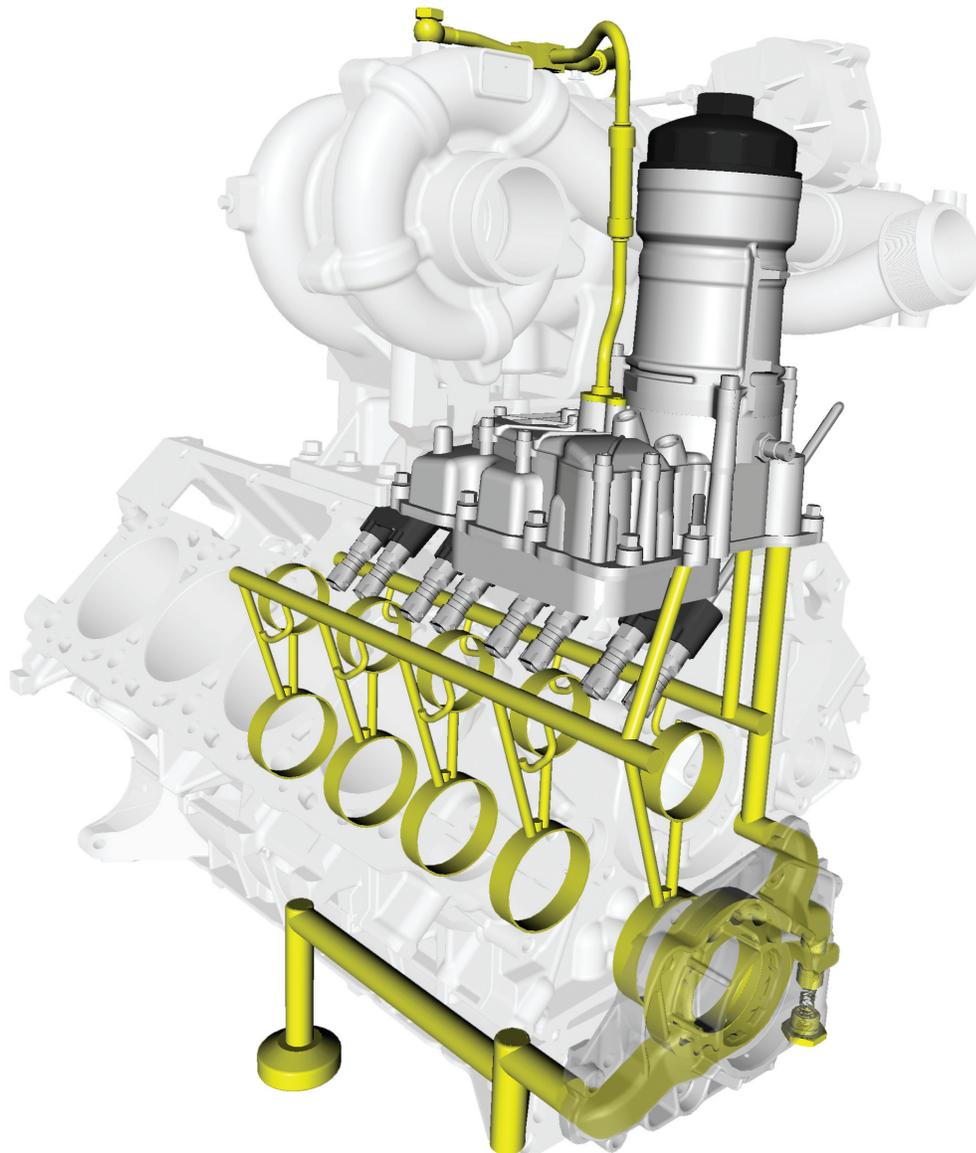


Lubrication System Features

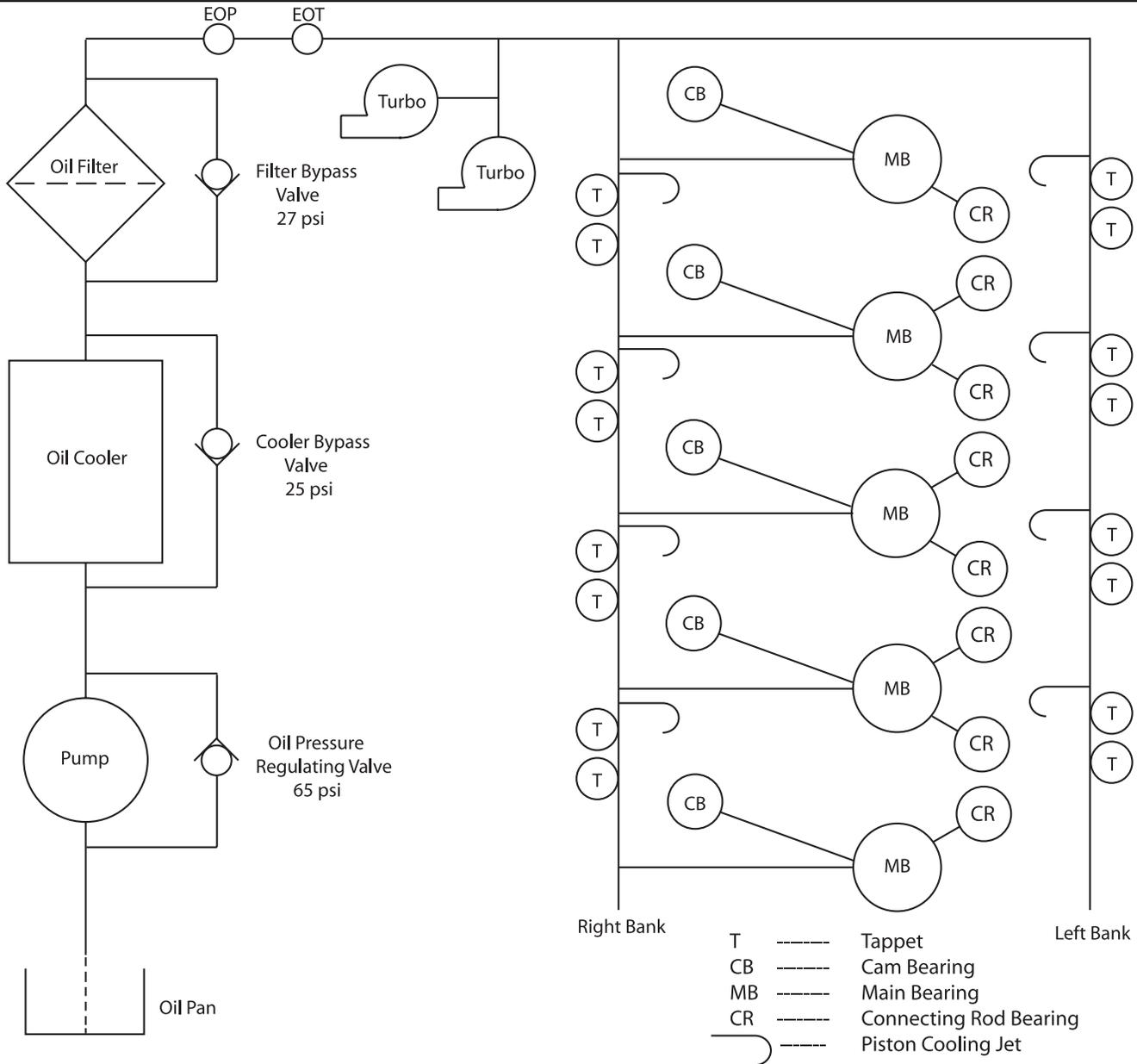
- Integrated Oil Cooler
- No External Oil Passages in Crankcase
- Easy Access Cartridge Style Oil Filter
- External Oil Pressure Regulator

Lubrication System Features

- The 6.4L Power Stroke® Diesel uses an oil cooler that is mounted in the valley of the engine under the oil filter.
- The oil filter is a cartridge style filter mounted on the top of the engine for ease of service. This system also incorporates a valve that drains the oil to the pan when the filter is removed.
- The gerotor oil pump and oil pressure regulator are both located in the front of the engine behind the vibration damper in their own removeable aluminum housing.



