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Document ID: IK1200526

Availability: ISIS, Bus ISIS, FleetISIS

Revision: 9

Major System: ENGINES

Created: 8/31/2010

Current Language: English

Last Modified: 8/11/2015

Other Languages: [Français](#), [Español](#)

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Viewed: 16692

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Coding Information

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Title: I-6 MAF Sensor Calibration Diagnostics

Applies To: 2010 + MaxxForce DT, 9, 10, N9 & N10 (ESN 3,300,000 and later)

CHANGE LOG

DO NOT delete the CHANGE LOG

Updated : 08/10/2016 - Added step based diagnostics; 02/16/15 - Added information on MAF A/B coefficients set to 0; 05/29/14 - Author changed to Jaime Ochoa. Rewrote entire MAF article to include diagnostic information for MAF sensor calibration failure.

DESCRIPTION

This document provides diagnostic steps for MAF sensor calibration failures.

The MAF calibration is used to measure the volume and density of air entering the engine at any given time. The ECM uses this MAF to:

- Calculate the correct amount of EGR during engine operation
- Limit fueling to minimize soot (smoke limited fueling)

MAF Calibration Pre-Checks

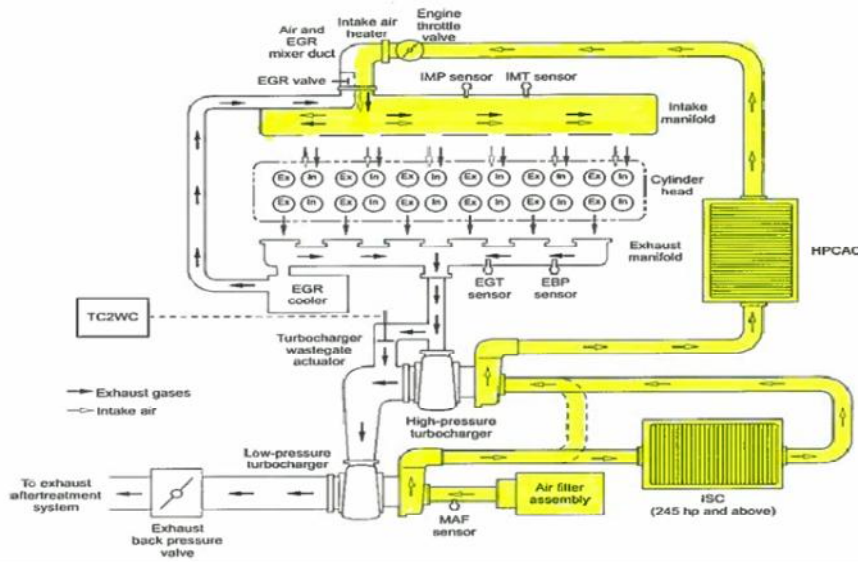
NOTE: Verify the following before running the MAF Calibration Procedure:

- No active fault codes, other than SPN 132 FMI 13
- KOER Standard Test run at or above 158°F (70°C)
- Engine Oil Temperature (EOT) at or above 176°F (80°C)
- Engine Coolant Temperature (ECT) at or above 176°F (80°C)

Temperatures need to stay above 176°F (80°C) during entire test

- DPF Status = Regeneration Not Needed
- No leaks in intake air system
- No leaks in exhaust system
- No shop exhaust hose attached
- No engine performance issues
- No engine misfire issues
- Engine hood is closed
- Transmission in Park or Neutral
- Clutch engaged
- Engine Fan OFF
- Parking brake ON
- Power Takeoff (PTO) disabled
- Direct Drive Power Takeoff (PTO) disconnected
- Air conditioning OFF
- Accelerator pedal not depressed
- MAF sensor within KOEO specification
- IMP sensor within KOEO specification
- IMT sensor within -22°F (-30°C) and 257°F (125°C)

Continue to MAF Calibration Procedure



SYMPTOMS

Diagnostic Trouble Codes:

Fault Code	Fault Description	Action
132-11	MAF sensor calibration – insufficient number of data points	Follow below diagnostics
132-13	MAF sensor calibration Needed	Follow below diagnostics
132-14	MAF sensor calibration Failed	Follow below diagnostics

Lamp Reaction:

Amber Warning Lamp (AWL) illuminates when any of these faults are detected.

