



NASCAR Approved Spec Engine Kit Assembly Manual - Updated April 2011

Thank you for purchasing a NASCAR Approved Spec Engine Kit from Robert Yates Racing Engines. We appreciate your business. This manual offers preparation and assembly recommendations based on our research. Note that all parts and procedures referenced in this document apply specifically to the current version of the NASCAR Approved Spec Engine.

- Place timing chain in oil.
- Install water drain plugs on both sides of the block.
- Measure and record the main housing bore (Spec. 2.7509 – 2.7515).
- Line bore blocks if preferred or if you find specs are not within tolerance.
- Remove main caps notating direction of #5 cap and position of studded bolts.
- Clean oil galleries with cleaning solution and brush.
- Blow out galleries with air and inspect with light.
- Install eight - 1/8 NPT plugs in the “on demand ports in valley”. Use Teflon paste.
- Install one – 1/8 NPT plus in dipstick tube hole and bottom out. Use Teflon paste.
- Scrub cylinders with towel and automatic transmission fluid until clean.
- Wipe out cylinders with towel and lacquer thinner.
- Wipe out main housing bores and caps.
- Clean backside of main bearings and install.



- Measure and record main bearing clearance one at a time starting with #5. Record journal size and set gauge at each main journal. The thrust bearing has three grooves that go to the rear. (Torque spec. 55 lb / ft main bolts. 22 lb / ft side bolts with oil). (Spec. 0.0020 – 0.0025).
- Lube rod bolts with ARP lube. Tap caps onto rods and install bolts (Torque 70-72 lb / ft).
- Measure and record rod housing bore (Spec. 2.2247 – 2.2252).
- Wipe out rod bores with lacquer thinner.
- Clean rod bearing backsides.
- Untorque rods and install bearings. A combination of standard and 0.0001 under may be needed to achieve recommended clearance spec.
- Tap caps back on and torque rod bolts to 70-72 lb / ft.
- Measure and record rod journal and rod bearing clearance (Spec. 0.0020 – 0.0025).
- Measure and record pistons 0.500 down from edge of skirt (About 3.9935).
- Set dial bore gauge (0.0001) to 4.0000. Measure and record bore diameter. Calculate piston to wall clearance.
- Measure and record lifter diameter (0.8423) and place in oil.
- Set dial bore gauge (0.0001) to 0.8440. Measure and record lifter clearance.
- Take out upper rings and wipe off with lacquer thinner. Grind the gap to 0.020 and deburr edges.
- Take out the second rings and wipe off with lacquer thinner. Grind the gap to 0.022 and deburr edges.
- Take out the oil rails and wipe off with lacquer thinner. Take all sixteen rails and place in one cylinder with the gap aligned up. Square rings and check gap to make sure it is at least 0.015, then record.
- Remove rod caps and main caps. Do not remove bearings.



- Take out **ONLY** the thrust bearing. Measure flange thickness. The rear three grooves should be no thicker than 0.093; the front two grooves should be no thicker than 0.089.
- Clean and reinstall thrust bearing.
- Lay out rod and rod caps one through eight. Lay out pistons upside down with "JE" facing towards you. Lay out two locks and one pin per piston.
- Install one lock using small modified screwdriver and pin.
- Oil the pin bores in piston and rod. Oil the pin and hang the rod with number side and the "JE" side of the piston toward you. Hold up assembly and visually check that the valve notches are away from the number side of the rod.
- Install other pin lock and verify you have locks all the way in and have pin float.
- There should be **NO** lock on the bench.
- Lube cam bearings.
- Lube camshaft and install into block.
- Lube cam side of the thrust plate and install. Torque bolts to 18 lb. / ft with blue Loctite.
- Clean crankshaft journals and oil holes with lacquer thinner. Inspect holes with light.
- Lube main bearings and install crank in block.
- Check end play with no caps (0.005 – 0.008).
- Check end play after installing each main cap. Install and torque caps in the order # 2, # 4, # 1 and # 5. Main bolts 55 lb / ft with oil. Side bolts 22 lb / ft with oil. Work from the center out.
- Install # 3 thrust cap. Lightly snug the two inner main bolts. Set end play and torque bolts within 0.001 of original reading.
- Install crank key and gear (gear is press fit).



