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|---|---|---|---|
| **Countries:** | CANADA, UNITED STATES | **Document ID:** | IK0800503 |
| **Availability:** | ISIS, Bus ISIS, FleetISIS | **Revision:** | 4 |
| **Major System:** | ELECTRICAL SYSTEM | **Created:** | 10/22/2014 |
| **Current Language:** | English | **Last Modified:** | 4/3/2015 |
| **Other Languages:** | NONE | **Author:** | David Horner |
| **Viewed:** | 1921 | | |

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**Title: ISB Starting System Diagnostics**

**Applies To: ISB Engine**

## CHANGE LOG

04/02/2015- Removed flexplate face to face measurement and updated diagnostic steps. Added ring gear damage acceptance chart and image for voltage check
01/22/2015- Changed flexplate face to face depth measurement replacement guideline to measurement with no action required
12/05/2014- Inserted flexplate face to face depth measurement replacement guideline
10/23/2014- Initial Article Release

## 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.

## 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
- Slow Engine Crank
- Click No-Crank
- No-Click No-Crank
- Crank No-Start

## SPECIAL TOOLS / SOFTWARE

| Tool Description | Tool Number | Comments | Instructions |
|---|---|---|---|
| Cummins Insite | | Cummins Tool | |
| Midtronics ESP | | | |
| DVOM | | Obtain Locally | |

Tools Resource Center

## SERVICE PARTS INFORMATION

| Kit Description | Part Number | Quantity | Notes |
|---|---|---|---|
| MOTOR,STARTING 12V , 38MT DELCO | 8201039 | 1 | Order Critical Truck Down Next Day Air |
| Flexplate (Automatic Transmission) | 3968672 | 1 | Order from Cummins |

## DIAGNOSTIC STEPS

| Step | Action | Decision |
|---|---|---|
| 1 | **Diagnostic Trouble Code Check:**<br><br>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)<br><br>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<br><br>**No**. Step 2 |

| Step | Action | Decision |
|---|---|---|
| 2 | **Cranking RPM Test:**<br><br>Monitor Engine RPM using Cummins Insite while cranking the engine<br><br>Does the engine crank at ~150RPM or more during the check? | **Yes**. Go to appropriate Cummins crank no start diagnostic<br><br>**No**. Step 3 |

| Step | Action | Decision |
|---|---|---|
| 3 | **Manual Engine Barring Test:**<br><br>Have an assistant bar the engine over from the alternator pulley<br><br>Does the engine rotate freely? | **Yes**. Step 4<br><br>**No**. Diagnose engine lock up condition. |

| Step | Action | Decision |
|---|---|---|
| 4 | **Perform battery test:**<br><br>Before testing batteries, inspect each cable end nut torque, insulation, routing, clipping, discoloration, and terminal arching<br><br>Follow IK0800482- Battery Testing, Diagnostics & Maintenance<br><br>Save screenshot of results (IK2700003- Midtronics Screen Print)<br><br>Is a warranty approval code (WAC) or failed battery result from any battery generated? | **Yes**. Replace ONLY failed battery and then recheck for symptom<br><br>**No**. Step 5 |

| Step | Action | Decision |
|---|---|---|
| 5 | **Alternator Cable Voltage Drop Test:** | **Yes**. Make required repair |

| | | |
|---|---|---|
| | Before performing any voltage drop test; inspect each cable end nut torque, insulation, routing, clipping, discoloration, and terminal arching<br><br>Follow Midtronics IK0800403- Alternator Troubleshooting Steps 12 and 13 for positive and negative cable voltage drop readings<br><br>Save screenshot of results (IK2700003- Midtronics Screen Print)<br><br>Does the Alternator Voltage Drop Test fail? | **No**. Step 6 |

| Step | Action | Decision |
|---|---|---|
| 6 | **Starter Cable Voltage Drop Test:**<br><br>Before performing any voltage drop test; inspect each cable end nut torque, insulation, routing, clipping, discoloration, and terminal arching<br><br>Follow IK0800407- Starter Diagnostics and Warranty Claim Procedure<br><br>Save screenshot of results (IK2700003- Midtronics Screen Print)<br><br>Does the Starter Cable Voltage Drop Test fail? | **Yes**. Make required repair<br><br>**No**. Step 7 |

