CRATE ENGINE BUILD-UP

At Ford Motor Company, "Quality is Job 1" and that extends to every facet of the business, including crate engines from Ford Racing Performance Parts (FRPP). Ford Racing crate engines are built with quality components, undergo rigorous testing both on a dyno and at the track and are assembled to exacting tolerances. FRPP crate engines begin with many new components, including rods and pistons, cylinder heads and the finest gaskets and seals available. Only after everything is assembled to Ford's strict standards do the FRPP crate engines earn the right to wear the Ford Oval.

To help illustrate FRPP's commitment to excellence, we walked through and photographed the crate engine assembly line to showcase some of the many steps that FRPP engines go through to ensure that customers receive one of the highest quality crate engines on the market.





Crankshafts are checked for proper journal dimensions, as well as run-out, taper and rotational eccentricity.





After the crank is polished, the surface is checked to make sure that it meets or exceeds FRPP requirements.



The crate engine building process employs the very latest computer-controlled boring equipment.



Block decks are machined to ensure even height and parallelism, then the RA of the finished surface is checked.





Finish-honing is done by a computer-controlled cylinder hone using diamond stones; the final step is plateau honing.



To ensure accuracy, computerized checks of every 5th camshaft are done.



Every piston gets measured and weighed before they are put together in matched sets using strict tolerances.







To ensure accuracy of compression ratios of the sealed crate engines (M-6007-D347SR/M-6007-Z351SR), combustion chamber volumes are checked and corrected, if necessary, to achieve proper specifications.



Connecting rods are inspected to make sure they meet specifications. The bearing bore is studied for taper, bore size and roundness. Then, weight is



checked at the big and small end of the connecting rod and sets are weight-matched.



After engines are completely assembled, they are hot-tested (except M-6007-XEFM, -X302B, -X302E, -Z50Z) to check oil pressure and detect water leaks. The completed engines are run for approximately 20 minutes during this process.

THE PROCEDURES HIGHLIGHTED ABOVE SERVE TO ILLUSTRATE THE RIGOROUS CONTROLS THAT GO INTO BUILDING FRPP'S HIGH-QUALITY PUSHROD CRATE ENGINES.

"CAMMER" ENGINE

Not long ago, the term "dual over-head cam engine" was reserved for the high-tech racing community. Although the DOHC technology employed in mainstream production engines is almost commonplace today, the technical procedures to machine and assemble a modern DOHC engine are rather complex.

Compared to the Windsor-based Ford V-8 engine family, the modular four-valve engines require greater attention to detail regarding machining, torque sequences and number of fasteners (i.e., the overall complexity of the assembly process itself). The following photographs offer an inside look at the build of a 4.6-liter dual overhead cam V-8 down the same line as the Aluminator.



A CNC machine is used to bore the cylinders on center, deck the block and chamfer the tops of the cylinder bores.



Finish-honing of the cylinder bores is accomplished via a Gehring CNC hone.

After honing, all cylinder bores are inspected for concentricity and final finish.





Cylinder heads are checked with 27.5 inches of vacuum to ensure the integrity of valve sealing.



The main bearing cap bolts are torqued down to spec by an automated torquing machine.



CRATE



After the short block is completed, the rotating effort is checked to verify proper assembly tolerances.



Spin-testing facilitates checking for compression, oil pressure, oil flow and effort to turn the long-block assembly.



Vacuum is also applied to the crankcase to check for any air leaks.



Engine oil has a dye added to it that shows up under black light to reduce the possibility of undetected leaks.



Long-block coolant passages are air-pressure checked to make sure there are no leaks in the block, heads or gaskets.



As a final step, engine assemblies are run for 20 minutes to inspect for oil and water leaks and to check oil pressure.

The Ford Racing Performance Parts Aluminator motor is the ultimate high-performance derivative of the Ford 4.6-liter engine. Others might make 4.6-liter modular engines, but only FRPP engines are backed by the Ford Oval. Whether you want a FRPP 4.6-liter Aluminator for the performance, the exclusivity or the looks, Ford know-how is with you every step of the way. And with 100 years of racing success behind it, that means you are getting the very best!

Aluminator 7000 RPM

14

Elemental power from Ford Racing

15

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The Aluminator line of performance modular 4.6L short and long blocks have been tested to 700hp through two seasons of Formula D drift competition with driver Ken Gushi.

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72

Hf 104

105

Built with the strongest aluminum 4.6L blocks ever produced these all new engines feature the best modular engine parts available at a price similar to the competition's remanufactured performance engines.

Aluminator from Ford Racing, it's elemental!



www.fordracing.com

ALUMINATOR 4.6L DOHC LONG BLOCK NATURALLY ASPIRATED M-6007-A46NA

• 4.6L (281 cubic inches)

- 10:1 compression ratio (nominal)
- Forged pistons
- H-beam connecting rods
- Forged steel crankshaft
- Aluminum block M-6010-A46NA
- Blue cam covers M-6582-A54 •
- Assembled long block with 2003-04 Mustang Cobra cylinder heads and camshafts
- Includes 1999-01 Mustang Cobra and 2003-04 Mach I timing chain cover, water pump, Cobra windage tray and oil pan
- Fits 1999-01 Mustang Cobra and 2003-04 Mach I
- Built with all NEW PARTS
- · Does not include oil cooler/oil filter adapter
- Built with current available parts. Photos and specs may vary
- Shipping weight approximately 500 lbs
- See Also...
- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog

ALUMINATOR 4.6L FORGED NATURALLY ASPIRATED SHORT BLOCK M-6009-A46NA*

- Cobra rotating assembly with forged steel 8-bolt crank, H-beam rods and forged flat top pistons
- Uses M-6010-A46NA block
- Approximately 10:1 compression ratio when used with 50 cc heads
- Fits 1996-04 Mustang GT, 1996-01 Cobra and 2003-04 Mach I front timing cover
- Built with all NEW PARTS
- Modifications may be necessary in some applications
- Requires 8-bolt flywheel

4.6L 3-VALVE **MUSTANG GT ENGINE** M-6007-3V46*

- Complete 3-valve 4.6L Mustang engine assembly
- 300 hp @ 5750 rpm, 320 lb-ft of torque @ 4500 rpm
- Aluminum block and cylinder heads
- · Composite intake manifold for light weight
- and intake charge temp reduction Includes manual
- transmission engine harness and flywheel
- Vehicle harnesses and computer not included
- Photo and specs may vary



ALUMINATOR 4.6L DOHC LONG BLOCK SUPERCHARGED M-6007-A46SC

- 4.6L (281 cubic inches)
- 8.5:1 compression ratio (nominal)
- Forged pistons
- H-beam connecting rods
- Forged steel crankshaft
- Aluminum block M-6010-A46SC
- Blue cam covers M-6582-A54
- Assembled long block with 2003-04 Mustang Cobra cylinder heads and camshafts
- Includes 2003-04 Mustang Cobra timing chain cover, water pump, Cobra windage tray and oil pan
- Fits 2003-04 Mustang Cobra Built with all **NEW PARTS**
- •
- Does not include oil cooler/oil filter adapter •
- Built with current available parts. Photos and specs may vary
- Shipping weight approximately 500 lbs See Also ...
 - Crate Engine Build-Up
 - Crate Engine Warranty •
 - Engine Tips & Specs
 - Crate Engine Catalog

ALUMINATOR 4.6L FORGED SUPERCHARGER SHORT BLOCK

M-6009-A46SC

- Cobra rotating assembly with forged 8-bolt crank, H-beam rods and forged pistons with 16cc dish
- Uses M-6010-A46SC block
- Approximately 8.5:1 compression
- ratio when used with 50 cc heads Direct bolt in for
- 2003-2004 Mustang Cobras
- Built with all NEW PARTS



ALUMINUM 4.6L FORGED SUPERCHARGER SHORT BLOCK M-6009-A46SCB

- 4.6L (281 cubic inch)
- Forged pistons with 16 cc dish
- Forged steel crankshaft •
- H-beam connecting rods •
- Uses M-6010-A46NA aluminum block
- Approximately 8.5:1 compression ratio
- with 50 cc heads Fits 1996-04 Mustang GT, 1996-01 Cobra and 2003-04 Mach I
- Built with all NEW PARTS
- Modifications may be necessary in •
- some applications Low compression for supercharged applications
- Requires 8-bolt flywheel

**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.

CRATE







ENGINE BLOCKS

ALUMINUM 5.0L BLOCK

M-6010-T50

- Big bore 4.6L aluminum block with cast iron liners
- 94 mm (3.70") cylinder bore size. Stock cylinder bore size 90.2 mm (3.552")
- 227 mm (8.9370") deck height (same as 4.6L)
- Produces 5.0L displacement when used with a 4.6L stock stroke crankshaft, stock length connecting rods and custom 94 mm-diameter pistons
- Cross bolted main bearing caps
- Same block that is used in the
- 5.0L "Cammer" crate engine
- Replacement sleeve M-6055-B



ALUMINUM 4.6L BLOCK M-6010-A46NA*

- Latest generation aluminum 4.6L block
- Features chilled bulkhead casting process for a stronger main web and bulkheads
- Round main web windows reduce stress areas for potential failure
- Ball burnished 17 mm-thick main caps for strength and rigidity
- Works with most production 4.6L aluminum block front dress

ALUMINUM 4.6L BLOCK FOR SUPERCHARGER M-6010-A46SC*

- Latest generation aluminum 4.6L block
- Features chilled bulkhead casting process
- for a stronger main web and bulkheadsRound main web windows reduce
- stress areas for potential failureBall burnished 17 mm-thick main
- caps for strength and rigidityMachined for 2003-04 Cobra front dress,
- will also fit some 2-valve front dress from iron 4.6L blocks • Knock sensor mounting bosses eliminated for use with
- supercharger applications

PRODUCTION CAST IRON 4.6L BLOCK

- M-6010-D46** Romeo Engine Plant
- Production replacement 4.6L SOHC 2V cylinder block
 Creat for quotient statistics in the
- Great for custom engine builds
- Fully machined



CAST IRON 5.0L BLOCK M-6010-B0SS50*

The Boss 5.0 block is a 4.6L deck height 94 mm cylinder bore cast iron block.



- Siamese 94 mm bore
- · 4-bolt main with interference fit nodular iron machined caps
- Increased main web window size for less oil movement and greater power
- Approximately 165 lbs



ALUMINUM 5.4L BLOCK M-6010-GT**

- Original equipment for the 2005 Ford GT supercar
- 356-T6 aluminum casting with cast iron sleeves
- 90.2 mm bore
- Dry sump machined, can be machined for wet sump
- Enhanced bulkhead and main webbing strength compared to production 4.6L aluminum block
- Machined for piston oil squirters
- Block modifications required for starter in non GT applications
- Block modifications required for starter in non GT app
 Weight: 110 lbs



PRODUCTION CAST IRON 5.4L BLOCK M-6010-M54**

- Production 5.4L block
- Windsor-style main cap locators
- 90.2 mm bore size
- Newer casting design features lower end improvements to minimize noise, vibration and harshness



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HIGH-PERFORMANCE CYLINDER HEAD

M-6049-D46 Complete 1996-98 Only

Add approximately 35 hp over production 4.6L SOHC heads. This cylinder head





assembly is considered to be the basic cornerstone for increased performance of the naturally aspirated engine. The primary design goal for the head is to provide increased airflow capability resulting in significant horsepower gain. Specific design features include:

• Bolt-on interchangeability with the production head. All head faces (cam cover, intake manifold, exhaust manifold and deck face) are identical to production. The head can be used with production or Ford Racing intake and exhaust manifolds, and all other accessories in production position

• Larger inlet and exhaust valve size. Intake valve M-6507-D461 diameter has increased from 44.5 mm to 46.83 mm. Exhaust valve M-6505-D461 diameter has increased from 34.0 mm to 35.88 mm. Extensive flow development was done to optimize port contours to take advantage of these changes. Final test

- results show approximate airflow increases over production of 27% (intake) and 44% (exhaust). The above results are at maximum production valve lift (12 mm)
- · Intake valve centerline has been moved 2.0 mm closer to chamber centerline. This has the effect of unshrouding the intake valve, and making better use of the increased valve size
- Potential for high-lift camshafts, larger valve springs and additional racing port work at customer discretion
- · Excellent quality chamber and port finish, 356-T6 aluminum casting
- · Performance calibration recommended
- 51 cc combustion chamber

• Uses spark plug AGSF-32C NOTE: Use of M-6067-D46 head changing kit recommended.









**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.

FORD GT CYLINDER HEAD ASSEMBLIES

- M-6049-GT** RH M-6099-GT** LH GT heads feature a reduced size lash adjuster allowing for a raised intake port, creating a more direct intake path
- These heads are the final revision of the 2000 Cobra R heads
- The most durable highest flowing modular engine cylinders heads available
- Same casting used on M-6007-R50 Grand Am cup race engine
- Fully loaded assembly
- 37 mm intake valves, 32 mm exhaust valves •
- Intake valve lift: 11.2 mm, exhaust valve lift: 11.5 mm
- 42.5 to 45 cc combustion chambers



4.6L POWER IMPROVEMENT (PI) CYLINDER HEADS M-6049-P46** RH 2V

- M-6050-P46** LH 2V
- Current production 4.6L SOHC 2V Romeo engine aluminum cylinder heads
- Fully machined and assembled with production Mustang GT valvetrain and camshaft
- Great for custom engine builds
- Less expensive than replacing valvetrain
- and remachining a used cylinder head Less expensive alternative to aftermarket
- performance heads Can be used on 1996-98 engines
- with additional modifications and parts 43.9 +/- 1.5 cc combustion chamber
- Raises compression on 1996-98 engines to 10:1



ENGINE



CNC PORTED 3-VALVE CYLINDER HEAD ASSEMBLIES

- M-6049-463P* RH CNC Ported M-6050-463P* LH CNC Ported New production cylinder head castings
- · CNC ported to increase flow and performance
- 50.3 cc combustion chamber
- Intake flow increased approximately 20%
- Exhaust flow increased approximately 30%
- Assembled with production springs, valves, retainers, locks and seals
- Does not include camshaft, followers and hydraulic lash adjusters
- Minimize your vehicle down time waiting for a shop to port your heads. Get a brand new head for a little more than the price of exchange!
- No exchange required





M-6049-463P shown

CNC PORTED 4-VALVE CYLINDER HEAD ASSEMBLIES



- M-6049-464P* RH CNC Ported
- M-6050-464P* LH CNC Ported
- New production cylinder head castings
- Fits 1999-04 DOHC 4.6L Mustangs
- 52 cc combustion chambers
- · CNC ported to increase flow and performance
- Intake flow increased approximately 15%
- Exhaust flow increased approximately 29%
- Assembled with 2004 Cobra production springs, valves, retainers, locks and seals
- Does not include camshafts, followers and hydraulic lash adjusters
- Minimize your vehicle down time waiting for a shop to port your heads. Get a brand new head for a little more
- than the price of exchange! • No exchange required



CYLINDER HEAD CHANGING KIT

M-6067-D46** SOHC 2V M-6067-T46** DOHC 4V① Contains all components necessary for changing cylinder heads on 1996-04 4.6L Mustang. Includes several parts that make this task significantly easier. Highly recommended when installing M-6049-D46/ P46/T46 cylinder heads. **NOTE:** ① Except supercharged engines.

