Assembly Check List, Pontiac V-8

 This procedure was written to aid the assembly of a motor and to serve as a future reference to what work was – or was not – performed, specifications, and what parts were used. It is primarily directed towards the Pontiac V-8, but may be of use towards other makes as well. The steps are arranged in an order that I find logical, but by no means should the order presented be taken to be the only possible order.

 No torque values or any other specifications have been provided. Some builders may have personal specifications they wish to use, while others may wish to obtain specifications from some other reference source. I strongly suggest that ALL specifications be verified by a second, unrelated, reference.

 All blanks may not be applicable to your specific engine. I suggest that *no blanks be left*, but to enter "*N/A*" for "not applicable", "*N/M*" for "not measured", and "*?*" for anything you are unsure of. If more than one person is doing the assembly, it would be beneficial if each person *initialed* the steps they complete in lieu of simply "checking off" the step.

 Steps/measurements that are needed for calculating compression ratio have been positively identified by a “ \*\*\* ”. For ease of calculation, I recommend using the “Compression Calculator” that can be found on the “Restoration” page of the “Classical Pontiac” website, **w****ww.classicalpontiac.com**or at **www.wallaceracing.com**

 I, the author, accept no liability for the use of this document. By using this document, the user accepts all liability.

# Machine shop used: Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Address: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Phone Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Head work by: Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Address: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 Phone Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Engine assembled by: Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Address: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 Phone Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Reference documents: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 **Block Prep**

If any deburring/polishing to the block is to be done, such as in the lifter valley, I suggest doing so BEFORE the block is taken to the machine shop. This is to minimize the chances of metal shavings and debris contaminating the block after cleaning.

 Cam bearings installed and cam test fitted? [ Y / N ]

 [*this is usually done at the machine shop, when picking up the block*]

Deck Plate used for bore/hone [ Y / N ]

 Block line-bored/honed [ Y / N ]

 Amount block decked: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” [if known]

If using stroker crankshaft then test fit crankshaft, grind block for clearance if needed. [ Y / N ]

 Edges filed off of sharp edges [ Y / N ]

 All bolt-holes thread chased & cleaned [ Y / N ]

 Oil passages rifle-brushed [ Y / N ]

 Block washed \_\_\_ times with \_\_\_\_\_\_\_\_\_\_ (cleaner)

 Interior oil gallery plug (from **NOTE** below) has been installed

 [ Y / N ] and [not drilled / drilled to \_\_\_\_\_” ]

 **NOTE!** The “interior oil gallery plug” *is located at passenger side, rear-most lifter supply oil gallery plug was installed. This is NOT the plug at the back of the block, rather it isaccessed THROUGH the plug at the back of the block. The main eason to drill a SMALL hole in the plug above is to provide a flowof oil to the distributor/camshaft gear interface when using a roller camshaft. This hole also eliminates the “dead-head” situation and allows the oil to flush out small debris that may migrate to this area.*

 Remaining oil gallery plugs installed [ Y / N ]

 Brand \_\_\_\_\_\_\_\_\_\_\_ Part # \_\_\_\_\_\_\_\_\_\_

 Freeze Plugs: Brass \_\_\_ Steel \_\_\_ Sealant (if any) \_\_\_\_\_\_\_

 Install dip-stick tube (middle piece, in block) [ Y / N ]

[*the tube will be very difficult to install after the crankshaft is installed*]

 Date section completed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Notes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Crank Prep**

 Main [bolts/studs], brand/part # \_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_

 Bearing brand/part #'s: main \_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_; rod \_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_

 Oil holes chamfered [ Y / N ]

 Journals turned: main \_\_\_\_\_\_\_; rod \_\_\_\_\_\_\_

 Journals and oil passages cleaned [ Y / N ]

 \*\*\*Offset ground [ Y / N ] by \_\_\_\_\_\_\_”

 Rear seal type/part #, sealant used, installation notes:

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 Bearing prep (if any) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Assembly lube used on crank/bearings \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Rear seal lubricated [ Y / N ] with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Lube used on main cap bolts (or studs) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Main caps [ 2 / 4 ]-bolt brand/part# \_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_

 Main bearing clearances:

 1\_\_\_\_\_; 2\_\_\_\_\_; 3\_\_\_\_\_; 4\_\_\_\_\_; 5\_\_\_\_\_

 Main cap torque steps \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_.

