

Detroit MDEG Services Readiness



Steve Cummins



DD5 Specifications

Configuration	Inline 4 Cylinder
Displacement	313 cu in (5.1L)
Compression Ratio	17.6:1
Bore	4.33 in (110mm)
Stroke	5.31 in (135mm)
Engine Brake	(Optional)
Weight (Dry)	1188 lb (539kg)
Electronics	DDEC®
Service Fill (Oil & Filter Change)	18 qt (17.5 L)
Horsepower Range	210 – 230 Hp
Torque Range	575-660 lb-ft

Power Ratings

Dual Stage Turbo
210 HP / 575 lb-ft
230 HP / 660 lb-ft



DD8 Specifications

Configuration _____ Inline 6 Cylinder
Displacement _____ 470 cu in (7.7L)
Compression Ratio _____ 17.6:1
Bore _____ 4.33 in (110mm)
Stroke _____ 5.31 in (135mm)
Engine Brake _____ (Optional)
Weight (Dry) _____ 1455 lb (660kg)
Electronics _____ DDEC®
Service Fill (Oil & Filter Change) __ 27 qt (25.5 L)
Horsepower Range _____ 260 -375 Hp @ 2200 rpm
Torque Range _____ 660-1050 lb-ft @1400 rpm

Power Ratings

Single Stage Turbo

260 HP / 660 lb-ft

260 HP / 720 lb-ft

280 HP / 800 lb-ft

300 HP / 860 lb-ft

Dual Stage Turbo

330 HP / 1000 lb-ft

350 HP / 1050 lb-ft

375 HP / 1050 lb-ft*

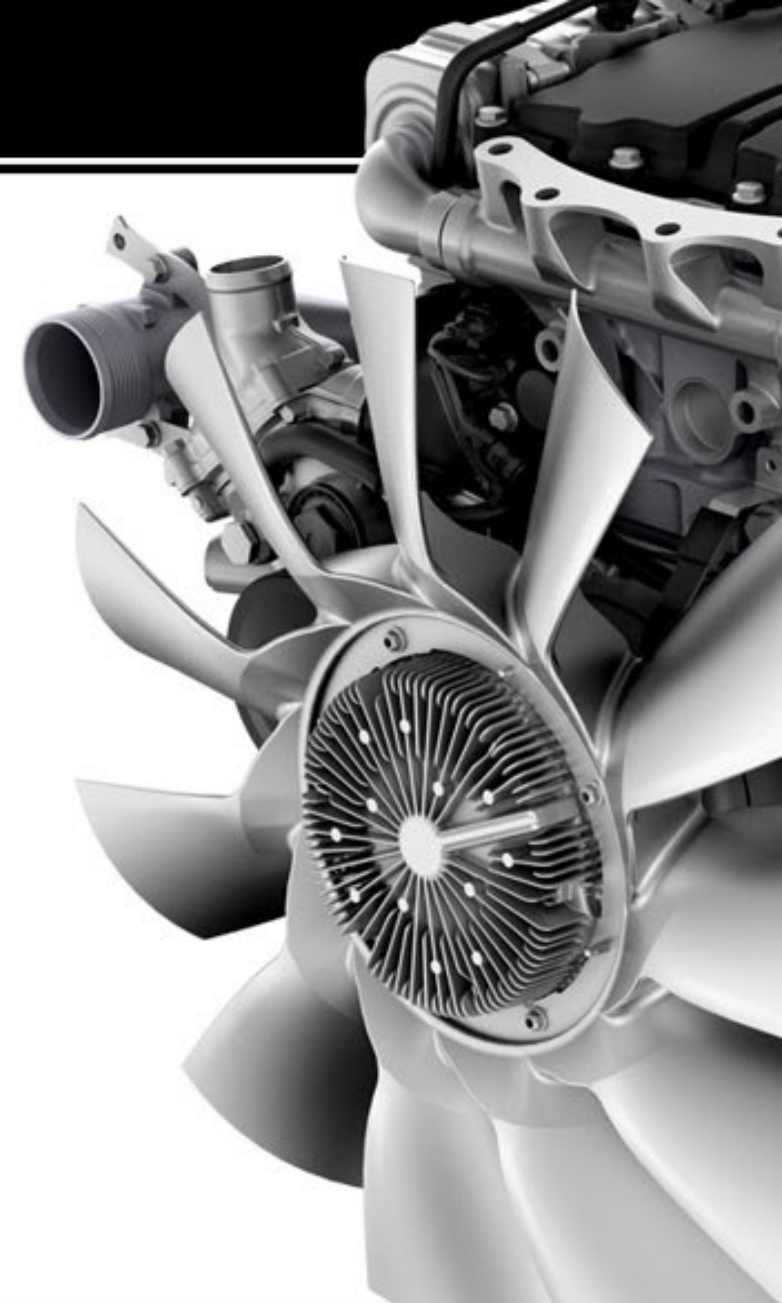
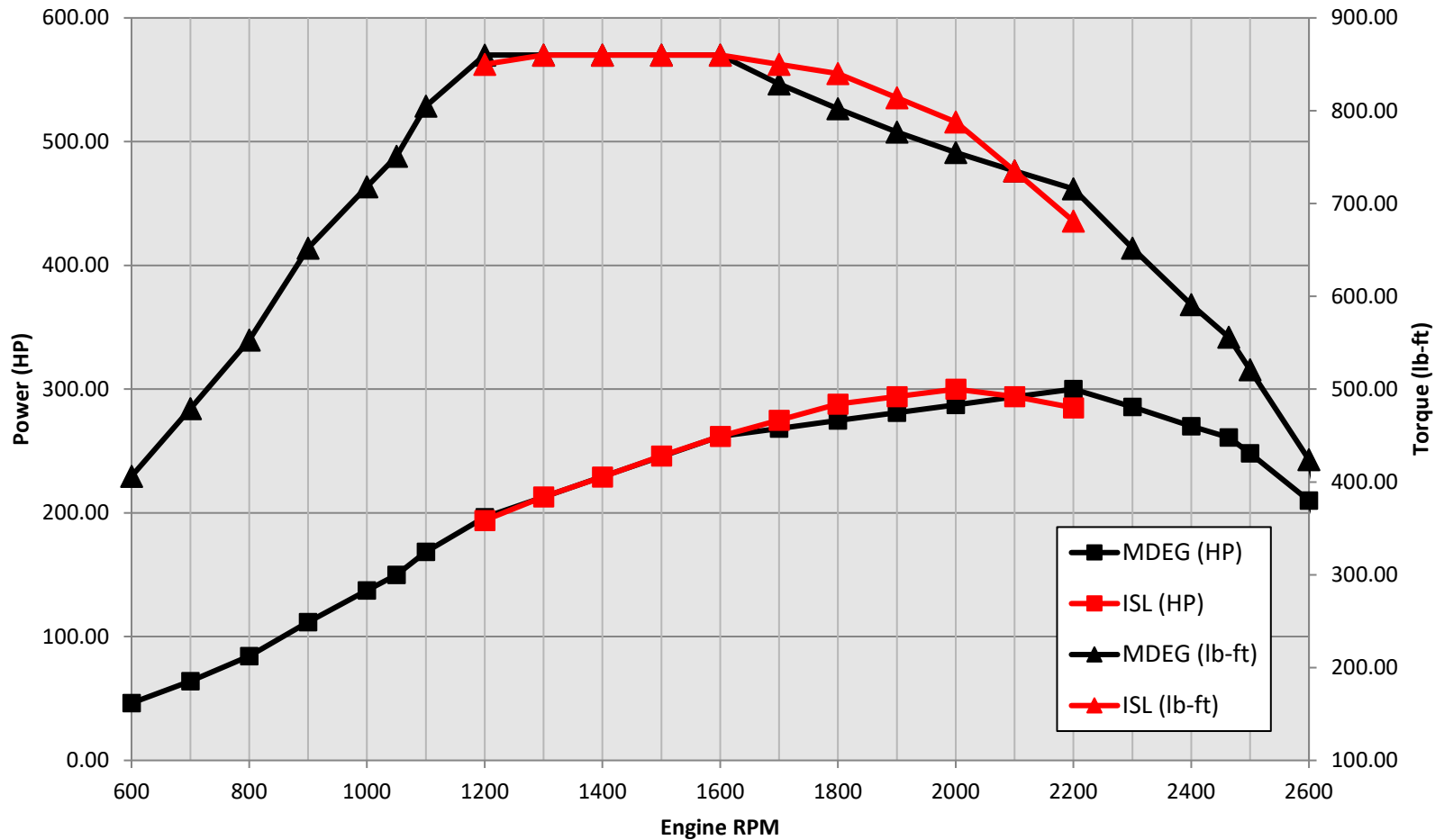
*Fire_EMS_RV Only



