NASCAR SPEC ENGINE
Assembly Check List
used By UTI Students for NASCAR Spec Engine
August 27, 2008

1. ❑ Put the timing chain in oil.
2. ❑ Install the water drain plugs on both sides of the block.
3. ❑ Measure and record the main housing bore. (spec. 2.7509 – 2.7515)
4. ❑ Take off the main caps notating the direction of #5 cap and the position of the studded bolts.
5. ❑ Clean oil galleries w/ acetone and brush.
6. ❑ Blow out galleries w/ air and inspect w/ light.
7. ❑ Install ⅛ NPT plugs in the “on demand ports in valley”. Use Teflon paste. 8 plugs.
8. ❑ Install ⅛ NPT plug in the dipstick tube hole and bottom out. Use Teflon paste. 1 plug.
9. ❑ Scrub out the cylinders w/ towel and ATF until clean.
10. ❑ Wipe out the cylinders w/ towel and acetone.
11. ❑ Wipe out the main housing bores and caps w/ acetone.
12. ❑ Clean the backside of the main bearings w/ acetone and install.
13. ❑ Measure and record the main bearing clearance. Do one at a time starting with #5. Record the journal size and set the gauge at each main journal. The thrust bearing has 3 grooves that go to the rear. (Torque spec. 55lb/ft main bolts 22 lb/ft side bolts w/ oil) (Clearance .0016 - .0022)
14. ❑ Lube rod bolts w/ ARP lube. Tap caps onto rods and install bolts (Torque 62 lb/ft)
15. ❑ Measure and record rod housing bore (spec. 2.2247 – 2.2252).
16. ❑ Wipe out the rod bores w/ acetone.
17. ❑ Clean the rod bearing backsides.

18. ❑ Untorque the rods and install the bearings. CAUTION!! You will be splitting H and H-1 bearings. Put 4 of the H upper bearings in rods 1-4. Put 4 of the H-1 lower bearings in rod caps 1-4. Put 4 of the H-1 upper bearings in rods 5-8 and 4 of the H lower bearings in rod caps 5-8.
19. ❑ Tap the caps back on and torque the rod bolts to 62 lb/ft.
20. ❑ Measure and record the rod journal and rod bearing clearance. (spec. .0014 - .0019)
21. ❑ Measure and record the pistons .500 down from edge of skirt (about 3.9935)
22. ❑ Set a dial bore gauge (.0001) to 4.0000. Measure and record the bore diameter. Calculate the piston to wall clearance.
23. ❑ Measure and record the lifter diameter.(.8423) Place in oil
24. ❑ Set a dial bore gauge (.0001) to .8440. Measure and record the lifter clearance.
25. ❑ Take out the upper rings, wipe them off w/ acetone. Grind the gap to .020, deburr the edges. Number w/ sharpie and place in order into the box.
26. ❑ Take out the second rings, wipe them off w/acetone. Grind the gap to .022, deburr the edges. Number w/ sharpie and place in order into the box.
27. ❑ Take out the oil rails, wipe them off w/ acetone. Take all 16 rails and place in 1 cylinder with the gap aligned up. Square the rings and check the gap and make sure that it is at least .015, record.
28. ❑ Remove the rod caps and main caps. Do not remove the bearings.
29. ❑ Take out ONLY the thrust bearing. Measure the flange thickness. The rear (3grooves) should be no thicker than .093; the front (2 grooves) should be no thicker than .089. Get the instructor to help you show how to sand the bearing flange.
30. ❑ Clean and reinstall the thrust bearing.
31. ❑ Lay out the rods and rod caps 1-8. Lay out the pistons upside down w/ JE toward you. Lay out 2 locks and 1 pin per piston.
32. ❑ Install 1 lock using the small modified screwdriver and pin. Get help from the Instructor, you cannot bend a lock, it will be ruined.
33. ❑ Oil the pin bores in the piston and rod. Oil the pin and hang the rod w/ number side and the JE side of the piston toward you. Hold the assembly up and visually check that the valve notches are AWAY from the number side of the rod.

