



**M-6007-A50NA  
5.0L Engine Assembly**

NO PART OF THIS DOCUMENT MAY BE REPRODUCED WITHOUT PRIOR AGREEMENT AND WRITTEN PERMISSION OF FORD RACING PERFORMANCE PARTS



**M-6007-A50NA ENGINE  
SPECIFICATIONS AND OWNER'S MANUAL**

FORDRACINGPARTS.COM

Factory Ford shop manuals are available from Helm Publications, 1-800-782-4356



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Please visit [www.fordracingparts.com](http://www.fordracingparts.com) for the most current instruction information.

**!!! PLEASE READ ALL OF THE FOLLOWING INSTRUCTIONS CAREFULLY PRIOR TO INSTALLATION.  
AT ANY TIME YOU DO NOT UNDERSTAND THE INSTRUCTIONS, PLEASE CALL THE FORD RACING  
TECHLINE AT 1-800-367-3788 !!!**

**Note: Engine is shipped dry with no engine oil; do not start without adding engine oil.  
Pilot bearing is provided but not installed to allow for an automatic transmission.**

### 1) Technical Specifications M-6007-A50NA Crate Engine:

Engine Assembly Part Number	M-6007-A50NA
Engine Type	5.0L 4V TiVCT – 2011 Mustang
Engine Weight	195.5 kg. (431 lbs)
Displacement	4.957L, (302 ci)
Cylinder Block	M-6010-A50L4V
Bore	92.2 mm (3.629 in)
Stroke	92.7 mm (3.649 in)
Firing Order	1-5-4-8-6-3-7-2
Compression Ratio	11:1
Maximum rated rpm	6800 rpm
Spark Plug (0.032 Gap)	M-12405-M50
Crankshaft	Forged Steel, Internal Balance
Vibration Damper	BR3E-6316-JA, Neutral Balance
Connecting Rod (14042R-8)	Manley Forged Steel w/ ARP2000 Bolts
Piston (part # 0930008101)	Mahle Forged, dome
Camshafts	Hydraulic Roller
Cam Timing	Variable
Camshaft Duration Int./Ex.	Intake: 260°, Exhaust 263° Total Duration
Camshaft Lift Int./Ex.	Intake: 12mm, Exhaust 11mm
Rocker Arm	2:1 Ratio
Cylinder Head	Aluminum
Chamber Volume	54.5-57.5 cc
Valve Head Diameter Int./Ex.	37mm (1.45 in) / 31mm (1.22 in)
Oil Filter	M-6731-FL820
Oil Pressure	80 psi @ 70° F/ 650 rpm
Max Oil Temperature	280° F
Engine Oil (8.0 qts.)	Motorcraft SAE 5W-50 Full Synthetic XO-5W50-QGT or equivalent
Engine Coolant	Motorcraft Specialty Orange Engine Coolant VC-3-B (US); CVC-3-B (Canada)
Max Coolant Temperature	230° F

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### 2) Recommended Ford Racing Parts Not Included:

Tuner Supercharger Kit (front cover already machined)	M-6066-MGT23T
5.0L 4V Control Pack (NA calibration)	M-6017-A504V
Colder Spark Plugs (already installed)	M-12405-M50
Power Steering Pump Bracket	M-8511-M50BR
Alternator Kit	M-8600-M50ALT
Remote Oil Filter Adapter	M-6881-M50
Blue Coil Covers	M-6P067-M50B