Power Curves

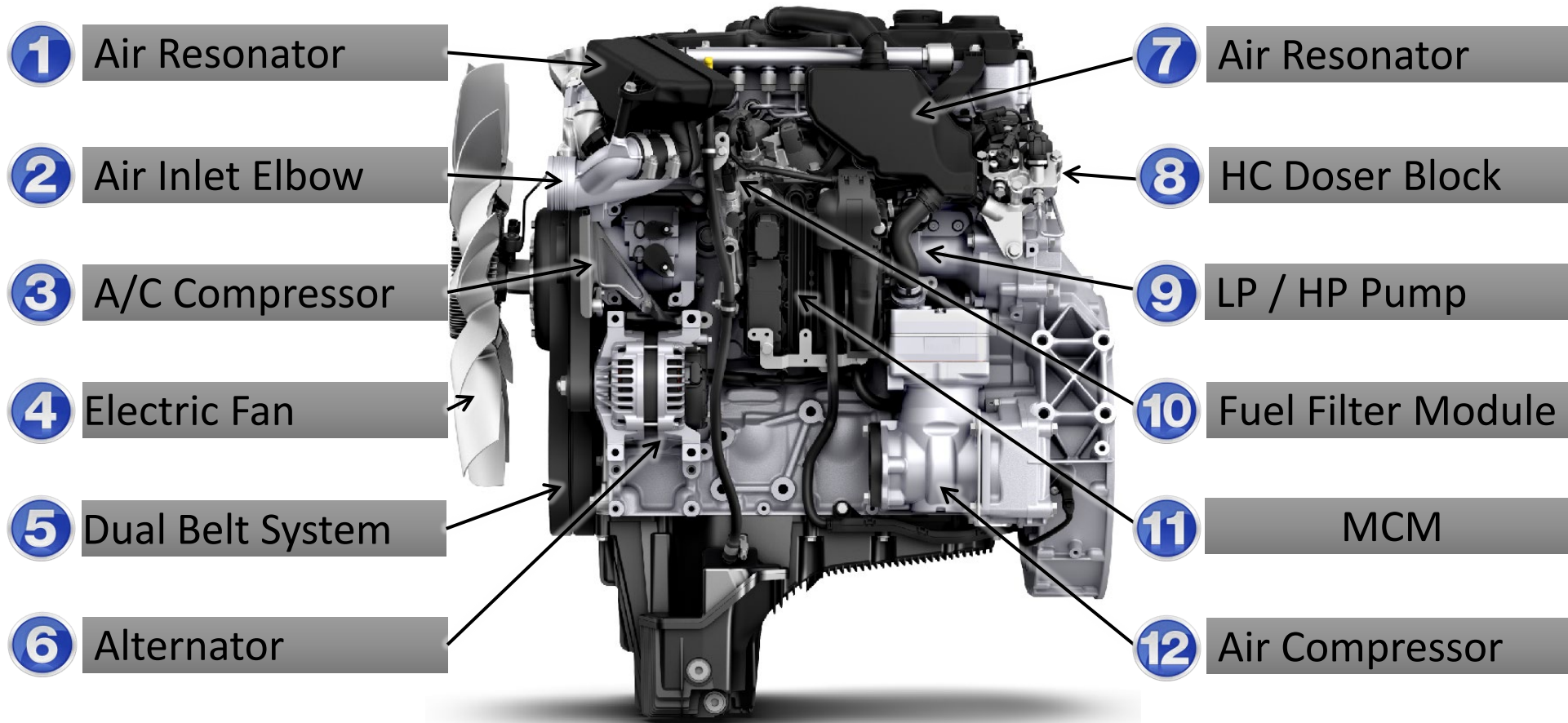
Power Curves available on DDCSN

Detroit DD8 300/860 vs Cummins L9 300/860



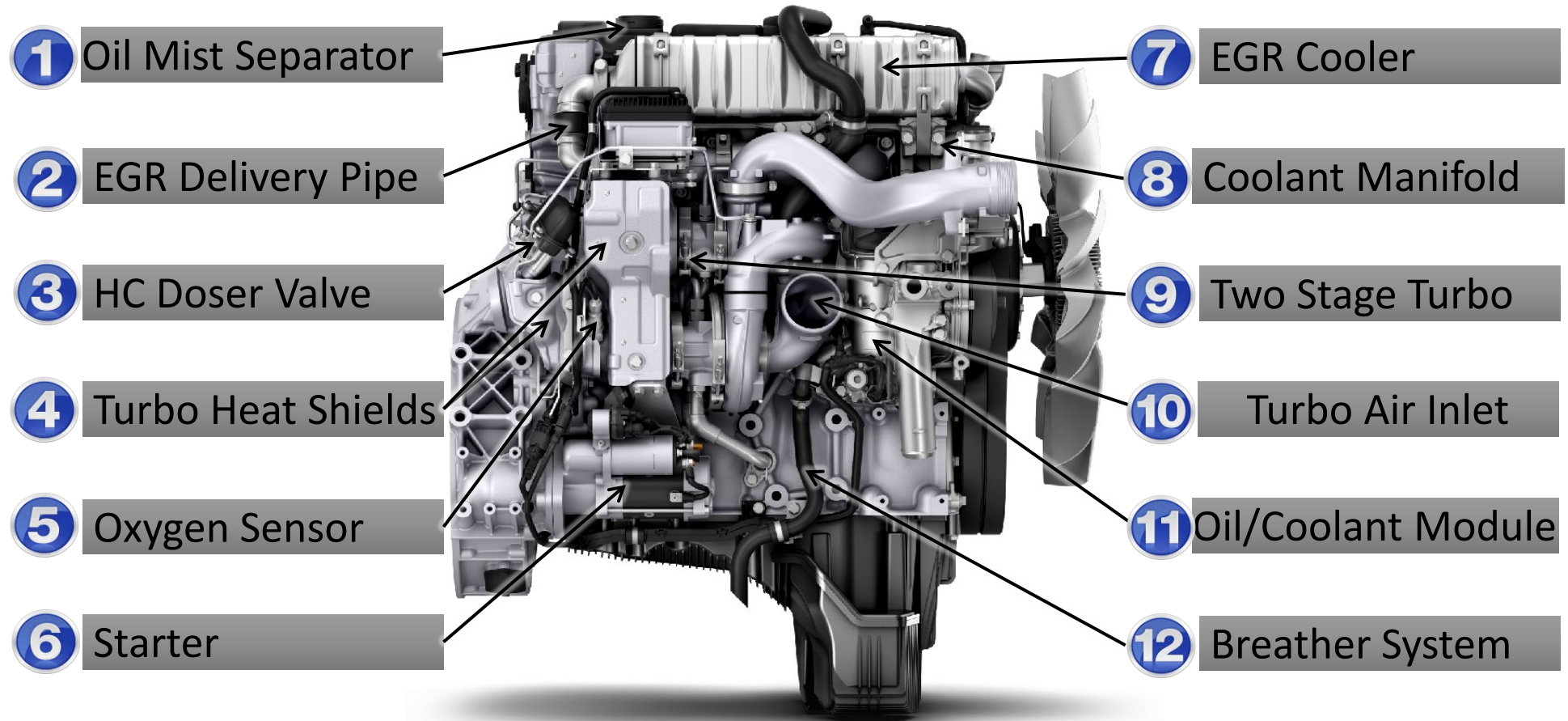
DD5 Walk Around

Left Side



DD5 Walk Around

Right Side



DD8 Walk Around

Video

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DAIMLER TRUCKS NORTH AMERICA

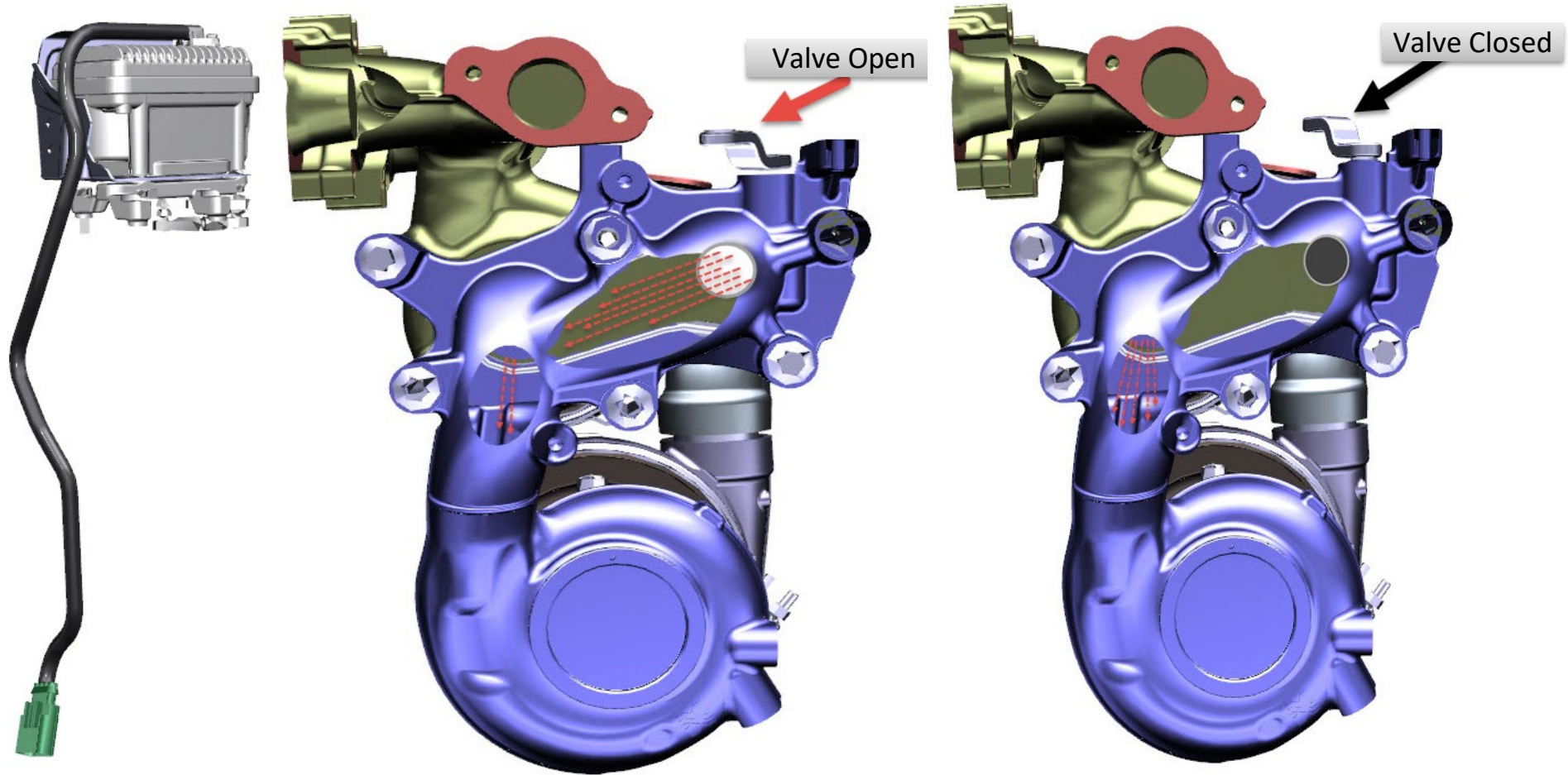


DD8 Engine Walk Around
There Is No Narration To This Module



Dual Stage Turbo Charger

Wastegate Operation



Dual Stage Turbo Charger

That Didn't Work



Dual Stage Turbo Charger

Video

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Updated CTT Dual Stage Turbo

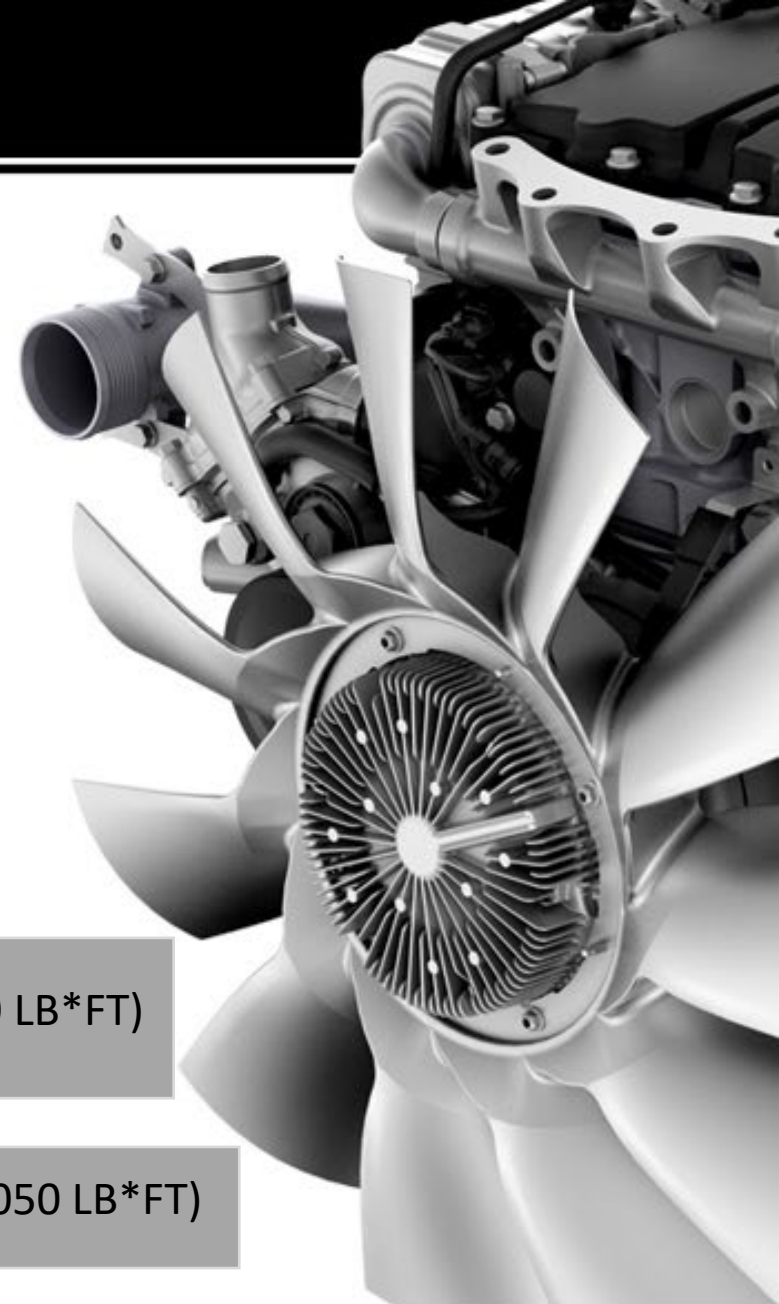
DD5 Sept 2018

DD8 Sept 2017

There Is No Narration For This Module

DD5 200-240HP (560 - 660 LB*FT)

