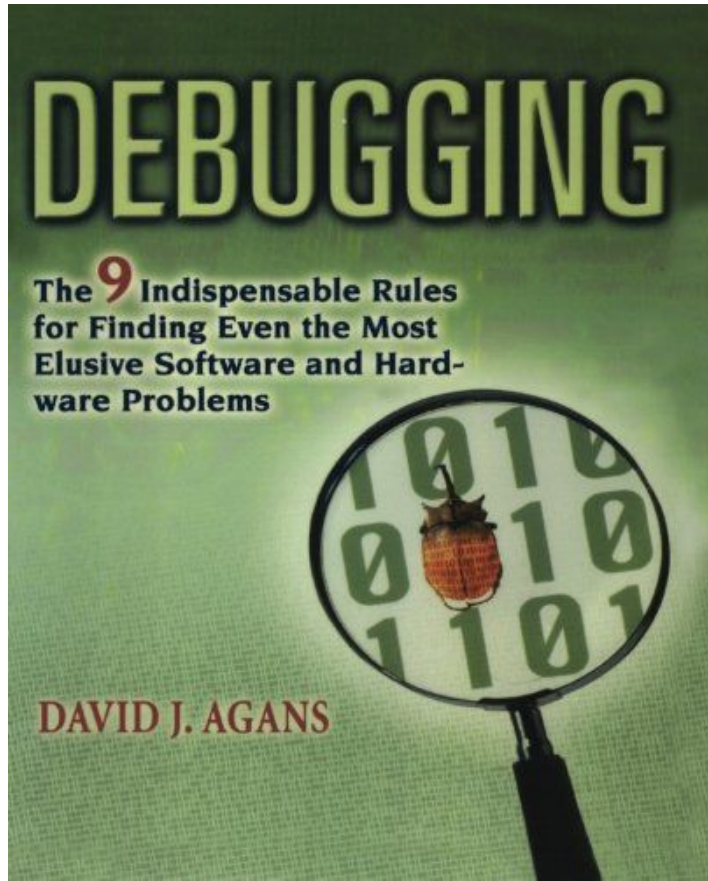
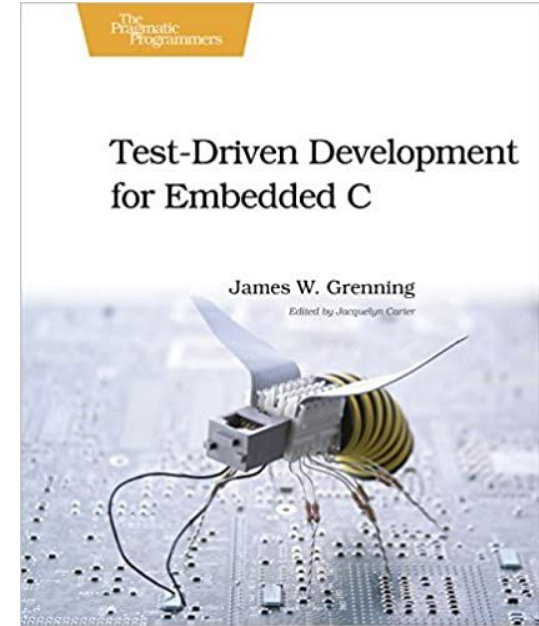
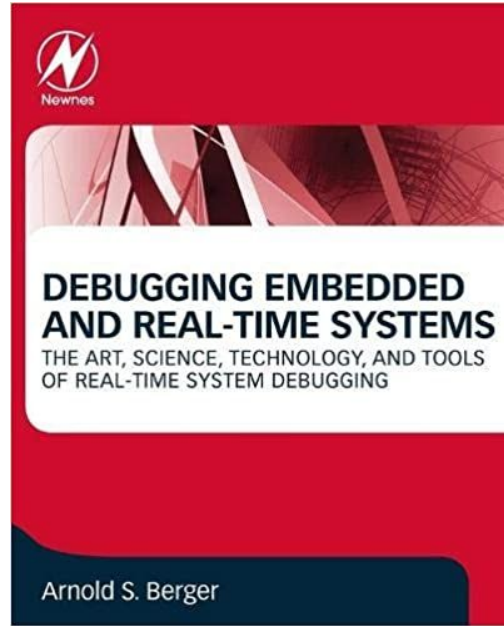
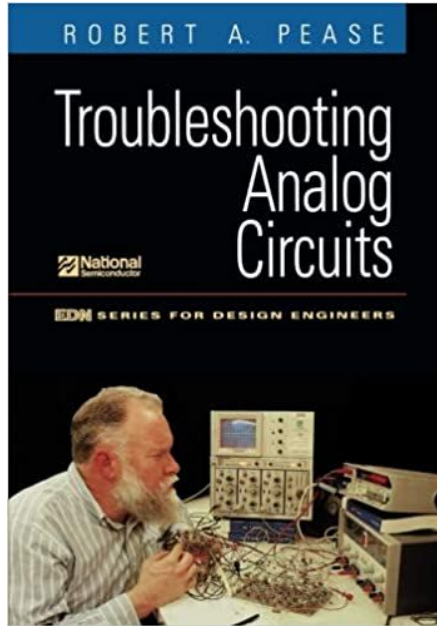


