



**FORD PERFORMANCE**

## **M-6007-A52XS 5.2L Aluminator 5.2 XS Crate Engine**

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Please visit [www.performanceparts.ford.com](http://www.performanceparts.ford.com) for the most current instruction and warranty 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 PERFORMANCE TECHLINE AT 1-800-367-3788**

Ford Performance has taken the technology and hardware developed for the Shelby GT350 Mustang and has created the ultimate naturally aspirated, 5.2L cross-plane crankshaft crate engine. With a rating of 580 horsepower, the new Aluminator 5.2 XS is the most powerful naturally aspirated modular crate engine ever built by Ford Performance. This is the worthy successor of our previous rendition-the "A50XS". Every Aluminator is hand assembled by the same technicians that build the Mustang Cobra Jet drag racing engines. Premium aftermarket components are used to ensure durability like; unique Manley® connecting rods, ARP® rod bolts, Mahle® forged pistons, forged steel crankshaft sprocket, and billet oil pump gears. Unique components developed specifically for the Cobra Jet racing program are used including Cobra Jet short runner-high RPM intake manifold, 1517 CFM dual 65mm Cobra Jet throttle body, and high RPM pulse ring. Ford Performance Engineers developed a balanced combination of high end, 580 horsepower and strong mid-range torque with the Cobra Jet intake manifold, unique camshafts and fully CNC ported GT350 cylinder heads.

- Designed to work with 2015-2017 Mustang GT electronics-custom calibration required!
- 580 Horsepower 445 FT.-LB. Torque 5.2L
- 317 Cubic Inches
- 12:1 Compression Ratio
- Mahle® hard anodized forged pistons with low friction coating
- Unique Manley® H-beam connecting rods with ARP2000® bolts
- Unique Ford Performance [M-6303-M52](#) Forged steel cross-plane crankshaft
- Uses Ford Performance [M-6010-M52](#) Shelby GT350 cylinder block
- 
- Ford Performance [M-6675-M52](#) Shelby GT350 oil pan which features integrated windage and slosh baffles as well as an integrated oil pickup
- Ford Performance [M-9424-M50CJA](#) Cobra Jet tuned intake (will not clear production 2015-2017 hood without modification). Please contact the Ford Performance Techline for more information
- Ford Performance [M-9926-CJ65](#) Cobra Jet dual bore 65mm bore throttle body
- Four-valve-per-cylinder Shelby GT350 fully CNC ported aluminum heads with Roller-finger camshaft followers
- Unique PAC® valve springs
- Ford Performance [M-6550-M52](#) camshafts
- Camshaft specifications:
  - Intake camshaft - 14mm lift / 270 degrees duration
  - Exhaust camshaft - 14mm lift / 270 degrees duration
- Robust primary timing chains as used on Shelby GT350R
- Low-leak rate variable cam timing (VCT) phasers
- Ford Performance [M-6600-M52](#) billet steel gerotor oil pump
- Forged steel crankshaft sprocket

Factory Ford shop manuals are available from Helm Publications, 800-782-4356 or [www.helminc.com](http://www.helminc.com)



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- Ford Performance [M-9593-LU47](#) 47 lb. fuel injectors
- Ford Performance [M-12A227-CJ13](#) high RPM pulse ring
- Unique Ford Performance blue coil covers with added unique badging. **This coil cover set is not available anywhere other than the Aluminator 5.2XS!**
- Ford Performance [M-12405-M50A](#) zero (0) heat range spark plugs
- Ford Performance [M-6731-FL820](#) oil filter (quantity-1 included)
- 200 amp alternator and Front Engine Accessory Drive (FEAD) kit as used on the Cobra Jet race car
- **NOTES:**
- Vehicle harness and PCM not included. Use Ford Performance Control Pack which contains wiring, PCM and installation kit [M-6017-504V](#) -designed for installation with a manual transmission. For automatic transmission version, please see [M-6017-M50A](#) Control Pack. Custom calibration required with either control pack!
- Engine does not include engine harness or flywheel/flex plate
- Engine mount bosses and bell housing mount pattern common to 4.6L modular engines.
- Headers not included
- Assembly plant lift brackets not included
- Custom PCM calibration required when installing crate engine in all vehicles including 2015-2017 Mustang
- The supplied intake manifold eliminates Intake Manifold Runner Control (IMRC)
- Premium unleaded fuel only!

### Engine

Item	Specification
Displacement	317 CID (5.2 L)
No. of cylinders	8
Bore	3.70 in (94 mm)
Stroke	3.666 in (93 mm)
Firing order	1-5-4-8-6-3-7-2
Spark plug	CYFS-092-YPT (SP542)
Spark plug gap	0.028-0.035 in (0.7-0.9 mm)
Compression ratio	12.0:1
Engine weight (without accessory drive components)	431.0 lb (195.5 kg)

### Engine Tolerances and Clearances

Item	Specification
Main Bearing Clearance	0.0011 – 0.0025 in (0.027 – 0.063 mm)
Crankshaft End Play	0.0043 – 0.0110 in (0.110 – 0.280 mm)

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Connecting Rod Bearing Clearance	0.0011 – 0.0027 in (0.029 – 0.069 mm)
Connecting Rod Side Clearance	0.0059 – 0.0197 in (0.150 – 0.500 mm)
Piston Pin to Connecting Rod Clearance	0.0003 – 0.0008 in (0.008 – 0.021 mm)
Piston Pin to Piston Bore Clearance	0.0003 – 0.0006 in (0.008 – 0.015 mm)
Piston to Bore Clearance	-0.0010 – 0.0023 in (-0.025 – 0.059 mm)
Piston Ring Gap – Top	0.0059 – 0.0098 in (0.15 – 0.25 mm)
Piston Ring Gap – 2 <sup>nd</sup>	0.0118 – 0.0217 in (0.30 – 0.55 mm)
Piston Ring Gap – Oil Control Segment	0.0059 – 0.0177 in (0.15 – 0.45 mm)
Valve Spring Installed Height (Intake and Exhaust)	1.8061 – 1.8159 in (45.875 – 46.125 mm)
Valve Stem to Guide Clearance – Intake	0.0007 – 0.0027 in (0.019 – 0.069 mm)
Valve Stem to Guide Clearance – Exhaust	0.0017 – 0.0037 in (0.044 – 0.094 mm)
Collapsed Lash Adjuster Gap	0.0177 – 0.0354 in (0.45 – 0.90 mm)

