
	<b>Hard Start and No Start Diagnostics</b> MaxxForce® DT, 9, and 10 Beginning with 2010 Model Year	Technician _____		Date _____	ECM Calibration _____	EFRC _____	Hours _____
		VIN _____		Unit No. _____	ACM Calibration _____	Engine SN _____	Miles _____
		Complaint _____			HP Rating _____	Transmission: Manual _____ Auto _____	
		Note: This form must be completed before calling for technical assistance.					

 **WARNING**

To prevent personal injury or death, read all safety instructions in the "Safety Information" section of *Engine Diagnostics Manual* EGES-455 before doing form procedures.

Notes: Look up the VIN on the ISIS® network for build date, engine hp, engine serial number, ECM calibration, and transmission.

See "Hard Start and No Start Diagnostics" in EGES-455 for additional information to do each test or procedure. Record results on this form.

Do all checks in sequence unless otherwise stated. Doing a check or test out of sequence could cause incorrect results.

See EGES-455 Appendix A for Performance Specifications and Diagnostic Trouble Code Index.

Note: If troubleshooting a cold start problem and ECT1 is less than -1°C (30°F), do Inlet Air Heater in Special Test

1. Initial Key On Check

☐ Check indicator for WATER IN FUEL lamp.

Comments
----------

- If the WATER IN FUEL lamp stays on, do Fuel Quality Check.

2. Visual Inspection

- ☐ Check all fluid levels.
- ☐ Inspect electrical connectors.
- ☐ Inspect air filter gauge.
- ☐ Inspect CAC and piping.
- ☐ Inspect for visible exhaust damage.

Comments
----------

Fuel Level Check

- ☐ Check instrument panel gauge and look into tank to verify fuel level.
- If fuel gauge reads above empty, but tank is empty, diagnose gauge.
- If fuel tank is empty, add fuel and prime system. See Fuel System Priming in Hard Start and No Start Diagnostics.

Fuel Quality Check

- ☐ Place clear approved container under fuel drain valve and open.
- If fuel does not drain, turn ignition switch to ON to run Fuel Pump.
- ☐ Check for water, waxing, icing, sediment, gasoline, or kerosene.

Comments
----------

- If fuel quality is questionable, correct problem. Take a sample to verify fuel quality is satisfactory.

3. EST Connection and Data Recording

- ☐ Use ServiceMaxx™ software to record KOEO pressure and temperature values.
- Note: With Key ON, Engine OFF (KOEO), Fuel Pump will run for 10 seconds. Take reading after Fuel Pump shuts off.

Sensor	Spec.	Actual
Air Inlet Temp	-	
Engine Coolant Temp1	-	
Engine Oil Temp	-	
Mass Air Flow	0 kg/hr	
Injection Control Pressure	0 psi	
Exhaust Back Pressure	0 psi	
Intake Manifold Pressure	0 psi	
Barometric Pressure	14 psia	
DPF Differential Pressure	0 psi	

- If sensor is out of specification, go to suspect sensor in Electronic Control Systems Diagnostics.
- ☐ Use ServiceMaxx™ software to run Output State Test High and Low. Record results.

Signal	Output State Low	Output State High
EGR Control	35%	90%
Engine Throttle Position	1.12 V	4.7 V

Note: EGR Control signal displays duty cycle and not actual valve position. EGR valve closed is 35% and valve open is 90%.

- If actuator is out of specification, go to suspect actuator in Electronic Control Systems Diagnostics.
- Note: Visually monitor Exhaust Back Pressure Valve; ServiceMaxx™ does not have a feedback position signal.
- Note: Verify air tanks are full before running this test.
- Note: Engine will cycle valve three times when engine is shut down.
- ☐ Start engine and idle for 5 seconds.
  - ☐ Shut down engine and visually inspect for valve movement.

EBPV Movement	Yes <input type="checkbox"/>	No <input type="checkbox"/>
---------------	------------------------------	-----------------------------

- If EBPV does not cycle open and closed, go to next step.
  - If EBPV cycles open and closed, valve is working correctly.
- ☐ Disconnect air supply to actuator.
  - ☐ Start engine and idle for 5 seconds.
  - ☐ Shut down engine and verify air flow from supply line.
  - If air flow cannot be heard, go to EBPV in Electronic Control Systems Diagnostics.
  - If air flow can be heard when cycled high, check valve or linkage for sticking.
  - ☐ Use ServiceMaxx™ software to record DPF status signal value.

