

Honda Racing

HPD 

HPD L15A7 Engine Kit Assembly Manual

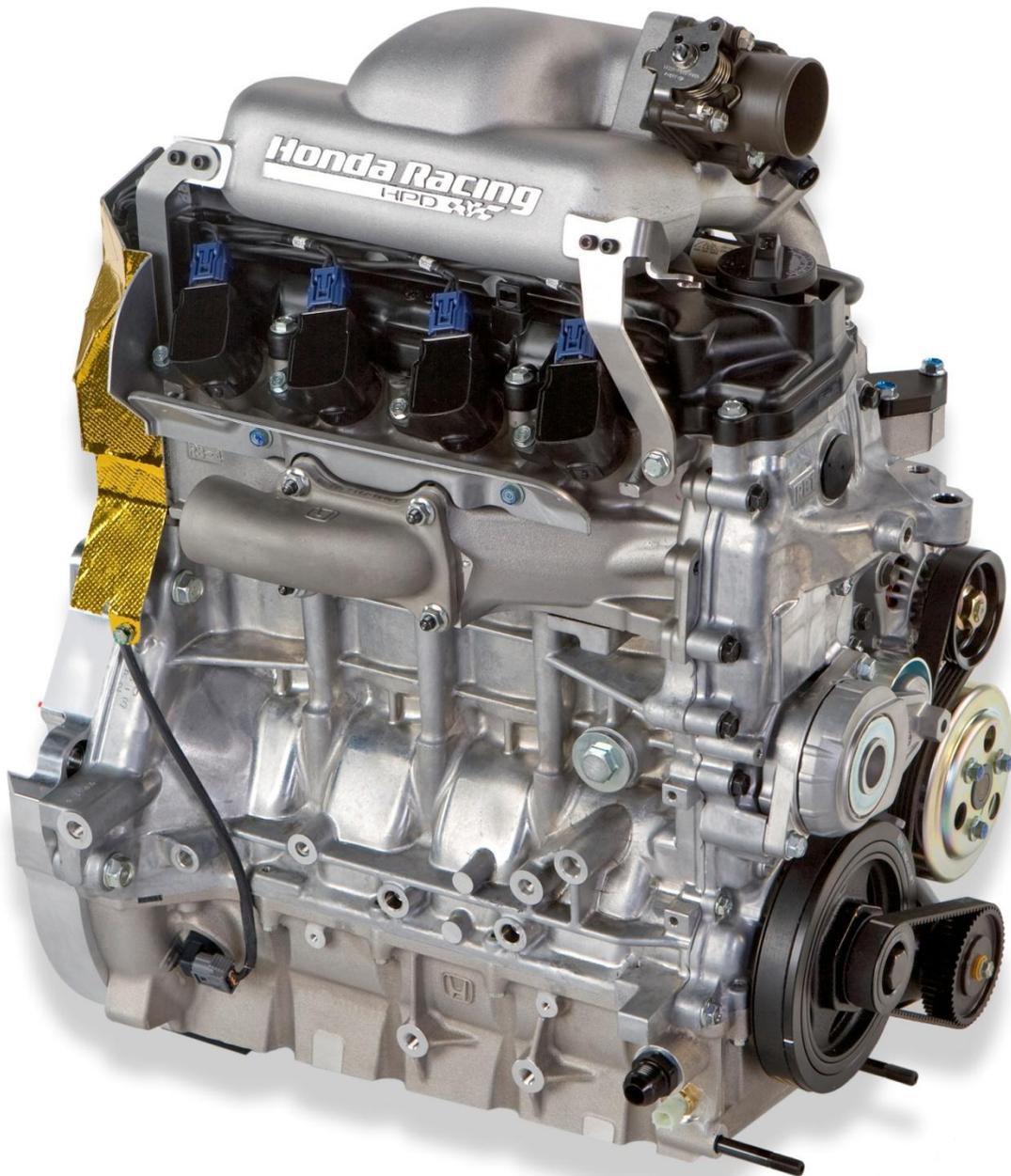


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Safety Precautions

The information in this manual is intended for use by qualified, professional technicians. Attempting service or repairs without the proper training, tools and equipment could cause injury or death to you and others. It could also cause damage to the engine / vehicle or create an unsafe condition.

This manual describes the proper methods and procedures for the race kit installation related to your chassis, in addition to service and repair procedures described in the Honda Fit service manual. Some procedures require the use of specifically designed tools and dedicated equipment. Any person who intends to use a replacement part, a service procedure, or a tool that is not recommended by Honda or the race sanctioning body, must determine the risk to their personal safety, and the safe operation of the vehicle.

If you need to replace any parts, always use the correct parts supplied by Honda Performance Development or American Honda Motor Co., Inc. Do not use inferior quality or unapproved parts.

Proper service and maintenance is essential to the racer's safety and the reliability of the race car. Any error or oversight while performing this conversion or service can result in faulty operation, damage to the vehicle, or injury to yourself, or others.

Because this manual is intended for professional technicians, we do not provide warnings for basic shop safety practices – for example, hot parts = wear gloves. If you have not received shop safety training or do not feel confident about your knowledge about safe servicing practices, we recommend that you do not attempt the procedures described in this manual. We cannot warn you of every conceivable hazard that can arise in doing service and repair procedures. Only you can decide whether or not you should do a given task.

WARNING

Improper service or repairs can create an unsafe condition that can cause your customer or others to be seriously hurt or killed.

Follow the procedures and precautions in this manual and other service materials carefully.

Failure to properly follow instructions and precautions can cause you to be seriously hurt or killed.

Follow the procedures and precautions in this manual carefully.

This manual details the steps necessary to install the HPD L15A7 engine kit on Honda's OE engine platform. Disassembly and assembly procedures for Honda's OE L15A7 engine should be referenced in the 2009 / 2010 Honda Fit service manual, which is included in the HPD chassis / electrical kit.

During disassembly, the reuse of gaskets and O-rings is specified. This is because the L15A7 engine is delivered in new condition. It has not been started, and so the gaskets remain 'as new' for their designed purpose. It is recommended after running the engine that if any gasket or O-ring is disturbed / removed, that it be replaced with a new gasket / O-ring per the *2009/2010 Honda Fit Service Manual*.

Remove the OE L15A7 Honda engine from the crate



Remove the lid and cross-bracing.



Attach lifting straps as shown.



Lift the engine from the crate.

Remove the OE L15A7 Honda engine from the crate cont'd



Once removed from the engine crate, secure the engine onto an engine stand for the HPD engine kit installation.

Prepare The L15A7 Honda Engine For The Engine Kit Installation



Remove the A/F Sensor.
Remove the heat shield.



Remove the catalytic converter. Save the exhaust gasket and hardware for reuse in the HPD engine kit.



Remove the throttle body.
Save one of the four OE throttle body mounting bolts for mounting the HPD engine kit ACG.

Prepare The L15A7 Honda Engine For The Engine Kit Installation



Remove the EGR.
Remove the EGR pipe (not shown).
Refer to Emissions section of the Fit manual

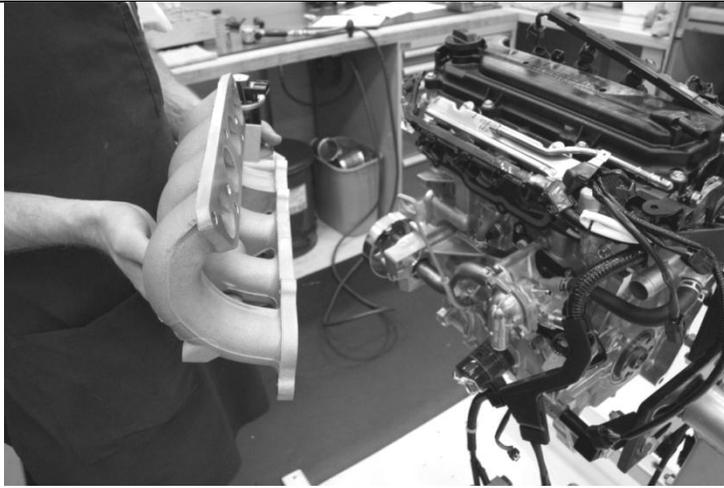


Remove the engine mounting stud.
Use either a stud removal tool, or double-nut the stud to unscrew it from the engine.



Remove the intake manifold chamber. Save the seals for reuse in the engine kit intake plenum.
Remove MAP sensor for reuse in the HPD engine kit.

Prepare The L15A7 Honda Engine For The Engine Kit Installation



Remove the intake runner. Save the intake runner and gasket for reuse in the HPD engine kit.



Remove the wiring harness and bracket.



Remove the water outlet. Save the 4 x 16mm bolts for reuse in the HPD engine kit.

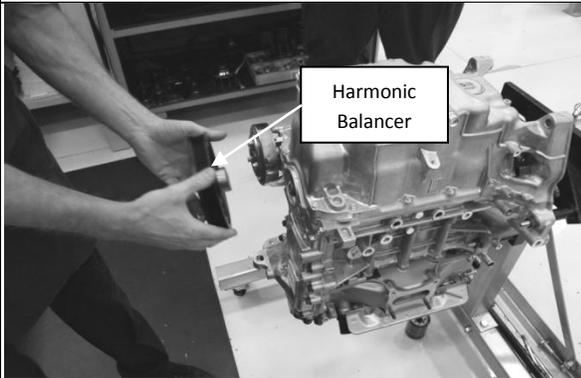
Remove the water temperature sensor and O-ring from the water outlet housing. Save them for reuse in the HPD engine kit.

Prepare The L15A7 Honda Engine For The Engine Kit Installation



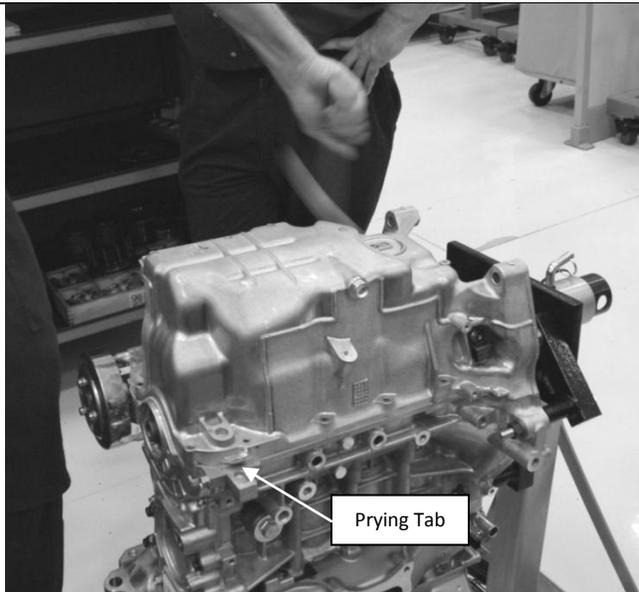
V-TEC Pressure Sensor

Remove the V-TEC pressure sensor. Save the O-ring for reuse in the HPD engine kit.



Harmonic Balancer

Remove the harmonic balancer. If not using an impact wrench, use a crankshaft pulley holder.