DD8 330-350HP (1000 – 1050 LB*FT)



Single Stage Turbo Charger

Video

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DD8 Single Stage Turbo Charger
There Is NO Narration To This Module

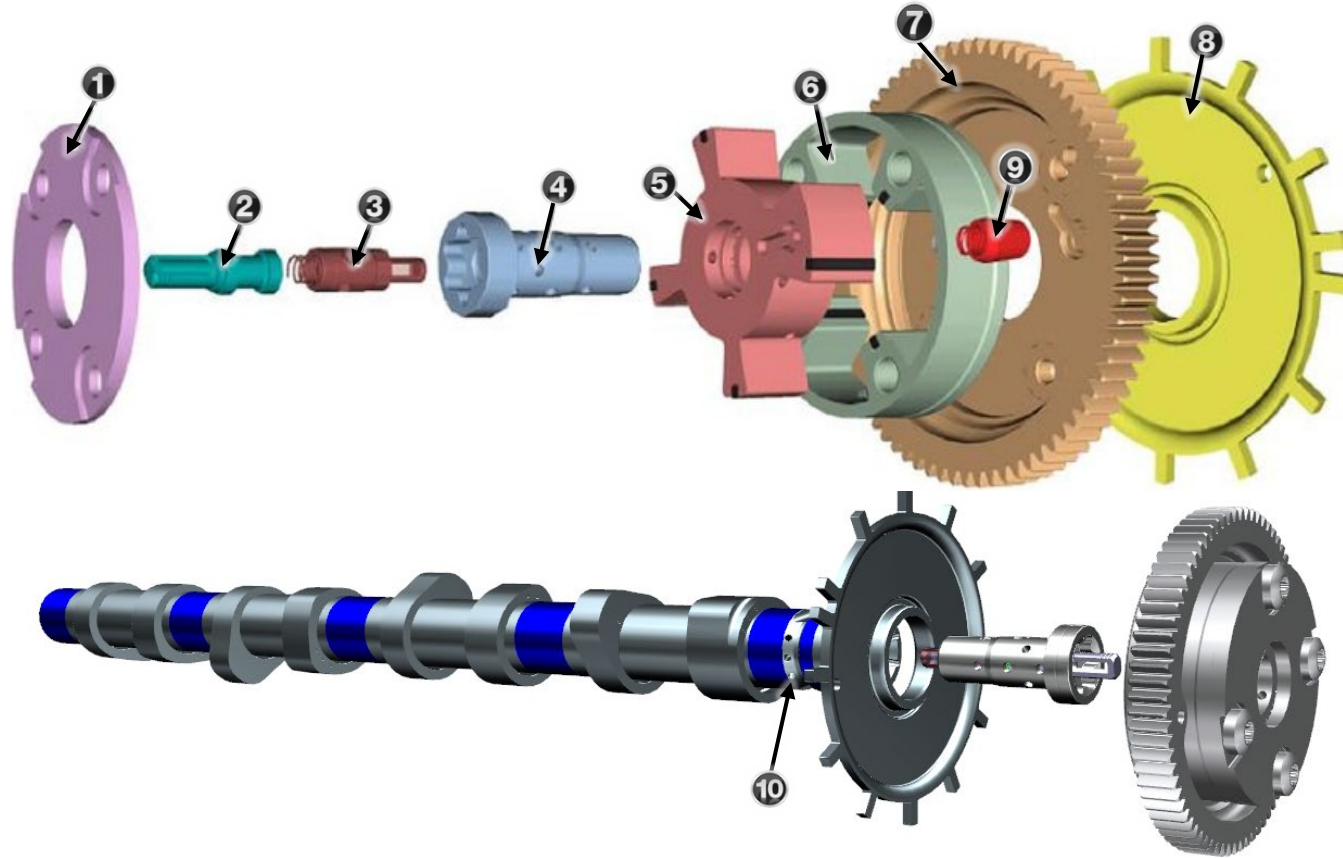
DD8 260-300HP (660 – 860 LB*FT)



Variable Camshaft Phaser

Mechanical Components

- 1** Cover Plate
- 2** Control Plunger
- 3** Return Check Valve
- 4** Valve Housing
- 5** Rotor
- 6** Adjustment Housing
- 7** Exhaust Cam Gear
- 8** Timing Plate
- 9** Locking Pin & Spring
- 10** Circuit Oil Feed



Variable Camshaft Phaser

Video

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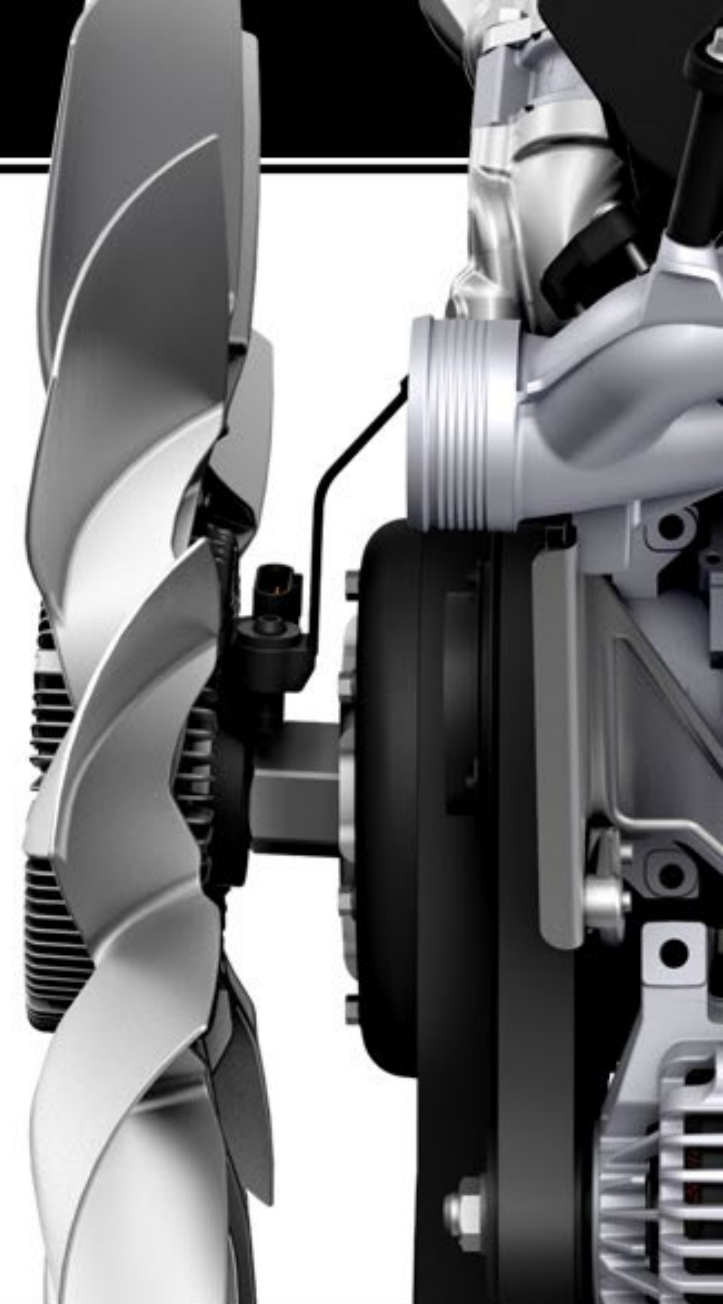
Variable Camshaft Phaser Operation