DIAGNOSTICS

Step	Action	Decision
1	1. Turn ignition switch to ON, engine OFF. 2. Start ServiceMaxx™ software. 3. Start engine. Ensure engine operating temperature is at or above 176°F (80°C). 4. Run KOER Standard Test. 5. Run MAF Sensor Calibrate procedure. Does MAF calibration fail?	Yes: Continue to Step 2. No: If calibration is successful, clear previously active MAF fault.
2	Ensure MAF configuration is the same between the Service Portal and ServiceMaxx (Graph 1). 1. Check MAF Configuration in Service Portal (Enter last 8 of VIN in ISIS -> Select Components Tab -> Scroll down and check which VEPS PROG, AIR FLOW SENSOR Programmable Parameter # is set) 2. Check ServiceMaxx for what MAF Configuration is programmed into the unit (Parameters tab -> Parameter ID 99131) Note: Monaco RV 405HP, Monaco RV350 HP and KME Firetruck 405HP MAF configuration should be set to 5. Does the MAF configuration match?	Yes: Continue to Step 3. No: Open case file for I6 technical service team and request MAF configuration programming due to incorrect information.

Graph 1

Vehicle Information - Windows Internet Explorer
 https://evalue.internationaldelivers.com/service/service_info/VehicleInfo.aspx?chassis=D6303364

International Vehicle Information

Home Publications Service Reference (Diagnostic) Write Up Dealer Warranty Support Chassis / VIN Number

Select tab(s) to print Print

Summary Health Report Managed Repairs Details Components Serial Numbers Service Contracts Warranty History iKnow Search Case History iApprove iRequest

Components

VIN : 4DRBUAAN20B303364 347 components found.

S.No	Class Description	Parts Catalog Component	Component Line Drawing	Description
1	FRAMES	0001CAC	0001CAC	FRAME RAIL 50,000 PSI YIELD 480.1" OAL High Strength Low Alloy Steel (50,000 Yield); 10.125" x 3.062" x 0.312" (257.2mm x 77.8mm x 8.0mm); 480.1" (12195mm) Maximum OAL
2	FRAMES	0001LLE	0001LLE	BUMPER-FULL WIDTH-HD AERO-STEEL Full Width, Aerodynamic, Heavy Duty, Mounted
3	FRAMES	0001LMW	0001LMW	CROSS GATE/FRONT/ELECT/YELLOW BMP MOUNT Electric, Yellow Blade, Bolt Mounted
4	FRAMES	0001SAM	0001SAM	2 REAR AF CROSSMEMBER
5	FRAMES	0001WJE	0001WJE	WHEEL BASE RANGE 276" ONLY 276" (700cm) Only
6	FRAMES	0001S7Q	0001S7Q	TWO FRONT TOW HOOKS Frame Mounted
7	FRONT AXLES	0002ARX	0002ARX	MERITOR MFS-10-143A 10K FT AXLE WIDE TRK Wide Track, I-Beam Type, 10,000-LB Capacity
8	FRONT SUSPENSIONS	0003ADB	0003ADB	10,000-LB FRT PARABOLIC TAPER LEAF SUSP Parabolic, Taper Leaf, 10,000-LB Capacity, With Shock Absorbers
9	BRAKES	0004AZJ	0004AZJ	BENDIX ABS/AUTO TRACTION CONTROL Full Vehicle Wheel Control System (4 Channel) With Automatic Traction Control
283	ENGINE	0510999	0510999	ENGINEERING PROGRAMMING TOOL
284	ENGINE	0512005	0512005	ELECTRONIC CRUISE CONTROL Electronic, Mounted in Center Panel
285	ENGINE	0512030	0512030	VEPS PROG, #3 AIR FLOW SENSOR Programmable Parameter #3 : for CE Bus with EPA 10 MaxForce DT Engine
286	REAR AXLES, SUSPENSIONS	0514001	0514001	REAR SUSPENSION PARTS
287	CABS, COWLS, BODIES	0516024	0516024	CAB ACCESS NO STEPS No Steps