**NOTE:** *rotate crank at end of each torque step to verifythere is no binding and that crankshaft rotates smoothly.*

 Main cap final torques: 1-4 \_\_\_\_\_\_; rear \_\_\_\_\_

 Source(s) for torque specs \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Final torque double check:

 Front 2 3 4 Rear

 pass. side \_\_\_ \_\_\_ \_\_\_ \_\_\_ \_\_\_

 drvr. side \_\_\_ \_\_\_ \_\_\_ \_\_\_ \_\_\_

 Crankshaft endplay measurement: \_\_\_\_\_\_\_\_ "

 Date section completed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Notes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Pistons, Rods and Lower-End**

 ***SUGGESTION:*** *If degreeing the camshaft, install ONLY piston #1 and procede to camshaft installation. With only the one piston installed, it will be easier & smoother to rotate the crankshaft.*

Pistons: brand/part # \_\_\_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Piston pins: brand/part #/weight \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \*\*\*Piston valve relief/dish/dome volume \_\_\_\_\_\_\_cc’s

 Piston prep (pins fitted, polishing, coatings, etc.): \_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Diameters: bore/***piston*** (enter "N/C" if not checked)

 1 - \_\_\_\_\_/\_\_\_\_\_ 3 - \_\_\_\_\_/\_\_\_\_\_ 5 - \_\_\_\_\_/\_\_\_\_\_ 7 - \_\_\_\_\_/\_\_\_\_\_

 2 - \_\_\_\_\_/\_\_\_\_\_ 4 - \_\_\_\_\_/\_\_\_\_\_ 6 - \_\_\_\_\_/\_\_\_\_\_ 8 - \_\_\_\_\_/\_\_\_\_\_

 \*\*\*Average final bore size \_\_\_\_\_\_\_\_\_”

 Final piston to bore clearance (bore – *piston* = clearance)

 1 - \_\_\_\_\_\_\_\_ 3 - \_\_\_\_\_\_\_\_ 5 - \_\_\_\_\_\_\_\_ 7 - \_\_\_\_\_\_\_\_

 2 - \_\_\_\_\_\_\_\_ 4 - \_\_\_\_\_\_\_\_ 6 - \_\_\_\_\_\_\_\_ 8 - \_\_\_\_\_\_\_\_

 Rods: brand/type \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Shot peened [ Y / N ] ; Polished [ Y / N ]

 Resized [ Y / N ]

 Rod bolts: brand/part # \_\_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_\_

 Rings: brand/part # \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_\_\_

 Ring gap (mark here \_\_\_ if rings installed w/o measure):

 Top 1 \_\_\_\_ 3 \_\_\_\_ 5 \_\_\_\_ 7 \_\_\_\_

 2 \_\_\_\_ 4 \_\_\_\_ 6 \_\_\_\_ 8 \_\_\_\_ > 0.0\_\_\_” gap

 2nd 1 \_\_\_\_ 3 \_\_\_\_ 5 \_\_\_\_ 7 \_\_\_\_

 2 \_\_\_\_ 4 \_\_\_\_ 6 \_\_\_\_ 8 \_\_\_\_ > 0.0\_\_\_” gap

 Oil – check the scraper rings to verify they have at least 0.015” gap

 1 \_\_\_\_ 3 \_\_\_\_ 5 \_\_\_\_ 7 \_\_\_\_

 2 \_\_\_\_ 4 \_\_\_\_ 6 \_\_\_\_ 8 \_\_\_\_

 Ring clock position:

 Driver's side - top \_\_\_o'clock; 2nd \_\_\_o'clock

 Passenger - top \_\_\_ o'clock; 2nd \_\_\_o'clock

 Type of lube used on pistons skirts/rings: \_\_\_\_\_\_\_\_\_\_\_\_\_

 Rod bearing prep: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Lube used on rod bearings: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 **NOTE:**  *remember protective caps for rod bolts during piston/rod installation.*

 **Pistons, Rods and Lower-End cont.**

Rod bolts tightened to:

 a final stretch of 0.0 "; or

 a final torque of \_\_\_\_\_, using \_\_\_\_\_\_\_ as lube.

 Rod bearing final clearances:

 1\_\_\_\_\_ 3\_\_\_\_\_ 5\_\_\_\_\_ 7\_\_\_\_\_

 2\_\_\_\_\_ 4\_\_\_\_\_ 6\_\_\_\_\_ 8\_\_\_\_\_

 **Rotate crankshaft after each journal pair of rods/pistons are**

**completed to verify nothing is binding.**

Clearance between each rod pair.