- Get cam gear, adapter, proper centering bushing (probably Black) and three bolts. Centering bushing **MUST** fit cam gear. Green = 0.554. Black = 0.550. Red = 0.685. Yellow = 0.686.
- Install gear and chain, lining up dots. Install proper bushing (usually Black) and adapter; torque the three bolts to 26 lb / ft with red Loctite.
- Measure and record cam end play.
- Install timing chain guide and torque 18 lb / ft with blue Loctite.
- Layout rod / piston assembly, rod caps and rings in order.
- Install rings. Oil expander first, top rail second, lower rail third, second ring fourth, top ring fifth. Visually verify that rings are installed properly, free to rotate and gaps are staggered.
- Wipe out bores with automatic transmission fluid and lacquer thinner.
- Oil the bores with engine oil.
- Lube bearings in the rods and rod caps. Double check rings for position and oil the pistons and rings.
- Use tapered sleeve and chopstick to install piston / rod assembly. Install rod cap and bolts.
- After all eight rod assemblies are in, check rod bolt stretch and record. Torque to 70-72 lb / ft with ARP lube (0.0053 – 0.0057).
- Measure rod side clearance and record.
- Measure deck clearance and record (+ is out of hole; - is in hole). The pistons usually stick out about +0.004 to +0.008.
- Degree cam and record. (Intake centerline should be 105.5 to 106.25). Use of a degreed cam bushing to remain inside spec is acceptable by NASCAR rules.
- Install front oil squirter and torque to 18 lb / ft with blue Loctite.



- Install front 16mm (5/8) cup plug in oil gallery next to squirter.
- Install lifters into the plastic supports. Install the four lifter assemblies into the block and torque to 125 lb / in with blue Loctite.
- Install fuel pump eccentric and distributor gear onto the cam adapter and torque to 60 lb / ft with red Loctite.
- Lube the eccentric and distributor gear with extreme pressure lube.
- Install front seal into the front cover. **DO NOT LUBE.** Remove the black pointer and install the sheet metal pointer.
- Install the 1/8 diameter pin onto the crank snout.
- Install front cover bolts and gasket on the front cover. Note the countersunk bolt where the fuel pump mounts. Torque to 22 lb / ft with blue Loctite.
- Install plastic oil diverter. (O-ring to the outside).
- Install the rear seal into the rear cover if not installed. **DO NOT LUBE.**
- Install the rear cover bolts and gasket on the rear cover. Run bolts in evenly and white plastic will push out. Torque to 22 lb / ft with blue Loctite.
- Install the bolts and gasket onto the top valley cover. The two long bolts are for the oil pressure out. Torque to 150 lb / in with blue Loctite.
- Assemble the damper, note the offset hole marked with a dimple. Use blue Loctite on the six bolts and use the bolts to pull the hub and ring together.
- Use extreme pressure lube on the damper and crank snout. **DO NOT LUBE** the seal surface. Press the damper on and torque to 150 lb / ft with red Loctite.
- Torque six damper bolts to 16 lb / ft. with anti-seize.
- Using a dead stop, zero the timing pointer. This will have to be trimmed. Use blue Loctite and silicone.
- Wipe pan rail with lacquer thinner and towel.



- Double check rods and main bolts.
- Install windage tray and put blue Loctite on main studs. Torque to 25 lb / ft.
- Remove heads from the boxes. Clean the valve guides with lacquer thinner and brush.
- Wipe valve stems and number the valve heads with a Sharpie. Measure valve guide clearance and record.
- Slide valves into the corresponding valve guides. Wash and install spring seats.
- Measure and record the spring installed height. **NOTE: THE RETAINER DOES NOT FIT ON THE OUTSIDE LIP OF THE TOOL; YOU MUST SUBTRACT 0.150 FROM THE READING.**
- Calculate the valve fit using a 1.7:1 rocker arm and '0' lash.
- Record the closed and open valve spring pressure.
- C.C. the # 1 combustion chamber and record. C.C. the # 1 piston @ '0' deck height and record. Calculate the volume of the piston protrusion and subtract from the block pour volume. Note calculations. Head gaskets are 10.08 cc.
- Clean # 1 chamber and valves. Oil all valve guides and valves stems. Install valves.
- Install valve seals. Measure retainer to seal distance. Record the retainer to seal clearance.
- Install the valve springs. Valve springs are to be set at 1.800 inches with approximately 130 lbs of seat pressure.
- Clean the # 1 cylinder. Clean the decks of the block and heads with lacquer thinner.
- Install the dowel pins and head gaskets. **CAUTION: THE HEAD GASKETS ARE DIRECTIONAL.**
- Sort the head bolts in a set for each head. You may have stock bolts or ARP bolts. The stock bolts use oil under the head. If you have ARP bolts use the washers and ARP lube. Torque the bolts # 1 through # 10 in sequence. # 1 – 20 lb / ft. # 2 – 45 lb / ft. # 3 – 75 lb / ft. Torque bolts # 11 - # 15 in sequence. # 1 – 90 lb / in. # 2 – 15 lb / ft. # 3 – 22 lb / ft.