LUBRICATION SYSTEM

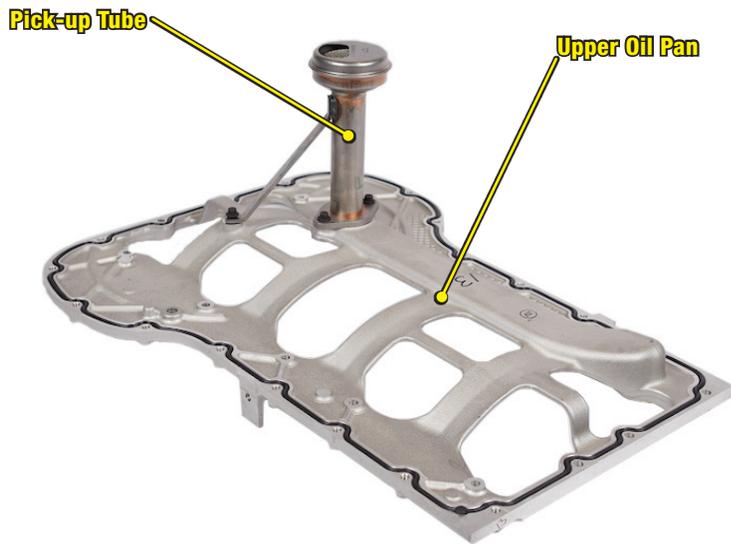


Lubrication System Oil Flow

- Oil is drawn from the oil pan through the pick-up tube. The oil is then routed through a passage cast into the upper oil pan before being routed through a passage in the block, a passage in the front cover, and finally to the oil pump inlet.
- The regulator valve utilizes a force, provided via the regulator spring, to apply a pressure equal to 65 psi. Whenever oil pressure exceeds this force, the regulator valve will move downward and allow the excess pressure to bleed off back through a passage that routes the oil back to the inlet side of the pump.
- From the oil pump, oil is directed to the oil cooler and then to the oil filter.
- From the oil filter the oil is supplied to a chamber incorporating five (5) passages. One (1) is to the turbochargers for lubrication. Two (2) are to the EOT and EOP sensors.

- The two (2) other passages are to the tappet oil supply on the right and left banks. The tappet galleries also provide oil to the piston cooling jets.
- Cross drillings off of the right bank tappet gallery supply oil to the main bearings.
- Another cross drilling vertically up from each main bearing supplies oil to the camshaft bearings.

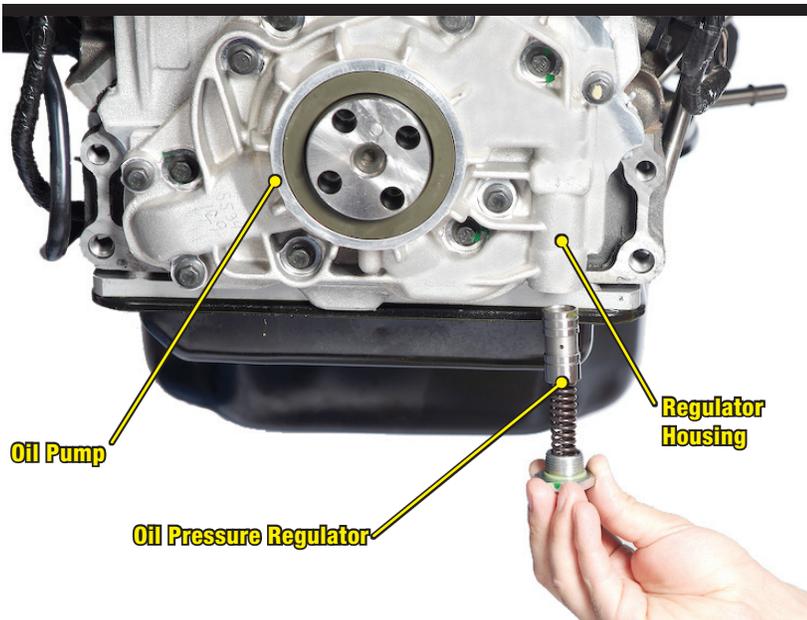
Note: This oil supply routing is different than the 6.0L and uses different bearings which are also placed differently with respect to the oil holes.



Pick-up Tube / Oil Aeration

- The pick-up tube supplies oil from the oil pan to the oil pump.
- The pick-up tube is sealed to the upper oil pan utilizing an o-ring. If the o-ring is damaged or missing, it could cause oil aeration.

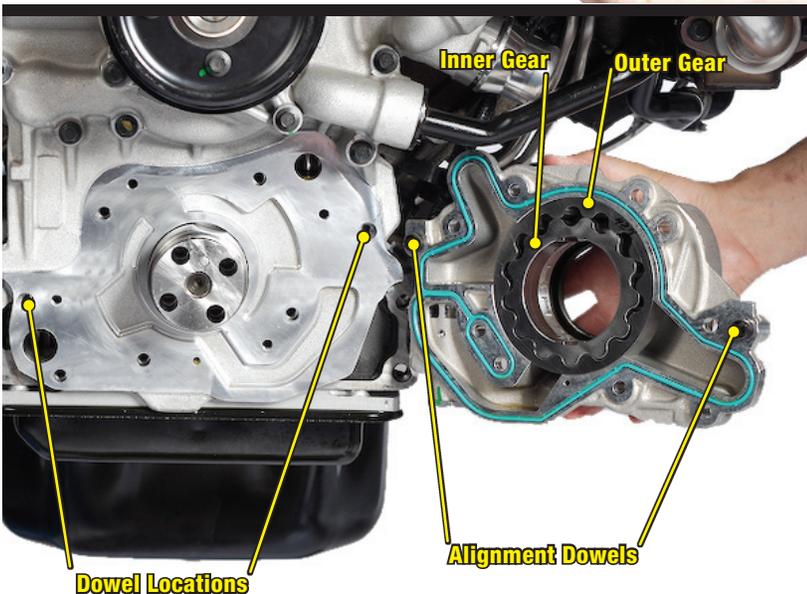
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Oil Pressure Regulator