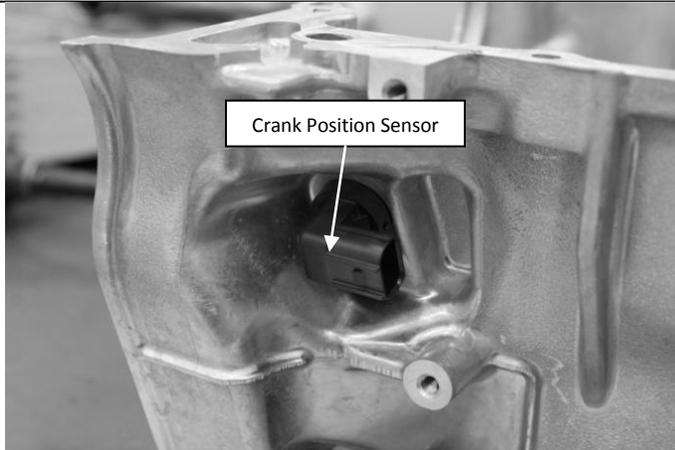


Prying Tab

Remove the oil pan. The gasket sealant used during assembly is quite strong, so oil pan removal will be challenging. Alternate mallet strikes to sides of the oil pan near bottom front and rear until the tone changes then use prying tabs to lift pan from engine block surface.

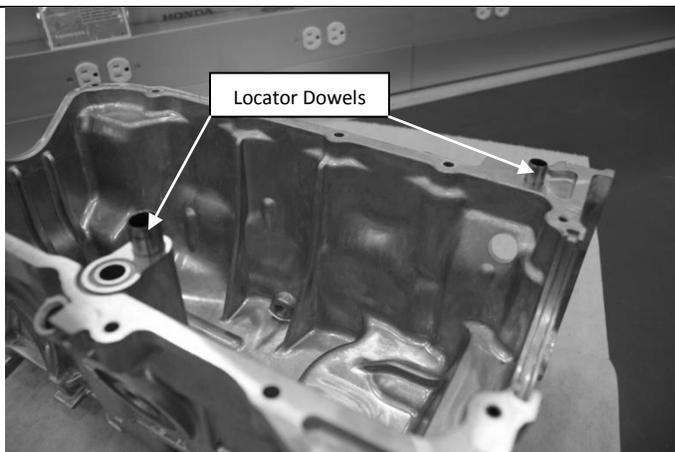
NOTE: Do not pry against the sealing surface.

Prepare The L15A7 Honda Engine For The Engine Kit Installation



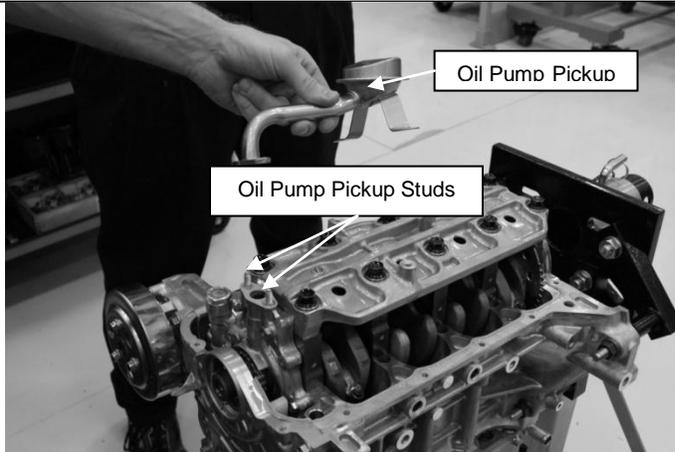
Once the pan is removed from the engine, remove the locating dowels, crank position sensor, and threaded oil filter mounting boss from the standard pan for reuse in the HPD engine kit oil pan.

Also, remove the oil drain bolt for reuse in the HPD engine kit.

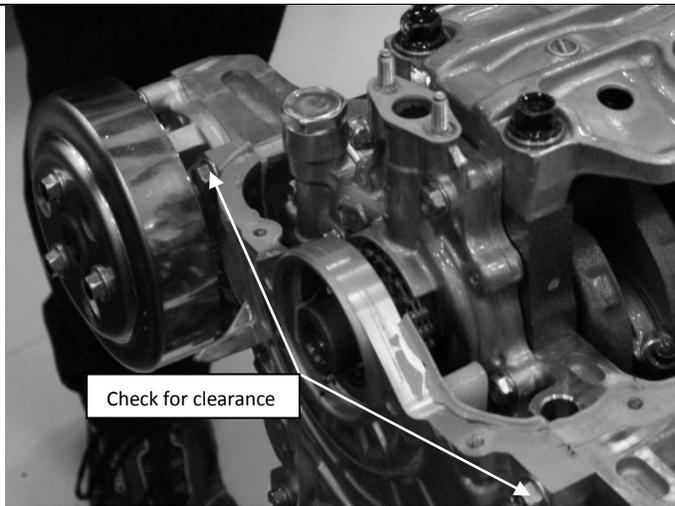


Remove the locator dowels from the original oil pan. Save them for reuse in the HPD engine kit.

Prepare The L15A7 Honda Engine For The Engine Kit Installation



Remove the oil pump pickup and its mounting studs.



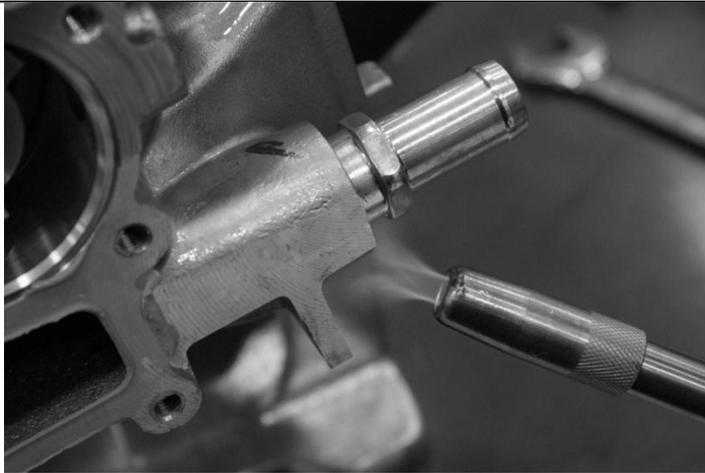
Check the flange bolts indicated in the illustration to ensure the bolt flange does not protrude above the oil pan sealing surface. If it / they do, remove it / them for appropriate flange diameter reduction. Use a grinder / grinding wheel to remove only the amount of material (bolt flange) necessary

Reinstall flange bolts and torque to 31 N·m / 23 lb-ft.

At this point, your L15A7 Honda engine is ready to accept the HPD engine kit parts. Ensure all parts necessary for the build are included in your kit, using the supplied bill of materials (BOM).

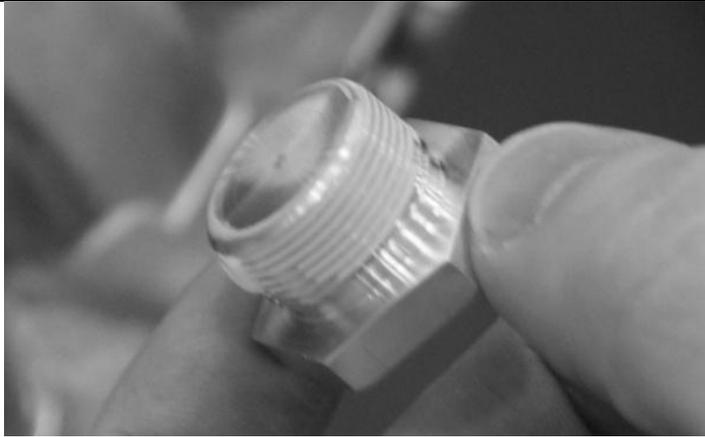
Clean all sealing surfaces in preparation for race kit parts installation. Do not allow sealant to enter the engine.

Top End

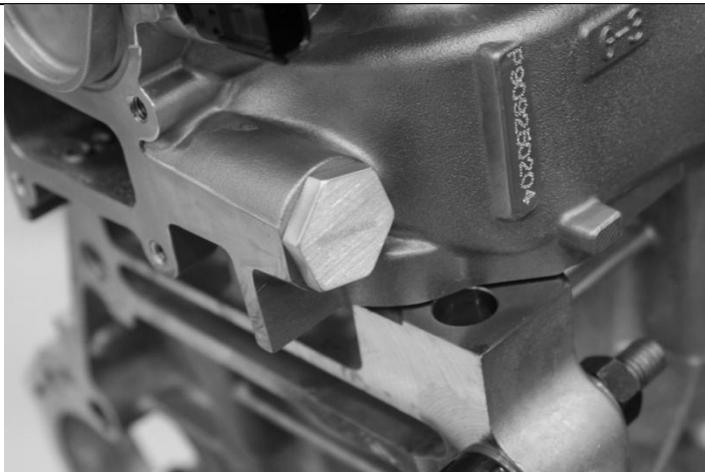


Water Outlet – The water outlet nipple has fine pitch threads with a thread locking agent. It is recommended that a MAP gas torch, or similar device be used to heat the area around the nipple to avoid damaging the thread in the cylinder head when removing it.

Remove the cam position sensor prior to heating to prevent damage to the sensor.



After cleaning the threads apply a liquid thread sealant to the water outlet block off plug.



Install the block off plug after thoroughly cleaning the thread locking agent from the threads.

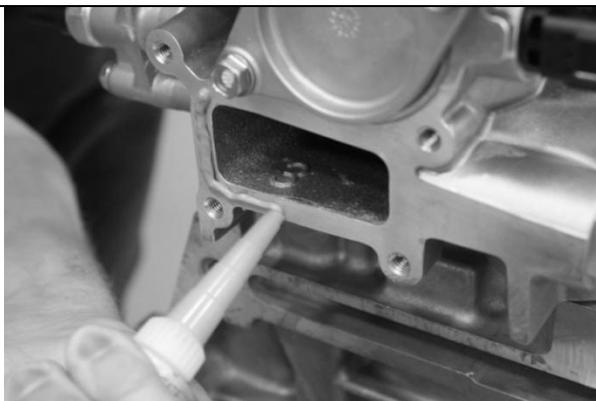
Torque the plug to 40 N·m / 29 lb-ft.

Top End cont'd



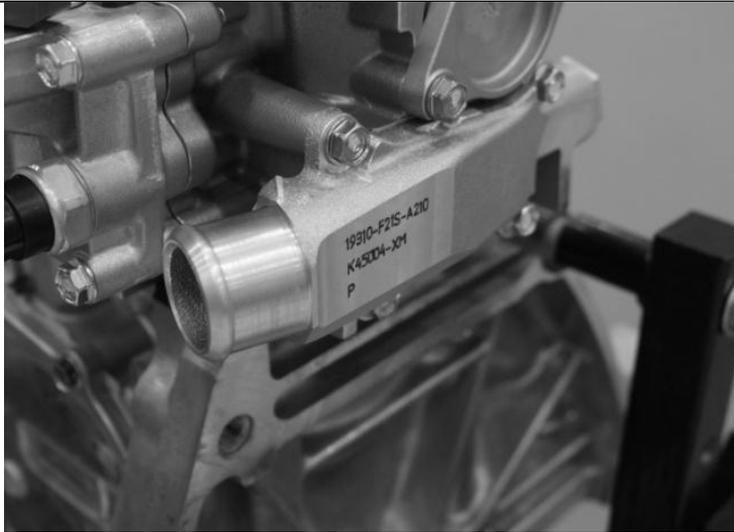
Install the EGR bypass plate. Install the metal gasket with the raised inner diameter facing out using the flange nuts from the EGR bypass pipe.