### 3) Specifications:

Main Bearing Clearance	0.025 - 0.050 mm
Crankshaft End Play	0.110 - 0.280 mm
Connecting Rod Bearing Clearance	0.027 - 0.069 mm
Connecting Rod Side Clearance	0.150 - 0.500 mm
Piston Pin to Connecting Rod Clearance	0.003 - 0.023 mm
Piston Pin to Piston Clearance	0.018 - 0.023 mm
Piston to Bore Clearance	0.020 - 0.040 mm
Piston Ring Gap – Top	0.15 - 0.25 mm
Piston Ring Gap – 2 <sup>nd</sup>	0.30 - 0.55 mm
Piston Ring Gap – Oil Control Segment	0.15 – 0.45 mm
Valve Spring Installed Height	40 mm Intake and Exhaust
Valve Stem to Guide Clearance - Intake	0.020 – 0.069 mm
Valve Stem to Guide Clearance - Exhaust	0.045 – 0.094 mm
Collapsed Lash Adjuster Gap	0.35 – 0.85 mm

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**4) Accessory Drive Belt Layout:**

**5.0L-4V**  
**S197**

**CORRECT BELT INSTALLATION:**  
Belt **FULLY SEATED** In Pulley Grooves and **CENTERED**

**INCORRECT BELT INSTALLATION:**  
Belt **NOT FULLY SEATED** In Pulley

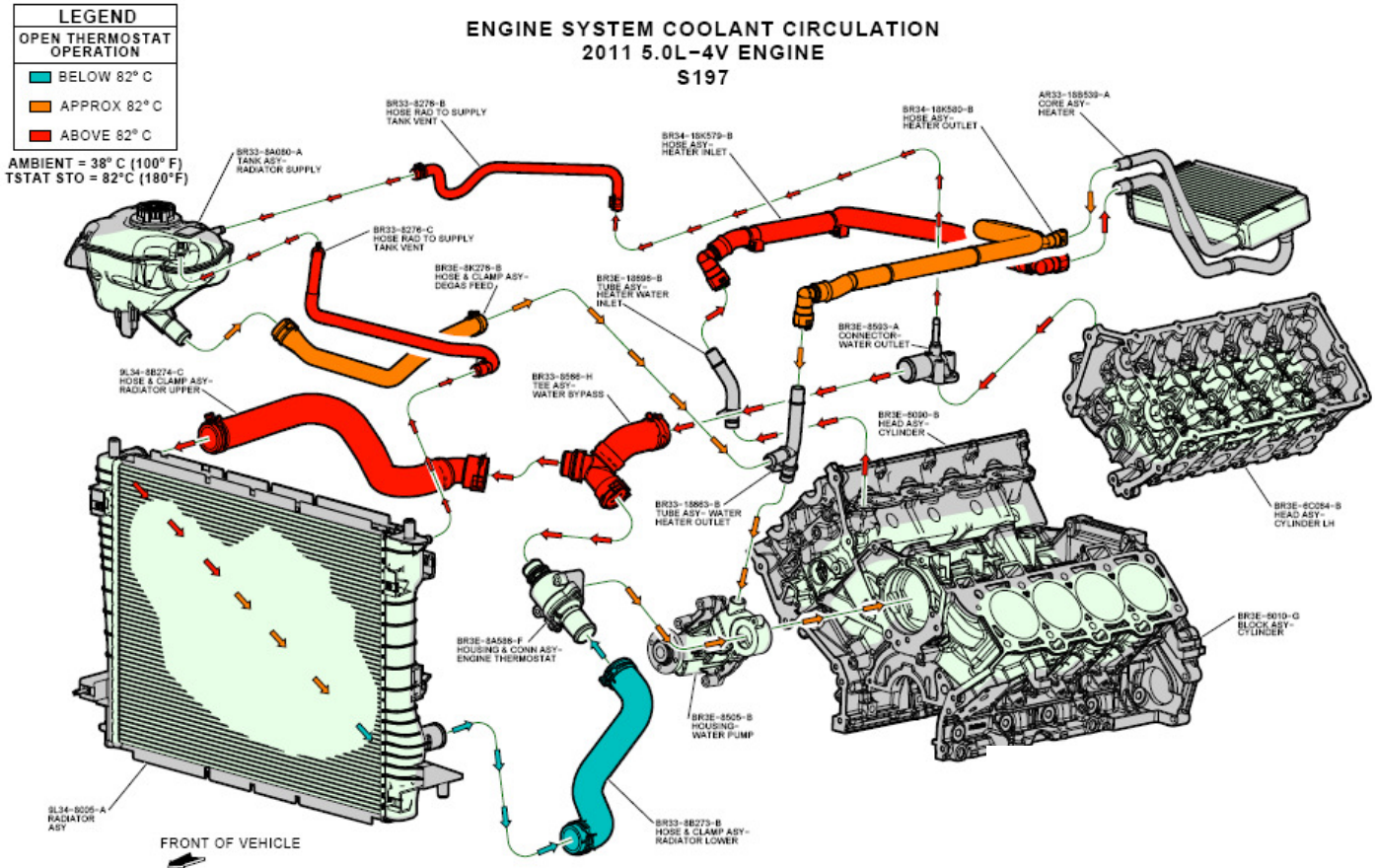
**BELT MUST BE FULLY SEATED ON ALL PULLEYS:**  
BELT ROUTING OVER **ALTERNATOR PULLEY** IS CRITICAL TO PREVENT BELT DAMAGE

