



**CUSTOMER SUPPORT
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S60, MBE4000 & MBE900 Engine Updates

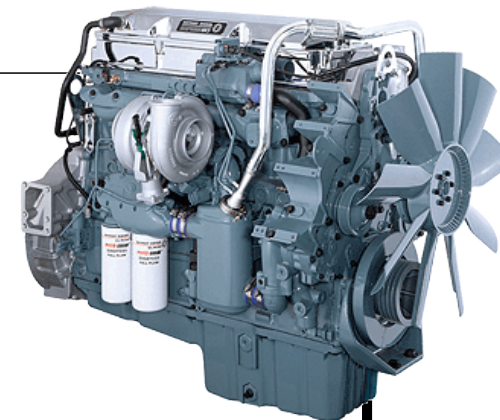
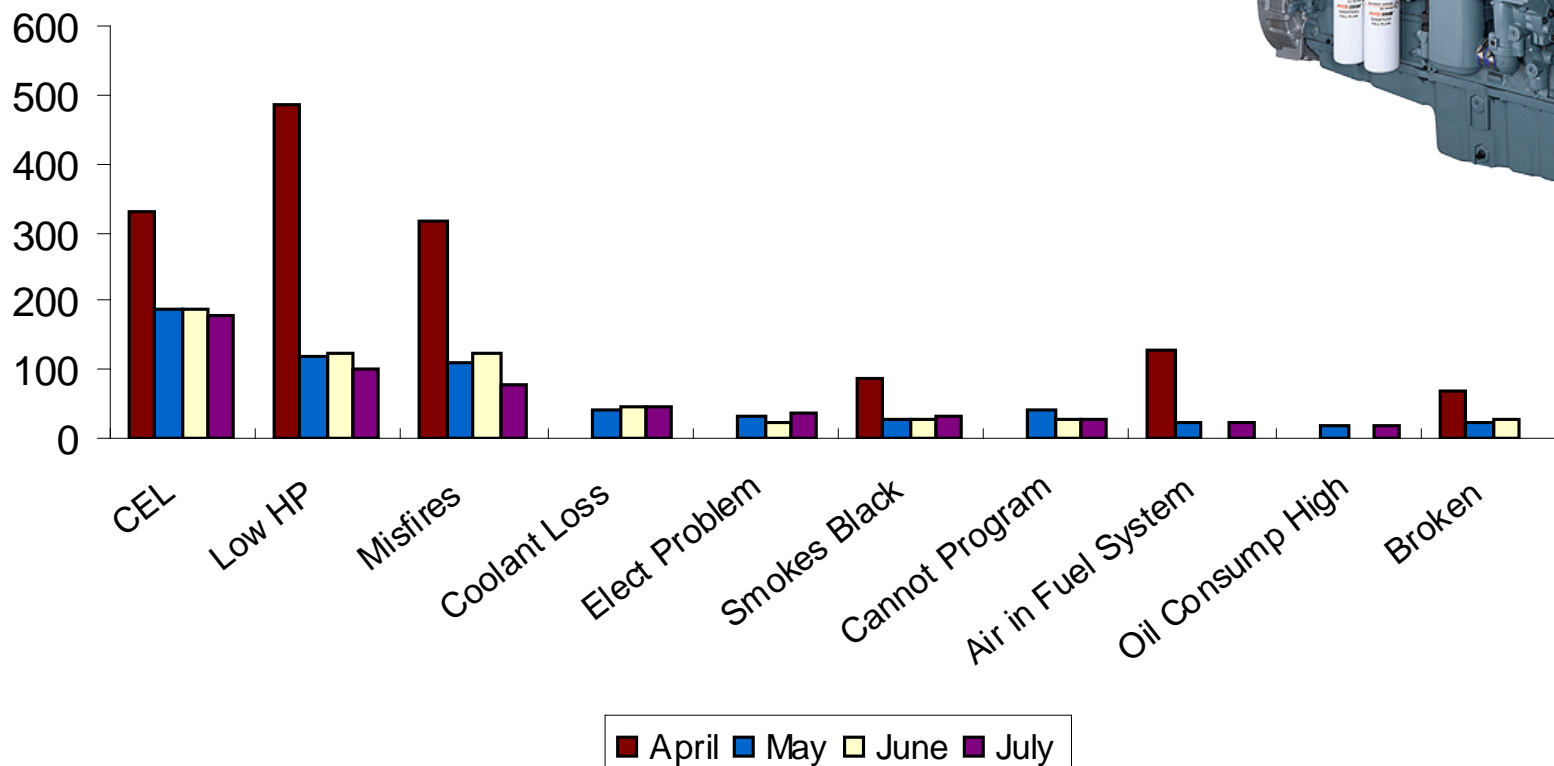


Customer Support Center



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S60 Top Ten Complaints

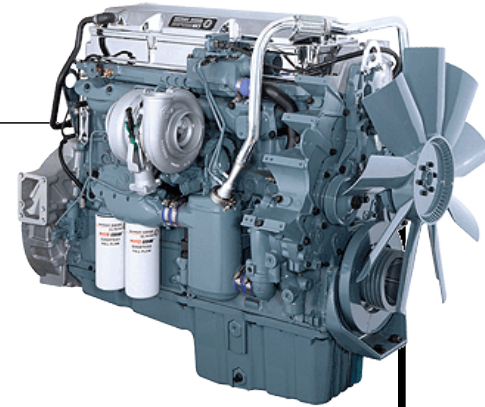


Customer Support Center

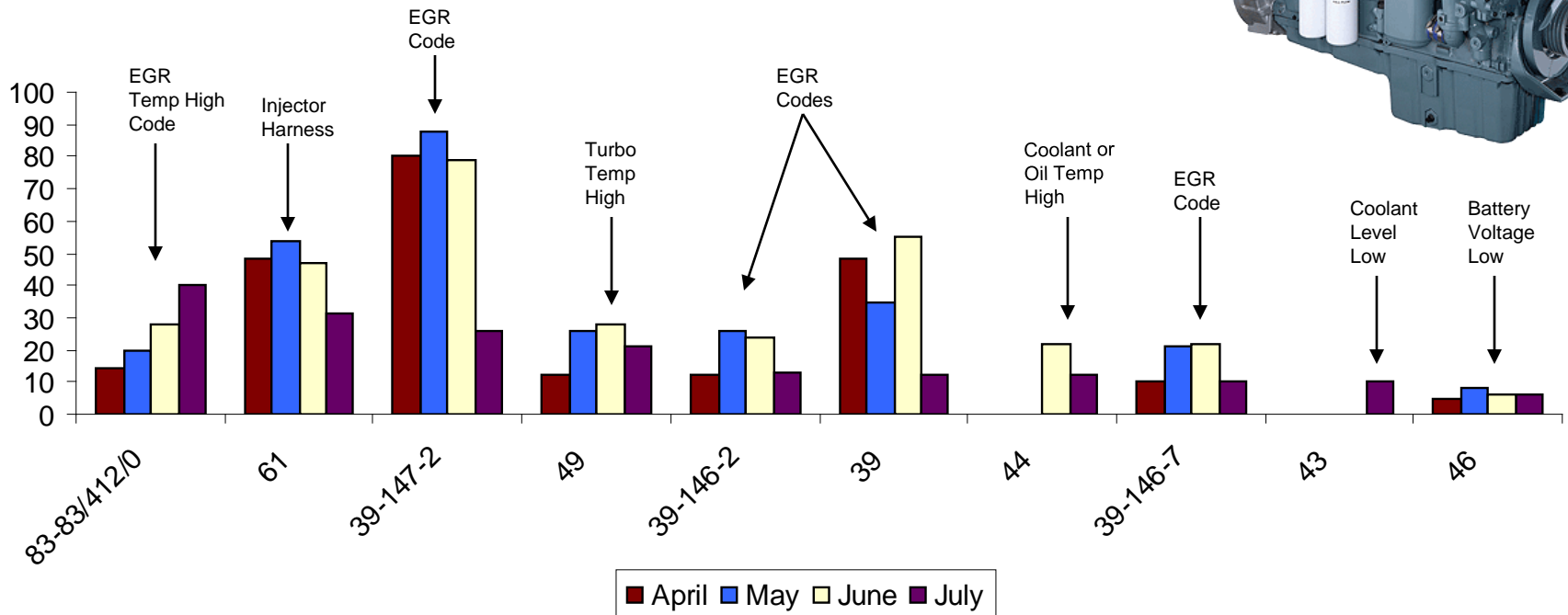


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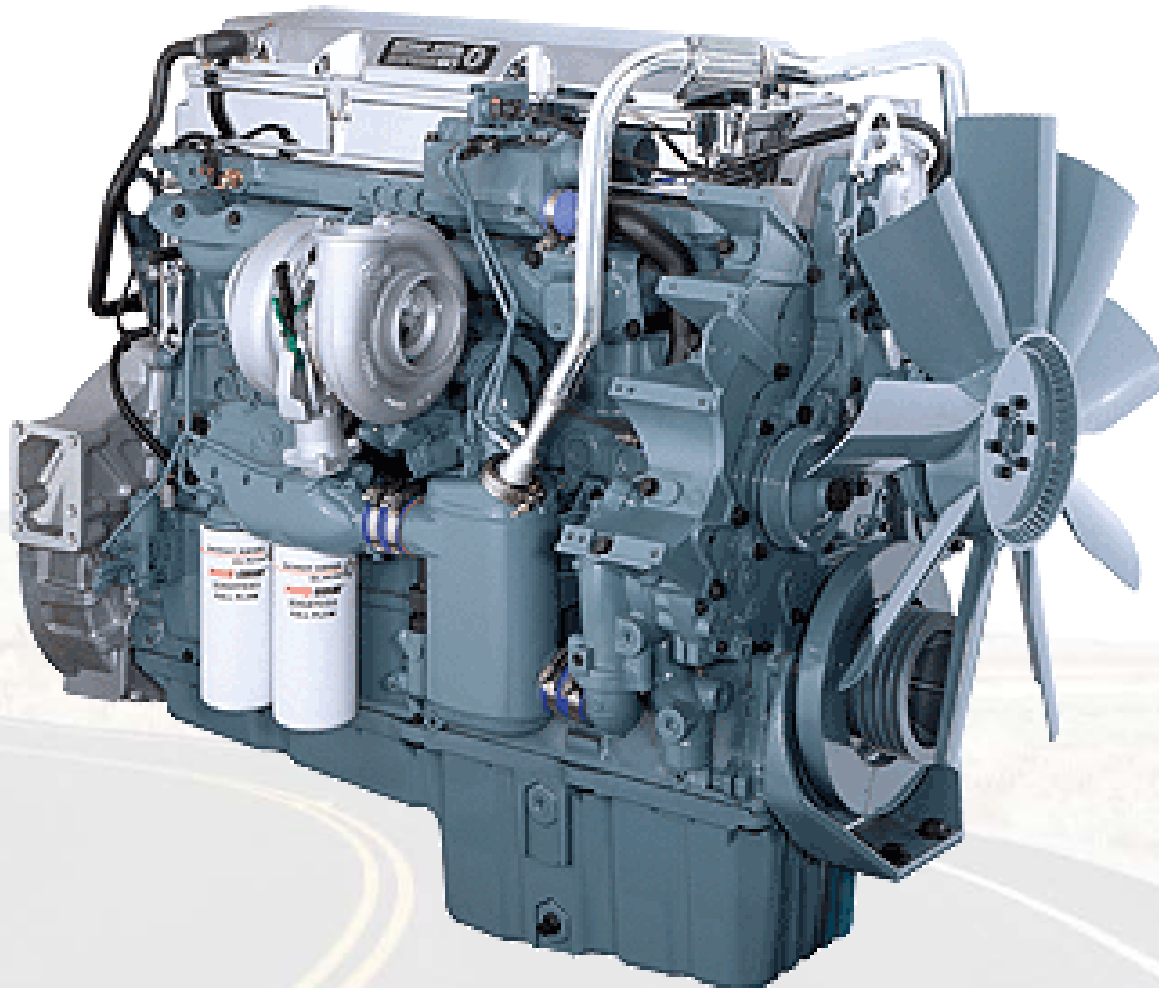