Torque the fasteners to 25 N·m / 18 lb-ft.

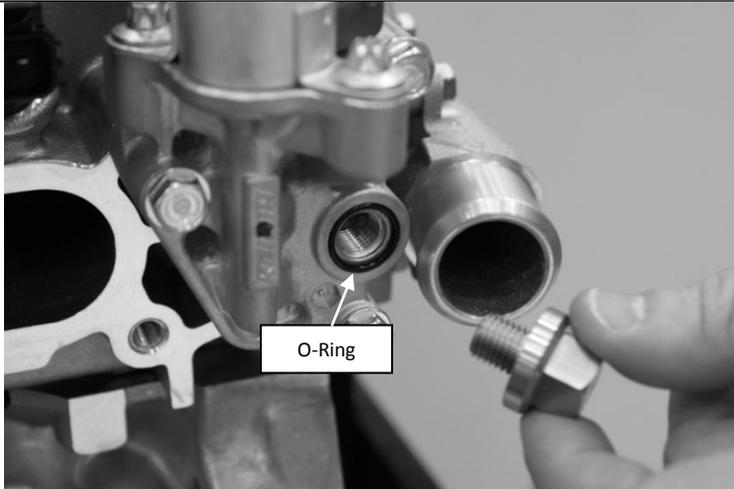


Install the HPD engine kit water outlet manifold using the original hardware. Apply liquid gasket per the 2009/2010 *Honda Fit Service Manual*, or its equivalent.

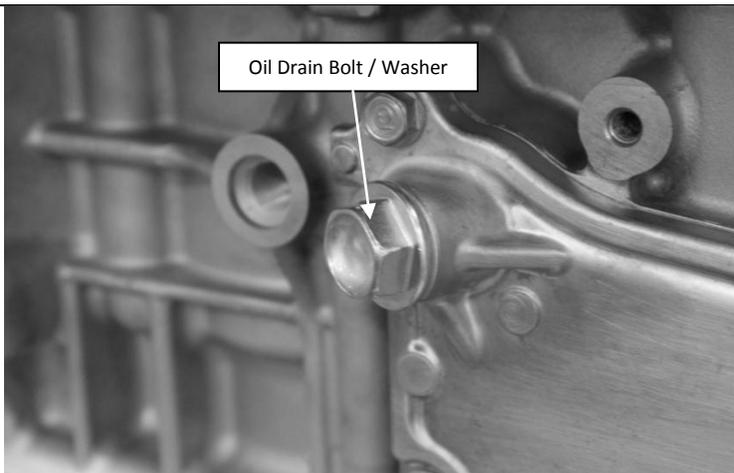
Top End cont'd



Torque the fasteners to 9.8 N·m / 7 lb-ft.



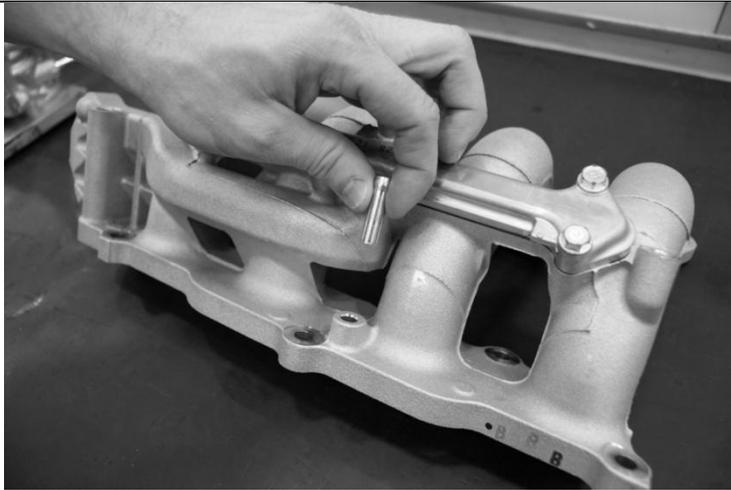
Install the V-TEC block-off plug.
Ensure the O-ring is in place.
Torque the plug to 22 N m / 16 lb-ft.



Install the oil drain plug and sealing washer from the original oil pan in place of the PCV fitting.
Torque plug to 39 N m / 29 lb-ft.

NOTE: Honda Performance Development recommends replacement of the washer every time the oil drain bolt is removed.

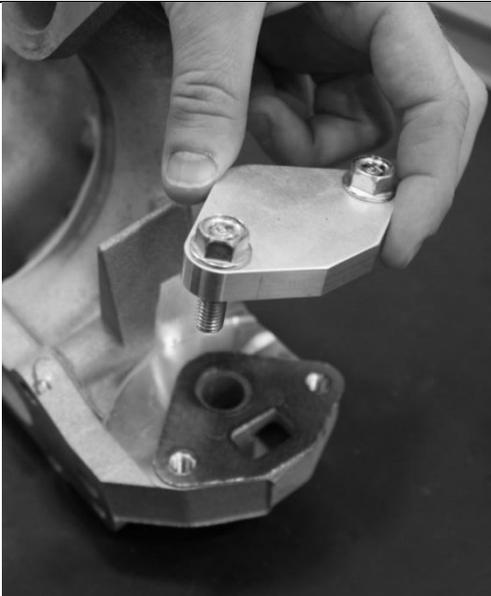
Top End cont'd



Remove the PCV nipple by tapping it out from the back of the intake runner. Be careful not to damage the bore.



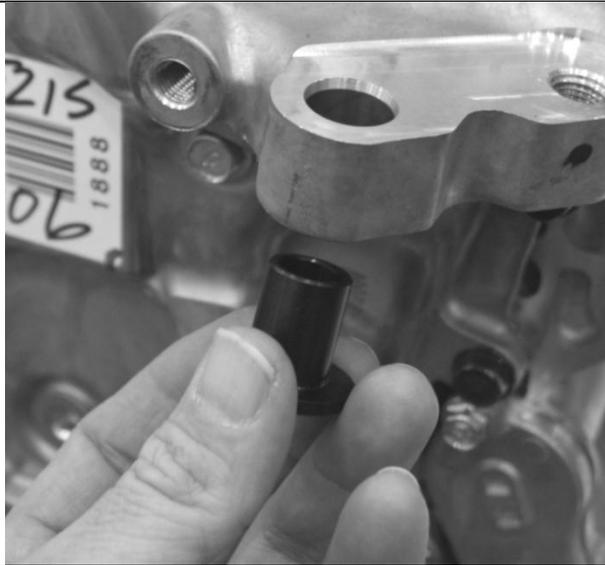
Heat the intake runner to 120°C / 248°F. Install the PCV block off plug flush, with the chamfered end down.



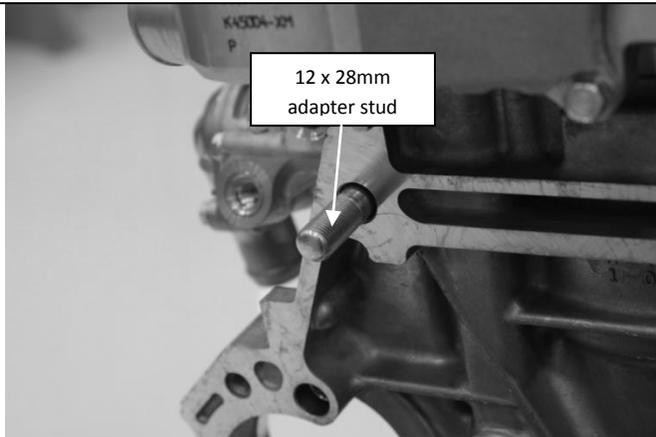
Install the EGR block-off plate. Use the standard gasket and fasteners.

Torque the fasteners to 24 N·m / 17 lb-ft.

Top End cont'd



Insert the top hat spacer. Use an adhesive media to hold it in place.



Install the bell housing adapter 12 x 28mm stud. Use Hondalock 3, thread locking agent or equivalent.

Engine Wiring Harness

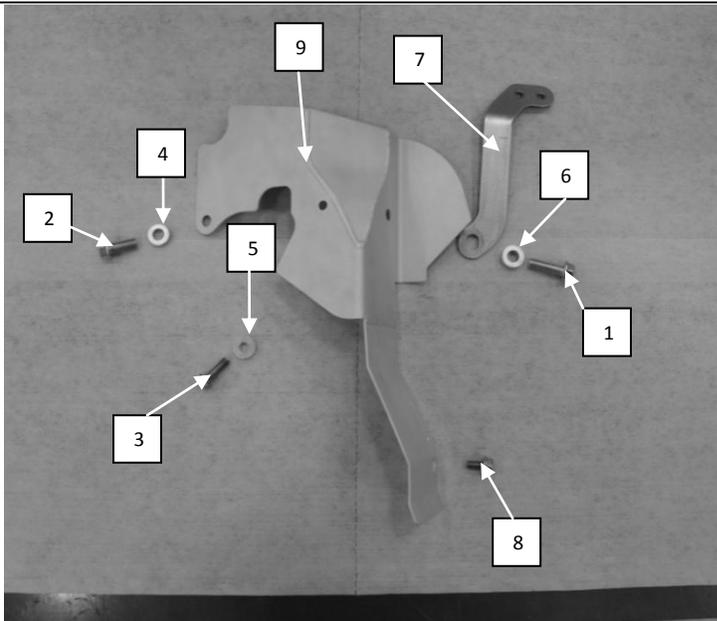
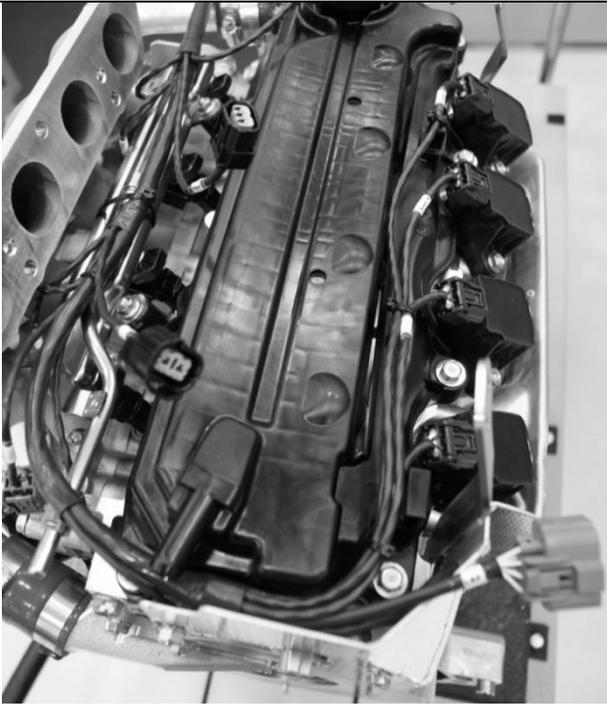


Install the HPD engine kit wiring harness. Use anchor points that minimize harness exposure to heat and chafing.



cont'd

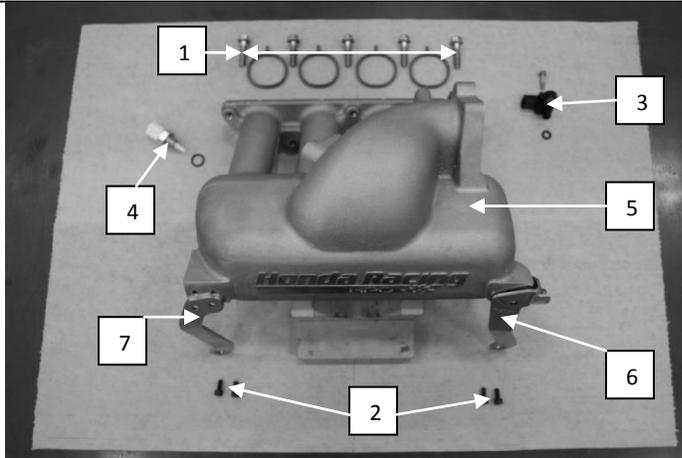
Engine Wiring Harness cont'd



Install heat shield and intake plenum supports.

