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SPRING SEMINAR

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Troubleshooting Modern LED Lighting and Controls Systems

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 **Acuity**Brands®

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Course Description

Time is money, and multiple trips to a jobsite to troubleshoot misbehaving LED lighting or lighting controls can cut into your profit. Join Acuity Brands to discuss how to diagnose modern LED lighting and controls: what information to gather, what questions to ask, and what tools you need to quickly identify



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Learning Objectives

- 1 Identify the steps to take when an LED system is not functioning as intended
- 2 Describe the concept of “good in, bad out” and how this mantra can guide your troubleshooting efforts
- 3 Recognize when a reported malfunction is not a problem, but a misunderstanding of how the system *SHOULD* work



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Destination – *SUCCESS!*

Benefits

- Energy savings
- Long system life
- Reduced maintenance
- Instant-on
- Controllability



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Legacy Systems vs LED

HID

Ambient Temperature

- Operates in both hot and cold environments

Cycling

- 10-hour cycle to maintain average life (min. burn time)
- Strike/restrike cycle takes time
- Restrike 1x per week for safety (max. burn time)

Vulnerable to physical damage

- Breakage
- Release of hazardous materials

LED

Ambient Temperature

- The colder the better!
- Higher ambient temps affect life

Cycling

- No effect on system life
- Full light output immediately

Solid State Lighting

- No moving parts
- No hazardous materials

Fluorescent

Ambient Temperature

- T12 magnetic - 50° F
- T8 electronic - 0° F
- T8/T5 HO - -20° F

Cycling

- Negatively effects system life
- Full light output at 3-5 minutes

Vulnerable to physical damage

- Breakage
- Release of hazardous materials



LED System Troubleshooting



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1

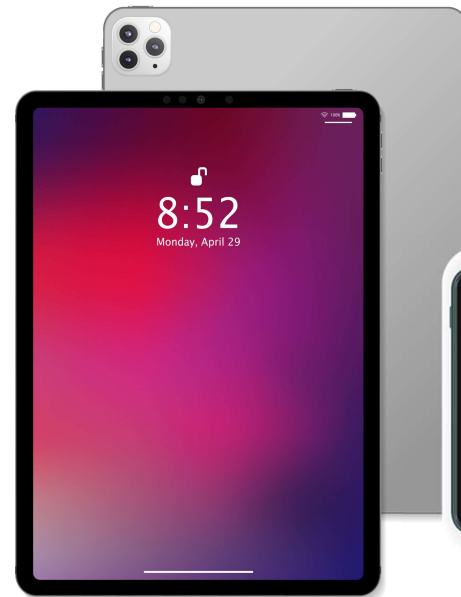
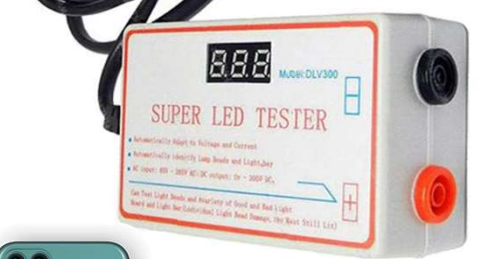
Gather Tools and Information



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Tools

- Camera (mobile device camera is fine)
- Device with internet access
- Multimeter
- Temperature gun
- LED tester (recommended)



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1. Gather Information

- A. Take a photo of the luminaire, control components and their respective labels
- B. Source or request wiring diagrams for the fixture and controls
- C. Determine the electrical circuits feeding the fixtures
 - 1. Use your multimeter, not just a voltage tester
 - 2. What else is on the circuit?
- D. Get the Sequence of Operations for the space
- E. Ask what was the observed misbehavior
- F. Did it ever work?
- G. Changes?
 - 1. Mechanical or electrical work performed?
 - 2. Equipment added to the space or circuit(s)?
 - 3. Arrangement or contents of the space? (Furniture, partitions, window shades, computer equipment, anything that may add electrical noise or interference?)



2

Understand the Malfunction

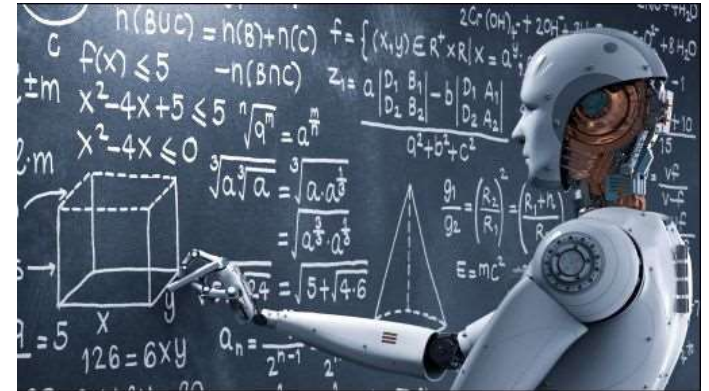


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2 – Understand the Malfunction

A. How should it work?

1. Dim to off?
2. Auto on/off? – Manual on/Auto off?
3. Turn on to a dim level?
4. Manual dimming?
5. Daylight harvesting?
6. Scenes? Presets? Profiles?