"CAMMER" 5.0L HEAD **CHANGING KIT** M-6067-T50*

- Similar to kit M-6067-T46 but for "Cammer"
- 5.0L modular engine with 94 mm bore • Contains head gaskets, spacers, head bolts,
- exhaust gaskets and dipstick tube Highly recommended for simplifying a
- difficult task

HIGH-LIFT CAMSHAFT KIT M-6550-T46*

In order to maximize the performance potential of the high-flow cylinder heads, we recommend these higher lift camshafts. Contained in the kit are all components necessary to utilize these improved profiles (including valves and springs). These camshafts provide excellent power right to the fuel cutoff at 7000 rpm, and actually bolster low-end torque as well. Drivability on the street is superior to production cams. Because it is necessary to install new valves with these cams, it is recommended that this kit be purchased and installed at the same time as the cylinder heads. Cam specs: lift 12 mm, intake duration 258°, exhaust duration 254°, 109° center line.



HIGH-LIFT 4.6L VALVE SPRINGS

- M-6513-T46* Sold in sets of 32 • Replacement springs for the M-6550-T46 high-lift cam kit
- Recommended install height 39.45 mm



4.6L DOHC 4V

- Original equipment camshafts for the Ford GT supercar
- Direct retrofit to the 2007-08 SVT Mustang • Increases lift from the stock 10 mm to 11.14 mm intake and 11.36 mm exhaust
- Compatible with production springs, followers and lash adjusters
- May require calibration to achieve optimized performance



FORD RACING PERFORMANCE **PARTS USED:**

FRPP Gears FRPP Tach **FRPP** Supercharger FRPP 47# Fuel Injectors FRPP Oil Filter



**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.

ENGINE COMPONENTS

SUPERCHARGERS





2003-04 MUSTANG COBRA UPGRADED SUPERCHARGER KITS

M-6066-CT46P* Polished M-6066-CT46* Black Wrinkle

- DESIGNED FOR USE WITH FACTORY TWIN BORE THROTTLE BODY!!!
- Kit includes supercharger and supercharger inlet, manifold adapter plate and hardware kit
- · Does not require PCM, fuel pump or MAF meter upgrades
- Simple bolt on increase at the rear wheels of 85 horsepower and 50 lb-ft of torque
- Installation of this kit will void your new vehicle engine warranty

2003-04 MUSTANG COBRA UPGRADED SUPERCHARGER KITS FOR AFTERMARKET THROTTLEBODY M-6066-CT46PHP* Polished

M-6066-CT46HP* Black Wrinkle

- Designed for use with most aftermarket single blade oval bore throttle bodies
 - For applications using factory twin bore throttle body, use M-6066-CT46P
- Kit includes supercharger, supercharger inlet, manifold adapter plate and hardware kit
- Requires PCM, fuel pump and MAF meter upgrades
- Installation of this kit will void your new vehicle engine warranty





2007-08 SVT MUSTANG SUPERCHARGER **UPGRADE KIT**

- M-6066-SGT* Black Wrinkle Finish
- Fits 5.4L DOHC 2007-08 SVT Mustang
- 105 hp increase over stock (605 hp vs. 500 hp), 90 lb-ft increase in torque over stock (570 lb-ft vs. 480 lb-ft) using correction factor **SAE J1349**
- 2.3L Twin Vortices Series Eaton supercharger features 4-lobe 160 degree twist rotors
- Includes open element cold air intake system
- · Includes Pro-Cal tool voucher with kit
- Engineered by Roush for Ford Racing
- · Premium fuel required
- · Available as part of Shelby Super Snake Package
- 2007 SVT Mustangs must use upgraded damper M-6312-SVT
- (see www.fordracingparts.com) to maintain warranty coverage DUE TO MULTIPLE CALIBRATIONS, ONLINE REGISTRATION IS
- **REQUIRED TO RECEIVE PRO-CAL TOOL AFTER PURCHASE** • E.O. # Pending

See www.fordracingparts.com for the most up-to-date warranty information.

Jamie McMurray celebrates his NASCAR Nextel Cup Series win at Daytona



**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.

SUPERCHARGERS

MUSTANG GT SUPERCHARGER KITS

M-6066-M463V Black Wrinkle

M-6066-M463P Polished

- Fits 2005-06 Mustang GT with MANUAL or AUTOMATIC transmission
- See www.fordracingparts.com for 2008 manual and automatic transmission applications
- Produces 400 hp with 93 octane at approximately 5 psi of boost
- Kit includes intake manifold supercharger, drive belt and all other accessories for installation of the supercharger
- Includes Pro-Cal tool voucher
- Premium fuel required
- DUE TO MULTIPLE CALIBRATIONS, ONLINE REGISTRATION IS REQUIRED TO RECEIVE PRO-CAL TOOL AFTER PURCHASE
- E.O. #D-231-24
- Engine calibrations are developed and supported for U.S. and Canadian vehicles only

NOTE: Superchargers are built to order. Please allow 7 days for assembly. See www.fordracingparts.com for the most up-to-date warranty information



2005-06 MUSTANG 4.6L BIG BOOST KIT M-9066-M11

- Big Boost kit converts M-6066-M463V/M463P from 400 hp to 500 hp
- Fits 2005-06 Mustang GT with MANUAL transmission ONLY.
- See www.fordracingparts.com for 2008 manual transmission applications
- Produces 500 hp at 5800 rpm with 93 octane at approximately 11 psi of boost!
- Kit includes intercooling system, M-9407-GT05 fuel pump kit and smaller pulley
- DUE TO MULTIPLE CALIBRATIONS, ONLINE REGISTRATION IS REQUIRED TO RECEIVE PRO-CAL TOOL AFTER PURCHASE
- Includes Pro-Cal voucher with official Ford Racing calibration
- E.O. #D-231-24
- Engine calibrations are developed and supported for U.S. and Canadian vehicles only

M-6066-M463V7 Black Wrinkle M-6066-M463P7 Polished



- Fits 2007 Mustang GT with MANUAL or AUTOMATIC transmission
 See www.fordracingparts.com for 2008 manual and automatic transmission applications
- Produces 400 hp with 93 octane at approximately 5 psi of boost
- Kit includes intake manifold supercharger, drive belt and all other accessories for installation of the supercharger
- Includes Pro-Cal tool voucher
- Premium fuel required
- DUE TO MULTIPLE CALIBRATIONS, ONLINE REGISTRATION IS REQUIRED TO RECEIVE PRO-CAL TOOL AFTER PURCHASE
- E.O. #D-231-24
- Engine calibrations are developed and supported for U.S. and Canadian vehicles only
- NOTE: Superchargers are built to order. Please allow 7 days for assembly.



2007 MUSTANG 4.6L BIG BOOST KIT M-9066-M117



- Big Boost kit converts M-6066-M463V7/M463P7 from 400 hp to 500 hp
- Fits 2007 Mustang GT with MANUAL transmission ONLY.
- See www.fordracingparts.com for 2008 manual transmission applications
- Produces 500 hp at 5800 rpm with 93 octane at approximately 11 psi of boost!
- Kit includes intercooling system, M-9407-GT05 fuel pump kit and smaller pulley
- DUE TO MULTIPLE CALIBRATIONS, ONLINE REGISTRATION IS REQUIRED TO RECEIVE PRO-CAL TOOL AFTER PURCHASE
- Includes Pro-Cal voucher with official Ford Racing calibration
- E.O. #D-231-24
- Engine calibrations are developed and supported for U.S. and Canadian vehicles only



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500 HP MUSTANG GT SUPERCHARGER KITS

M-6066-M11 Black Wrinkle

M-6066-M11P Polished

- Fits 2005-06 Mustang GT with MANUAL transmission ONLY
- See www.fordracingparts.com for 2008 manual transmission applications
 Produces 500 hp at 5800 rpm with 93 octane at approximately 11 psi of boost!
- Produces 470 lb-ft of torque at 4200 rpm
- Kit includes intake manifold supercharger, drive belt and all other accessories for installation of the supercharger
- Includes Pro-Cal tool voucher with official Ford Racing calibration
- Premium fuel required
- DUE TO MULTIPLE CALIBRATIONS, ONLINE REGISTRATION IS REQUIRED TO RECEIVE PRO-CAL TOOL AFTER PURCHASE •
- Similar to 400 hp kit but with smaller pulley, complete air to liquid intercooler system and dual fuel pump, fuel pump driver and harness • E.O. #D-231-24
- Engine calibrations are developed and supported for U.S. and Canadian vehicles only
- NOTE: Superchargers are built to order. Please allow 7 days for assembly.

M-6066-M117* Black Finish M-6066-M11P7 Polished



- Fits 2007 Mustang GT with MANUAL transmission ONLY
- See www.fordracingparts.com for 2008 manual transmission applications
- Produces 500 hp at 5800 rpm with 93 octane at approximately 11 psi of boost!
- Produces 470 lb-ft of torque at 4200 rpm
- Kit includes intake manifold supercharger, drive belt and all other accessories for installation of the supercharger
- Includes Pro-Cal tool voucher with official Ford Racing calibration
- Premium fuel required
- DUE TO MULTIPLE CALIBRATIONS, ONLINE REGISTRATION IS REQUIRED TO RECEIVE PRO-CAL TOOL AFTER PURCHASE
- Similar to 400 hp kit but with smaller pulley, complete air to liquid intercooler system and dual fuel pump, fuel pump driver and harness • E.O. #D-231-24
- Engine calibrations are developed and supported for U.S. and Canadian vehicles only
- NOTE: Superchargers are built to order. Please allow 7 days for assembly.



ENGINE

ENGINE COMPONENTS

4.6L PERFORMANCE IMPROVEMENT (PI) INTAKE MANIFOLD

M-9424-P46**

- Current production plastic intake manifold used on
- 2001-04 4.6L SOHC 2V Mustang GT • Less expensive alternative to aftermarket performance
- intake manifolds for PI head swapsManifold fits 1999-04 Power Improvement head ports
- Manifold fits 1999-04 Power improveme
 Great for custom engine builds
- Great for custom engine builds
 Can be used on 1996-98
- Call be used off 1996-96 engines with Performance Improvement (PI) heads
- Additional modifications and parts required



HI-FLOW 70MM THROTTLE BODY

- M-9926-D462* 1996-04 Mustang
- Bolts to stock intake manifold
- Significant power increase



THROTTLE BODY GASKET M-9933-D462* 1996-04 Mustang

 Replacement gasket for M-9926-D462 throttle body

Did you know ...

The Ford GT head is a derivative of the 2000 Cobra R head. Those same heads have been used on the Rough Rider off-road racing program to make nearly 700 hp out of 6 liters naturally aspirated!

FORD RACING PERFORMANCE PARTS USED:

Ford Racing Supplied Body in White FRPP Cylinder Block FRPP PI Cylinder Heads FRPP Intake FRPP Steel Crankshaft FRPP Oil Pump FRPP Competition Gauges and Gauge Pod



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COATED DOHC CAM COVERS 4.6/5.4L COATED 3-VALVE CAM COVERS 4.6/5.4L **M-6582-C543V** Powdercoated for chrome appearance M-6582-C464 • Fits 32V 4.6/5.4L engines with coil on plug (except Ford GT M-6582-3VB Blue and 2007-08 SVT Mustang, see M-6582-CC) M-6582-3VBLK Black Wrinkle • Powdercoated for chrome appearance M-6582-3VS Silver • Fits all 2005-08 3-valve 4.6/5.4L engines Powdercoated finish **BLUE DOHC CAM COVERS 4.6/5.4L** M-6582-A54 FORD RACING COIL COVERS • Fits all 1997-present 32V 4.6/5.4L engines with coil on plug (except Ford GT and 2007-08 SVT Mustang) M-6067-A • Fits most 4.6L/5.4L DOHC engines with coil on plug ignition • Painted Ford GT blue • Micro polished billet aluminum • Shown with coil cover M-6067-A (sold separately) • For 2007-08 SVT Mustang, see M-6582-C · Features two-color Ford Racing ball milled logo Ford (0 RACING RACINC (Jurd) RACINC ENGINE COMPONENTS 4.6/5.4L "POWERED BY FORD" **COIL COVERS UNDERDRIVE HORSEPOWER** M-6067-GT **PULLEY KIT** • Original equipment on the Ford GT 5.4L DOHC M-8509-D462* 1996-98 Mustang • Fits most 4.6L/5.4L DOHC engines (Does not fit 1999-04) with coil on plug ignition · Significant power increase, reduces power loss from accessories by reducing accessory pulley speed • Three-piece kit with hardware and instructions • 4.6L SOHC engines · Aids acceleration by reducing accessory speed compared to the crankshaft WARNING: Engine cooling will be reduced 2007-08 SVT MUSTANG COIL COVERS M-6067-C • Original equipment on the 2007-08 SVT Mustang • Fits most 4.6L/5.4L DOHC engines with coil on plug ignition POWERED E **A.C. ELIMINATOR KIT** M-19216-D46 **HIGH-VOLUME** • Fits 1996-08 Mustang with **OIL PUMP** 4.6L engine SOHC/DOHC M-6600-D46 • Cast aluminum idler pulley · Original equipment on bracket replaces the air 4.6L 4V conditioning compressor Increases flow on 4.6L Removes weight from the 2V engines front of car for better weight transfer when racing Bolts included Uses stock belt

*Not legal for sale or use on pollution-controlled motor vehicles. **Direct replacement part. See pages 2-8 for important safety, emissions and warranty information.

ENGINE COMPONENTS

STEEL 4.6L COBRA CRANKSHAFT

M-6303-D46*

- Original equipment replacement crankshaft for 1996-01 4.6L DOHC Cobra engine
- Can be used in 4.6L SOHC engines if 8-bolt flywheel is used
- May require minor block modifications for counterweight clearance



DEEP SUMP 5.4L TRUCK OIL PAN M-6675-L54

- Fits all 1996-2004 5.4L F-150s with PN96 body
- Increased capacity and baffling over stock pans for better oil control
- Requires oil pump pickup tube (sold separately)



MUSTANG 4.6L OIL PAN M-6675-D46**

- Production 4.6L Mustang oil pan core
- Fits 1996-04 4.6L SOHC 2V and DOHC 4V
- Unpainted
- Does not include
- pickup tubeWorks with
- oil pump and pickup kit
- M-6600-D46
 Can be used to build custom oil pan

CRANKSHAFT DAMPER

M-6316-D461*

- 4.6L SOHC
- Neutral balance
- High-performance replacement damper
- Meets SFI 18-1 specs



STEEL 5.4L LIGHTNING CRANKSHAFT M-6303-M54**

- Original equipment for the 1999-04 SVT Lightning 5.4L
- Forged steel
- 106 mm stroke
- Standard journal diameters
- 8-bolt flywheel



MUSTANG PERFORMANCE FLYWHEELS

The manual transmission flywheels listed below fit 4.6L SOHC/DOHC and Cobra engine applications. They are dimensionally the same as stock and have the same zero-balance specification as stock flywheels. The nodular iron units are stronger and have increased rpm capability. The billet steel units have even higher rpm capability and meet SFI specification 1.1.