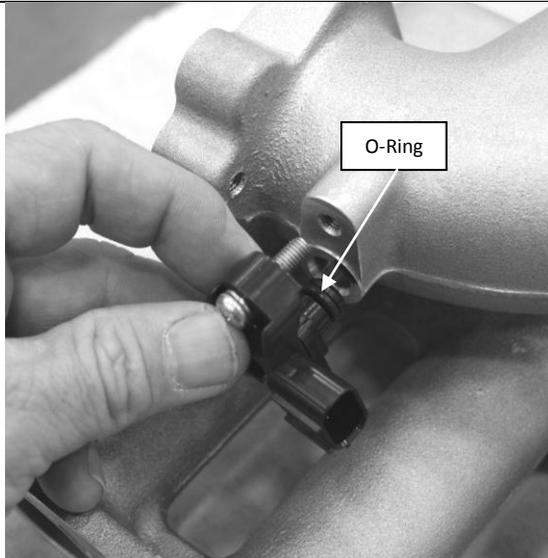
1. 8 x 25mm flange bolt
2. 8 x 20mm flange bolt
3. 6 x 20mm flange bolt
4. Spacer 'A' - 5 x 8mm
5. Spacer 'B' - 5 x 6mm
6. Spacer 'C' - 7 x 8mm
7. Rear plenum support bracket
8. 6 x 12mm
9. Heat shield

Induction



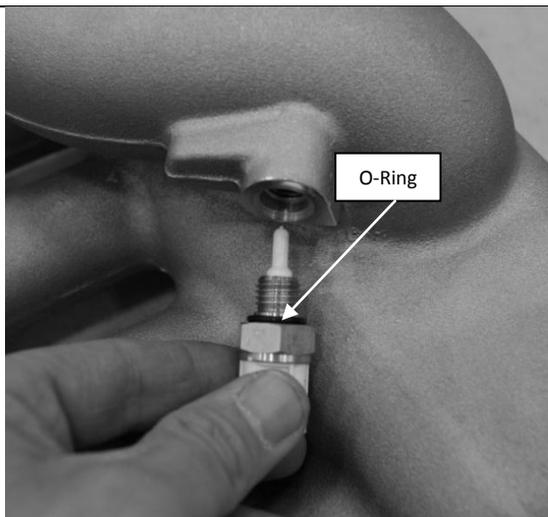
Intake Plenum, gaskets, hardware and sensors.

1. 8 x 30mm flange bolt
2. 5 x 12mm socket head bolt/washer
3. OE MAP sensor w/fastener and 11 x 2.5mm O-ring
4. Air temperature sensor w/15 x 2mm o-ring
5. Intake plenum
6. Intake Plenum Support (F)
7. Intake Plenum Support (R)



Lubricate the O-ring with liquid silicone. Install the OE MAP sensor and O-ring.

Torque fastener to 40 kg-cm / 35 in-lb.

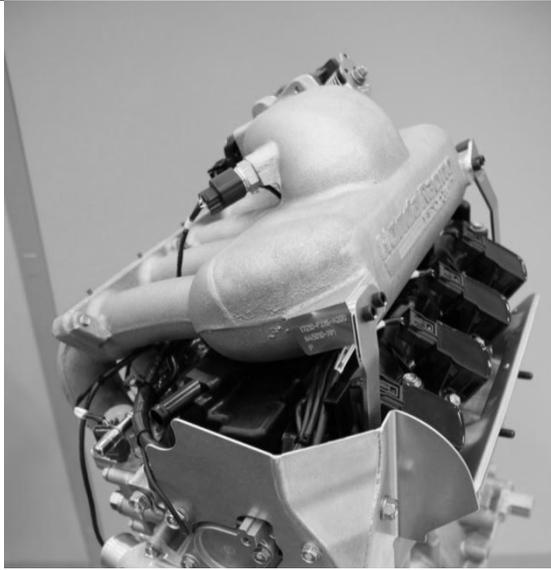


Lubricate the O-ring with liquid silicone.

Install the air temperature sensor and O-ring.

Torque to 138 kg-cm / 10 lb-ft.

Induction cont'd



Install the intake plenum.

Torque the 8 x 30mm plenum fasteners to 24 N·m / 17 lb-ft.

Torque 5 x 12mm plenum support bracket fasteners to 70 kg-cm / 5 lb-ft.



Replace the original throttle body lever.

Use the following procedure.



Hold the throttle lever while removing the shaft nut. The spring is under high tension and hand / eye injury could result if you lose control.

Induction cont'd

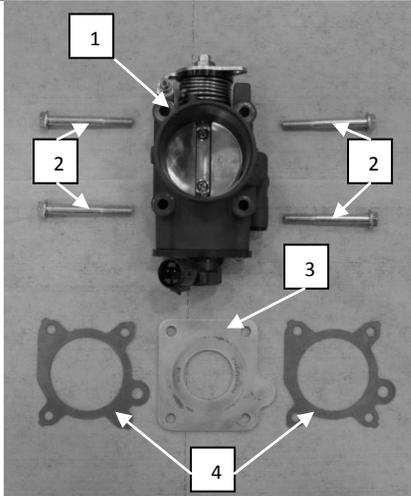


While managing the spring tension, remove the throttle lever from the shaft.



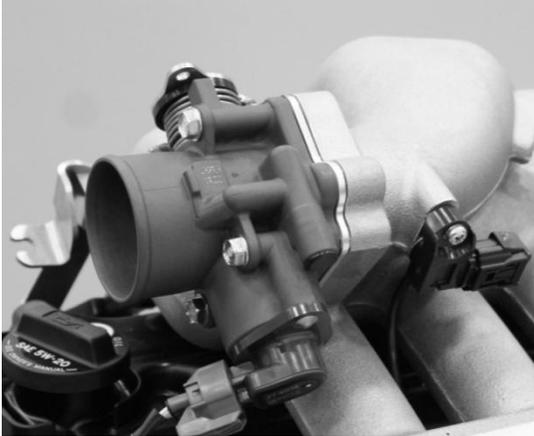
Replace the OE throttle lever with the HPD engine kit throttle lever. The throttle lever can only be installed one way. Install it in the reverse order of disassembly.

Torque the throttle lever shaft nut to 90 kg-cm / 7 lb-ft.



1. Throttle body
2. 6 x 55mm flange bolts
3. Restrictor
4. Gaskets

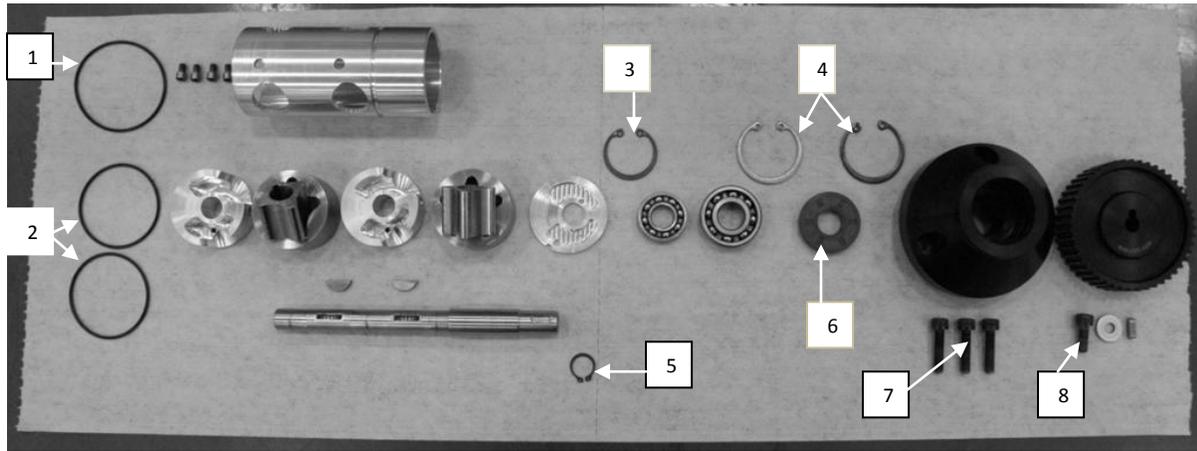
Induction cont'd



Install the throttle body with the restrictor and gaskets onto the intake plenum. Match the orientation of the gaskets and restrictor to the throttle body.

Torque the fasteners to 12 N·m / 8.8 lb-ft.

Oil Scavenge Pump



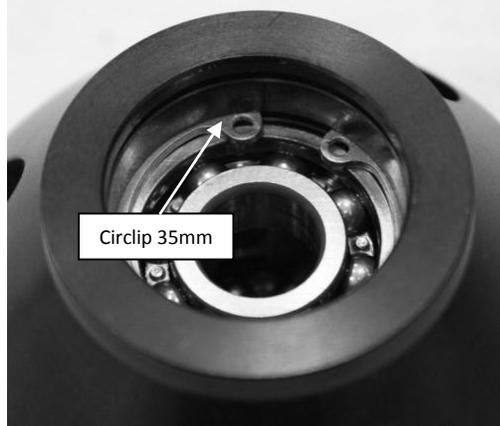
- 1. O-Ring 1.78 x 53.7mm
- 2. O-Ring 1.78 x 47.37mm
- 3. Circlip Internal 29mm
- 4. Circlip Internal 35mm

- 5. Circlip External 12.7mm
- 6. Seal 15 x 35 x 7mm radial shaft
- 7. 6 x 20mm socket head bolts
- 8. 6 x 16mm Flange Bolt

Before assembly, inspect grooves, corners and edges of parts for sharpness. Polish with 600 grit (or finer) emery paper as necessary.

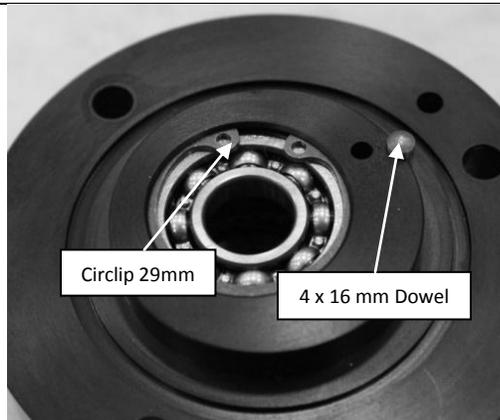
During assembly, apply a light coat of motor oil to parts.

