Hard Start and No Start Diagnostics

International® DT 466, DT 570, and HT 570

Technician _____ Miles _____ Transmission:
Date _____ Hours _____ Manual ____ Auto ____
Unit No. _____ VIN _____ Truck build _____

Ambient temperature _____
Coolant temperature _____
Complaint _____

Engine SN _____
Engine HP _____
Engine Family Rating Code _____

ECM calibration _____
IDM calibration _____
Injector No. _____
Turbocharger No. _____

WARNING

To avoid serious personal injury, possible death or damage to the engine or vehicle, read all safety instructions in the "Safety Information" section of *Engine Diagnostics Manual* EGES-270 before doing procedures on this form.

Notes:

1. See "Hard Start and No Start Diagnostics"- Section 5 in EGES-270. Use figures and additional information to do each test or procedure on this form. Record results on this form.

2. For starting concerns with ECT temperatures below 38 °C (100 °F), do Test 15 (Inlet Air Heater System) and service as required. If a problem was found and corrected, **it is not necessary to complete the rest of the form** unless a starting concern remains.

3. Do all checks in sequence unless otherwise stated. Doing a check or test out of sequence could cause incorrect results. If a problem was found and corrected, **it is not necessary to complete the rest of the form** unless a starting concern remains.

4. Minimum cranking speed and duration specifications are based on typical service bay ambient temperature. For colder temperatures, see *Engine Diagnostics Manual* EGES-270 for specifications.

5. See Appendix A or B in EGES-270 for engine specifications.

6. See Appendix C in EGES-270 or Form CGE 310-1 for Diagnostic Trouble Codes (DTCs).

1. Initial Ignition Switch On (Do not start)

- ☐ Listen for injector precycle. (Duration is temp. dependent.)
- ☐ Check for WAIT TO START.
- ☐ Listen for turbocharger pre-cycle.
- ☐ Check Water In Fuel (WIF) lamp.

Comments

2. Engine Cranking

- ☐ Does engine crank?
- ☐ Check cranking rpm. (Instrument panel)
- ☐ Check oil pressure. (Instrument panel)
- ☐ Check smoke color.

Check	Spec	Actual
rpm		
Oil pressure		
Smoke color	—	

3. Diagnostic Trouble Codes

- ☐ Install Electronic Service Tool (EST).
- ☐ Use EST to read DTCs.
- ☐ Use EST to check KOEO values for temperature and pressure sensors.

Active DTCs	
Inactive DTCs	
Abnormal sensor values Suspect sensor/value	☐ Yes ☐ No

- Correct problem causing active DTCs before continuing.
- To access DTCs without EST, see "Diagnostic Software Operation" in Section 3 of EGES-270.

4. KOEO Standard Test

- ☐ Use EST to run KOEO Standard Test.

Active DTCs

- Correct problem causing active DTCs before continuing.
- To do KOEO Standard Test without EST, see "Diagnostic Software Operation" in Section 3 of EGES-270.

5. KOEO Injector Test

- ☐ Use EST to run KOEO Injector Test.

Active DTCs

- Correct problem causing active DTCs before continuing.

6. EST Data List

- ☐ Enter data in the Cranking Spec column.
- ☐ Monitor KOEO values and enter in KOEO column.
- ☐ Crank engine and monitor DATA for 20 seconds. (See note 4.)
- ☐ Enter data in the Cranking Actual column.

PID	KOEO	Cranking Spec	Cranking Actual
VBAT			
RPM			
ICP			
EOP			
EGRP			
BCP (if equipped)			

- If voltage is below spec, see "ECM PWR" - Section 7.
- If no rpm is noted, check DTCs.
- If ICP is below spec, do "Low ICP System Pressure" - Test 14.
- If EOP is below spec, see "Engine Symptoms Diagnostics" - Section 4.
- EGRP should equal 0.
- If BCP is out of range, see "BCP Sensor" - Section 7.

7. Fuel

- ☐ Fuel level in tank
- ☐ Free of water, icing, and clouding
- ☐ Free of contaminants
- ☐ Correct fuel grade
- ☐ Check water in fuel lamp

Note: If unit was run out of fuel, see "Priming the Fuel System" in Section 4.

