Freightliner LLC New Vehicle and Aftermarket Parts Limited Warranties warrant that Freightliner LLC products will be free from defects in material and workmanship that occur under normal use within the applicable warranty period, subject to certain limitations and exclusions as specified in the Warranty Manual.

This Warranty Evaluation Guide applies to Remy 38MT and 39 MT series starters, and it differentiates warrantable and non-warrantable starter failures. Many warrantable starter failures may have similar vehicle symptoms to non-warrantable failures: be sure to thoroughly examine the starter for non-warrantable conditions. (See section 1 of the Warranty Manual and sections 15.03.03 to 15.03.06 of this document for a description of damages excluded from warranty).

Always follow the troubleshooting instructions in the appropriate Workshop Manual. **Starters damaged during removal or installation are not warrantable and should not be submitted for warranty claims.**

Operators should always follow the starting instructions in the Driver's Manual. Failure to do so will damage the starter and void the warranty. **Starters damaged by abnormal operation are not warrantable, and should not be submitted for warranty claims.**

Use quality test equipment. Accuracy of warranty checks depends upon the proper use of quality test equipment that is maintained and calibrated. This guide presumes that the technician will use a high quality multi-meter. (In addition, a technician may evaluate a starter with a Delco Remy bench-top tester where available.) If warranty checks are not completed with quality test equipment then warranty may not be assessed correctly.

Numerous starting problems are caused by a problem outside the starter. Analysis indicates that about 1 out of every 5 starters returned for warranty is fully operational. **Submitting a fully operational starter for a warranty claim will be returned as trouble not found.**

Before replacing a starter, verify that there are **no other causes of starting trouble** such as:

- **Batteries.** All the batteries must be fully charged. U.S. and Canadian dealers must use a Midtronics battery tester; each battery must have a result of "Good Battery." (See section 54 of Workshop/Service Manual of the vehicle being serviced for complete details on Battery diagnosis and charging, and optional diagnostic procedures for outside of the USA & Canada.)

- **Cables.** The cables must not be damaged or broken.

- **Cable connections.** All connections at the alternator, starter, battery, frame rail terminal, battery cut-off switch, and all cable junctions (depopulation studs) must be clean and tightened to the proper torque. (See section 15 of Workshop/Service and Maintenance Manual for the vehicle being serviced for details on maintaining connections.)

- **Switches.** The magnetic switch, ignition switch, and battery cut-off switch must be operating correctly. (See section 54 of the Workshop/Service, for the vehicle being serviced for complete details on troubleshooting the magnetic switch.)

Definitions

Click, no-crank: The starter solenoid will click and actuate the drive assembly, but the starter motor will not crank. This is caused by either a faulty motor or a tooth abutment.

Closed Switch: The switch position that completes the circuit and allows current to pass

Continuity: A completed electrical path between two points in a circuit; no opens or breaks between two points.

Continuity Test: Using a digital multimeter to confirm continuity.

Gear Reduction Starter: Starter equipped with a gear reduction drive between the motor and pinion. This includes Remy 29MT, 38MT and 39MT series starters. Gear reduction starters are also known as planetary gear starters.

No-click, no-crank: The starter solenoid will not click, because the solenoid will not actuate the drive assembly, and the starter motor will not crank.

Non-pressure side: Refers to the side of the pinion tooth that does not contact the ring gear while the engine is being cranked (Fig. A, Ref 2).

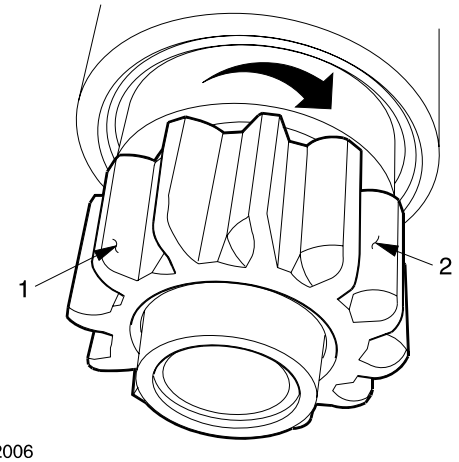

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Figure A. Starter pinion gear with clockwise rotation. Reference 1 is the pressure side of the pinion tooth, and reference 2 is the non-pressure side of the pinion tooth.

Observations: Any indications that can be seen or measured with tools available at all repair facilities.

Open circuit: No electrical path between two points, thus no current flow.

Pinion: The gear on the starter that engages the flywheel (Fig. A).

