

Performing Fault Analysis and Troubleshooting on Electrical Systems

Part 1: Dialogue

Context: An electrical engineer is discussing fault analysis and troubleshooting on electrical systems with a colleague.

Liam: We've been getting reports of intermittent failures in the system. Have you checked for **short circuit detection** in the main panel?

Sophie: Yes, but I think the issue might be a **ground fault**. The insulation on some wiring looks worn out.

Liam: That makes sense. If the insulation is damaged, it could be causing leaks. Did you test the **insulation resistance**?

Sophie: Not yet. I'll run an insulation resistance test to check for degradation. Have you looked at **harmonic distortion** in the system?

Liam: I did. Some frequency imbalances might be contributing to the problem. We should also check for **electromagnetic interference (EMI)** from nearby equipment.

Sophie: Good idea. EMI can disrupt sensitive circuits and lead to unstable performance.

Liam: Exactly. If the interference is significant, we may need shielding or filters.

Sophie: I'll also inspect the wiring layout to see if any cables are too close to high-power sources.

Liam: Let's document the issues and propose corrective actions for the team.

Sophie: Agreed. We'll also schedule follow-ups to ensure the fixes hold.

Part 2: Comprehension Questions

1. What does Sophie suspect might be causing the issue?
(A) A transformer failure
(B) A ground fault

- (C) A faulty switch
 - (D) A power surge
2. Why does Liam suggest testing insulation resistance?
- (A) To check for wiring degradation
 - (B) To increase voltage output
 - (C) To measure battery efficiency
 - (D) To calibrate electrical meters
3. What problem might **harmonic distortion** be causing?
- (A) A disconnected power supply
 - (B) Lower fuel consumption
 - (C) Reduced battery life
 - (D) Overheating of electrical components
4. What additional factor does Liam think could be affecting the system?
- (A) Incorrect breaker size
 - (B) A software glitch
 - (C) Electromagnetic interference (EMI)
 - (D) Weak Wi-Fi signals
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Part 3: Key Vocabulary with Definitions

- **Short circuit detection (短絡検出)** – The process of identifying unintended electrical connections that cause excessive current flow.
- **Ground fault (接地故障)** – An electrical fault where current unintentionally flows to the ground, often due to insulation damage.
- **Harmonic distortion (高調波歪み)** – Unwanted frequency variations in electrical systems that can cause overheating and inefficiencies.
- **Insulation resistance (絶縁抵抗)** – A measure of how well electrical insulation prevents current leakage.

- **Electromagnetic interference (EMI) (電磁干涉)** – Disruptions in electrical circuits caused by external electromagnetic sources.
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Part 4: Answer Key

1. **What does Sophie suspect might be causing the issue?**
☒ (B) A ground fault
2. **Why does Liam suggest testing insulation resistance?**
☒ (A) To check for wiring degradation
3. **What problem might harmonic distortion be causing?**
☒ (D) Overheating of electrical components
4. **What additional factor does Liam think could be affecting the system?**
☒ (C) Electromagnetic interference (EMI)