NODULAR IRON FLYWHEEL

- M-6375-D46⁽¹⁾⁽²⁾
- 164-tooth
- 0 oz.-in.
- 4.6L SOHC Mustang. Has increased rpm capability over stock cast iron flywheel

BILLET STEEL FLYWHEELS

- M-6375-F46(1)(2)
- 164-tooth
- 0 oz.-in.
 - 4.6L SOHC Mustang. Has increased rpm capability over stock cast iron or M-6475-D46 nodular iron flywheel. Fits 10.5" and 11" clutch. Meets SFI 1.1

$M-6375-G46^{(1)(2)}$

- 164-tooth
- 0 oz.-in.
- 4.6L SOHC Mustang GT/DOHC Mustang Cobra. Has increased rpm capability over stock Cobra flywheel. Fits 10.5" and 11" clutch. Meets SFI 1.1

ALUMINUM FLYWHEEL

- M-6375-R00⁽¹⁾⁽²⁾
- 164-tooth
- 0 oz.-in.
 Used on th
- Used on the 2000 Cobra "R" Mustang. Fits Cobra 4.6L/5.4L DOHC 4-valve engines and other Mustangs with 8-bolt crank. Reduced rotating mass for faster engine acceleration in race applications. Fits 10.5" and 11" clutch. Meets SFI 1.1

NOTES:

- ⁽¹⁾ Diaphragm clutch uses metric bolts and dowel pins. Requires metric pressure plate bolts N602549-S51M and alignment dowel pins D1FZ-6397-B. Ford Racing kit M-6397-A302.
- ⁽²⁾ 4.6L engines may have 6 or 8 bolts to attach to the crankshaft. Check the engine code before ordering. Romeo built engines have 6 bolts and Windsor built engines have 8 bolts. All Cobra engines have 8 bolts. The 8th character in the VIN is (X) for Windsor engine plant or (W) for Romeo engine plant.



SHORTY HEADERS

FEATURES:

STAINLESS STEEL

409 stainless exhaust material is titanium stabilized ferritic stainless steel. 409 stainless is used in applications where appearance is a secondary consideration to properties and corrosion resistance and where some weldability is required. An example of stainless usage is catalytic converter assemblies. 409 stainless has excellent forming characteristics and is rustthrough resistant. A surface rust will form in most instances. This rust retards further corrosion.

PART NUMBER	TYPE	APPLICATION
M-9430-C54*	Stainless Steel	2007-08 SVT Mustang
M-9430-C54C* Ceramic Coated		2007-08 SVT Mustang
M-9430-E462*	Stainless Steel	1996-04 Mustang GT 4.6L SOHC
M-9430-E463*	Ceramic Coated	1996-04 Mustang GT 4.6L SOHC
M-9430-E464*	Stainless Steel	1996-02 4.6L Cobra DOHC ①
M-9430-E465*	Ceramic Coated	1996-02 4.6L Cobra DOHC ①
M-9430-S197*	Stainless Steel	2005-08 Mustang GT
M-9430-S197C*	Ceramic Coated	2005-08 Mustang GT
NOTE: 1) Does not fit	2003 and up.	

REPLACEMENT HEADER GASKETS (SOLD IN PAIRS)

(00000)	
PART NUMBER	CYLINDER HEAD APPLICATION
M-9448-A462*	4.6L SOHC
M-9448-A464*	4.6L DOHC
M-9448-3V*	4.6L 3V (Sold in package of 12 sets only)

- 409 stainless steel tubes
- Machined flange
- Bolts to stock exhaust pipes
- Includes gaskets, bolts and studs

CERAMIC COATED STAINLESS STEEL

- Identical to stainless steel header, but with Jet-Hot[®] ceramic finish
- Stain and rust resistant
- Super-premium quality
- Lifetime Warranty

M-9448-A464 show

Finest short-tube headers you can buy

JET-HOT® LIMITED WARRANTY

This limited warranty becomes void if the product shows evidence of bending or mutilating of parts or burnout resulting from improper tuning. Warranty covers rust-through only and does not cover cosmetic rust or discoloration of material. This limited warranty shall be limited to the repair, adjustment or replacement of defective parts only. Does not cover any labor claims. Ask your dealer for a copy of this "Jet-Hot" limited warranty.



ENGINE COMPONENTS

FORD RACING PERFORMANCE PARTS USED:

FRPP Ford GT Engine FRPP Tach FRPP Twin 33# Fuel Injectors FRPP Oil Filter FRPP Gauges



*Not legal for sale or use on pollution-controlled motor vehicles. **Direct replacement part. See pages 2-8 for important safety, emissions and warranty information.

CRATE ENGINE DEVELOPMENT PROCESS

All great crate engines start as an idea. The engineer begins with a horsepower target and the engine family for hitting that target. Then, the engineer documents the components that will likely achieve targeted horsepower and meet durability requirements. This procedure is based on years of experience in the high-performance engine building business. Many formulas also support this process. Next, the engineer has one or more development engines built and sent to

CRATE ENGINE

the engine dynamometer lab for break-in and testing. During dyno-testing, fuel distribution, best cam timing and best ignition timing for maximizing horsepower and torque are assessed. If target performance numbers are not met—or can be improved—changes are made accordingly. Oftentimes, different carburetors, camshafts, intake manifolds and cylinder heads are evaluated. After target numbers are reached, the engine is run for durability. Durability testing is based on the market application of the engine. Various durability tests may be run—sometimes as severe as 50 hours at wide open throttle, full power. Others may be cycling tests where the engine accelerates from peak torque to peak power, then decelerates back to peak torque, then repeats the cycle for many hours. The tests selected vary depending on the market application. Upon successful completion of durability testing, the engine package is released for production.

PART NUMBER	M-6007-XEFM	M-6007-Z50Z	M-6007-X342	M-6007-Z347	M-6007-347NST
Displacement (ci)	302	302	342	347	347
Horsepower (hp)	340	390	N/A	450	N/A
Torque (lb-ft)	310	360	N/A	400	N/A
Compression Ratio	9.0:1	10.0:1	10.0:1	9.7:1	10.0:1
Heads	X303 GT-40	Z304DA High Flow	X303 GT-40	Z304DA High Flow	Z304DA
Camshaft	E303 Hyd. Roller Cam	Z303 Hyd. Roller Cam	X303 Hyd. Roller Cam	Crane Hyd. Roller Cam	F303 Hyd. Roller Carr
Crank	3.00" Stroke Cast	3.00" Stroke Cast	3.40" Stroke Cast	3.40" Stroke Forged	3.40" Stroke Forged
Piston	4.000" Forged	4.000" Forged	4.000" Hypereutectic	4.030" Forged	4.030" Forged
Intake	No Intake	No Intake	Victor Jr.	Victor Jr.	Victor Jr.
Distributor	No Distributor	No Distributor	Billet Distributor	Billet Distributor	Billet Distributor
Valve Cover	M-6000-K302R	M-6582-R302	M-6582-E302P	M-6582-BOSS	M-6582-R302
Oil Pan	Production	Production	Production	7qt. Rear Sump	7qt. Rear Sump
Water Pump	Serpentine Belt	V Belt	V Belt	V Belt	V Belt
CRATE ENGINE Part Number	M-6007-D347SR	M-6007-D351FT	M-6007-D351RT	M-6007-J58	M-6007-S58
Displacement (ci)	347	351	351	351	351
Horsepower (hp)	415	385	385	240	250
Torque (lb-ft)	400	377	377	340	350
Compression Ratio	10.0:1	9.0:1	9.0:1	8.5:1	8.5:1
Heads	Z304DA	X305 GT-40	X305 GT-40	Production Cast Iron	Production Cast Iron
Camshaft	F303 Hyd. Roller Cam	Z303 Hyd. Roller Cam	Z303 Hyd. Roller Cam	Standard Hyd. Cam	Standard Hyd. Cam
Crank	3.400" Forged	3.50" Stroke Cast	3.50" Stroke Cast	3.50" Stroke Cast	3.50" Stroke Cast
Piston	4.030" Forged	4.000" Forged	4.000" Forged	4.000" Hypereutectic	4.000" Hypereutectic
Intake	Victor Jr.	Victor Jr.	Victor Jr.	2V Aluminum	FRPP Dual Plane
Distributor	Billet Distributor	Billet Distributor	Billet Distributor	Ford Duraspark	Ford Duraspark
Valve Cover	M-6582-R302	M-6582-E302P	M-6582-E302P	Production	M-6582-E302P
Oil Pan	7qt. Rear Sump	7qt. Front Sump	7qt. Rear Sump	Full Sump Production	Full Sump Production
Water Pump	V Belt	Both	Both	V Belt	V Belt
CRATE ENGINE PART NUMBER	M-6007-D392FT	M-6007-D392RT	M-6007-Z351SR	M-6007-C392FT	M-6007-C392RT
Displacement (ci)	392	392	351	392	392
Horsepower (hp)	430	430	400	475	475
Torque (Ib-ft)	450	450	375	495	495
Compression Ratio	9.7:1	9.7:1	9.0:1	10.0:1	10.0:1
Heads	X303 GT-40	X303 GT-40	Z304DA	Z304DA High Flow	Z304DA High Flow
Camshaft	Crane Hyd. Roller Cam	Crane Hyd. Roller Cam	Hyd. Roller Cam	Hyd. Roller Cam	Hyd. Roller Cam
Crank	3.85" Stroke Cast	3.85" Stroke Cast	3.50" Forged	3.85" Forged	3.85" Forged
Piston	4.030" Forged	4.030" Forged	4.000" Forged	4.030" Forged	4.030" Forged
Intake	Victor Jr.	Victor Jr.	Victor Jr.	Victor Jr.	Victor Jr.
Distributor	Billet Distributor	Billet Distributor	No Distributor	Billet Distributor	Billet Distributor
Valve Cover	M-6582-E302P	M-6582-E302P	M-6582-R302	M-6582-E302P	M-6582-E302P
				7	Zet Deer Ourse
Oil Pan	7qt. Front Sump	7qt. Rear Sump	10qt. Rear Sump	7qt. Front Sump	7qt. Rear Sump

BOSS 302 ENGINE





The Boss 302 block is the cornerstone of the new Ford Racing Performance Parts 302 crate engines. This new Boss family of engines will replace some existing crate engines. You can expect the same level of quality now with an even stronger 4-bolt engine block.

STOCK BLOCK ENGINE NEW BOSS BLOCK ENGINE M-6007-XE3M M-6007-X302E

M-6007-XE3M M-6007-XB3M M-6007-Z50Z M-6007-C347 NEW BOSS BLC M-6007-X302E M-6007-X302B M-6007-Z302Z

M-6007-Z347

*Not legal for sale or use on pollution-controlled motor vehicles. **Direct replacement part. See pages 2-8 for important safety, emissions and warranty information. CRATE ENGINES

5.0L/302 - 340 HP GT-40 **ALUMINUM HEAD FORD RACING PERFORMANCE CRATE ENGINE ASSEMBLY**

M-6007-X302B* B303 Camshaft - Manual transmission

- M-6007-X302E* E303 Camshaft Auto or Manual Transmission • 302 cubic inch
- 345 hp with M-6250-B303, 340 hp with M-6250-E303 camshaft, headers and 65 mm throttle body not included
- 9.0:1 compression ratio (nominal)
- Forged pistons
- Forged steel connecting rods
- BOSS 4-bolt main block M-6010-BOSS302
- Hydraulic roller camshaft M-6250-B303, .480" lift intake and exhaust, duration at .050" is 224 degrees intake and exhaust
- Hydraulic roller camshaft M-6250-E303, .498" lift intake and exhaust, duration at .050" is 220 degrees intake and exhaust
- Double roller timing chain set M-6268-A302
- Forged steel crankshaft
- Rear sump pan fits most Fox body cars
- Ford Racing aluminum GT-40 cylinder heads M-6049-X306 with 1.94" intake valves and 1.54" exhaust valves
- Roller rocker arms M-6564-B351
- Built with all new parts
- Can be used in kit cars, street rods, Mustangs, Fox-bodied cars and trucks
- Depending on your application, a different timing cover, water pump, performance oil pan and pickup may be required. See installation notes

See Also ...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog





INSTALLATION NOTES:

See engine installation and tuning tips on page 95. Some or all of the following items may need to be changed from your original engine or modified for proper installation:

- This engine has a rear sump oil pan and pickup, regular rotation timing cover and reverse rotation water pump and non-EFI valve covers.
- A different performance oil pan and pickup may be required for your application. Call the Techline at (800) FORD788 for more information.
- The timing chain cover will work with most regular rotation water pumps.
- Fuel pump eccentric M-6287-B302 installed, allows use of mechanical fuel pump.
- A reverse rotation water pump is installed on the engine. Other applications may require different water pumps and timing chain covers found on page 123.
- The valve covers (M-6582-BOSS302) should fit most non-EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The flywheel included (M-6375-B302) should work for most 157-tooth manual transmission applications. For other transmission applications use the proper O balance flywheel, see pages 171-172.
- Firing order 1-3-7-2-6-5-4-8 (5.0L HO and 351W order).
- Built with current available parts. Photo and specs may vary.
- Shipping weight approximately 425 lbs.



5.0L/302 – 340 HP GT-40 ALUMINUM HEAD FORD RACING PERFORMANCE CRATE ENGINE ASSEMBLY M-6007-XEFM* E303 Camshaft -

Auto or Manual Transmission

- 302 cubic inch
- 340 hp @ 5500 rpm
- 9.0:1 compression ratio (nominal)
- Forged pistons
- Forged steel connecting rods
- Hydraulic roller camshaft M-6250-E303, .498" lift intake and exhaust, duration at .050" is 220 degrees intake and exhaust
- Double roller timing chain set M-6268-A302
- Nodular iron crankshaft
- Rear sump pan fits most Fox body cars
- Ford Racing aluminum GT-40 cylinder heads M-6049-X303 with 1.94" intake valves and 1.54" exhaust valves
- Roller rocker arms M-6564-B351
- New block, oil and water pumps, oil pan, flywheel and harmonic balancer
- Can be used in kit cars, street rods, Mustangs, Fox-bodied cars and trucks
- Depending on your application, a different timing cover, water pump, performance oil pan and pickup may be required. See installation notes

See Also ...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog



INSTALLATION NOTES:

See engine installation and tuning tips on page 95.

Some or all of the following items may need to be changed from your original engine or modified for proper installation:

- This engine has a rear sump oil pan and pickup, regular rotation timing cover and reverse rotation water pump and EFI valve covers.
- A different performance oil pan and pickup may be required for your application. Call the Techline at (800) FORD788 for more information.
- The timing chain cover will work with most regular rotation water pumps.
 Fuel pump eccentric M-6287-B302 installed, allows use of mechanical
- fuel pump.
- A reverse rotation water pump is installed on the engine. Other applications may require different water pumps and timing chain covers found on page 123.
- The valve covers (M-6582-K302R) should fit most 1986-93 Mustang EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The flywheel included (M-6375-B302) should work for most 157-tooth manual transmission applications. For other transmission applications use the proper 50 oz. flywheel, see pages 171-172.
- Firing order 1-3-7-2-6-5-4-8 (5.0L HO and 351W order).
- Built with current available parts. Photo and specs may vary.
- Shipping weight approximately 425 lbs.

