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## Service Information Bulletin

SUBJECT	DATE
Engine Replacement Procedures	October 2018

### Additions, Revisions, or Updates

Publication Number / Title	Platform	Section Title	Change
DDC-SVC-MAN-0190	HG17 Heavy Duty	Replacement Long Block Engine Preparation	This is a new procedure.



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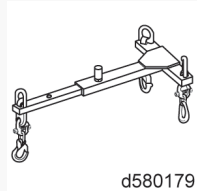
## 2 Replacement Long Block Engine Preparation

The instructions listed below explain how to remove the necessary components from a failed engine and install them onto a replacement warranty long block or ¾ engine assembly. These are specifically written for a Freightliner Cascadia model truck equipped with a GHG17 DD engine where the complete powertrain was removed as an assembly and will be reinstalled as an assembly.

**NOTE:** The most efficient shop setup for this procedure is to have both the failed engine and replacement engine in close proximity to each other. A table or bench close to the work site for temporary engine component storage is also highly recommended. When possible, it is best to remove and install components as assemblies to minimize customer downtime.

**NOTE:** New gaskets and seals should be used when reusing original parts or installing new components.

Table 1.

Service Tools Used in the Procedure		
Tool Number	Tool Name	Tool Graphic
W470589056200	Engine Lifting Bar	

**NOTE:** NOTE: If the powertrain assembly is still in the chassis, Refer to section "Removal of the Complete Powertrain Assembly".

Remove components from the failed engine as follows:

1. Remove the chassis powertrain interface harness from the engine and transmission.
2. Remove the radiator support rods and brackets, if equipped.
3. Remove the cooling package from the powertrain assembly. Keep the cooling package as complete as possible for ease of re-installation. Place the cooling package in a suitable location, standing upright.
4. Remove the engine cooling fan. Refer to the Original Equipment Manufacturer (OEM) procedures.
5. Remove the drive belts from the engine.
6. Remove the engine cooling fan hub. Refer to the OEM procedures.
7. Remove the belt drive idler pulleys and idler pulley bracket.
8. Remove the vibration damper, if replacement engine is a warranty long block.
9. Support the engine and remove the front engine mount.
10. Remove the front engine lifting bracket/Exhaust Gas Recirculation (EGR) crossover and EGR venturi pipe as an assembly.
11. Remove the Diesel Exhaust Fluid (DEF) coolant lines from the powertrain.
12. Remove the transmission cooler lines, if equipped.
13. Remove the transmission assembly. Refer to the OEM procedures.
14. Remove the transmission clutch assembly, if equipped. Refer to the OEM procedures.
15. Remove the hydrocarbon fuel doser line.
16. Remove the rear engine lifting brackets.
17. Remove the rear engine mounts.
18. Remove the cold boost pipe and mixer pipe as an assembly.
19. Remove the coolant crossover pipe.
20. Remove the air compressor coolant lines.

21. Remove the oil dipstick and tube.
22. Remove the fuel filter module.
23. Remove the engine sensor harness.
24. Remove the Motor Control Module (MCM).
25. Remove the air compressor and power steering pump as an assembly.
26. Remove the high pressure fuel lines (high pressure fuel pump to fuel rail and fuel rail to fuel injectors).
27. Remove the low pressure fuel return lines (needle, amplifier and pressure limiting valve).
28. Remove the hydrocarbon fuel doser block assembly.
29. Remove the rocker cover.
30. Bar the engine to Top Dead Center (TDC) on cylinder number one, if possible.

**NOTE:** If the failed engine is seized and cannot be rotated for high pressure fuel pump removal, remove the flywheel housing and fuel pump timing plate.