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**Torque Specifications**

Item	Specification
Accessory drive belt tensioner bolt	35 lb-ft (48 Nm)
Accessory drive idler pulley	24 lb-ft (32.5 Nm)
A/C compressor bolts	18 lb-ft (25 Nm)
Camshaft bearing cap bolts	53 lb-in + 45° (6 Nm + 45°)
Camshaft position sensor bolt	89 lb-in (10 Nm)
Connection rod cap	62.5 lb-ft (85 Nm)
Coolant outlet bolts	89 lb-in (10 Nm)
Coolant outlet pipe bolt	89 lb-in (10 Nm)
Coolant pump bolts	15 lb-ft+60° (20 Nm+60°)
Coolant pump pulley bolts	18 lb-ft (25 Nm)
Crankshaft position sensor bolts	89 lb-in (10 Nm)
Crankshaft damper bolt	Stage 1: 103 lb-ft (140 Nm) Stage 2: Back out to a minimum of 4 lb-ft (5 Nm) Stage 3: Torque 96 lb-ft +90° (130 Nm +90°)
Crankshaft rear seal retainer bolts	89 lb-in + 45° (10 Nm + 45°)
Cylinder head pipe plugs	124 lb-in + 180° (14 Nm + 180°)
Cylinder head temperature sensor	97 lb-in (11 Nm)
Front cover bolts	18 lb-ft + 60° (25 Nm +60°)
Oil filter	¾ to 1 turn after contact
Engine oil pressure sensor	124 lb-in + 180° (14 Nm + 180°)
Engine mount bracket bolts	41 lb-ft (55 Nm)
Exhaust manifold nuts	24 lb-ft (32 Nm)
Exhaust manifold studs	18 lb-ft (25 Nm)
Fuel rail bolts	89 lb-in + 90° (10 Nm + 90°)
Alternator bolts	35 lb-ft (48 Nm)
Ignition coil on plug bolts	53 lb-in + 45° (7 Nm + 45°)
Intake manifold bolts	100 lb-in + 35° (11.5 Nm + 35°)
Knock sensors	15 lb-ft (20 Nm)
Oil filter adapter bolts	15 lb-ft + 60° (20 Nm + 60°)

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Item	Specification
Oil pan bolts	89 lb-in + 45° (10 Nm + 45°)
Oil pressure sensor	10 lb-ft + 180° (14 Nm + 180°)
Pick up tube strap to main cap	18 lb-ft (25 Nm)
Piston cooling jets	27 lb-in (4 Nm)
Primary timing chain tensioner bolts	89 lb-in (10 Nm)
Spark plugs	133 lb-in (15 Nm)
Thermostat housing bolts	89 lb-in (10 Nm)
Timing chain guide	89 lb-in (10 Nm)
Throttle body	89 lb-in + 60° (10 Nm + 60°)
Cam cover bolts	89 lb-in (10 Nm)
VCT phaser assembly bolts	133 lb-in + 90° (15 Nm + 90°)
VCT solenoid bolts	70 lb-in + 30° (8 Nm + 30°)

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## Lubricants

Item	Specification
Motorcraft® SAE 5W-50 Full Synthetic Motor Oil (US);	XO-5W50-QGT (US)

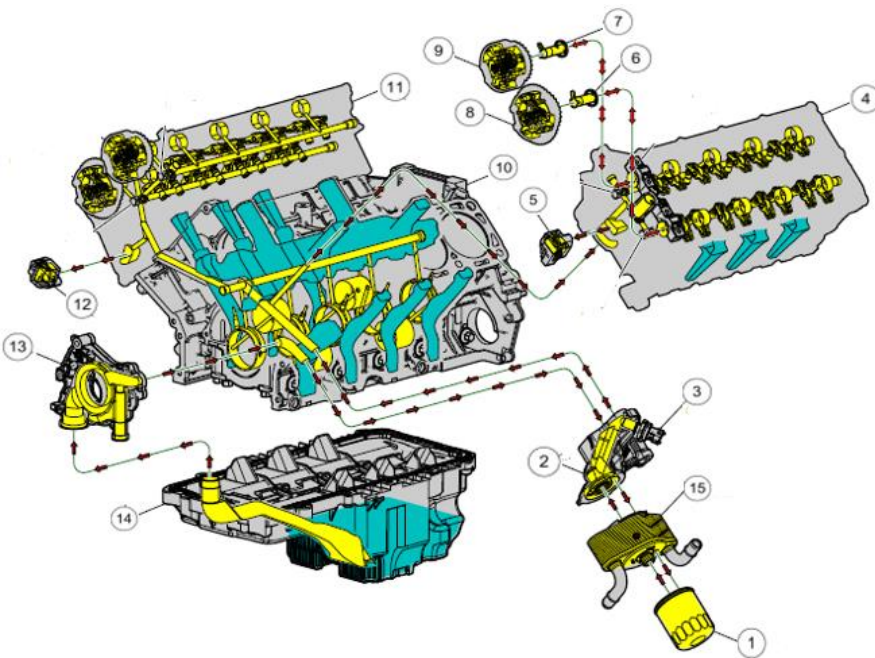
## Engine Oil Capacity

Item	Specification
Service fill including oil filter	10.0 qt (9.5 L)

## Oil Pressure

Item	Specification
Oil pressure @ idle with engine at normal operating temperature	20–30 psi (138–207 kPa)
Oil pressure @ 2,000 rpm with engine at normal operating temperature	55–70 psi (379–483 kPa)

## Engine Oil Flow Illustration



Item	Description
1	Oil filter
2	Oil filter adapter
3	EOP switch
4	Cylinder head – LH
5	Timing chain tensioner – LH
6	Exhaust camshaft
7	Intake camshaft
8	Exhaust VCT unit
9	Intake VCT unit
10	Cylinder block
11	Cylinder head – RH
12	Timing chain tensioner – RH
13	Oil pump
14	Oil pan
15	Oil cooler

## Proper Priming of the 5.2L DOHC Engine

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The 5.2L DOHC engine must be primed with an engine pre-lube tank. Unlike the earlier pushrod engines, there is no oil pump driveshaft to rotate and prime the engine. Priming ensures that there is oil in all the critical areas when you start the engine. Do NOT prime the engine by cranking it.



**Engine pre-lube tank**

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### Priming the Engine with the Oil Filter in the Stock Location



Check and note oil level on dipstick. With oil filter installed and full of oil, remove oil pressure sending unit. Using proper adapters, attach engine pre-lube tank to the port that the sending unit was screwed into. Following the engine pre-lube tank manufacturer's instructions, prime the engine.

Check oil level; if engine was properly primed, the level will have risen. It may take a few minutes for the oil to drain down to the pan. Drain excess oil if necessary.

Remove engine pre-lube tank from filter adapter. Apply sealant to the threads of the oil pressure sending unit. Reinstall and torque to 14 Nm, then rotate an additional 180 degrees.

**Warning, some vehicle applications require relocation of the oil filter.**

Ford Performance highly recommends the use of M-6881-M50A oil line adapter and a high flow, high quality filter adapter and -12 line.

Insert part number AL3Z-6890-A allows removal of oil cooler for additional oil filter clearance.