Customer Support Center
S60 CEL Codes



Customer Support Center

- EGR System



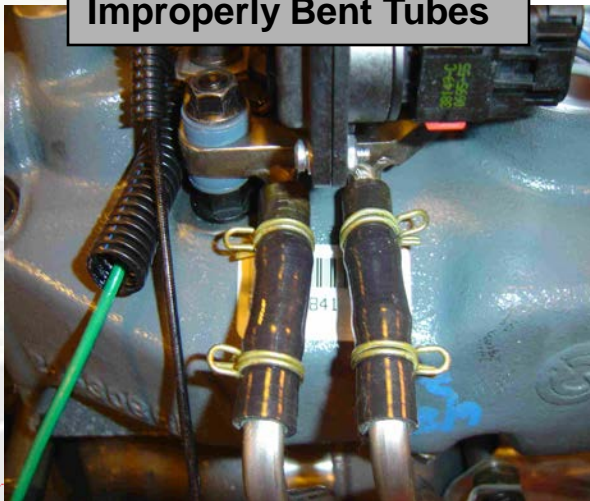
S60 EGR Broken Delta P Sensor Mounting Bracket – Ref 05 TS-53



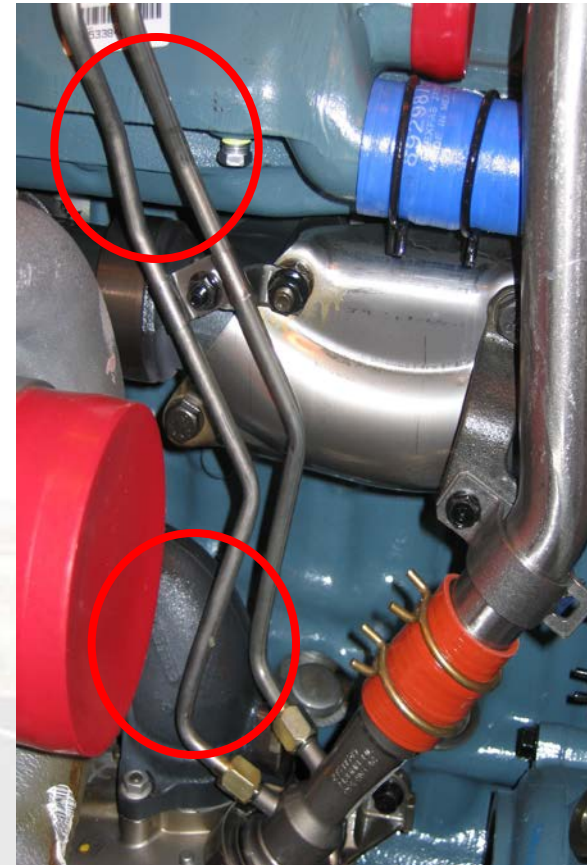
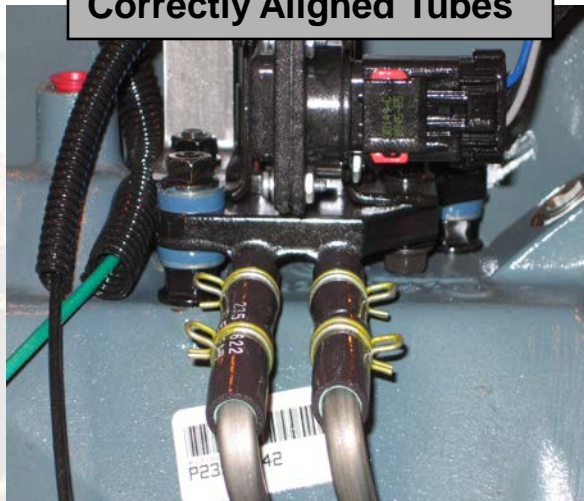
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- Hose Connection Points Crack or Break Due to Improper Repair Procedures or People Stepping on it (cleaning windshield, etc.)
 - To save time, technicians will pull tubes off the bracket & bend them
 - The tubes will then be pushed back onto the bracket, which creates a stress point on the bracket & subsequent failure
- Proper Repair Procedures for Removing the Delta P Tubes
 - Loosen the four hose clamps
 - Remove the P-clips to the exhaust manifold heat shield
 - Loosen the tubes at the venturi
- S60 Service Manual was incorrect & has been fixed
- Stronger bracket new p/n 23536986 replaced p/n 23535850 effective with s/n 06R0926421 on 6/30/06

Improperly Bent Tubes

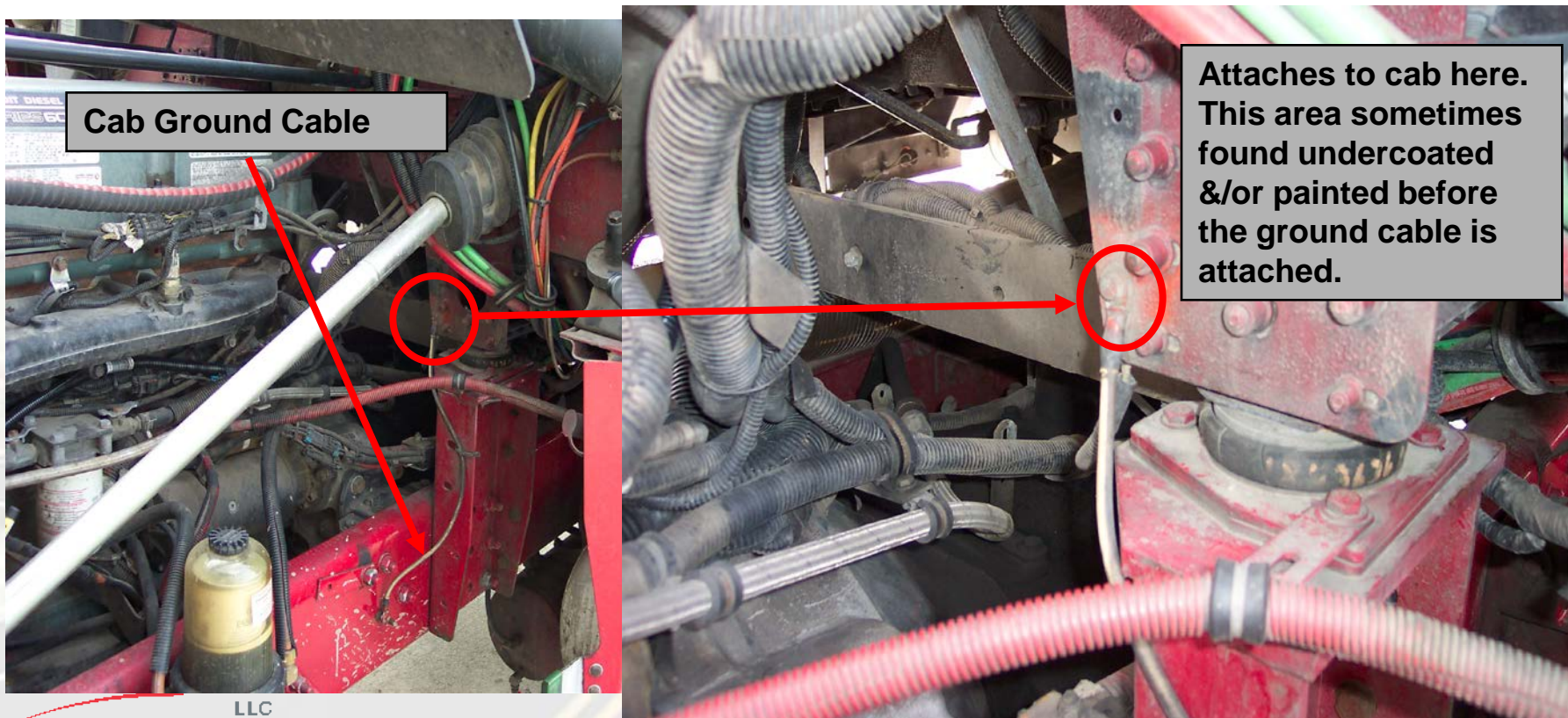


Correctly Aligned Tubes



S60 EGR Delta P Sensor Issues

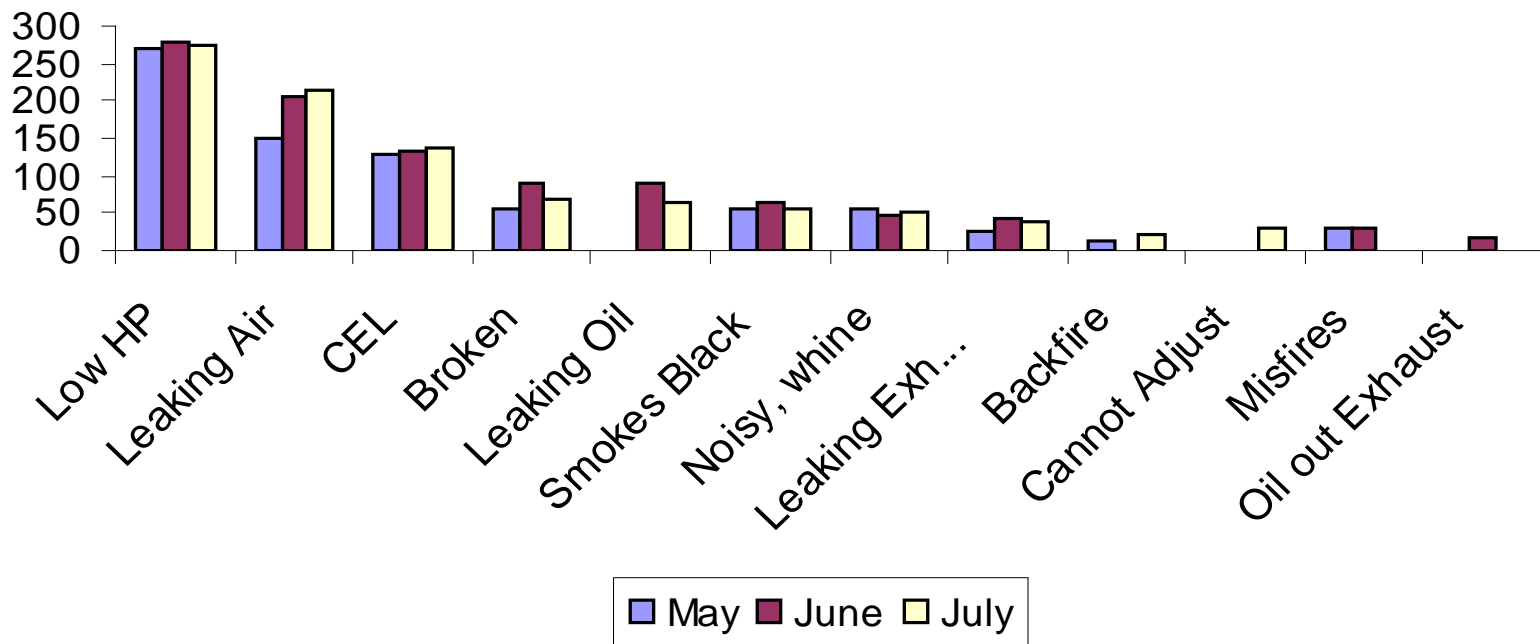
- High Number of No Trouble Found on Returned Sensors.
- SIB's 1-DDECV-05, 2-DDECV-05, & 2-SECM-05 Lists New DPS Counts to be 86-118 with Key On Engine Off (KOEO).
- For High DP Counts, Check for Undercoating Beneath Cab Ground Cable.
- Sensors with Moisture in Them Should be Cleaned, Dried & Reused.