34. ❑ Install the other pin lock and verify that you have the locks all the way in and you have pin float.
35. ❑ There should be NO lock on the bench.
36. ❑ Lube the cam bearings.
37. ❑ Lube the camshaft and install into the block.
38. ❑ Lube the cam side of the thrust plate and install. Torque bolts to 18 lb/ft w/blue loctite.
39. ❑ Clean the crankshaft journals and oil holes w/ acetone. Inspect holes w/ light.
40. ❑ Lube the main bearings and install the crank in the block.
41. ❑ Check the end play w/ no caps. (.005 - .008)
42. ❑ Check the end play after installing each main cap. Install and torque the caps in the order of #2, #4, #1, and #5. Main bolts 55 lb/ft w/ oil Side bolts 22 lb/ft oil. Work from the center, out.
43. ❑ Install #3 thrust cap. Lightly snug the 2 inner main bolts. Set the end play and torque the bolts. (within .001 of original reading)
44. ❑ Install crank key and gear. (gear is press fit)
45. ❑ Get cam gear, adapter, proper centering bushing (probably black) and 3 bolts. Centering bushing MUST fit the cam gear. Green = .554 Black = .550 Red = .685 Yellow = .686
46. ❑ Install the gear and chain, lining up the dots. Install the proper bushing (usually Black) and adapter; torque the 3 bolts to 26 lb/ft w/ red loctite.
47. ❑ Measure and record the cam end play.
48. ❑ Install the timing chain guide and torque 18 lb/ft w/ blue loctite.
49. ❑ Lay out rod/piston assembly, rod caps, and rings in order.
50. ❑ Install the rings. Oil expander 1st, Top rail 2nd, Lower rail 3rd, Second ring 4th, and Top ring 5th. Visually verify that the rings are installed proper, free to rotate, and the gaps are staggered.
51. ❑ Wipe out bores w/ ATF and acetone. (yes, again)
52. ❑ Oil the bores w/ engine oil
53. ❑ Lube the bearings in the rods and rod caps. Double check the rings for position, oil the pistons and rings.

54. ❑ Use the tapered sleeve and chopstick to install the piston/rod assembly. Install the rod cap and bolts
55. ❑ After all 8 rod assemblies are in check rod bolt stretch and record. Torque to 62 lb/ft with ARP lube (.005 - .0055)
56. ❑ Measure rod side clearance and record.
57. ❑ Measure the deck clearance and record. + is out of the hole, - is in the hole. (the pistons usually stick out about .004 - .008)
58. ❑ Degree cam and record. (Intake centerline should be 105.5 to 106.25)
59. ❑ Install front oil squirter and torque to 18lb/ft w/ blue loctite.
60. ❑ Install front 16mm (5/8) cup plug in oil gallery next to the squirter.
61. ❑ Install lifters into the plastic supports. Install the 4 lifter assemblies into the block and torque to 105 lb/in with blue loctite.
62. ❑ Install the fuel pump eccentric and distributor gear onto the cam adapter and torque to 60 lb/ft with red loctite.
63. ❑ Lube the eccentric and the distributor gear with extreme pressure lube.
64. ❑ Install the front seal into the front cover. DO NOT LUBE! Remove the black pointer and install the sheet metal pointer.
65. ❑ Install the ⅛ diameter pin onto the crank snout.
66. ❑ Install the front cover bolts and gasket on the front cover. Note the countersunk bolt where the fuel pump mounts. Torque to 22 lb/ft w/ blue loctite.
67. ❑ Install the plastic oil diverter. (O-ring to the outside)
68. ❑ Install the rear seal into the rear cover if not installed. DO NOT LUBE!
69. ❑ 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 w/ blue loctite.
70. ❑ Install the bolts and gasket onto the top valley cover. The 2 long bolts are for the oil pressure out. Torque to 150 lb/in w/ blue.
71. ❑ Assemble the damper, note the offset hole that is marked with a dimple. Use blue loctite on the 6 bolts, and use the bolts to pull the hub and ring together.
72. ❑ 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 w/ red loctite.
73. ❑ Torque 6 damper bolts to 16 lb/ft.