CRATE

5.0L/302 CID SMALL BLOCK 390 HP "Z" HEAD FORD RACING PERFORMANCE **CRATE ENGINE ASSEMBLY**

M-6007-Z50Z*

- 302 cubic inch
- 390 hp (with headers, and a 650 CFM Holley carburetor not included)
- 360 lb-ft of torque @ 5000 rpm
- 10.0:1 compression ratio (nominal)
- Forged pistons
- Forged steel cap screw connecting rods
- Hydraulic roller camshaft M-6250-Z303, .569" lift intake and exhaust, duration at .050" is 228 degrees intake and exhaust
- Double roller timing chain M-6268-A302
- Nodular iron crankshaft
- Rear sump pan fits most Fox body cars
- Ford Racing aluminum "Z" cylinder heads M-6049-Z304DA with 2.02" intake valves and 1.60" exhaust valves
- Roller rocker arms M-6564-F351 · New block, oil and water pumps, oil pan and high-performance harmonic damper
- · Can be used in kit cars, street rods, Mustangs, Fox-bodied cars and trucks
- Depending on your application, a different timing cover, water pump, performance oil pan and pickup may be required. See installation notes

See Also...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog



INSTALLATION NOTES:

See engine installation and tuning tips on page 95. Some or all of the following items may need to be changed from your original engine or modified for proper installation:

- This engine has a rear sump oil pan and pickup, regular rotation timing cover, reverse rotation water pump and non-EFI valve covers.
- · A different performance oil pan and pickup may be required for your application. Call the Techline at (800) FORD788 for more information.
- The timing chain cover will work with most regular rotation water pumps.
- Fuel pump eccentric M-6287-B302 installed, allows use of mechanical fuel pump.
- A standard rotation water pump is installed on the engine. Other applications may require different water pumps and timing chain covers found on page 123.
- The valve covers (M-6582-R302) should fit most non-EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The damper assembly M-6316-A50 may require a spacer for pulley alignment, see page 126.
- The flywheel (M-6375-C302) not included should work for most 157-tooth manual transmission applications. For other transmission applications use the proper 50 oz. flywheel, see pages 171-172.
- Firing order 1-3-7-2-6-5-4-8 (5.0L HO and 351W order).
- · Built with current available parts. Photo and specs may vary.
- Shipping weight approximately 405 lbs.

MINI STARTERS – SMALL BLOCK

M-11000-A50 1.1 kw Hi-torque Starter

- M-11000-B51 1.4 kw Super Hi-torque Starter
- Small diameter mini-starter-great for additional header clearance
- · Weighs approximately 5 lbs. less than pre-1989 production starter, yet provides more cranking power
- · Comes with special battery cables and instructions. Must use firewall solenoid
- Fits most 289/302/351W/351C engines except 164-tooth manual transmission

NOTE: For optional flywheels (sold separately), see pages 171-172.



**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.

FLYWHEELS



5.0/342 GT-40 ALUMINUM HEAD FORD RACING PERFORMANCE CRATE ENGINE M-6007-X342*

IVI-0007-X342

- 342 cubic inch
- hp to be determined
- Ib-ft of torque to be determined10.0:1 compression ratio (nominal)
- Hypereutectic pistons
- Forged steel cap screw connecting rods
- Hydraulic roller camshaft M-6250-X303 with .542" lift intake and exhaust, duration at .050" is 224 degrees intake and exhaust
- Double roller timing chain M-6268-A302
- Nodular iron crankshaft
- Rear sump pan fits most Fox body cars
- MSD billet distributor
- Ford Racing aluminum GT-40 cylinder heads M-6049-X303 with 1.94" intake valves and 1.54" exhaust valves
- Roller rocker arms M-6564-B351
- Single plane "Victor Jr." intake manifold M-9424-D302
- New block, oil and water pumps, oil pan, steel billet flywheel and harmonic balancer
- Can be used in kit cars, street rods, Mustangs, Fox-bodied cars and trucks
 Depending on your application, a different timing cover, water pump,
- performance oil pan and pickup may be required. See installation notes

See Also ...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog



COMPLETE 5.8L/351 CRATE ENGINE ASSEMBLIES

M-6007-J58* 240 hp 2V M-6007-S58* 250 hp 4V

- 5.8L/351 cubic inch
- 240 hp @ 3800 rpm-2V
- 250 hp @ 3800 rpm-4V
- 340 lb.-ft. @ 3200 rpm-2V
- 350 lb.-ft. @ 3300 rpm-4V
- 8.5:1 compression ratio
- Aluminum 2V intake E6TE-9424-DA on 240 hp
- Ford Racing 4V dual plane intake on 250 hp
- High-torque, hydraulic flat tappet camshaft E7JE-6250-AA
- Cylinder heads E5AE-6090-CA without thermactor passages
- Duraspark distributor, coil and spark plug wires
- Block is hydraulic roller cam compatiable
- Depending on your application, a different timing cover, water pump, performance oil pan and pickup may be required. See installation notes

See Also...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog



INSTALLATION NOTES:

See engine installation and tuning tips on page 95. Some or all of the following items may need to be changed from your original engine or modified for proper installation:

- This engine has a rear sump oil pan and pickup, regular rotation timing cover and regular rotation water pump and non-EFI valve covers.
- A different performance oil pan and pickup may be required for your application. Call the Techline at (800) FORD788 for more information.
- The timing chain cover will work with most regular rotation water pumps.
- Fuel pump eccentric M-6287-B302 installed, allows use of mechanical fuel pump.
- A regular rotation water pump is installed on the engine. Other applications may require different water pumps and timing chain covers found on page 123.
- The valve covers (M-6582-R302) should fit most non-EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The flywheel included (M-6375-A302) should work for most 157tooth manual transmission applications. For other transmission applications use the proper 28 oz. flywheel, see pages 171-172.
- Firing order 1-3-7-2-6-5-4-8 (5.0L HO and 351W order).
- Built with current available parts. Photo and specs may vary.
- Shipping weight approximately 425 lbs.

INSTALLATION NOTES:

See engine installation and tuning tips on page 95. Some or all of the following items may need to be changed from your original engine or modified for proper installation:

- This engine has a mid-sump oil pan and pickup, regular rotation timing cover and regular rotation water pump and non-EFI valve covers.
- A different oil pan and pickup may be required for your application. Call the Techline at (800) FORD788 for more information.
- The timing chain cover will work with most regular rotation water pumps.
- A standard rotation water pump is installed on the engine. Other applications may require different water pumps and timing chain covers found on page 123.
- The valve covers on 240 hp should fit most non-EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The valve covers M-6582-E302P on 250 hp should fit most non-EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The flywheel included F4TR-6380-AA 164-tooth HD truck, will not work for most applications. For other transmission applications use the proper 28 oz. flywheel, see pages 171-172.
- Firing order 1-3-7-2-6-5-4-8 (5.0L HO and 351W order).
- Built with current available parts. Photo and specs may vary.
- Shipping weight approximately 595 lbs.

*Not legal for sale or use on pollution-controlled motor vehicles. **Direct replacement part. See pages 2-8 for important safety, emissions and warranty information.

CRATE

5.0L/302-347 CID SMALL BLOCK 450 HP "Z" HEAD FORD RACING PERFORMANCE **CRATE ENGINE ASSEMBLY**

M-6007-Z347*

- 347 cubic inch
- 450 hp @ 6000 rpm (with headers, and a 650 CFM Holley carburetor not included)
- 400 lb-ft of torque @ 4900 rpm
- 9.7:1 compression ratio (nominal)
- Forged pistons
- Forged steel cap screw connecting rods
- Hydraulic roller camshaft, .580" lift intake .602" exhaust, duration at .050" is 232 degrees intake and 240 degrees exhaust with 1.6 rocker arms
- Double roller timing chain set M-6268-A302
- Forged steel crankshaft
- "BOSS" 4-bolt main block, M-6010-BOSS302
- High-performance rear T-sump oil pan
- Rear sump pan fits most Fox body cars
- · MSD billet distributor
- Ford Racing aluminum "Z" cylinder heads M-6049-Z304DA with 2.02" intake valves and 1.60" exhaust valves
- Roller rocker arms M-6564-F351
- Single plane "Victor Jr." intake manifold M-9424-D302
- New heavy-duty block, oil and water pumps, performance oil pan and highperformance harmonic balancer
- Can be used in kit cars, street rods, Mustangs, Fox-bodied cars and trucks
- Depending on your application, a different timing cover, water pump, performance oil pan and pickup may be required. See installation notes

See Also ...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog



INSTALLATION NOTES:

See engine installation and tuning tips on page 95. Some or all of the following items may need to be changed from your original engine or modified for proper installation:

- This engine has a rear T-sump performance oil pan and pickup, regular rotation timing cover and regular rotation water pump and non-EFI valve covers.
- A different performance oil pan and pickup may be required for your application. Call the Techline at (800) FORD788 for more information.
- · The timing chain cover will work with most regular rotation water pumps.
- Fuel pump eccentric M-6287-B302 installed, allows use of mechanical fuel pump.
- · A standard rotation water pump is installed on the engine. Other applications may require different water pumps and timing chain covers found on page 123.
- The valve covers (M-6582-BOSS) should fit most non-EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The damper M-6316-C351 may require a spacer for pulley alignment, see page 126.
- The flywheel (M-6375-A302) not included should work for most 157-tooth manual transmission applications. For other transmission applications use the proper 28 oz. flywheel, see pages 171-172.
- Firing order 1-3-7-2-6-5-4-8 (5.0L HO and 351W order).
- · Built with current available parts. Photo and specs may vary.
- · Shipping weight approximately 465 lbs.

347 CID FORD RACING STROKER SHORT BLOCK ENGINE ASSEMBLY M-6009-Z347*

- 347 CID
- "BOSS" 4-bolt main block, M-6010-BOSS302
- Forged aluminum .030" overbore pistons with valve reliefs for Z304, X306, X307, N351, GT-40 and other inline valve Windsor cylinder heads. Valve notches approximately 4 cc. Check valve to piston clearance for valve lift over .500". Piston to deck .000" (nominal)
- 3.40 stroke forged steel stroker crank
- Forged steel connecting rods
- Hydraulic roller camshaft compatible
- Balanced for 28.2 in./oz. damper and flywheel
- · Assembled and ready for your heads, cam and timing chain set
- Requires head gaskets M-6051-CP331 or M-6051-S331 or equivalent
- Photo and specs may vary





5.8L/351-385 HP GT-40 ALUMINUM HEAD FORD RACING PERFORMANCE CRATE ENGINE ASSEMBLY

M-6007-D351FT* Front Sump T-pan (Manual Transmission) M-6007-D351RT* Rear Sump T-pan (Manual Transmission)

- 351 cubic inch
- 385 hp (with headers, and a 650 CFM Holley carburetor not included)
- 377 lb-ft of torque @ 4500 rpm
- 9.0:1 compression ratio (nominal)
- Forged pistons
- Forged steel cap screw connecting rods
- Hydraulic roller camshaft M-6250-Z303, .552" lift intake and exhaust, duration at .050" is 228 degrees intake and exhaust
- Double roller timing chain set M-6268-A302
- Nodular iron crankshaft
- High-performance T-sump oil pan
- · Front sump fits most passenger cars that came factory equipped with front sump pan
- Rear sump pan fits most Fox body cars
- · MSD billet distributor
- Ford Racing aluminum GT-40 cylinder heads M-6049-X305 with 1.94" intake valves and 1.54" exhaust valves
- Roller rocker arms M-6564-B351
- Single plane "Victor Jr." intake manifold M-9424-V351
- New heavy-duty 5.8L "Sportsman" block, oil and water pumps, performance oil pan, steel billet flywheel and high-performance harmonic balancer
- Can be used in kit cars, street rods, Mustangs, Fox-bodied cars and trucks
- Depending on your application, a different timing cover, water pump, performance oil pan and pickup may be required. See installation notes

See Also ...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog



CRATE

INSTALLATION NOTES:

See engine installation and tuning tips on page 95. Some or all of the following items may need to be changed from your original engine or modified for proper installation:

- This engine has a T-sump performance oil pan and pickup, regular rotation timing cover and both regular (installed) and reverse rotation water pumps and non-EFI valve covers.
- · A different performance oil pan and pickup may be required for your application. Call the Techline at (800) FORD788 for more information.
- The timing chain cover will work with most regular rotation water pumps. • Fuel pump eccentric M-6287-B302 installed, allows use of mechanical
- fuel pump. • A standard rotation water pump is installed on the engine and a reverse rotation is included loose in the box. Other applications may require different water pumps and timing chain covers found on page 123.
- The valve covers (M-6582-R302) should fit most non-EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The damper assembly M-6316-C351 may require a spacer for pulley alignment, see page 126.
- The flywheel included (M-6375-A302) should work for most 157-tooth manual transmission applications. For other transmission applications use the proper 28 oz. flywheel, see pages 171-172.
- Firing order 1-3-7-2-6-5-4-8 (5.0L HO and 351W order).
- Built with current available parts. Photo and specs may vary.
- Shipping weight approximately 545 lbs.



5.8L/351-392 CID SMALL BLOCK 430 HP GT-40 HEAD FORD RACING PERFORMANCE CRATE ENGINE ASSEMBLY

M-6007-D392FT* Front Sump T-pan (Manual Transmission)

M-6007-D392RT* Rear Sump T-pan (Manual Transmission) • 392 cubic inch

- 430 hp @ 5500 rpm (with headers, and a 750 CFM Holley carburetor not included)
- 450 lb-ft of torque @ 4000 rpm
- 9.7:1 compression ratio (nominal)
- Forged pistons
- Forged steel connecting rods
- Hydraulic roller camshaft with .563" lift intake and 584" lift exhaust, duration at .050" is 232 degrees intake and 240 degrees exhaust
- Double roller timing chain set M-6268-A302
- Nodular iron crankshaft
- High-performance T-sump oil pan
- Front sump fits most passenger cars that came factory equipped with front sump pan
- Rear sump pan fits most Fox body cars
- MSD billet distributor
- Ford Racing aluminum GT-40 cylinder heads M-6049-X303 with 1.94" intake valves and 1.54" exhaust valves
- Roller rocker arms M-6564-B351
- Single plane "Victor Jr." intake manifold M-9424-V351
- New heavy-duty 5.8L "Sportsman" block, oil and water pumps, performance oil pan, steel billet flywheel and high-performance harmonic balancer
- Can be used in kit cars, street rods, Mustangs, Fox-bodied cars and trucks
 Depending on your application, a different timing cover, water pump,
- performance oil pan and pickup may be required. See installation notes

See Also...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog





INSTALLATION NOTES:

See engine installation and tuning tips on page 95. Some or all of the following items may need to be changed from your original engine or modified for proper installation:

- This engine has a T-sump performance oil pan and pickup, regular rotation timing cover and both regular (installed) and reverse rotation water pumps and non-EFI valve covers.
- A different performance oil pan and pickup may be required for your application. Call the Techline at (800) FORD788 for more information.
- The timing chain cover will work with most regular rotation water pumps.
- Fuel pump eccentric M-6287-B302 installed, allows use of mechanical fuel pump.
- A standard rotation water pump is installed on the engine and a reverse rotation is included loose in the box. Other applications may require different water pumps and timing chain covers found on page 123.
- The valve covers (M-6582-R302) should fit most non-EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The damper assembly M-6316-C351 may require a spacer for pulley alignment, see page 126.
- The flywheel included (M-6375-A302) should work for most 157-tooth manual transmission applications. For other transmission applications use the proper 28 oz. flywheel, see pages 171-172.
- Firing order 1-3-7-2-6-5-4-8 (5.0L HO and 351W order).
- Built with current available parts. Photo and specs may vary.
- Shipping weight approximately 545 lbs.