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- VNT Turbocharger - Authorization**

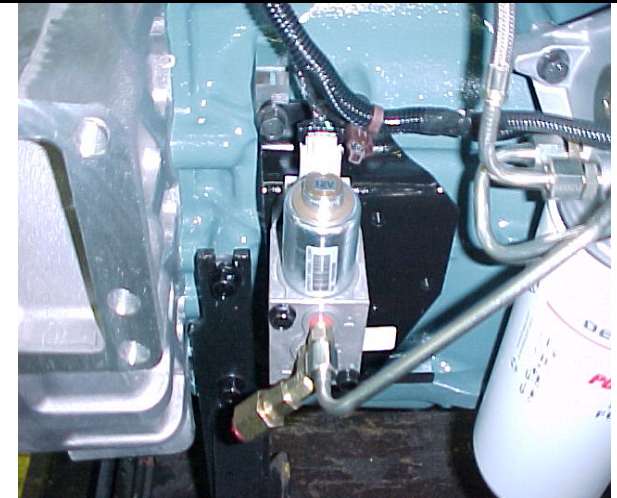
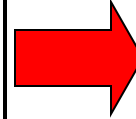
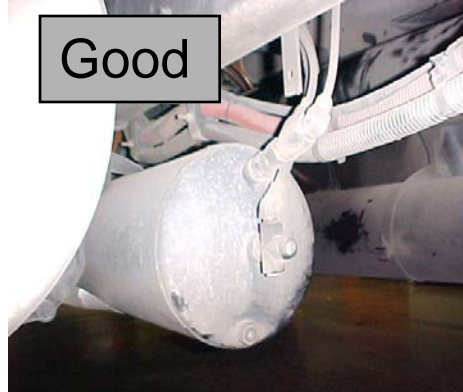
S50 / S60 Top Ten Turbo Complaints



S60 EGR Engines

VPOD and Air Supply

- Possible Performance Problems Due To Shared Or Dirty Air Supply From Vehicle
- Must Be Dedicated Line From Secondary Air Tank
- Reference 04 TS-46, 05 TS-21, F/L Bulletin 01-81 & Campaign SF314A.

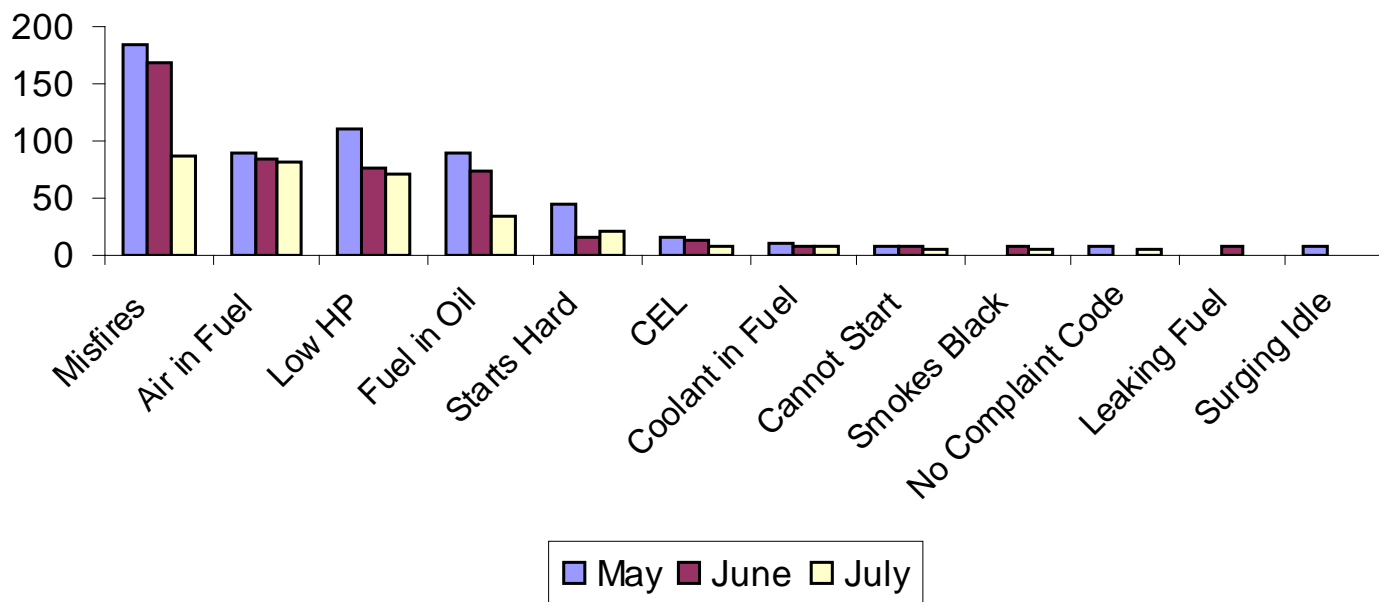


- Seal Injection Change To Eliminate Rubber Valve Seat Failures – Effective In Oct-03
- Air Inlet Filter Screen & Improved Viton Internal Seal – SOP 3Q06

Customer Support Center

- N3 Injectors - Authorization**

S50 / S60 Injector Top Ten Complaints



S60 DDEC V EGR 2004 N3 Injector

Low Power/Missing/White Smoke – 05 TS-56



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- N3 Injectors Require The Use Of Lower Micron Fuel Filters For 200,000 Mile Warranty Coverage
- Refer to 7SE270 "Lubricating Oil, Fuel & Filters" For Filtration Requirements
- Maintenance Interval Is 15,000 miles - Refer To S60 Operators Guide 6SE484
- Check For Plugged Fuel Filters
 - Poor Quality Of Fuel From Post Hurricane Distribution Problems, etc.
 - May Not Last 30-50,000 Miles To Coincide With Oil Changes.
 - Plugging Issues Before 15,000 Miles Primarily Involve Secondary Spin-On Filter – New Filter Released – Estimated Effectivity 3Q06
- DDC Power Guard Filter Part Numbers
 - Primary Spin-On Fuel/Water Separator P/N 23512317
 - Secondary Spin-On Filter P/N 23533726
 - Davco Fuel Pro Filter P/N 23533816

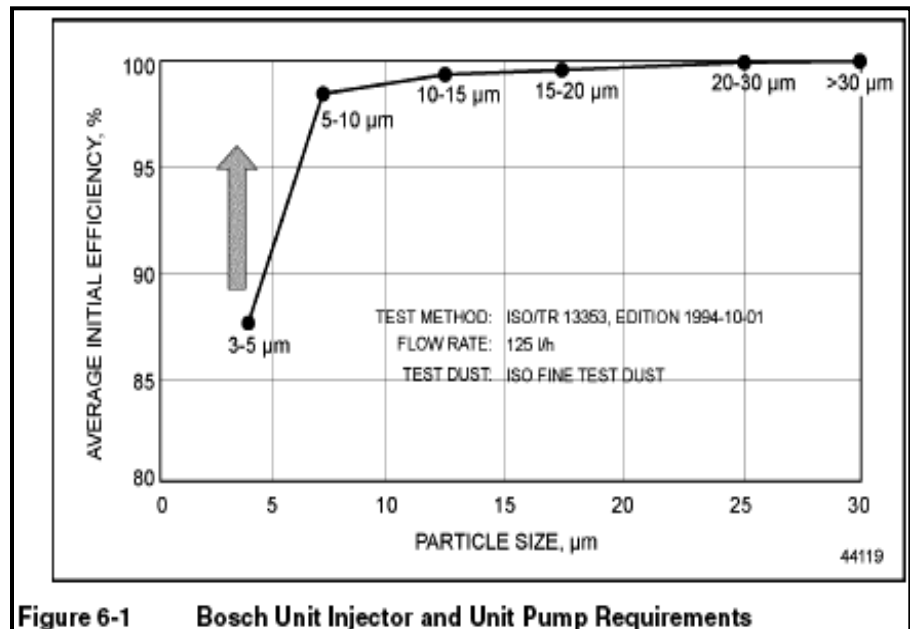


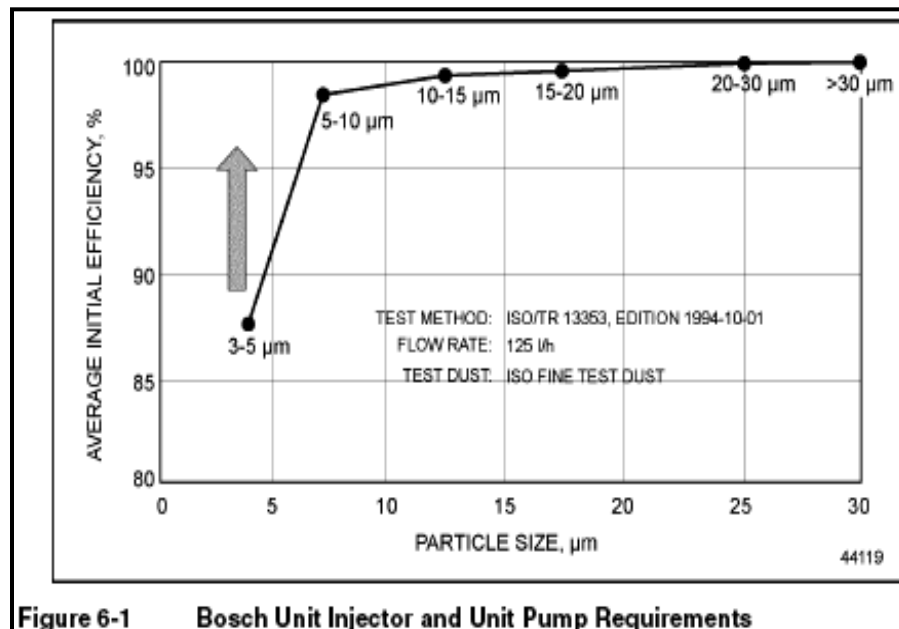
Figure 6-1 Bosch Unit Injector and Unit Pump Requirements

S60 DDEC V EGR 2004 N3 Injector Low Power/Missing/White Smoke



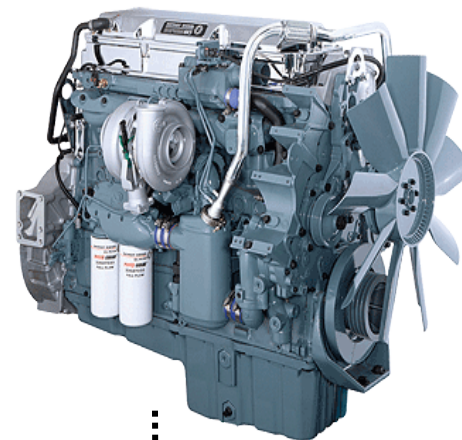
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- Alliance/Racor filters also suffering short life
- Standard filter option from Freightliner
- Filters were TOO efficient – trapping more material than necessary
- New filters released by Freightliner – reference F/L Service Bulletin 47-19
 - New filter F/L p/n ABP N122 R50416 replaces p/n ABP N122 R50406
 - New filter F/L p/n ABP N122 R50417 replaces p/n ABP N122 R50407