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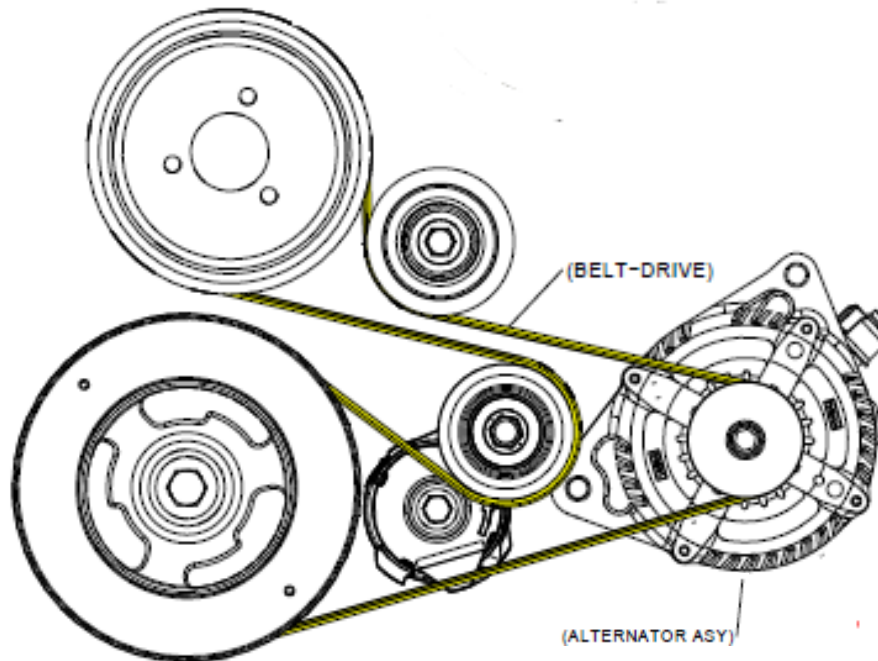
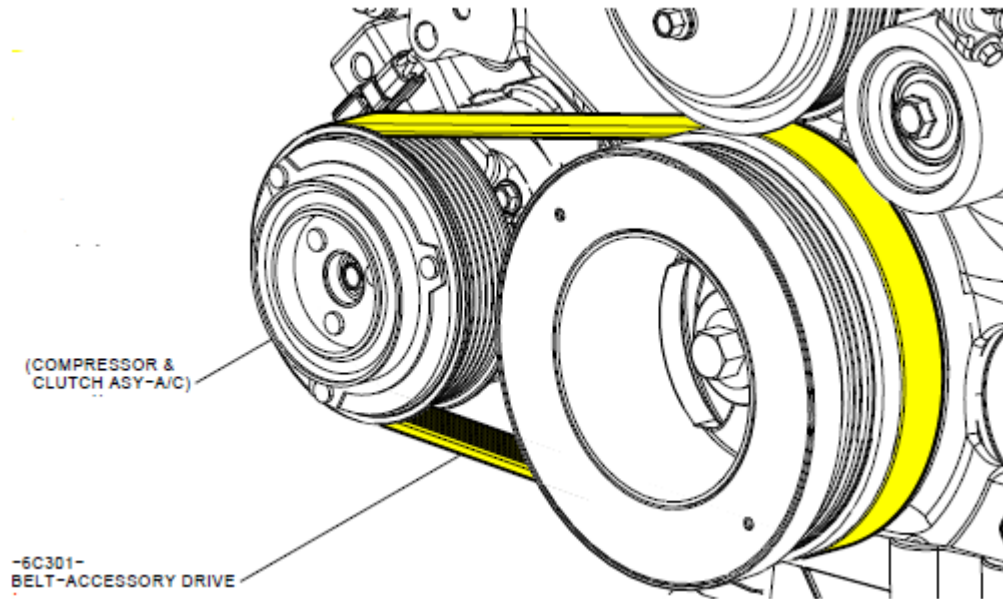


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### Accessory Drive Belt Layout



**NOTE:**  
ALL FEAD COMPONENTS AND FASTENERS  
MUST BE INSTALLED AND TORQUED BEFORE  
BELT INSTALLATION

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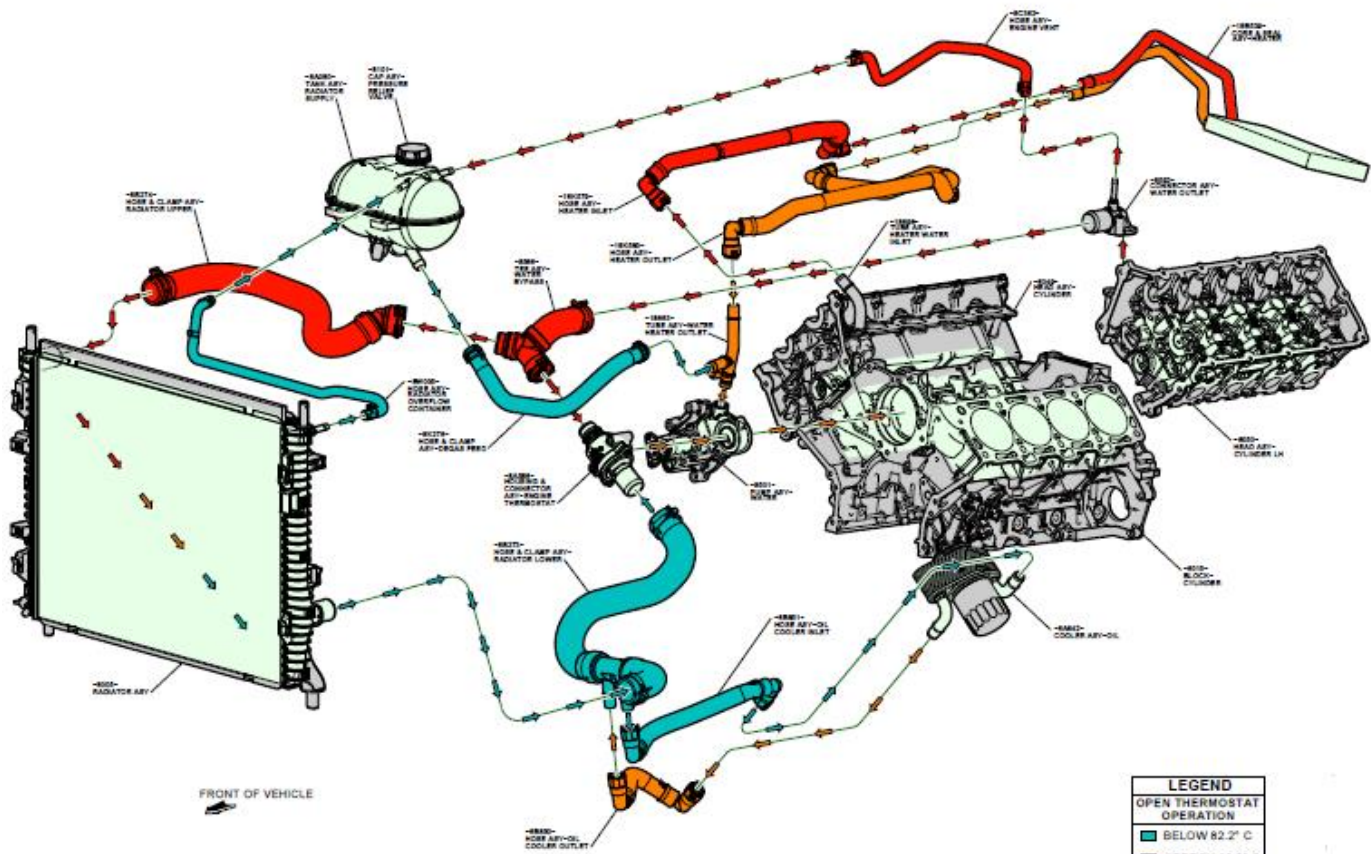
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## Coolant Flow Diagram

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.