Parameters

Undo All Changes... Program Engine... Only Show Watched

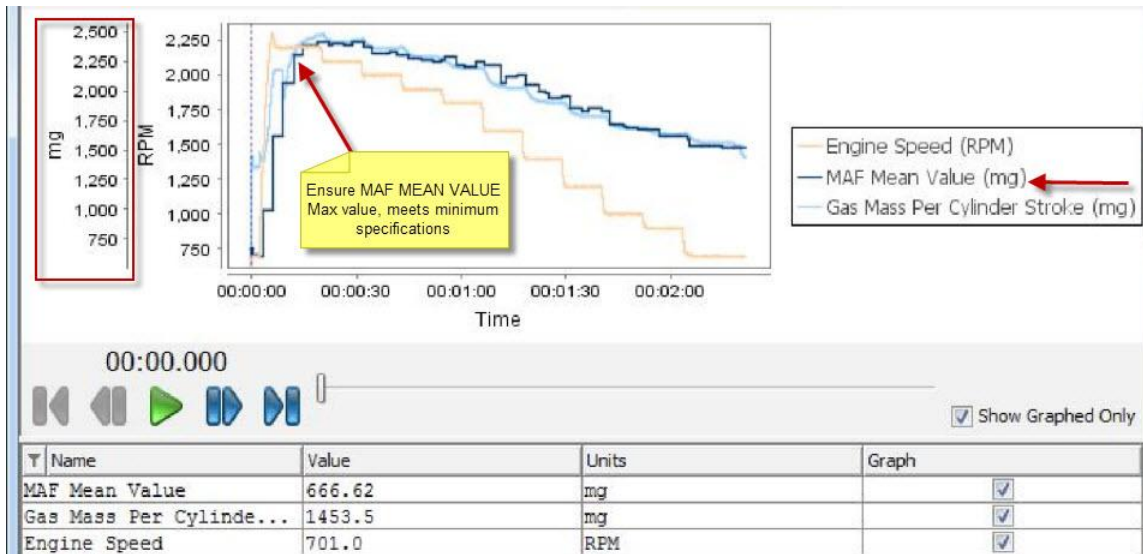
ID	Name	Value	Units
89061	Hybrid Propulsion Configuration	Disable	
93001	Hydraulic Pressure Governor Enable	Disable	
74004	Idle Shutdown Timer Mode	Disable	
68000	Last Customer Service Tool Identification Number Level 1	
68010	Last Customer Service Tool Identification Number Level 2	
68030	Last Software Calibration Programming Date	
68020	Last Software Calibration Programming Tool Identification Number	
68050	Last Software Strategy Programming Date	
68040	Last Software Strategy Programming Tool Identification Number	
80051	Low Axle Ratio Pulses Per Mile Count	46,504	
82020	Low Idle Engine Speed	700	RPM
99131	MAF Configuration Selection	Configuration 3	
99153	MAF Learned Reset	No	
99393	MAFT Co-efficient A1	21.44	
99403	MAFT Co-efficient B1	3.03	
99423	MAFT Process is Pass/Fail or Auto-Trim is complete	Save PF Auto trim com...	
79021	Max Vehicle Speed with Road Speed Limiting On	69	mph
99091	Maximum Vehicle Speed at which Regen Inhibit can be enabled	100	mph
99081	Maximum Vehicle Speed at which Stationary Regen can be enabled	2	mph
99101	Minimum Vehicle Speed at which Normal Regen can be enabled	0	mph
63101	Minimum engine running time between two acquisition of close end of motion time	No Min ERT	
63001	Mode 1: Time factor for coking accumulation	61,123	
63011	Mode 2: Time factor for coking accumulation	133,775	

Step	Action	Decision
3	Using ServiceMaxx, please check parameters 99393 (MAFT Coefficient A) and 99403 (MAFT Coefficient B) for being set to 0.00. This will also be accompanied with performance issues including not being able to rev engine over 1300 RPM. Are MAF coefficients both set to 0.00?	Yes: The values should not read 0.00. Please open a case file with I6 Technical Service group and provide this information in the description. Parameters are not dealer writeable. No: Continue to Step 4.

Step	Action	Decision
4	Visually inspect intake air system and CAC system for boost leaks. Visually inspect hoses and clamps from turbocharger to intake manifold: Look for tears in boost hoses, improper sealing of hoses, loose clamps, etc Were any leaks identified?	Yes: Repair leaks. If boost leak is large, please rerun MAF. If boost leak is minor, proceed to step 5. No: Continue to Step 5