5.8L/351-392 CID SMALL BLOCK 475 **HP "Z" ALUMINUM HEAD FORD RACING** PERFORMANCE CRATE ENGINE ASSEMBLY

M-6007-C392FT* Front Sump T-pan (Manual Transmission) **M-6007-C392RT*** Rear Sump T-pan (Manual Transmission)

- 392 cubic inch
- 475 hp @ 5600 rpm (with headers, and a 750 CFM Holley carburetor not included)
- 495 lb-ft of torque @ 4400 rpm
- 10:1 compression ratio (nominal)
- Forged pistons
- Forged steel cap screw connecting rods
- Hydraulic roller camshaft, .580" lift intake and .602" lift exhaust, duration at .050" is 232 degrees intake and 240 degrees exhaust
- Double roller timing chain set M-6268-A302
- · Forged steel crankshaft
- High-performance T-sump oil pan
- · Front sump fits most passenger cars that came factory equipped with front sump pan
- Rear sump pan fits most Fox body cars
- MSD billet distributor
- Ford Racing aluminum "Z" cylinder heads M-6049-Z304DA with 2.02" intake valves and 1.60" exhaust valves
- Roller rocker arms M-6564-F351
- Single plane "Victor Jr." intake manifold M-9424-V351
 New heavy-duty 5.8L "Sportsman" block, oil and water pumps, performance oil pan, steel billet flywheel and high-performance harmonic balancer
- Can be used in kit cars, street rods, Mustangs, Fox-bodied cars and trucks
- Depending on your application, a different timing cover, water pump, performance oil pan and pickup may be required. See installation notes

See Also ...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog





INSTALLATION NOTES:

See engine installation and tuning tips on page 95. Some or all of the following items may need to be changed from your original engine or modified for proper installation:

- This engine has a T-sump performance oil pan and pickup, regular rotation timing cover and both regular (installed) and reverse rotation water pumps and non-EFI valve covers.
- A different performance oil pan and pickup may be required for your application. Call the Techline at (800) FORD788 for more information.
- The timing chain cover will work with most regular rotation water pumps.
- Fuel pump eccentric M-6287-B302 installed, allows use of mechanical fuel pump.
- A standard rotation water pump is installed on the engine and a reverse rotation is included loose in the box. Other applications may require different water pumps and timing chain covers found on page 123.
- The valve covers (M-6582-R302) should fit most non-EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The damper assembly M-6316-C351 may require a spacer for pulley alignment, see page 126.
- The flywheel included (M-6375-A302) should work for most 157-tooth manual transmission applications. For other transmission applications use the proper 28 oz. flywheel, see pages 171-172.
- Firing order 1-3-7-2-6-5-4-8 (5.0L HO and 351W order).
- Built with current available parts. Photo and specs may vary.
- Shipping weight approximately 545 lbs.

CRATE

347 CID SMALL BLOCK 415HP SEALED CRATE ENGINE ASSEMBLY

M-6007-D347SR

- 347 cubic inch
- 415 hp @ 6000 rpm (with headers, and a 650 CFM Holley carburetor not included)
- 400 lb-ft of torque @ 4900 rpm
- 10.0:1 compression ratio (nominal)
- Forged pistons
- Forged steel cap screw connecting rods
- Hydraulic roller camshaft M-6250-F303, .523" lift intake and
- exhaust, duration at .050" is 226 degrees intake and exhaust • Double roller timing chain set M-6268-A302
- Forged steel crankshaft
- High-performance rear sump circle track oil pan
- MSD billet distributor
- Ford Racing aluminum "Z" cylinder heads M-6049-Z304DA with 2.02" intake valves and 1.60" exhaust valves
- Roller rocker arms M-6564-F351
- Single plane "Victor Jr." intake manifold M-9424-D302
- New heavy-duty race block, oil and water pumps, performance oil pan and high-performance harmonic damper
- Depending on your application, a different timing cover, water pump, performance oil pan and pickup may be required
- Engine is sealed for circle track competition where rules allow
- Engine is internally balanced, "0" balance flywheel required
- · Flywheel is not included

See Also ...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog

347 CID SMALL BLOCK 405HP SEALED CRATE ENGINE ASSEMBLY

M-6007-347NST

- 347 cubic inch
- 405 hp @ 6000 rpm (with headers, and a 650 CFM Holley carburetor not included)
- 10:1 compression ratio (nominal)
- Forged pistons
- Forged steel cap screw connecting rods
- Hydraulic roller camshaft M-6250-F303, .528" lift intake and exhaust, duration at .050" is 226 degrees intake and exhaust
- Double roller timing chain set M-6268-A302
- · High-performance rear sump circle track oil pan
- Forged steel crankshaft
- MSD billet distributor
- Ford Racing aluminum "Z" cylinder heads M-6049-Z304DA with 2.02" intake valves and 1.60" exhaust valves
- Roller rocker arms M-6564-F351
- Single plane "Victor Jr." intake manifold M-9424-D302
- New heavy-duty race block, oil and water pumps, performance oil pan and high-performance harmonic damper
- Depending on your application, a different timing cover, water pump, performance oil pan and pickup may be required. See installation notes
- · Engine is sealed for circle track competition where rules allow
- Engine is internally balanced, "0" balance flywheel required
- Flywheel is not included
- Designed for use in NASCAR Late Model Series
- Same as M-6007-D347SR except cam timing change to conform with NASCAR rules





See Also ...

- Crate Engine Build-Up
- Crate Engine Warranty
- Engine Tips & Specs
- Crate Engine Catalog



THERE IS NO REPLACEMENT FOR DISPLACEMENT.

Heads turn, the ground shakes, mothers check for their children, the air fills with the sweet smell of exhaust!

There's nothing like the sound of a big block Ford roaring to life! Ford Racing has always been at the forefront of the big block performance by providing engines of the highest quality with over 600hp and gobs of torque. Even road racers grin from ear to ear when they hear a big block! We are proud to usher in the new era of big block performance with an entire new line of crate engines based on a new Ford Racing block. Look for coverage of this exciting new product at fordracingparts.com and on the newsstand in your favorite enthusiast magazine in the months to come. The new era of big block performance is coming so when you can't find any replacement for displacement, look no further than Ford Racing!

460 FOX ENGINE SWAP MOUNTS M-6038-A460*

Use in 1979-95 Mustang and other Fox-chassis cars to mount 429/460 engines. Our rubber insulated mount kit is designed to work with M-6675-A460 rear sump oil pan kit and custom headers.

NOTE: Does not fit I-6 cylinder front crossmember.

FLYWHEEL M-6375-Z460

- Fits 1979-97 460 and 460/514 Ford Racing crate engines with external balance
- For external balance only 11" long or diaphragm-style clutch
- with 5/16" holes 11.5" and 12" long or
- diaphragm-style clutch
- 11" diaphragm Ford Trucks even pattern
- Meets SFI 1.1



M-6007-Z351SR

- 351 cubic inch
- 400 hp @ 5800 rpm (with headers and 650 CFM holley carburetor)
- 375 lb-ft @ 4700 rpm
- 9.0:1 compression ratio (nominal) Forged pistons
- Forged steel connecting rods
- Hydraulic roller camshaft, .513" lift intake and .526" lift exhaust, duration at .050" is 226 degrees intake and 228 degrees exhaust
- Double roller timing chain set M-6268-A302
- Forged steel crankshaft
- High-performance rear sump circle track oil pan
- MSD distributor
- Ford Racing aluminum "Z" cylinder heads M-6049-Z304DA with 2.02" intake valves and 1.60" exhaust valves
- Roller rocker arms M-6564-F351
- Single plane "Victor Jr." intake manifold M-9424-V351
- New heavy duty 351 race block, oil and water pumps and a highperformance harmonic damper
- Depending on your application, a different timing cover, water pump, performance oil pan and pickup may be required. See installation notes
- Engine is sealed for circle track competition where rules allow
- Engine is internally balanced, "0" balance flywheel required
- Flywheel is not included

See Also ...

- Crate Engine Build-Up
- Engine Tips & Specs
- · Crate Engine Catalog



INSTALLATION NOTES:

See engine installation and tuning tips on page 95. Some or all of the following items may need to be changed from your original engine or modified for proper installation:

- This engine has a rear sump performance oil pan and pickup, regular rotation timing cover and regular rotation water pump and non-EFI valve covers.
- A different performance oil pan and pickup may be required for your application. Call the Techline at (800) FORD788 for more information.
- The timing chain cover will work with most regular rotation water pumps.
- Fuel pump eccentric M-6287-B302 installed, allows use of mechanical fuel pump
- A standard rotation water pump is installed on the engine. Other applications may require different water pumps and timing chain covers found on page 123.
- The valve covers (M-6582-R302) should fit most non-EFI applications, optional valve covers (sold separately) are available on pages 128-130.
- The damper M-6316-C351 with counterweight removed, may require a spacer for pulley alignment, see page 126.
- The flywheel (M-6375-D302) not included should work for most 157-tooth manual transmission applications. For other transmission applications use the proper "0" balance flywheel, see pages 171-172.
- Firing order 1-3-7-2-6-5-4-8 (5.0L HO and 351W order).
- Built with current available parts. Photo and specs may vary.
- · Shipping weight approximately 545 lbs.

**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.



CRATE





ENGINE COMPONENTS

ENGINE SWAP SIZE CHART (SEE INDIVIDUAL ENGINE INSTALLATION NOTES PAGES 84-91 FOR WEIGHTS)





Did you know...

That an aluminum 4.6L block weighs approximately 85 lbs. while the iron versions weigh approximately 155 lbs.

Did you know...

The new 3-valve 4.6L engine in the 2005-08 Mustang weighs only 420 lbs. dressed.

Did you know...

5.4L blocks received more material in 2002 for Noise Vibration and Harshness (NVH) control. Pre-2002 blocks weighed 185 lbs., later blocks weigh 200 lbs.

Did you know...

You can easily distinguish Romeo vs. Windsor 4.6 liter iron blocks by the main caps. Windsor blocks have dowels to locate the main caps while Romeo blocks use jack screws to locate the main caps.

Did you know...

All 5.4L iron blocks are made with the Windsor main cap style, even those that go into engines coming out of Romeo engine plant.

ENGINE TECH TIPS



ENGINE INSTALLATION AND TUNING TIPS

Performance engine durability is dependent on several supporting systems including the cooling system, fuel delivery system, ignition system and oiling system. If the support systems are not adequate, poor engine performance and possible engine failure could result.

OILING SYSTEM CONSIDERATIONS/ COMMON PROBLEMS

- Priming the oiling system before starting a new engine is crucial to engine life. This is important on initial start-up of a new engine and if a used engine has not been run for extended periods of time.
- Does the oil pan have adequate capacity? Most performance vehicles require a 7 qt. minimum capacity. All engines will benefit from increased oil pan capacity.
- Does the oil pan have proper oil control baffling for the vehicle's braking, acceleration and cornering capabilities? Road Race cars need oil control in four directions: braking, acceleration, LH cornering and RH cornering. Drag race cars need oil control in two directions: braking and acceleration. Baffles must be designed to keep oil over the pickup screen at all times.
- Is the pickup screen the proper distance from the bottom of the oil pan? If the oil pickup screen is too close to the bottom of the oil pan, it can cause cavitation. If it is too far away, it will cause the pump to draw air and minimize lubrication capacity. The pickup screen should be located .250" to .375" from the bottom of the pan. Does the design of the screen on the pickup tube create restrictions? We have seen some pickup tube screen designs that restrict oil flow as much as 75%. Wire mesh is good. Perforated metal is usually restrictive. Measure the wire size and calculate the flow area. Most aftermarket screens have less flow area than stock screens.
- If using a remote oil filter mount or oil cooler, make sure that all of the components are large enough to eliminate any restrictions to oil flow. Many Cobra replica kit cars use components that are too restrictive.
- Undersize oil lines commonly restrict oil flow.
 The more bends/turns in an oiling system.
- the more restrictions are created.
- Poorly designed remote filter mounts and adapters can create restrictions.
- Be sure that the oil cooler flows enough oil to meet the engine's requirements.
- Never reuse a used oil cooler. Debris gets trapped and cannot be cleaned out.
- Poorly designed oil filters can cause a restriction.
 Many oil systems only flow one way. Connecting the remote oil filter or oil cooler lines backwards can

IGNITION SYSTEM CONSIDERATIONS/ COMMON PROBLEMS

cause engine damage/failure.

- The ignition system must deliver a properly timed spark. There are a lot of factors that determine when the spark should be delivered. The most common factors include: compression ratio, fuel quality, fuel octane rating, combustion chamber design, engine operating temperature, power adders such as NOS or supercharger, inlet air temp, altitude and load.
- Avoid too much or too little timing for your engine combination.
- Avoid hooking up the vacuum advance to intake manifold vacuum instead of ported vacuum.

- Avoid inductive crossfire created by improper plug wire routing. Separate plug wires on cylinders that fire in sequence.
- Improper timing can damage pistons, rod bearings, head gaskets and many other engine parts.
- Typical total mechanical advance timing at 4000 rpm for Ford Racing Performance Parts crate engines: 5.0L: 36° to 38°, 347/351: 34° to 36°, 392/460/514: 30° to 32°.

FUEL DELIVERY CONSIDERATIONS

- Size of fuel pump, size of fuel line, fuel pump placement, fuel filter placement, fuel filter size, injector size, fuel rail size, fuel pressure, jet size and baffling in the fuel tank.
- Does the fuel system maintain full pressure at peak engine horsepower in high gear?

Altitude, air temperature and fuel characteristics including quality, specific gravity and octane rating, will affect your jetting requirements. Engine efficiency and Brake Specific Fuel Consumption (BSFC) also have an effect. Here are some examples of a Holley 750 CFM 4V.

Octane	Temp.	Altitude	Jetting Front	Jetting Rear
94	80 F	0 ft.	81	86
Aviation 100LL	80 F	0 ft.	81	84
110 Race	80 F	0 ft.	78	83
94	80 F	3000 ft.	76	81
94	80 F	6000 ft.	73	77
94	40 F	0 ft.	84	89
94	120 F	0 ft.	78	83

As you can see by these examples, jet requirements can vary a lot depending on fuel, altitude and temperature. Oxygenated fuels are available in some states and can dramatically affect your jetting requirements. Make sure you get your jetting correct. Aviation fuel is lighter and will require richening an engine in relationship to its requirement with pump gas. We have found in the dyno testing of our crate engines that 1 point richer on air/fuel ratio equals only a few percent less power. Running an engine as lean as possible produces the best power but also increases combustion temperatures and the chances of engine damage.