Troubleshooting

John R. Leeman
GEARS 2022



- Understand the System
- Make it Fail
- Quit Thinking and Look
- Divide and Conquer
- Change One Thing at a Time
- Keep an Audit Trail
- Check the Plug
- Get a Fresh View
- If You Didn't Fix it, It Ain't Fixed



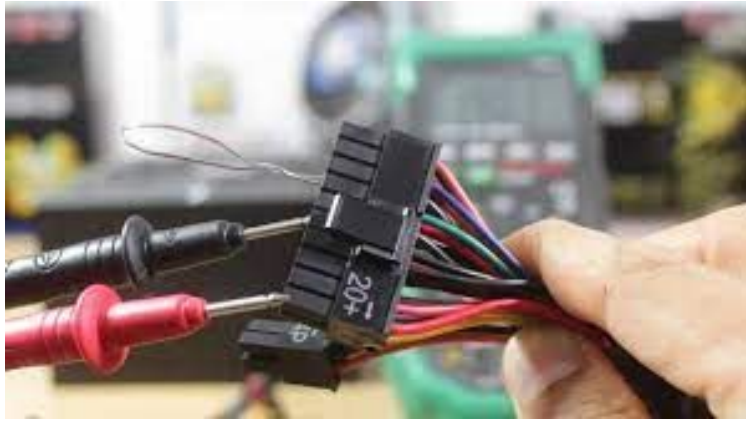
Look at the fuses, power source, and batteries