Timing Of Exhaust Valve Openings

Normal Engine Sounds

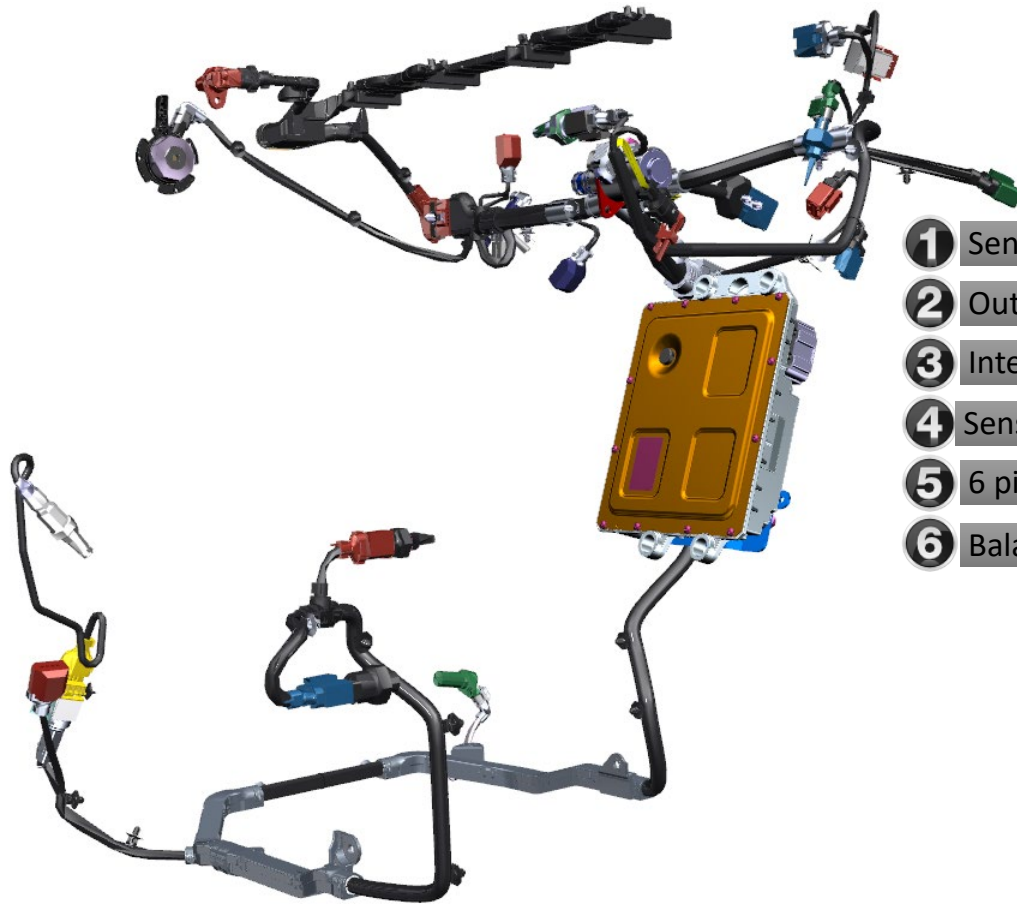
VCP Support ATS At Low RPM

The Video's Of This Module Have Sound

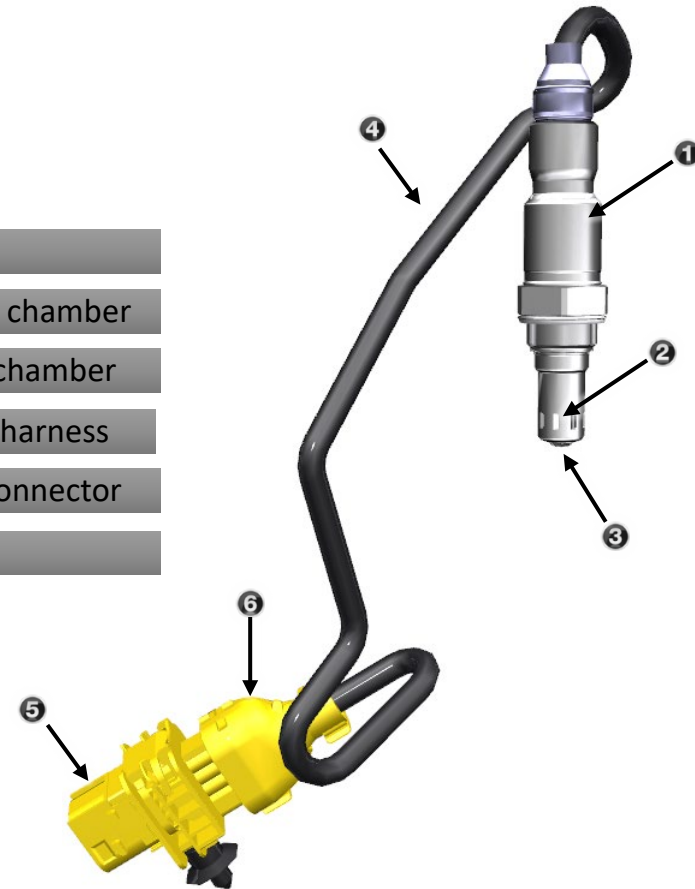


Oxygen Sensor

Components



- 1 Sensor Housing
- 2 Outer protective chamber
- 3 Inter protective chamber
- 4 Sensor electrical harness
- 5 6 pin electrical connector
- 6 Balance Resistor



DD5 Maintenance Intervals

Item	Mi/Km/Hr	Severe Duty	Short-Haul	Long-Haul
Engine Oil & Filter Change*	Miles	35,000	45,000	50,000
	Kilometers	56,000	73,000	80,000
	Hours	1,000	1,500	
Fuel Filter Change	Miles	35,000	45,000	50,000
	Kilometers	56,000	73,000	80,000
	Hours	1,000	1,500	
Valve Lash Adjustment	Miles	Every 70,000	Every 90,000	Every 100,000
	Kilometers	Every 113,000	145,000	161,000
	Hours	2,000	3,000	3,400
Diesel Particulate Filter	Check engine light will illuminate when ash requires removal Normal DPF ash clean interval is every 190,000 – 225,000 miles (306,000 – 362,000 km) (6,300 – 7,500 hrs) (Duty Cycle Dependent)			
DEF Pump Filter	Replace filter every 3 years or 500, 000 miles (805,000 km) whichever comes first			



Maintenance

Short Haul

Short Haul service applies to vehicles that annually travel up to 60,000 miles (96,000 km) and average between 10.1 and 11.9 miles per gallon and operate under normal conditions. Examples of Short Haul service are: operation primarily in cities and densely populated areas, local transport with infrequent freeway travel, or a high percentage of stop-and-go travel.

DD5 Short Haul Maintenance Intervals (GHG17)

Miles X 1000	45	90	135	180	225
Km X 1000	73	145	217	290	362
Hours*	1500	3000	4500	6000	7500
Months*	18	36	54	72	90
Lubricating Oil	R	R	R	R	R
Lubricating Oil Filter	R	R	R	R	R
Coolant	Refer to DDC-SVC-BRO-0002 for the listing of required intervals using the recommended coolants.				
Fuel Filters (frame and engine)	Every 45,000 miles (72,000 km) (1,500 hrs)				
Valve Lash Adjustment	Every 90,000 miles (145,000 km) (3,000 hrs)				
Belts	I	I	I	I	R
Air System	I	I	I	I	I
Air Cleaner	Refer to vehicle maintenance procedures				
Exhaust System	I	I	I	I	I
Aftertreatment Devices	Inspect external hardware and connections every 6 months or at oil change intervals.				
Diesel Particulate Filter	190,000 – 225,000 miles (306,000 – 362,000 km) (6300 – 7500 hrs) Detroit DPF Cleaning Process (Liquid Cleaning)**				
DEF Pump Filter	Replace every 500,000 miles (805,000 km) (10,000 hrs) (3 years) *				
Air Compressor	I	I	I	I	I

R = Replace

I = Inspect

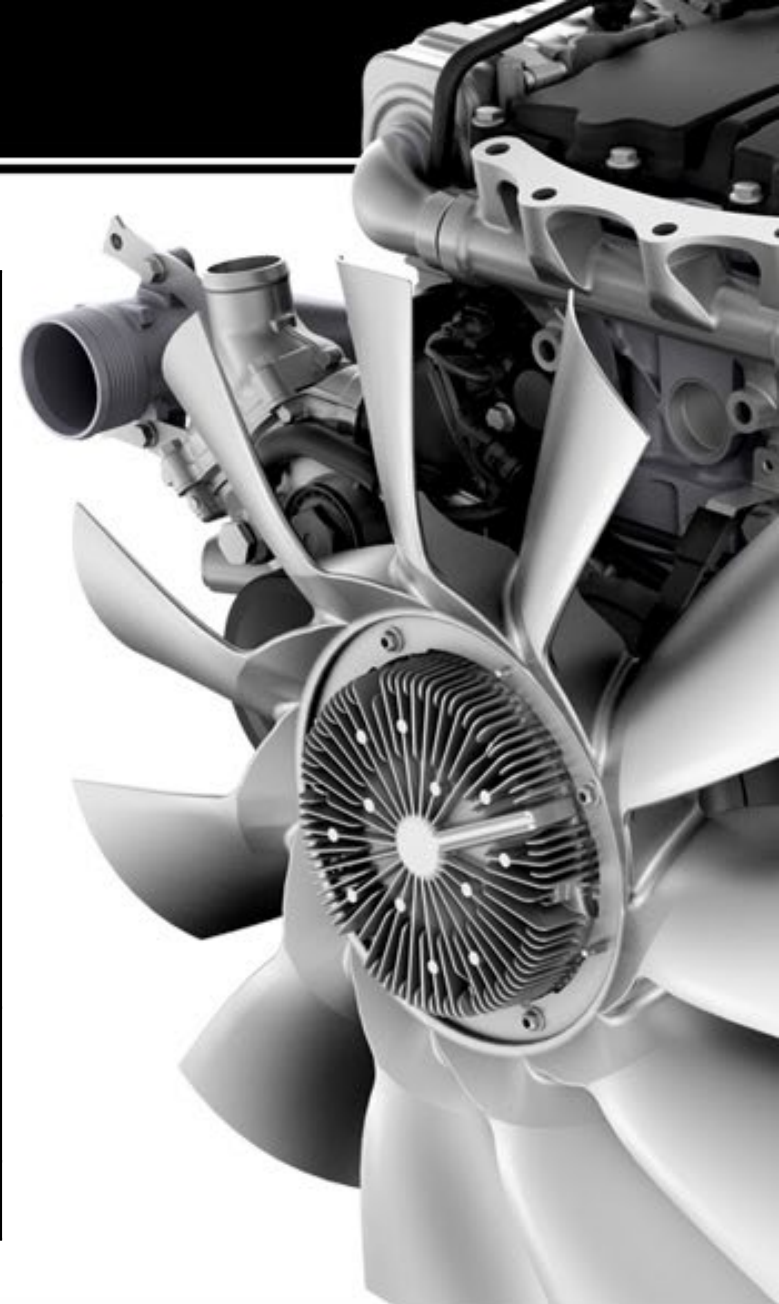
*Whichever comes first.

**Detroit highly recommends replacing the DPF with a Detroit™ genuine DPF to ensure maximum replacement life.

- Currently, only Detroit™ Fuel Filter/Water Separator & Davco 245 or Racor 6600 are the only frame-mounted filtration systems compatible for Detroit™ Engines.
- Refer to "Routine Preventive Maintenance" for a description of all items.

DD8 Maintenance Intervals

Item	Mi/Km/Hr	Severe Duty	Short-Haul	Long-Haul
Engine Oil & Filter Change*	Miles	45,000	55,000	60,000
	Kilometers	72,000	88,000	96,000
	Hours	1,500	1,800	
Fuel Filter Change	Miles	45,000	55,000	60,000
	Kilometers	72,000	88,000	96,000
	Hours	1,500	1,800	
Valve Lash Adjustment	Miles	Every 90,000	Every 110,000	Every 120,000
	Kilometers	Every 145,000	Every 177,000	Every 193,000
	Hours	3,000	3,600	4,000
Diesel Particulate Filter	Check engine light will illuminate when ash requires removal Normal DPF ash clean interval is every 150,000 miles (241,000 km) (5,000 hrs) (Duty Cycle Dependent)			
DEF Pump Filter	Replace filter every 3 years or 500,000 miles (805,000 km) whichever comes first			



Maintenance Intervals

DD8 Short Haul

Short Haul

Short Haul service applies to vehicles that annually travel up to 60,000 miles (96,000 km) and average between 6.5 and 8.5 miles per gallon and operate under normal conditions.

Examples of Short Haul service are: operation primarily in cities and densely populated areas, local transport with infrequent freeway travel, or a high percentage of stop-and-go travel

DD8: Short Haul Maintenance Intervals GHG17 with ULSD Fuel GHG17 Using DFS 93K222(CK-4) or 93K223(FA-4) Approved Oils	
Lubricating Oil	Replace every 55,000 miles (88,000 km) (1,800 hrs) (18 months) *
Lubricating Oil Filter	Replace every 55,000 miles (88,000 km) (1,800 hrs) (18 months) *
Coolant – Standard Life	Maintain every 55,000 miles (88,000 km) (1,800 hrs) (12 months) * Replace every 300,000 miles (480,000 km) (3,600 hrs) (24 months) *
Coolant – Extended Life	Maintain every 110,000 miles (177,000 km) (1,800 hrs) (12 months) * Replace every 600,000 miles (965,000 km) (7,200 hrs) (48 months) *
Fuel Filters (frame and engine)	Replace every 55,000 miles (88,000 km) (1,800 hrs) (18 months) *
Valve Lash Adjustment	Adjust every 110,000 miles (177,000 km) (3,600 hrs) (36 months) *
Belts	Inspect every 55,000 miles (88,000 km) (1,800 hrs) (18 months) * Replace every 150,000 miles (241,000 km) (5,000 hrs) (54 months) *
Air System	Inspect every 55,000 miles (88,000 km) (1,800 hrs) (18 months) *
Air Cleaner	Refer to vehicle maintenance procedures
Exhaust System	Inspect every 55,000 miles (88,000 km) (1,800 hrs) (18 months) *
Aftertreatment Devices	Inspect external hardware and connections every 6 months or at oil change intervals. *
Diesel Particulate Filter	A Check Engine Light will illuminate when ash requires removal. Normal DPF ash clean interval is every 150,000 miles (241,000 km) (5,000 hrs) * Detroit DPF Cleaning Process (Liquid Cleaning)**
DEF Pump Filter	Replace every 500,000 miles (805,000 km) (10,000 hrs) (3 years) *
Air Compressor	Inspect every 55,000 miles (88,000 km) (1,800 hrs) (18 months) *
<p>*Whichever comes first. **Detroit highly recommends replacing the DPF with a Detroit™ genuine DPF to ensure maximum replacement life.</p> <ul style="list-style-type: none"> • Currently, only Detroit™ Fuel Filter/Water Separator & Davco 245 or Racor 6600 are the only frame-mounted filtration systems compatible for Detroit™ Engines. • Refer to "Routine Preventive Maintenance" for a description of all items. 	