Planetary gear starter: See gear reduction starter.

Pressure side: Refers to the side of the pinion tooth that contacts the ring gear while the engine is being cranked (Fig. A, Ref. 1).

Short circuit: A path of lower resistance that causes current to bypass the intended circuit.

Slow crank: The starter will crank the engine slowly such that the engine does not turn fast enough to start (Also known as: hard starting and sluggish cranking).

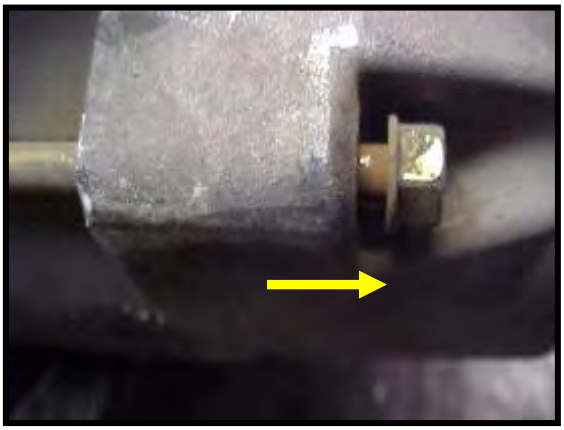
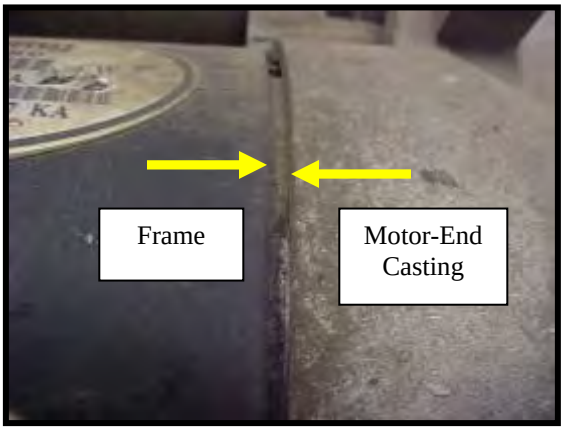
Straight drive starter: The starter motor directly drives the pinion gear without gear reduction. This includes 41MT and 42MT starters.

Symptom: Abnormal operation noticed by the operator.

Tooth abutment: The pinion extends and contacts the ring gear but the gears do not mesh.

Table of Contents

Internal Starter Failure	**Section 15.03.01**
	Damage Code: 155-001A04590
No picture.	**Vehicle Symptoms** An internal starter failure is indicated by <u>any one</u> of the following: • click, no-crank • no-click, no-crank • slow cranking • intermittent cranking • starter spins, but does not crank the engine **IMPORTANT:** The same symptoms can result from a problem outside the starter: **Before replacing the starter,** make sure there are no other causes of starting trouble (see page 1). **Post-Removal Observations** No externally visible indication of damage must be observed to confirm an internal failure (See Sections 15.03.03 to 15.03.06 below).
	Warranty Coverage: A starter with an internal failure is **warrantable**, unless a **non-warrantable** condition exists as described in sections 15.03.03 to 15.03.06 below.

Loose Through-bolts	**Section 15.03.02** **Damage Code: 155-001A04590**
 Figure 2A. Through bolt backed out.  Figure 2B. End casting separated from the frame.	**Vehicle Symptoms** Loose through bolts are indicated by slow cranking. **Post-Removal Observations** Any one of the following must be observed to confirm a loose through bolt failure: • The through bolts will be visibly loose (See Fig. 2A). • A gap will be visible between the motor-end casting and the frame (See Fig. 2B). • Starter may appear to be twisted between the drive-end casting and the motor-end casting. • Through bolt backs out completely. **Warranty Coverage**: A starter with through bolts loosened during normal operation is **warrantable**, unless a **non-warrantable** condition exists as described in sections 15.03.03 to 15.03.06. Starters with through bolts loosened by the customer or repairing dealer are **not warrantable**.

Over-crank	**Section 15.03.03**
	Damage Code: N/A

Figure 3A. Melted varnish will flow from the starter and become black from heat.

Figure 3B. Motor strap insulator discolored by over-crank. Compare this to Fig. 3C.