2004/2005 Engine Update

S60 DDEC V N3 Injector Harness Modification



**Original 05M-2
Modification
(May 5, 2005)**

Harness, Washers & Pump/Regulator

Engine Population: 51,294

**Harness
& Washers
8,531**

**Addendum to
05M-2
Modification
(October 1, 2005)**

**12.7L N3 Replacement
Population: 9,991 Units**

**Extension of
05M-2
Modification
(November 21,
2005)**

**Code 61, Misfire, Low Power and Air in
Fuel Occurrences have Continued on
Engine Built from 2/15/05 to 5/5/2005**

**Harness &
Washers
17,237 Units**

**Start of
05M-2**

Jan 1 '04

Sept 1 '04

Jan 1 '05

Feb 15 '05

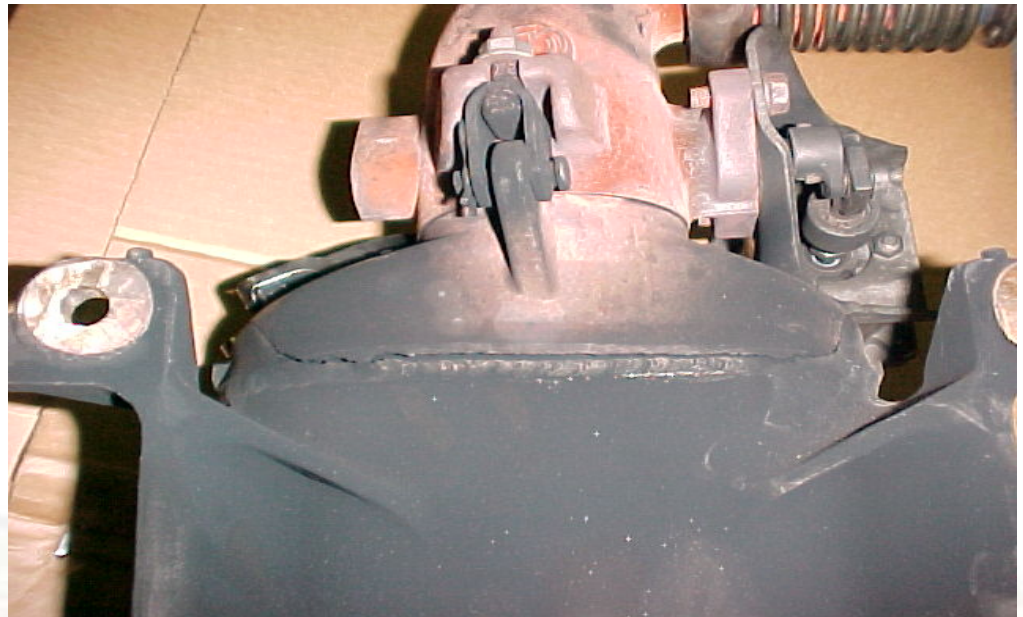
May 5 '05

Engine Build Dates

Customer Support Center

- **EGR Cooler**

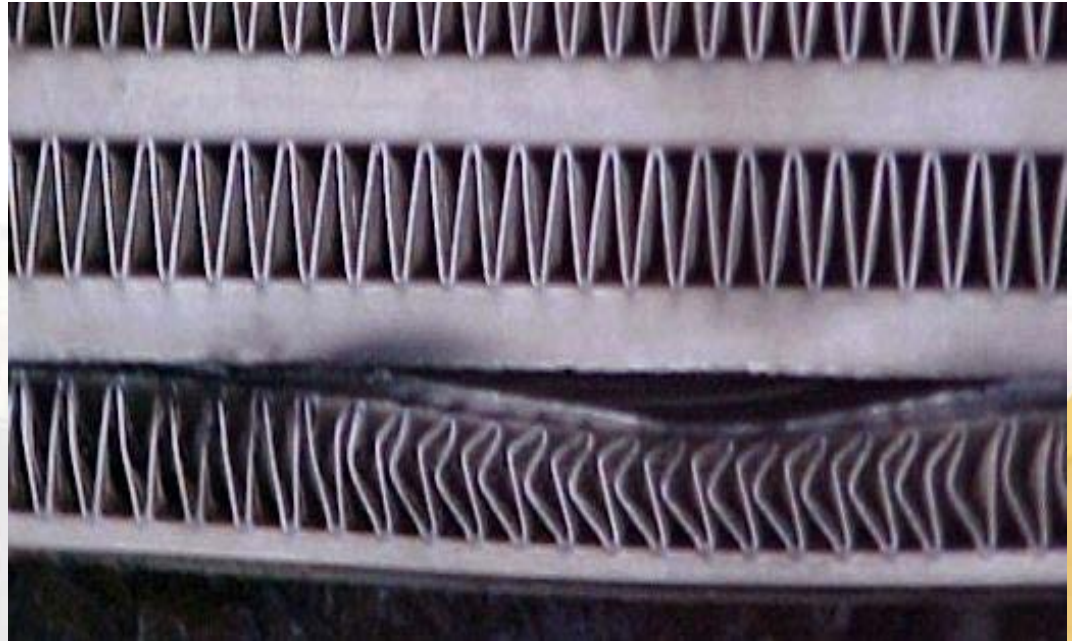
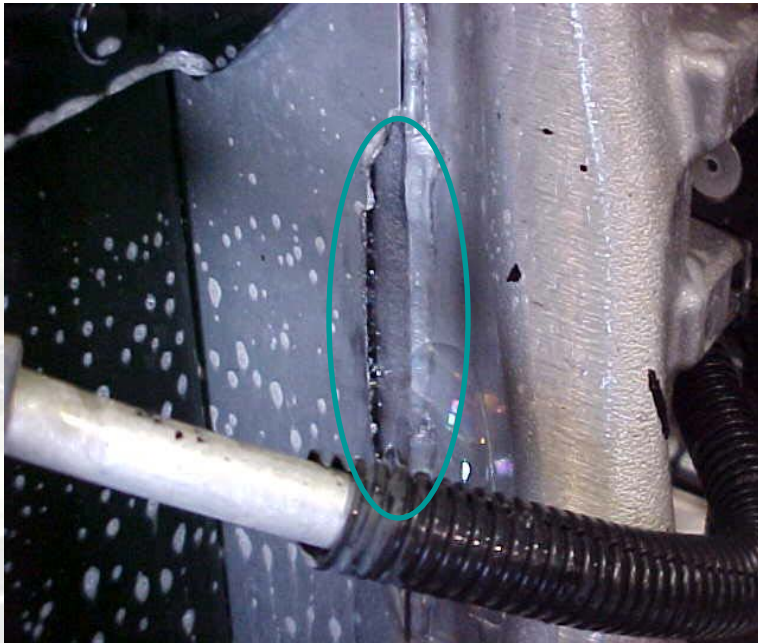
• *An improvement to the EGR cooler was made in March, 2005, by using a thicker weld wire. This improvement was a running change to EGR cooler p/n 23533180. The first EGR cooler with this improvement is s/n IC-2770-M. The letter "I" is the year (H=2004, I=2005, etc.), & the letter "C" is the month (A=Jan, B=Feb, C=Mar, etc.) of EGR cooler manufacture, followed by the number serialization. For this type of failure, check the EGR cooler s/n to make sure it is before this changepoint. A rough engine s/n is 06R0832434 (made 1-Apr-05).*



S60 EGR Engines

CAC Leaks – Ref 05 TS-01

- Results In Poor Performance, Reduced Fuel Economy, High Exhaust Temperatures, Warped Turbo Flanges & High Soot Levels In The Oil
- S60 Operators Guide 6SE484 States To Inspect The CAC System & The Air Inlet & Exhaust Piping Every 15,000 miles
- SIB #12-60-03 Details The CAC Inspection Procedure



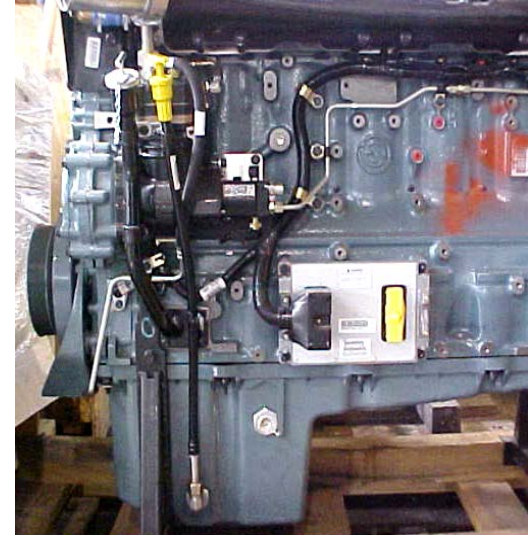
S60 EGR Engines

Properly Measuring Crankcase Pressure (blowby) – Ref 06 TS-15



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- Measuring crankcase pressure on a dipstick tube that is submerged in oil in the bottom of the oil pan will not give accurate crankcase pressure readings.
- Do NOT measure crankcase pressure at the breather tube. Doing so can cause engine damage.
- To correctly measure crankcase pressure on engines with this style of dipstick, use the oil filler tube or the 1/4" NPT hole on the left side of the block along the pan rail.