Step	Action	Decision
5	Please check the quality of the air filter and check if it's an OEM brand or not. Is the air filter plugged/dirty? Is the air filter a non-OEM brand?	Yes to plugged: Replace as needed, then move on to Step 6
		Yes to non-OEM: Install OEM air filter and rerun MAF calibration
		No: Continue to Step 6
6	Please check exhaust manifold for excessive leaks at the rear (large amounts of soot) and cracks throughout the manifold. Is the exhaust manifold cracked or leaking from the rear (cylinder 6)?	Yes: Replace with exhaust manifold kit
		NOTE: Reference JK1200949
		No: Continue to Step 7
7	Using ServiceMaxx, compare IMP, IMT and EBP readings to specifications. Also pull sensors and inspect coking or damage. Are ServiceMaxx readings KOEO specifications? Are the sensors plugged or damaged?	Yes to KOEO: Check circuits for issues
		Yes to plugged/damaged: Clean/replace as needed
		No: Continue to Step 8
8	Using terminal test kit, inspect connections at the MAF Air Flow (MAF) sensor. With key OFF, disconnect MAF sensor connector. Check MAF sensor and connector for the following: Damaged or pinched wires Corroded terminals Loose, bent, or broken pins Broken connector housing. Are the MAF sensor connector, harness, and terminals clean and undamaged?	Yes: Continue to Step 9
		No: Repair connector, harness, or terminal damage. After repairs are complete, clear the code, and retest for the fault.
9	Check if unit is a Monaco RV and check ServiceMaxx's default page under Vehicle Information for rated power. Is the unit a Monaco RV with rated power of 350 HP?	Yes: If unit has good power and no issues other than passing a MAF calibration. Please open a case file and request MAF A/B coefficient programming.
		No: Continue to Step 10
10	Perform & record MAF Sensor Calibration if one was not already recorded. Plot MAF Mean Value, Gas Mass per Cylinder Stroke and Engine Speed (Excel or in ServiceMaxx). Graph 2 Is MAF Mean Value > (greater than) 1500 MG?	Yes: Continue to Step 12
		No: Continue to Step 11

Graph 2



Step	Action	Decision
11	<p>Inspect turbos for coking (refer to IK1200656) and inspect CAC for plugging/restrictions.</p> <p>If unit has an interstage cooler, please ensure it is not plugged.</p> <p>Are turbos coked and/or CAC restricted?</p>	<p>Yes: Follow IKnow article for cleaning procedure and clean/replace CAC as needed. IK1201175 - CAC Cleaning Procedure</p> <p>No: Continue to Step 12</p>

Step	Action	Decision
12	<p>Perform & Record Air Management Test.</p> <p>MAF Mean Value Delta obtain the reading by subtracting the high reading in the beginning of the test to the low reading near the end as shown below in Graph 3:</p> <ol style="list-style-type: none"> 466 ST ≥ 690 mg 466 HT ≥ 740 mg 570 ≥ 850 mg <p>Intake Manifold Pressure (IMP) Graph 4:</p> <ol style="list-style-type: none"> 2 + PSI <p>Does Air Management test meet specifications listed above?</p>	<p>Yes: Continue to Step 16</p> <p>No IMP: Continue to Step 16</p> <p>No MAF Delta: Continue to step 13</p>

Graph 3
 1. MAF Mean Value High Point
 2. MAF Mean Value Low Point



Graph 4
1. Intake Manifold Pressure (IMP)



Step	Action	Decision
13	Remove the Engine Throttle Valve (ETV) from the EGR mixer housing and inspect for 80% or more plugging	Yes: Clean plugging as needed, do not replace the EGR valve ; clean & replace O-rings if needed.
	Is a severe amount of plugging present in the EGR mixer housing?	No: Go to step 14
14	Perform EGR Operational Test 5 times and check for a sticking valve. (Tests -> KOEO Tests -> High output state test)	Yes: Replace and retest for MAF calibration
	Do not remove the EGR valve unless it is stuck open more than 1/8" Is EGR valve stuck open?	No: Go to step 15
15	Remove rear EGR crossover pipe and inspect for plugging Is the rear of the EGR cooler plugged?	Yes: Replace the EGR cooler, clear the code. Then rerun AMT and ensure flow is good. Rerun MAF calibration afterwards.

	No:Continue to Step 16
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Step	Action	Decision
16	Inspect Boost Control Solenoid (BCS) and boost lines for any damage or leaking lines. Test BCS per manual or follow Turbocharger wastegate adjustment in IK1201103 . Is the BCS or boost lines damaged?	Yes:Replace failed component and retest.
		No:Continue to Step 17

Step	Action	Decision
17	Test charge air cooler (CAC) and hoses for boost leaks using kit ZTSE 4341. If no leaks are present, follow smoke test with Navistar LeakLocator (tool number 19-700-01). Are hoses, clamps or CAC leaking?	Yes:Replace/repair leaking components as needed and retest for MAF calibration.
		No:Continue to Step 18

Step	Action	Decision
18	If no external leaks are found, inspect turbos for coking (refer to IK1200656) and inspect CAC for plugging/restrictions. If unit has an interstage cooler, please ensure it is not plugged. Are turbos coked and/or CAC restricted?	Yes:Follow IKnow article for cleaning procedure and clean/replace CAC as needed.
		No:Please contact technical service team for additional assistance.