Maintenance Intervals

DD8 Server Duty

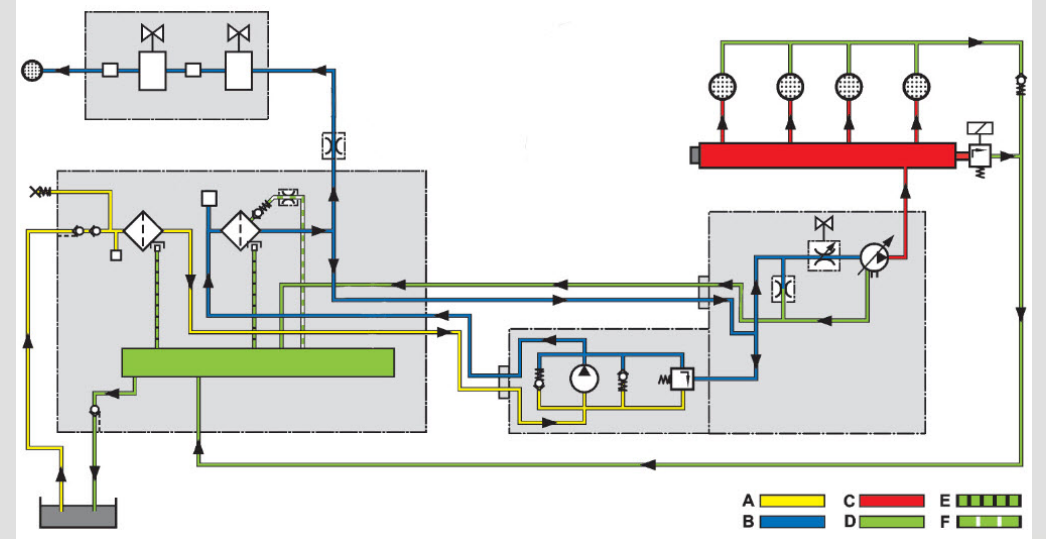
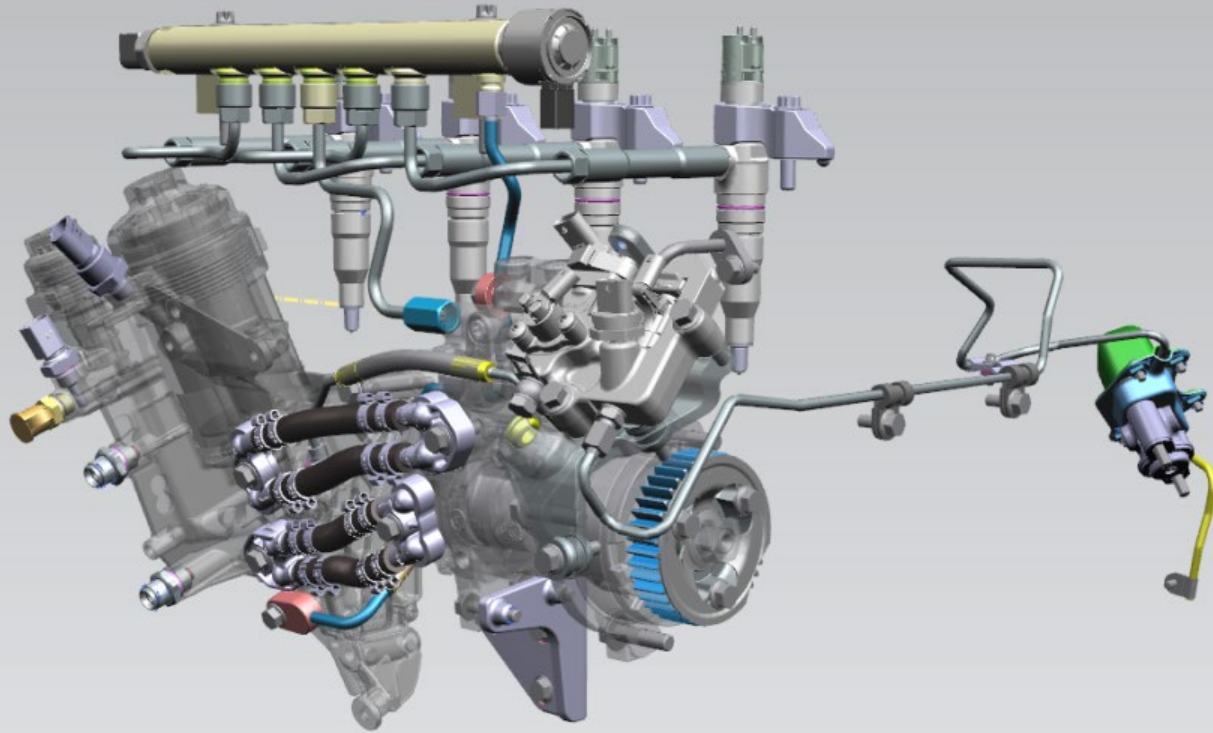
Server Duty

Severe service applies to vehicles that average below 6.4 miles per gallon or that operate under severe conditions. Examples of Severe Service are: idle time over 40%, load factor over 55%, operation on extremely poor roads or under heavy dust accumulation; constant exposure to extreme hot, cold, salt-air, or other extreme climates; frequent short-distance travel; construction-site operation; or farm operation. Only one of these conditions needs be met to categorize an application as Severe Service

DD8: Severe Service Maintenance Intervals GHG17 with ULSD Fuel GHG17 Using DFS 93K222(CK-4) or 93K223(FA-4) Approved Oils	
Lubricating Oil	Replace every 45,000 miles (72,000 km) (1,500 hrs) (12 months) *
Lubricating Oil Filter	Replace every 45,000 miles (72,000 km) (1,500 hrs) (12 months) *
Coolant – Standard Life	Inspect every 45,000 miles (72,000 km) (1,500 hrs) (12 months) * Replace every 300,000 miles (480,000 km) (3,000 hrs) (24 months) *
Coolant – Extended Life	Inspect every 90,000 miles (145,000 km) (1,500 hrs) (12 months) * Replace every 600,000 miles (965,000 km) (6,000 hrs) (48 months) *
Fuel Filters (frame and engine)	Replace every 45,000 miles (72,000 km) (1,500 hrs) (12 months) *
Valve Lash Adjustment	Adjust every 90,000 miles (145,000 km) (3,000 hrs) (24 months) *
Belts	Inspect every 45,000 miles (72,000 km) (1,500 hrs) (12 months) * Replace every 135,000 miles (217,000 km) (4,500 hrs) (36 months) *
Air System	Inspect every 45,000 miles (72,000 km) (1,500 hrs) (12 months) *
Air Cleaner	Refer to vehicle maintenance procedures
Exhaust System	Inspect every 45,000 miles (72,000 km) (1,500 hrs) (12 months) *
Aftertreatment Devices	Inspect external hardware and connections every 6 months or at oil change intervals.*
Diesel Particulate Filter	A Check Engine Light will illuminate when ash requires removal. Normal DPF ash clean interval is every 150,000 miles (241,000 km) (5,000 hrs) * Detroit DPF Cleaning Process (Liquid Cleaning)**
DEF Pump Filter	Replace every 500,000 miles (805,000 km) (10,000 hrs) (3 years) *
Air Compressor	Inspect every 45,000 miles (72,000 km) (1,500 hrs) (12 months) *
<p>*Whichever comes first. **Detroit highly recommends replacing the DPF with a Detroit™ genuine DPF to ensure maximum replacement life.</p> <ul style="list-style-type: none"> • Currently, only Detroit™ Fuel Filter/Water Separator & Davco 245 or Racor 6600 are the only frame-mounted filtration systems compatible for Detroit™ Engines. • Refer to "Routine Preventive Maintenance" for a description of all items. 	

Fuel System

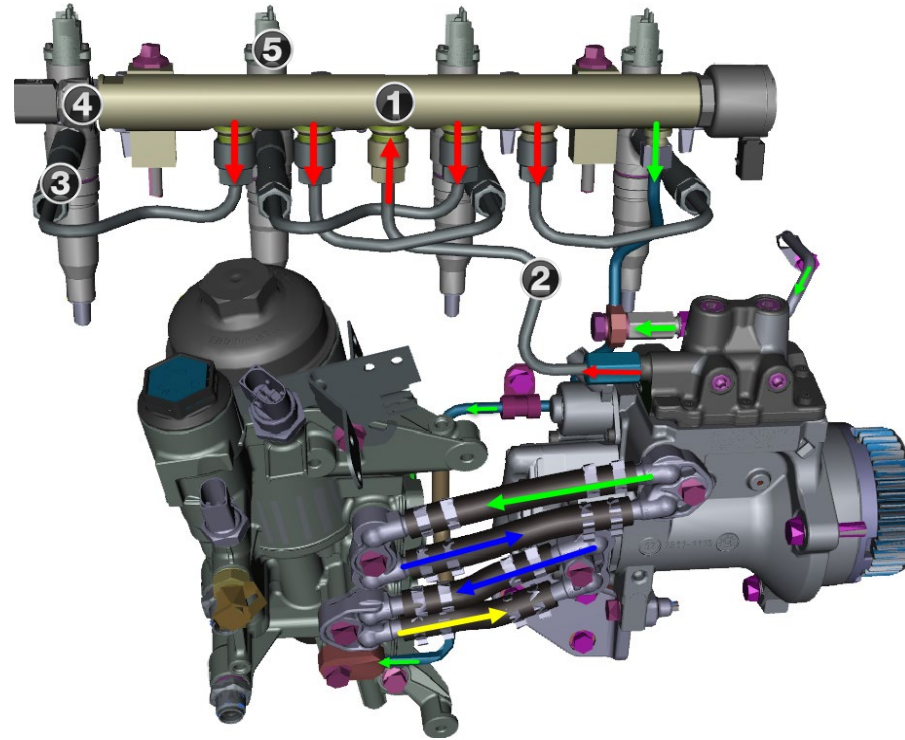
Over View



Fuel System

Components

- 1** Rail
- 2** HPP feed to Rail
- 3** Feed Line to Injector
- 4** Rail Pressure Sensor
- 5** Injector