ENGINE SYSTEM COOLANT CIRCULATION  
2016 5.2L-4V ENGINE S550 GT350 (RWD)  
FOR -550- PACKAGE ONLY



LEGEND	
OPEN THERMOSTAT OPERATION	
	BELOW 82.2° C
	APPROX 82.2° C
	ABOVE 82.2° C
AMBIENT = 32° C (100° F) TSTAT STG = 82.2° C (180° F)	

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### Flywheel Assembly Torque Procedure

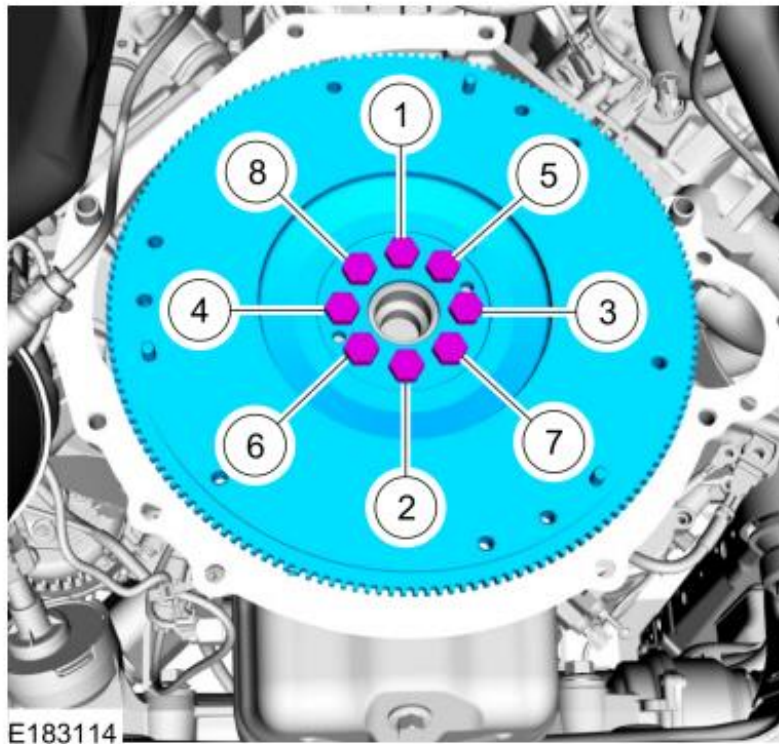
**Flywheel bolts.** Bolts are one time use. See below for torque sequence pattern.

*Torque:*

Stage 1: 89 lb-in (10 Nm)

Stage 2: 177 lb-in (20 Nm)

Stage 3: 60°



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### Manual transmission applications

Clean the input shaft and apply a small amount of grease to the splined surface and the pilot bearing surface.

*Material:* Premium Long-Life Grease / XG-1-E1 (ESA-M1C75-B)

Using a clutch aligner, position the clutch disc on the flywheel.

Install new pressure plate bolts by turning the bolts 1 turn at a time in a star pattern until the clutch is fully secured.

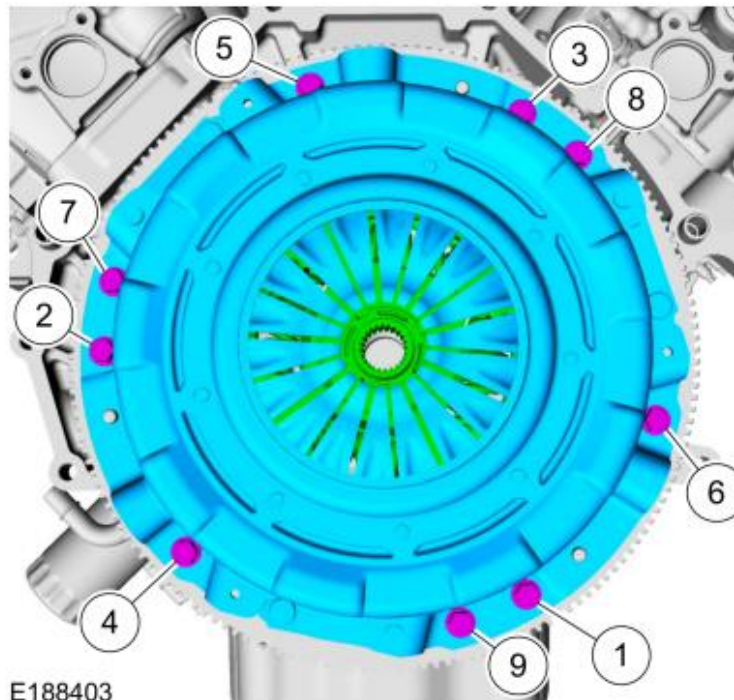
Use the General Equipment: Clutch Alignment Tool

With production pressure plate bolts,

*Torque:*

Stage 1: 46 lb.ft (63 Nm)

Stage 2: 60°



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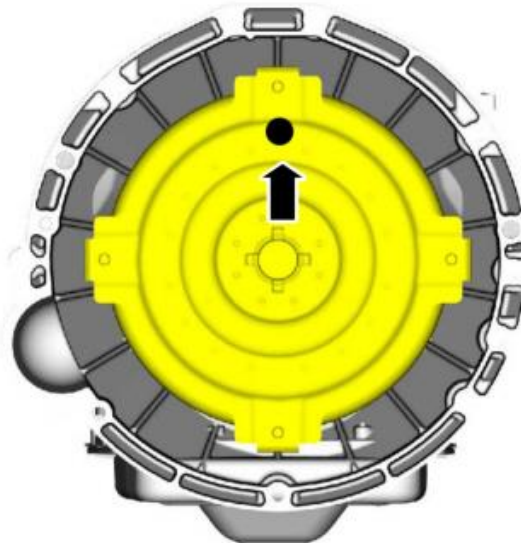
### 6-speed Automatic applications

#### Warning: verify that a pilot bearing is not installed

Lubricate the torque converter pilot hub with multi-purpose grease.

*Material:* Motorcraft® Multi-Purpose Grease Spray / XL-5-A (ESB-MIC93-B)

If the transmission has a new torque converter align the sticker to the 12 o'clock position.



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1. Install the special tool which retains torque converter.

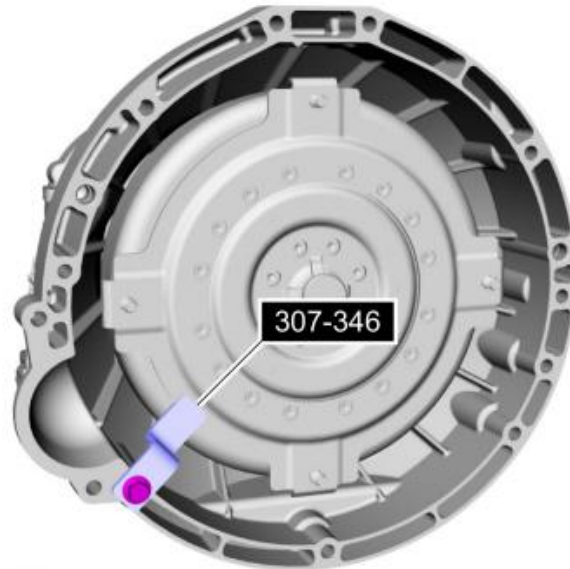
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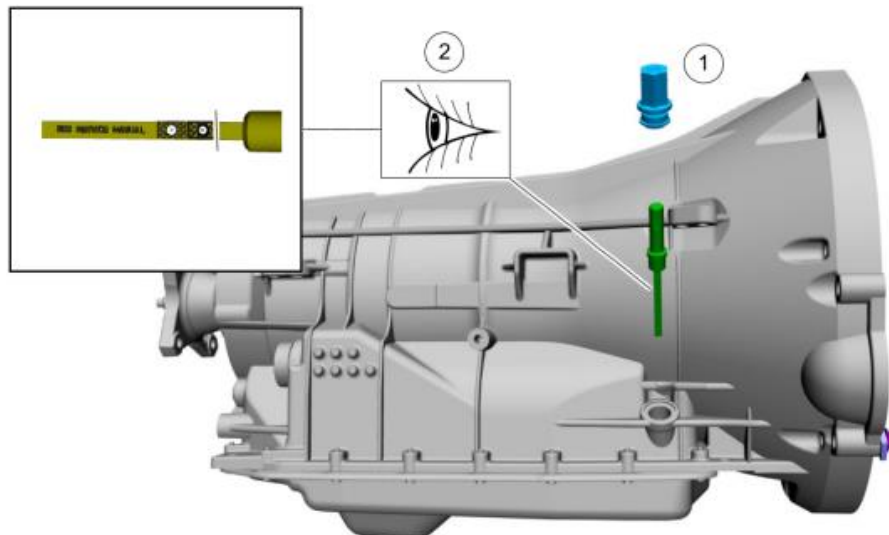
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2. Remove the transmission fluid fill plug transmission fluid level indicator assembly.  
*Torque: 19 lb.ft (26 Nm)*
3. Verify transmission is filled with transmission fluid.



