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Availability: ISIS, Bus ISIS, FleetISIS **Revision:** 13
Major System: ELECTRICAL SYSTEM **Created:** 10/22/2014
Current Language: English **Last Modified:** 10/29/2015
Other Languages: NONE **Author:** David Smith
Viewed: 5803

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Coding Information

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Title: ISB Starting System Diagnostics

Applies To: ISB Engine

CHANGE LOG

10/29/2015 - Added Extra decision to step 2 if clunk noise is heard. Added SRT link, and fixed format issues
 09/10/2015 - Changed verbiage in step 7 per feedback request. Added Warranty Note under Description
 07/09/2015 - Updated link in Step 11
 06/25/2015- Inserted break date for plant production update & control circuit update installation instruction
 06/04/2015- Updated flexplate part numbers to match Automatic Transmission feature codes

DESCRIPTION

This document will guide the user through Cummins ISB starter and ring gear diagnostics. It is important to review all the material to prevent repeat failures, especially in instances of ring gear damage by the starter.

NOTE: Warranty claims with a failure date of 09/21/2015 and later will not be allowed if the complete repair is not performed. See steps 10 and 11 of the diagnostics. As some vehicles may require an overlay harness to prevent repeat starter motor failures.

SYMPTOMS

Diagnostic Trouble Codes

DTC/Light	Description
N/A	

Customer Observations or Concerns:

Operator may hear one of the following from the starter:

- Click
- Clunk
- Grind
- Squeal
- Starter spins, doesn't rotate engine
- Slow Engine Crank
- Click No-Crank
- No-Click No-Crank
- Crank No-Start

SPECIAL TOOLS / SOFTWARE

Tool Description	Tool Number	Comments
Cummins Insite		Cummins Tool
Midtronics ESP		

[Tools Resource Center](#)

PARTS

Description	Part Number	Quantity	Source From	Application
MOTOR,STARTING 12V , 38MT DELCO	8201039	1	Navistar	Engine- ISB
Flexplate	3968672	1	Cummins	Trans- 0013ASP Allison 2000
Flexplate	29545469	1	Allison	Trans- 0013AVE Allison 3000

DIAGNOSTICS

NOTE: Before performing any voltage drop test; inspect each cable end nut torque, insulation, routing, clipping, discoloration, and terminal arching

Step	Action	Decision
1	Diagnostic Trouble Code Check: Review current health report for Cummins or Body Controller fault codes that may cause an extended crank condition (Crankshaft Position Sensor, Camshaft Sensor, Fuel System, Electrical codes)	Yes. Go to appropriate diagnostic manual to diagnose crank no start symptom
	Are there pending/active/previously active DTC's causing a crank no start?	No. Step 2

Step	Action	Decision
2	Manual Engine Barring Test: Have an assistant bar the engine over from the alternator pulley	Yes. (with no audible clunk noise) Go To Step 3
	TIP: If an audible noise is heard from the starter area when the engine is rotated by hand, there is most likely flexplate ring gear damage.	Yes. (With audible clunk noise) Go to Step 4
	Does the engine rotate freely, and no clunk noise was heard?	No. Diagnose engine lock up condition.

Step	Action	Decision
3	Cranking RPM Test: Monitor Engine RPM using Cummins Insite while cranking the engine	Yes. Go to appropriate Cummins crank no start diagnostic. Do NOT replace starter motor
	Does the engine crank?	No. Step 4

Step	Action	Decision
4	Perform battery test: Follow IK0800482- Battery Testing, Diagnostics & Maintenance	Yes. Replace ONLY failed battery and then recheck for symptom
	Is a warranty approval code (WAC) or failed battery result from any battery generated?	No. Step 5

Step	Action	Decision
5	Starter Cable Voltage Drop Test:	Yes. Make required repair

	No. Step 6
Follow Midtronics starter cable voltage drop test	
Is combined + & - voltage drop greater than 0.5v?	

Step	Action	Decision
	Alternator Cable Voltage Drop Test:	Yes. Make required repair
6	Follow Midtronics alternator cable voltage drop test	No. Step 7
	Is combined + & - voltage drop greater than 0.5v?	