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## 5) Coolant Flow Diagram:

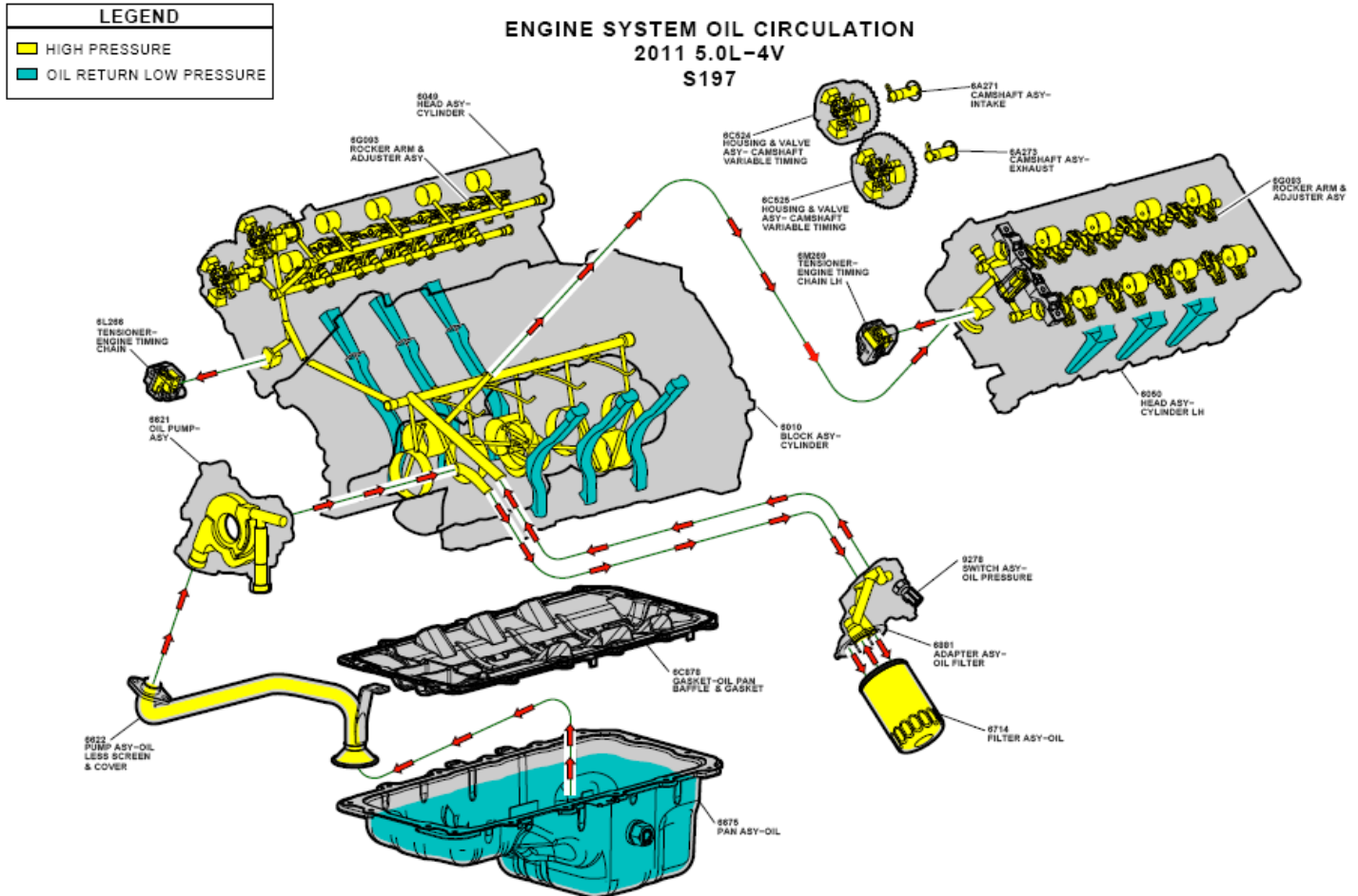
If a heater circuit is not used then the heater supply must be connected to the heater return to allow air to be purged from the right hand cylinder head and provide sufficient coolant flow through the right hand cylinder head. Install a 5/16" (0.3125) diameter restrictor in this hose.