- The oil pressure regulator is located in the gerotor housing just to the right (when looking at the engine from the front) of the gerotor oil pump.
- The oil pressure regulator is calibrated to open at pressures above 65 psi. It should be closed below that pressure.
- The regulator valve utilizes a force, provided via the regulator spring, to apply a pressure equal to 65 psi. Whenever oil pressure exceeds this force, the regulator valve will move downward and allow the excess pressure to bleed off back through a passage that routes the oil back to the inlet side of the pump.

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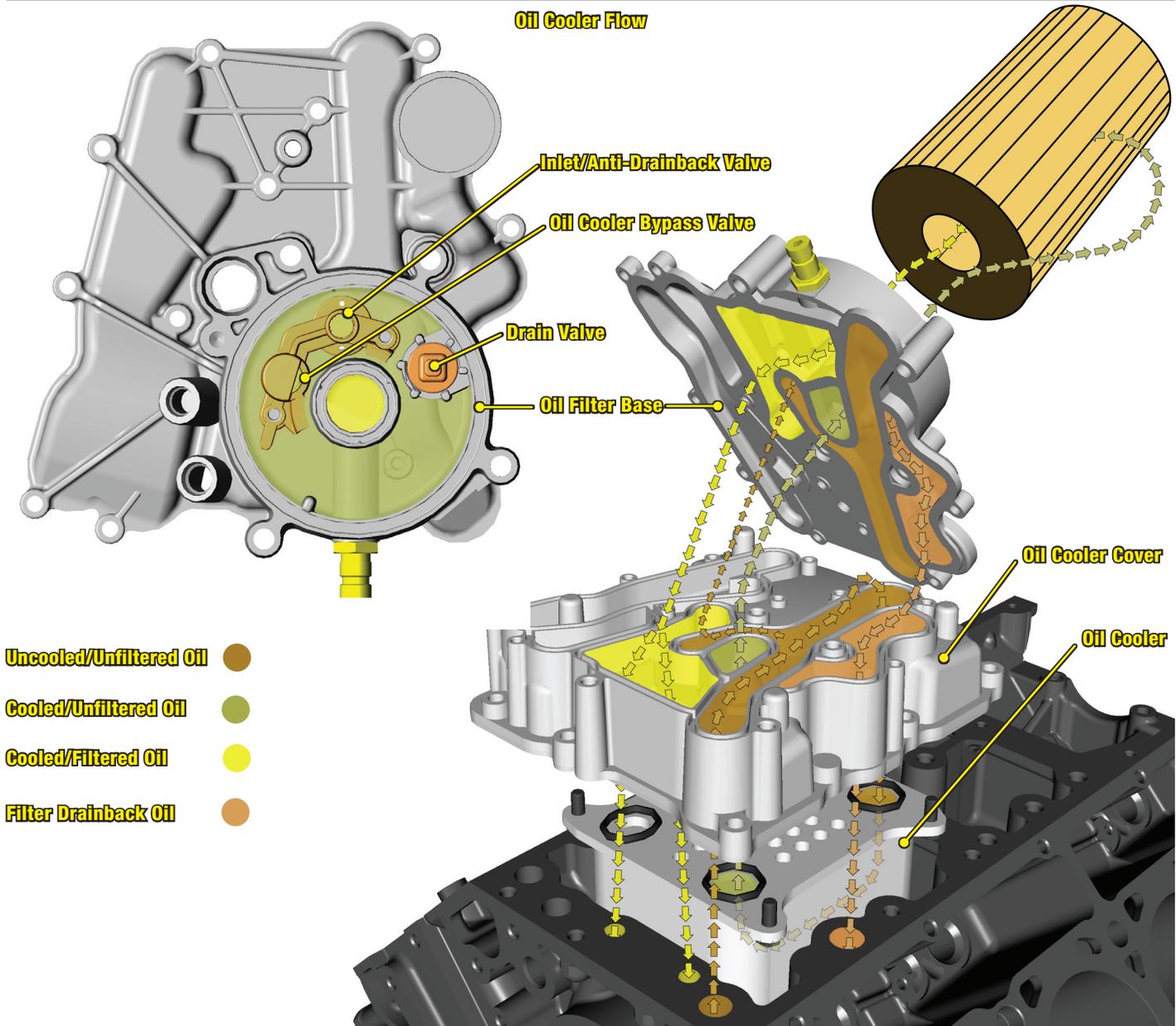
Gerotor Oil Pump

- The gerotor oil pump is driven off of the flats on the nose of the crankshaft.
- The gerotor oil pump and regulator valve are held in their own removeable housing.