Heat scavenge pump cover 20 minutes for bearing installation. Do not exceed 120°C / 248°F



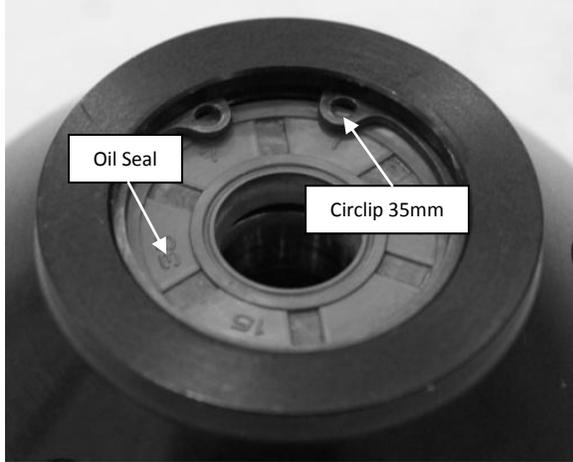
Install the bearings into the front cover. Allow the front cover to cool to room temperature.

Install the circlips for bearing retention.

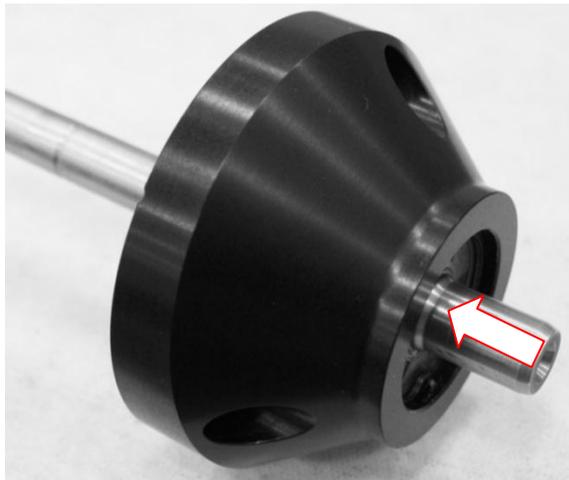


Install the 4 x 16mm dowel pin. The pin will bottom out when fully seated.

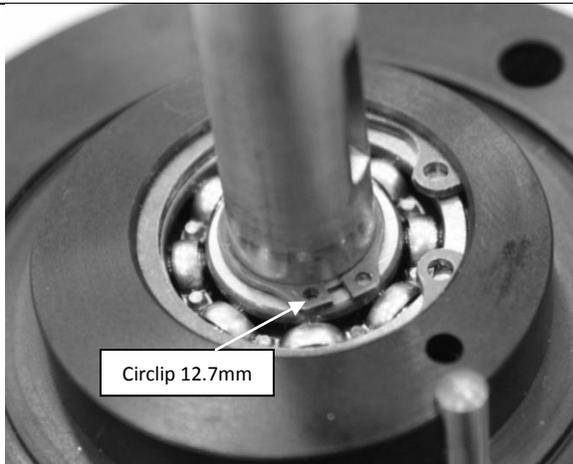
Oil Scavenge Pump cont'd



Install the oil seal and retaining circlip.



Insert the drive shaft from the front of the scavenge pump cover.



Install the retaining circlip.

Oil Scavenge Pump cont'd



Place the scavenge port 'B', with cutouts facing up. Locate the dowel cutout on the dowel pin.



Ensure the Woodruff key fits in the slot on the shaft. Lapping of the key may be necessary.

Install the woodruff key.

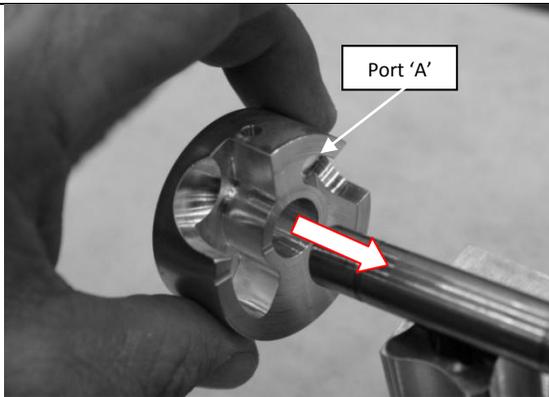


Place the inner rotor onto the shaft.

Oil Scavenge Pump cont'd

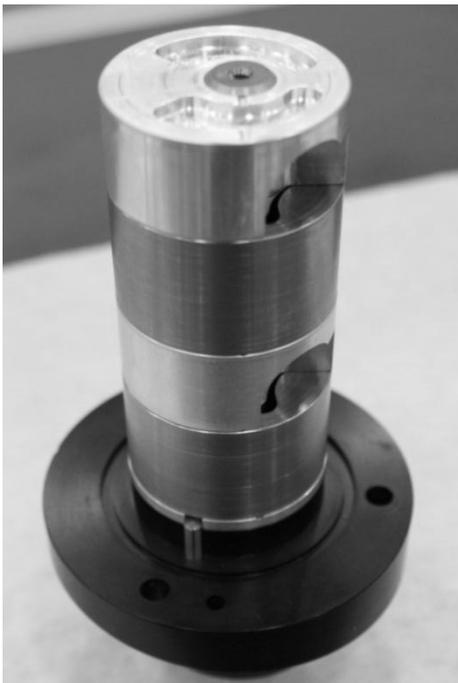


Install the outer rotor.



Install the scavenge port 'A'. The ports are identical, so the placement order is not critical.

Repeat steps for remaining rotor and port installation.

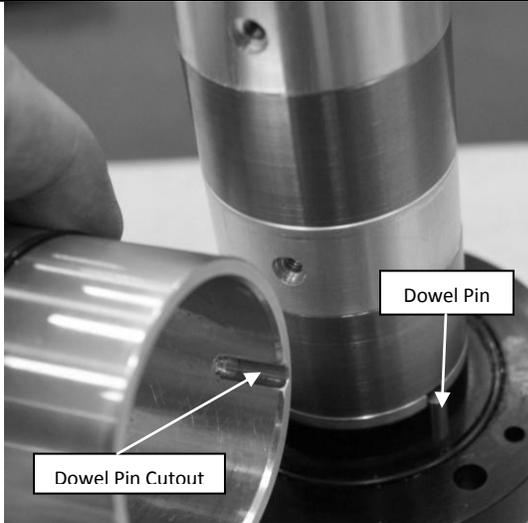


Align the rotors and ports so that the scavenge cartridge can be installed onto the scavenge pump cover.

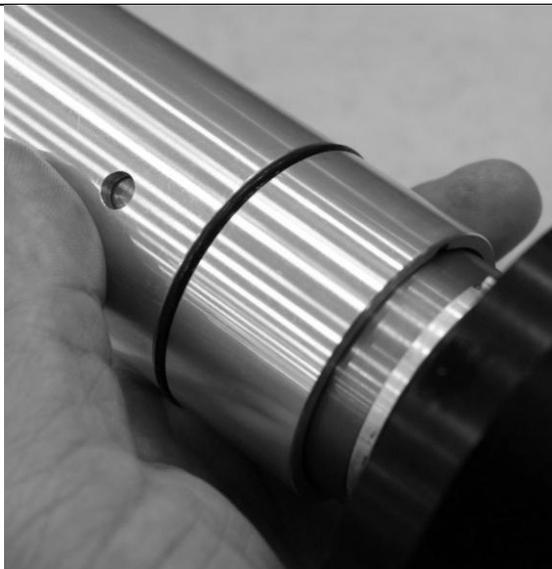
Oil Scavenge Pump cont'd



Place the 47.37 x 1.78mm O-ring onto the cartridge.



Align the dowel pin cutout in the cartridge with the dowel pin on the scavenge pump cover.

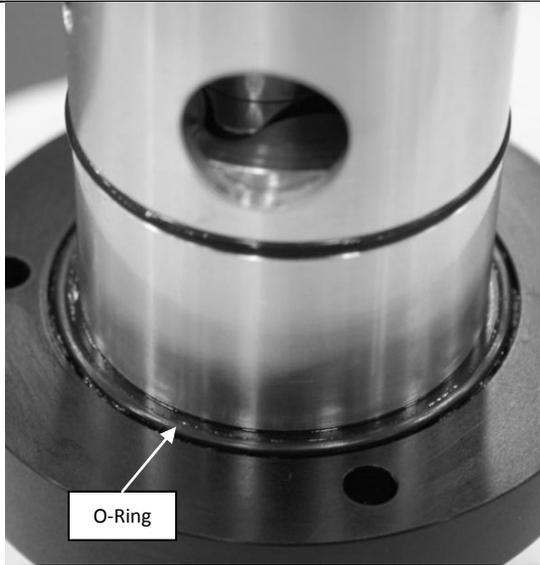


Install the cartridge over the rotors and scavenge ports. The first installation may be a tight fit over the dowel pin.

Oil Scavenge Pump cont'd

		<p>Install the scavenge port set screws. Sparingly apply Hondalock 2 thread locking agent or equivalent to the set screws.</p> <p>Torque the screws to 40 kg-cm / 35 in-lb.</p> <p>NOTE: Pick up / carry the pump by the front cover only. Damage to the pump could result if the cartridge separates from the front cover. The set screws are scavenge port locators and are not designed to retain the cartridge on the scavenge pump cover.</p>
		<p>Check for proper port and rotor clearance with a feeler gauge. If the minimum thickness gauge does not go between the rotor and port face, lapping of the face of the port will be necessary.</p> <p>Clearance specification: 0.080mm - 0.180mm</p>
		<p>Lap the port as shown in the picture.</p> <p>Use 600grit or finer emery paper, and lubricate with WD-40 or equivalent.</p> <p>Use a figure eight pattern, stopping to rotate the port 90 degrees approximately every half dozen cycles to maintain even material removal.</p> <p>Test fit the parts occasionally to avoid removing excess material. Reassemble the pump once proper clearance has been achieved.</p>