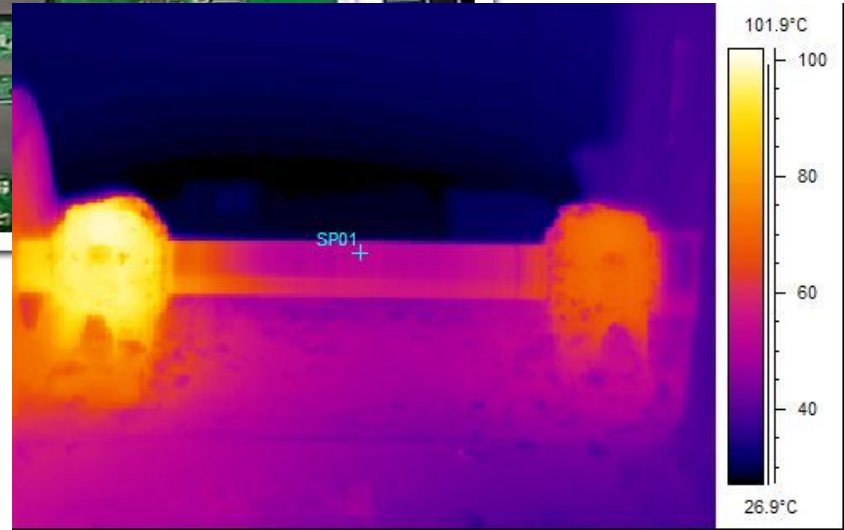
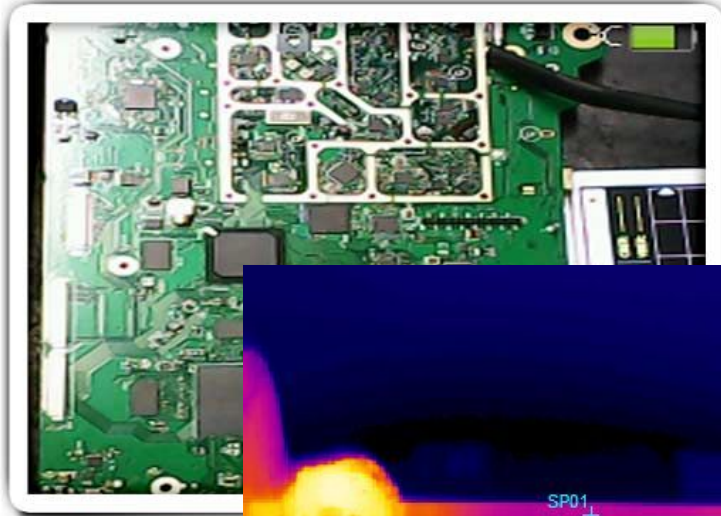
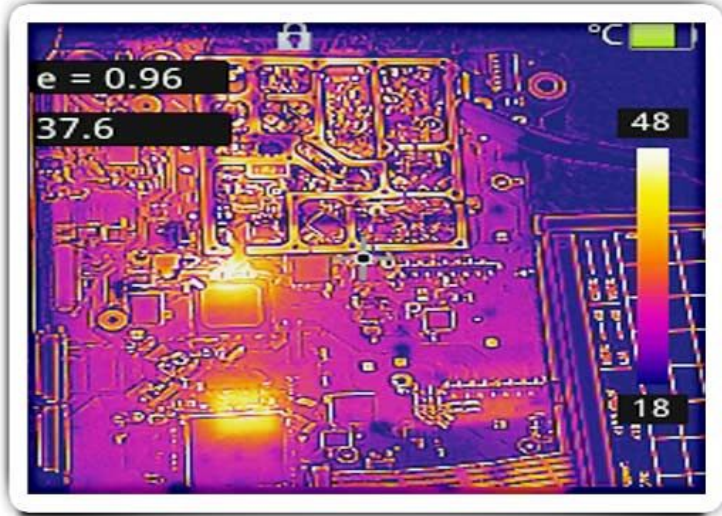
Look/listen - anything loose, burned, etc?



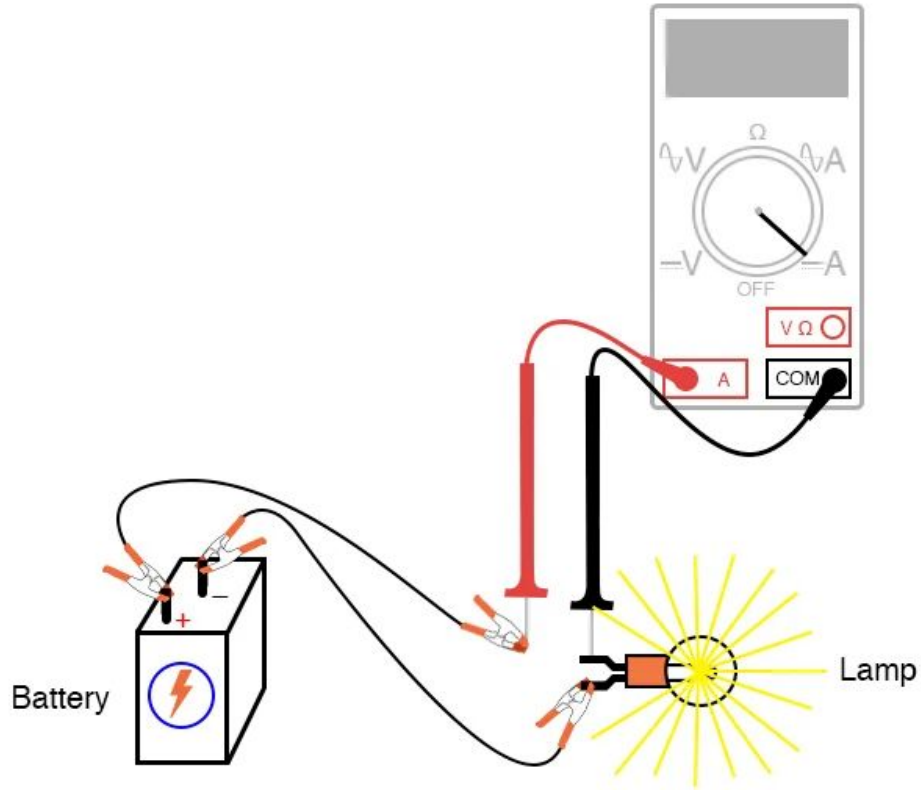
Check voltages - start with the power supply inputs/outputs



