



Countries: CANADA, UNITED STATES **Document ID:** IK0800503
Availability: ISIS, Bus ISIS, FleetISIS, NotSIR **Revision:** 28
Major System: ELECTRICAL SYSTEM **Created:** 10/22/2014
Current Language: English **Last Modified:** 1/3/2019
Other Languages: NONE **Author:** Charles Schroeder
Viewed: 22773

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Coding Information

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Title: ISB Starting System Diagnostics**Applies To:** ISB Engine

Change Log

Please refer to the change log text box below for recent changes to this article:

01/03/2019 - Added note under diagnostics "Failure to follow all steps may result in a repeat failure."
11/29/2018 - Updated MidTronics Instruction Manual Hyperlinks.
08/23/2018 - Updated voltage check on Step 7 for clarification based on dealer feedback. Removed date from Step 10 and added feature code for improved vehicle identification.
09/22/2017 - Author updated for feedback purposes.
01/23/2017 - Corrected next steps under Step 7.

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. Steps 10 and 11 only apply to vehicles with feature code '0508051 - Electrical system MUX fror BC prog only', which are 250k Baud rate vehicles.

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	Instructions
Cummins Insite		Cummins Engine Diagnostic Software	
MidTronics inTellec EXP battery and electrical diagnostic tester	EXP-1000-HD-NAV		Instruction Manual

[Service Tool Resource Center](#)

Service Parts Information

Kit Description	Part Number	Package Quantity	Source From	Notes
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.

Failure to follow all steps may result in a repeat failure.

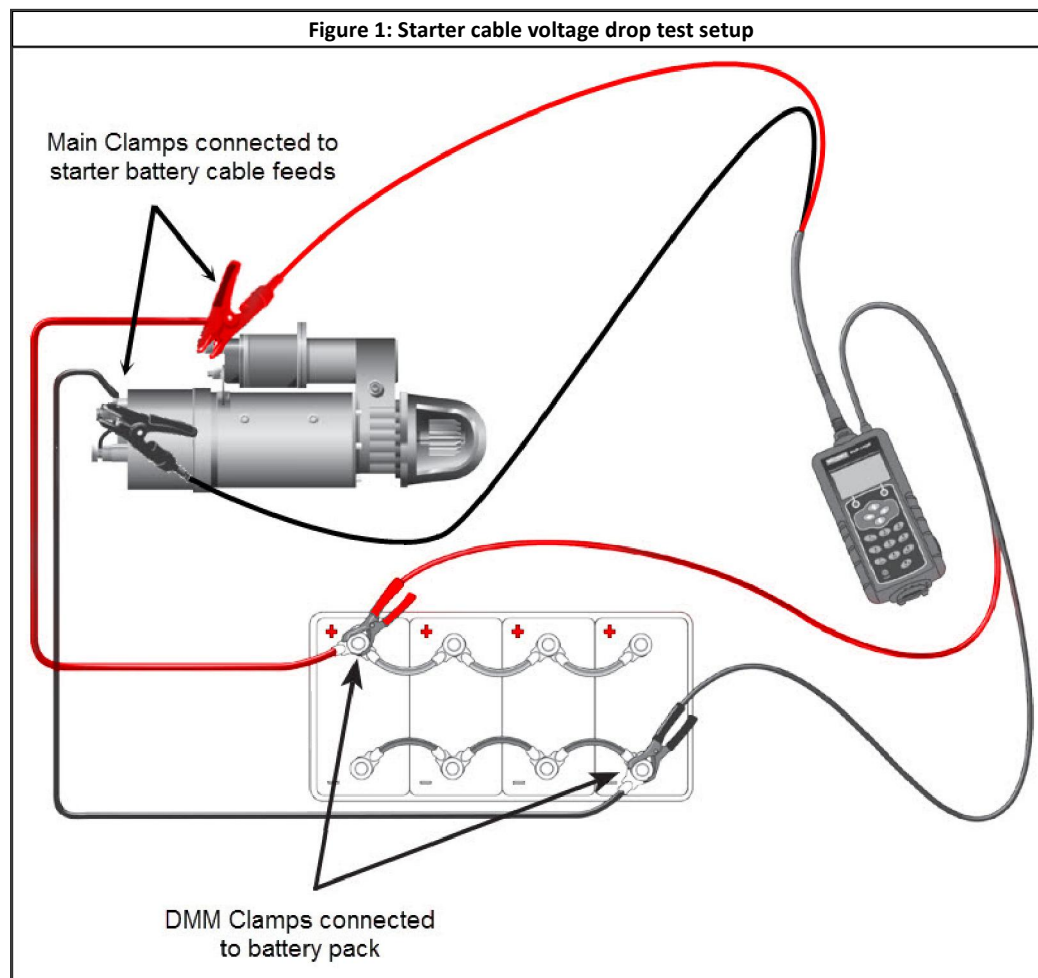
Step	Action	Decision
1	Diagnostic Trouble Code Check: Review current health report for fault codes that may cause an extended crank condition (Crankshaft Position Sensor, Camshaft Sensor, Fuel System, Electrical codes) Are there pending/active/previously active DTC's causing a crank no start?	Yes: Go 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?	Yes: Step 3
		No: Diagnose engine lock up condition.

