



**Countries:** CANADA, UNITED STATES **Document ID:** IK0800503  
**Availability:** ISIS, Bus ISIS, FleetISIS **Revision:** 15  
**Major System:** ELECTRICAL SYSTEM **Created:** 10/22/2014  
**Current Language:** English **Last Modified:** 2/24/2016  
**Other Languages:** NONE **Author:** David Smith  
**Viewed:** 9173

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Coding Information

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**Title:** ISB Starting System Diagnostics

**Applies To:** ISB Engine

## CHANGE LOG

- 02/24/2016 - Adjusted special tool description, and responded to feedback.
- 12/11/2015 - Added a note about manual transmission equipped vehicles in diagnostics. Added Starter diagnostic worksheet to this iKnow to match starter process for all other vehicles per feedback request.
- 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

## 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
<a href="#">Midtronics ESP</a>		

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

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

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

Step	Action	Decision
4	Perform battery test:	<b>Yes.</b> Replace <b>ONLY</b> failed battery and then recheck for symptom

<p>Follow <a href="#">IK0800482- Battery Testing, Diagnostics &amp; Maintenance</a></p> <p>Is a warranty approval code (WAC) or failed battery result from any battery generated?</p>	<p><b>No.</b> Step 5</p>
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Step	Action	Decision
5	Starter Cable Voltage Drop Test:	<b>Yes.</b> Make required repair
	Follow Midtronics starter cable voltage drop test	<b>No.</b> Step 6
	Is combined + & - voltage drop greater than 0.5v?	

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



Figure 1: Starter IMS S terminal DVOM Hookup Location

Step	Action	Decision
7	<p>Starter Control Circuit Check:</p> <p>Connect DVOM test leads on IMS (Mag switch) "S terminal" and ground to solenoid case as indicated in Figure 1</p> <p>Have an assistant hold keyswitch in start position for 5 seconds.</p> <p>Compare DVOM IMS (Mag switch) "S terminal" reading to B+ voltage at batteries</p>	<p><b>Yes.</b> Perform starter control diagnostics for possible causes:</p> <ul style="list-style-type: none"> <li>Wiring</li> <li>F3A Fuse</li> <li>Start Relay (Neutral Relay)</li> <li>Crank Inhibit Relay</li> <li>Clutch Switch (Manual Trans)</li> <li>TCM (Auto Trans)</li> <li>ECM</li> <li>Key Switch</li> </ul>

No. Step 8

Does the DVOM not read battery voltage +/-0.5 volts?

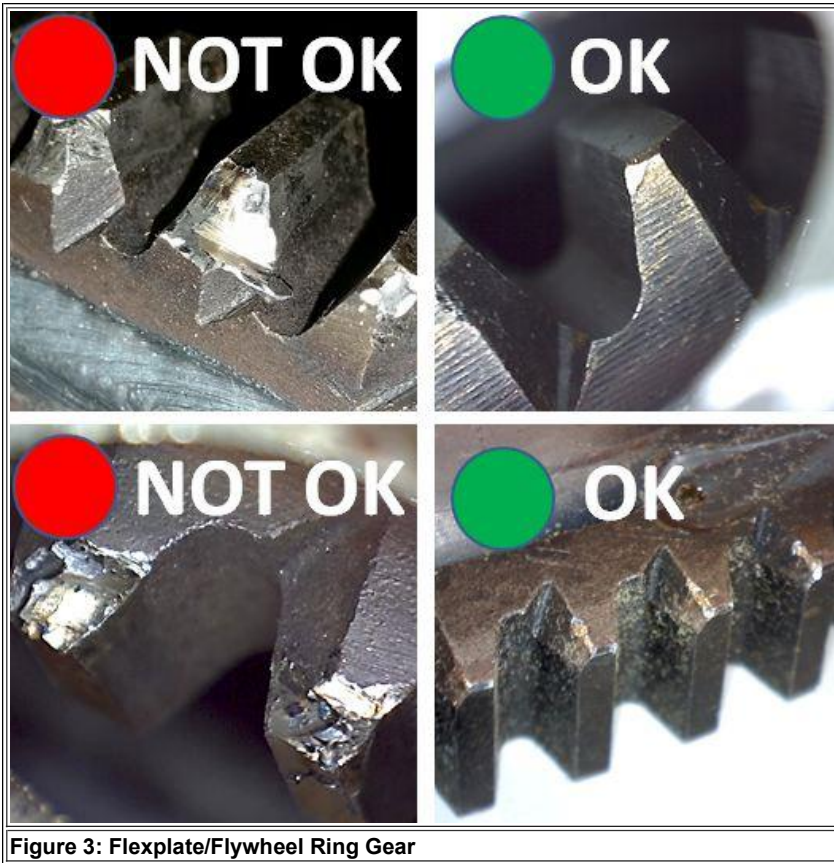


Figure 3: Flexplate/Flywheel Ring Gear

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)  <b>TIP: This can be done as a one man operation using a borescope or by looking through the starter mount hole</b>  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 ( <b>Manual Transmission equipped vehicles End diagnostics here</b> )
	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 ( <b>Manual Transmission equipped vehicles End diagnostics here</b> )

Step	Action	Decision
10	Build date inspection:	Yes. Step 11

Inspect truck or bus build date  Was the truck or bus build on or <b>BEFORE 5/31/2015</b> ?	No. Repair complete
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**Figure 4: Rectifier Diode Inspection**

Step	Action	Decision
11	<b>Overlay harness inspection:</b>  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?	<b>Yes.</b> Repair complete (state in warranty claim the harness was installed prior to repair)
		<b>No.</b> Follow instructions <a href="#">Click Here</a> ( <b>Manual Transmission equipped vehicles do not click for instructions end diagnostics</b> )

## 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:

<b>Group:</b>	08540- Cranking System
<b>Noun:</b>	202- Motor, Starter

### Standard Repair Times:

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

Automatic Transmission (Removal & Reinstall)			
Flexplate Replacement	CE Bus	Cummins ISB	<a href="#">GY13-9114SB-1</a>
Flexplate Replacement	4300	Cummins ISB	<a href="#">KL13-9114SB-1</a>

## **OTHER RESOURCES**

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