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LUBRICATION SYSTEM

Oil Cooler Flow



- Uncooled/Unfiltered Oil ●
- Cooled/Unfiltered Oil ●
- Cooled/Filtered Oil ●
- Filter Drainback Oil ●

Lube System Flow: Oil Cooler

- Uncooled/Unfiltered oil is directed out of the crankcase at the front left corner of the engine via a drilled passage from the oil pump.
- Uncooled/Unfiltered oil is then directed across the oil cooler cover then down into the oil cooler.
- The oil is then cooled via the oil cooler as it passes through the cooler towards the front of the engine.
- The cooled/unfiltered oil is routed up through the oil cooler cover then through the oil filter base where it enters the oil filter housing (there is a small inlet valve in the oil filter base that the oil must pass through to keep the oil from draining out of the filter housing during non-operation). At this point the oil flows through the filter (from the outside of the filter to the center) where it is cleaned.

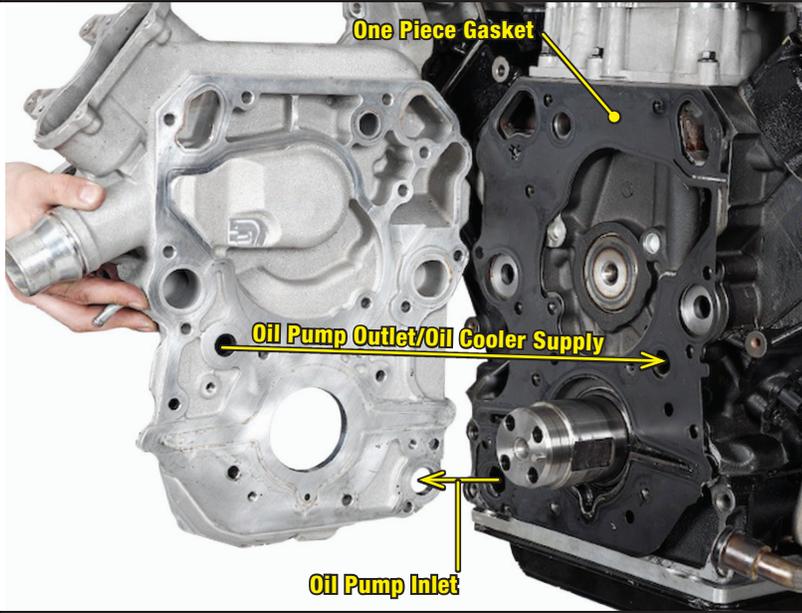
Note: There is an oil filter bypass valve located at the top of the oil filter stand pipe (plastic tube the oil filter slides over) which will open and allow unfiltered oil to enter the system whenever a pressure differential of 27 psi is reached.

- After being cleaned via the oil filter, the oil is routed through the oil filter base and into a cavity that has ports to direct the oil to the following areas: left and right oil galleries, turbocharger oil supply, and the EOT & EOP sensors.

Note: There is a drain valve inside the oil filter base which is held closed by the oil filter whenever the oil filter cap is tight. Whenever this cap is loosened, the valve is allowed to open and oil will then escape through this valve, through the oil cooler cover, and then down through a drilled passage in the crankcase to the oil pan.

Note: There is an oil cooler bypass valve inside the oil filter base which will open and let uncooled oil bypass the oil cooler and enter the oil filter housing whenever a pressure differential of 25 psi is reached.

