# **Engine Starter System**



# Starting system



# Components: • starter

- Ignition switch
- Cables and wires

- Starter solenoid Manual Lever Position switch MLP ٠
- Starter Clutch Pedal Position Switch SCPP
- Flexplate or Flywheel

#### Starting system operation

- Battery provides power to ignition switch and starter
- Closing the ignition switch provides power through the MLP to the starter
- The starter relay energizes the starter solenoid and motor.



The magnetic pole in the armature is attracted and rotates toward the opposite magnetic pole of the field

The commutator rotates with the armature

with the armature reversing the armature's current flow/magnetic field and the like magnetic poles now move the armature away from the

#### **Electric Motor**



 A magnetic field is produced within the armature and that is opposite the field magnets. This opposites produces a push and pull force to line up the armature and field magnetic fields.

### **Moveable Pole Shoe Starter**

- The moveable pole shoe starter uses a fender mounted relay to send all current to the starter.
- The moveable pole shoe is used to engage the starter gear into the flywheel power to flow for the starter motor.



#### Solenoid actuated starter

- Battery power is provided to the starter and the ignition switch.
- By closing the switch the power is sent through the MLP/CPP switches to the starter relay.
- The starter relay provides power the starter mounted relay/solenoid.
- The relay/solenoid engages the starter gear to the flywheel and makes contact to power the starter motor.

The starter drive gear

has an overrunning

(one way) clutch that engages the pinion gear with the flywheel

as the starter motor

clutch freewheels as

the engine takes over

to prevent damage to the starter, gear, and

The overrunning

turns.

flywheel.



#### Starter Drive Components

- Armature
- Field (either coil or permanent magnet style)
- Brushes
- Solenoid/relay
- Starter drive gear
- Starter housing



# Starter Draw and Performance

- Connect an inductive ammeter to measure current flow from battery during cranking
- Connect a tachometer to measure cranking speed
- Disable the fuel injection system and ignition system
- Crank the engine for 15 seconds and monitor current flow and engine cranking speed
- Listen for any abnormal sounds during engagement operation and disengagement
- Compare your results to the vehicle's specifications

## Types of concerns

- "Engine does not crank" = the starter does not engage the engine to turn it over. No activity.
- "Engine does not start" = the starter does engage the engine and the engine is turning over. But, the engine does not start to run on it's own power.
- "Engine cranks slowly" = the starter does engage the engine but the rpm of the engine is too slow to allow the engine to take over.
- "Unusual starter noise" = there is an abnormal noise during starting weather the starter engages or not.

# "Engine does not Crank"

- Loose or corroded battery cable connections
- Undercharged battery
- Malfunctioning starter motor
- Malfunctioning ignition switch
- Malfunctioning starter relay or solenoid
- Malfunctioning transmission or clutch safety switch

# "Engine does not Start"

- Fuel delivery concern
- Ignition concern
- Battery power concern
- Electronic engine control concern



# "Engine Cranks Slowly"

- Loose or corroded battery cable connections

- Loose or corroded starter motor connections
- Excessive engine rotational force required

# "Unusual Starter Noise"

- Starter motor improperly mounted
- Malfunctioning starter motor
- Damaged flywheel teeth and or starter drive