Oil Scavenge Pump cont'd

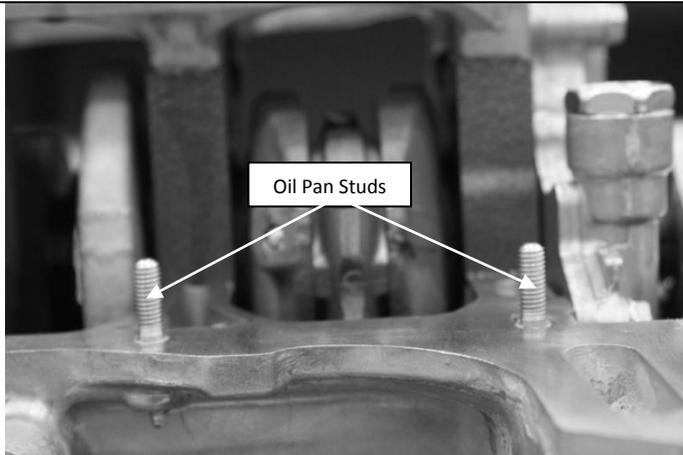
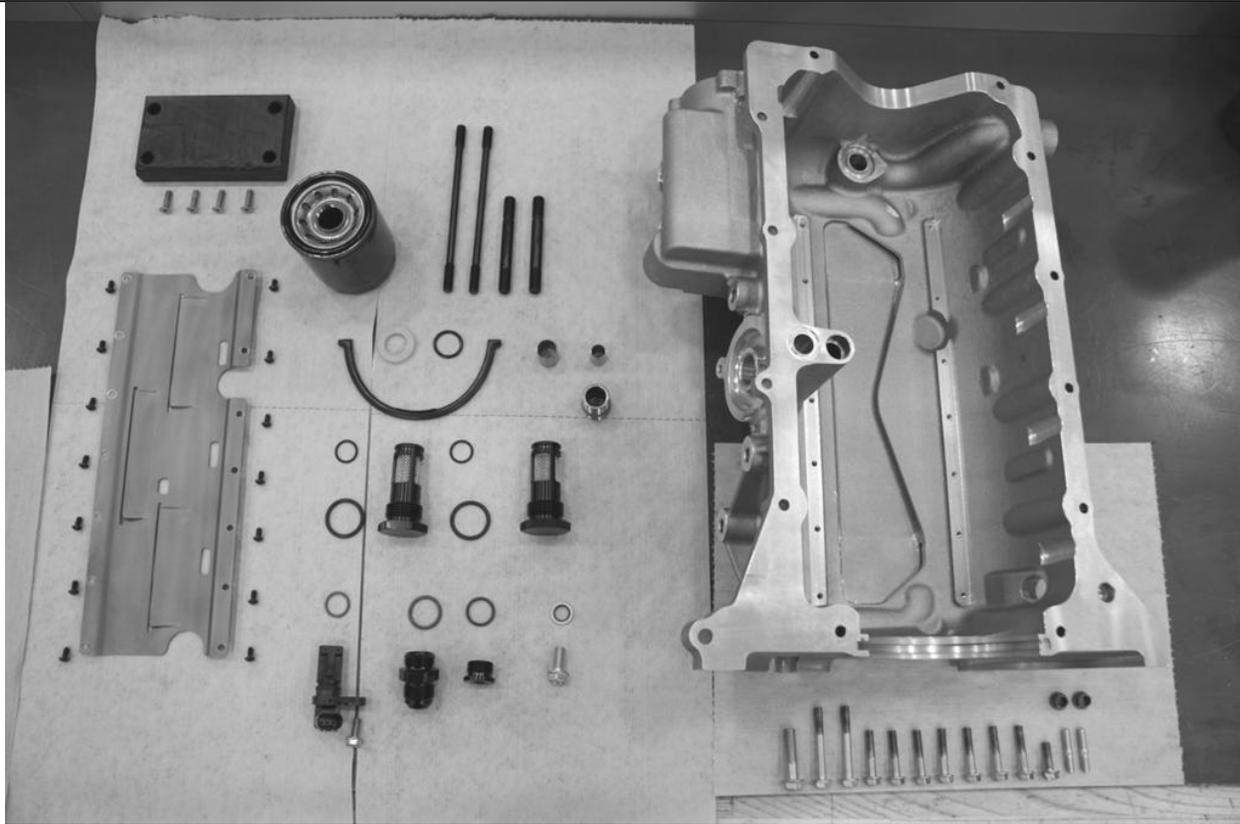


Install the 53.7 x 1.78mm O-ring into the groove in the scavenge pump cover.

The scavenge pump is ready for installation.

Oil Pan

Inspect and deburr all edges of the pan, the oil ports and the oil baffle pan. The skid block is not included in the kit.

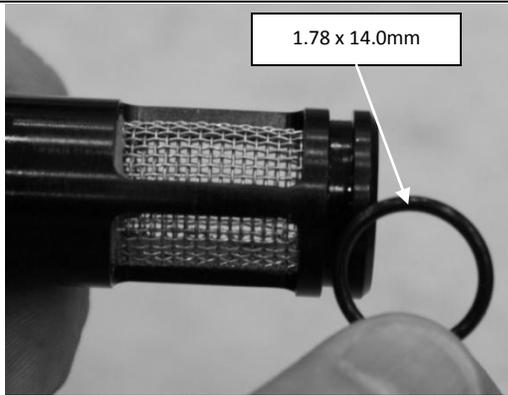


Install the oil pan studs in the engine block above the oil scavenge pump housing. The short thread end goes into the block.

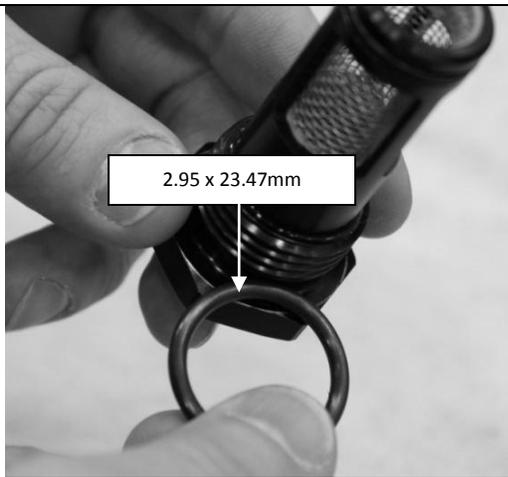
Use a high strength thread locking agent. Thread them in until the studs seat hand-tight.

*These studs are only used for the DB-1 / DB-6 Formula F chassis.

Oil Pan cont'd



Install the O-rings onto the two scavenge filter/strainers.



Lubricate the O-rings with liquid silicone, then install them into the scavenge ports.

Inspect the O-ring condition by looking in the oil scavenge pump cavity to ensure it has not been cut by the edge of the port during installation.

Increasing the radius of the edge of the port will be necessary if the O-ring is cut.

Torque the strainer to 45 N·m / 33 lb-ft.

Oil Pan cont'd



Lubricate the pre-installed 20.5 x 2.3mm O-ring with liquid silicone, then install the AN-8 port plug.

Torque the plug to 34 N·m / 25 lb-ft.



Lubricate the pre-installed 24 x 2.5mm O-ring with liquid silicone on the AN-10 male adapter oil inlet, then install the fitting.

Torque the adapter to 40 N·m / 29 lb-ft.



Lubricate the crankshaft position sensor O-ring with liquid silicone, then install the sensor.

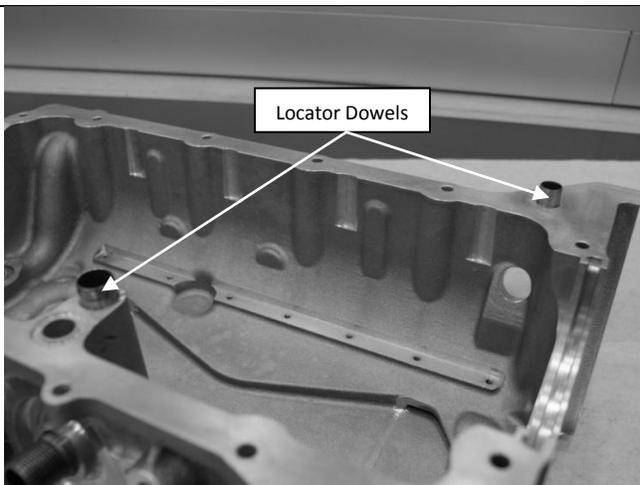
Torque the fastener to 98 kg·cm / 7 lb-ft.

Oil Pan cont'd



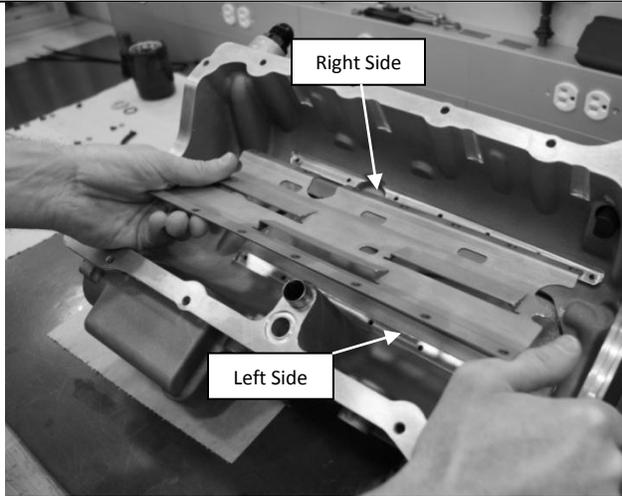
Install the plug with a new sealing washer. It is located forward, on the right side of the oil pan.

Torque the plug to 40 N·m / 30 lb-ft.



Install the locator dowels that were removed from the OE oil pan.

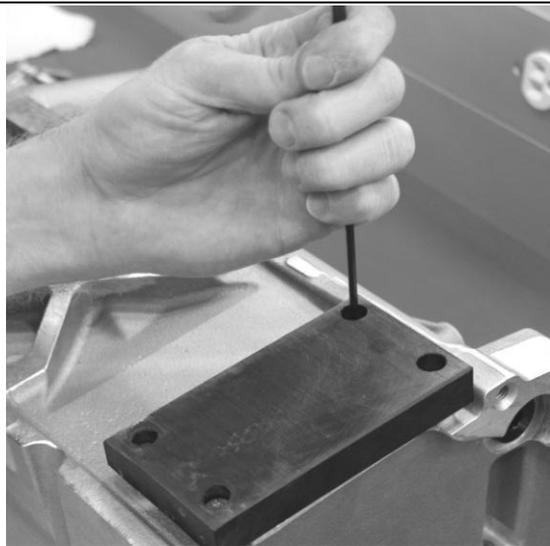
Oil Pan cont'd



Install the oil pan baffle plate.

Install 4 x 8mm button-head fasteners in the right side holes, and 4 x 10mm button-head fasteners in the left side holes. Use Hondalock 2 thread locking agent or equivalent.

Torque the fasteners to 40 kg-cm / 35 in-lb.



Install the oil pan skid plate.

Skid plate shown is for demonstration purposes only and is not included.



Install the seal for the oil pump inlet passage from the race kit; use grease to hold it in place.

Oil Pan cont'd



Install the OE 22 x 2.5mm O-ring that was retained during disassembly from the OE oil pan.



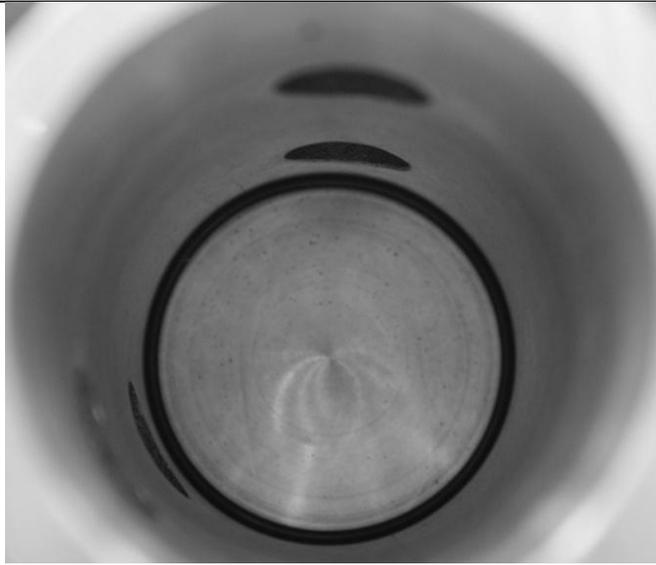
Install the rear main seal.
Install the oil pan gasket.
Install the oil pan.