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## 6) Oil Flow Diagram:



**WARNING:** Before installation, prime the engine by removing the oil pressure switch from the filter adapter. Install appropriate fitting and using a pre-lube tank to prime oiling system. Verify that the oil reaches the valve train, valve cover removal may be necessary. Oil at the valve train confirms the engine is primed. Check oil level and fill as necessary.



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### 7) Torque Specifications:

Application	Torque Nm	lb-ft	lb-in	Lubricant
Accessory drive belt tensioner bolt	48	35		
Accessory drive idler pulley	25	18		
A/C compressor bolts	15		133	
Camshaft bearing cap bolts	6 + 45 deg.		53 + 45 deg.	
Camshaft position sensor bolt	10		89	
Catalytic converter to exh. man. nuts	40	30		
Connecting rod cap (.0058 - .0062 stretch)	82		60	Engine oil
Coolant outlet bolts	10		89	
Coolant outlet pipe bolt	10		89	
Coolant pump bolts	20 + 60 deg.		177 + 60 deg.	
Coolant pump pulley bolts	20		177	
Crankshaft main bearing bolts	See illustration			Engine oil
Crankshaft position sensor bolts	10		89	
Crankshaft Damper bolt	See illustration			
Crankshaft rear seal retainer bolts	10 + 45 deg.		89 + 45 deg.	
Cylinder Head bolts	See illustration			Engine oil
Cylinder Head pipe plugs	14 + 180 deg.		124 + 180 deg.	
Cylinder head temperature sensor	11		97	
Front cover bolts	25 + 60 deg.	18 + 60 deg.		
Oil filter	¾ to 1 turn after contact			
Engine oil pressure sensor	14 + 90 deg.		124 + 90 deg.	
Engine mount bracket bolts	55	41		
Engine to transmission bolts	48	35		
Exhaust manifold nuts	25 then 35		18 then 26	
Exhaust manifold studs	25	18		
Flywheel	20 + 60 deg.		177 + 60 deg.	
Fuel rail bolts	10 + 90 deg.		89 + 90 deg.	
Alternator B+ wire terminal nut	17		150	
Alternator bolt and nut	48	35		
Ignition coil on plug bolts	6		53	
Intake manifold bolts	11.5 + 30 deg.		100 + 30 deg.	
Knock sensors	20		177	

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### 7) Torque Specifications (continued):