 1/2 \_\_\_\_\_, 3/4 \_\_\_\_\_, 5/6 \_\_\_\_\_, 7/8 \_\_\_\_\_

 \*\*\*Final deck heights:

 1\_\_\_\_\_ 3\_\_\_\_\_ 5\_\_\_\_\_ 7\_\_\_\_\_

 2\_\_\_\_\_ 4\_\_\_\_\_ 6\_\_\_\_\_ 8\_\_\_\_\_

 Oil pump: brand/part # \_\_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_

 Oil pump driveshaft: [ new / re-use old ] brand/part# \_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_

 **NOTE:** *remember to install driveshaft with pump at this time. Grinding the ears off the shaft to make it fit from the top can cause other problems later on.*

 Any oil pump prep (blueprinting, polish, etc.) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Pick up screen: pressed on \_\_\_, [welded / brazed] on \_\_\_

 clearance to oil pan \_\_\_\_\_\_\_\_\_\_\_\_\_”.

 Oil pump bolts torqued to \_\_\_\_\_\_\_\_\_\_\_\_\_.

If using a windage tray, it should be installed now, along with the lower dipstick tube. Turn crank several revolutions to verify there is no interference between the tray and crankshaft or connecting rods - [ Y / N ]

Locking compound used on windage tray bolts - [ Y / N ] type: \_\_\_\_\_\_\_\_\_

 Piston to valve clearances intake/exhaust [ \_\_\_\_ not checked]

 1 - \_\_\_\_/\_\_\_\_ 3 - \_\_\_\_/\_\_\_\_ 5 - \_\_\_\_/\_\_\_\_ 7 - \_\_\_\_/\_\_\_\_

 2 - \_\_\_\_/\_\_\_\_ 4 - \_\_\_\_/\_\_\_\_ 6 - \_\_\_\_/\_\_\_\_ 8 - \_\_\_\_/\_\_\_\_

 Date section completed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Notes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Camshaft**

 Brand \_\_\_\_\_\_\_\_\_\_\_ Grind # \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Specs: Duration (gross)\_\_­\_\_\_\_/\_\_­\_\_\_\_ (0.050")\_\_\_\_\_\_/\_\_\_\_\_\_

 (0.200")\_\_\_\_\_\_/\_\_\_\_\_\_

 Lobe lift \_\_\_\_\_/\_\_\_\_\_ Lobe separation angle \_\_\_\_\_\_

 Advance/Retard (circle one) ground into cam \_\_\_\_°

 Advance/Retard (circle one) as installed \_\_\_\_°

 Lifters: brand \_\_\_\_\_\_\_\_\_\_\_\_ part # \_\_\_\_\_\_\_\_\_\_

 Timing chain: brand \_\_\_\_\_\_\_\_\_\_\_\_ part # \_\_\_\_\_\_\_\_\_\_\_

 Type of lube applied to cam lobes \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Camshaft retaining plate bolts torqued to \_\_\_\_\_\_\_\_\_

 Locking compound used? [ Y / N ]

 Install timing gears/chain, and degree cam now Degreeing info: (for symmetrical lobed cams)

 \_\_\_\_\_ at 0.\_\_\_" before max intake lift + \_\_\_\_\_ at 0.\_\_\_" after max intake lift

 = \_\_\_\_\_ 2 = \_\_\_\_ = intake centerline

 Fuel pump eccentric: new \_\_\_\_\_\_ or used \_\_\_\_\_\_

 or eliminated for use of electric fuel pump \_\_\_\_\_\_\_.

 Cam bolt torqued to \_\_\_\_\_\_\_. Type of locking compound

 used \_\_\_\_\_\_\_\_\_\_\_

 ***SUGGESTION:*** *Before removing the degreeing equipment, return #1 piston to exactly TDC. Install timing cover and damper, and verify the correlation between the timing pad and “zero” mark on damper.*

 Timing cover (brand/part# \_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_)

 Install new seal on timing cover. Seal part # \_\_\_\_\_\_\_\_\_\_\_

 Seal lubricated with \_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_Timing cover installed. Anti-seize on bolts [ Y / N ]

 \_\_\_\_Inspect harmonic damper for damage (i.e. cracks

 around keyway, rubber deterioration, etc.)