COMMON PROBLEMS WITH FUEL DELIVERY SYSTEMS

- Do not mount an EFI electric fuel pump so it has to draw fuel from the tank. This creates negative pressure in the fuel line allowing the fuel to boil at a lower temperature.
- The pump must be mounted in the tank or in a location so that it is gravity fed.
- If the fuel rail is too small and you have large injectors, this can create a pulse in the fuel rail allowing fuel starvation on some cylinders.
- Fuel should be pushed through the fuel filter. Pulling fuel through a filter can cause cavitation. If a filter is to be used on the inlet of a rail-mounted fuel pump, a filter rating of 160 microns MINIMUM should be used.
- It takes approx. 1/2 lb. of gasoline to support 1 hp. This is commonly referred to as a .5 BSFC. You should always err in the safe direction of larger when sizing your injectors and fuel pump.

COOLING SYSTEM CONSIDERATIONS/ COMMON PROBLEMS

- Higher horsepower requires more cooling capacity.
- When the fill point of the cooling system is not the highest point, air pockets are created. The air pockets then create hot spots, and the hot spots promote improper combustion, which can cause engine failure.
- Improper pulley size makes the fan and water pump turn too slow or too fast. Production water pumps are normally run at 20% over engine speed and do not perform well over 5000 engine rpm. Underdrive pulleys generally reduce water pump speed to 85% of engine rpm and may not provide enough water flow to cool the engine.
- The radiator must have enough area to dissipate the heat being generated by the engine.
- If the fan size is too small, it will not move enough air across the radiator so it can properly dissipate the heat being generated. Fan shrouds increase the effectiveness of the fan significantly.
- Radiator location can affect airflow through the radiator at different vehicle speeds.

FLYWHEEL, CONVERTER AND TRANSMISSION PROBLEMS

- Installing the wrong flywheel for the balance factor of the engine will cause vibration and eventually damage the engine.
- Wrong length input shaft or "stack-up height" can force the crank forward, damaging the engine thrust bearing.
- Improperly installing the torque converter can force the crank forward, damaging the engine thrust bearing. This is most commonly caused by improperly locating the torque convertor drain plug in the flexplate.
- If the torque converter balloons, it can force the crank forward, damaging the engine thrust bearing and the transmission. Most high-performance torque converters have anti-ballooning features.
- Damage to the thrust bearing can happen in seconds!

MISCELLANEOUS PROBLEMS THAT CAN DAMAGE AN ENGINE

- Dropping nuts, bolts, washers or foreign materials down the intake. We have seen this more than once.
- Reusing an intake off an engine that had broken parts in a cylinder. The parts can get bounced up into the intake manifold, carburetor or air cleaner (pieces of piston or piston rings etc.). When you put your used intake on your new engine and start it, the pieces are drawn in and damage your engine.
- Bead-blasting an EFI intake. You will NEVER get all of the blasting media out. When the engine is started, it draws the blasting media into the cylinders, destroying the engine.
- Improperly torquing fasteners when installing new parts to your engine. Over-torquing of the intake manifold bolts to the cylinder head on 302 and 351W engines can cause head gasket sealing problems.
- Installing distributor gears at the incorrect height, or using gears made of the wrong material. We have seen this a lot on remanufactured distributors as well as popular aftermarket manufacturers of distributor assemblies. Use cast iron gears for cast iron flat tappet cams, and steel gears for steel hydraulic roller cams.

CRATE

ENGINE DYNAMOMETER TESTING BASICS

TYPES OF ENGINE DYNAMOMETERS

There are many types of dynamometers for testing engines: Water Brake, Eddy-Current, Electric...just to name a few. Depending on availability and engine application, Ford Racing utilizes any of those mentioned. The basic function of each of these dynamometers (referred to as dynos from this point forward) is the same. Each applies a different method to absorb the energy output of the engine. The engine output is measured as torque (work) and power is calculated. The energy produced by the engine is absorbed by the dyno and eventually dissipated as heat. Dynos measure this engine output over a range of engine conditions that vary with speed and load. Temperature, pressures, air fuel ratio, water, oil, fuel and airflow measurements are elements of the test cell. The accurate measurement of these parameters is just as vital to good testing as the dyno itself. The test cell that houses a dyno can vary widely. Conditioned airflow, exhaust evacuation and fuel delivery must be adequate for the power level of the engine tested. Shortfalls in any of these areas can impact the integrity of the test.

Ford Racing tests our crate engine offerings on any of the above-mentioned types of dynos. The type depends on test cell availability and type of engine application (street, sealed circle track, etc.). The engine is directly coupled to the dyno via a prop shaft. This type of testing yields brake power and torque. Test results are brake because measurements are taken directly from the crankshaft output.

Water brake dynos absorb energy by pumping water through various orifices. Speed and load are controlled through a feedback loop of inlet and outlet valves. Water brake dynos are typically capable of absorbing very high engine outputs and rpm.

Eddy-current dynos rotate a disc through a magnetic field. This magnetic field can be varied in strength to control the rpm of the disc. These dynos are desirable for engine development due to very good rpm control.

Electric dynos rotate a generator to absorb engine output; this yields an electric output that can be accurately measured. Typically, electric dynos can be used to spin a non-firing engine and measure pumping losses and friction. Those types of losses are difficult to ascertain in conventional dyno testing.

METHODS OF TESTING

Once the engine is installed in a test cell, and all desired operating parameters are instrumented, testing can begin. The dyno is capable of absorbing an infinite number of operating conditions ranging from idle to WOT (wide open throttle) and idle rpm to rpm's beyond peak horsepower. In cases where the dyno is operated manually, the operator will set the rpm value via a controller. The operator then opens the throttle via a throttle actuator and applies load to the dyno. As the throttle is opened further, the dyno will control the rpm to the set point and the load will increase until full throttle is reached. Many types of testing exist for evaluating engine performance. Crate engine testing consists of power development, durability, idle stability, etc.

POWER TESTING

Methods for performing power tests or power runs, vary by dyno facility and engine application. Acceleration tests (sometimes referred to as ramp tests) are controlled completely by dyno software through the dyno controller and throttle actuator. The rpm and transient times are programmed by the operator, and, once set, the controller takes the engine through the test. These tests typically do not let the engine stabilize at any given speed and data is collected throughout the ramp. For example: The test would begin at idle. Slowly the throttle will be opened and rpm controlled to the first chosen rpm test point. Eventually the throttle will reach WOT. From then, the rpm will increase at a given rate of rpm/time until the maximum test rpm is reached. Test data is recorded throughout the entire run. Finally the controller will close the throttle and return the engine to idle.

Another method of power testing is the step method. This can be controlled manually or by an automated test where the dyno software controls the engine operation. The dyno controller is set to the first rpm test point and the throttle actuator is slowly opened to the full throttle point. The controller will maintain the rpm of the engine to the set point. In the manual mode, the operator will observe the data until stable and then record. In automated mode, the dyno will hold the throttle and rpm for a set period of time and automatically record the data. In either case, this testing provides good steady readings and makes for good repeatable runs. The above procedure will be repeated for all desired rpm test points.

Results of power testing are used in the design of crate engine packages and for marketing/sales. For further information on interpreting results see article on "Correction Factors, Observed and Corrected Horsepower and Torque."

DURABILITY TESTING

Durability testing varies by engine application and configuration. The type of engine and where it will be used can influence the type of durability testing greatly. For example, durability testing criteria for a sealed circle track crate engine will be determined by minimum and maximum track conditions. Durability testing for a street application crate engine will be determined by peak torque and horsepower for the given components. Testing conditions are typically WOT or high-load conditions and variable rpm to cover as wide of a range as possible. In short, durability testing criteria vary, but the goal is the same. The goal is to produce an accelerated wear condition that exceeds the normal application of the engine as designed.



CORRECTION FACTORS, OBSERVED AND CORRECTED HORSEPOWER AND TORQUE

THE NEED FOR CORRECTED TEST RESULTS

The main reason for a correction factor is the ability to compare testing performed under different atmospheric conditions. The correction factor will contain a temperature, barometric pressure and an efficiency percentage. The temperature and barometric pressure have significant impact on the performance of an engine. Also, to a lesser degree, humidity can affect the performance. Some dyno facilities have controlled atmospheric chambers to condition air to a desired temperature, humidity and barometric pressure. These test cells are very sophisticated and usually booked with production, emission, cold start and hot test work. The test cells with these chambers can easily cost several hundred thousand. Considering these challenges, it becomes evident that there is a need to be able to test engines under observed operating conditions and correct the results to a standard set of conditions.

SOME DEFINITIONS

<u>Observed Operating Conditions</u> are measured near the entry of the carburetor or inlet air system of the engine. These conditions include inlet air temperature, wet bulb temperature and actual barometric pressure.

<u>Observed Torque</u> is the measured torque value while the engine is running. It typically uses a calibrated load cell. This load cell measures the work the engine is doing in real time. The observed torque value is then used in calculating the observed horsepower value. <u>Observed Horsepower</u> represents how fast the work (generated by the engine) is being done. This is calculated by the following formula (observed torque * rpm)/5252.

<u>Observed Barometric Pressure</u> is atmospheric pressure measured near the engine air inlet. <u>Observed Inlet Air Temperature</u> is self explanatory.

Wet Bulb Temperature is the temperature achieved by evaporating water into the observed inlet air. This is accomplished by using a wick with one end in a vessel containing water and the other connected to a thermometer or thermocouple. This reading is used in calculating vapor pressure, humidity and, ultimately, correction factor. <u>Corrected Torque</u> is the measured torque times the correction factor.

<u>Corrected Horsepower</u> is the measured horsepower times the correction factor. <u>Corrected Barometric Pressure</u> is the observed barometric pressure minus the corrected vapor pressure.

<u>Standard Barometric Pressure</u> is stated in the definition of the correction factor.

Load Cell is an electronic device capable of measuring force.

<u>Brake Horsepower</u> is useful power determined from the engine (no other power train losses); can be observed or corrected.

BASIC ENGINE PERFORMANCE AND ATMOSPHERIC CONDITIONS

Engines utilize fuel and air, and apply a form of combustion to convert the power stored in fuel into usable work. The air contains oxygen; this is the element that supports the combustion process. Cool dry air contains more oxygen molecules within a constant volume and pressure. As barometric pressure increases, additional oxygen molecules are present (maintaining a constant volume).

For example, if an engine was tested on a cool January day where the barometric pressure was relatively high, observed engine performance will be better than the same engine tested on a hot, muggy August day when a storm was coming in. Also, engine tests performed in higher altitudes have lower observed barometric pressure and engine performance is lower.

CORRECTION FACTORS

Several correction factors exist and this article will deal with two of them.

- (1) SAE J1349, June 1990 Data corrected to 77° F and 29.31 in Hg 85% efficiency.
- (2) SAE J607, Data corrected to 60° F and 29.92 in Hg.

SAE J1349

This formula utilizes the observed inlet air temperature and wet bulb readings to calculate saturated, current and corrected vapor pressure. The corrected vapor pressure is subtracted from the observed barometric pressure. It is subtracted because this pressure is due to water vapor in the air. This yields corrected barometric pressure.

The conditions for correction are 77° F and barometric pressure of 29.31 inches of mercury. Once the corrected barometric pressure is calculated and the observed inlet air temperature is known, those values are plugged into the following formula. The correction factor formula is:

C.F. = 1.18 #[(29.31/Corrected Barometric Pressure) * {(Observed Inlet Air Temp+460)/ (537)} ^.5]-.18

SAE J607

This formula utilizes the observed inlet air temperature and wet bulb readings to calculate saturated, current and corrected vapor pressure. The corrected vapor pressure is subtracted from the observed barometric pressure. It is subtracted because the pressure is due to water vapor in the air. This yields corrected barometric pressure. The conditions for correction are 60° F and barometric pressure of 29.92 inches of mercury. Once the corrected barometric pressure is calculated and the observed inlet air temperature is known, those values are plugged into the following formula. The correction factor formula is:

C.F. = [(29.92/Corrected Barometric Pressure) ^1.2 * {(Observed Inlet Air Temp+460)/ (520)} ^.6]

SUMMARY

Once a correction factor is calculated, the observed numbers are multiplied by it. These are the "corrected values." Undoubtedly, the best scenario is to test under the exact same conditions each time. If that is not achievable, a good rule of thumb is that engines corrected to the SAE J607 standard will yield corrected torque and power numbers approximately 4% higher than those corrected to SAE J1349. Unfortunately, SAE J607 conditions are not very realistic. The most commonly accepted standard is the SAE J1349. This corrects to a more practical set of atmospheric conditions and utilizes coefficients to compensate for an 85% mechanical efficiency. Please note temperature is converted Rankin degrees in both formulas.

CRATE ENGINES

*Not legal for sale or use on pollution-controlled motor vehicles. **Direct replacement part. See pages 2-8 for important safety, emissions and warranty information.

ENGINE BLOCKS



STOCK 302

1969-70 BOSS 302

FR BOSS 302







	STOCK 302	1969-70 BOSS 302	FR B0SS 302	
Main caps	2-bolt cast iron	4-bolt cast iron (2,3,4)	4-bolt nodular iron machined splayed (2,3,4)	
Siamese bore	amese bore No No		Yes with engineered cross drilling	
Freeze plugs	reeze plugs Press Screw in tapered pipe thread		Screw in O-ring sealed straight thread	
Material	laterial Cast iron Cast iron		Diesel grade heat treated cast iron	
Head bolts	7/16"	7/16"	1/2"	
Recommended Max. Bore	4.030"	4.030"	4.125"	
Front oil crossover for lifter galley	No	No	Yes	
Main bolts	7/16"	7/16" (all) 3/8" outer (2,3,4)	1/2" (all) 3/8" outer (2,3,4)	
Oil galley plugs	Pipe thread and press in	Pipe thread	Screw in O-ring sealed straight thread	
Hydraulic roller compatible	Yes	No	Yes	
Clutch cross shaft pivot hole	No	Yes	Yes	
Rear main seal	1-piece	2-piece	1-piece	
CID capacity	347	347	363	

Need Ford technical information on Performance Parts?

Call the Techline (800) FORD788 or visit our website at www.fordracingparts.com





BOSS 302 CYLINDER BLOCK M-6010-B0SS302*

The legend is reborn with this all new 302 block! Stronger than the original!

- 4.125" bore capacity, finished at 3.990" to 3.995" rough bore
- 8.2" deck height, finished at 8.200" plus .010" to .015"
- Maximum recommended stroke 3.400"
- Splayed 4-bolt main on 2, 3, 4, main caps
- 2-bolt main on first and fifth main caps
- · Main bearing bores finished to low limit
- Finished lifter bores
- · Machined to accept factory roller lifter guides and lifter guide retainer
- Fits factory Mustang oil pan with custom oil pickup tube
- Revised oiling and cooling system passageways
- · Siamese bore with drilled coolant crossover holes
- Increased bulkhead material
- Threaded core and galley plugs (straight thread port plugs with O-ring)
- ½" head bolts M-6065-BOSS recommended with M-6049-X306 heads
- Uses common OD cam bearings M-6261-J351/R351
- Unique cam plug M-6026-S351 included
- M-6051-S331 or M-6051-CP331 head gasket recommended
- Weighs approximately 175 lbs.
- Great price and value
- The foundation for 8.2" deck projects

BOSS 302 OIL PICKUP TUBE M-6622-B0SS302*

- For use with M-6010-BOSS302 block
- Clears 4-bolt main caps
- Fits stock Fox body Mustang pans
- Fits FISE pans used on 1991-95 Mustangs

351 ALUMINUM RACE BLOCK M-6010-C450* 7075 Aluminum Main Caps M-6010-C451* Billet Steel Main Caps

• 4" to 4.125" bore capacity

- Centrifugally cast liners
- · All aluminum water jacket and oil galley plugs
- 9.2" deck height
- · 4-bolt main journals one through five
- Dry sump design
- 2.750" main bearing journals
- Enclosed cam tunnel
- Light-weight at only 92 lbs.
- Recommended for Dirt late model, Sprint, 410 Sprint
- Use with M-6701-B351 crankshaft seal, M-6269-C450 cam thrust retainer.
- M-6268-C450 timing chain and gear set,
- M-6059-C450 timing cover, and
- M-6261-C450 cam bearings

OIL GALLERY RESTRICTOR KITS

M-6799-A302* 289/302/351W M-6799-R351* 351 Ford Racing M-6010-R351/R352/ S351/V351/W351

Increases oil flow to main bearings by reducing oil to valve train.