31. Remove the high pressure fuel pump.
32. Remove the fuel rail, if the replacement engine is a warranty long block.
33. Remove the air intake manifold.
34. Remove the starting motor.
35. Remove the alternator.
36. Remove the air conditioning compressor, if equipped.
37. Remove the accessory mounting bracket and belt tensioner as an assembly.
38. Remove the turbocharger and Axial Power Turbine (APT) heat shields, if equipped.
39. Remove the crankcase breather.
40. Remove the EGR hot pipe.
41. Remove the EGR actuator.
42. Remove the hydrocarbon fuel doser valve coolant lines.
43. Remove the turbocharger and turbocharger outlet pipe.
44. For DD16 engines, remove the interstage duct.
45. For DD16 engines, remove the exhaust S-pipe and hydrocarbon fuel doser valve.
46. For DD16 engines, remove the APT.
47. For DD16 engines, remove the APT gear box.
48. Remove the cylinder block cover plate, if equipped.
49. Remove the exhaust manifold as an assembly.
50. Remove the EGR cooler, water manifold and water outlet elbow as an assembly.
51. Remove the fuel injector harnesses.
52. Remove the fuel injectors, if the replacement engine is a warranty long block.
53. Remove the intake rocker arm assembly, if the replacement engine is a warranty long block.
54. Remove the exhaust rocker arm assembly, if the replacement engine is a warranty long block.
55. Verify the following parts of the replacement engine match the original engine configuration:
  - Flywheel housing (standard or rear engine power take-off)
  - Flywheel (manual transmission or automatic transmission or DT12 transmission)
  - Oil coolant module
  - Water pump (fixed or variable speed)
  - Intake camshaft (12 lobe or 6 lobe)
  - Oil pan (front or rear sump, plastic or aluminum)

**NOTICE:** If the oil pan configuration is different on the replacement engine and the oil pan from the original engine is used, the original oil suction manifold must also be used. Serious engine damage will occur if the correct oil suction manifold is not used.

56. If there are any parts on the replacement engine that do not match the original engine configuration, they must be replaced to maintain the same engine functions. Install components onto the replacement engine as follows:
57. Install the intake and exhaust rocker arm assemblies, if the replacement engine is a warranty long block.  
Refer to section "Installation of the Intake Rocker Shaft Assembly"  
Refer to section "Installation of the Exhaust Rocker Shaft Assembly"
58. Install the fuel rail. Refer to section "Installation of the Fuel Rail - Two-Filter System".

59. Install the fuel injectors and high pressure fuel injector lines, if the replacement engine is a warranty long block. Refer to section "Installation of the Fuel Injector - Two-Filter System".
60. Install the fuel injector harnesses.
61. Install the rocker cover. Install and hand tighten all mounting bolts; then torque to 20 N·m (14 lb·ft).
62. Install the EGR cooler, water manifold and water outlet elbow as an assembly.  
For DD13 engines, Refer to section "Installation of the DD13 Exhaust Gas Recirculation Cooler Water Manifold Assembly"  
For DD15 and DD16 engines, Refer to section "Installation of the DD15 and DD16 Water Manifold"
63. Install the exhaust manifold as an assembly.  
For DD13 and DD15, Refer to section "Installation of the DD13 and DD15 Exhaust Manifold"  
For DD16 engines, Refer to section "Installation of the DD16 Exhaust Manifold"
64. Install the cylinder block cover plate, if equipped. Torque the mounting bolts to 60 N·m (44 lb·ft).
65. For DD16 engines, install the axial power turbine gear box. Refer to section "Installation of the Axial Power Turbine Gear Box".
66. For DD16 engines, install the axial power turbine. Refer to section "Installation of the Axial Power Turbine".
67. For DD16 engines, install the exhaust S-pipe and hydrocarbon fuel doser valve. Refer to section "Installation of the DD16 Exhaust S-pipe".
68. For DD16 engines, loosely install the interstage duct.
69. Install the turbocharger.  
For DD13 and DD15 engines, Refer to section "Installation of the DD13 and DD15 Turbocharger"  
For DD16 engines, Refer to section "Installation of the DD16 Turbocharger"
70. Install the EGR actuator.  
For DD13 and DD15 engines, Refer to section "Installation of the DD13 and DD15 Exhaust Gas Recirculation Valve Actuator "  
For DD16 engines, Refer to section "Installation of the DD16 Exhaust Gas Recirculation Valve Actuator"
71. Install the EGR hot pipe. Refer to section "Installation of the Exhaust Gas Recirculation Hot Pipe".
72. Install the crankcase breather assembly to the engine block with a new gasket. Torque the bolts to 60 N·m (44 lb·ft).
73. Connect the crankcase breather pipe to the fitting on the cylinder block.
74. Connect electrical harness to breather speed sensor.
75. Install the turbocharger and axial power turbine heat shields, if equipped.
76. Install the right-hand radiator support rod bracket, if equipped, and torque mounting bolts to 68 N·m (51 lb·ft).
77. Install the accessory mounting bracket and belt tensioner as an assembly. Torque the six mounting bolts to 60 N·m (44 lb·ft).
78. Install the alternator. Refer to the OEM procedures.
79. Install the air conditioning compressor, if equipped. Refer to the OEM procedures.
80. Install the starting motor. Refer to the OEM procedures.
81. Remove the oil coolant module from the replacement engine. Discard the mounting gasket.
82. Install the air intake manifold with the thirteen flanged screws and isolator gaskets. Torque the mounting screws to 25 N·m (18 lb·ft) starting at the center of the manifold and then outward until all screws are torqued.
83. Install the oil coolant module onto the cylinder block with a new mounting gasket and the eleven mounting bolts. Refer to section "Installation of the Oil Coolant Module".
84. Install the high pressure fuel pump and bracket. Refer to section "Installation of the High Pressure Fuel Pump - Two Filter System".
85. Install the air compressor and power steering pump. Refer to section "Installation of the Air Compressor".