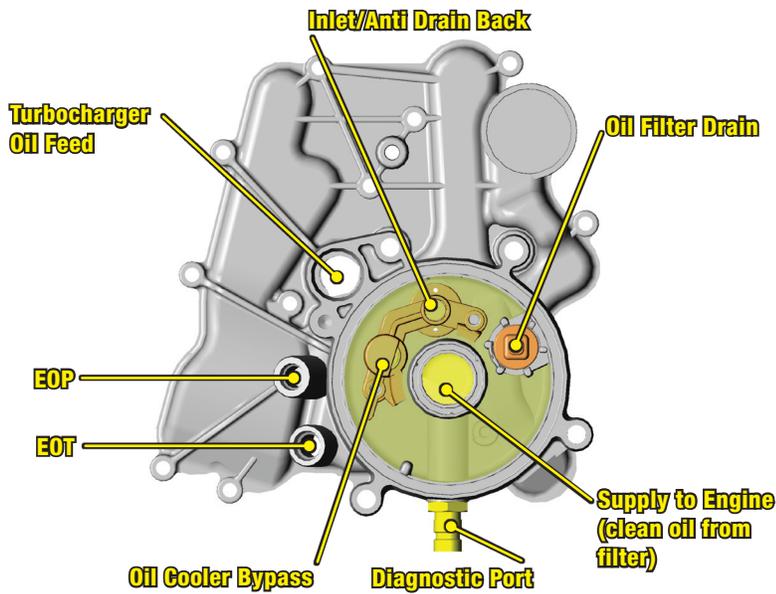
LUBRICATION SYSTEM



Front Cover

- Oil flows from the crankcase to the oil pump via a passage through the upper oil pan, front cover, and oil pump housing.
- When the oil pump is turned by the crankshaft it creates oil flow and pushes oil through two passages. One passage is to the oil cooler and the other is through the oil pressure regulator then to the oil pump inlet (this passage is only used when pressure exceeds 65 psi). When the oil reaches the numerous restrictions throughout the engine, pressure is then created (pressure is the resistance to flow).
- All of the passages from the front cover to the crankcase are sealed with a rubber coated metal, one piece gasket.

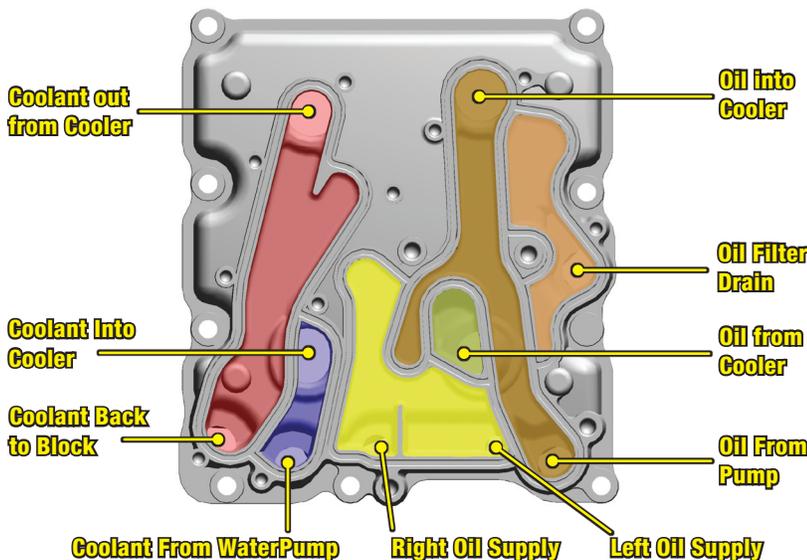
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Oil Filter Base

- The oil filter base contains the mounting provisions for the oil filter housing and the oil filter stand pipe (which contains the oil filter bypass valve).
- Inside the oil filter housing, there are the following valves: Inlet/Anti drainback valve, oil cooler bypass valve, and the oil filter drain valve.
- The oil filter base also contains the ports for the EOT, EOP, and turbocharger oil supply. These ports are all connected with the cooled/filtered oil passage directly beneath them.

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Oil Cooler Cover

- The oil cooler cover has passages in it to direct the flow of coolant and oil.
- Oil is routed from the front of the crankcase to the rear of the housing where it enters the oil cooler. The oil passes from the rear of the oil cooler to the front of the cooler and is cooled in the process. The oil is then sent to the oil filter through the oil filter base. Filtered oil is sent to the oil passages in the crankcase, the turbocharger supply line, and the EOT/EOP sensors.
- The coolant is directed from the front of the crankcase to the front of the oil cooler. It then passes through the oil cooler and cools the oil. As the coolant exits the front of the cooler it is directed down into the coolant stream where it re-enters the crankcase cooling system.

Note: If the oil cooler is damaged it could cause contamination of the lubrication and cooling systems.

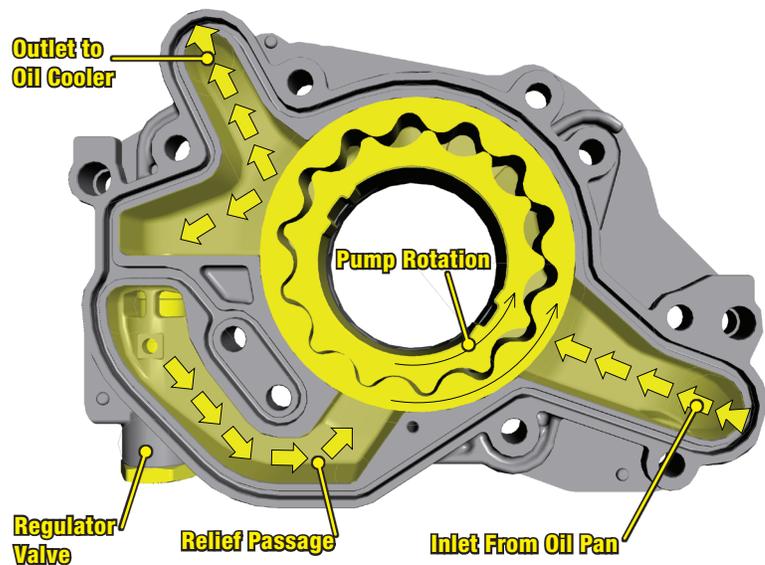
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LUBRICATION SYSTEM