B. How does it work?

1. Flickers?
2. Does not dim?
3. Does not turn on / off?
4. Does not tune CCT?
5. Indicators? Blink codes?



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3

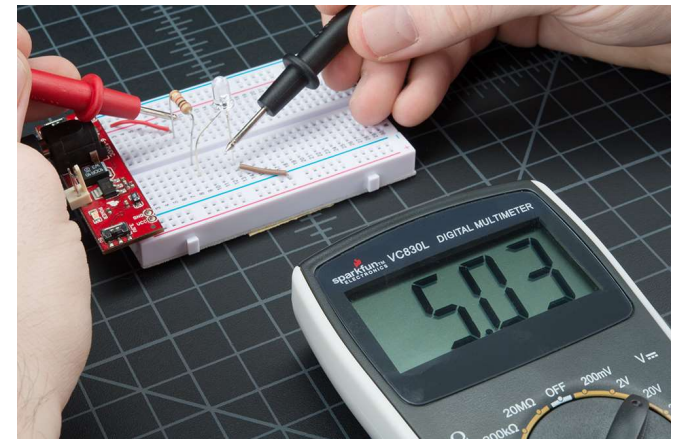
Identify and Measure



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3 – Identify and Measure

- A. Wiring, correct?
- B. Input Voltage
- C. 0-10V Voltage
- D. Temperature
- E. Bus Voltage
- F. Wireless Troubleshooting tools
 1. Connectivity test
 2. Device signal strength



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4

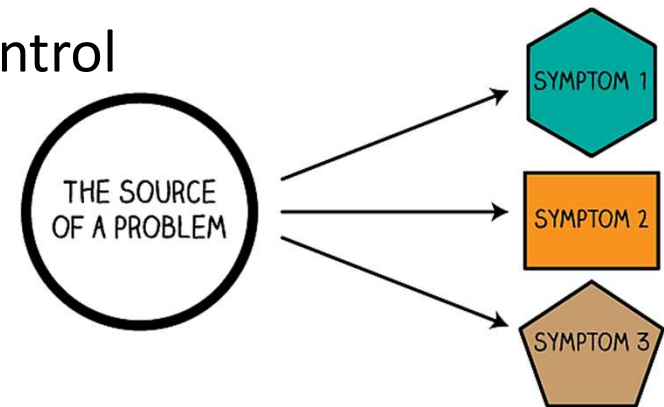
Identify Using Data and Analytical Tools



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4 – Identify Using Data and Analytical Tools

- A. Isolate the luminaire from the control system
- B. Isolate the driver from any embedded control
- C. Swap **ONE** component at a time



Good IN – Bad OUT



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5

Correct/Repair/Replace the Damaged/Defective
Component



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6

Verify the Repair



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7

Perform Root Cause Analysis

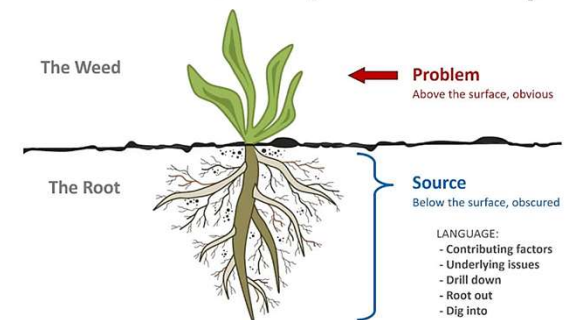


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Perform Root Cause Analysis and Report

- What was the end result of your investigation?
- WHY did the issue occur?
- What might prevent the issue in the future?
- Any tips that might help you or others diagnose a similar issue in the future?
- Who could benefit from this info? (building owner, facility manager, your manager/supervisor, other techs/installers, equipment manufacturer)

Root Cause Analysis - The Concept



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LED Lighting and Controls Troubleshooting Checklist

1. Gather Tools and Information

- Tool - Camera
- Tool - Device with internet connection
- Tool - Multimeter
- Tool - Temperature Gun
- Tool - LED Tester ([Example](#) on Amazon)
- Take photos of the luminaire, control components and all labels
- Obtain all wiring diagrams for luminaires & controls (manufacturer website/request)
- Determine electrical circuits feeding the luminaires with your multimeter (don't guess)
- What else is on the circuit?
- What is the intended sequence of operation for the space (how is it supposed to work?)
- What is the observed/identified misbehavior?
- Did the system ever work properly?
- Have there been changes to the system?
 - Mechanical or electrical work performed?
 - Equipment added to the space or circuit(s)?
 - Arrangement or contents of the space? (Furniture, partitions, window shades, computer equipment, anything that may add electrical noise or interference?)

2. Understand the Malfunction

How should the system work?

- Dim to off?
- Auto on/off?
- Manual on/Auto off?
- Turn on to a specific dim level?
- Manual dimming?
- Daylight harvesting?
- Scenes/Presets/Profiles?

How does the system work?

- Flickers?
- Does not dim?
- Does not turn on/off?
- Does not tune CCT?
- Indicators? Blink codes?

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3. Identify and Measure – Validate all measurements against published standards

- Wiring, correct?
- Input voltage? **Wireless Troubleshooting Tools**
- 0-10v voltage Connectivity test
- Temperature (mtg height and driver case) Device signal strength
- Bus Voltage

4. Identify Using Data and Analytical Tools *Good In – Bad Out*

- Isolate luminaire from the control system
- Isolate the driver from any embedded control
- Swap one suspect component at a time

5. Correct/Repair/Replace the Damaged/Defective Component

- Save all components for return to the manufacturer (if required/requested)

6. Verify the Repair

- All components functioning?
- Validate sequence of operation

7. Perform Root Cause Analysis

- What was the end result of your investigation?
- WHY did the issue occur?
- What might prevent the issue in the future?
- Any tips that might help you or others diagnose a similar issue in the future?
- Who could benefit from this info? (building owner, facility manager, your manager/supervisor, other techs/installers, equipment manufacturer)



Scan to download a copy of the checklist

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Questions?



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