M-6799-A302 shown

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ENGINE BLOCKS

351 SIAMESE BORE WET SUMP BLOCK

M-6010-V351* 9.200" Deck Height

- Cast iron block with 4-bolt main caps on journals 2, 3, 4, 5 and strengthened structural sections
- Nodular iron main caps
- Can be bored/stroked to produce 427 cu. in.
- Siamese cylinder bores
- Bore range from 4.000-4.125"
- Wet sump oiling design
- 2.749" main journal diameter (stock 351C size)
- · Weighs approximately 190 lbs.
- For professional competition (Circle Track, Drag Racing)
- Semi-finished lifter bores and main bearing bores—must be honed to fit
- Uses common OD cam bearings M-6261-J351/R351. See page 102
- Requires cam plug M-6026-S351 included

351 SIAMESE BORE WET SUMP BLOCK

- M-6010-W351* 9.500" Deck Height
- · Cast iron block with 4-bolt main caps
- on journals 2, 3, 4, 5 and strengthened structural sections Nodular iron main caps
- Can be bored/stroked to produce 454 cu. in.
- Siamese cylinder bores
- Bore range from 4.000-4.125"
- · Wet sump oiling design
- 2.749" main journal diameter (stock 351C size)
 Weighs approximately 205 lbs.
- For professional competition (Circle Track, Drag Racing)
- Semi-finished lifter bores and main bearing bores-must be honed to fit
- Uses common OD cam bearings M-6261-J351/R351. See page 102
- Requires cam plug M-6026-S351 included



NOTE: Siamese blocks are solid casting between the cylinder bores. There are no water passages between them. This is done to increase the strength of the block.

351 SIAMESE BORE DRY SUMP BLOCK

- M-6010-R452* 9.200" Deck Height
- 4.180" Overbore Capacity
- Cast iron block with 4-bolt main caps and strengthened structural sections
- Nodular iron main caps
- Can be bored/stroked to produce 434 cu. in. •
- Siamese cylinder bores
- Bore range from 4.000-4.180"
- Dry sump oiling design
- 2.248" main journal diameter (stock 302 size)
- Weighs approximately 190 lbs.
- For professional competition (NASCAR)
- Semi-finished lifter bores and main bearing bores-must be honed to fit
- Uses common OD cam bearings M-6261-J351/R351. See page 102
- Requires cam plug M-6026-S351 included



351 "SPORTSMAN" WET SUMP BLOCK M-6010-C58*

- · Cast iron block with nodular iron 2-bolt main caps
- Can be bored/stroked to produce 427 cu. in.
- Siamese cylinder bores—cross drilled for cooling
 Bore range from 4.000-4.030"
- Wet sump oiling design
- 3.000" main journal diameter
- · Weighs approximately 200 lbs.
- Uses common OD cam bearings M-6261-J351/R351. See page 102







460 SIAMESE BORE WET OR DRY SUMP BLOCK

M-6010-A460* 10.322" Deck Height

- Cast iron block with 4-bolt main caps on journals 2, 3, and 4
- Nodular iron main caps
- Can be bored/stroked to produce 598 cu. in.
- Siamese cylinder bores
- Bore range from 4.360-4.600"
- Wet sump oiling design
- 3.000" main journal diameter
- Weighs approximately 290 lbs.
- High-strength block for professional competition (Circle Track, Drag Racing)

460 PRO STOCK BLOCK

M-6010-A500* 9.300" Deck Height

- Cast iron block with 4-bolt main caps
- Billet steel main caps
- Can be bored/stroked to produce 500 cu. in.
- Siamese cylinder bores
- Bore range from 4.360-4.625"
- Dry sump oiling design
- 2.749" main journal diameter
- High-strength block for professional competition (Built specifically for Pro-Stock Drag Racing)
- Semi-finished block





351 FORD RACING NON-SIAMESE BORE WET OR DRY SUMP BLOCK

M-6010-M351* 9.200" Deck Height

- Cast iron block with 4-bolt main caps on journals 2, 3, and 4
- Nodular iron main caps
- Can be bored/stroked to produce 408 cu. in.
- Non-siamese cylinder bores
- Bore range from 4.000-4.030"
- Wet sump oiling design
- 2.749" main journal diameter
- Weighs approximately 200 lbs.
- High-strength block for professional competition (Circle Track, Drag Racing)
- Semi-finished main bearing bores and lifter bores—must be honed to fit

351 FORD RACING NON-SIAMESE BORE WET OR DRY SUMP BLOCK

M-6010-N351* 9.500" Deck Height

- Cast iron block with 4-bolt main caps on journals 2, 3, and 4
- Nodular iron main caps
- Can be bored/stroked to produce 434 cu. in.
- Non-siamese cylinder bores
- Bore range from 4.000-4.030"
- Wet sump oiling design
- 2.749" main journal diameter
- · Weighs approximately 205 lbs.
- High-strength block for professional competition (Circle Track, Drag Racing)
- · Semi-finished main bearing bores and lifter bores-must be honed to fit



NOTE: Siamese blocks are solid casting between the cylinder bores. There are no water passages between them. This is done to increase the strength of the block.

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ENGINE BLOCKS

ENGINE GROUP PART NUMBER	302 FORD M-6010-B0SS302*	351 FORD M-6010-C450/C451	351 FORD M-6010-C58*	351 FORD M-6010-M351*	351 FORD M-6010-N351*
Description/Intended Usage	Professional Competition	Professional Competition	Amateur Competition	Professional Competition	Professional Competition
Block Material	Cast Iron	Aluminum	Cast Iron	Cast Iron	Cast Iron
Nominal Deck Height	8.206"	9.200"	9.500"	9.200"	9.500"
CID Capacity	363	427	408	408	434
Cylinder Design	Siamese	Siamese	Siamese	Non-Siamese	Non-Siamese
Cylinder Bore Range	4.000-4.125"	4.000-4.125"	4.000-4.030"	4.000-4.030"	4.000-4.030"
Dil Sump Design	Wet	Dry	Wet	Wet	Wet
Crankshaft Journal Diameter	2.2480"	2.750"	3.0000"	2.7490"	2.7490"
Vain Cap Bolts	Four on 2,3,4	Four	Two	Four on 2,3,4	Four on 2,3,4
Bearing Cap Material	Nodular Iron	C450 7075 Aluminum/ C451 Billet Steel	Nodular Iron	Nodular Iron	Nodular Iron
Recommended Max. Stroke	3.400"	4.00"	4.000"	4.000"	4.250"
Rear Crankshaft Seal Type	One Piece	One Piece	One Piece	One Piece	One Piece
Cam Bearing Design	M-6261-R351 Common Journal Dia. Cam Req'd. M-6261-J351 Standard Cam	M-6261-C450 Common Journal Dia. Cam Req'd.	M-6261-R351 Std. Common Journal Dia. Cam Req'd. M-6261-J351 Standard Cam		Std.
Dil Filter Mount	Block	Remote	Block	Block	Block
lyd. Roller Cam. Compatible	Yes	No	Yes	-	-
Cam Plug	M-6026-S351	-	M-6026-S351	-	_
Engine group Part number	351 FORD M-6010-R452*	351 FORD <mark>M-6010-V351</mark> *	351 FORD M-6010-W351*	460 FORD M-6010-A460*	460 FORD M-6010-A500*
Description/Intended Usage	Professional Competition	Professional Competition	Professional Competition	Professional Competition	Professional Competition
Block Material	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Nominal Deck Height	9.200"	9.200"	9.500"	10.322"	9.300"
CID Capacity	427	427	454	598	537
Cylinder Design	Siamese	Siamese	Siamese	Siamese	Siamese Sleeves
Cylinder Bore Range	4.000-4.180"	4.000-4.125"	4.000-4.125"	4.360-4.600"	4.360-4.625"
Dil Sump Design	Dry	Wet	Wet	Wet	Dry
Crankshaft Journal Diameter	2.248"	2.749"	2.749"	3.000"	2.749"
Vain Cap Bolts	Four	Four on 2,3,4,5	Four on 2,3,4,5	Four on 2,3,4	Four
Bearing Cap Material	Nodular Iron	Nodular Iron	Nodular Iron	Nodular Iron	Billet Steel
Recommended Max. Stroke	4.000"	4.000"	4.250"	4.500"	4.000"
Rear Crankshaft Seal Type	One Piece	One Piece	One Piece	Two Piece	Two Piece
Cam Bearing Design	M-6261-R351	M-6261-R351	M-6261-R351	Std.	Roller
San soanny besign	Common Journal Dia. Cam Req'd. M-6261-J351 Standard Cam	Common Journal Dia. Cam Req'd. M-6261-J351 Standard Cam	Common Journal Dia. Cam Req'd. M-6261-J351 Standard Cam	υι υ .	
Oil Filter Mount	Remote	Remote	Remote	Block	Remote
Hyd. Roller Cam Compatible	Yes	Yes	Yes	-	_
Cam Plug	M-6026-S351	M-6026-S351	M-6026-S351	_	_

CAMSHAFT BEARINGS

M-6261-R351* 351 Ford Racing Blocks Common outer and inner diameter replacement cam bearings for use in M-6010-R302/S302/ R351/R352/S351/V351/W351/R451/R452/R453/ C58/BOSS302. Use with custom ground common OD camshaft.

M-6261-J351*

Common outer diameter service replacement cam bearings for Ford Racing 302 and 351 aluminum cylinder blocks and M-6010-R302/S302/R351/R352/ S351/V351/W351/R451/R452/R453/C58/B0SS302 cast iron blocks. Use with standard camshaft.



CAMSHAFT BEARINGS – ROLLER (SOLD IN ENGINE SETS)

These low-friction, roller camshaft bearings only require oil "splash" lubrication. Oil feed holes can be totally blocked off, to reduce oil aeration and windage losses. Engine block must be machined to accept bearing size shown in chart. **NOTE:** The 351 cam journals are NOT production dimensions. The 429-460 dimensions are production. These roller

bearings require an SAE 8620 steel camshaft.



PART NUMBER	APPLICATION	OD DESCRIPTION	ID DESCRIPTION	LENGTH
M-6261-C351*	302/351W 351 Ford Racing	2.283"	2.051"	0.625"
M-6261-A460*	429/460 Wedge	2.500"	2.125"	0.625"
M-6261-D351* ①	351 Ford	(1-4) 2.48" (5) 2.28"	(1-4) 2.165" (5) 1.969"	0.787"

NOTES: ① Requires special camshaft retainer plate sold separately.



"TURBO-SWIRL" ALUMINUM CYLINDER HEADS

M-6049-X306³ Complete Head (64 cc Chamber) M-6049-X307* Complete Head (58 cc Chamber)





THE FAST, EASY WAY TO BOLT ON 65 HORSEPOWER! TRUE BOLT-ON PERFORMANCE

- For use on 289/302/351 Windsor-style engines
 - Improved air flow over original GT-40 aluminum heads
- Intake flows approximately 240 cfm at .550" lift (at 28" of H20)
- Exhaust flows approximately 170 cfm at .500" lift (at 28" of H₂0)
- Machined for 1.94" intake and 1.54" exhaust valve diameters
- Unlike some aftermarket heads our GT-40 heads use either GT-40 or aftermarket performance: intake manifolds, headers and valve covers
- Intake port volume 178 cc, exhaust port volume 62 cc
- High temperature exhaust valve seats. Thick deck for improved sealing, increased section thickness in critical areas for porting and webbed rocker bosses for improved strength. Designed for bolt-on rocker arms, machined for tapered seat spark plug or gasketed. Compatible with Ford Racing intakes, headers and valve train components. Can be machined for diagonal exhaust header flange mounting

- High-quality original equipment style 356-T6 aluminum castings, machining and components
 - Each aluminum head weighs approximately 22 lbs. - approximately 25 lbs. lighter than each cast iron GT-40 head
- These GT-40 style heads use AGSF-32C spark plugs
- Each GT-40X head is leak tested prior to assembly ٠ Assembled with M-6507-J302 intake valves, M-6505-G302 exhaust valves, M-6513-A50 valve springs. The valve springs are compatible with all
- Ford Racing roller camshafts • Designed to be used on the M-6010-BOSS302 block with head gasket M-6051-CP331

INSTALLATION NOTES

- Will not fit 1986 5.0L with flat-top pistons unless pistons are notched for valve relief
- Must use head bolt kit M-6065-D289 to install cylinder heads on 289/302 blocks or head bolt and head gasket kit M-6051-A50 and intake gasket M-9439-A50/A51
- Check rocker arm clearance to valve springs with production rocker arms
- Check your intake manifold for port match; not all intakes are compatible due to the tall high-flow ports • Must use M-9439-A50 intake gasket

FORD RACING PERFORMANCE PARTS "Z" ALUMINUM HEAD

M-6049-Z304D* Bare Head M-6049-Z304DA* Complete Head M-6049-Z304P* CNC Ported Head





- **BARE HEAD FEATURES**
- This cylinder head was designed using Solid Modeling Technology
- Cast from prime A356 T6 aluminum
- Fits 5.0L/5.8L Windsor engines
- · Heads are cast with high-flow ports
- 20 degree inline valves
- Suggested valve sizes: 2.02" intake • and 1.60" exhaust
- Requires competition valve job and bowl blending
- Steel alloy intake and exhaust valve seats installed (no valve job)
- Manganese-bronze valve guides installed with semi-finished ID
- 63cc CNC'd combustion chamber
- Intake port volume as cast: 204 cc
- Exhaust port volume as cast: 85 cc
- · Bare head weighs 27 lbs.
- Accepts both tapered seat and gasket • style 14 mm spark plugs (Motorcraft AGSP-32-PP, Autolite 3924, 3925)
- Requires guide plate M-6566-Z304D (not included)
- Requires 7/16" screw-in studs (not included)
- Requires M-6564-F351 roller rocker arms (not included)
- Uses M-6505-B304 exhaust valve and M-6507-A304 intake valve (not included)
- · Raised exhaust port exit, custom headers may be required

ASSEMBLED HEAD FEATURES

 Premium stainless steel 2.02" intake M-6507-A304 and 1.60" M-6505-B304 exhaust valves

- Uses M-6513-BH Beehive style valve springs with machined retainers and machined valve locks. Most hydraulic cams can be used with these springs. 130lbs @ 1.800", 293 lbs. @ 1.200" and CB @ 1.085"
- Includes laser cut guide plates M-6566-Z304D for use with 5/16" pushrods and 7/16" rocker studs
- Requires M-6564-F351 roller rocker arms (not included)
- Check piston to valve clearance including radial valve clearance before installing these cylinder heads on your engine

