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# Spot Thermometers
# vs.
# Thermal Imaging Cameras

Ed Kochanek, FLIR Systems
Ed.Kochanek@FLIR.com

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# You aren’t doing everything you can to prevent unscheduled downtime!

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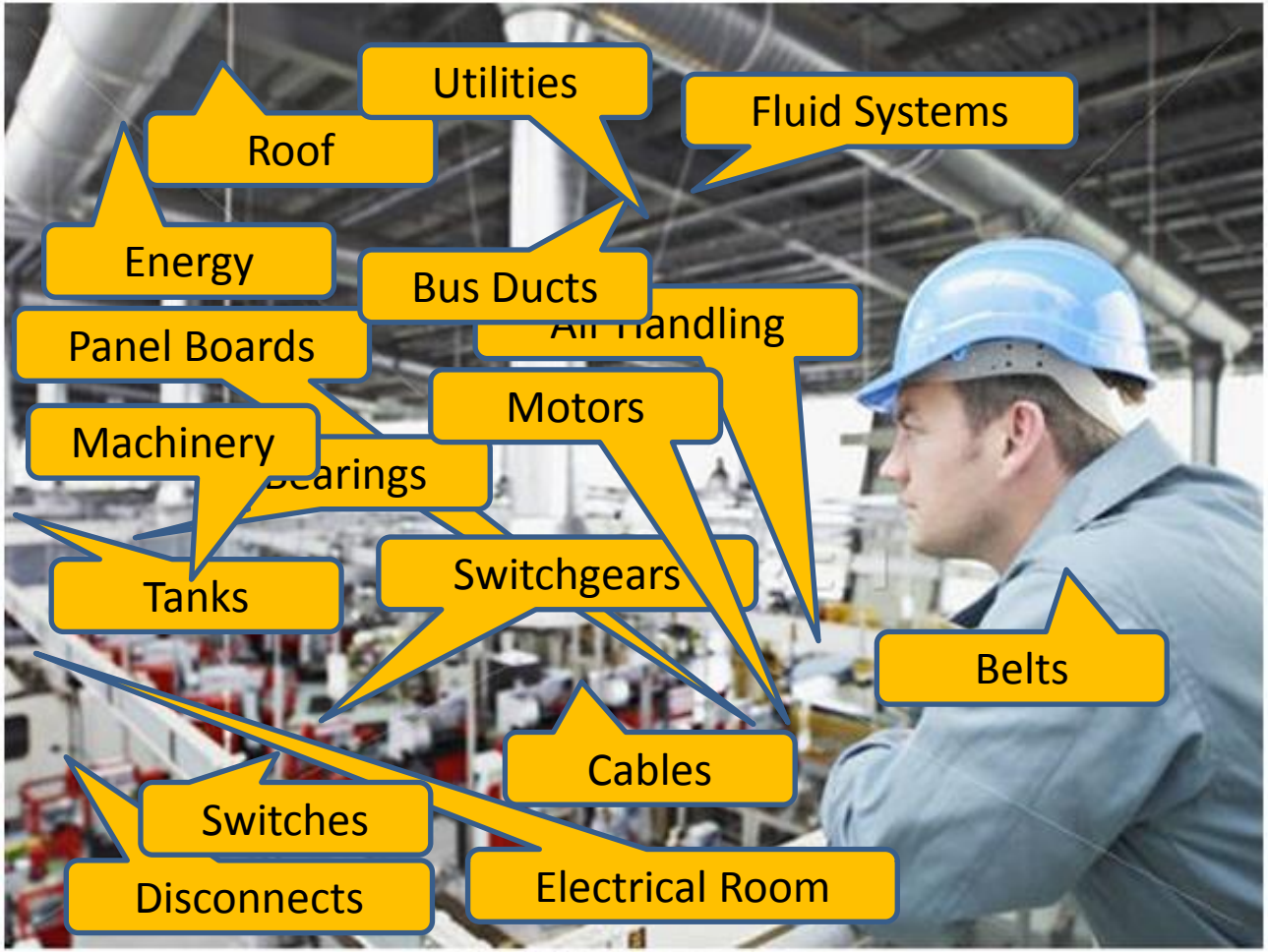


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- I smell something…
- We keep getting nuisance trips
- We feel a vibration
- The system is bad, broken, wrong, etc…
- Its musty, cold and  damp
- There is a roof leak

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# Consequences

- Every production line shut down
- Every minute trying to diagnosis a problem
- Every overtime request
- Lost reputation and customers

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# Add more Employee's?