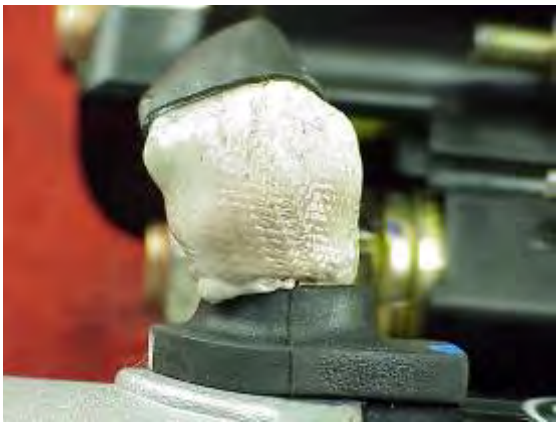


Figure 3C. A non-discolored motor strap insulator for reference.

Vehicle Symptoms

Over-crank is indicated by <u>any one</u> of the following:

- click, no-crank
- no-click, no-crank

Observations

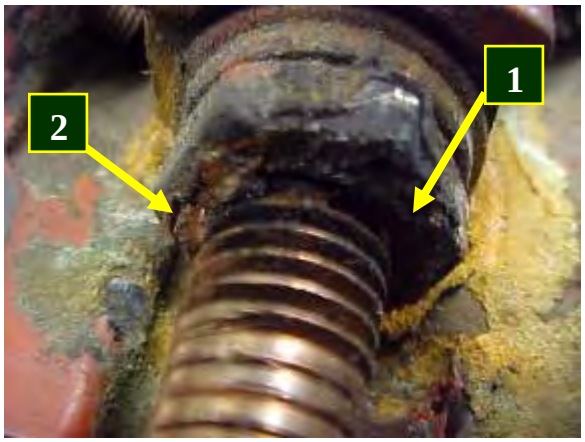
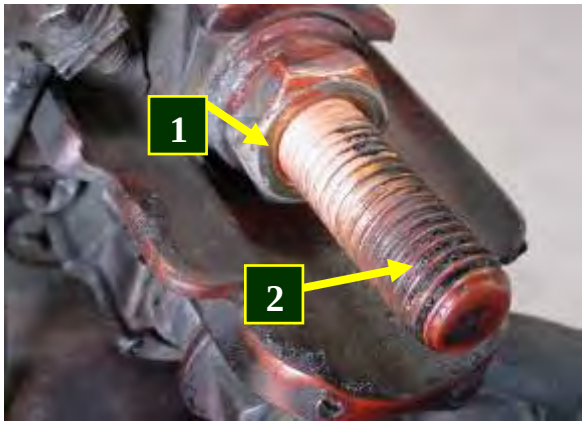
<u>All</u> of the following must be observed to confirm overcrank:

- varnish melted and became black on the outside of the starter housing (Fig. 3A)
- motor strap insulator discoloration (Fig.3B)

Warranty Coverage:

Over-cranked starters are **not warrantable,** because the operator caused the failure by the holding the ignition switch for too long when the engine would not start.

IMPORTANT: The Driver's Manual states: Do not crank the engine for more than 30 seconds at a time, and wait two minutes after each try to allow the starter to cool. Failure to do so will cause a non-warrantable over-crank failure.

Loose B+ Terminal	**Section 15.03.04** **Damage Code:** **155-001085690 (corroded), or** **155-001085950 (loose)**
 Figure 4A. This B+ terminal has evidence that the terminal nut became loose. The rust and dirt build-up on the terminal's contact surface (Ref. 1) and arcing marks (Ref. 2) indicate poor contact between the cable and B+ terminals.  Figure 4B. Clean and tight B+ terminal. Notice that there is a clean contact surface on the jam nut, the terminal is not corroded (Ref. 1) and there is a normal accumulation of dirt (Ref. 2).	**Vehicle Symptoms** A loose B+ terminal is indicated by <u>any one</u> of the following: • Intermittent "no-click, no-crank;" • Sluggish cranking. **Post-Removal Observations** <u>Any one</u> of the following must be observed to confirm that the B+ terminal became loose: • Rust and/or dirt build-up on the terminal jam-nut's contact surface (Fig. 4A, Ref. 1). • Arcing marks on terminal (Fig. 4A, Ref. 2). **Warranty Coverage** A starter with evidence of a Loose B+ is **warrantable** if the failure occurs within the vehicle's initial operating period. (Refer to the Initial Operating Period in section 1.5 of the Warranty Manual for details.) A starter with evidence of a Loose B+ is **not warrantable** if <u>any</u> of the following apply: • The starter is a replacement part. • The damage occurred after the vehicle's initial operating period. (Refer to the Initial Operating Period in section 1.5 of the Warranty Manual for details.) IMPORTANT: Terminals should be maintained periodically by removing the cable terminal and brushing off the contact surfaces according to the Maintenance Manual.