Comments

8. Engine Systems

- ☐ Leaks
- ☐ Loose connections

Fuel Oil Coolant Electrical Air

9. Engine Oil

- ☐ Leaks
- ☐ Contaminated oil (fuel or coolant)
- ☐ Oil grade, viscosity, and level
- ☐ Miles/hours on oil

Comments

10. Intake and Exhaust Restriction

- ☐ Hoses and piping
- ☐ Filter minder
- ☐ Intake and exhaust restriction

Comments

11. Main Power Relay Voltage to ECM

- ☐ Connect breakout harness between ECM main power relay and power distribution center.
- ☐ Crank engine and use a DMM to measure voltage to ECM. (Min. 130 rpm for 20 seconds. See note 4.)
- ☐ Check voltage between connector Pin 87 and ground.

Instrument	Spec	Actual
DMM	7V (min)	

12. Main Power Relay Voltage to IDM

- ☐ Connect 12 - Pin Breakout Harness between engine and chassis harness.
- ☐ Crank engine and use DMM to measure voltage to IDM. (Min. 130 rpm for 20 seconds. See note 4.)
- ☐ Check voltage between connector Pin 12 and Pin 1.

Instrument	Spec	Actual
DMM	7V (min)	

13. Fuel Pressure and Aerated Fuel

- ☐ Measure pressure at fuel rail (intake manifold).
- ☐ Minimum cranking speed 130 rpm for 20 seconds. (See note 4.)
- ☐ Check for Aerated fuel.

Instrument	Spec	Actual
0-100 psi Gauge		
Visual	Aerated fuel	Yes____ No ____
Vacuum gauge	> 12 in Hg	_____

Note: If unit was run out of fuel, see "Priming the Fuel System" in Section 4.

- If fuel pressure is below spec, replace fuel filter, clean strainer, and retest.
- Correct for aerated fuel before continuing.
- If still below spec, check fuel pump operation

14. Low ICP System Pressure

- ☐ Do only the low ICP tests below, if ICP was not to spec during Test 6.
- ☐ Start and continue Test 14.1 System Function, if lube oil pressure is not a concern and terminals on IPR valve and engine harness are not damaged or corroded.
- ☐ If test result is yes for 14.1 System Function, **do not do tests 14.2 through 14.5 for low ICP**.

Low ICP Tests

Test	Question	Result
14.1 - System Function	IPR connectors: Corroded, bent or pushed back pins	☐ Yes ☐ No
	Greater than 28 Mpa (4061 psi) 4.45 V?	☐ Yes ☐ No
14.2 - Oil Reservoir Level	Oil level full?	☐ Yes ☐ No
14.3 - IPR and High-pressure Pump Operation	Greater than 28 Mpa (4061 psi) 4.45 V?	☐ Yes ☐ No
14.4 - UVC Leak Test	Audible air leak? If equipped with engine brake, it is normal to have air passing through the system.	☐ Yes ☐ No
14.5 - IPR Function	Audible crankcase air leak?	Unplugged ☐ Yes ☐ No B+ and gnd applied ☐ Yes ☐ No

15. Inlet Air Heater System

- ☐ Install Amp Clamp around one of the two feed wires and do the Output State Test. After 2 seconds, measure amperage for each air heater wire.
- ☐ If amperage reading is not to spec for Test 15.1, do tests 15.2, 15.3, 15.4, and 15.5 for that circuit.

Test	Air Heater Wire Circuit 1	Spec	Circuit 2
15.1 - Amperage draw		125 ± 10 amps	
15.2 - Voltage at element		BAT V	
15.3 - Element continuity	☐ Yes ☐ No		☐ Yes ☐ No
15.4 - Wiring Harness continuity and resistance		< 5 ohms	
15.5 - Relay operation Battery feed Relay output		B+ B+	

Performance Diagnostics

International® DT 466, DT 570, and HT 570

Technician _____ Miles _____ Transmission:
Date _____ Hours _____ Manual____ Auto____
Unit No. _____ VIN _____ Truck build _____

Ambient temperature _____
Coolant temperature _____
Complaint _____

Engine SN _____
Engine HP _____
Engine Family Rating Code _____

ECM calibration _____
IDM calibration _____
Injector No. _____
Turbocharger No. _____

WARNING

To avoid serious personal injury, possible death or damage to the engine or vehicle, read all safety instructions in the "Safety Information" section of *Engine Diagnostics Manual* EGES-270 before doing procedures on this form.