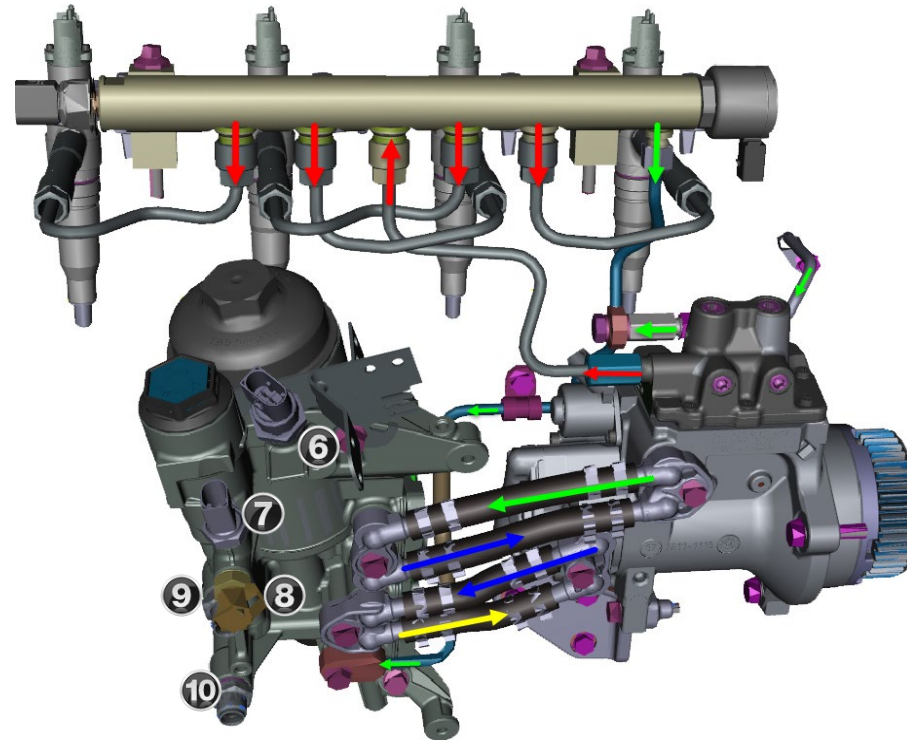


- 1. LPP inlet - pre filter draw fuel to low pressure pump inlet (yellow)
- 2. LPP Outlet - low pressure outlet to main fuel filter (blue)
- 3. HPP Inlet - main filter fuel to high pressure pump inlet (approximately 6 - 7 bar) (blue)
- 4. HPP Outlet - Leakage from high pressure pump (green)

Fuel System

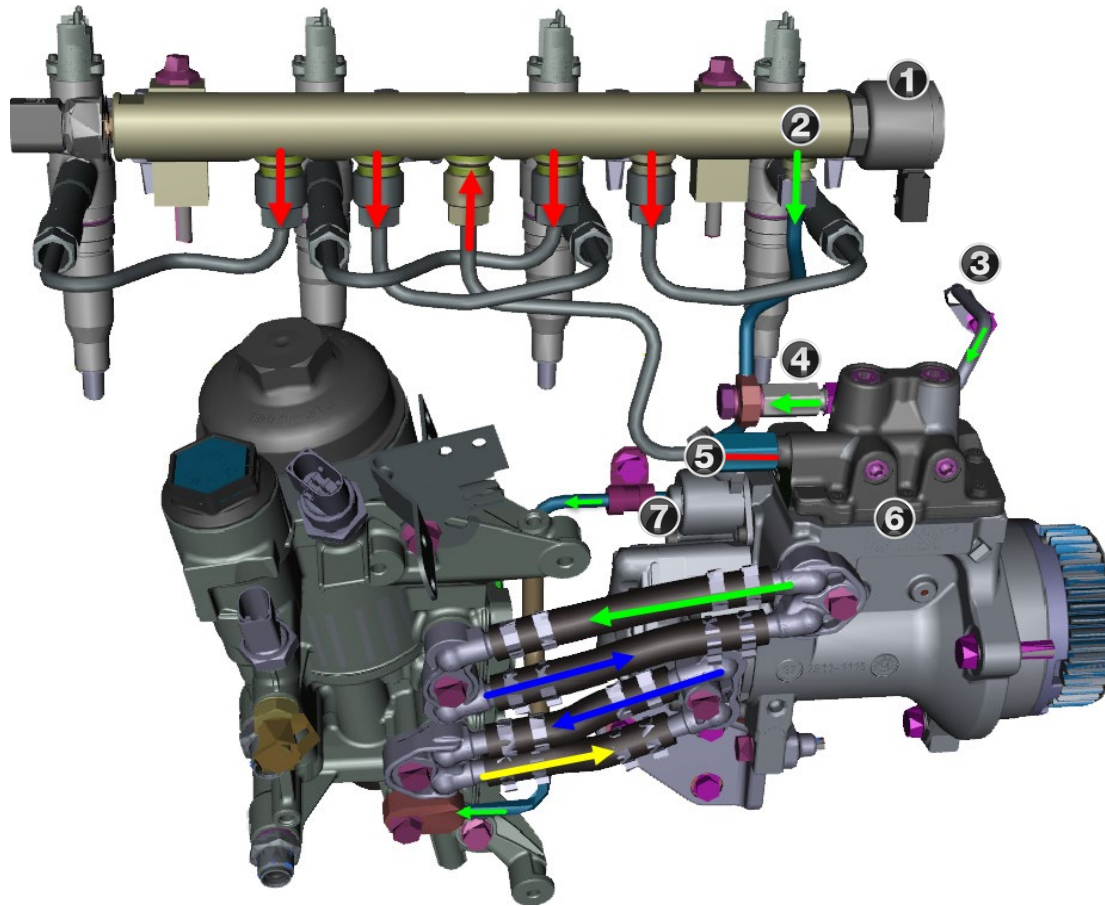
Components

- ⑥ LPPO Sensor
- ⑦ Fuel Temperature Sensor
- ⑧ Priming Port Suction Side
- ⑨ Fuel Supply From FMF
- ⑩ Fuel Black flow to Tank



- 1. LPP inlet - pre filter draw fuel to low pressure pump inlet (yellow)
- 2. LPP Outlet - low pressure outlet to main fuel filter (blue)
- 3. HPP Inlet - main filter fuel to high pressure pump inlet (approximately 6 - 7 bar) (blue)
- 4. HPP Outlet - Leakage from high pressure pump (green)

Fuel System Components



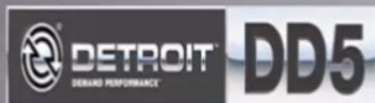
- 1 Pressure Control Valve
- 2 PCV Leakage
- 3 Injector Leakage
- 4 Injector Leakage Check Valve
- 5 Quantity Control Valve
- 6 High Pressure Pump
- 7 Low Pressure Pump

Fuel System

Video

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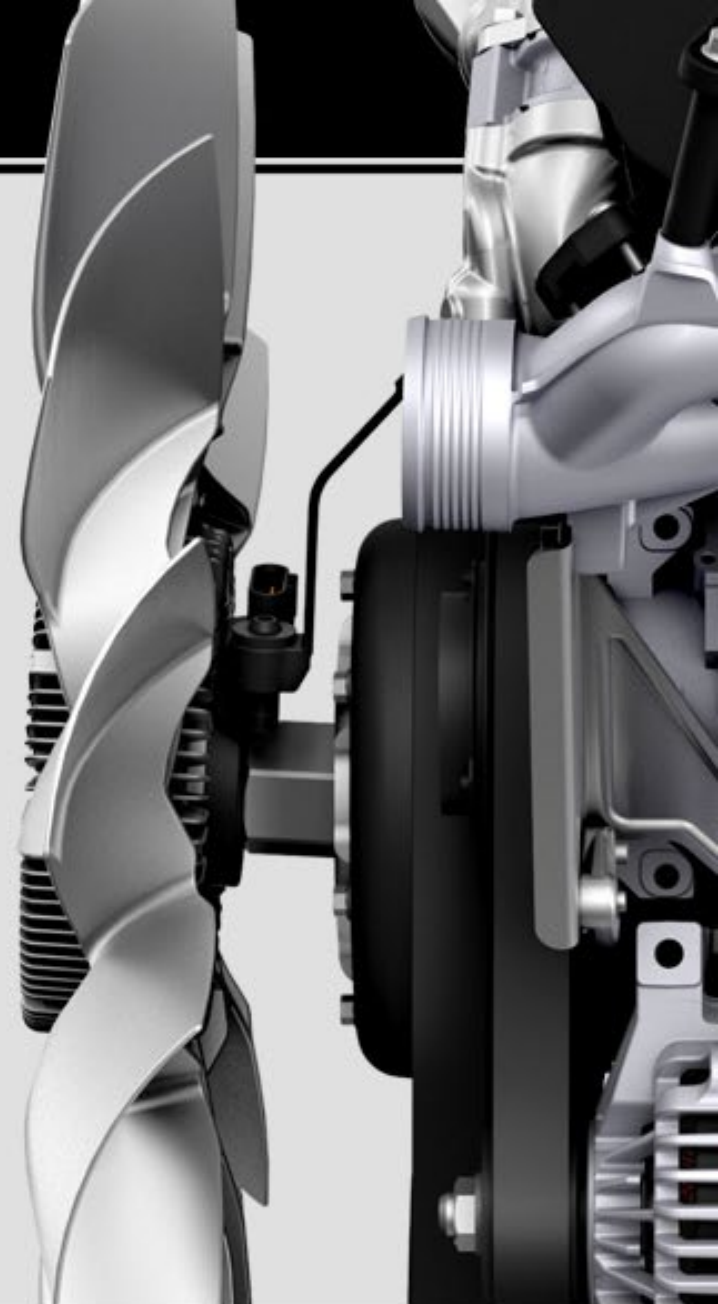
Updated Fuel Filter Module

DD5 Release Sept 2018

DD8 Release Sept 2017

ESOC Option Available

There is No Narration To This Module



Fuel System

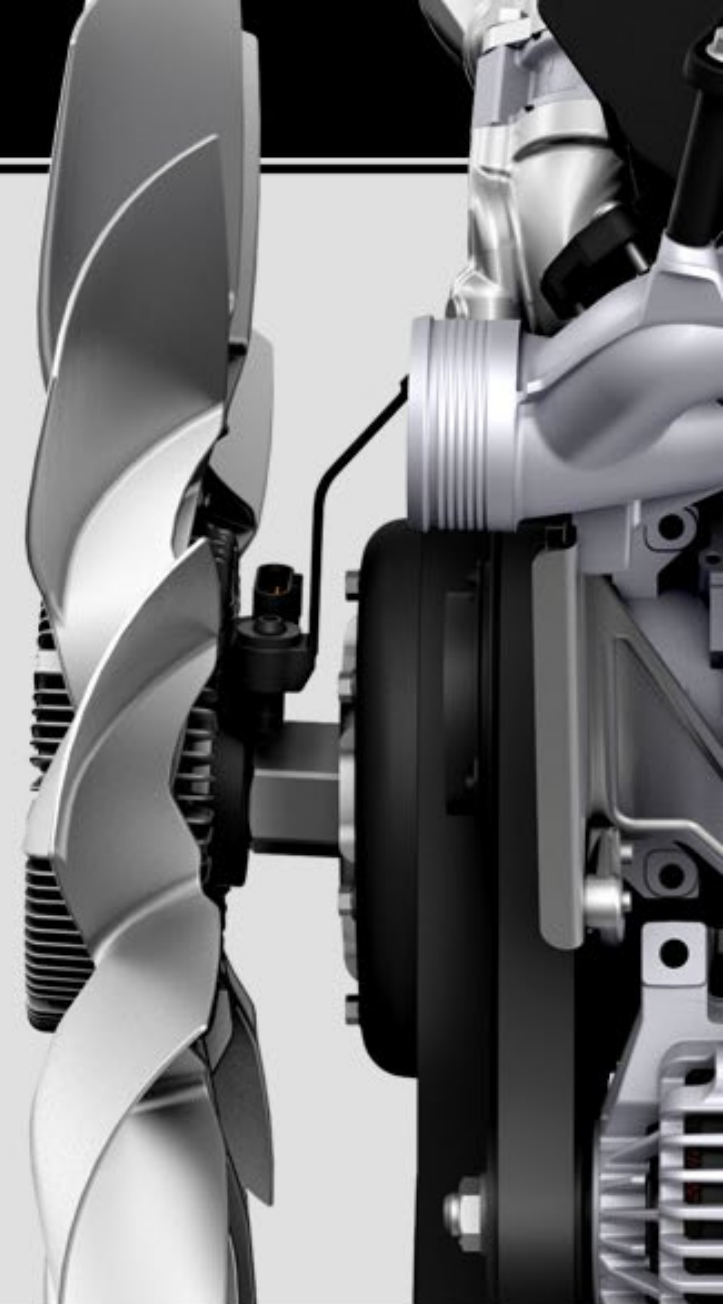
Final Filter Cap

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Final Filter Removal From Cap