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# What if you could see things differently?


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# Time And Temperature


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# Current  Temperature Technology

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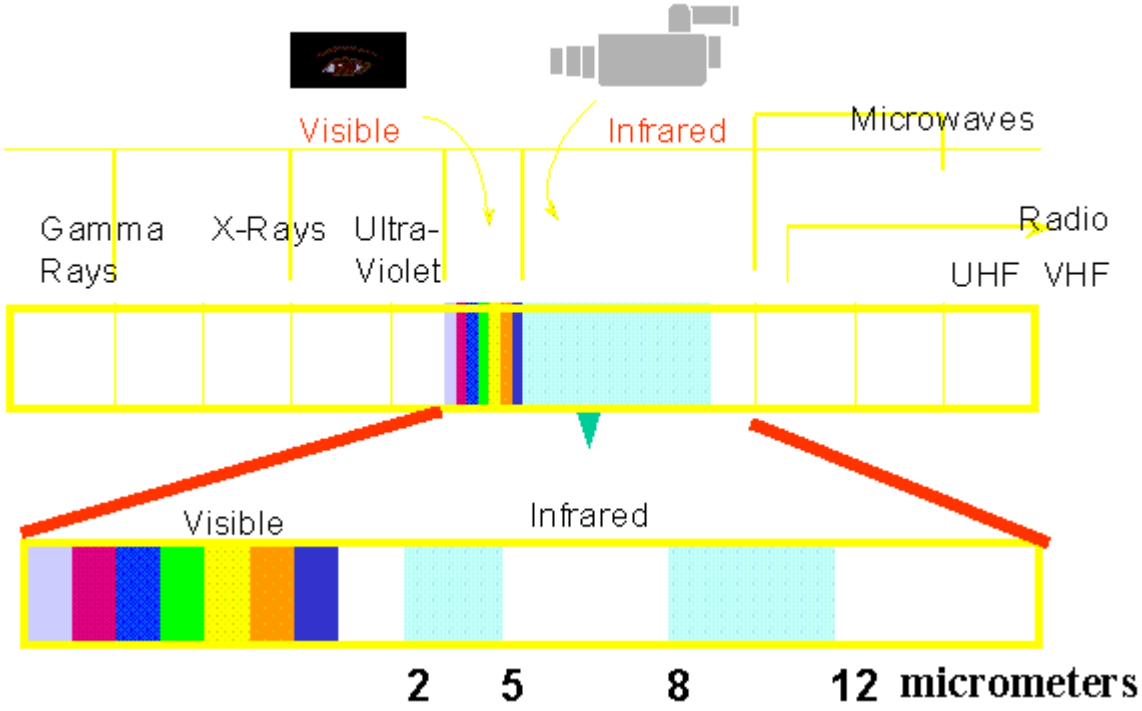
# What is Infrared?

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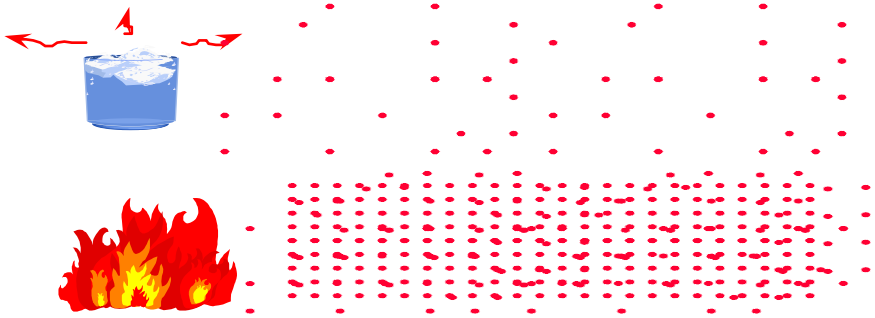
# How does it work?

