

# DENSO STARTER CONDITION DIAGNOSIS

## STARTER DIAGNOSIS / TESTING

The starting system on most vehicles or engine applications requires very little maintenance. As recommended by most vehicle manufacturers (see factory service manual), a charged battery and properly maintained electrical connections can provide years of trouble-free starter service.

### Starting Circuit Basic Inspection

- Inspect and/or test battery condition
- Inspect battery terminals and cables
- Inspect and/or test ignition switch, relays, start switches, etc.
- Inspect starter motor for damaged wiring, loose connections, missing bolts, etc.
- Inspect and/or test condition of vehicle wiring

### NOTE:

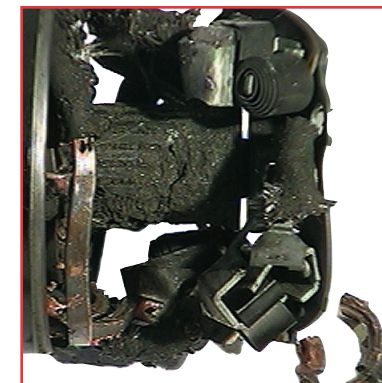
**When inspection or testing is required on any vehicle, engine, or related component part, procedures noted in the applicable factory service manual(s) should always be followed.**

## OVERRUN - EXPLODED COMMUTATOR

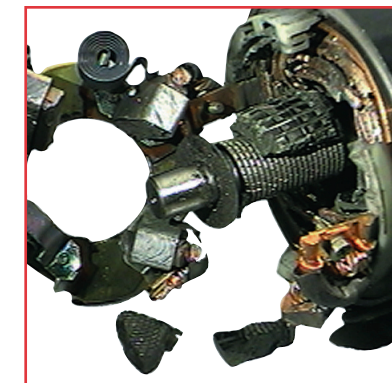
- Relay remains engaged (key switch held excessively in “start” position)
- Starter pinion turns at flywheel speed (engine speed)
- Commutator explodes causing damage to brushes, brush holder assembly, and commutator



Exploded commutator and brush debris.



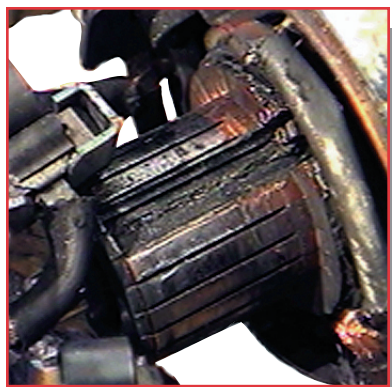
Damage to commutator brushes and brush holder assembly.



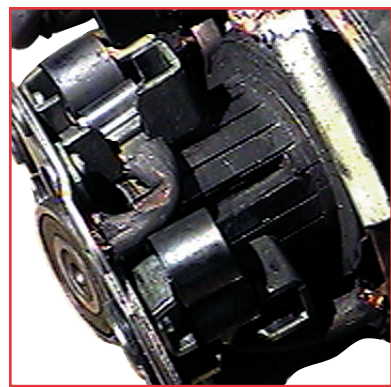
Completely exploded commutator and insulator assembly.

## CONTINUOUS CRANKING / OVERHEATED

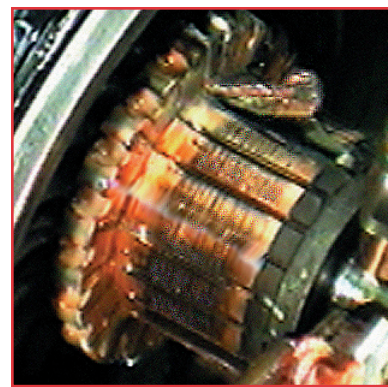
- Low battery voltage resulting in excessive current to starter motor
- Starter commutator overheated, bars on commutator lift from insulator
- Damage to brushes and/or brush holder assembly



- Commutator surface is glazed.
- Commutator segment bars missing.



- Commutator surface is burnt.
- Commutator segment bar missing.



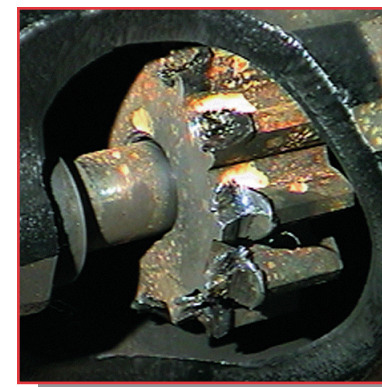
- Commutator segment bar has separated, raised and bent (distorted).

## RE-ENGAGEMENT - PINION TEETH MESHING PROBLEM

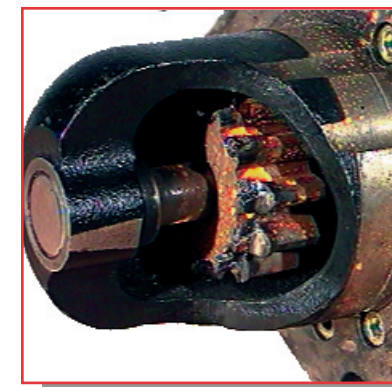
- Starter pinion teeth and flywheel do not mesh properly
- Starter pinion gear has excessive wear
- Operator error (holding the key switch in the “start” position while the engine is operating)
- Mechanical problem (ignition switch or relay contacts stuck closed)



- Minor case of re-engagement (will cause flywheel damage and have difficulty engaging into flywheel).