Notes:

1. See "Performance Diagnostics"- Section 6 in EGES-270. Use figures and additional information to do each test or procedure on this form. Record results on this form.
2. Do all checks in sequence unless otherwise stated. Doing a check or test out of sequence could cause incorrect results. If a problem was found and corrected, **it is not necessary to complete the rest of the form** unless a performance concern remains.
3. See Appendix A or B in EGES-270 for engine specifications.
4. See Appendix C in EGES-270 or Form CGE 310-1 for Diagnostic Trouble Codes (DTCs).

1. Diagnostic Trouble Codes

- ☐ Install Electronic Service Tool (EST).
- ☐ Use EST to read DTCs.
- ☐ Use EST to check KOEO values for temperature and pressure sensors.

Active DTCs
Inactive DTCs
Abnormal sensor values ☐ Yes ☐ No Suspect sensor/value

- Correct problem causing active DTCs before continuing.
- To access DTCs without EST, see "Diagnostic Software Operation" in Section 3 of EGES-270.

2. KOEO Standard Test

☐ Use EST to run KOEO Standard Test.

Active DTCs

- Correct problem causing active DTCs before continuing.
- To do KOEO Standard Test without EST, see "Diagnostic Software Operation" in Section 3 of EGES-270.

3. KOEO Injector Test

☐ Use EST to run KOEO Injector Test

DTCs found

- Correct problem causing active DTCs before continuing.

4. Engine Oil

- ☐ Leaks
- ☐ Contaminated oil (fuel or coolant)
- ☐ Oil grade, viscosity, and level
- ☐ Miles/hours on oil

Comments

5. Fuel

- ☐ Fuel level in tank
- ☐ Free of water, icing, and clouding
- ☐ Free of contaminants
- ☐ Correct fuel grade
- ☐ Check water in fuel lamp

Comments

6. Fuel Pressure and Aerated Fuel

- ☐ Measure pressure at fuel rail (intake manifold).
- ☐ Measure pressure at low and high idle.
- ☐ Measure pressure under load. (automatic only – torque converter stall)
- ☐ Check for Aerated fuel.

Instrument		Spec	Actual
0-100 psi Gauge	Low idle		
	High idle		
	Auto only (converter stall)		
Clear fuel line	Aerated fuel	Yes____	No ____

- If fuel pressure is below spec, replace fuel filter, clean strainer, and retest.
- Correct for aerated fuel, before continuing

7. Intake Restriction

☐ Measure restriction at high idle, no load.

Instrument	Spec	Actual
Magnehelic gauge or Manometer	12.5 in H_20	

- Correct problem causing out of spec values, before continuing.

8. Exhaust Restriction

- ☐ Inspect exhaust system.
- ☐ Disconnect EGR valve.
- ☐ Use EST to monitor EBP at high idle, no load.

Instrument	Spec	Actual
EST		
DMM		

- If pressure is above spec, remove turbo outlet exhaust pipe and retest.
- If pressure is good with pipe removed, correct problem from turbocharger to tail pipe.
- If EBP is still high with turbo outlet exhaust pipe removed, plug EGR back in, do key switch cycle, clear DTCs, and do **Tests 13** and **14**.

9. KOER Standard Test

Note: Engine coolant temperature must be above 70 °C (158 °F).

☐ Use EST to run KOER Standard Test.

DTCs found

- Correct problem causing active DTCs before continuing.

10. Injection Control Pressure

☐ Use EST to monitor ICP and engine speed.
BCP should be zero, when engine brake is inactive.