DPF Status
------------

- If DPF status is "Regen needed-critical level", run an onboard filter cleanliness test.

4. Check for DTCs

- ☐ Use ServiceMaxx™ software to record SPN/FMI.

Active SPN/FMI	Previously Active SPN/FMI

- Correct any active SPN/FMI. See Diagnostic Trouble Code Index.
- Evaluate previously active faults with high counts.

5. Engine Cranking

- ☐ Use ServiceMaxx™ software to load Hard Start and No Start session.
- ☐ Connect Fuel Pressure Gauge to Intake Manifold Fuel Test Port.
- ☐ Press record and start cranking engine for a maximum of 10 seconds.

Note: FDP sensor is only capable of measuring up to 75 psi of pressure. Always use fuel gauge to measure fuel pressure.

Signal	Spec.	Actual
Switched Battery	9V	
Engine Speed	130 rpm	
Fuel Delivery Pressure	75 psi	
Injection Control Pressure	725 psi	
Exhaust Back Pressure	<5 psi	

- If SWBAT drops below specification, check cranking voltage at batteries using DMM. If okay, go to ECM Power in Electronic Control Systems Diagnostics. If not okay, check batteries and charging system, connect battery charger, and retest.
- If no rpm signal is present, see CKP Sensor and CMP Sensor in Electronic Control Systems Diagnostics.
- If Engine Speed is below specification, check batteries and starting system.
- If Fuel Pressure is below specification, go to Fuel Pump Electrical Test in Special Test Procedures.
- If ICP is below specification, go to ICP Open Loop Test in Special Test Procedures.
- If EBP is above specification, disconnect exhaust before DOC and inspect for face plugging.

6. Relative Compression Test

Note: Use a battery charger when performing this test. It is important that cranking rpm remains consistent throughout test.

- ☐ Use ServiceMaxx™ software to run Relative Compression Test.

	Speed Difference
Cylinder 1	rpm
Cylinder 2	rpm
Cylinder 3	rpm
Cylinder 4	rpm
Cylinder 5	rpm
Cylinder 6	rpm

- If Speed Difference for one cylinder is significantly lower than others, cylinder is suspect for compression loss.

Special Test Procedures

Inlet Air Heater (IAH)

- ☐ Install amp clamp around IAH relay B+ feed circuit.
- ☐ Use ServiceMaxx™ software to run KOEO Intake Air Heater Test.

Meter	Specification	Actual
Amperage Draw	125±30 Amps within 2 seconds	

- If amperage draw is below specification, see IAH in Electronic Control Systems Diagnostics.

Fuel Pump Electrical Check

- Note: Run this test if FDP is below specification or Fuel Pump cannot be heard when turning ignition switch ON.
- Note: With ignition switch ON, Fuel Pump will run for 10 seconds. Wait 10 seconds between ignition switch cycles.
- Note: FDP sensor is only capable of measuring up to 75 psi of pressure.
- ☐ Connect Breakout Harness 6023 between engine harness and Fuel Pump.
  - ☐ Using a DMM, measure voltage between pins 1 and 4, then between pins 1 and 6.
  - ☐ Turn ignition switch to ON, engine OFF.

Pins	Actual Voltage
1 to 4	
1 to 6	

- If voltage is below 9V, go to Fuel Pump Control in Electronic Control Systems Diagnostics.
- If voltage is above 9V, go to Aeration Check.

Aeration Check

- Note: Plugged supplemental filters or separators mounted on vehicle will influence fuel pressure, restriction, and aeration. Aeration cannot be measured using FDP sensor.
- ☐ Connect Fuel Pressure Gauge to fuel test port on front of intake manifold.
  - ☐ Route clear hose into diesel fuel container.
  - ☐ Close Fuel Pressure Gauge shut-off valve. Turn ignition switch to ON and measure fuel pressure. Open valve to check for aeration.

Aerated	Yes <input type="checkbox"/>	No <input type="checkbox"/>
---------	------------------------------	-----------------------------

- If fuel is aerated, go to next step.
  - If not aerated, go to Fuel Filter Check.
- ☐ Disconnect fuel supply line at filter housing.
  - ☐ Connect Clean Fuel Tank Tool to filter housing.
  - ☐ Turn ignition switch to ON, open Fuel Pressure Gauge shut-off valve to check for aeration (bubbles flowing through clear line).