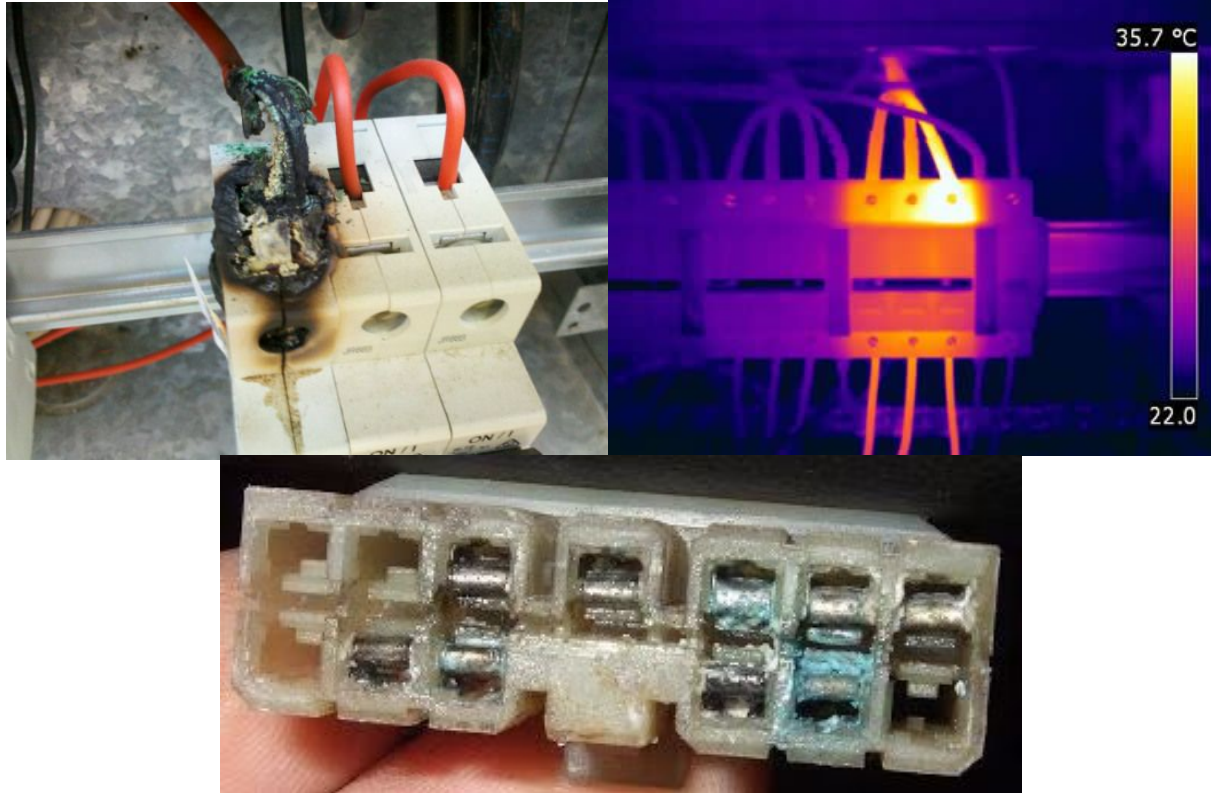
Look for thermal anomalies



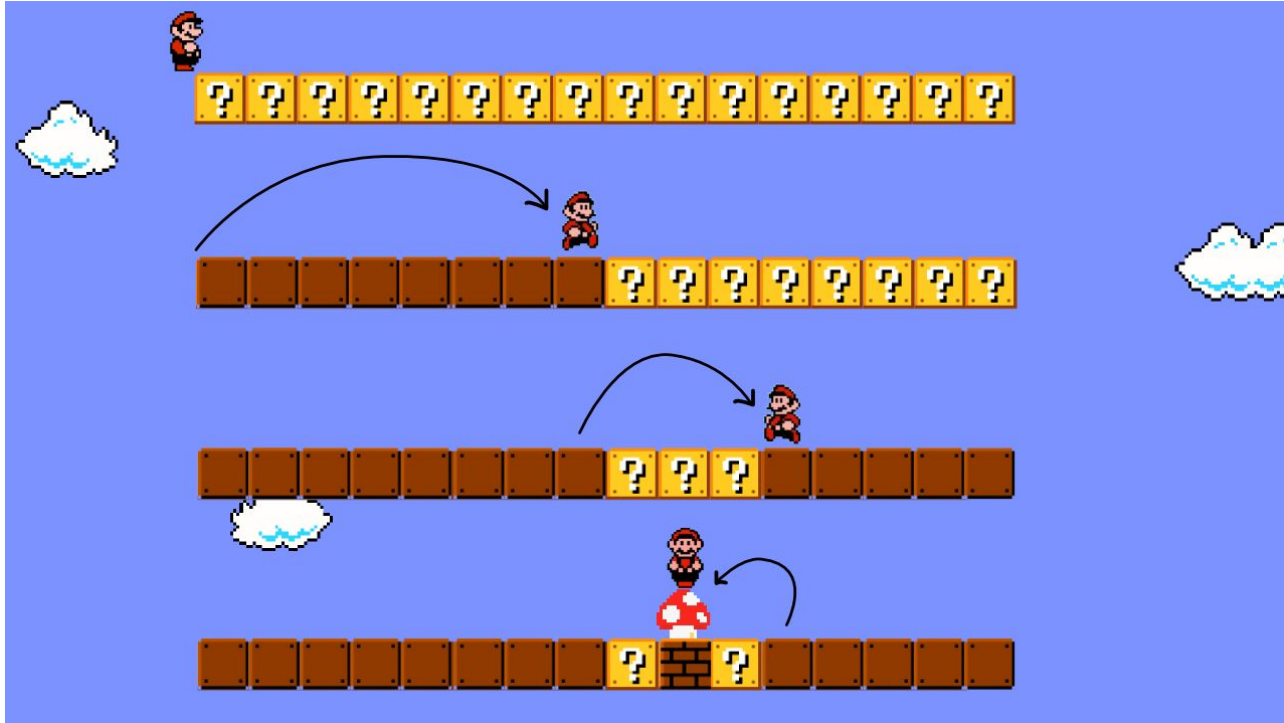
Look at the device current draw



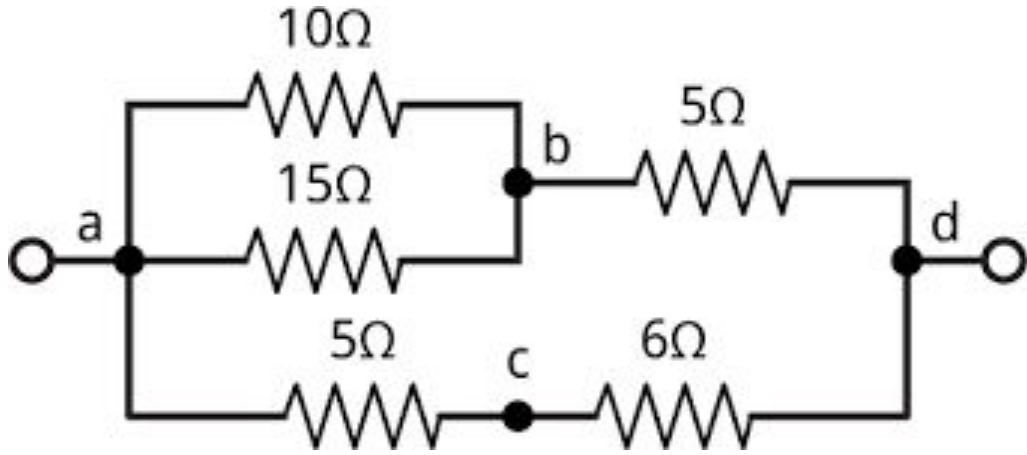
Look for loose, dirty, corroded connections



Follow signals or power rails with a binary search approach



Be wary of in-circuit component checks



Common failures

- Loose connections
- Failed power supply
- Failed capacitors
- Ground loops/issues
- Leaking air/hydraulics
- Failed conductors
- Improper operation
- Lack of lubrication
- Loose set screws/pulleys