- IR waves are emitted by all objects
- IR radiation increases with temperature
- Mechanical items because of friction
- Electrical items because of resistance
- Moisture because of evaporation
- Energy



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# Replacement of inaccurate, inefficient or ineffective technology


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# The Hidden Truth about Spot Temperature Guns:

## A TRANSITION IS OCCURRING


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# The conversion to thermal cameras?


- Safety
- Speed
- Accuracy

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# ONE detector and NO image


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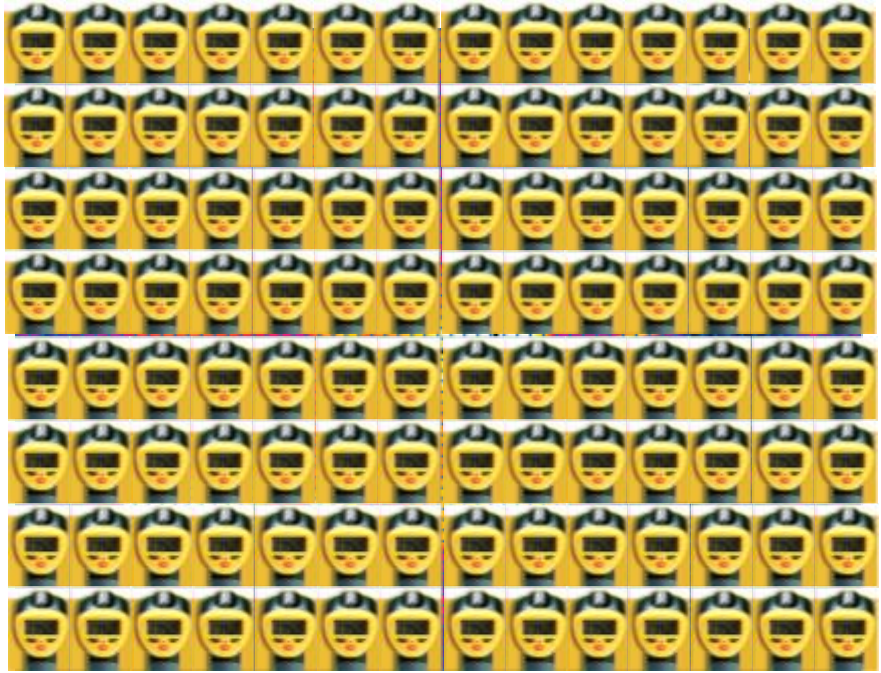
# 160x120
# 19,200 detectors

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# Speed


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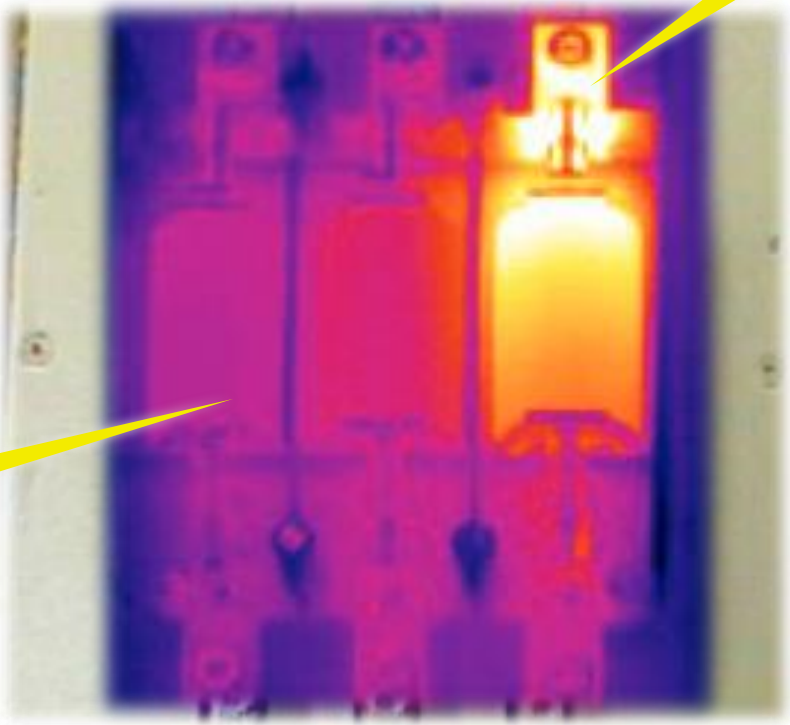


