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Other Languages:	NONE	**Author**:	Andrew Boyd
Viewed:	15663		

Less Info

Title: ISB Starting System Diagnostics

Applies To: ISB Engine

CHANGE LOG

01/23/2017 - Corrected next steps under Step 7.
05/02/2016 - Author addressed feedback.
04/06/2016 - Adjusted Harness install instruction link to reduce field confusion.
04/01/2016 - Author addressed feedback.
03/30/2016 - Added diode inspection location for DuraStar on step 11. Location may vary depending on if plant or dealer installed.

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.

Following the step based procedure below will determine if there is an issue with a starter motor and help prevent warranty denials for No Trouble Found (NTF).

When testing for a Starter related failure, the technician will complete the proper **diagnostic worksheet**. Critical diagnostic testing values are to be printed and submitted with the claim.

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

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) Are there pending/active/previously active DTC's causing a crank no start?	**Yes.** Go to appropriate diagnostic manual to diagnose crank no start symptom **No.** Step 2

Step	Action	Decision
2	Manual Engine Barring Test: Have an assistant bar the engine over from the alternator pulley **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.** Does the engine rotate freely, and no clunk noise was heard?	**Yes.** (with no audible clunk noise) Go To Step 3 **Yes.** (With audible clunk noise) Go to Step 4 **No.** Diagnose engine lock up condition.

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

Step	Action	Decision
4	Perform battery test:	**Yes.** Replace ONLY failed battery and then recheck for symptom

	Follow IK0800482- Battery Testing, Diagnostics & Maintenance 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: Follow Midtronics starter cable voltage drop test Is combined + & - voltage drop greater than 0.5v?	**Yes.** Make required repair **No.** Step 6

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

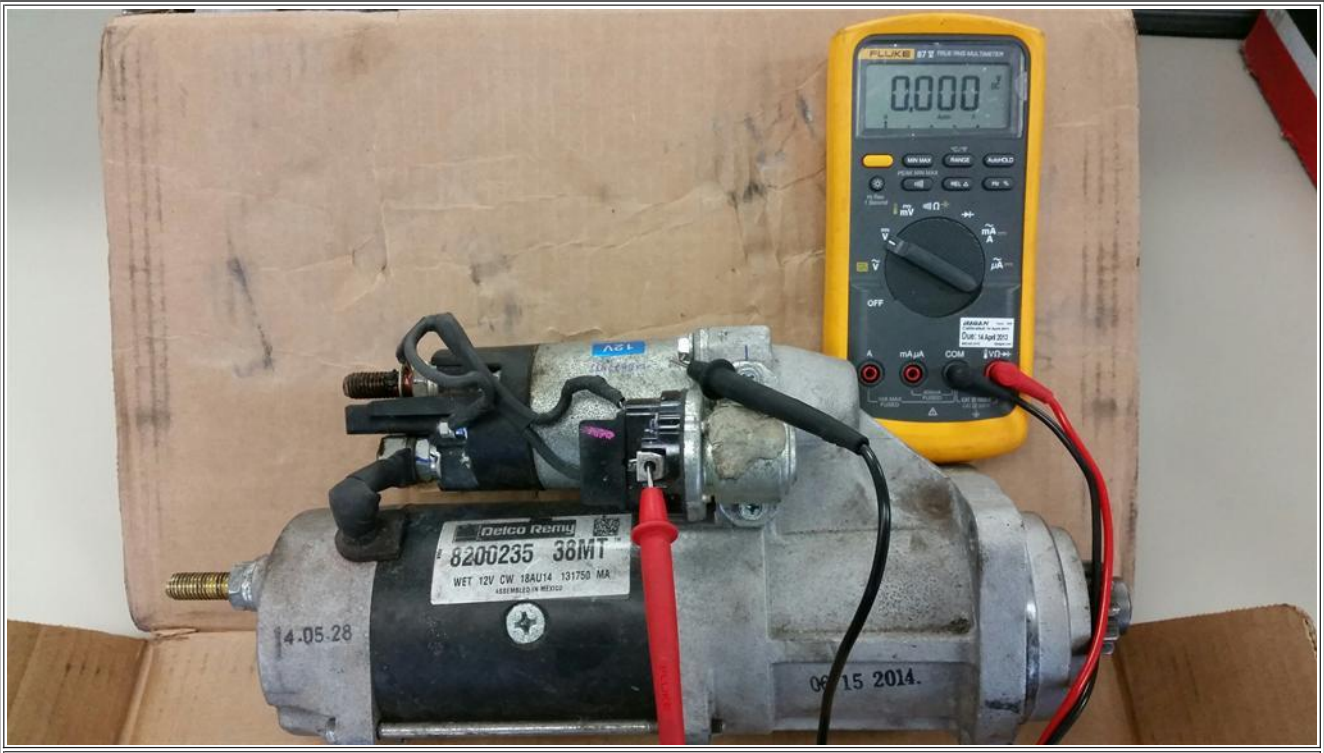

Figure 1: Starter IMS S terminal DVOM Hookup Location

Step	Action	Decision
7	Starter Control Circuit Check: 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	**Yes.** Step 8:

	Does the DVOM not read battery voltage +/-0.5 volts?	**No.** PERFORM STARTER CONTROL DIAGNOSITCS FOR POSSIBLE CAUSES. *Wiring* *F3A Fuse* *Start Relay (Neutral Relay)* *Crank Inhibit Relay* *Clutch Switch (Manual Trans)* *TCM (Auto Trans)* *ECM* *Key Switch*

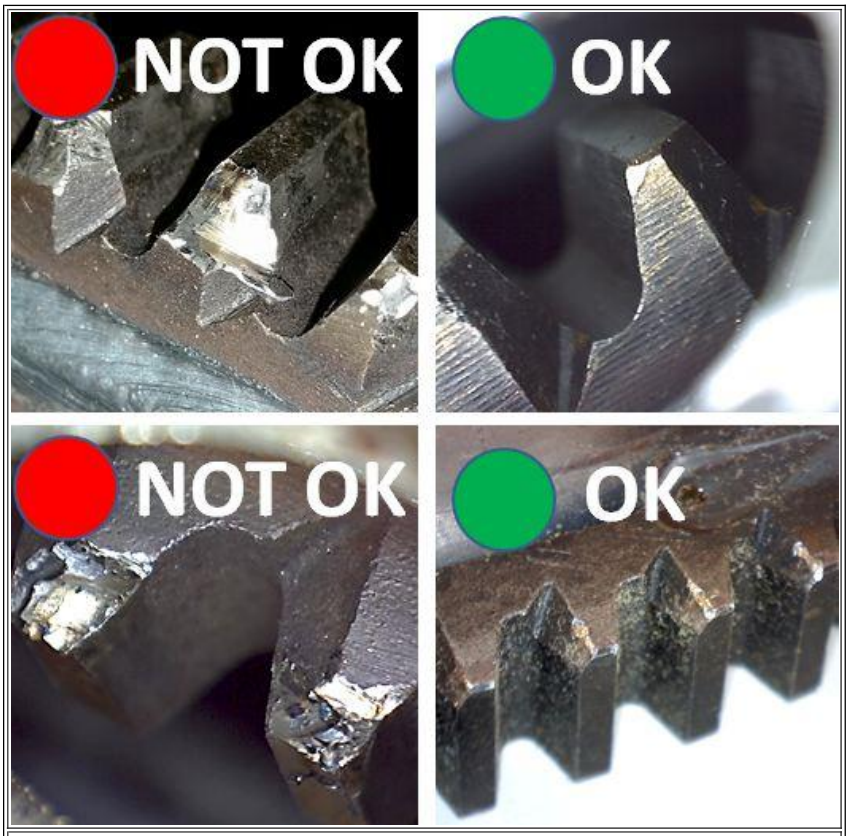

Figure 3: Flexplate/Flywheel Ring Gear

Step	Action	Decision
8	Flexplate/Flywheel Ring Gear Inspection: Remove starter Mark the flexplate ring gear with a paint pen 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?	**Yes.** Step 9 **No.** Inspect each tooth

Step	Action	Decision
9	Flexplate replacement determination:	**Yes.** Replace flexplate & starter and then go to step 10 **(Manual Transmission equipped vehicles End diagnostics here)**

	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 **(Manual Transmission equipped vehicles End diagnostics here)**

Step	Action	Decision
10	Build date inspection: Inspect truck or bus build date Was the truck or bus build on or **BEFORE 5/31/2015**?	**Yes.** Step 11 **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, or located beneath the dash by the steering column. 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 **(Manual Transmission equipped vehicles do not click for instructions end diagnostics)**

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	SRT Times
Starter Diagnostics	4300	Cummins ISB	KL08-2202A	

Starter Motor Replacement (SRT Not allowed w/ Transmission Removal)	CE Bus	Cummins ISB	GY08-4202SB
Starter Motor Replacement (SRT Not allowed w/ Transmission Removal)	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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