Non-Remy Starter or Incorrect Primary Failed Item (PFI)	**Section 15.03.05**
	Damage Code: N/A
 Figure 5. A non-Remy badge.	**Observations:** A non-Remy or wrong part returned is indicated by <u>any one</u> of the following: • Starter without a Remy badge or with a non-Remy badge (Fig. 5). • Starter does not have a Remy part number.
	Warranty Coverage: Components returned that do not match the part number of the primary failed item in the claim are **not warrantable**.

Damaged, Modified, Repaired, or Disassembled Starters	**Section 15.03.06**
	Damage Code: N/A
 Figure 6A. Cross-threaded and bent B+ terminal.  Figure 6B. Terminal broken during removal.  Figure 6C. A broken solenoid end cap.	**Observations** A damaged, modified, repaired, or disassembled starter is indicated by <u>any one</u> of the following: • Damaged terminals (Fig 6A & 6B). • Cracked or broken solenoid end cap (Fig. 6C). • Cracked or broken component (Fig. 6D). • Disassembled Starter (Fig. 6E). • Components missing from the starter. • Starter with Non-Remy components installed. • Other damage. **Warranty Coverage**: Disassembled, damaged, modified, or repaired starters are **not warrantable.** IMPORTANT: Excessive torque while tightening or loosening a starter terminal can cause internal damage, break the terminal, or crack the solenoid end cap.

Damaged, Modified, Repaired, or Disassembled Starters (cont.)	**Section 15.03.06 (cont.)**
	Damage Code: N/A
 Figure 6D. The drive housing on this starter was damaged.  Figure 6E. Disassembled starter.	**Observations:** Refer to the previous page. **Warranty Coverage**: Damaged, modified, repaired, and disassembled starters are **non-warrantable**.

External Solenoid Damage Due to Prolong Power Applied	**Section: 15.03.07**
 Figure 7A. Solder reflow due to excessive heat of solenoid  Figure 7B. Good solder connection  Figure 7C. Charring of the solenoid case	**Damaged Code:** N/A **Vehicle Symptoms** **Prolong Power** damage is indicated by the following: • no-click, no-crank **Observations** All of the following must be observed to confirm Prolong Power Applied: • Solenoid solder reflow due to excessive heat of solenoid (Fig. 7A) • Burnt smell in solenoid assembly • See figure 7B for good solder connection **Note:** A few Prolong Power failures will also include charring of the case (Fig. 7C). **Warranty Coverage** Starters with prolong power applied are **not warrantable as the PFI** and may have progressive damage depending on the root cause. The prolong power supplied to the pull-in coil can be caused by: • Ring gear damage (abuse) • Attempted engagement into running engine (abuse) • High Vehicle control circuit resistance creating insufficient soft-start torque thus not allowing the pinion to clear abutment while attempting to crank the engine. (Maintenance or vehicle defect)

Pinion Gear Damage.

Section 15.03.08

Damage Code: (not warrantable)

Figure 8A. Chipped pinion tooth damage is caused by the starter being cranked too soon after the previous crank (rapid reengagement). The pinion gear is damaged when coming in contact with a moving ring gear.

Figure 9 Pinion gear milling. This is caused by a pinion gear contacting a running engine.

Symptoms:

- Click, with gears grinding. Possibly intermittent.

Post Removal Observations

- Pinion gear damaged or missing**.**
- Possible ring gear damage.

Warranty Coverage:

Starter gear damage is **not warrantable as the PFI**. This type of damage is the result of driver abuse that is not warrantable, or a faulty truck electrical system. In the case of a faulty electrical system, starter damage can be claimed as progressive damage in a warrantable claim.

Pinion Shaft Damage.

Section 15.03.09

Damage Code: (not warrantable)

Figure 8B. Starter Shaft damage is caused by the starter being cranked too soon after the previous crank (rapid reengagement) or by a starter staying engaged to a running engine (extended overrun).

Symptoms:

- Click, with unengaged starter spinning
- Starter engagement problems

Post Removal Observations

- Pinion shaft and gear damaged or missing**.**
- Possible ring gear damage.

Important: Recover missing pieces of starter that may interfere with operation if still in bell housing.

Warranty Coverage:

Starter shaft damage is **not warrantable as the PFI**. This type of damage is the result of driver abuse or a faulty truck electrical system. In the case of a faulty electrical system, starter damage can be claimed as progressive damage in a warrantable claim.