Oil Pump Flow (back side)

- The oil pump is a gerotor style pump driven off of the flats on the front of the engine's crankshaft.
- The 6.4L oil pump is held in its own removeable aluminum housing which also contains the regulator valve.
- Oil is drawn into the pump via the combination of atmospheric pressure (applied to the oil in the pan) and the low pressure area that is created between the gerotor gears on the inlet side of the pump whenever the pump is being driven by the crankshaft.
- Once this happens, the oil will flow into the pump and the pump will create a generous amount of oil flow.
- When the oil reaches various restriction throughout the engine, pressure is created.
- Pressure is limited via a pressure regulator valve located inside the pump housing. Whenever a pressure of 65 psi is reached, the regulator valve will open and allow pressurized oil to flow back through a relief passage to the inlet side of the pump, thus regulating system pressure.

Back Side of Pump



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Oil Filter

- The 6.4L Power Stroke® Diesel uses a cartridge style oil filter, located on the top of the engine.
- When the oil filter is removed, the oil filter housing drain valve is automatically opened to drain most of the oil from the housing.
- The oil filter element snaps into the oil filter lid.

Note: The oil filter lid should be removed before draining the oil from the oil pan so that the oil can drain from the filter housing into the oil pan.

Oil Filter Element



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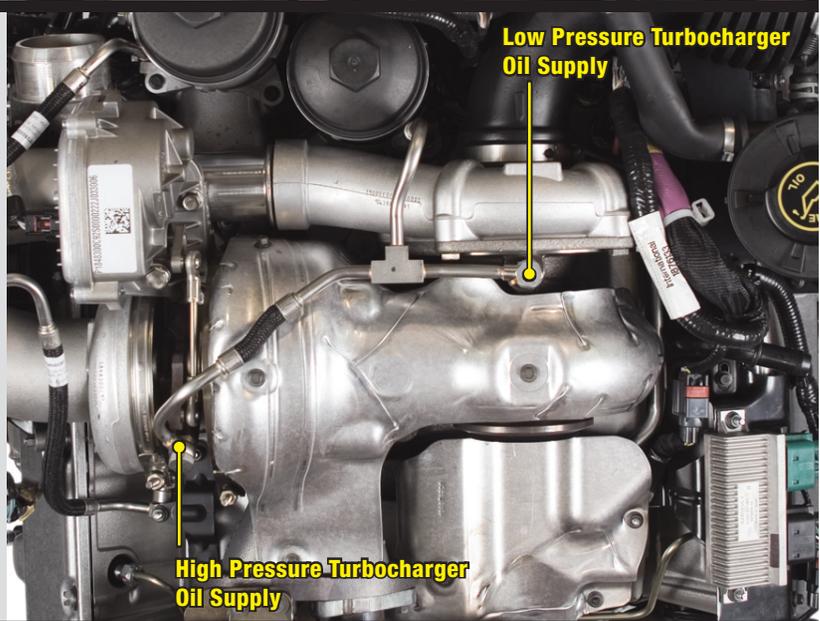
Turbocharger Oil Supply

- Oil is supplied to the turbochargers from the oil filter base via a steel oil line, a steel T fitting, and two separate steel lines to each turbo (the high pressure turbocharger oil supply line has a flexible link in it).
- The oil lines are connected to each turbo via banjo fittings and washer gaskets.

Note: The washer gaskets (which are used as a gasket medium) must be replaced each time the banjo fittings are loosened.