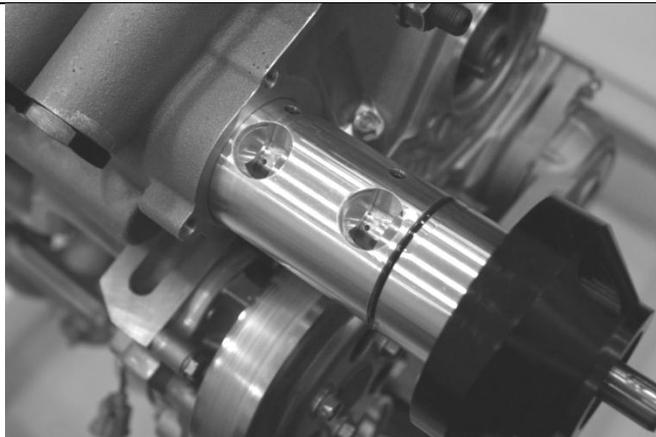
Install the front chassis mounting studs with Hondalock 3 thread locking agent or equivalent.

Torque the studs to
12 N·m / 8.8 lbf-ft.

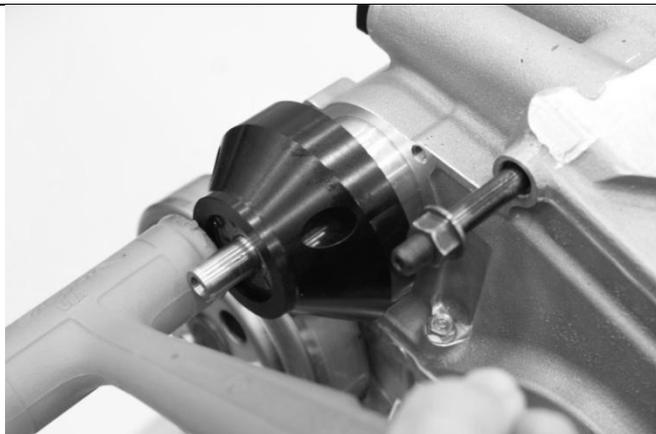
Oil Pan cont'd



Lubricate the 47.37 x 1.78mm scavenge pump sealing O-ring with liquid silicone, then install it at the base of the scavenge pump bore.



Lubricate the O-ring with liquid silicone. Align the scavenge pump ports in the pan and the scavenge pump body, then insert the scavenge pump.



Using a soft-blow hammer, tap on the scavenge pump cover to get O-ring into the scavenge pump bore, continue until the pump is lightly seated.

Put oil on the threads of the scavenge pump bolts.

Torque bolts to 12 N·m / 8.8 lb-ft.

Engine Accessories



Insert the Woodruff key for the pulley into the slot on the shaft. The key may need lapping for a proper fit.

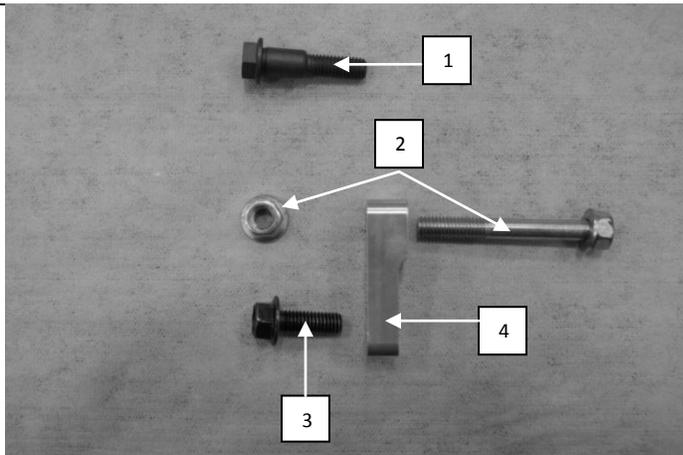


Install the pulley onto the scavenge pump shaft.

Apply Hondalock 2 thread locking agent or equivalent to the threads of the bolt.

Install bolt with the washer.

Torque the bolt to 12 N·m / 8.8 lb·ft.

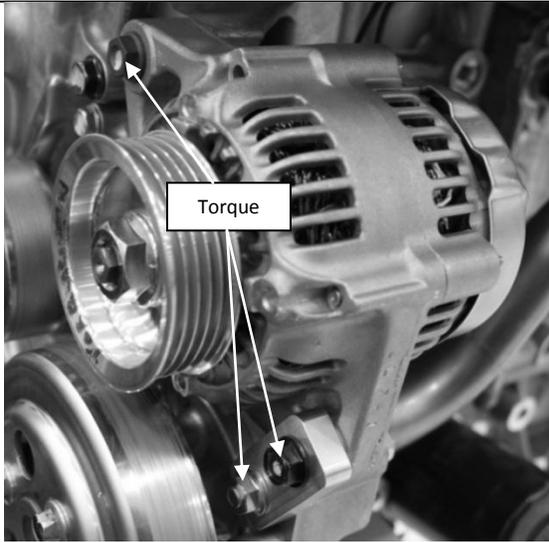


If using the optional, small alternator, install the alternator using the following hardware:

1. 8 x 36mm knock bolt
2. OE throttle body bolt/flange nut
3. OE exhaust manifold bolt
4. Alternator bracket

If the original alternator is fitted, use the original hardware and follow the 2009/2010 Honda Fit Service Manual procedure for installation.

Engine Accessories cont'd



Torque the alternator fasteners to 20 N·m / 15 lb-ft.



Torque the pulley retaining nut to 40 N·m / 30 lb-ft.



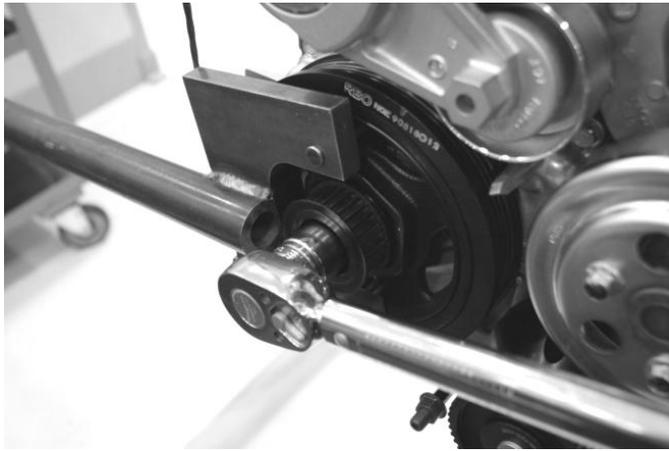
Install the harmonic balancer with spacer, 14 x 53mm flange bolt, and the pulley per Honda Fit service manual procedure.

Engine Accessories cont'd



HPD special tool – Excaliber.

Available for purchase.

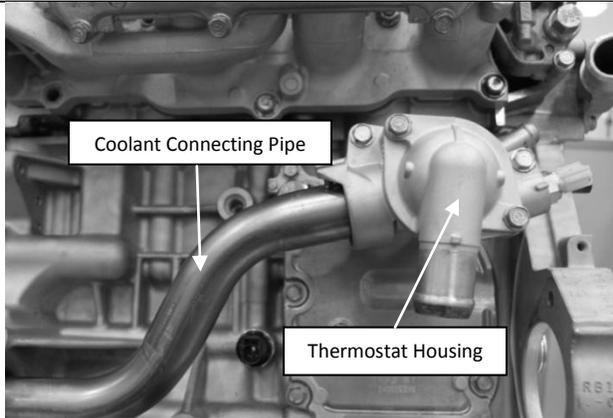


Install the water pump and alternator drive belt, then the scavenger pump toothed drive belt.

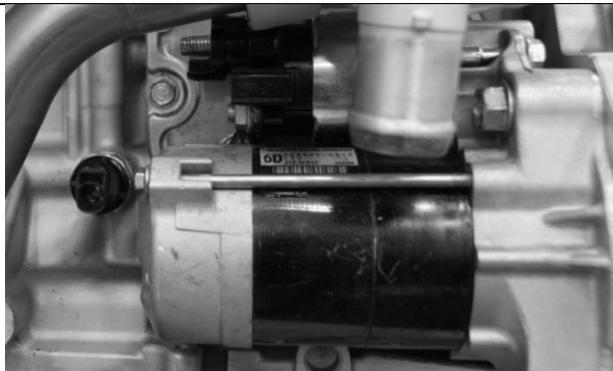
Install the flywheel per the *2009/2010 Honda Fit Service Manual*.

Install the clutch per the *2009/2010 Honda Fit Service Manual*.

Engine Accessories cont'd



Install the coolant connecting pipe, thermostat housing (see engine kit installation notes), and thermostat per the *2009/2010 Honda Fit Service Manual*.



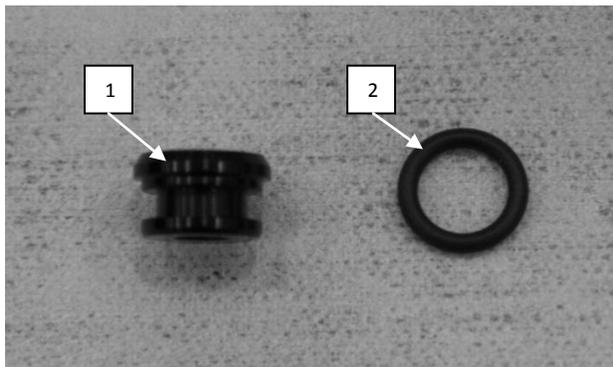
Install the starter motor.

Torque the flange bolt to 64 N·m / 47 lb-ft.



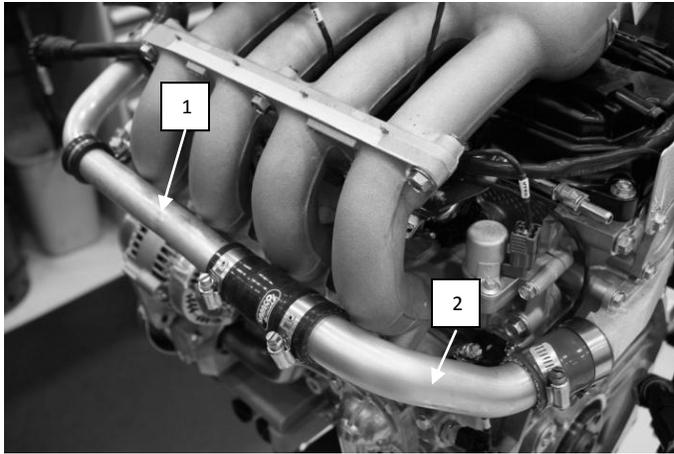
Install the O-ring onto the breather restrictor, and then install the restrictor into the crankcase breather pipe on the cam cover

1. Crankcase breather restrictor
2. O-Ring - 1.78mm x 7.66mm

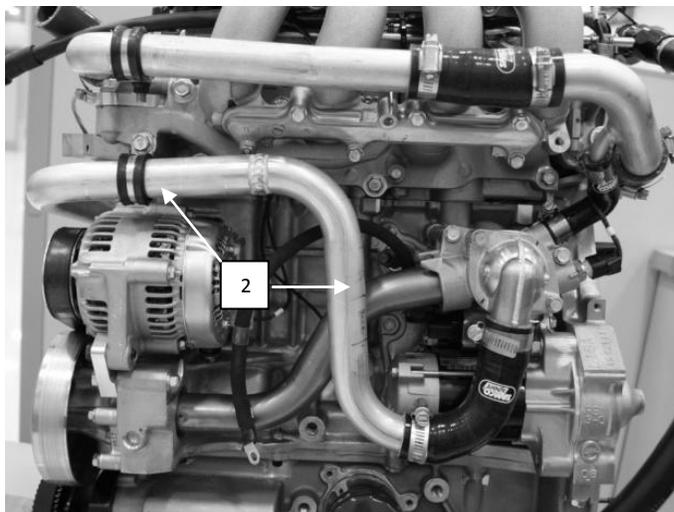


Engine Coolant Plumbing

Install the water cooling pipes appropriate to your chassis specifications. It is recommended that the pipes be installed prior to installing the engine in the chassis. The DB-1/ DB-6 configuration is pictured.