- Extreme case of pinion re-engagement.



- Extreme case of pinion re-engagement.

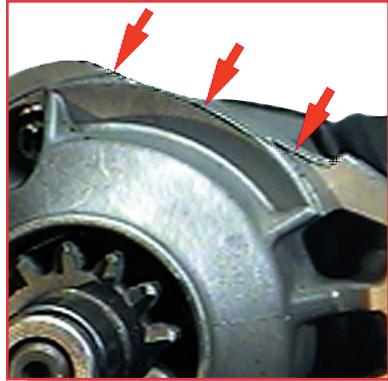
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## MODIFIED STARTER - ALTERED FROM ORIGINAL DESIGN

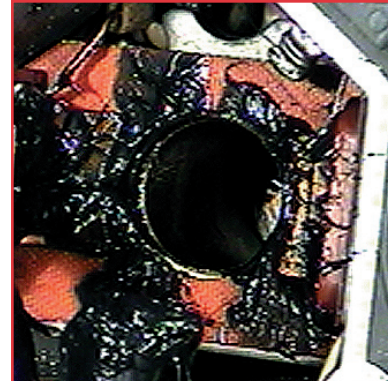
- Photos below are examples of starters that have been modified. DENSO CORPORATION designs and engineers all starters to meet specific OEM requirements.



Epoxy has been added to a damaged key switch terminal insulator in an attempt to prevent accidental grounding.



This starter housing has been modified possibly to fit another application.



Grease applied to the solenoid contacts. This acts as an insulator and prevents current flow.

## PHYSICAL DAMAGE / ABUSE

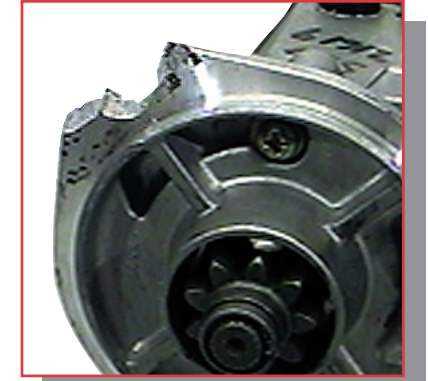
- These 3 pictures are examples of physical damage (abuse) to starter components and to the starter assembly.



Solenoid cover has been struck repeatedly with a hammer or some other foreign object.



Key switch terminal insulator cover has been damaged. This terminal could possibly ground out on the starter housing.



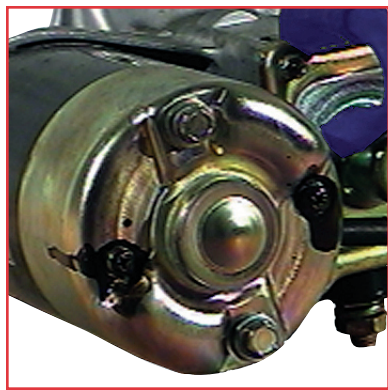
Starter to engine mounting bolt hole broken off due to mishandling, improper installation, or over-torquing of the engine bolt.

## SIGNS OF STARTER ABUSE / NEGLECT

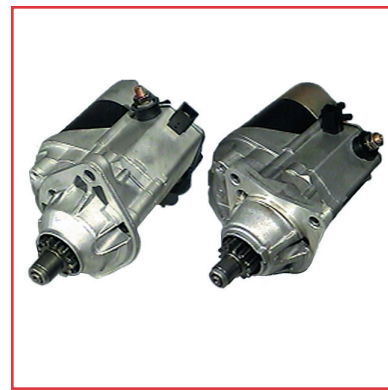
- Photos below are examples of starters that have been abused or neglected.



ID tag has been overheated and has shrunk. This is a sign of excessive heat.



Melted insulation on the starter end housing thru bolts. This is a definite sign of starter abuse (overheated).



Normal starter (left), pinion gear fully retracted. Overheated (right), pinion gear not fully retracted. Once a starter has become overheated, the return spring loses tension and the pinion gear will not fully retract.

## BASIC STARTER DIAGNOSIS

SYMPTOM	POSSIBLE CAUSE
Engine will not crank	<ul style="list-style-type: none"> <li>Battery (low voltage or defective)</li> <li>Loose battery terminals or defective cables</li> <li>Defective ignition switch, solenoid, relay, or cut switch</li> <li>Vehicle engine problem (mechanical)</li> </ul>
Noise heard during cranking	<ul style="list-style-type: none"> <li>Worn bushing or bearing</li> <li>Worn pinion ring gear or flywheel teeth</li> </ul>
Engine cranks slow	<ul style="list-style-type: none"> <li>Battery (low voltage or defective)</li> <li>Loose or corroded battery terminals, cables, or vehicle wiring</li> <li>Vehicle engine problem (mechanical)</li> <li>Faulty starter motor</li> </ul>
Starter spins freely, but will not crank engine	<ul style="list-style-type: none"> <li>Faulty starter clutch</li> <li>Defective or worn pinion gear, ring gear or flywheel</li> </ul>

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