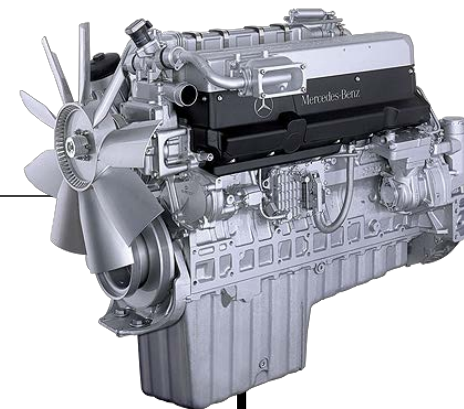


Customer Support Center

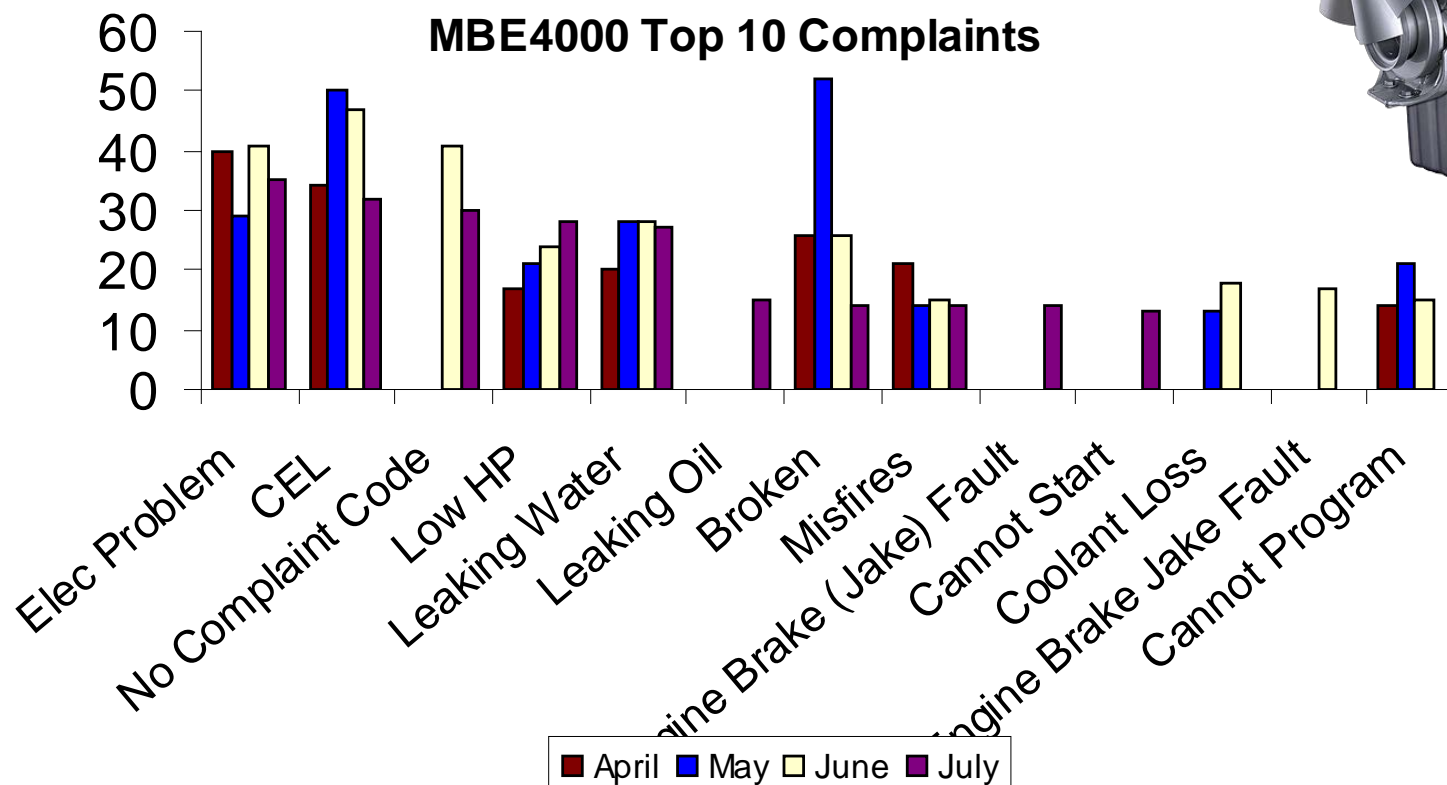


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MBE4000 Top 10 Complaints

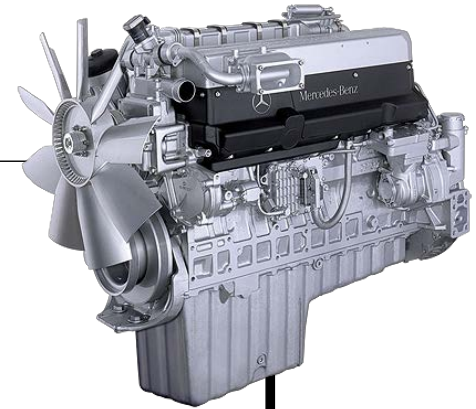


Customer Support Center

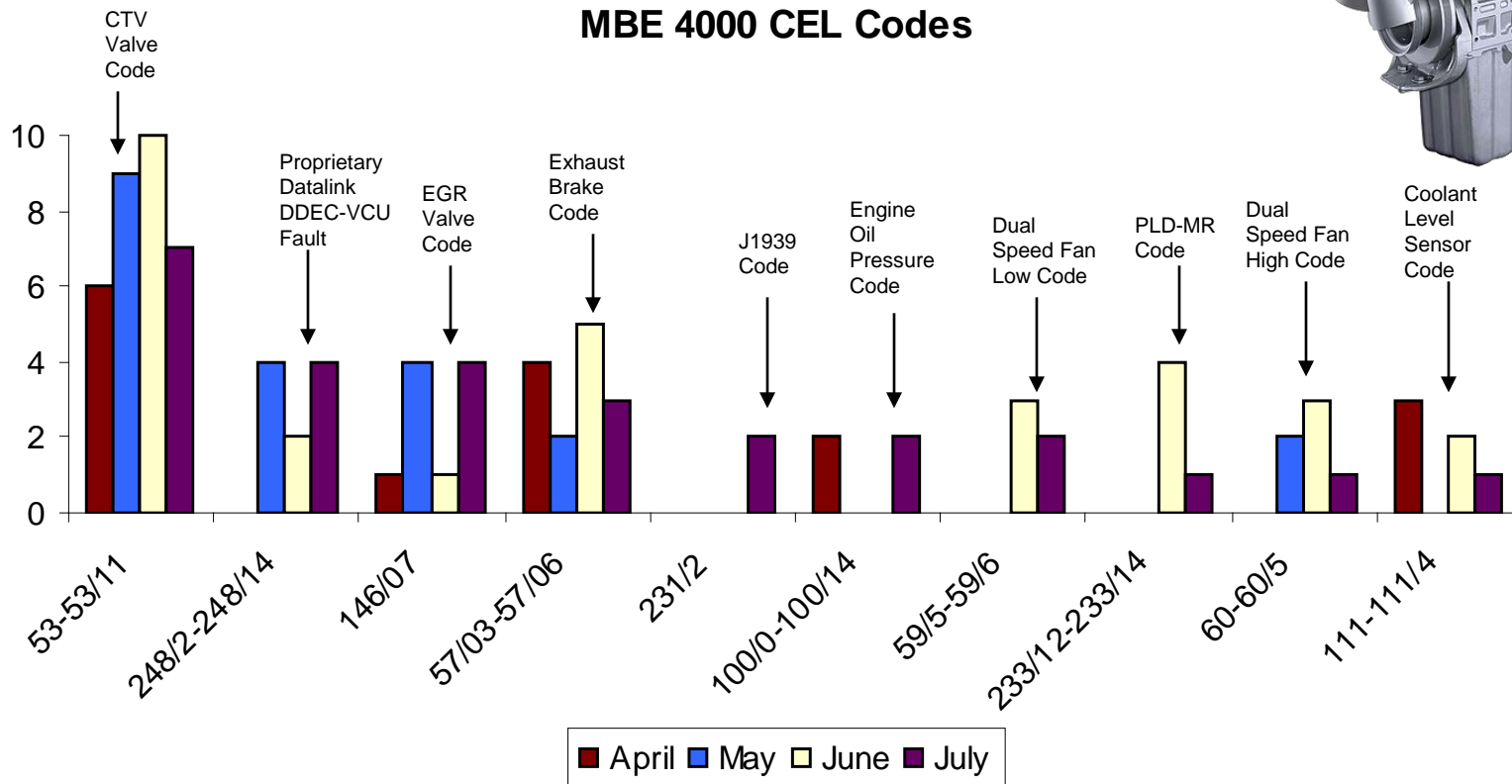


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Customer Support Center MBE 4000 CEL Codes



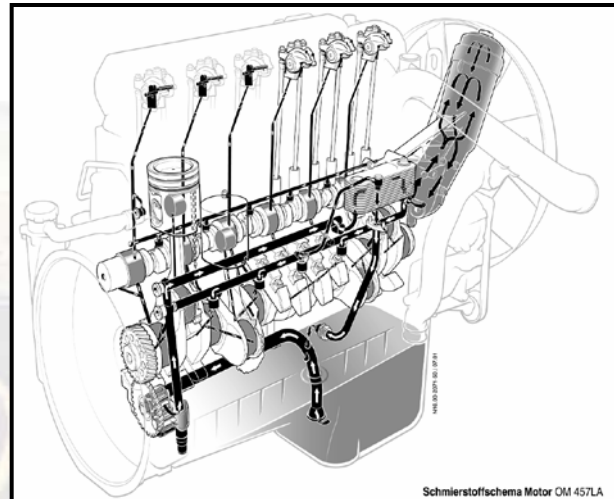
MBE 4000 EGR Engines

Oil Gallery Cup Plug 06 TS-10 & 06 M-05 - Background



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- Brazil went from a Threaded Oil Gallery Plug to a Cup Plug in May, 2005, with s/n 0460817468.
- In November, 2005, the Cup Plugs began Blowing Out in Cold Weather Locations in NAFTA.
- Brazil Returned to Threaded Plugs for NAFTA on 12-Dec-05, with s/n 0460840295
 - Block changed effective with 0460855264 on 2-May-06 resulting in plug being flush or recessed slightly in the block (no longer proud).
- Oil Travels from the Pan through the Oil Pump and up Past the Two Cup Plugs in the Rear of the Block. The Oil Pressure is Dampened by the Oil Cooler, so the Front Plug is Not a Concern.



Cup Plug
Location On
Block

MBE 4000 EGR Engines

Oil Gallery Cup Plug 06 TS-10 & 06 M-05 - Background



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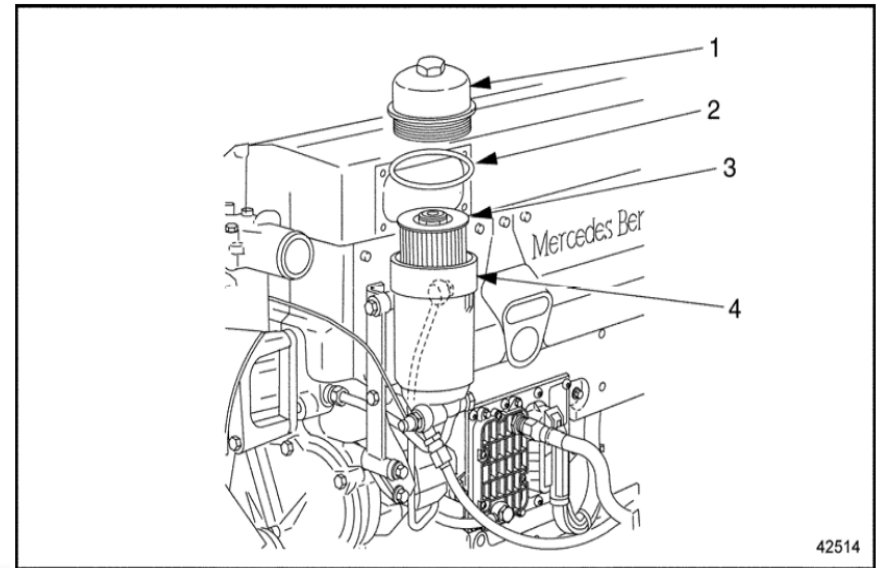
- A Bracket & Epoxy Kit (p/n 23536001) was Designed to Retain the Oil Gallery Cup Plugs.
 - The Bracket and Epoxy kit is effective in preventing catastrophic failures because it retains the cup plug in the bore. This will prevent the units from being disabled on the road.
 - Current service repair is to install brackets on all engines under **Modification 06 M-05**.
 - Reference Tool Letter 05TL-09 for dispenser tool information.
 - Oil cup plug failures will be covered under warranty.
- A Threaded Plug Kit (p/n 23536501) was Designed to Repair Engines that Suffer a Cup Plug Leak.
 - Reference Tool Letter 06 TL-05 for tapping tool information.



MBE 4000 EGR Engines

Fuel Filter – Ref 05 TS-12 Rev

- Non-EGR engines use a Hengst filter & housing.
- EGR engines use a Mann filter & housing.
- MBE has standardized on the Hengst filter p/n 5410900151 for all MBE 4000 engines effective with s/n 0460837675 on 25-Nov-05.
- Problems with using the wrong filters were traced to improper replacement procedures – Reference 05 TS-22.
 - Install filter.
 - Fill with fuel.
 - Install cap.



1. Fuel Filter

2. O-ring

3. Filter Element

4. Filter Housing

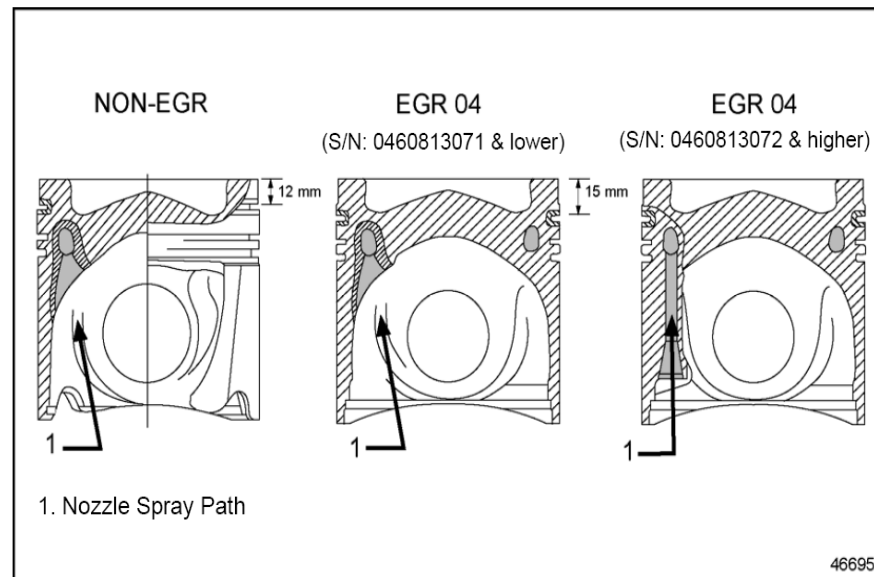
MBE 4000 Engines

Piston & Oil Nozzle Changes – Ref 05 TS-55rev



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- **Spray Nozzle to Piston Alignment is Critical. If Alignment is Not Correct, Engine Damage May Occur.**
- **When Servicing Spray Nozzles, Pistons, or any Component within the Crankcase where Accidental Damage to the Spray Nozzle can Occur, Slowly Rotate the Engine. If Resistance is Felt during Engine Rotation, inspect Spray Nozzles for Interference. Correct if Necessary.**



<u>Engine type</u>	<u>Piston P/N</u>	<u>Cylinder Kit P/N</u>	<u>Oil Spray Nozzle P/N</u>
Non-EGR	4600300517	4600300937	4601800043
EGR s/n 0460813071 & lower	4600300817	4600301337	4601800343
EGR s/n 0460813072 & higher	4600301017	4600301237	4601800443