1. Upper front coolant pipe.
2. Upper Rear coolant pipe.



1. Lower Front coolant pipe (not shown – opposite, right side)
2. Lower Rear coolant pipe

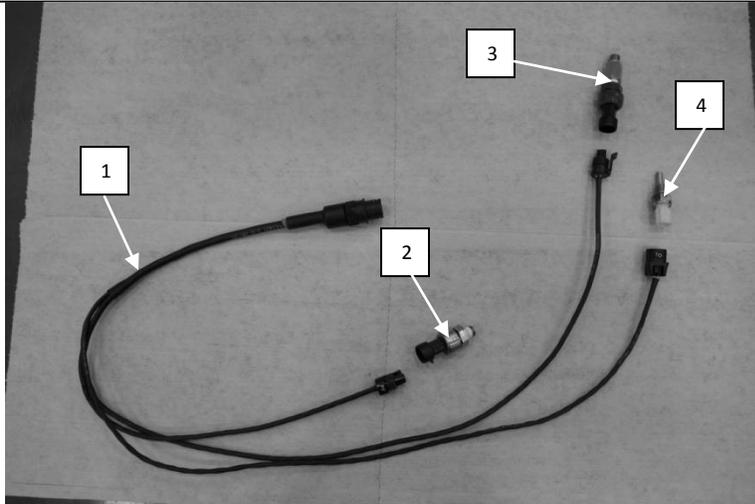
Quick Reference Torque Specification Sheet

Cylinder Head	
Cylinder Head Bolt	29 N·m / 22 lb-ft + 130°
Camshaft Sprocket Bolt	56 N·m / 41 lb-ft.
Camshaft Pulse Plate	34 N·m / 23 lb-ft
Cam Chain Tensioner	12 N·m / 8.8 lb-ft
Camshaft Thrust Cover Bolt	9.8 N·m / 7.2 lb-ft
Cam Chain Case Cover	12 N·m / 8.8 lb-ft (6 x 1.00mm) 31 N·m / 23 lb-ft (8 x 1.25mm)
Rocker Shaft Holder Bolt	15 N·m / 11 lb-ft (#'s1-10) 9.8 N·m / 7.2 lb-ft (#11)
Exhaust Manifold Bolt	31 N·m / 23 lb-ft
Intake Manifold Bolt	24 N·m / 18 lb-ft
Throttle Body Bolt	24 N·m / 18 lb-ft
Ignition Coil	9.8 N·m / 7.2 lb-ft
Fuel Rail	12 N·m / 8.8 lb-ft
O2 Sensor	44 N·m / 33 lb-ft
Engine Block	
Oil Pan	24 N·m / 18 lb-ft (#1) 12 N·m / 8.8 lb-ft (2-13)
Rod Bearing Cap Bolt	9.8 N·m / 7.2 lb-ft + 90°
Main Bearing Cap Bolt	25 N·m / 19 lb-ft + 40°
Oil Pressure Pump Bolt	12 N·m / 8.8 lb-ft
Oil Pump Screen Bolt	12 N·m / 8.8 lb-ft
Crank Position Pulse Plate Bolt	19 N·m / 14 lb-ft
Oil Pressure Switch	18 N·m / 13 lb-ft
Oil Filter	¾ Turn after the seal seats – 12 N·m / 8.8 lb-ft
Crankshaft Pulley Bolt	New Bolt or Crankshaft: 177 N·m / 130 lb-ft – Remove & retighten to 37 N·m / 27 lb-ft + 90° Reused Bolt / Crankshaft: 37 N·m / 27 lb-ft + 90°
Belt Tensioner	24 N·m / 17 lb-ft
Alternator Mount	14 N·m / 17 lb-ft

Quick Reference Torque Specification Sheet cont'd

Cooling System	
Water Pump Pulley Bolt	14 N m / 10 lb-ft
Water Pump Bolt	12 N m / 8.8 lb-ft
Thermostat Cover Bolt	12 N m / 8.8 lb-ft
Thermostat Housing Bolt	9.8 N m / 7.2 lb-ft
Water Outlet Bolt	12 N m / 8.8 lb-ft

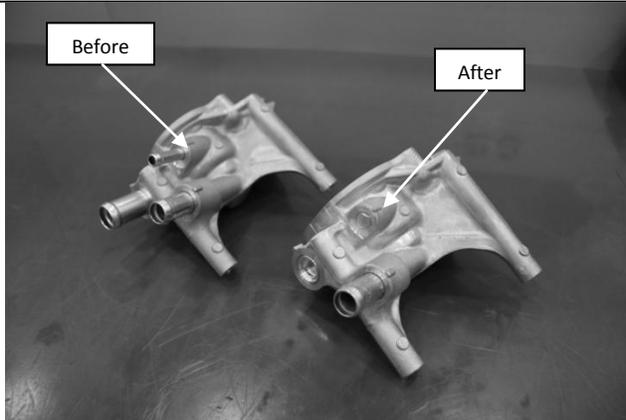
Optional Accessories



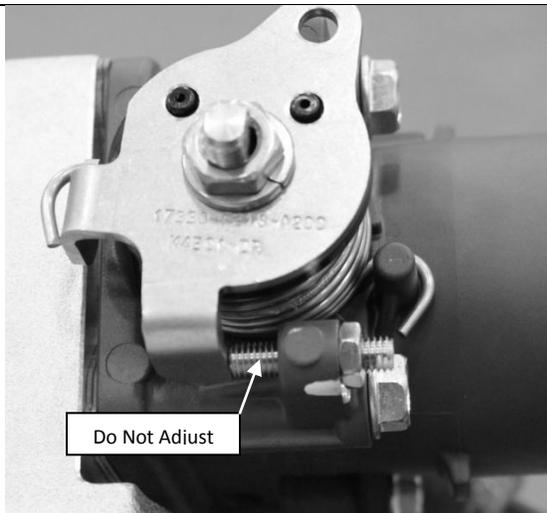
Optional sensor kit assembly

1. Secondary harness
2. Fuel pressure sensor
3. Oil pressure sensor
4. Oil temperature sensor

HPD Engine Kit Installation Notes

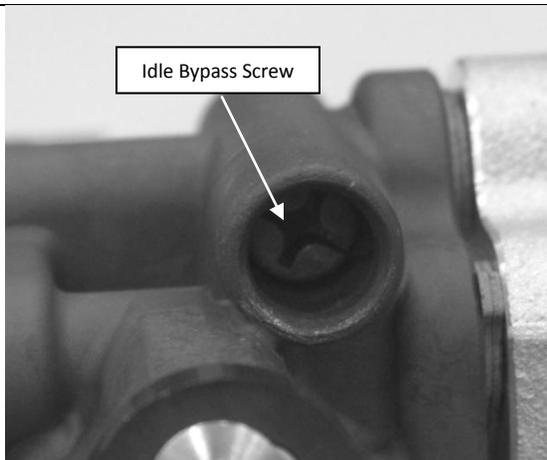


Thermostat Housing - Engines purchased from HPD will be delivered with housings already modified. Those who purchase a Honda Fit engine outside of HPD will need to send a serviceable, core thermostat housing to HPD to exchange for a modified thermostat housing.



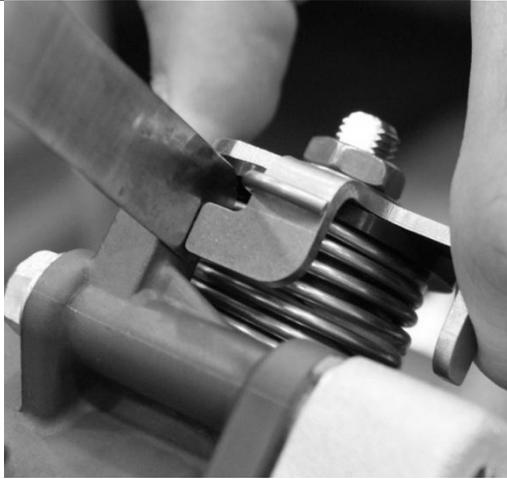
Throttle Position Sensor
 Initial adjustment of the throttle position sensor (TPS) is performed at HPD using the idle adjustment stop screw to ensure compatibility with supplied ignition / fueling maps.

Do Not Adjust This Screw For Idle Speed Adjustment



Idle Speed Adjustment
 The initial screw setting is ¼ turn out from fully seated. Warm the engine to a minimum of 75°C / 167°F. Remove the rubber plug. Using the idle bypass screw, turn either clockwise or counter-clockwise to achieve an 800-900 rpm idle speed with no cable attached. Replace the rubber plug.

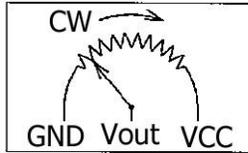
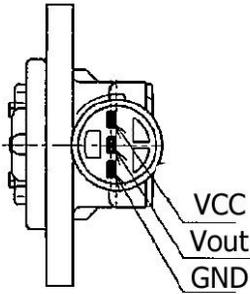
Race Kit Installation Notes cont'd



WOT Adjustment

Attach the throttle cable to the throttle lever. With the throttle lever against the idle set screw, adjust the cable to show visible slack. Adjust the WOT set-point on the pedal so that there remains a 0.40mm gap between the throttle lever and the throttle body. This minimizes cable wear and stretching, and limits the possible cause of cable breakage due to cable wear and fatigue.

Throttle Position Sensor Calibration



Across VCC and VOut

Resistance is .670 k Ohms at WOT, 4.470 k Ohms at idle, and 4.6 k Ohms at 0% throttle

Voltage is 4.7 V at WOT, 0.5 V at idle, and 0.5 V at 0% throttle

NOTE: 0% throttle is with the idle adjustment screw backed away from contacting the the throttle lever.

Engine Operation Parameters

Water temperature minimum before going on the track - 75°C / 167°F

Water temperature maximum – 100°C / 212°F

Oil pressure minimum at idle / operating temperature – 340 kPA / 49 psi

Oil pressure minimum at 5000 rpm / operating temperature – 490kPA / 71 psi

Oil temperature maximum – 140°C / 284°F

Contact Information

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