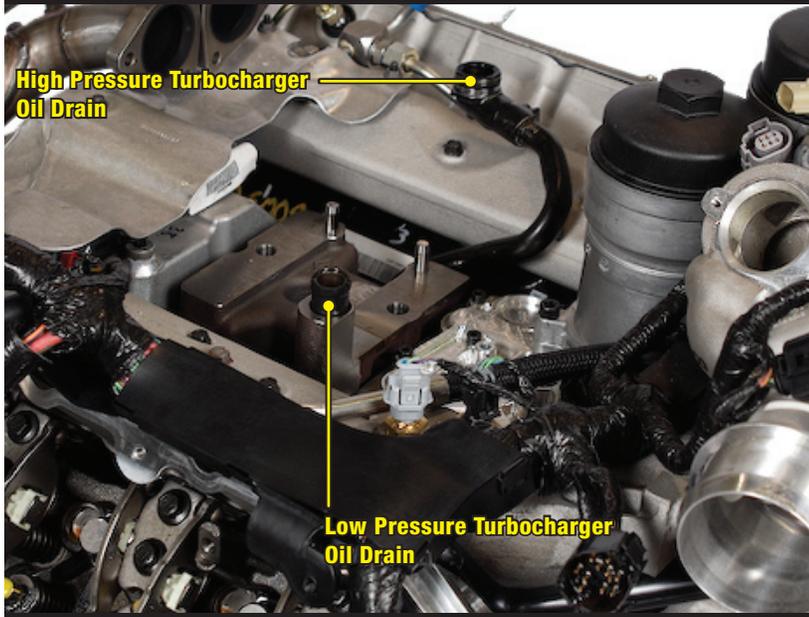
Low Pressure Turbocharger Oil Supply

High Pressure Turbocharger Oil Supply



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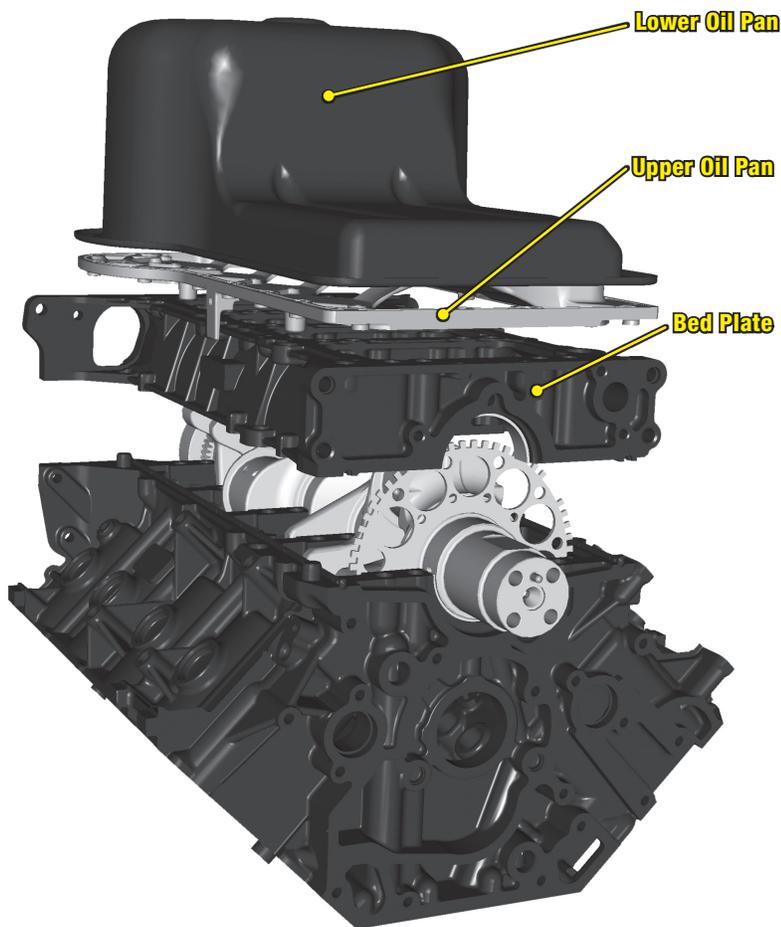
LUBRICATION SYSTEM



Turbocharger Oil Drain Tubes

- Oil is supplied to the turbochargers to lubricate and cool the bearings.
- Each turbocharger has its own drain. The high pressure turbocharger uses a removable tube where as the low pressure turbocharger utilizes a small extension tube off of a machined passage in the turbocharger pedestal.
- The high pressure turbocharger drain tube is sealed via two (2) O-rings, one at each end of the tube.
- The low pressure turbocharger drain extension tube is sealed via a rubber coated metal tube.

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Oil Pan / Bed Plate

- The 6.4L Power Stroke® Diesel uses a two piece oil pan. The lower half is wider than the bottom of the engine to increase the oil capacity of the system. Due to this wider oil pan, an upper oil pan is used to adapt the lower pan to the bed plate. The upper pan also acts as an oil baffle.
- The upper pan is bolted to the bed plate. The bed plate replaces the individual main bearing caps, resulting in a more rigid bearing retaining system.

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