4. Position the transmission into the vehicle behind the engine and remove the special tool.

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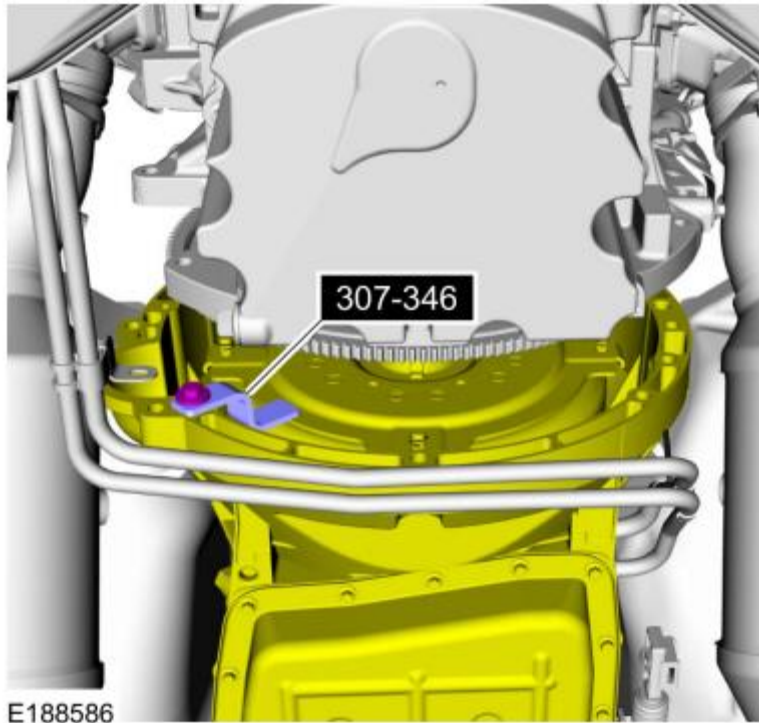




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**NOTE:** Make sure the torque converter is fully seated in the transmission before aligning the transmission to the engine.

**NOTE:** With the transmission in a horizontal position, move it toward the engine and position it on the dowel pins.

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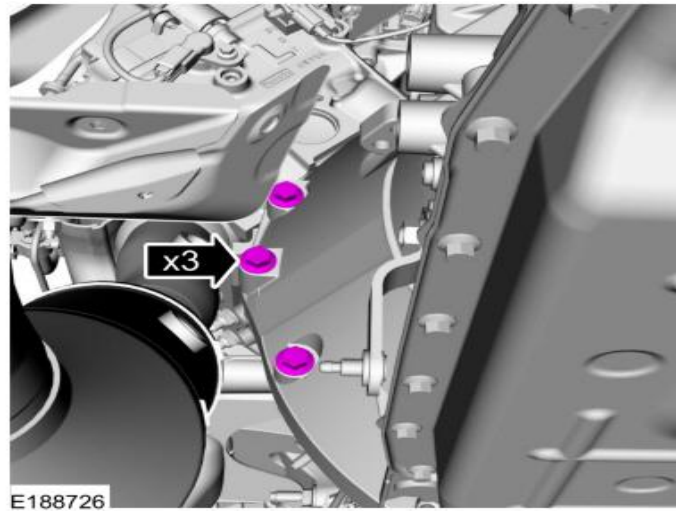


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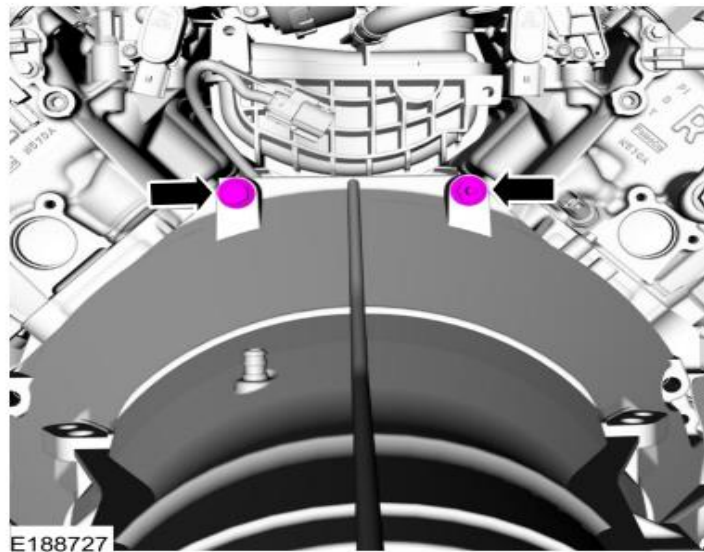
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5. Install the LH side bellhousing bolts.



6. Install the RH side bellhousing bolts.
7. Install the upper bellhousing bolt and stud bolt.  
*Torque all bellhousing bolts to: 35 lb.ft (48 Nm)*



**NOTE:** Only rotate the crankshaft in a clockwise direction.

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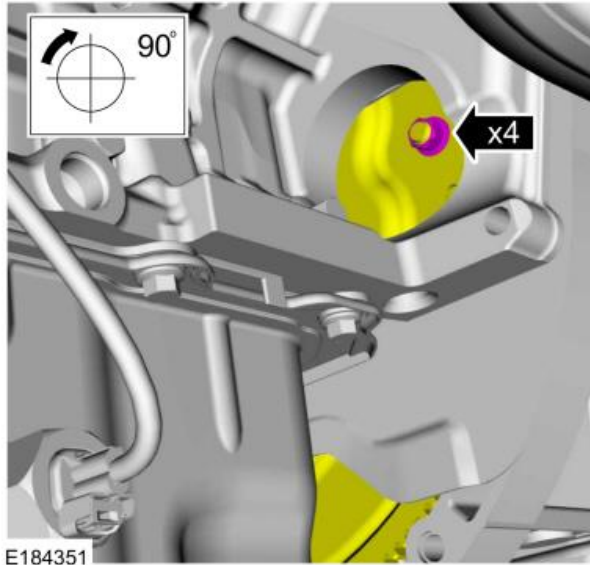