Fuel System

Normal Fuel Filter Conditions

Detroit Frame Mount Filtration



Normal Used Filter Media



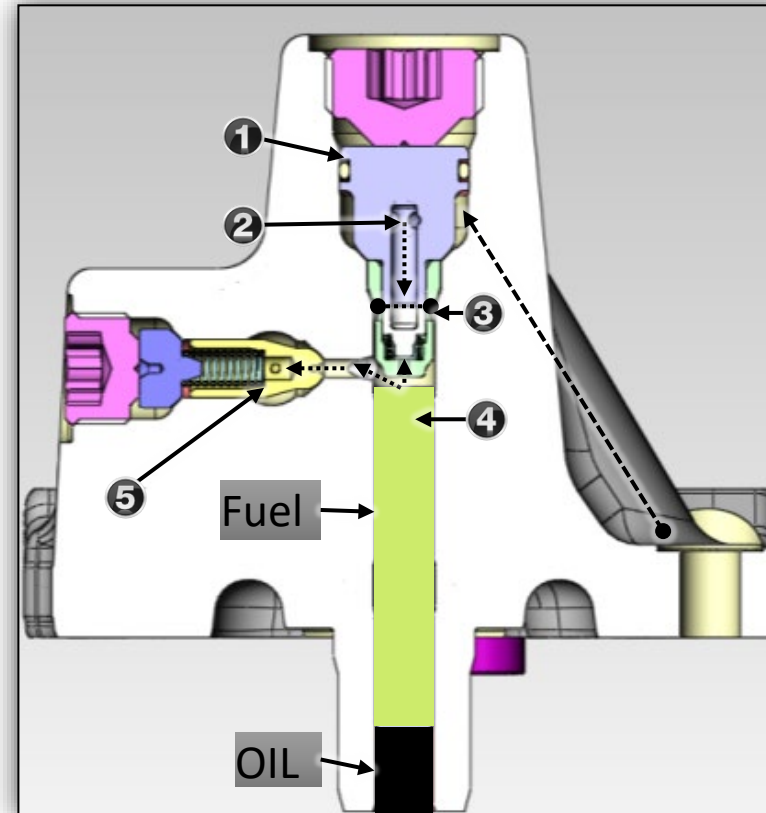
Normal Used Filter Media



Fuel System

Microscopic Oil Transfer

- 1** Inlet Valve Assembly
- 2** Inlet Piston
- 3** Fill Valve
- 4** High Pressure Piston
- 5** Outlet Valve
- 6** Microscopic Oil Transfer



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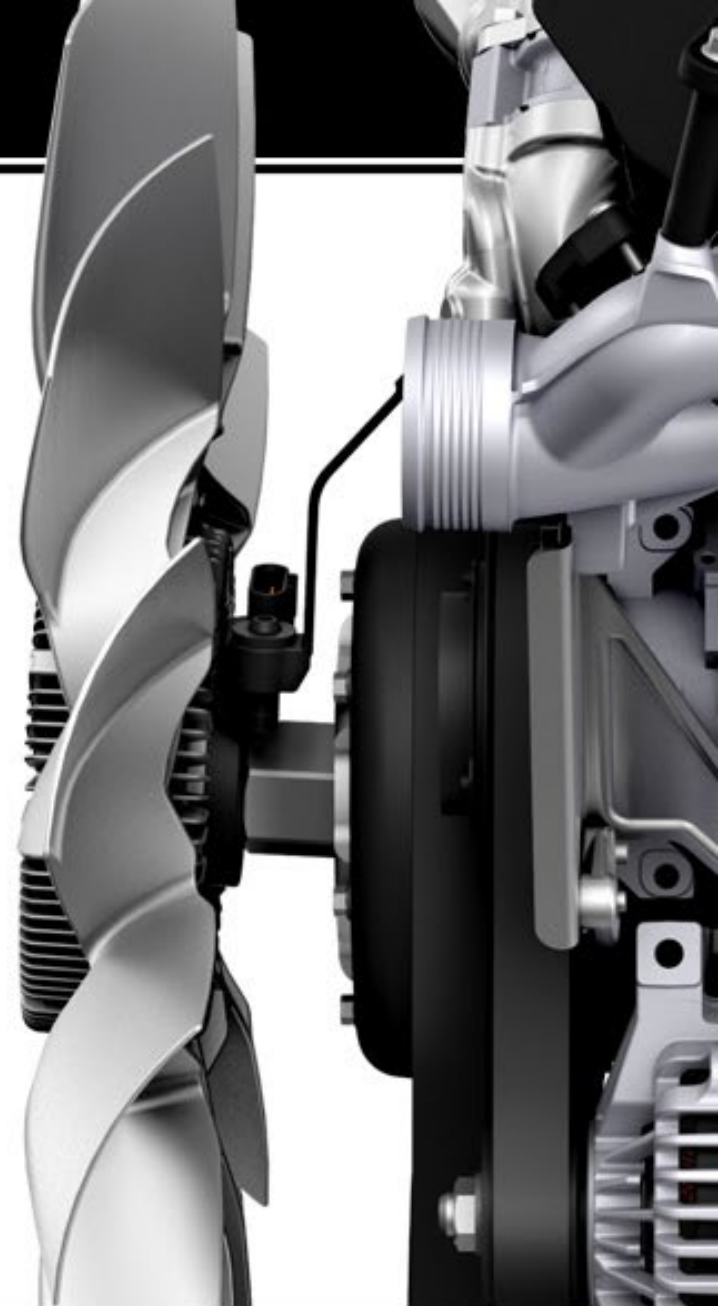
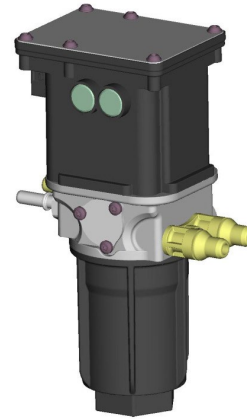
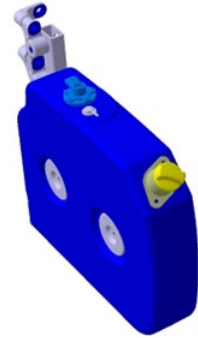
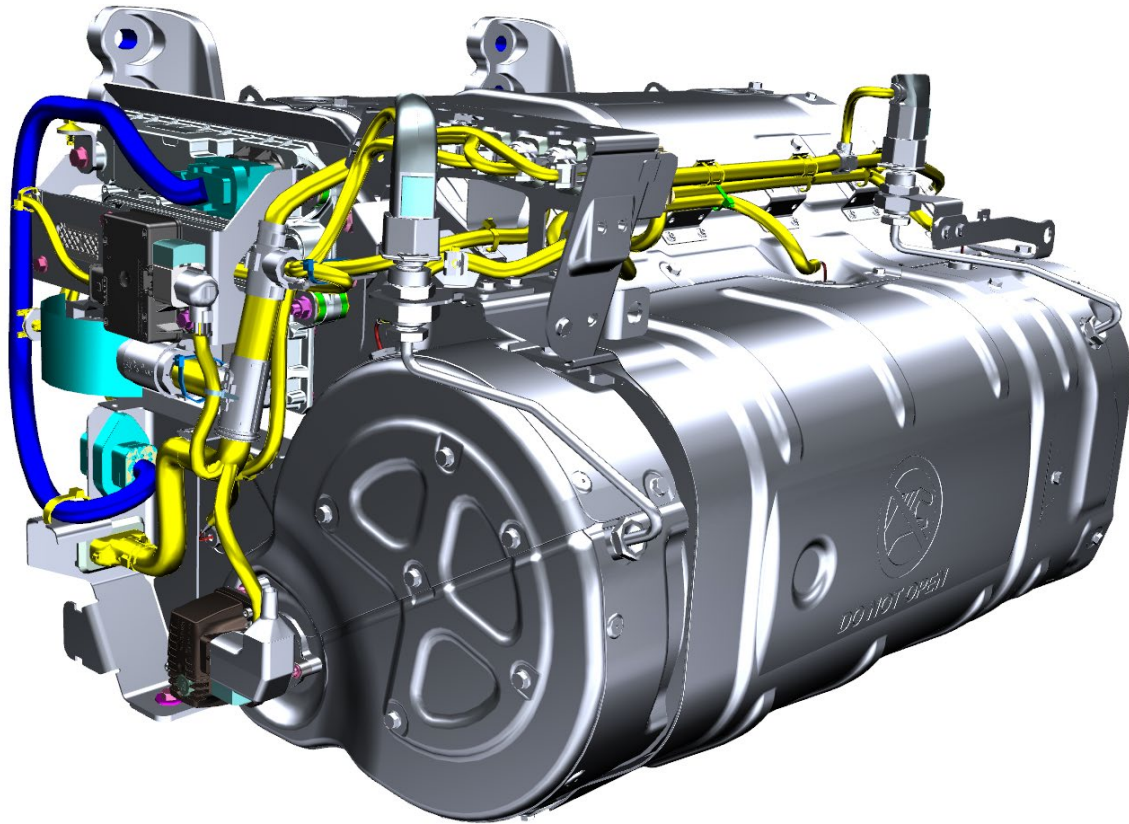
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MDEG DiagnosticLink 8.07 FSIC Update