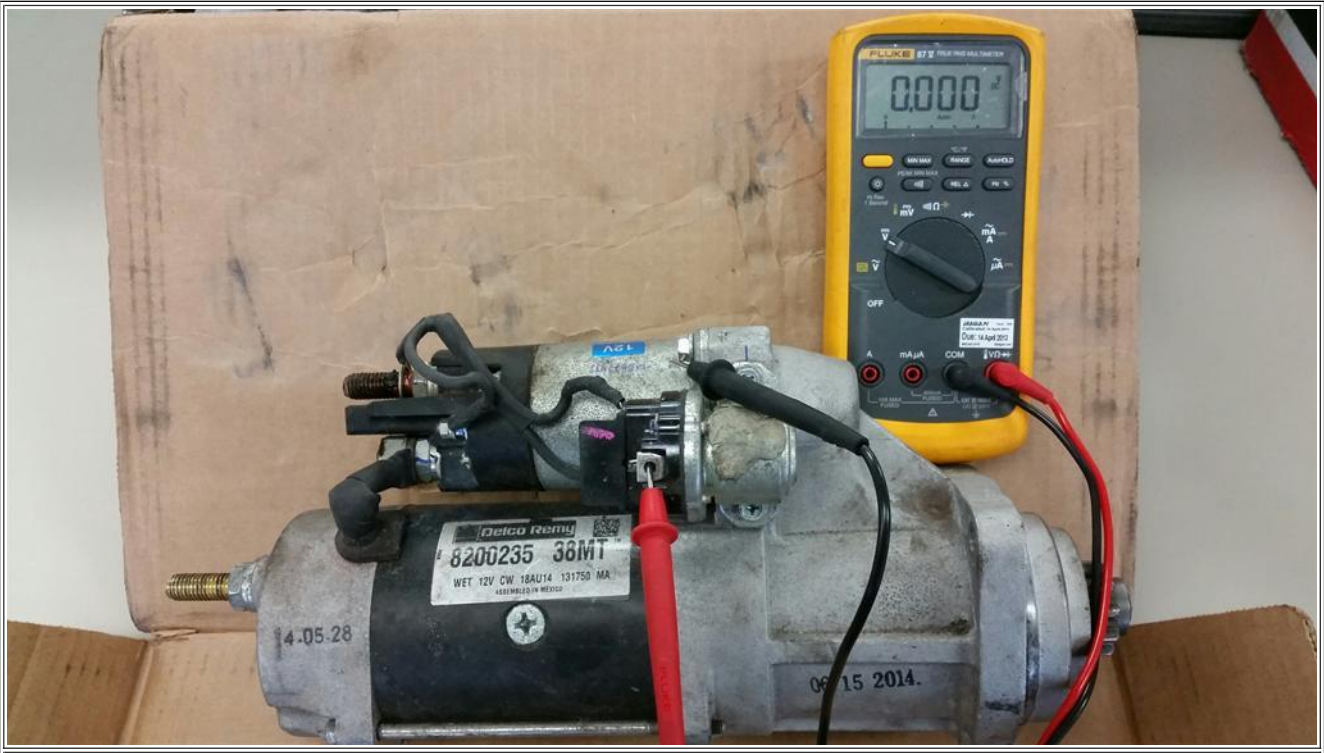


**Figure 1: Starter IMS S terminal DVOM Hookup Location**

| Step | Action | Decision |
|---|---|---|
| 7 | **Starter Control Circuit Check:**<br><br>Before performing Starter Control Circuit Check; inspect each wire end nut torque, insulation, routing, clipping, discoloration, and terminal arching.<br><br>Connect DVOM test leads on IMS (Mag switch) "S terminal" and ground to solenoid case as indicated in Figure 1 while having an assistant hold keyswitch in start position for 5 seconds. | **Yes**. Perform starter control diagnostics for possible causes:<br><br>*Wiring*<br>*F3A Fuse*<br>*Start Relay (Neutral Relay)*<br>*Crank Inhibit Relay*<br>*Clutch Switch (Manual Trans)*<br>*Trans Control Module (Auto Trans)* |

| | | |
|---|---|---|
| | Compare DVOM to B+ at batteries<br><br>Does the DVOM not read battery voltage +/-0.5 volts? | *Key Switch*<br>**No**. Step 8 |