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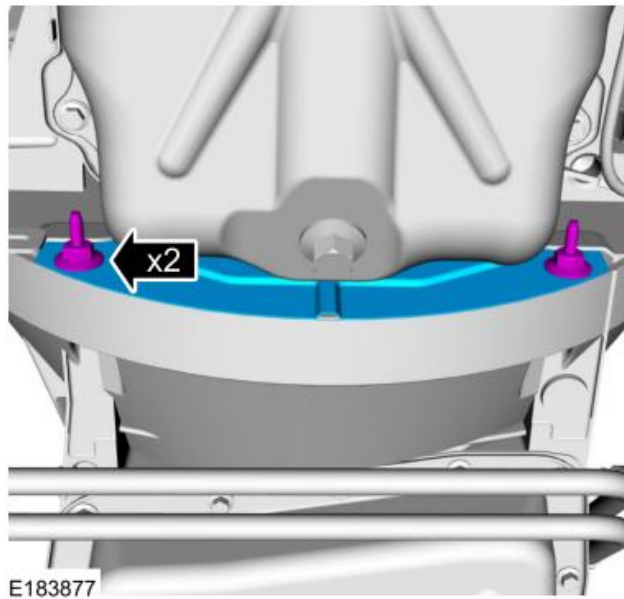
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8. Install the new torque converter nuts.  
*Torque: 35 lb.ft (48 Nm)*



9. Install the flexplate inspection cover and the stud bolts.  
*Torque: 35 lb.ft (48 Nm)*



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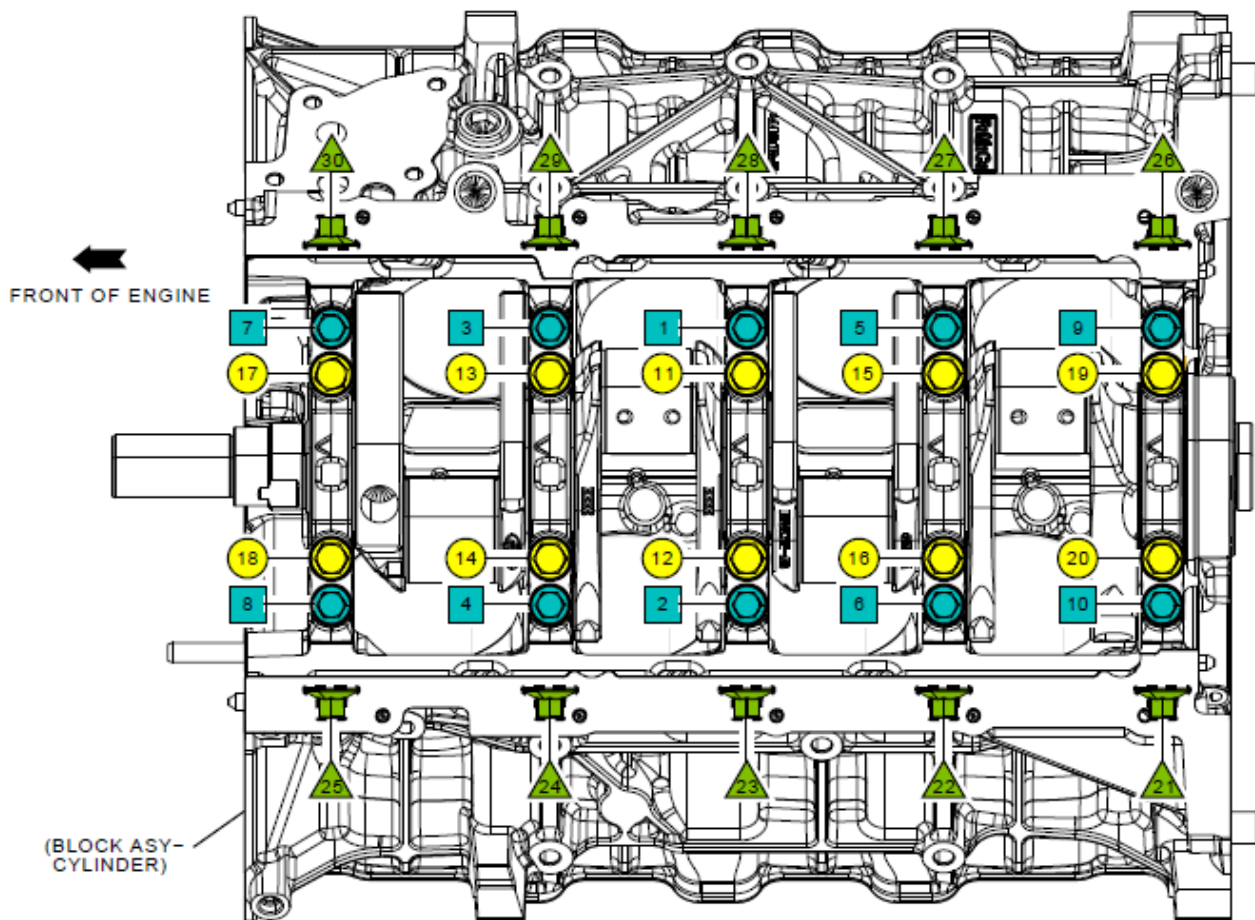
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### Crankshaft Main Bearing Caps and Fasteners Final Torque Procedure

1. Torque fasteners 1-20 in sequence 15 lb-ft (20 Nm)
2. Torque outer fasteners 1-10 in sequence 30 lb-ft (40 Nm)
3. Torque inner fasteners 11-20 in sequence 48 lb-ft (65 Nm)
4. Rotate fasteners 1-20 in sequence clockwise 90°
5. Torque side bolts 21-30 in sequence 22 lb-ft (30 Nm)
6. Torque side bolts 21-30 in sequence clockwise 60°