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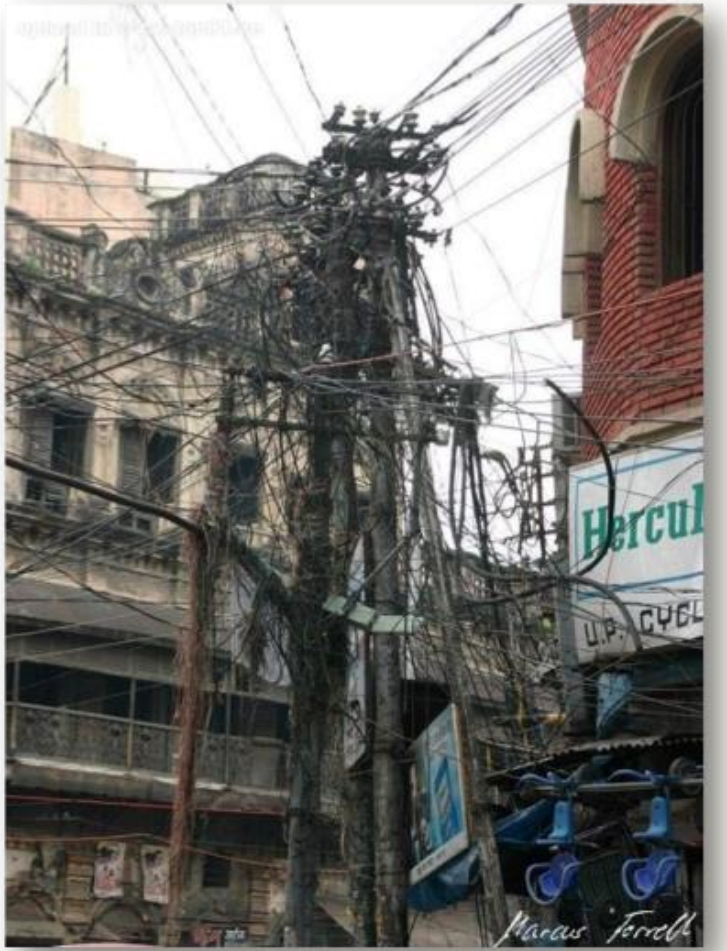

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# Accuracy



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# Spot Size Ratio
# 12 to 1

4’ or 48” distance to target

4”

Measurement Size

6”

