



# LESSON 4 – TYPES OF CIRCUITS

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# INTRODUCTION

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Every vehicle contains hundreds of circuits—some simple, others complex. Whether you're wiring a headlight or diagnosing an ECU fault, you must understand how current travels through a system. Circuits determine how electricity flows, how components are powered, and how failures occur. This lesson introduces the major types of circuits used in automotive systems and how they behave.



# LEARNING OBJECTIVES

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

1. Differentiate between the three basic types of circuits: series, parallel, and series-parallel.
2. Describe how each type of circuit affects voltage, current, and resistance.
3. Identify common automotive systems that use each circuit type.



# SECTION 1: WHAT IS AN ELECTRICAL CIRCUIT?

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A circuit is a closed path through which electricity flows. It must contain:

- A power source (e.g., battery)
- A load (e.g., bulb or motor)
- Conductors (wires)
- Control device (e.g., switch)

If the path is broken → circuit is open → no current flows.



## SECTION 2: TYPES OF CIRCUITS - SERIES

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### **Series Circuit:**

- One continuous path
- Current flows through every component in order
- If one component fails → entire circuit stops

### **Characteristics:**

- Current is the same everywhere
- Voltage is divided between components
- Total resistance = sum of all resistances

Example: Old Christmas lights, Dashboard indicator circuits



## SECTION 2: TYPES OF CIRCUITS

### - PARALLEL

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#### **Parallel Circuit:**

- Multiple branches; current splits across paths
- Each branch has its own connection to power and ground
- If one branch fails → others keep working

#### **Characteristics:**

- Voltage is the same across each branch
- Current divides based on resistance
- Total resistance is reduced

Example: Car lighting system, Headlamps, Tail lights, Dome lights





## SECTION 2: TYPES OF CIRCUITS

### - SERIES-PARALLEL

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#### **Series-Parallel Circuit:**

- Combination of both
- Some parts are in series, others in parallel
- Used to balance current, protect sensitive parts, or control groups

Example: HVAC blower fan circuits, ECMs, Sensor networks

## SECTION 3: VOLTAGE AND CURRENT IN EACH TYPE

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Circuit Type	Current	Voltage	Resistance
Series	Same in all parts	Divides among loads	Adds up
Parallel	Divides by branch	Same across branches	Total drops
Series-Parallel	Mixed	Mixed	Calculated in segments



## SECTION 4: WHY CIRCUIT TYPE MATTERS IN AUTO WORK

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Application	Circuit Type	Reason
Headlight system	Parallel	Allows individual bulbs to work independently
Door lock control	Series-Parallel	Combines relays and motors for synchronized function
Fuse box	Parallel	Supplies many branches from one source
Battery charging	Series	Battery cells are linked in series to provide 12V total



# RECOMMENDED VIDEO

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Video: “Types of Electrical Circuits –

Region 10 ESC

Source: [https://www.youtube.com/watch?v=RQ3dj0s\\_LY8](https://www.youtube.com/watch?v=RQ3dj0s_LY8)

Covers:

- Visual examples of series, parallel, and series-parallel circuits
- Simulations of what happens when one part fails
- Real-world examples in vehicles



## SECTION 5: COMMON MISCONCEPTIONS

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- “All circuits in a car are the same” → Different functions require different circuit types
- “One broken bulb stops all others” → Only true in series circuits
- “Parallel circuits always draw more power” → Depends on the number and size of the loads



## SUMMARY – KEY POINTS

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- Series circuits: one path, shared current, voltage divided
- Parallel circuits: multiple paths, same voltage, current divides
- Series-parallel: used for complex control and sensor networks
- Knowing the type of circuit helps technicians predict behavior, diagnose faults, and design modifications safely



# REFERENCES

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- Auto Electrical System Module – Competency-Based Learning Material

<https://www.scribd.com/document/601714455/Auto-Electrical-System-Module-PDF>

TESDA Training Regulations – Automotive Servicing NC II

<https://www.tesda.gov.ph>

YouTube – The Engineering Mindset

“Types of Electrical Circuits Explained – Automotive”

[https://www.youtube.com/watch?v=Wq\\_DX4wuQAI](https://www.youtube.com/watch?v=Wq_DX4wuQAI)