74. ❑ Using a dead stop, zero the timing pointer. This will have to be trimmed. Blue loctite and silicone.
75. ❑ Wipe pan rail w/ acetone & towel.
76. ❑ Double check the rods & main bolts.
77. ❑ Install the windage tray and put blue loctite on the main studs. Torque to 25 lb/ft.
78. ❑ Remove the heads from the boxes. Clean the valve guides with acetone and a brush.
79. ❑ Wipe the valve stems and number the valve heads w/ sharpie. Measure valve guide clearance and record.
80. ❑ Slide valves into the corresponding valve guides. Wash and install the spring seats.
81. ❑ Measure and record the spring installed height. NOTE: THE RETAINER DOES NOT FIT ON THE OUTSIDE LIP OF THE TOOL; YOU MUST SUBTRACT .150 FROM THE READING.
82. ❑Calculate the valve lift using a 1.7:1 rocker arm and '0' lash.
83. ❑ Record the closed and open valve spring pressure.
84. ❑ 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 that from the block pour volume. Notate your calculations. Head gaskets are 10.08 c.c.
85. ❑ Clean #1 chamber and valves. Oil all valve guides and valve stems. Install valves.
86. ❑ Install valve seals. Measure retainer to seal distance. Record the retainer to seal clearance.
87. ❑ Install the valve springs.
88. ❑ Clean the #1 cylinder. Clean the decks of the block and heads w/ acetone.
89. ❑ Install the dowel pins and head gaskets. CAUTION: THE HEAD GASKETS ARE DIRECTIONAL!!
90. ❑ 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 - #10 in sequence 1st 20lb/ft, 2nd

45lb/ft, 3rd 70 lb/ft. Torque bolts #11 - #15 in sequence 1st 90 lb/in, 15 lb/ft, 23 lb/ft.

91. ❑ Wipe out the oil pan w/ acetone and towel. Install the oil pan gasket and pan. Torque to 125 lb/in w/ blue loctite. Some bolts are not accessible and have to be tightened by hand. CAUTION: BOLT HOLES STRIP EASILY!!
92. ❑ Install lash caps. They are a precision fit, if you twist them while trying to install them, they tend to go on.
93. ❑ Inspect the pushrods by holding them up and looking at the light through the hole. Install the pushrods.
94. ❑ ROCKER ARM INSTALLATION: Install the rocker arm stand on the head and align it by putting 3 rocker arm bolts through the holes and screw into the head. Rotate the engine and hold the #1 pushrods down (the lifters will hold the pushrods up) until the exhaust pushrod starts to rise (Ex Open). Lube the pushrod tips. Bolt on the #1 intake rocker and torque to 22 lb/ft. Rotate the crank ¼ turn. Bolt 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 the exhaust rockers.
95. ❑ Oil the inside and outside of the rocker arm, pushrod hole, and rocker tip, and spring.
96. ❑ Install the gaskets into the receiver slot in the valve cover. Lightly lubricate the rubber sealing washer w/ oil. Bolt down evenly and torque to 60 lb/in.
97. ❑ Install breather tube and valve cover plugs. Lubricate the o-rings w/ oil and tighten by hand. The breather tube goes into the LF hole.
98. ❑ Trim ⅛ inch from the bottom of the intake gasket on the stomp shear. Ask for help, please.
99. ❑ Clean the intake surface w/ acetone and towel. Glue the intake port perimeter w/ 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.
100. ❑ Install the intake manifold, aligning the intake ports the best you can. Torque in 3 steps, 1st 25 lb/in, 2nd 45 lb/in, 3rd 90 lb/in. in a spiral pattern.
101. ❑ Neatly cover the exhaust ports and carb flange w/ duct tape. Install the carb studs by hand. Install the spacer and gaskets and lift plate on the intake.
102. ❑ Install the water pump and gaskets. Torque to 18 lb/ft w/ red. Leave the upper RH bolt out.

103. ❑ Install the water outlet fitting and gasket. Torque to 30 lb/ft w/blue.