 = -8345-G (15mm HEX)  
BOLT- MAIN BEARING

 = -8C358- (13mm HEX)  
SIDE BOLT- MAIN BEARING

 = -8345-H (13mm HEX)  
BOLT- MAIN BEARING

**NOTE:**  
CRANKSHAFT MAIN BEARING CAP BOLTS  
CAN BE RE-USED A MAXIMUM OF (5) TIMES.

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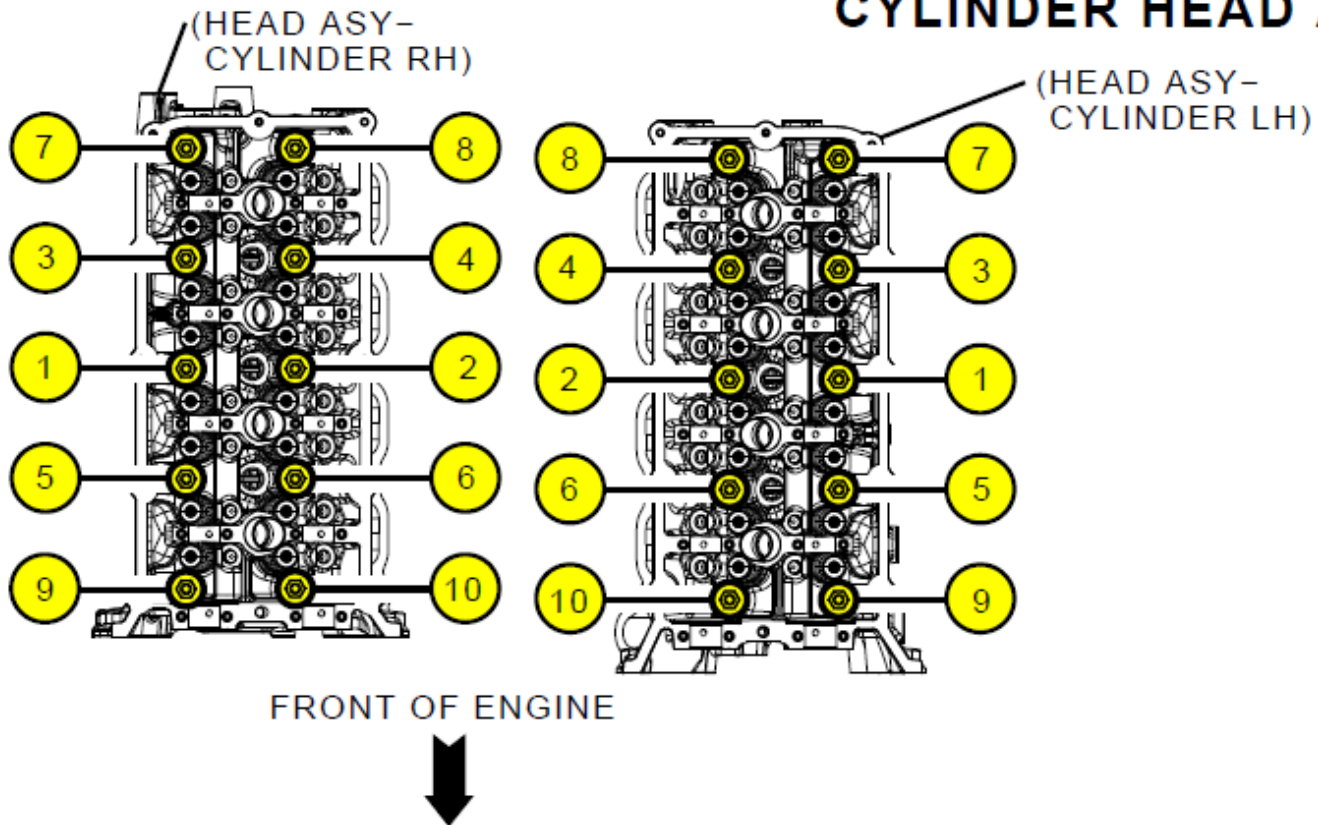
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### Cylinder Head Assembly Final Torque Procedure

1. Torque all fasteners in sequence 22 lb-ft (30 Nm)
2. Torque all fasteners in sequence 37 lb-ft (50Nm)
3. Rotate all fasteners in sequence Clockwise 90°
4. Rotate all fasteners in sequence Clockwise an additional 90°

### CYLINDER HEAD ASY



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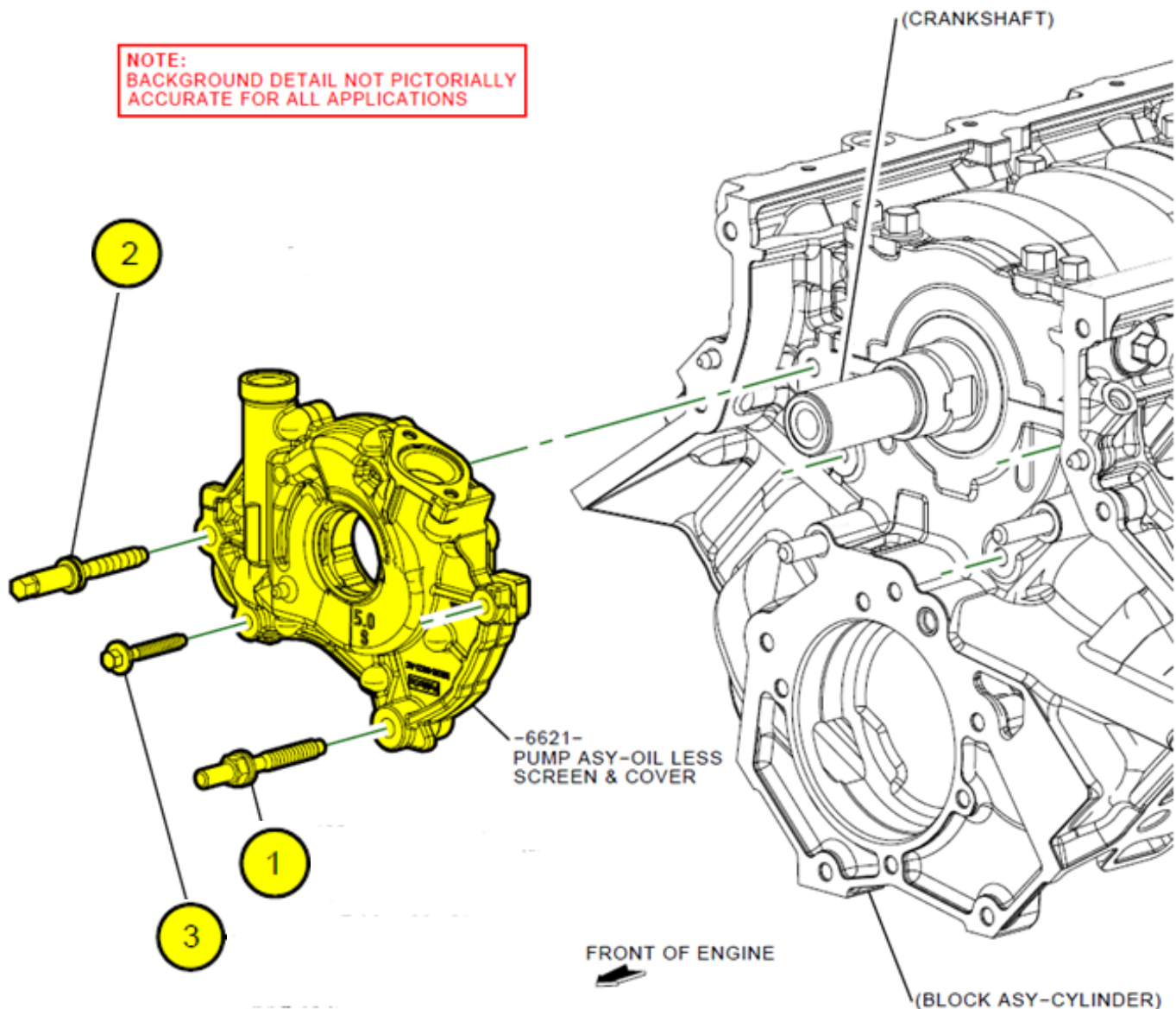
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### Oil Pump Assembly Torque Procedure

1. Rotate inner rotor of oil pump asy to align with flats on crankshaft post and slip oil pump over until seated against block. *Note: Pump must be held against block until bolts are torqued*
2. Rotate oil pump, align bolt holes and install fasteners
3. Torque fasteners 0 lb-ft (0 Nm)
4. Torque fastener #1 to (25Nm), Fastener #2 to (20 Nm) and Fasteners #3 to (10 Nm)
5. Rotate fastener #1 75°, Fastener #2 60°, and fasteners #3 45°

**NOTE:**  
BACKGROUND DETAIL NOT PICTORIALLY  
ACCURATE FOR ALL APPLICATIONS



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# M-6007-A52XS 5.2L Aluminator 5.2 XS Crate Engine