MBE4000 Engines

Low Pressure Fuel Lines Summary



- **06C-1 for EGR Engines**
 - Roughly 22,000 engines affected.
 - Requires installation of fuel priming kit p/n 23535320. Reference 18SP610.
 - Requires grinding of rear engine beauty cover & inspection of Fuel Injector Spill Line. Reference 05TS-45.
 - Requires removal of tie straps on Main Fuel Return Line & inspection of line. Reference 05TS-45.
- **06C-2 for non-EGR Engines**
 - Roughly 22,000 engines affected.
 - Requires installation of fuel priming kit p/n 23535320 (Freightliner – except M2) or p/n 23535927 (Western Star, Sterling, & F/L M2). Reference 18SP610.
 - Requires installation of low pressure fuel line & fuel filter stiffening kit p/n 23535928 (Freightliner – except M2). Reference 18SP615.
 - Requires grinding of rear engine beauty cover & inspection of Fuel Injector Spill Line. Reference 05TS-45.
 - Requires removal of tie straps on Main Fuel Return Line & inspection of line. Reference 05TS-45.
- **No high pressure lines or transfer tubes are included in these Modifications!**
- **100% Kit Availability – make sure the correct kit is ordered!**

MBE4000 Engines

High Pressure Fuel Line

Assembly Line Changes:

- Assembly Line Marks with Plastic Seal After Being Tightened. Creates Visual Quality Control for Torque Procedures & Keeps Evidence of Serviced Lines. Effective With S/N 0460766302.
- Engine Test and OEM Assembly Line Fuel Priming Provisions

Design Changes:

- Changed Internal Radius & Coating Effective with S/N 0460784382 On 24-Jun-04 – new p/n 4570701033 - **Significant Reduction In Leaks**
- Nut Material Change Effective With S/N 0460818087 On 25-May-05 – new p/n 4570701333
- Tube Material Change Effective With S/N 0460836880 on 11-Nov-05 – new p/n 4570701533
- Tube Dimensional Change Effective With S/N 0460847831 on 21-Feb-06 – new p/n 4570701733



MBE 4000 EGR

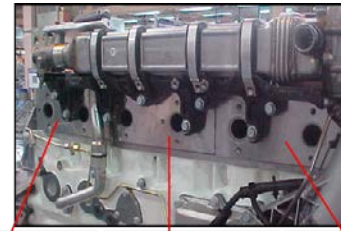
Exhaust System Changes



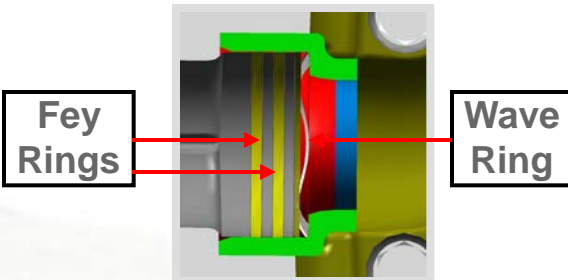
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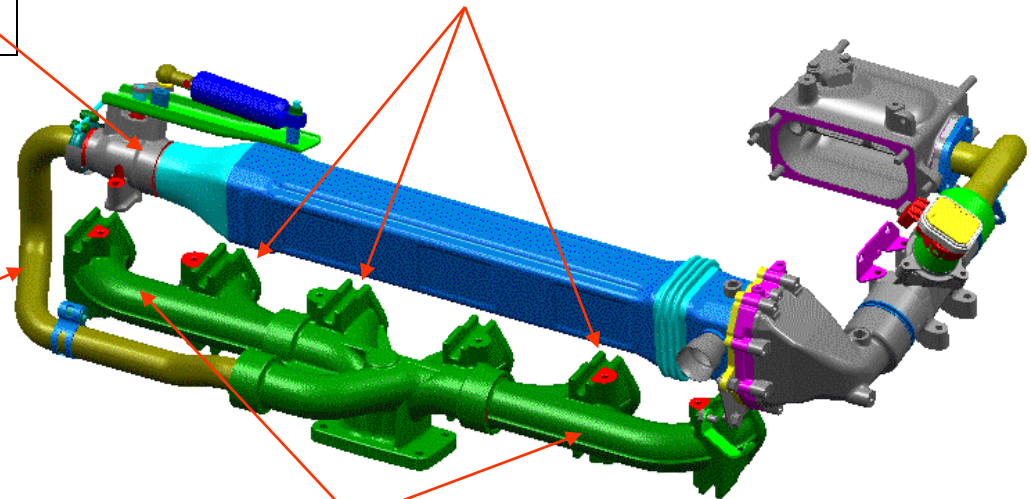
Connector Pipe – kit p/n 23536463
Change Point: 16-Oct-05, s/n 0460833653



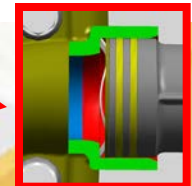
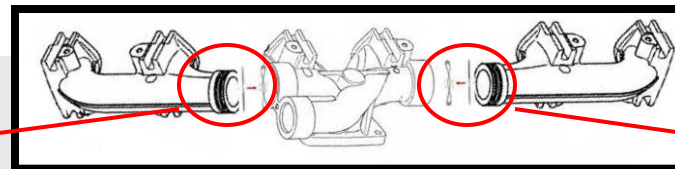
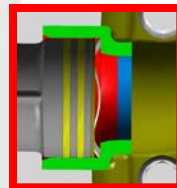
Exhaust Manifold Gaskets - p/n 4601421580
(2) p/n 4601421480
Change Point: 20-Jan-05, s/n 0460804201



Wave Ring - p/n 0001428257
Fey Ring - p/n 0001427657
Change Point: 5-May-06, s/n 0460855340



End Exhaust Manifold – (2) p/n 4601420801
Change Point: 11-Nov-05, s/n 0460836656



MBE 4000 Engines

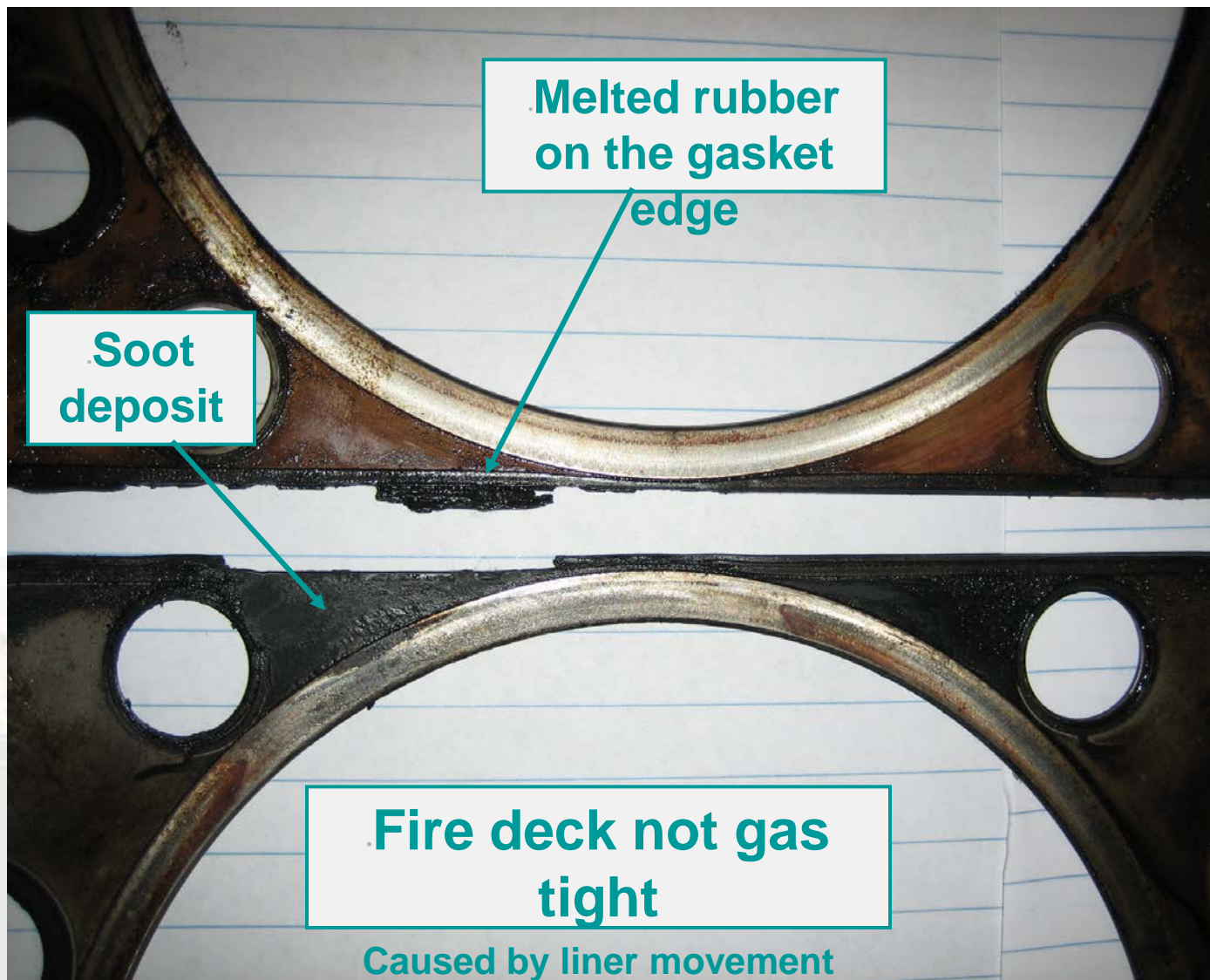
Coolant Leaks

- **Complaint: Coolant leak at the cylinder head.**
- **Possible source: Cylinder Head, Cylinder Head Gasket, Counter bore/liner seal ring.**
- **Root cause identification:**
- **VISUAL INDICATIONS (EVIDENCE) ARE THE EASIEST WAY TO IDENTIFY THE ROOT CAUSE, NOT MEASUREMENTS!!**

MBE 4000 Engines

Coolant Leaks - Root Cause Evidence

- Sequence of events:
 - Liner movement
 - Causes exhaust gas leak
 - Melts gasket rubber seals
 - Results in coolant leak



MBE 4000 Engines

Coolant Leaks - Root Cause Evidence

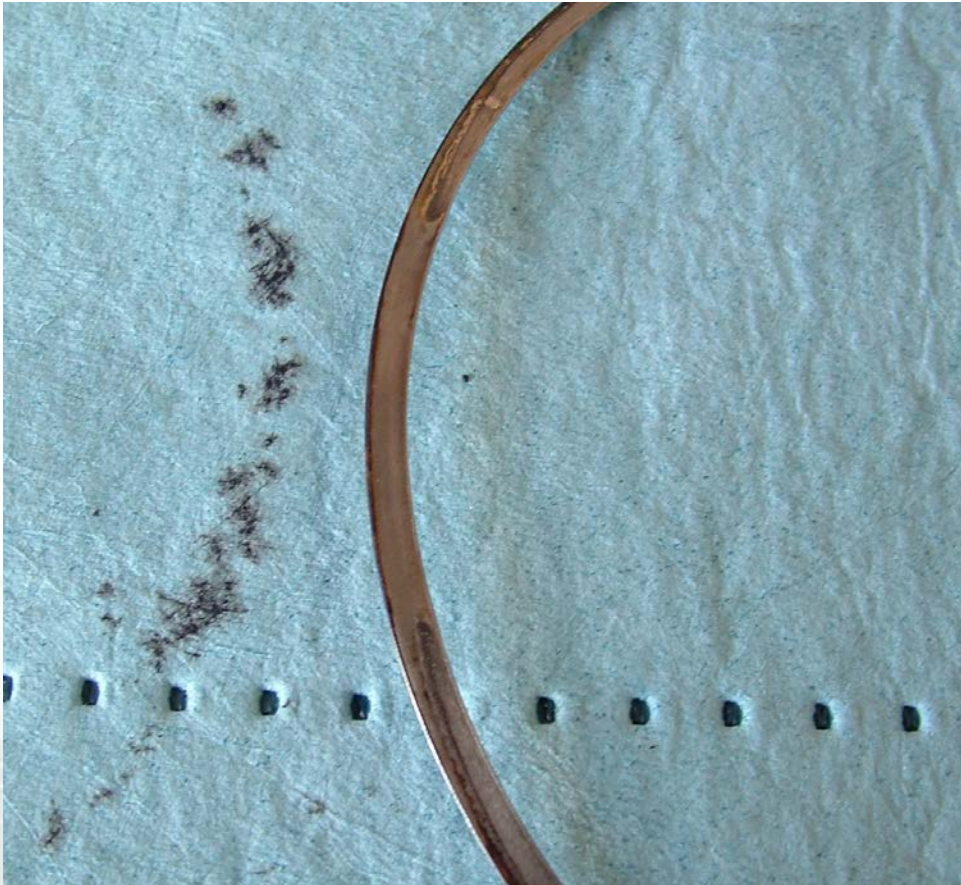


- **Sequence of events:**
 - Liner movement
 - Generates a gap between liner, seal ring, and counter bore
 - Results in coolant leak