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

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

Figure 1: Starter cable voltage drop test setup

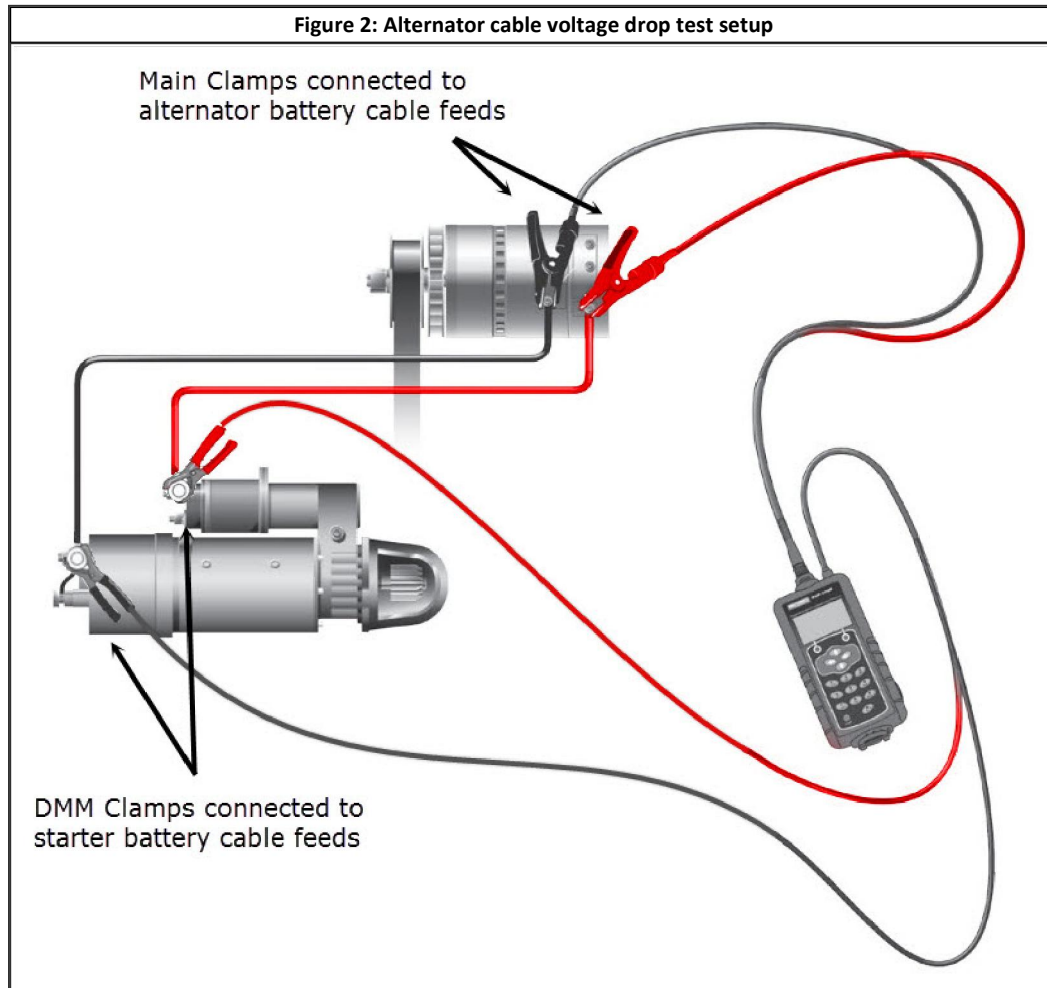


Step	Action	Decision
5	Starter Cable Voltage Drop Test: Follow Midtronics starter cable voltage drop test The test sends a signal through the circuit at the component under test. The tester then simultaneously calculates voltage drop on the positive (+) and negative (-) sides of any circuit as well as the total voltage drop.	Yes: Make required repair to the cable with the excessive voltage drop
	EXAMPLE STARTER CIRCUIT TESTER CIRCUIT DROP: 0.380 + DROP: 0.150 - DROP: 0.150 A PRINT END Voltage drop across positive side of circuit Voltage drop across negative side of circuit Total circuit voltage drop Is total circuit voltage drop greater than 1.0v?	No: Step 6

