
- After cleaning is complete, carefully remove the shop rags from the cylinders and discard. Use new, unused, and clean shop rags to clean the cylinders and coat the cylinder walls with a thin film of engine oil to protect them from corrosion.
- Inspect the old dowels in the block. If they are in poor condition, then install new head alignment dowels.
- Place the new head gaskets on the engine block.

3) Valvetrain Installation and 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, and 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.
- Your PowerPort® cylinder heads use a shaft mounted rocker arm system which mounts directly onto the pedestals on your cylinder heads.

NOTE: Any work performed on your cylinder heads, such as milling the heads, modifying your valve job or camshaft base circle changes can affect the pushrod length.

- Trick Flow highly recommends using our rocker arm shaft system hold down stud kit *(TFS-61400613)*. This kit, when used correctly, will prevent pulling the threads out of the cylinder heads when tightening down the rocker arm shaft system. ***We do not recommend using standard rocker shaft bolts.***
- Place the rocker arm shaft system on the pedestals and tighten the hold down nuts/bolts. Be sure that the oiling holes in the shaft are properly aligned with the oil gallery in the head. **Do not torque the nuts/bolts yet.**

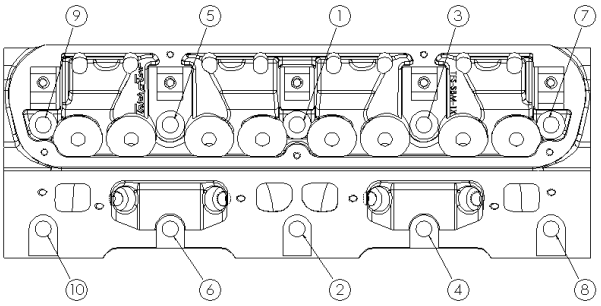
- Adjust the lash according to the camshaft manufacturer's recommendations.
- Once you believe that you have the rocker arm centered on the valve tip and your lash is set, rotate the engine a few times, returning to TDC on #1.
- Next, remove the cylinder head and gently cut the clay into slices and look 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 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 <u>before</u> purchasing an aftermarket camshaft.

4) Installing the PowerPort® Cylinder Heads

- With the block deck surfaces and cylinders clean, as well as all check completed, position the head gaskets on the block per the manufacturer's markings.

  NOTE: Do not be alarmed if some 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. When using head bolts, place a small amount of ARP moly lube on the tops of the head bolt washers and on the threads. When using head studs, place ARP moly lube on the threaded end of the stud with the nut as well as on both sides of the washers. The washers are required to prevent galling of the aluminum head and to get an accurate torque reading.
- Torque the bolts in three stages following the sequence shown below.



<u>½"-13 Head Bolts/Studs</u>
Stage 1: 40 ft.-lbs.
Stage 2: 70 ft.-lbs.
Stage 3 *Bolts*: 100 ft.-lbs.
Stage 3 *Studs*: 110 ft.-lbs.

5) Final Valvetrain Adjustment

- Back off all rocker adjusters and install the rocker arm shaft system on the pedestals and slightly tighten the hold-down bolts/studs. As performed earlier, be sure that the oiling holes in the shaft are properly aligned with the oil gallery in the cylinder head. **Do not torque the bolts yet.**
- Center the rockers over the valve tips and measure the endplay of each rocker arm individually as previously performed in step 4 *"Valve Train Installation and Piston-to-Valve Clearance."*
- Torque the hold-down bolts/studs to 25 ft.-lbs.
- Adjust the lash according to the camshaft manufacturer's recommendations.

6) Reassembling the Rest of the Engine

- Install as many items as you can without putting the valve covers on the cylinder heads. This will allow you to pre-lube the valvetrain. See *"Pre-Lubing the Valvetrain."*

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

7) Pre-Lubing the Valvetrain

- A Magnum block will oil the rockers through the pushrods, whereas an LA block will oil the rockers through the rocker shaft.
- Use an oil pump primer to pre-lube the valvetrain.
- Lubricate your valvetrain with motor oil. An excessive amount is not necessary; just enough to lubricate each moving part.
- Reinstall the valve covers as soon as possible to keep contaminants out of the engine.

NOTE: Most valve covers will work with your new cylinder heads, but make sure that if your valve cover has baffles, that they clear the rockers.

- Finish reassembling all other components, brackets, and vacuum lines.

NOTE: *DO NOT START THE ENGINE IF THE TOP HALF OF THE ENGINE HAS NOT BEEN PRE-LUBED!*

8) Break-In Procedure and Tuning

- To ensure long life and trouble-free use, *allow 2-4 hours of normal driving time* before running the engine hard. Doing this will break-in the valvetrain properly.