**No contact between
Liner / Seal Ring / Counter bore**

MBE 4000 Engines

Coolant Leaks - Root Cause Evidence

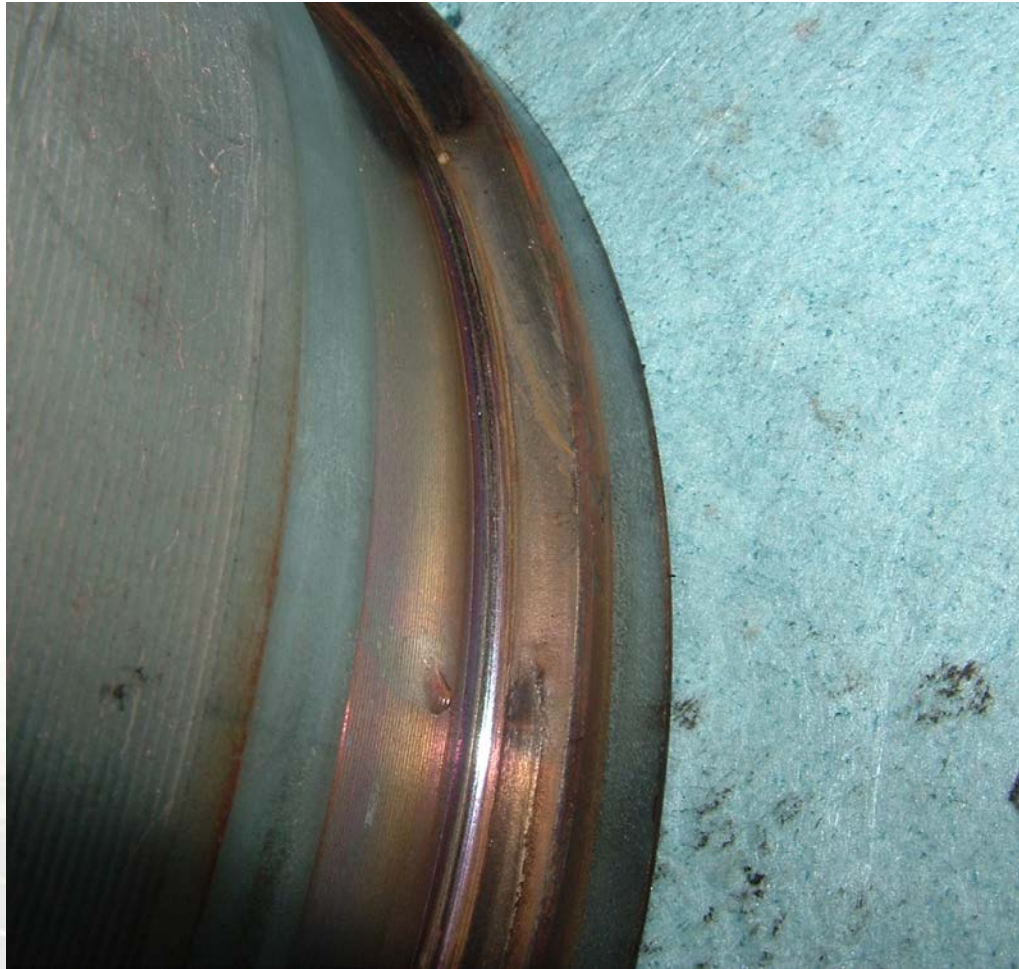


**No Contact between
Liner / Seal Ring / Counter bore**

- **Sequence of events:**
 - **Liner movement**
 - **Generates a gap between liner, seal ring, and counter bore**
 - **Results in coolant leak**

MBE 4000 Engines

Coolant Leaks - Root Cause Evidence



- Sequence of events:
 - Liner movement
 - Generates a gap between liner, seal ring, and counter bore
 - Results in coolant leak

**No Contact between
Liner / Seal Ring / Counter bore**

MBE4000 EGR Engines



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EGR Temperature Sensor Tip Failure – Ref 05 TS-40

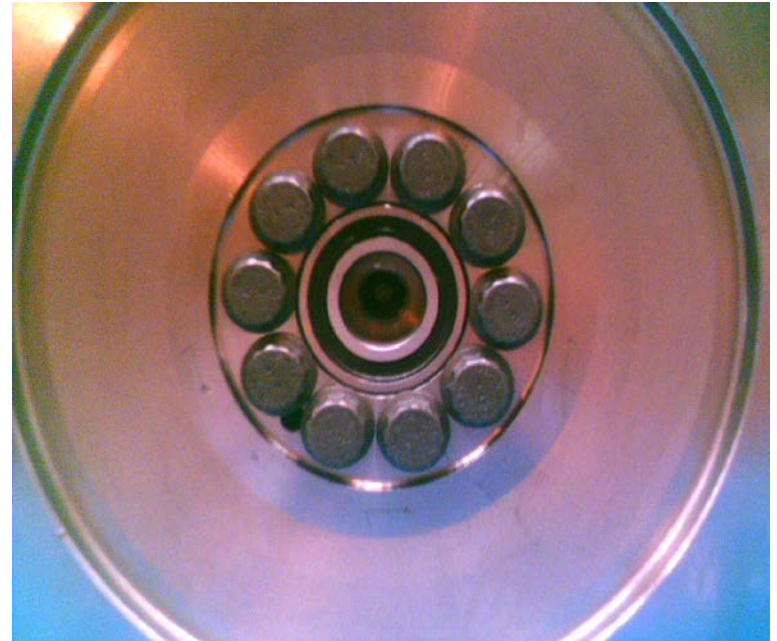
- **Tips Breaking Off & Causing Downstream Damage**
- **Will Eliminate Sensor**
 - Remove sensor, plug hole & harness, & reflash PLD.
 - Revised TS letter deals with errors in reprogramming.
 - Be careful when removing the adaptor from the housing to prevent damaged threads.
 - Investigating using cap nut instead of removing adaptor.
 - Sensor eliminated effective with engine s/n 0460829623 on 9-Sep-05.
 - If tip breaks off, make reasonable effort to find the lost tip.



MBE 4000 EGR Engines

Pilot Bearing

- Bearing installed by DCX in Brazil.
- Bearing is overheating & failing.
- Day cabs have higher failure rate than Line Haul trucks due to increased clutch use.
 - Estimated that 70% of MBE 4000's are in day cabs.
- Improved bearing released for Service with higher temp grease:
 - New p/n 0099816525 replaces p/n 000625446206.
 - Not in Production yet on assembly line in Brazil.
- Current repair procedure is Fix-as-Fail.
- Don't forget the spacer in the flywheel.