NOTE:

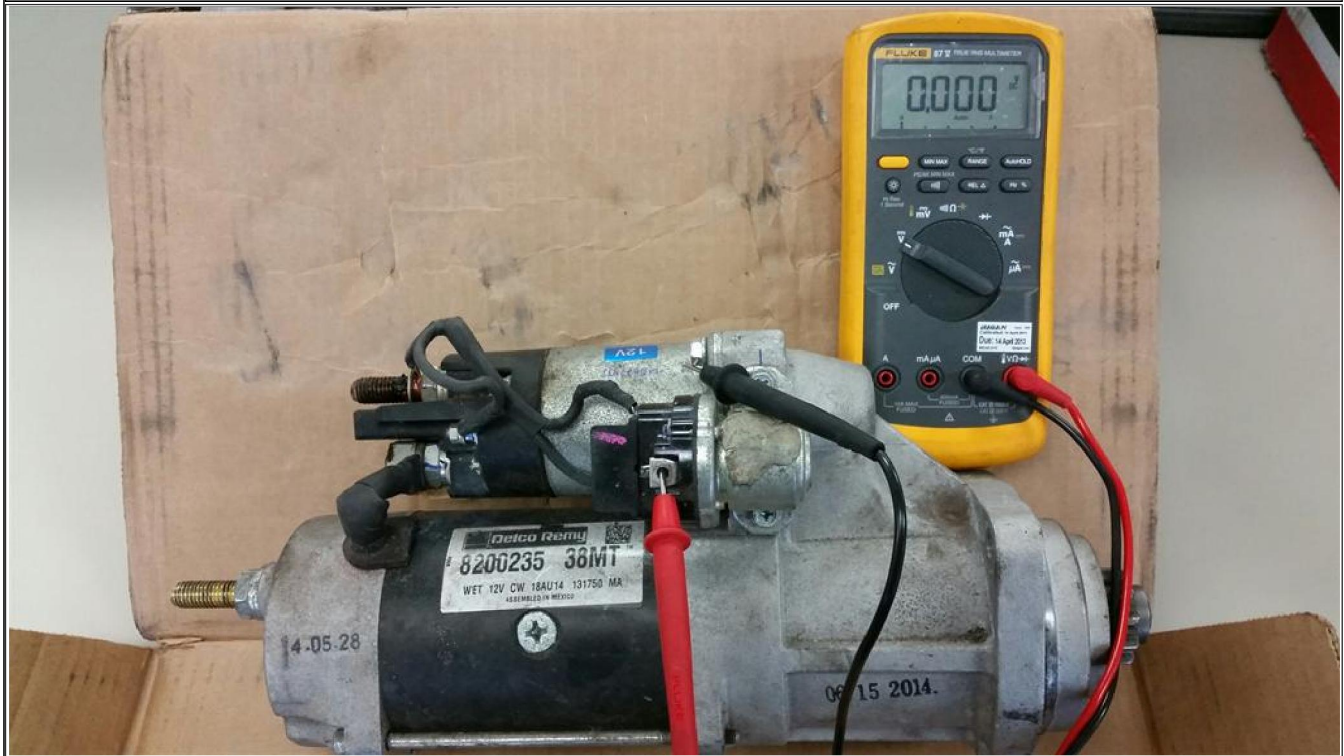
This procedure is outlined in Chapter 6 of the [Midtronics Instruction Manual](#)
Refer to Image 2 above for connecting the tester