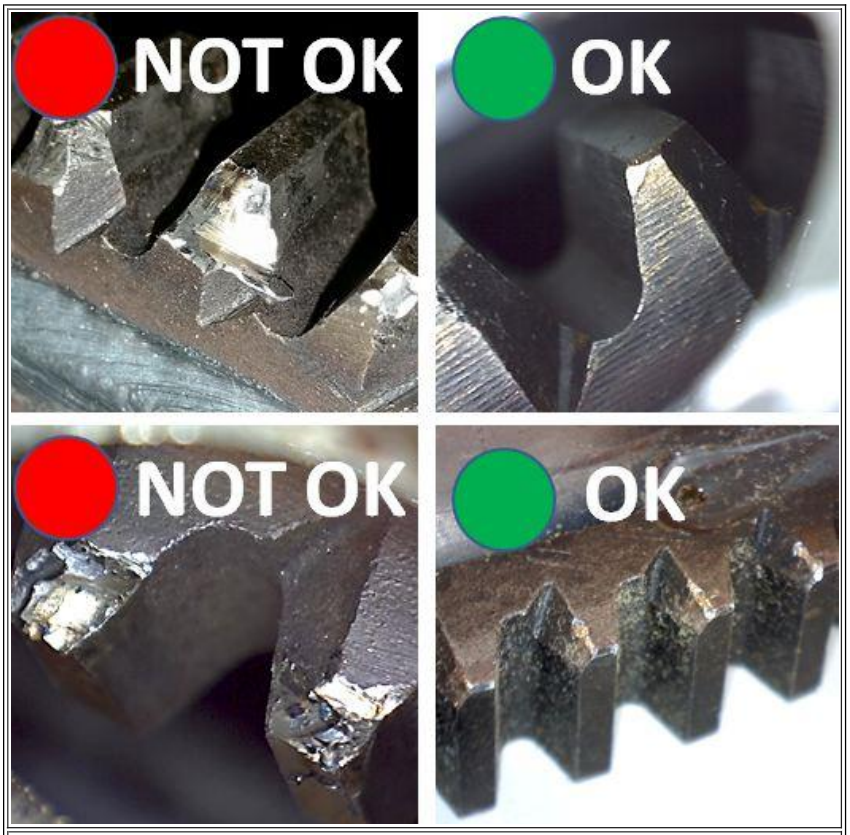


**Figure 3: Flexplate/Flywheel Ring Gear Acceptance**

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

| Step | Action | Decision |
|---|---|---|
| 9 | **Repair:**<br><br>Does the flexplate need to be replaced? | **Yes**. Replace flexplate & starter<br><br>**No**. Replace starter |

## 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 | Hours |
|---|---|---|---|---|
| Starter Diagnostics | CE | Cummins ISB | GY08-2202A | 0.9 |
| Starter Diagnostics | 4300, Durastar | Cummins ISB | KL08-2202A | 0.9 |
| Starter Motor Replacement | CE | Cummins ISB | GY08-4202SB | 0.8 |
| Starter Motor Replacement | 4300, Durastar | Cummins ISB | KL08-4202SB | 1.1 |
| Automatic Transmission (Removal & Reinstall) | CE, 4300, Durastar | Cummins ISB | A13-3101 | 5.0 |
| Flexplate Replacement | CE, 4300, Durastar | Cummins ISB | A13-101-3 | 0.4 |

## OTHER RESOURCES

Master Service Information Site

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|---|---|---|---|
| | U00T714 | You received the following feedback From: U00T714 - Bryan Fresse Email Address: Bryan.Fresse@navistar.com Job Classification: SE008, Service Technician Dealer: Field Personnel Feedback: correct SRT for CE bus with ISB transmission- GY13-9114SB. add on GY13-9114SB for flex plate. | 4/21/2015 8:29:31 AM |
| | U00T714 | You received the following feedback From: U00T714 - Bryan Fresse Email Address: Job Classification: SE008, Service Technician Dealer: Field Personnel Feedback: durastar with ISB Transmission srt- KL13-9114SB. flex plate- KL13-9114SB-1 | 4/21/2015 8:31:14 AM |