Aftertreatment Systems

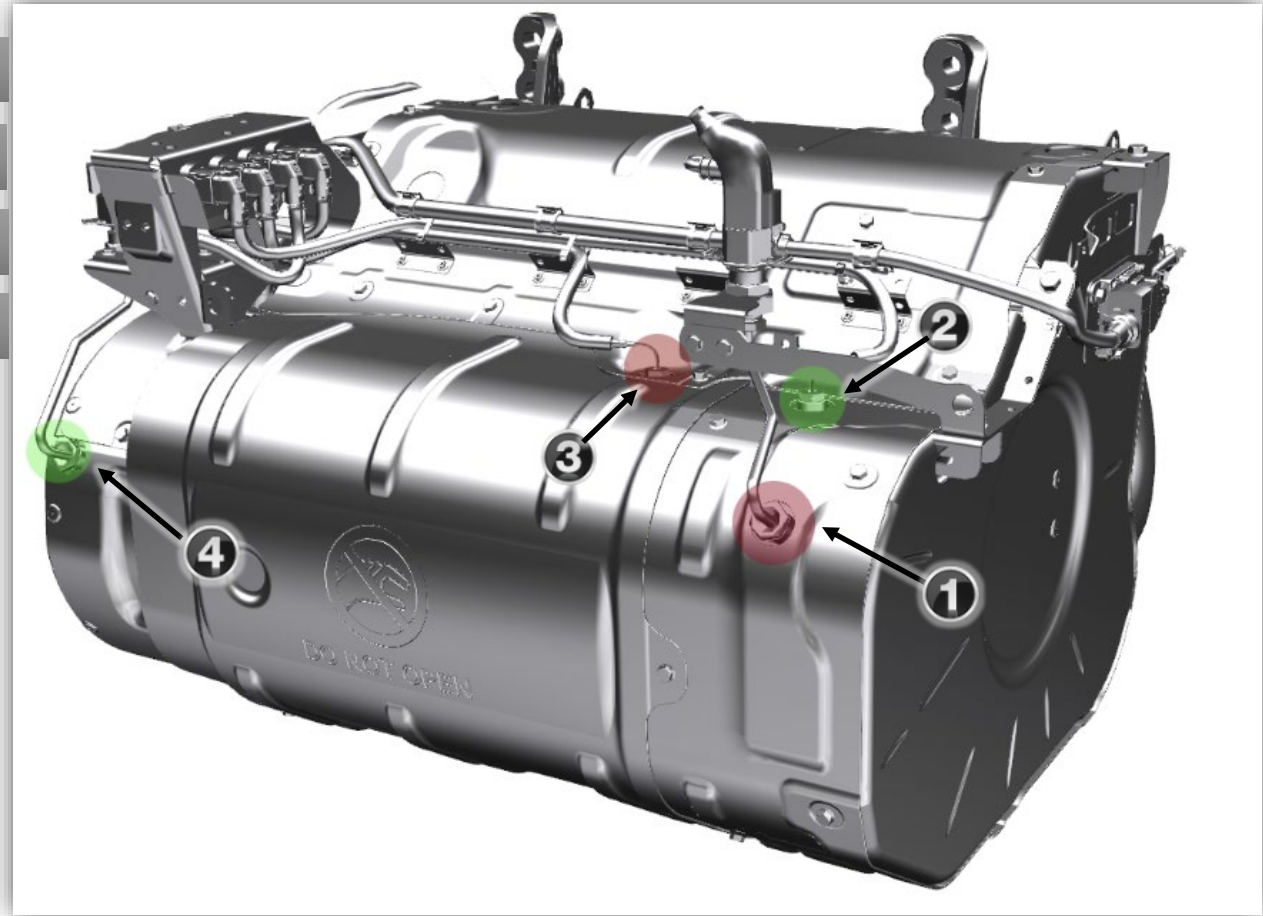
Overview



Aftertreatment Systems

1 Box System

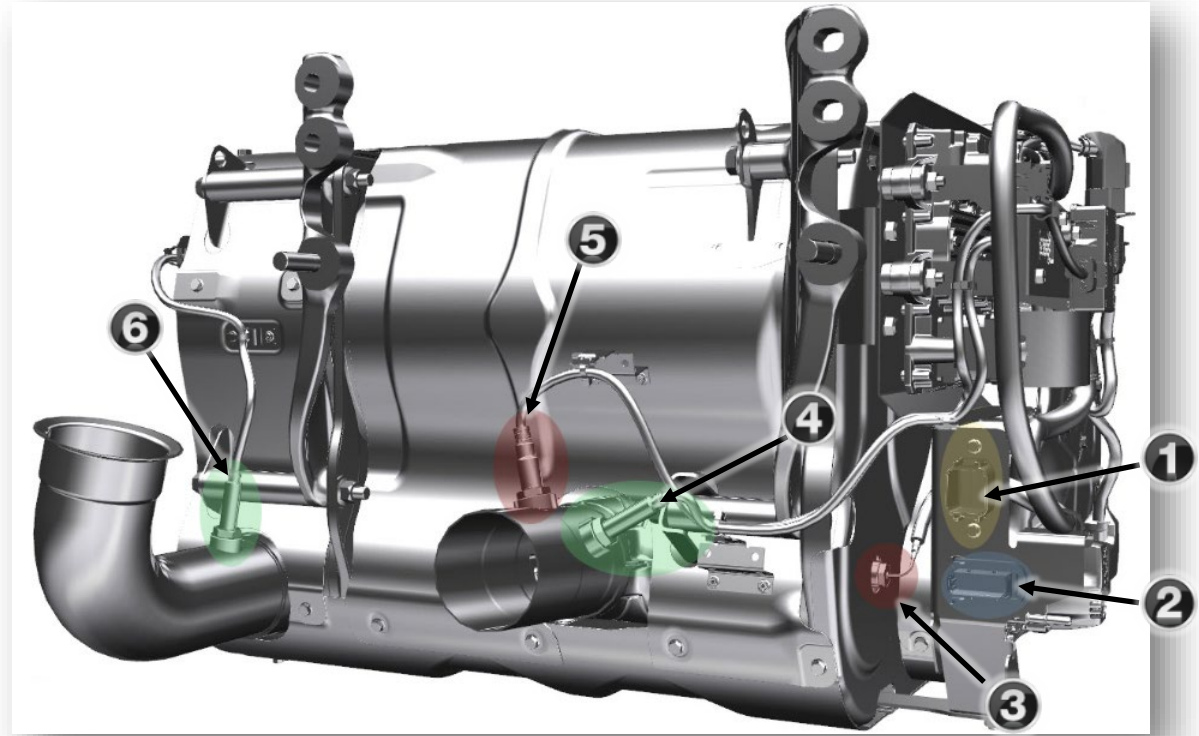
- 1 DOC Inlet Pressure
- 2 DOC Inlet Temperature
- 3 DOC Outlet Temperature
- 4 DPF Outlet Pressure



Aftertreatment Systems

1 Box System

- ① Vehicle Interface
- ② DEF Tank/Pump Interface
- ③ SCR Outlet Temperature
- ④ Soot Sensor
- ⑤ NOx Outlet Sensor
- ⑥ NOx Inlet Sensor



Aftertreatment Systems

2 Box System

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DD8 Single Stage Turbo ATS

DD8 Dual Stage Turbo ATS

2Box Horizontal ATS

There Is No Narration To This Module



Aftertreatment Systems

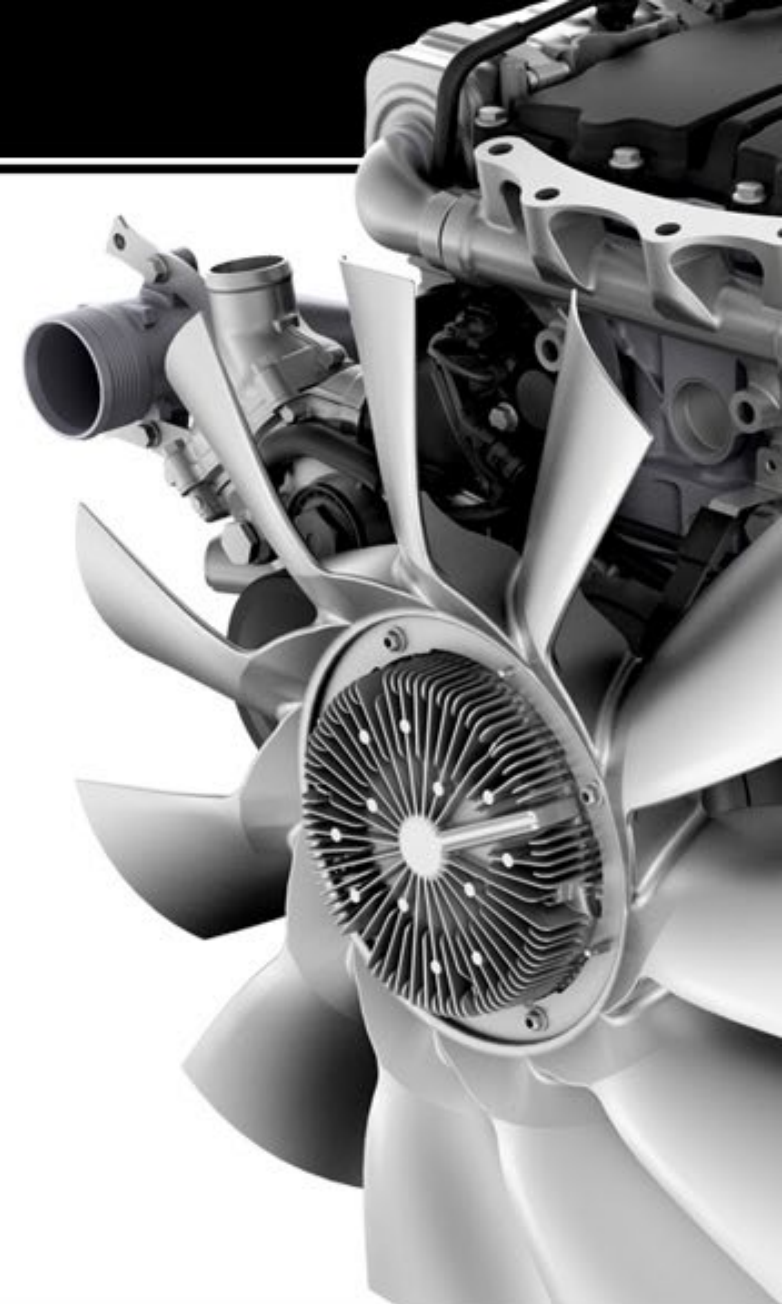
2 Box System Delta Pressure Sensor

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ATS Delta Pressure Sensor
There Is No Narartion To This Module



VCP & TM Modes

The Basic Entry Conditions for VCP are:

1. Coolant Temperature Above 35 degrees Celsius or 95 degrees Fahrenheit
2. Stationary Vehicle after 5 minutes idle time or from working governor to idle
3. Thermal management mode 1 or 3

Thermo-management modes of the engine :

1. TMO - Engine warm-up
2. TM1 - DOC heating / Engine warm-up,
3. TM2 - SCR heating
4. TM3 - DPF regeneration (active)
5. TM4- protection (passive)
6. TM5 - Hot mode = Normal mode
7. TMh – A Sub function within TM3
8. TMx - A Sub function within TM3



TM Mode Switching

The switch to and from each of these zones are controlled by a variety of factors which are different between HDEP and MDEG. The calibrations for these thresholds can be different for each variant/rating of the multiple engines as well. Each thermal management mode has a specific purpose. The description below are to the main switching factors. However, there are others which are also used (ambient conditions, altitude weighting, etc).

1. TM1: Low NOx, Engine warm up mode: Switching to TMX sub condition of TM3 governed by coolant, SCR enthalpy calculation, DOC inlet temp and SCR outlet temp.
2. Enthalpy is a property of a thermodynamic system . The enthalpy of a system is equal to the system's internal energy plus the product of its pressure and volume.



TBB Regen Summary

1. As long as the engine is in Tm3 mode there will be no speed limit threshold to start a regen.
2. The HC dosing system will be disabled under 5 kilometers an hour(3 mph).
3. VCP is supported in TM1 and Tm3 with a minimum coolant temp of 35 degrees Celsius(95 Fahrenheit).
4. VCP allows regen timer to continue accumulating with no Hc dosing