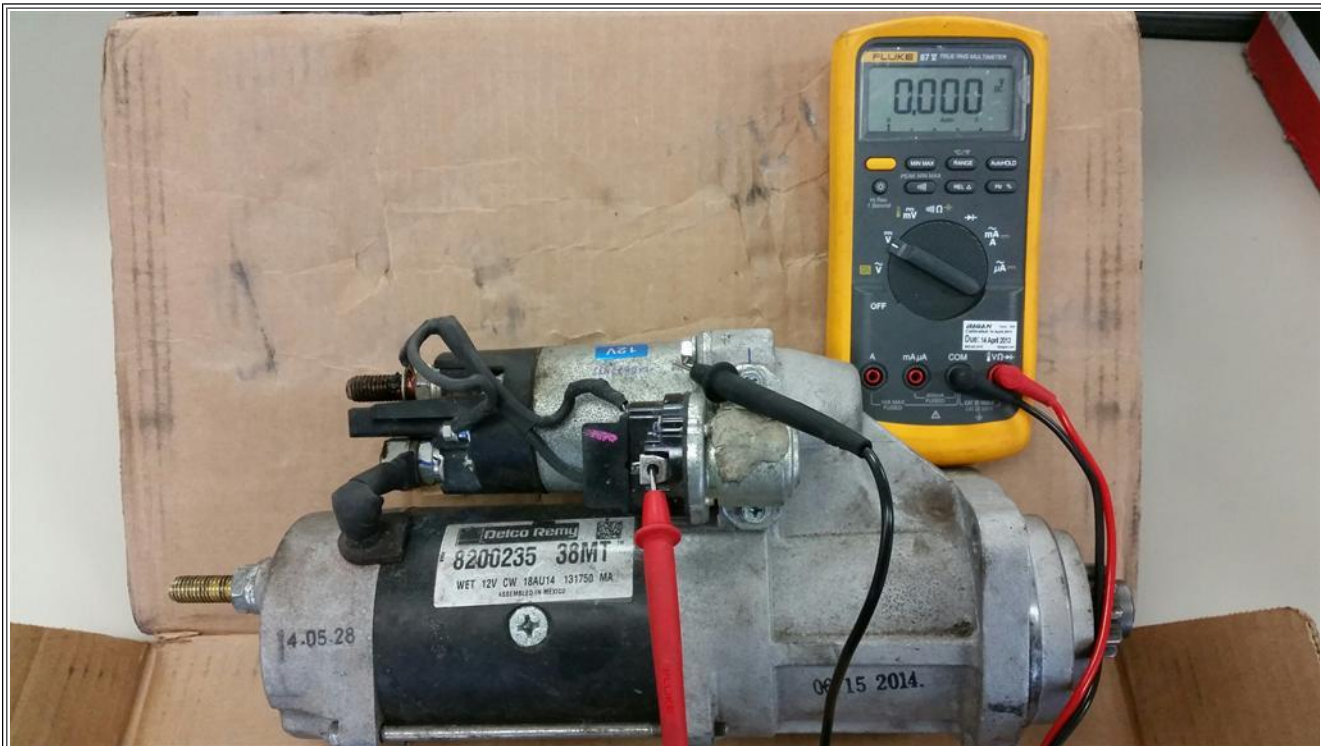


Figure 1: Starter IMS S terminal DVOM Hookup Location

Step	Action	Decision
	Starter Control Circuit Check:	Yes. Perform starter control diagnostics for possible causes: <i>Wiring</i> <i>F3A Fuse</i> <i>Start Relay (Neutral Relay)</i> <i>Crank Inhibit Relay</i> <i>Clutch Switch (Manual Trans)</i> <i>TCM (Auto Trans)</i> <i>ECM</i> <i>Key Switch</i>
7	Connect DVOM test leads on IMS (Mag switch) "S terminal" and ground to solenoid case as indicated in Figure 1	
	Have an assistant hold keyswitch in start position for 5 seconds.	
	Compare DVOM IMS (Mag switch) "S terminal" reading to B+ voltage at batteries	
	Does the DVOM not read battery voltage +/-0.5 volts?	No. Step 8