· Cork valve cover gasket recommended **PORTED HEAD FEATURES**

- CNC ported version of M-6049-Z304D cylinder head to increase flow on intake and exhaust
- Intake and exhaust airflow increased approximately 10%
- Bare casting

TYPICAL AIRFLOW (@ 28" OF H₂O DEPRESSION) WITH 2.02 INTAKE VALVE, 1.60 EXHAUST VALVE AND COMPETITION VALVE JOB

LIFT	INTAKE As cast	FLOW CNC	EXHAUST AS CAST	FLOW CNC
.050	31.1	34.4	26.4	30.5
.100	64.6	68.7	55.8	61.0
.150	103.0	108.7	84.6	85.7
.200	135.3	148.7	113.3	110.4
.250	167.0	187.0	146.8	134.6
.300	199.0	225.3	171.6	158.8
.350	227.2	251.7	190.2	175.2
.400	245.2	278.1	200.4	191.7
.450	259.8	296.1	207.2	206.6
.500	271.9	314.1	212.8	221.5
.550	277.3	319.7	218.1	227.7

**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.

ENGINE COMPONENTS

FORD RACING "SPORTSMAN" SHORT TRACK CAST IRON CYLINDER HEADS

M-6049-N351* Bare Head (64 cc Chamber)



- For use in NASCAR Late Model Stock, I.M.C.A., D.I.R.T., and most other stock car sanctioning groups on 351W engines
- Much improved air flow over previous E351 heads
- Developed by Ford Racing with the help of Larry Lackey and Robert Yates of Robert Yates RacingMachined for 2.02" intake
- and 1.60" exhaust valve diameters
- Intake and exhaust valves have been moved .070" to unshroud the intake valve
- Valve angle changed from 20° to 10° to further improve air flow
- Intake port volume 195 cc, exhaust port volume 78 cc nominal
- Accepts stud girdle M-6569-C351
- Thick deck and reinforced structure for improved sealing, increased section thickness in critical areas and webbed rocker bosses for improved strength. Designed for stud mount rocker arms. Compatible with stock and Ford Racing intakes
- These heads use .708" reach tapered seat spark plugs depending on application

INSTALLATION NOTES

- Requires M-6564-F351/J351 roller rocker arms with offset intake valve pushrod cup
- Unique header flange required
- Must use head bolt kit M-6065-C351 to install cylinder heads

Parts to assemble M-	6049-N351*:
M-6566-D351*	Pushrod guideplate
	(pkg. of 8)
M-6527-C311*	Rocker arm studs
	(pkg. of 16)
M-6505-A351*	High-flow stainless
	steel exhaust valve
M-6507-A351*	High-flow stainless
	steel intake valve
M-6514-A50*	Retainers (pkg. of 16)

HIGH-PORT HEAD M-6049-SC1*

- Unfinished combustion chambers, typical finished volumes range from 40 cc to 70 cc
 Raised intake and exhaust runners for better airflow and greater power
- Fits 302 and 351 Ford Racing blocks
- Used for Drag, Sprint Car and Circle Track Racing
- Intake and exhaust runner raised .400" over "Yates" C3 head for better flow characteristics
- Intake valves up to 2.180" diameter, 5.685" long
- Exhaust valves up to 1.625" diameter, 5.565" long
- Redesigned integral rocker pad for greater stiffness
- Uses M-9424-W352 intake manifold with 9.200" deck block
- Uses Motorcraft AGS-Series spark plugs
- Cylinder head comes semi-finished. Machining does not include valve seat bores
- Must be ported
- · Bronze guides and valve seats included

HIGH-PORT NASCAR HEAD M-6049-D3*

- M-6049-D35* Without seats, guides or pushrod holes
- Fits 5.0L and 5.8L Ford Racing blocks
- Raised intake and exhaust ports
- Used primarily in NASCAR and ARCA racing
- Intake and exhaust runners raised .400" over "Yates" C3 head
- Capable of 400 CFM intake, 267 CFM exhaust
 Accepts intake valves up to 2.180" diameter, exhaust valves up to 1.625" diameter
- Integral rocker pad for greater stiffness
- Cylinder head comes semi-finished. Combustion chamber and ports, unfinished
- · Bronze guides and valve seat inserts included (not installed)
- Intake manifold mounting bolt holes 90° to mounting flange
- Use with M-9424-D451 or D452 intake manifold











**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.

SUPER COBRA JET CYLINDER HEADS

- M-6049-SCJ* Bare Head M-6049-SCJA* Assembled Head for 429-460 Engines M-6049-SCJB* Assembled Head for 514 Engines
- · Revised valve angles and locations to reduce cylinder wall shrouding and improve flow
- Redesigned combustion chambers to accommodate the more centrally located valves
- Uses same valves, valve springs, retainers and standard 7/16" stud mounted roller rockers as Ford Racing 429 Cobra Jet cylinder heads. Requires new pushrod guide plates (M-6566-SCJ) and new pushrods, M-6565-P460 or R460
- Standard Cobra Jet intake and exhaust manifolds bolt on
- · Current valve covers fit
- 2.200" intake valve, 1.76" exhaust valve
- · Flows approximately 330 cfm intake and 225 cfm exhaust
- 72 cc combustion chambers
- 290 cc intake runner,
- 148 cc exhaust runner
- 25-50 hp increase over Ford Racing aluminum Cobra Jet heads depending on displacement and camshaft
- The best street/strip Ford big block cylinder head on the market today!
- Uses Motorcraft AGSP series spark plugs

NOTE: If replacing Ford Racing or production Cobra Jet heads, new intake valve notches are required.









VALVE TRAIN COMPONENTS INSTALLED IN M-6049-B429/SCJA* "COBRA JET" AND "SUPER COBRA JET" CYLINDER HEADS

PART NUMBER	DESCRIPTION	NOTES
M-6507-B429*	Intake Valve	Stainless Steel (2.20" dia.)
M-6505-A429*	Exhaust Valve	Stainless Steel (1.76" dia.)
M-6536-E351	Valve Spring Seat for CJ	1.460" OD springs
M-6513-A351	Valve Springs ${}_{}$	For use with Ford Racing hydraulic camshaft M-6250-A443. Spring load: 130 lbs.–closed, 375 lbs.–open. For other camshafts, follow manufacturer's recommendations.
M-6514-A50	Valve Spring Retainers	7° Retainers
M-6518-B351	Valve Spring Keepers	Use with 7° retainers.
M-6527-C311	Rocker Arm Studs	7/16" with or without stud girdle. (Engine Set)
M-6566-SCJ*	Pushrod Guide Plates for SCJ	Flat design for .375" dia. pushrods. (Engine Set)
M-6536-SCJ*	Valve Spring Seat for SCJ	Spring OD 1.460", Cup OD 1.680", Cup ID .577", Material machined steel, Thickness .062"

NOTE: 10 CJ cylinder head accepts valve springs with up to 1.625" OD and installed height of 1.900".

2.3L ALUMINUM CYLINDER HEAD

M-6049-A230* Competition only aluminum cylinder head M-6049-E23A* D-Port aluminum head Available from: Esslinger Engineering 14320 Potrero South El Monte, CA 91733 Telephone: (626) 444-4919

4.9L 6-CYLINDER RACE HEAD M-6049-149*

High-flow aluminum drag race only cylinder head for 4.9L inline 6-cylinder. No water passages in cylinder head. NHRA accepted for Competition Eliminator as OEM generally available. Order through Alan Johnson Cylinder Heads (805) 922-1202.

**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.

ENGINE COMPONENTS

FORD RACING 460 "SPORTSMAN" WEDGE-STYLE CYLINDER HEADS M-6049-C460

- For use with M-6010-A460 Ford Racing cylinder block
- Used for professional competition and serious "Sportsman" racers
- Made from 356-T6 aluminum, with bronze valve guides, and a premium valve seat
- insert material compatible with titanium valves • Valve angles are 7.5° intake, 8.0° exhaust with no side cant
- Raised intake and exhaust ports
- 65 cc wedge-style combustion chamber
 4.600" recommended bore size (4.500" minimum)
- 2.450" intake, 1.900" exhaust recommended diameters
- Port and combustion chamber design based on Ford Racing 351 "Yates" cylinder head







NHRA PRO STOCK CYLINDER HEAD M-6049-E460*

- Made from 356-T6 Aluminum
- Raw casting





M-9486-A51* Stock 5.0L Manifold - .5" M-9486-A52* GT-40 Manifold - .5" M-9486-A53* GT-40 Manifold - 1" thick for clearance with M-6582-E302P Valve Covers

New and improved quality, made in the USA. CNC machined from Westinghouse. Type C phenolic material fits between the upper and lower manifolds to help dissipate heat and significantly increase performance. Includes longer bolts.



EFI UPPER-TO-LOWER INTAKE MANIFOLD GASKET M-9486-A50*

GT-40 upper to lower gasket. Fits M-9424-Z51 or M-9424-Z51P intake manifold.



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**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.

ENGINE COMPONENTS

INTAKE MANIFOLDS

289/302 DUAL PLANE **INTAKE MANIFOLD** M-9424-F302

- · For use with 8.206" deck height block and inline valve heads
- 4.375" at the front of the carburetor pad, 5.250" at the rear
- Dual plane intake
- 1500-6000 rpm range
- For use with mid-rpm small block application,
- great for street cars and mild race engines • Excellent fuel distribution
- Does not fit "Z" or the GT-40 "X" heads



CHROME APPEARANCE 289/302 "PERFORMER RPM" INTAKE

M-9424-E302C*

- Same as M-9424-E302 with powdercoat for chrome appearance
- For use with 8.206" deck height block and inline valve heads
- 4.30" at the front of the carburetor pad. 5.50" at the rear
- Dual plane "Performer RPM" style intake
- 1500-6500 rpm range
- For use with mid-rpm
- small block application, great for street cars and mild race engines



351W SINGLE PLANE "VICTOR JR." INTAKE MANIFOLD M-9424-V3513

- For use with 9.500" deck height block and inline valve heads
- 5.75" carburetor pad
- Single plane "Victor Jr." style intake
- 3500-7500 rpm range • For use with high-rpm small block application

429/460 SINGLE PLANE **DOMINATOR FLANGE INTAKE MANIFOLD**

- M-9424-H429
- For use with 10.322" deck height block and production and Ford Racing CJ/SCJ heads
- 6.30" carburetor pad • Single plane "Victor" style intake
- 3500-8000 rpm range with Dominator carburetor flange
- For use with high-rpm big block application



289/302 POLISHED DUAL PLANE **INTAKE MANIFOLD** M-9424-A302P



- · For use with standard 302 cylinder blocks and heads
- 4.20" at the front of the carb pad, 5.50" at the rear
- Dual plane intake 1500-6500 rpm range
- Great for street rods, mild race engines and any mid-rpm 289-302 application



289/302 SINGLE PLANE "VICTOR JR." **INTAKE MANIFOLD**

M-9424-D302*

- For use with 8.206" deck height block and inline valve heads 5.35" at the front of the carburetor pad,
- 5.42" at the rear Single plane "Victor Jr."
- style intake 3500-8000 rpm range • For use with high-rpm
- small block application



429/460 SINGLE PLANE **"VICTOR JR." INTAKE** MANIFOLD M-9424-G429

- · For use with 10.322" deck height block and production or

- 3500-8000 rpm range
- For use with high-rpm big block application

429/460 DUAL PLANE INTAKE MANIFOLD M-9424-J429

• For use with 10.322" deck height block and

- production or Ford Racing CJ/SCJ heads • 5.84" carburetor pad height
- Dual plane "Performer RPM" style intake with standard Holley carburetor flange
- 1500-6500 rpm range



460/460 FORD RACING SINGLE PLANE INTAKE MANIFOLD

- M-9424-C460*
- For use with 10.322" deck height block and M-6049-C460 "wedge" race heads
- 8.64" carburetor pad height
- High-rpm power
- · For use on drag race engines



108 Techline (800) FORD788

**Direct replacement part. *Not legal for sale or use on pollution-controlled motor vehicles. See pages 2-8 for important safety, emissions and warranty information.

Ford Racing CJ/SCJ heads 6.30" carburetor pad Single plane "Victor Jr." style intake



351 FORD RACING SINGLE PLANE D3 NASCAR RESTRICTOR INTAKE M-9424-D451³

- For use with 9.200" deck height block and M-6049-D3 heads and restrictor plate
- 6.40" carburetor pad
- Single plane intake used for NASCAR restrictor plate rule.
- With extra material for runner modification



351 FORD RACING SINGLE PLANE INTAKE MANIFOLD M-9424-D452*

- The latest intake manifold for NASCAR
- Fits 9.200" deck height blocks with M-6049-D3/D35 heads
- Weighs 19 lbs. with generous wall thickness for custom porting
- 4.00" depth carb. flange to plenum floor
- Tuned for substantial power improvement over 8500 rpm compared to other aftermarket manifolds
- · Does not have a valley tray (for weight reductions)
- Replaces M-9424-W351



351 FORD RACING SINGLE PLANE INTAKE MANIFOLD M-9424-D453

- The latest intake manifold for NASCAR
- Fits 9.200" deck height blocks with M-6049-D3/D35 heads
- Weighs 19 lbs. with generous wall thickness for custom porting
- 4.00" depth carb. flange to plenum floor
- Tuned for substantial power improvement over 8500 rpm compared to other aftermarket intakes
- Does not have valley tray (for weight reductions)
- Accommodates Busch and Truck tuning ranges



INTAKE MANIFOLD -ALUMINUM WITH HOLLEY 4V BOLT PATTERN

Ford Racing offers 4V single plane and dual plane intake manifolds in low and high designs. Note that the 351 Ford Racing engine block is available in two deck heights (9.200" and 9.500"). The carburetor pad dimensions are listed to assist in calculating underhood clearance.



Carburetor Pad Dimensions

ENGINE COMPONENTS

PART NUMBER	ENGINE BLOCK	DECK HEIGHT	CYLINDER HEADS	"A"	"B"	TYPE/NOTES
M-9424-C460*	Ford Racing 460	10.322"	M-6049-C460	8.64"	8.64"	Single plane single 4V
M-9424-D302*	289/302	8.206"	Inline Valves	5.35"	5.42"	Single plane, "Victor Jr." 3500-8000 rpm range
M-9424-F302*	302	8.200"	Inline Valves	4.375"	5.25"	Dual plane intake manifold 1500-1600 rpm range
M-9424-G429*	429/460	10.322"	Production & M-6049-A42 B429/SCJ/SCJA/SCJB	29/ 6.30"	6.30"	Single plane, "Victor"
M-9424-H429*	429/460	10.322"	Production & M-6049-A42 B429/SCJ/SCJA/SCJB	29/ 6.30"	6.30"	Single plane, Dominator Flange
M-9424-J429*	429/460	10.322"	M-6049-SCJ/SCJA	5.84"	5.84"	Dual plane, "Performer RPM" 1500-6500 rpm range
M-9424-V351*	351W	9.500"	Inline Valves	5.75"	5.75"	Single plane, "Victor Jr." 3500-7500 rpm range