



LESSON 2 – EXPLAIN THE BASIC OPERATION OF A STARTER MOTOR



INTRODUCTION

The starter motor plays a critical role in engine operation. It is the first component to move when you turn the ignition key, using electrical power to generate mechanical motion. Understanding how the starter works step by step allows technicians to troubleshoot starting problems with confidence and accuracy.



LEARNING OBJECTIVES


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

- Describe the sequence of operations when a vehicle is started.
- Explain how the starter motor converts electrical energy to mechanical rotation.
- Identify the interaction between the starter motor and other starting system components.

SECTION I: STARTING SYSTEM OVERVIEW

The starting system includes the following components:

- Battery – Supplies electrical power
- Ignition Switch – Activates the starting circuit
- Starter Relay / Solenoid – Controls the flow of high current
- Starter Motor – Cranks the engine
- Flywheel / Flexplate – Connected to the crankshaft for engine rotation

 These parts work together in a brief but powerful burst to start the engine.

SECTION 2: STEP-BY-STEP OPERATION OF THE STARTER MOTOR

Let's break it down:

1. Driver turns ignition key to “START” position

→ The ignition switch sends a low-current signal to the starter solenoid

2. Solenoid activates

→ Two simultaneous actions:

- Sends **high-current power** from the battery to the starter motor
- Pushes the **pinion gear** forward to engage the flywheel

3. Starter motor spins

→ The **armature rotates** rapidly within the motor housing


→ This turns the **pinion gear**, which rotates the **flywheel** and crankshaft

SECTION 2: STEP-BY-STEP OPERATION OF THE STARTER MOTOR

4. Engine starts (spark, fuel, compression occurs)

- Key is released to “ON” position
- Power to solenoid is cut off

5. Starter disengages

- Pinion gear retracts
- Starter motor stops spinning
-  The engine now runs on its own.

KEY CONCEPTS IN STARTER OPERATION

Concept	Description
Electromagnetic Force	The solenoid uses a magnetic field to move the gear and close contacts
High Current Draw	Starter motors can draw 150–300 amps for just a few seconds
Overrunning Clutch	Prevents engine from spinning the starter after start-up
Short Duration Operation	Starters are designed for brief use—excessive cranking can overheat it

SUGGESTED VIDEO FOR UNDERSTANDING

Video: Starter Motor Working Animation

YouTube Channel: Lesics

 <https://www.youtube.com/watch?v=7eNlgxH6lE4>

Features:


- it show cross-section of starter
- Step-by-step explanation of gear engagement
- Armature and solenoid function



SECTION 3: STARTER MOTOR IN ACTION – A REAL-WORLD EXAMPLE

Imagine a car that won't crank. The technician turns the key and hears a click, but no cranking sound.

Here's what might be happening:

- The solenoid clicks, but the motor doesn't spin → worn brushes or open winding
 - The starter spins, but engine doesn't turn → broken or jammed Bendix gear
 - No sound at all → faulty ignition switch, relay, or flat battery
-  Knowing the operation sequence helps pinpoint which part failed.



COMMON ISSUES RELATED TO OPERATION

Symptom	Likely Cause
One click, no crank	Bad starter motor or solenoid
Repeated clicks	Weak battery or poor connection
Cranking but no start	Ignition or fuel problem
Grinding noise	Misaligned or worn pinion gear



LESSON SUMMARY

- The starter motor converts electrical power into motion to turn the engine
- The solenoid is the gatekeeper, directing current and engaging the gear
- Once the engine starts, the system disengages automatically
- Understanding this process is key to troubleshooting no-start conditions



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 – Lesics
How a Starter Motor Works (Animation)
<https://www.youtube.com/watch?v=7eNIgxH6IE4>