Airflow Results
PowerPort 190

Lift Value	Intake Flow CFM	Exhaust Flow CFM
.100"	66	54
.200"	134	121
.300"	200	181
.400"	248	213
.500"	281	231
.600"	293	237
.700"	301	240

Tests conducted at 28" of water (pressure).
Bore size: 4.000"; exhaust with 1⅞" pipe.

9) Specifications

Material:	A356-T61 Aluminum
Combustion Chamber Volume:	60cc CNC-Profiled
Intake Port Volume:	190cc CNC Street Ported
Intake Port Location:	Standard
Intake Port Dimensions:	1.160" x 2.270"
Intake Valve Diameter:	2.020"
Intake Valve Seat:	Ductile Iron
Exhaust Port Volume:	81cc CNC Street Ported
Exhaust Port Location:	Stock
Exhaust Port Dimensions:	1.250" x 1.400"
Exhaust Valve Diameter:	1.570"
Exhaust Valve Seat:	Ductile Iron
Valve Angles:	18°
Valve Guide Material:	Bronze Alloy
Valve Seals:	Viton® Fluoroelastomer Canister
Valve Seat Angles:	45° x Multi-Angle
Valve Spring Pocket Diameter:	1.740"
Valve Spring I.D. Locators:	1.500" x .060"
Valve Spring Retainers:	Steel or Titanium
Valve Stem Locks:	7° or 10° Steel
Minimum Bore Diameter:	3.830"
Push Rod Length:	Longer than stock may be required
Rocker Arm Type:	Shaft Mount
Approximate Weight:	22 lbs.

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10) Replacement Components:

Intake Valve:	*TFS-61400211*
Exhaust Valve:	*TFS-61400212*
Intake Valve Guide:	*TFS-52600251*
Exhaust Valve Guide:	*TFS-52600251*
Valve Seal:	*TFS-30400454*
Intake Valve Seat:	*TFS-61400271*
Exhaust Valve Seat:	*TFS-30600274*
Valve Spring I.D. Locator:	*TFS-21400440*
Valve Stem Locks:	*TFS-52400444 (10°)*
	TFS-51400444 (7°)

Retainers:

[*TFS-31400424 (Chromoly 7° x 1.50")*]
[*TFS-41400423 (Chromoly 10° x 1.55")*]
[*TFS-214T0520 (Titanium 10° x 1.55")*]

11) Recommended Components

Head Gaskets:	*Fel-Pro 1008*
Intake Gaskets:	*Fel-Pro 1213*
Exhaust Gaskets:	*Fel-Pro 1413*
Spark Plugs:	*Autolite 3924*
Head Bolts:	*TFS-92030*
Head Studs:	*TFS-61404304*
Intake Manifold:	*TFS-61400111*
Rocker Arm Studs:	*TFS-61400613*

12) Options

Valve Springs

Standard: 1.460" O.D. Dual Spring *(TFS-16893-16)*
120 lbs. @ 1.900" Installed Height
394 lbs. @ 1.175" Open
390 lbs./inch Rate
.650" Maximum Valve Lift

Option 1: 1.550" O.D. Dual Spring *(TFS-16094-16)*
138 lbs. @ 1.950" Installed Height
430 lbs. @ 1.250" Open
420 lbs./inch Rate
.680" Maximum Valve Lift

Option 2: 1.560" O.D. Dual Spring *(TFS-16318-16)*
240 lbs. @ 2.000" Installed Height
600 lbs. @ 1.280" Open
500 lbs./inch Rate
.700" Maximum Valve Lift

Rocker Arms

LA: 1.50 Ratio *(Harland Sharp S70025K)*
1.60 Ratio *(Harland Sharp S70026K)*

Magnum: 1.50 Ratio *(Harland Sharp S72025K)*
1.60 Ratio *(Harland Sharp S72026K)*

NOTE: Magnum engines must use the recommended Harland Sharp shaft mount roller rocker arms for proper rocker arm oiling.

13) Replacement Cylinder Heads

- **TFS-61417801-C00**
  - CNC Street Ported
  - 1.460" Dual Valve Springs
  - 190cc Intake Runners
- **TFS-61417802-C00**
  - CNC Street Ported
  - 1.550" Dual Valve Springs
  - 190cc Intake Runners
- **TFS-6141T783-C00**
  - CNC Street Ported
  - 1.550" Dual Valve Springs
  - Titanium Retainers
  - 190cc Intake Runners
- **TFS-6141T784-C00**
  - CNC Street Ported
  - 1.560" Dual Valve Springs
  - Titanium Retainers
  - 190cc Intake Runners

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.

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