Aerated	Yes <input type="checkbox"/>	No <input type="checkbox"/>
---------	------------------------------	-----------------------------

- If fuel is not aerated, repair fuel supply line from fuel tank to filter housing for sucking air.
- If fuel is aerated, replace fuel filter housing.

Fuel Filter Check

- ☐ Connect Fuel/Oil Pressure Test Coupler and Fuel Pressure Gauge to fuel filter housing test port.
- ☐ Close Fuel Pressure Gauge shut-off valve. Turn ignition switch to ON and measure fuel pressure.

Gauge	Specification	Actual
Fuel Pressure	85-95 psi	

- If fuel pressure is within specification, replace fuel filter element and clean strainer.
  - If fuel pressure is below specification, continue to next step.
- ☐ Disconnect fuel return line from fuel filter housing. This will restrict fuel leaving filter housing and cause system to build maximum pressure.
  - ☐ Turn ignition switch to ON. Measure fuel pressure.

Gauge	Specification	Actual
Fuel Pressure	85-95 psi	

- If fuel pressure is now above specification, replace Fuel Pressure Regulator.
- If fuel pressure is below specification, go to Alternative Fuel Supply Test.

Alternative Fuel Supply Test

- ☐ Connect Fuel Pressure Gauge to fuel test port on front of intake manifold.
- ☐ Disconnect fuel supply line at filter housing.
- ☐ Connect Clean Fuel Tank Tool to filter housing.
- ☐ Turn ignition switch to ON and measure fuel pressure.

Gauge	Specification	Actual
Fuel Pressure	85-95 psi	

- If fuel pressure is within specification, repair supply line for open or restriction.
- If fuel pressure is below specification, replace Fuel Pump.

Injection Control Pressure (ICP) Open Loop Test

- Note: This test will set a DTC. Ignore ICP related DTC and clear after reinstalling UVC connector.
- ☐ Disconnect gray UVC connector 1 at front of valve cover gasket.
  - ☐ Crank engine for a maximum of 20 seconds.
  - If engine starts, see ICP Sensor in Electronic Control Systems Diagnostics.
  - If engine does not start, go to High-pressure Pump Reservoir Inspection.

High-pressure Pump Reservoir Inspection

- ☐ Loosen EOT sensor to verify reservoir has oil in it.
- If reservoir is empty, see Lubrication System in Engine Symptoms Diagnostics.
- If reservoir is full, go to IPR Control Test.

IPR Control Test

- ☐ Connect gray valve cover connector.
- ☐ Disconnect IPR connector. Inspect for damage or corrosion. Repair if necessary.
- ☐ Connect Breakout Harness 4484 to IPR valve. Leave engine harness disconnected.
- ☐ Energize IPR valve by connecting B+ and GND to breakout harness.
- ☐ Use ServiceMaxx™ software to open Hard Start No Start session.
- ☐ Crank engine while monitoring ICP.

Signal	Specification	Actual
ICP	above 4000 psi	

- If ICP builds above 4000 psi, see IPR in Electronic Control Systems Diagnostics.
- If ICP does not build to 4000 psi, go to High-pressure Oil Pump Test.

High-pressure Oil Pump Test

- ☐ Remove high-pressure hose from cylinder head fitting.
- ☐ Connect 10,000 psi mechanical gauge to high pressure hose.
- ☐ Energize IPR valve and crank engine while monitoring ICP on gauge.

Signal	Specification	Actual
ICP	above 4000 psi	

- If ICP builds above 4000 psi, go to High-pressure Rail Leak Test.
- If ICP does not build to 4000 psi, go to IPR Block-Off Test.

**IPR Block-off Test**

- ☐ Remove IPR valve.
- ☐ Install IPR Plug Tester.
- ☐ Crank engine while monitoring gauge pressure.

Signal	Specification	Actual
ICP	above 4000 psi	

- If ICP builds above 4000 psi, replace IPR valve.
- If ICP does not build to 4000 psi, replace high-pressure pump.

**High-pressure Oil Rail Leak Test**

- ☐ Connect high-pressure hose to cylinder head.
- ☐ Remove engine valve cover, and disconnect all 6 injector electrical connectors.
- ☐ Energize IPR and crank engine while visually inspecting around high-pressure rail for leaks.

Note: Look for excessive oil leak from each injector oil inlet adaptor, center of rail to head O-ring, and sensor or brake shutoff valve.

Comments
----------

- ☐ Repair as necessary.