 Damper (brand/part# \_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_) torqued to \_\_\_\_\_\_\_

 SFI approved ? [ Y / N ]

 **NOTE:** *if only #1 piston has been installed, return to and complete the* **Pistons and Rods** *section.*

Date section completed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Notes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 Casting # \_\_\_\_\_\_\_ Date codes drvr/pssgr \_\_\_\_\_\_/\_\_\_\_\_\_

 Ported by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to flow

 \_\_\_\_cfm at \_\_\_\_" valve lift at \_\_\_" of water (intake)

 \_\_\_\_cfm at \_\_\_\_" valve lift at \_\_\_" of water (exhaust)

 Surfaced/milled \_\_\_\_\_\_\_\_\_\_" Intake face milled \_\_\_\_\_\_\_\_"

 \*\*\*Chamber volumes:

 1 \_\_\_\_ 3 \_\_\_\_ 5 \_\_\_\_ 7 \_\_\_\_

 2 \_\_\_\_ 4 \_\_\_\_ 6 \_\_\_\_ 8 \_\_\_\_

 Pushrod holes enlarged for 1.65 rocker arms: [ Y / N ]

 Exhaust crossover filled [ Y / N ] with \_\_\_\_\_\_\_\_\_\_\_.

 Valve job angles (int) \_\_\_\_\_\_\_\_\_\_

 (exh) \_\_\_\_\_\_\_\_\_\_

 Valve guides [iron / bronze] [new / old] [honed / knurled]

 Valve seals: intake \_\_\_\_\_\_\_\_; exhaust \_\_\_\_\_\_\_\_\_

 Valve springs, brand/part #: int \_\_\_\_\_\_\_\_\_\_/exh\_\_\_\_\_\_\_\_\_

 installed height (int/exh) \_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_

 Pressures: seat \_\_\_\_\_/\_\_\_\_\_ open \_\_\_\_\_/\_\_\_\_\_

 Max safe valve lift \_\_\_\_/\_\_\_\_

 Coil bind at \_\_\_\_\_/\_\_\_\_\_ ; Retainer to seal \_\_\_\_\_/\_\_\_\_\_ Retainers: brand/part # \_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_; material \_\_\_\_\_\_\_

 Locks: brand/part # \_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_ [ 7° / 10° ]

 Head fasteners [bolts/studs]: brand \_\_\_\_\_\_\_\_\_\_\_\_; part # \_\_\_\_\_\_

 Head gasket: brand \_\_\_\_\_\_\_\_\_\_\_\_; part # \_\_\_\_\_\_\_\_\_\_

 check for imperfections - drvr[ Y / N ]; pssgr[ Y / N ]

 \*\*\* Head gasket compressed thickness 0.0\_\_\_\_”

 Head and cylinder deck cleaned with solvent [ Y / N ]

 Lube used on head fastener threads \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Head bolts torqued in steps of \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_,

 to a final torque of \_\_\_\_.

 Rocker arms: brand \_\_\_\_\_\_\_\_\_\_\_\_; part # \_\_\_\_\_\_\_; ratio \_\_\_\_

 Rocker studs: brand \_\_\_\_\_\_\_\_\_\_\_\_; part # \_\_\_\_\_\_\_; size \_\_\_\_

 torqued to \_\_\_\_\_\_\_\_\_ with locking compound [ Y / N ]

 Adjusting nuts: brand \_\_\_\_ \_ ; part # \_\_ \_\_

 Pushrods: brand \_\_\_\_\_\_\_\_\_\_\_\_; part # \_\_\_\_\_\_\_; length \_\_\_\_\_

 \_\_\_\_ Install lifters, pre-lubed [ Y / N ] with \_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_ Install pushrods & rocker arm assemblies

 Rocker arm ( lash / preload ) adjusted to \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_ Install valley pan (brand/part# \_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_).

 New PCV grommet used [ Y / N ]

 **NOTE:** *if using roller lifters, make sure the linkbar does not contact the backside of the valley pan.*

**Heads & Valvetrain cont.**

 Date section completed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Notes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Buttoning it up**

 \_\_\_\_Test fit oil pan

 \_\_\_\_Install oil pan & gaskets. Sealant used \_\_\_\_\_\_\_\_\_\_

 (Flywheel / flexplate) brand/part # \_\_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_

SFI approved [ Y / N ]

bolts torqued to \_\_\_\_\_\_\_\_

 Locking compound used [ Y / N ]

 **NOTE**: *installation of flexplate/flywheel will may not be possible while motor is mounted on some engine stands.*

 Date section completed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Notes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 At this point, I consider the engine "built". Intake, distributor, exhaust manifold.... and the remaining installations are rather straight forward, and do not fall in the scope of this document.

Courtesy of Lee Atkinson, www.LNLPD.com

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