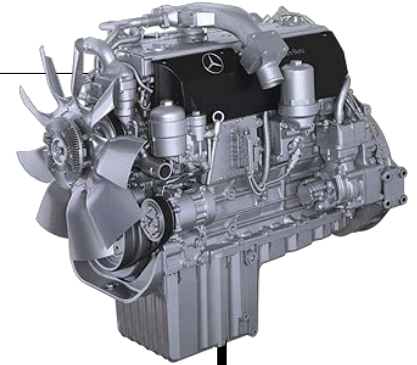


Customer Support Center

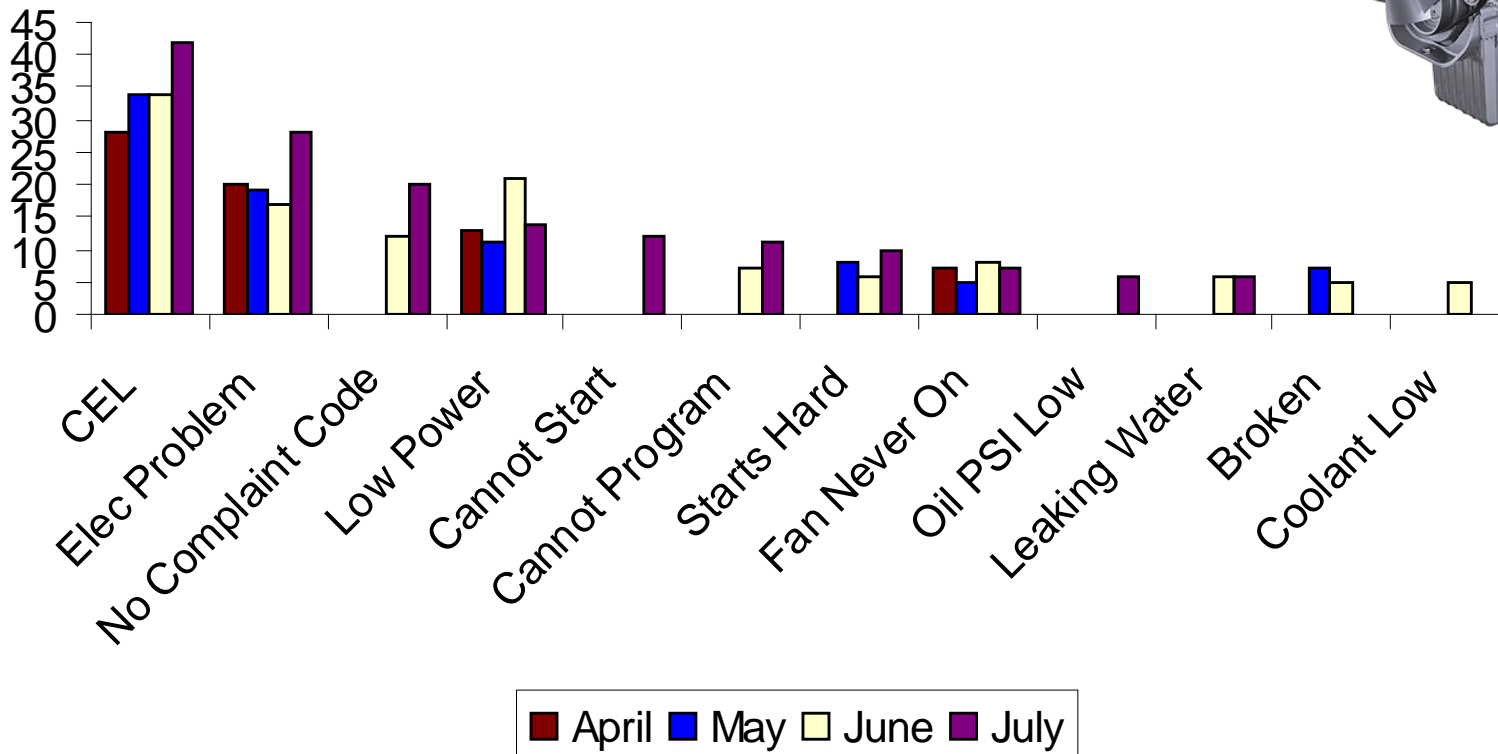


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MBE 900 Top 10 Complaints

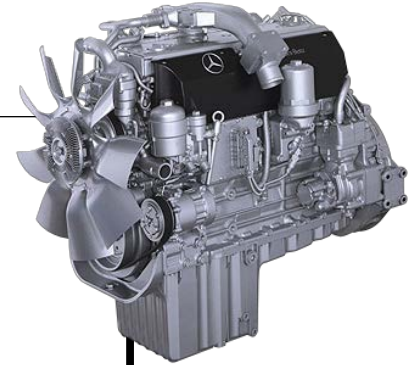


Customer Support Center

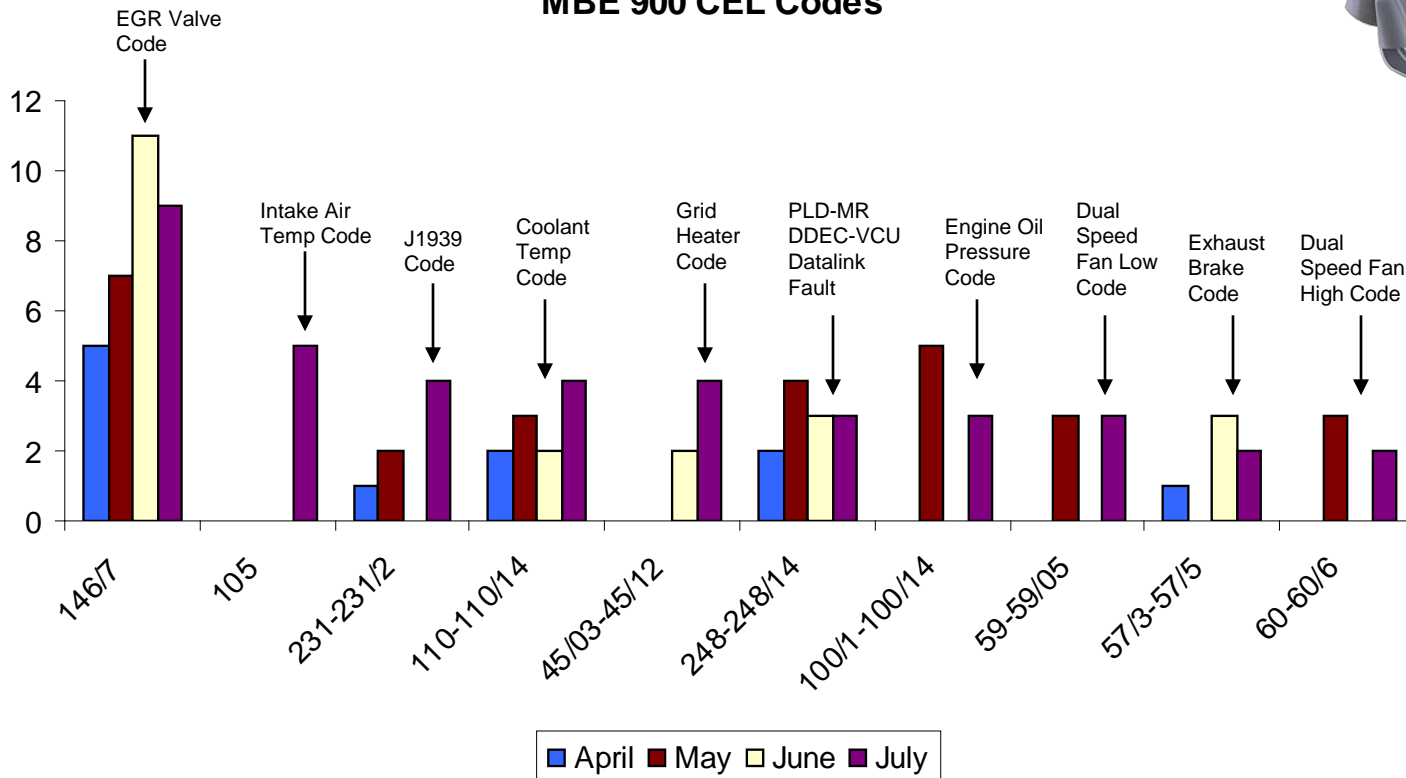


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Customer Support Center
MBE 900 CEL Codes



MBE 900 Engines

New EGR valve w/new clutch material & software



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- **New EGR valve with new clutch material and software change.**
 - New clutch material holds up to high EGR temperatures.
 - Software changes within EGR valve corrects sensitivity trouble codes.



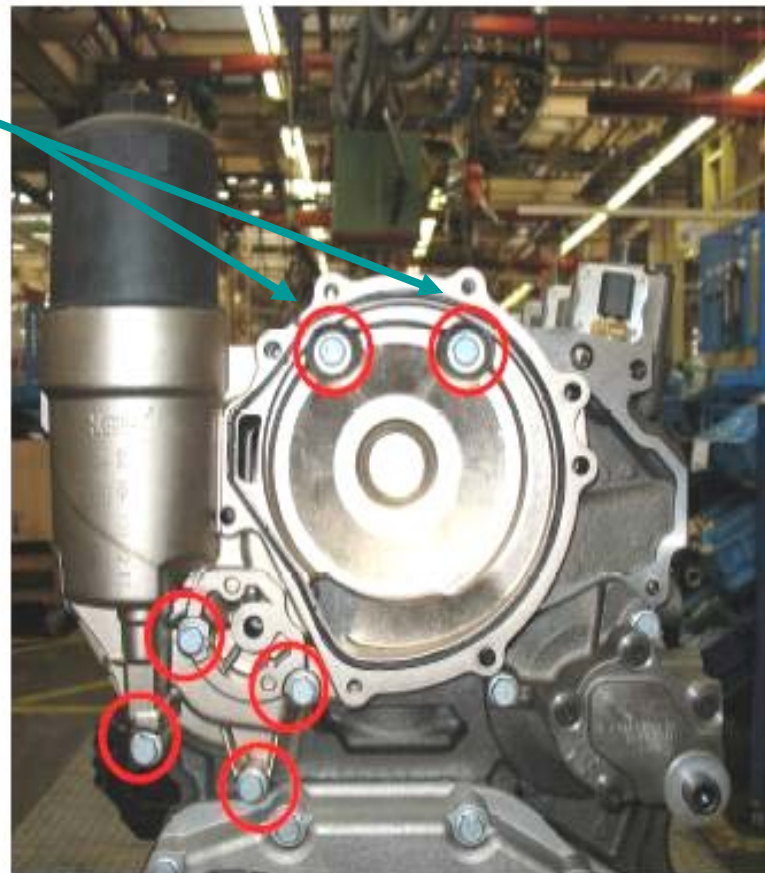
Current
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MBE 900 EGR Engines

Coolant Intermediate Plate

- Water pump impeller failure due to internal bolts (top two pictured).
- Coming loose and contacting the back side of the water pump impeller.

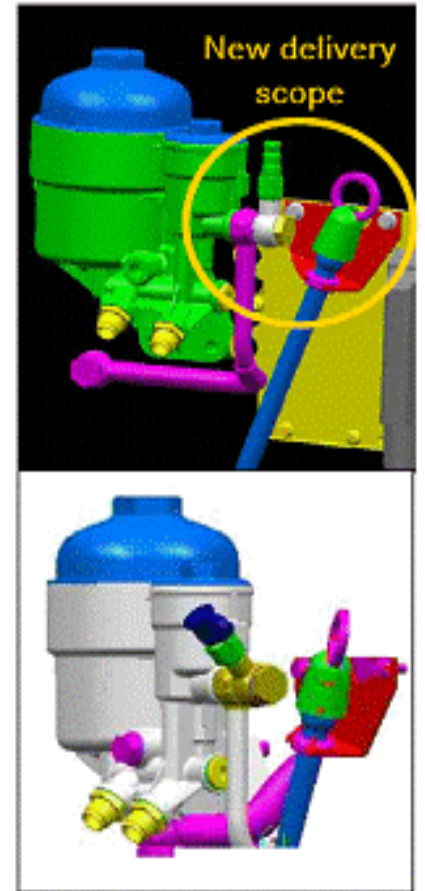
6 bolts for EPA04



MBE 900 Engines

Fuel Priming Valve on Engine

- Priming valve added to the fuel filter housing allowing OEM plants and field service the capability to pressurize the fuel system to eliminate “Hard Start” Problems
- Implementation date at NAFTA modification centers – May 23rd, 2005
- Implementation date at Mannheim – June 15th, 2005, effective with serial number 0906494959
- Parts to be released for Service for retrofits



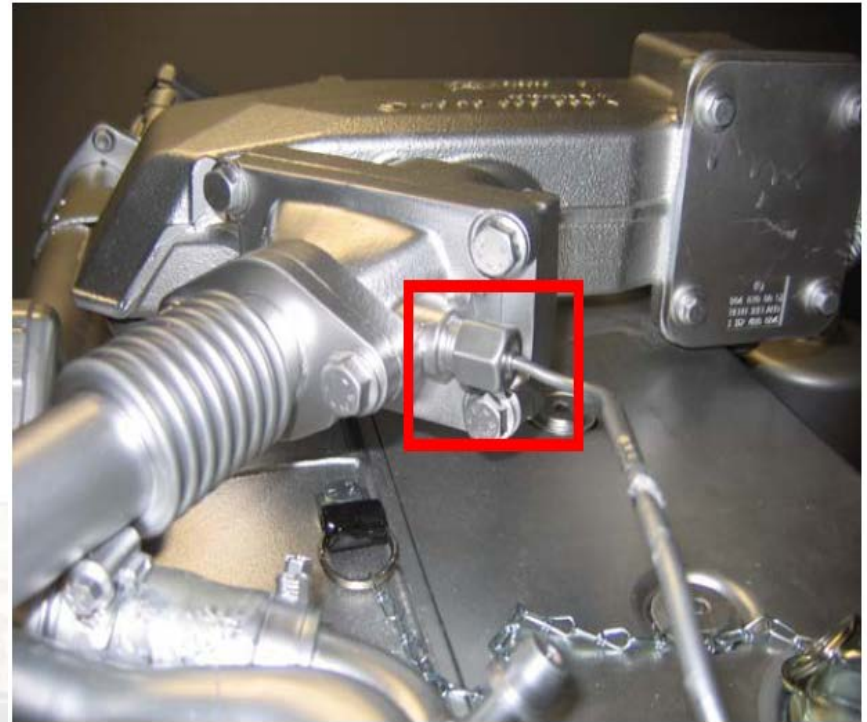
MBE900 EGR Engines

EGR Temperature Sensor Failure – Ref 05 TS-47



**CUSTOMER SUPPORT
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- **Sensor Stops Working, Resulting In Codes SID 146, FMI 0, 1, or 12**
- **Removed Sensor Effective With s/n 515294 on 7-Sep-05**
- **For Service, Do NOT Replace Sensors That Fail**
 - **Reflash PLD To Turn Off Sensor**
 - **Revised TS letter deals with errors in reprogramming.**



MBE 900 Engines

Pilot Bearing

- Installed by Freightliner at their assembly plants – not DCX.
- Failures can be attributed to a tolerance issue:
 - ID of hole in flywheel is too large
 - OD of bearing is too small
- Replace the bearing & flywheel when bearing fails.



MBE900 EGR & non-EGR Engines

Engine Derating in F/L M2 Chassis



- Engine derates & loses speed for no apparent reason
- No codes or visible signs
- Sometimes clears up on its own – other times requires the key to be cycled
- Could be caused by faulty ABS controller that is falsely sensing a spinning wheel
- Disable ABS controller by pulling fuse to see if the problem goes away
 - If problem goes away, replace ABS controller
 - Get vehicle owners permission before pulling ABS fuse!

MBE 900 EGR & non-EGR Engines



Wrong Oil Filter – Ref 05 TS-51

- Aftermarket oil filters may not properly fit housing & result in poor fit on drain back valve.
- Can result in low oil pressure & delayed oil flow to turbocharger.
- Use the correct DDC filter.
- MBE 4000 has similar situation. TS letter will be revised. Also reference F/L Bulletin 47-15.

<u>Engine Type</u>	<u>Part Number</u>
MBE906 and 926	0001801709
MBE904 and 924	0001801609

<u>Engine Type</u>	<u>Part Number</u>
MBE 4000	0001802109

MBE900 Engines

Auxiliary PWM Driver #1 Fault – Ref 06TS-09



- **57/04 code – PV1 (proportional valve – Exhaust Flap) Shorted to Ground (PLD).**
- **Check to see if the PLD is improperly grounded – for example by a steel braided fuel line.**
- **In the 16 pin connector to the PLD, check the power & ground wires to the battery.**
- **In the 55 pin connector to the PLD, check to see if the Proportional Valve circuits are improperly grounded – for example the wire from Pin 12 (12V power for Exhaust Flap & Fan) may be pinched in the Harness.**