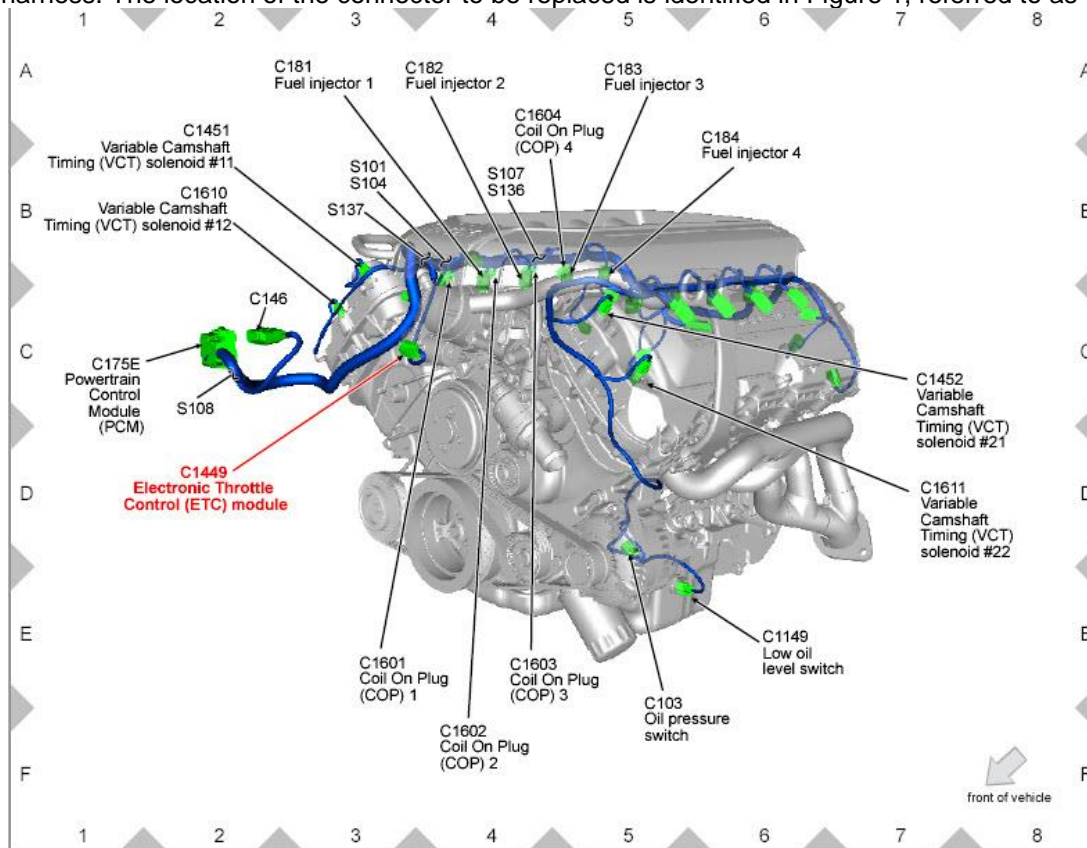
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**Note-you will need to provide an engine harness, please see Ford Performance M-12000-M50 or M-12000-M50A for additional details.**

### Engine harness to throttle body harness modifications:

Replace the factory connector with the provided mating connector

The factory harness connector will need to be replaced by using the new mating connector provided with the throttle body jumper harness. The location of the connector to be replaced is identified in Figure 1, referred to as C1449 (in RED).



Identify the correct connector using Figure 2 below. This connector will be replaced with the connector shown in Figure 3.

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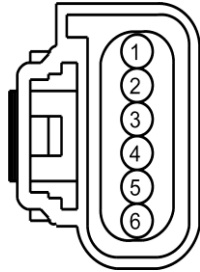


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**Figure 2**  
(Factory Harness Connector Face)



**Figure 3**  
(Replacement Connector Face)



### Replacing the factory harness connector:

The use of a pin extraction tool is recommended for this process. If you do not have a pin extraction tool, you may use a very thin screwdriver such as those used for repairing eyeglass frames.

**TO INSURE THIS PROCEDURE IS DONE PROPERLY, IT IS HIGHLY RECOMMENDED TO SWAP ONLY ONE PIN AT A TIME!!**

**STEP 41A:** Unplug the factory connector from the throttle body. The red locking tab on the factory harness connector must be released to do this.



LOCKED



UNLOCKED

**STEP 41B:** Gently pry the red retaining lock from the factory connector to reveal the female terminals.

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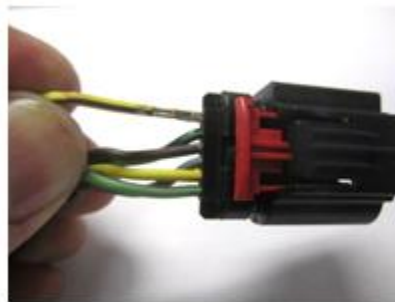
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**STEP 41C:** Starting with Pin 1, carefully pry back the plastic retaining tab (which holds the female terminal into the connector housing) while gently pulling on the wire from behind until the terminal has been released.



**STEP 41D:** Completely remove the wire and terminal from the factory connector.



**STEP 41E:** Prepare the NEW replacement connector for terminal insertion by removing the red retaining lock from the connector. Like the previous connector, this lock can also be removed by gently prying out.

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**STEP 41F:** Insert the terminal (from STEP 41D) into the NEW replacement connector, noting the orientation of the terminal. A locating tab on the terminal will allow the terminal to insert in only one direction.  
**DO NOT FORCE!**

**NOTE:** When the terminal seats properly, you should hear a light clicking sound. Gently pull on the wire to insure that it has seated properly into the NEW connector housing.



**STEP 41G:** Return to STEP 41C, and follow the same sequence for Pin 2 through Pin 6. Once all six terminals have been moved, replace the red locking tab (previously referred to in STEP 41E).

**STEP 41H:** After the NEW connector has been attached to the engine harness, connect the new jumper harness and route to the new throttle body's Throttle Position Sensor (TPS) and Electronic Throttle Control (ETC) motor. There is a fir tree clip that will allow the harness to be securely fastened to the cylinder head.

When properly assembled, the factory wire colors should match the connector as follows:

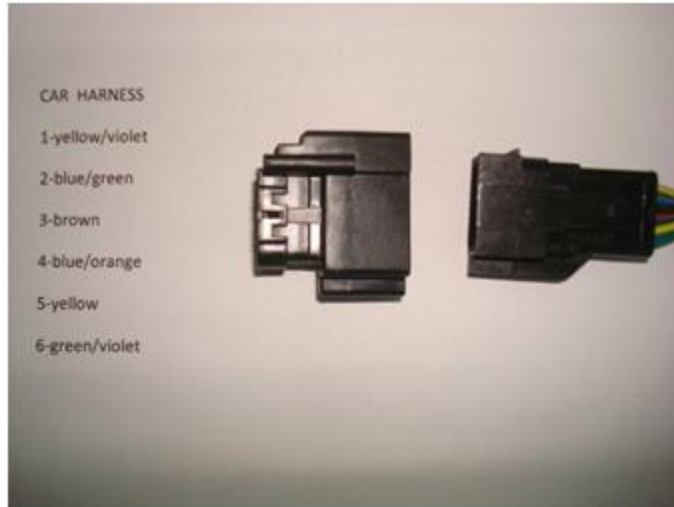
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**STEP 42:** Clip the provided jumper harness into the newly installed mating connector.



**STEP 43:** Clip the remaining (2) connectors on the jumper harness to the throttle body.



What

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