Condition	Spec	Actual
KOEO		
Low idle		
High idle - Initial		
High idle – After 2 min.		
Aerated oil	Yes____ No ____	After 2 min. ____

- If BCP is above zero, when engine brake is inactive, diagnose BCP sensor, circuit, and engine brake parts.
- If ICP is high or unstable, hold at high idle for 2 minutes. Return to low idle, take oil sample, check for foam, and correct condition if oil is aerated.
- If oil is not aerated, disconnect ICP sensor and check for engine stability.
- If problem is corrected, see Operational Voltage checks for "ICP Sensor" in Section 7 of EGES-270.
- If ICP still high or unstable, replace IPR and retest.

11. Injector Disable

☐ Use EST to run injector disable diagnostics to identify suspect cylinders.

Selected cylinder	EOT	Average fuel rate	Deviation	Average engine load	Deviation
Base Line					
1					
2					
3					
4					
5					
6					
Base Line					
Cut-off values:		Fuel rate		Engine load	

- If any cylinder is suspect, do **Test 12**.

12. Relative Compression

- ☐ Turn ignition switch to ON.
- ☐ Use EST to run Relative Compression Test.
- ☐ Crank engine following EST instructions.

Cylinder Compression Test	Value
Cylinder 1 Relative Compression	
Cylinder 2 Relative Compression	
Cylinder 3 Relative Compression	
Cylinder 4 Relative Compression	
Cylinder 5 Relative Compression	
Cylinder 6 Relative Compression	

- If a Relative Compression Test and Injector Disable Test identify a suspect cylinder, check for a mechanical problem.
- If a Relative Compression Test does not identify a suspect cylinder, but the Injector Disable Test does, replace suspect injector(s).

13. Air Management

☐ Use EST to monitor data while running Air Management Test.

DTCs found

- Correct problem causing active DTCs before continuing.

14. VGT Test

☐ Use EST to toggle turbocharger operation and monitor EBP and MAP.

Duty Cycle	Yes	No
Low to medium		
Medium to high		
High to low		
Low to high		

- Did EBP and MAP change for each transition?
- If turbocharger is suspected cause of low power, see "Low Power (Turbocharger Assembly and Actuator)" in Section 4 of EGES-270.

15. Torque Converter Stall (Automatic only)

- ☐ Set parking brake and apply service brake.
- ☐ Put transmission in drive.
- ☐ Push accelerator to the floor, begin timing and monitor tachometer until tachometer stops moving.
- ☐ Record RPM and time.

Condition	Spec	Actual
Stall RPM		
Time (Idle to stall in seconds)		

- If minimum RPM is reached within specified time, for a launch concern **do not continue** with performance diagnostics.
- If RPM is low, or was not reached within specified time, continue with performance diagnostics.

16. Crankcase Pressure

Note: Engine coolant temperature must be above 70 °C (158 °F).

- ☐ Measure at road draft tube with crankcase pressure test adapter.
- ☐ Measure at high idle, no load.

Instrument	Spec	Actual
Magnehelic gauge or Manometer		

17. Test Drive (Full load, rated speed)

☐ Use EST to monitor **boost pressure** and engine speed.

Condition	Spec	Spec	Actual
	Engine speed	Boost	EST boost reading
Peak HP			
Peak Torque			

- If boost pressure is not to spec continue performance diagnostics; **if to spec do not continue.**

☐ Measure **fuel pressure** at fuel rail (full load, rated speed)

Instrument	Spec	Actual
0 - 100 psi gauge		

- If fuel pressure is low, replace fuel filter, clean fuel strainer, and retest.
- If pressure is still low measure fuel inlet restriction at full load, rated speed.

☐ Use EST to monitor **ICP** and engine speed.
BCP should be zero, when engine brake is inactive.

Instrument	Spec	Actual
EST		
Aerated oil	Yes____ No ____	After 2 min. ____

- If BCP is above zero, when engine brake is inactive, diagnose BCP sensor, circuit, and engine brake parts.
- Disconnect ICP and test drive vehicle.
- If problem is corrected, see Operational Voltage checks for "ICP Sensor" in Section 7 of EGES-270.
- If still high or unstable, replace IPR and retest.

STOP

Note: If **Tests 1- 17** meet specifications and engine operation is good, **Test 18** is not necessary.

18. Valve Lash and Engine Brake Lash

☐ Valve lash and engine brake actuator lash:
Engine OFF: Cold

Instrument	Spec	Actual
Feeler gauge	0.019 in	