104. ❑ Install the water pump fittings. WATER TEMP FITTING: LR hole next to #1 cyl. WATER LINE FITTING: R.F. water pump hole. Plug remaining holes w/ proper sized NPT plug. Use Teflon paste

105. ❑ Install the o-rings into the black aluminum cylinder head corner caps. Install the blanked caps on the rear. Install the caps with the ⅛ NPT threads in the front. Use antiseize on the bolts and carefully torque to 120 lb/in.

106. ❑ Install the 90°-4 x ⅛ NPT fitting in the LF cylinder head. Install the ⅛ NPT -4 tee in the RF cylinder head. Use Teflon paste.

107. ❑ Install the -4water lines w/ antiseize on the fittings. Clock the fittings so the lines are not in a bind.

108. ❑ Install the fuel pump and gasket. NOTE: THE SUPPLIED BOLTS ARE TOO SHORT. Get 2, ⅜-18 x 1½ bolts. Shorten to 1⅜ long, torque to 35 lb/ft w/blue.

109. ❑ Install the o-ring on the distributor. Lube the gear and shaft w/ grease. Set engine to 30° BTDC compression. Install the distributor w/ the vent to the front. Dist turns CCW.

110. ❑ Install the lower drive and pulleys. 1st Adapter torque to 35lb/ft w/ blue loctite. 2nd spacer, 3rd oil pump gear, 4th water pump pulley, 5th the hat washer. Make sure that a ½ washer will fit into the center of the hat washer, if not, get one. Torque to 95 lb/ft w/ blue.

111. ❑ Put the oil pump belt on the drive pulley.

112. ❑ Install the oil pump mount. Use 2 of the 3 short Allen bolts. Torque to 30 lb/ft w/blue.

113. ❑ Install the oil pump using the short and long Allen bolts. Test fit the bolts to make sure that they thread in first.

114. ❑ Install and align the oil pump gear, use blue loctite on the set screws. Torque to 30 lb/ft w/ blue after the belt is set.

115. ❑ Install the oil pump pulley retaining bolt and washer. Hand tighten w/ blue loctite.

116. ❑ Install the left engine mount on the head. Use 4 Allen bolts and washers. Torque to 35 lb/ft w/ red.

117. ❑ Install the left chassis mount. Torque to 110 lb/in w/ blue loctite.

118. ❑ Install the power steering spacer and mount. Torque to 35 lb/ft w/ red.

119. ❑ Install the right side engine/alt mount assembly. Use 3 medium length Allen bolts and 1 short one. Grind the head thickness of 1 medium bolt to less than .350 for alternator clearance. Torque to 35 lb/ft w/ red loctite.
120. ❑ Install the right chassis mount. Torque to 110 lb/in w/ blue loctite.
121. ❑ Install the flange nut in the back side of the alternator bracket.
122. ❑ Install the alternator and upper support. Use the 6th water pump bolt and torque to 18 lb/ft w/ red. Don't throw out the box.
123. ❑ Install the water pump pulley. (cannot tighten yet)
124. ❑ Install the alternator pulley. Use a battery powered impact to tighten.
125. ❑ Install and adjust the belt and torque the alternator to 35lb/ft on the top bolt and 30 lb/ft on the bottom.
126. ❑ Torque the water pump pulley to 100lb/in.
127. ❑ Gap the sparkplugs to .030. Install w/ antiseize and tighten 1/16 turn. CAUTION: DO NOT OVER TIGHTEN!!
128. ❑ Route the sparkplug wires. 1-8-7-2-6-5-4-3 CCW
129. ❑ 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.
130. ❑ Wipe out the drip tray on the engine stand.
131. ❑ Place the pilot bearing, bellhousing dowel pins, and, the power steering hub and pulley in the alternator box.
132. ❑ Place the fuel log and fuel line in the carb box.
133. ❑ Place the clutch box, the header box, the carb box, and the alternator box w/ the small parts neatly on the tray.
134. ❑ Clean the 4 tier cart and flatten any leftover boxes. Take the boxes to the dumpster. Clean and straighten up all of the hand tools, box drawers and counter top. Sweep your area.

WEGNER MOTORSPORTS, INC.
N2258 HILLTOP ROAD, MARKESAN, WI 53946 - PH 920-394-3557 - FAX 920-394-3555 - WWW.WEGNERAUTOMOTIVE.COM