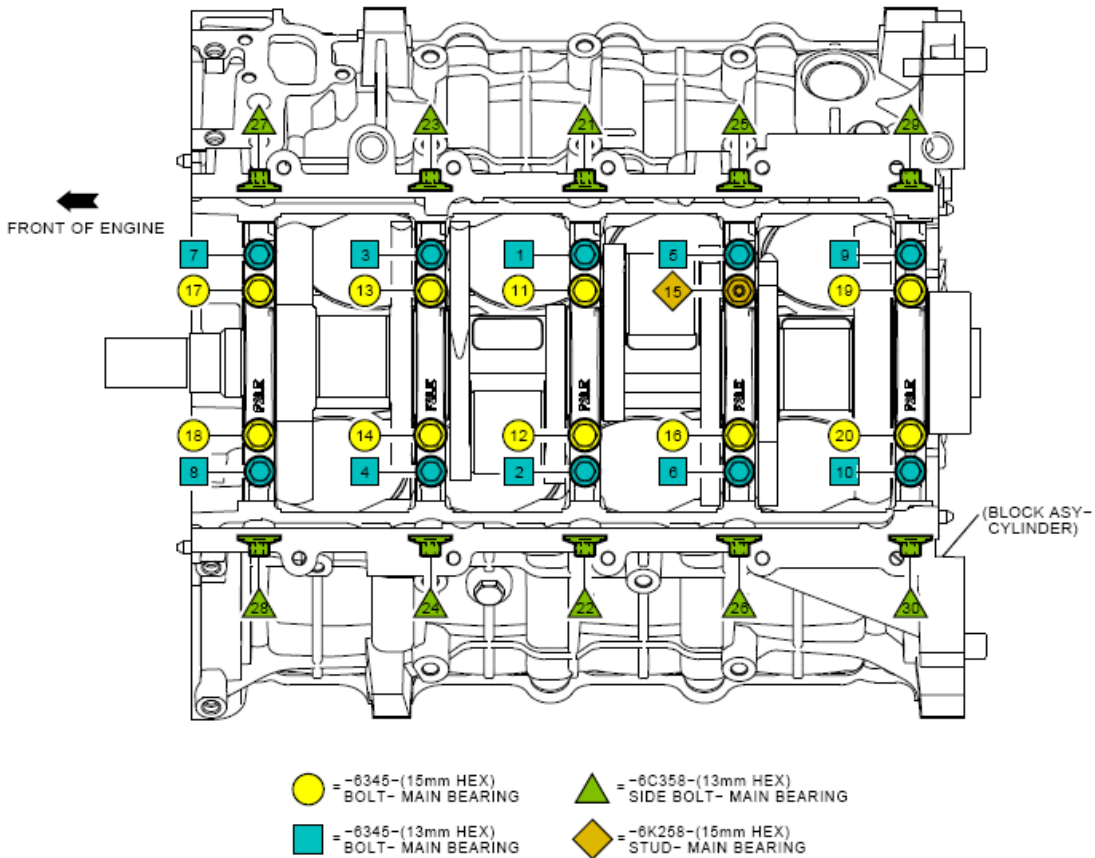
Application	Torque Nm	lb-ft	lb-in	Lubricant
Oil filter adapter bolts	20 + 60 deg.		177 + 60 deg.	
Oil pan bolts	10 + 45 deg.		89 + 45 deg.	
Oil pan drain plug	26	19		
Oil pump bolts	20 + 60 deg.		177 + 60 deg.	
Oil pump pick up tube to pump	10 + 45 deg.		89 + 45 deg.	
Oil pressure sensor	14 + 180	10 + 180		
Pick up tube strap to main cap	25		19	
Pick up tube spacer to main cap	25		19	
Piston cooling jets	10 + 45 deg.		89 + 45 deg.	
Primary timing chain tensioner bolts	10		89	
Spark plugs	15		133	
Thermostat housing bolts	10		89	
Timing chain guide	10		89	
Throttle Body	10 + 60 deg.		89 + 60 deg.	
Cam cover bolts	10		89	
VCT phaser assembly bolts	15 + 90 deg.		133 + 90 deg.	
VCT Solenoid bolts	8 + 30 deg.		70 + 30 deg.	

