



LESSON 1 – DESCRIBE THE CONSTRUCTION OF A STARTER





INTRODUCTION

The starter motor is a vital part of the vehicle's starting system. Its job is to crank the engine fast enough for combustion to begin. To do this, it must convert electrical energy into mechanical motion. Understanding how a starter is built allows technicians to identify wear points, anticipate faults, and perform reliable repairs or replacements.



LEARNING OBJECTIVES


By the end of this lesson, students should be able to:

1. Identify the main parts of a starter motor and their functions.
2. Describe how each component works together to initiate engine rotation.
3. Explain the purpose of the starter solenoid and how it interacts with the motor.

SECTION I: WHAT IS A STARTER MOTOR?

A starter motor is a small but powerful DC electric motor that engages the flywheel of the engine to begin combustion.

Powered by the 12V battery, the starter turns the crankshaft via a gear system until the engine can run on its own.

 Once the engine fires, the starter is automatically disengaged to prevent damage.

SECTION 2: MAIN COMPONENTS OF A STARTER MOTOR

Component	Function
Armature	The rotating shaft that carries current and spins inside the field coils
Field Windings / Magnets	Create a magnetic field to make the armature turn
Commutator	A segmented copper ring that reverses current to keep armature spinning
Brushes	Conduct electricity to the armature via the commutator
Drive Pinion (Bendix Gear)	Engages with the engine's flywheel to turn the engine
Overrunning Clutch	Prevents damage by allowing the pinion to spin freely after start
Solenoid	Electromagnetic switch that pushes the pinion out and connects high current
Housing (Yoke)	Protects and supports all components



SECTION 3: HOW IT WORKS – STEP BY STEP

1. Ignition switch is turned to START
2. Solenoid receives current and acts like an electromagnet
3. Solenoid:
 - Closes a high-current contact from the battery
 - Pushes out the drive pinion to mesh with flywheel
4. Power flows to the starter motor, turning the armature
5. The armature rotates the pinion gear, cranking the engine
6. Once engine starts:
 - Key is released → power stops
 - Drive pinion automatically retracts



SECTION 4: KEY CONCEPTS

- **High Torque, Low Speed:**
Starters need very high current (100–300 amps) but operate briefly.
- **Overrunning Clutch (One-Way Clutch):**
Prevents the engine from driving the starter motor once it fires up.
- **Brush and Commutator Wear:**
These are common wear points in starter motors and lead to cranking problems.



VISUAL AID REFERENCE

To enhance learning, consider this labeled diagram (searchable on YouTube or Google Images):

“Parts of a Starter Motor – Cross Section Diagram”

You may also use this 3D interactive model video:

Video: How a Starter Motor Works

YouTube Channel: The Engineering Mindsed

<https://www.youtube.com/watch?v=gXKqhFENnQc>



SECTION 5: TYPES OF STARTER MOTORS

Type	Description
Conventional starter	Standard for most gasoline engines
Gear-reduction starter	Has additional gears for increased torque with lower weight
Inertia type (older)	Uses spinning action to extend gear (now rare)
PMGR (Permanent Magnet Gear Reduction)	Compact, efficient type with permanent magnets instead of field coils

✅ Most modern vehicles use gear reduction starters for efficiency and compact size.



TECHNICIAN TIP

If you understand how the starter is built, you can better diagnose:

- Clicking noise (bad solenoid or contact)
- No crank (brush/commutator wear)
- Grinding noise (damaged drive pinion or flywheel teeth)



LESSON SUMMARY

- The starter converts battery power into mechanical rotation to crank the engine
- Key parts: armature, brushes, solenoid, drive pinion, clutch
- The solenoid both activates the starter and engages the gear
- Starter motor issues often involve brush wear, gear damage, or solenoid failure



REFERENCES

- Auto Electrical System Module – Competency-Based Learning Material (TESDA)
<https://www.scribd.com/document/601714455/Auto-Electrical-System-Module-PDF>
- TESDA Training Regulations – Automotive Servicing NC II
<https://www.tesda.gov.ph>
- YouTube – Learn Engineering
How Starter Motor Work
<https://www.youtube.com/watch?v=gXKqhFENnQc>