- Wipe out oil pan with lacquer thinner and towel. Install oil pan gasket and pan. Torque to 125 lb / in with blue Loctite. Some bolts are not accessible and have to be tightened by hand. **CATUTION: BOLT HOLES STRIP EASILY.**
- Install lash caps. They are a precision fit. If you twist them while trying to install them they tend to go on.
- Inspect the pushrods by holding them up and looking at the light through the hole. Install pushrods.
- Install rocker arm stand on the head and align it by putting three rocker arm bolts through the holes and crew into head. Rotate the engine and hold the # 1 pushrod down (lifters will hold pushrods up) until the exhaust pushrod starts to rise. Lube the pushrod tips. Bolt on the # 1 intake rocker and torque to 22 lb / ft. Rotate the crank ¼ turn. Blot on the intake for the next cylinder in the firing order. 1 – 8 – 7 – 2 – 6 – 5 – 4 – 3. Once all intakes are on, rotate the engine to intake closing and do the same thing for exhaust rockers.
- Oil the inside and outside of the rocker arm, pushrod hole, rocker tip and spring.
- Install the gaskets into the receiver slot in the valve cover. Lightly lubricate the rubber sealing washer with oil. Bolt down evenly and torque to 60 lb / in.
- Install breather tube and valve cover plugs. Lubricate the o-rings with oil and tighten by hand. The breather tube goes into the LF hole.
- Clean the intake surface with lacquer thinner and towel. Glue the intake port perimeter with Gaskacinch. Glue the cylinder head side of the intake gasket. Let the glue dry and then place the gasket on the head, aligning the ports. The glue is contact cement, it won't move after it is put on.
- Install the intake manifold, aligning the intake ports the best you can. Torque in three steps (first 25 lb / in; second 45 lb / in; third 90 lb / in) in a spiral pattern using blue Loctite.
- Neatly cover the exhaust ports and carb flange with duct tape. Install the carb studs by hand. Install the spacer, gaskets and lift plate on the intake.
- Install the water pump and gaskets. Torque to 18 lb / ft with blue Loctite. Leave the upper RH bolt out.



- Install water outlet fitting and gasket. Torque to 30 lb / ft with blue Loctite.
- Install the water pump fittings. **Water Temp Fitting:** LR hole next to # 1 cylinder. **Water Line Fitting:** RF water pump hole. Plug remaining holes with proper sized NPT plug. Use Teflon paste.
- Install o-rings into the black aluminum cylinder head corner taps. Install the blanked caps on the rear. Install the caps with the 1/8 NPT threads in front. Use anti-seize on the bolts and carefully torque to 120 lb / in.
- Install the 90° -4 x 1/8 NPT fitting in the LF cylinder head. Install the 1/8 NPT – 14 “T” in the RF cylinder head. Use Teflon paste.
- Install the -4 water lines with anti-seize on the fittings. Clock the fittings so the lines are not in a bind.
- Install the fuel pump and gasket. Torque fuel pump bolts to 30-35 lb / ft with oil.
- Install o-ring on the distributor. Lube the gear and shaft with grease. Set engine to 30° BTDC compression. Install the distributor with the vent to the front. Distributor turns counter-clockwise.
- Install the lower drive and pulleys. First adapter torque to 35 lb / ft with blue Loctite.
- Second spacer, third oil pump gear, fourth water pump pulley, fifth hat washer. Make sure that a ½ washer will fit into the center of the hat washer. If not, get one. Torque to 75-80 lb / ft with blue Loctite.
- Put oil pump belt on drive pulley.
- Install oil pump bracket. Use two of the three short Allen bolts. Torque to 30 lb / ft with blue Loctite.
- Install oil pump using the short and long Allen bolts. Test fit the bolts to make sure that they thread first.
- Install and align oil pump pulley, use blue Loctite on set screws. Torque oil pump bolts to 30 lb / ft with blue Loctite after the belt is set.



- Install oil pump pulley retaining blot and washer. Torque to 30 lb / ft with blue Loctite.
- Install the left engine plate on the head. Use four Allen bolts and washers. Torque to 35 lb / ft with blue Loctite.
- Install the left engine tab. Torque to 110 lb / in with blue Loctite.
- Install the power steering spacer and engine plate. Torque to 35 lb / ft with blue Loctite.
- Install the right side engine / alternator mount assembly. Use three medium length Allen bolts and one short one. Torque to 35 lb / ft with red Loctite.
- Install the right engine tab. Torque to 110 lb / in with blue Loctite.
- Install the flange nut in the back side of the alternator bracket.
- Install the alternator and upper support. Use the 6th water pump blot and torque to 18 lb / ft with blue Loctite.
- Install, but don't yet tighten, the water pump pulley.
- Install the alternator pulley. Use a battery powered impact to tighten.
- Install and adjust the belt and torque the alternator to 35 lb / ft on the top bolt and 30 lb / ft on the bottom.
- Torque the water pump pulley to 100 lb / in.
- Gap the sparkplugs to 0.030. Install with anti-seize and tighten to 13 lb / ft. **CAUTION: DO NOT OVERTIGHTEN.**
- Route the sparkplug wires. 1-8-7-2-6-5-4-3 counter clockwise.
- Install the oil lines. Install the 90° end on the oil pan so that the rear line lies on top of the front line and lightly snug. Use a wrench to twist the rear line so the 45° end will line up with the middle fitting on the oil pump. The line should be against the block and the rear oil fitting on the pump should be accessible. Do the same for the front line, lining it up with the front fitting. **TAKE YOUR TIME. DO NOT CROSS THREAD.** Once both lines are on, tighten them.