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## 8) Main Bearing Cap Torque:

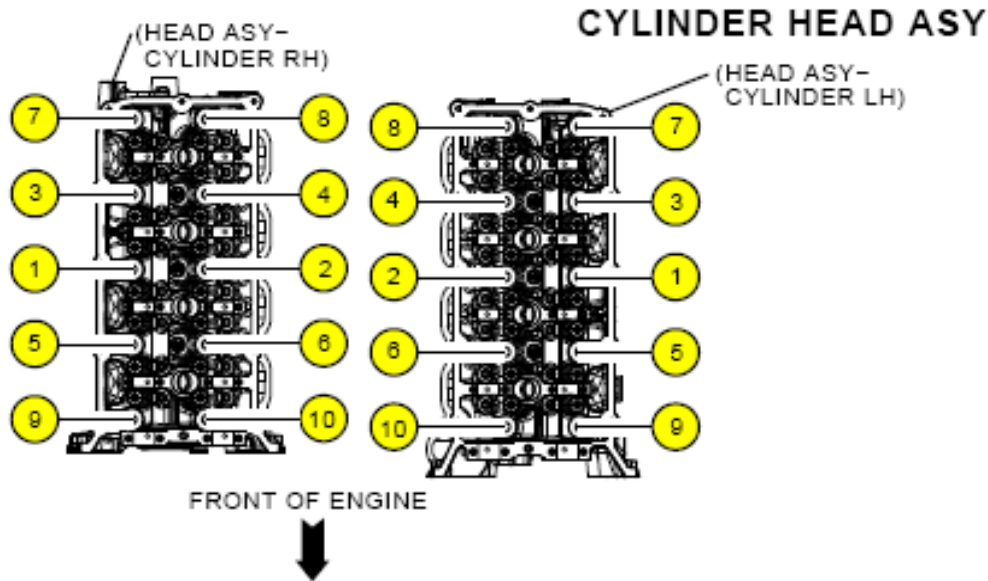


1. TORQUE FASTENERS #1 - #20 IN SEQUENCE 20 Nm.
2. TORQUE OUTER FASTENERS #1 - #10 IN SEQUENCE 40 Nm.
3. TORQUE INNER FASTENERS #11 - #20 IN SEQUENCE 65 Nm.
4. ROTATE FASTENERS #1 - #20 IN SEQUENCE CLOCKWISE 90°.
5. TORQUE SIDE BOLTS #21 - #30 IN SEQUENCE 10 Nm.
6. TORQUE SIDE BOLTS #21 - #30 IN SEQUENCE 30 Nm.
7. ROTATE SIDE BOLTS #21 - #30 IN SEQUENCE CLOCKWISE 60°.

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**9) Cylinder Head Torque:**



1. INSTALL CYLINDER HEAD ASY'S (-8049-/8050-) OVER DOWELS.
2. INSTALL AND HAND START (10) M12 HEAD BOLTS INTO EACH CYLINDER HEAD.
3. TORQUE ALL FASTENERS #1 THRU #10 25 Nm IN SEQUENCE.
4. TORQUE ALL FASTENERS #1 THRU #10 40 Nm IN SEQUENCE.
5. ROTATE ALL FASTENERS #1 THRU #10 CLOCKWISE 90° IN SEQUENCE.
6. ROTATE ALL FASTENERS #1 THRU #10 CLOCKWISE AN ADDITIONAL 90° (180° TOTAL).

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**10) Crankshaft Damper Torque:**

**NOTE:**  
 APPLY WSE-M4G323-A6 (5900) SEALER TO KEYWAY AREA OF -6316- DAMPER PRIOR TO INSTALLATION. SEAL AREA MUST BE FREE OF DIRT OR GRIT.

**NOTE:**  
 DAMPER MUST BE INSTALLED WITHIN (5) MINUTES OF SEALER APPLICATION.