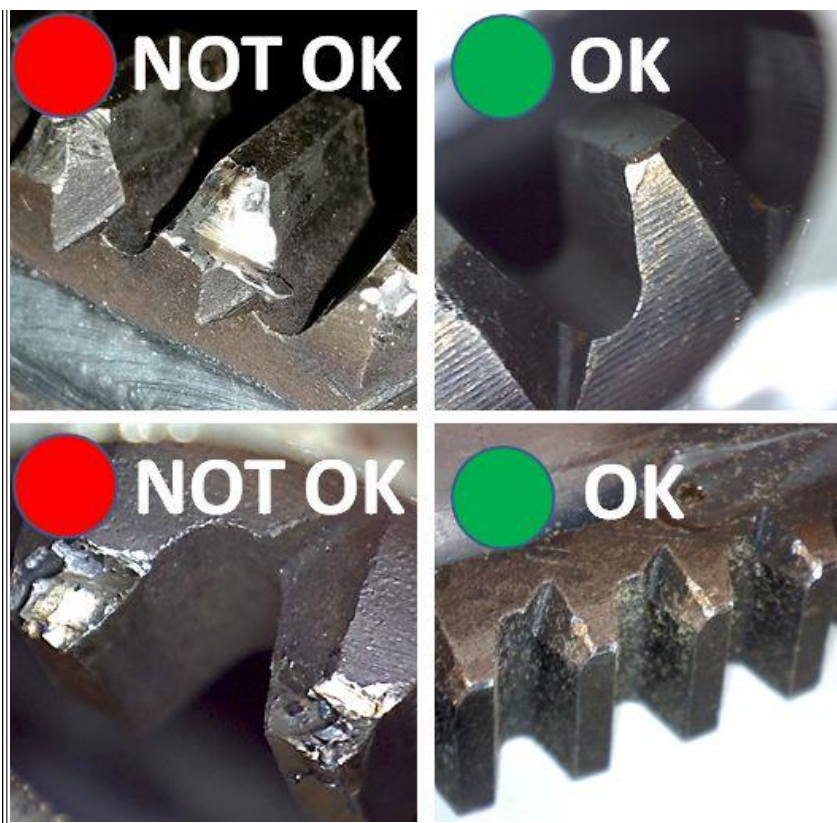


Figure 3: Flexplate/Flywheel Ring Gear

Step	Action	Decision
8	Flexplate/Flywheel Ring Gear Inspection: Remove starter Mark the flexplate ring gear with a paint pen	Yes. Step 9
	Have an assistant bar the engine over while you inspect each tooth for damage: burrs, milling, chips, etc. (Figure 3) TIP: This can be done as a one man operation using a borescope or by looking through the starter mount hole Did all 127 teeth get inspected?	No. Inspect each tooth

Step	Action	Decision
9	Flexplate replacement determination:	Yes. Replace flexplate & starter and then go to step 10
	Does the flexplate need to be replaced when ring gear teeth are compared to Figure 3?	No. Replace starter and then go to step 10

Step	Action	Decision
10	Build date inspection:	Yes. Step 11
	Inspect truck or bus build date Was the truck or bus build on or BEFORE 5/31/2015 ?	No. Repair complete

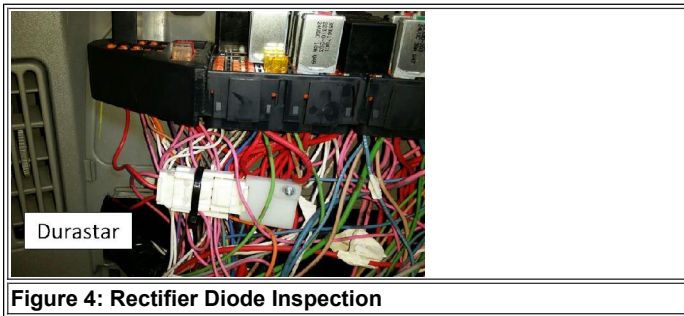


Figure 4: Rectifier Diode Inspection

Step	Action	Decision
11	Overlay harness inspection: Inspect for previously installed rectifier diode assembly -CE Bus located on trunk of harness under dash next to cowl on driver side -Durastar located near relay block Is the overlay harness with rectifier diode installed when compared to Figure 4?	Yes. Repair complete (state in warranty claim the harness was installed prior to repair)
		No. Follow instructions Click Here

WARRANTY INFORMATION

Any of the following symptoms should be documented in notes on the warranty claim

- Click
- Clunk
- Grind
- Squeal
- Slow engine crank
- Click no-crank
- No-click no-crank
- Crank no-start

Warranty Claim Coding:

Group:	08540- Cranking System
Noun:	202- Motor, Starter

Standard Repair Times:

Description	Chassis	Engine	SRT	
Starter Diagnostics	CE Bus	Cummins ISB	GY08-2202A	<i>SRT Times</i>
Starter Diagnostics	4300	Cummins ISB	KL08-2202A	
Starter Motor Replacement	CE Bus	Cummins ISB	GY08-4202SB	
Starter Motor Replacement	4300	Cummins ISB	KL08-4202SB	
Automatic Transmission (Removal & Reinstall)	CE Bus	Cummins ISB	GY13-9114SB	
Automatic Transmission (Removal & Reinstall)	4300	Cummins ISB	KL13-9114SB	
Flexplate Replacement	CE Bus	Cummins ISB	GY13-9114SB-1	
Flexplate Replacement	4300	Cummins ISB	KL13-9114SB-1	

OTHER RESOURCES

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