**NOTE:** Do not ground the MCM housing. This can result in false codes being logged.

86. Install the motor control module (MCM) to the cylinder block with four bolts and isolators. Torque the MCM-to-engine bolts to 15 N·m (11 lb·ft).
87. Install the left-hand radiator support rod bracket, if equipped, and torque mounting bolts to 68 N·m (51 lb·ft).
88. Install the fuel filter module and torque the mounting bolts to 60 N·m (44 lb·ft).
89. Install the hydrocarbon fuel doser block assembly and torque the mounting bolts to 32 to 36 N·m (24 to 27 lb·ft).

**NOTICE:** The high pressure fuel rail feed lines, vibration dampers, P-clips, mounting bracket and hardware are one-time use components and **MUST** be replaced any time they are removed. Refer to TS letter14 TS-19Rev for the high pressure fuel line kit numbers.

90. Install all low pressure and high pressure fuel lines.  
Refer to section "Installation of the Low Pressure Fuel Pump Lines - Two-Filter System"  
Refer to section "Installation of the Needle, Amplifier, and Pressure Limiting Valve Return Lines - Two-Filter System"  
Refer to section "Installation of the High Pressure Fuel Rail Feed Lines - Two-Filter System"
91. Install the engine wiring harness. Refer to section "Installation of the Engine Wiring Harness".
92. Install the air compressor coolant lines.  
Refer to section "Installation of the Air Compressor Coolant Supply Line"  
Refer to section "Installation of the Air Compressor Coolant Return Line"
93. Install the coolant crossover pipe. Refer to section "Installation of the Coolant Crossover Pipe".
94. Install the cold boost pipe and mixer pipe. Refer to section "Installation of the Composite Cold Boost Pipe (Charge Air Pipe)".
95. Install the rear engine mounts. Refer to the OEM procedures.
96. Install the rear engine lifting brackets. Torque the bolts to 180 N·m (132 lb·ft).
97. Install the hydrocarbon fuel doser valve fuel supply line. Refer to section "Installation of the Hydrocarbon Fuel Doser Injector Valve Fuel Supply Line".
98. Install a new pilot bearing into the crankshaft, if equipped. Refer to the OEM procedures.
99. Install the clutch assembly, if equipped. Refer to the OEM procedures.
100. Install the transmission assembly. Refer to the OEM procedures.
101. Install the front engine lifting bracket/EGR crossover with the EGR venturi pipe as an assembly. Torque the mounting bolts to 60 N·m (44 lb·ft).
102. Install the front engine mount/radiator support to the cylinder block with four bolts in two steps as follows:
  - Torque the bolts to 125 N·m (92 lb·ft).
  - 90° torque turn
103. Install the vibration damper, if the replacement engine is a warranty long block. Refer to section "Installation of the Vibration Damper".
104. Install the engine cooling fan hub. Refer to the OEM procedures.
105. Install the engine cooling fan. Refer to the OEM procedures.
106. Install the idler pulley bracket to the cylinder block. Torque the bolts to 60 N·m (44 lb·ft).
107. Install the idler pulley to the idler pulley bracket. Torque to 60 N·m (44 lb·ft).
108. Install the non-bracketed idler pulley. Insert the bolt through the idler pulley and torque to 60 N·m (44 lb·ft).
109. Install the poly-V-belts. Refer to section "Installation of the Poly-V-Belts".
110. Install the cooling package. Refer to the OEM procedures.
111. Install the radiator support rods and brackets, if equipped. Refer to the OEM procedures.
112. Install the transmission cooler lines, if equipped. Refer to the OEM procedures.
113. Install the DEF coolant lines. Refer to the OEM procedures.
114. Install the chassis powertrain interface harness onto the engine and transmission.
115. The complete powertrain assembly is now ready to be installed in the chassis. Refer to section "Installation of the Complete Powertrain Assembly".