SPECIAL TOOL(s) or SOFTWARE

Tool Description	Tool Number	Comments
EZ-Tech Laptop	N/A	N/A
Cleaning Management System (CMS)	12-353-01	
Charge Air Cooler (CAC) Adapter Flushing Kit	09-925-01	
Charge Air Cooler (CAC) Pressure Test Kit	ZTSE 4341	

PARTS

ONLY replace parts if diagnostics lead to failed component.

Part Number	Quantity Required	Description	Notes
1890997C92	1	VALVE ASSY EGR	
7092501C95	1	KIT, EXHAUST MANIFOLD ASSEMBLY	
1846481C92	1	SENSOR, INTAKE MANIFOLD PRESSURE	
1881015C92	1	SENOSR, INTAKE MANIFOLD TEMP	
1883423C91	1	SENSOR, EXHAUST BACK PRESSURE	
1881016C92	1	SENSOR, MASS AIR FLOW	
2512460C1	5 gal	Fluid, EGR Cleaning	

WARRANTY INFORMATION

Standard Repair Time(s):

Step	Description	Chassis	Engine	SRT	Hours
1	MAF Sensor Calibration	All Models	MAXXFORCE DT/9/10, N9/10	A12-3510T-1	0.2
2-5	SMX and Visual Inspection	All Models	All Engines/Pre-check	N/A	0.00
6	Exhaust Manifold Replacement	RE/Motorhome	MAXXFORCE DT	NH12-6356T-21	6.6
		RE/Motorhome	MAXXFORCE DT/9/10, N9/10	NH12-6356T	7.0
		CE/BE below 245HP	MAXXFORCE DT	GY12-6356T-21	5.0

		CE/BE above 245HP	MAXXFORCE DT/9/10, N9/10	GY12-6356T-24	5.4
		4300/4400 below 245HP	MAXXFORCE DT	KL12-6356T-21	6.8
		4300/4400 above 245HP	MAXXFORCE DT/9/10, N9/10	KL12-6356T-24	7.4
		7000 series below 245HP	MAXXFORCE DT	M12-6356T-24	6.7
		7000 series above 245HP	MAXXFORCE DT/9/10, N9/10	M12-6356T-25	7.2
7	Removing and checking them	All Models	MAXXFORCE DT/9/10, N9/10	SRT Sensor	
8	MAF Sensor replacement	CE/BE	MAXXFORCE DT/9/10, N9/10	GY12-8993T	0.5
		RE	MAXXFORCE DT/9/10, N9/10	I12-8993T	0.4
		4300/4400	MAXXFORCE DT/9/10, N9/10	KL12-8993T	0.5
		7300/7400/7500	MAXXFORCE DT/9/10, N9/10	M12-8993T	0.5
9-10	MAF Sensor Calibration	All Models	MAXXFORCE DT/9/10, N9/10	A12-3510T-1	0.2
11	CAC Cleaning	All Models	MAXXFORCE DT/9/10, N9/10	A09-3925A	1.1
	CAC Replacements	CE/BE	MAXXFORCE DT/9/10, N9/10	GY09-3925T	2.7
		4300/4400	MAXXFORCE DT/9/10, N9/10	KL09-3925T	3.5
12	Air Management System (AMS) Test	All Models	MAXXFORCE DT/9/10, N9/10	G12-2267K	0.1
13-15	AMS Diagnostics	All Models	MAXXFORCE DT/9/10, N9/10	G12-2280K	1.4
16	Boost Control Solenoid (BCS) Valve, Replace	CE/ BE	MAXXFORCE DT/9/10, N9/10	GY12-6954T-20	0.4
		4300/4400	MAXXFORCE DT/9/10, N9/10	KL12-6954T-20	0.4
		7300/7400/7500	MAXXFORCE DT/9/10, N9/10	M12-6954T-20	0.4
17	CAC Pressure Test	All Models	MAXXFORCE DT/9/10, N9/10	KL09-3925T-1	N/A
18	CAC Replacement	CE/BE	MAXXFORCE DT/9/10, N9/10	GY09-3925T	2.7
		4300/4400	MAXXFORCE DT/9/10, N9/10	KL09-3925T	3.5
	CAC Cleaning	All Models	MAXXFORCE DT/9/10, N9/10	A09-3925A	1.1

Warranty Claim Coding:

Group	Noun
12000	716

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