Figure 2: Alternator cable voltage drop test setup



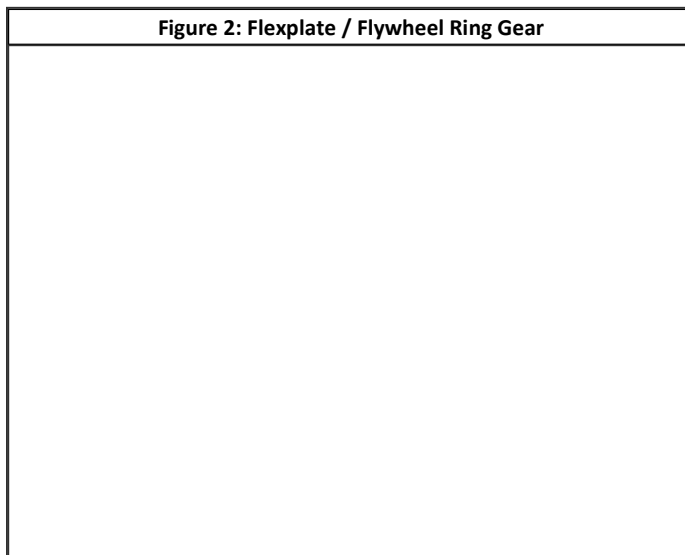
Step	Action	Decision
6	Alternator Cable Voltage Drop Test: Follow Midtronics alternator cable voltage drop test The test sends a signal through the circuit at the component under test. The tester then simultaneously calculates voltage drop on the positive (+) and negative (-) sides of any circuit as well as the total voltage drop. EXAMPLE STARTER CIRCUIT CIRCUIT DROP: 0.30V + DROP: 0.15V - DROP: 0.15V A PRINT END Total circuit voltage drop Voltage drop across positive side of circuit Voltage drop across negative side of circuit Is total circuit voltage drop greater than 1.0v? NOTE: This procedure is outlined in Chapter 6 of the Midtronics Instruction Manual Refer to Image 3 above for connecting the tester	Yes: Make required repair to the cable with the excessive voltage drop
		No: Step 7

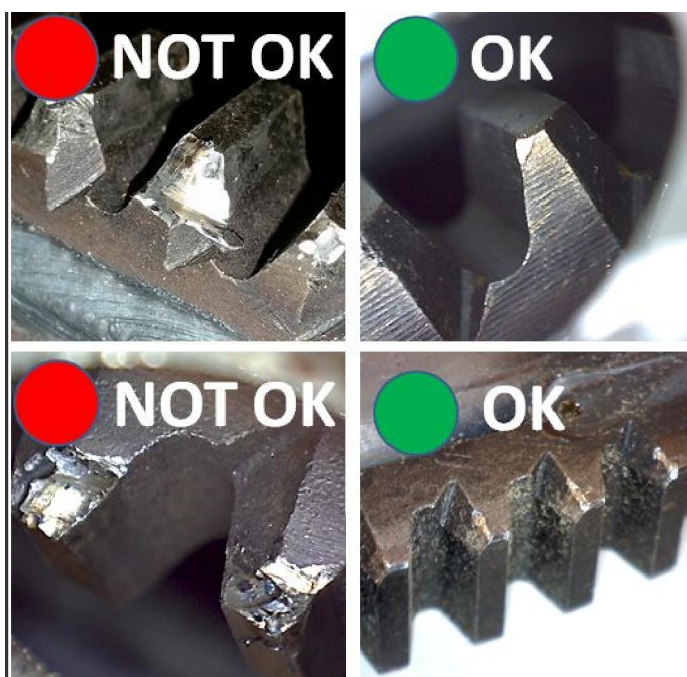
Figure 4: Starter IMS S terminal DVOM Hookup Location



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. Is measured voltage less than 9v?	Yes: Perform starter control diagnostics for possible causes: • Wiring • F3A Fuse • Start Relay (Neutral Relay) • Crank Inhibit Relay • Clutch Switch (Manual Trans) • TCM (Auto Trans) • ECM • Key Switch No: Step 8

Figure 2: Flexplate / Flywheel Ring Gear



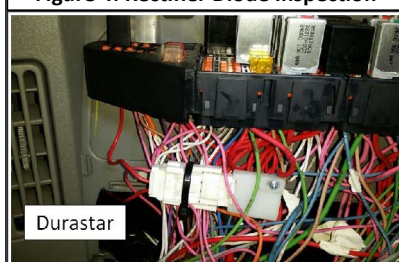


Step	Action	Decision
8	Ring Gear Inspection: Remove starter. Mark the flexplate ring gear with a paint pen. Have an assistant bar the engine over while you inspect each tooth for damage: burrs, milling, chips, etc. (Figure 2) TIP: This can be done as a one man operation using a borescope or by looking 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: Does the flexplate need to be replaced when ring gear teeth are compared to Figure 3?	Yes: Replace flexplate & starter and then go to step 10 (Manual Transmission equipped vehicles End diagnostics here)
		No: Replace starter and then go to step 10 (Manual Transmission equipped vehicles End diagnostics here)

Step	Action	Decision
10	Feature code inspection: Inspect truck or bus feature code for 250k baud rate identification. Does the truck or bus have feature code 0508051 ? NOTE: 0508051 indicated the vehicle is 250k baud rate	Yes: Step 11
		No: Repair complete

- The feature codes are listed in the components tab of the vehicle information page in Service Portal
- This inspection will not apply to 500k baud rate vehicles

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: Click Here and follow instructions to add Rectifier Diode (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	
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Other Resources

[Master Service Information Site](#)

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