The laser beam is not measuring the temperature

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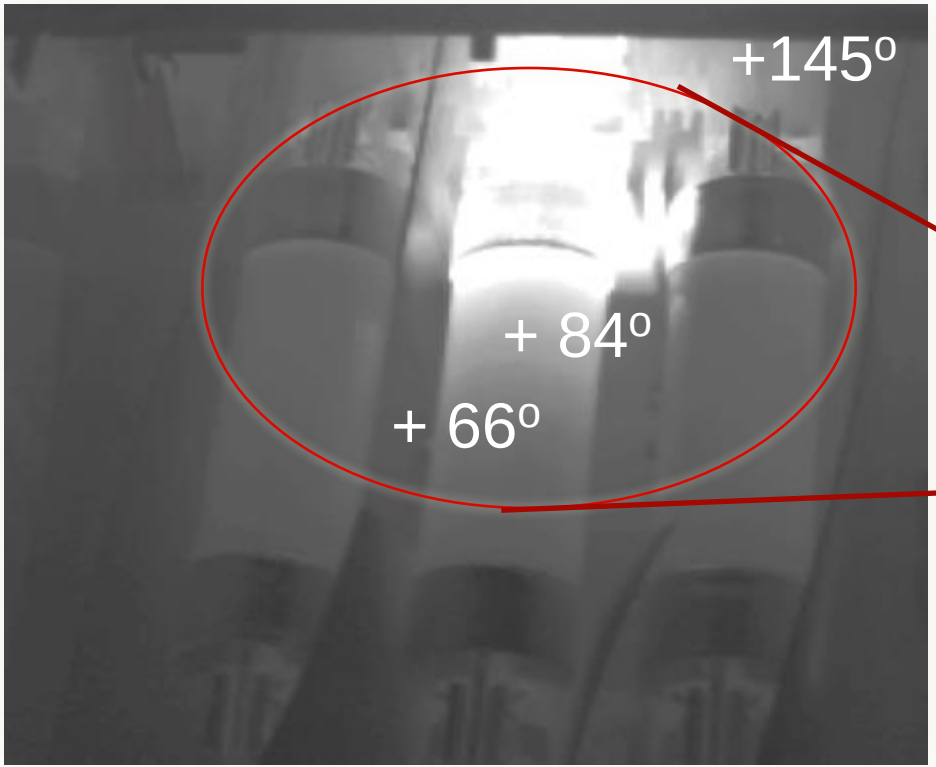
# Is this accurate? Is this acceptable?





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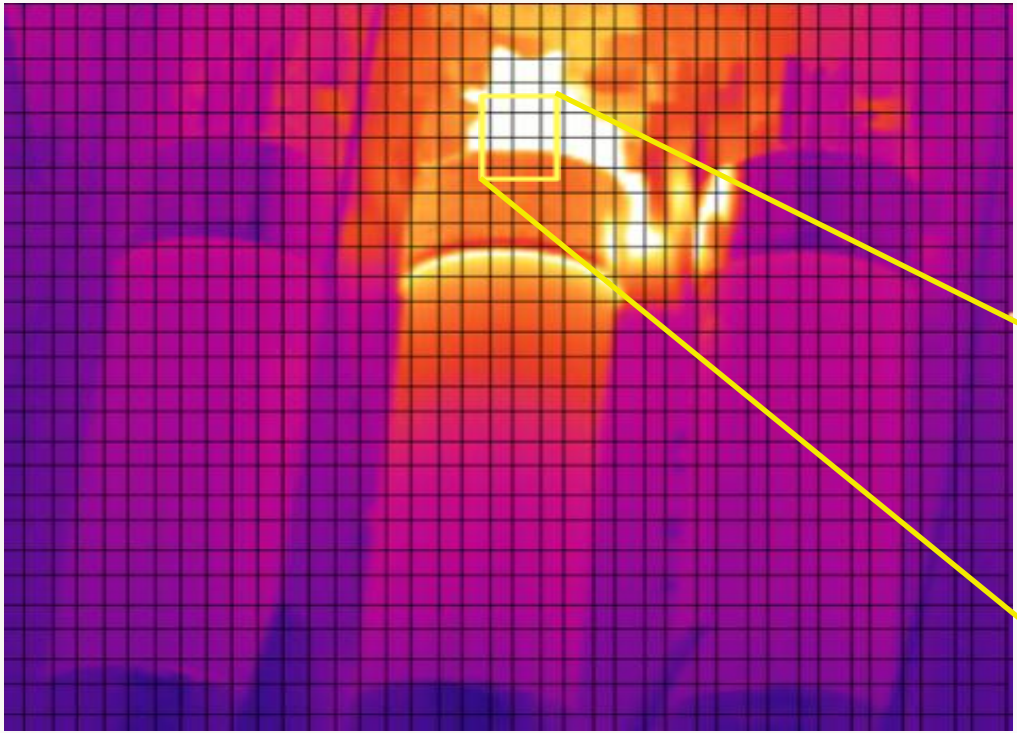
# Accuracy

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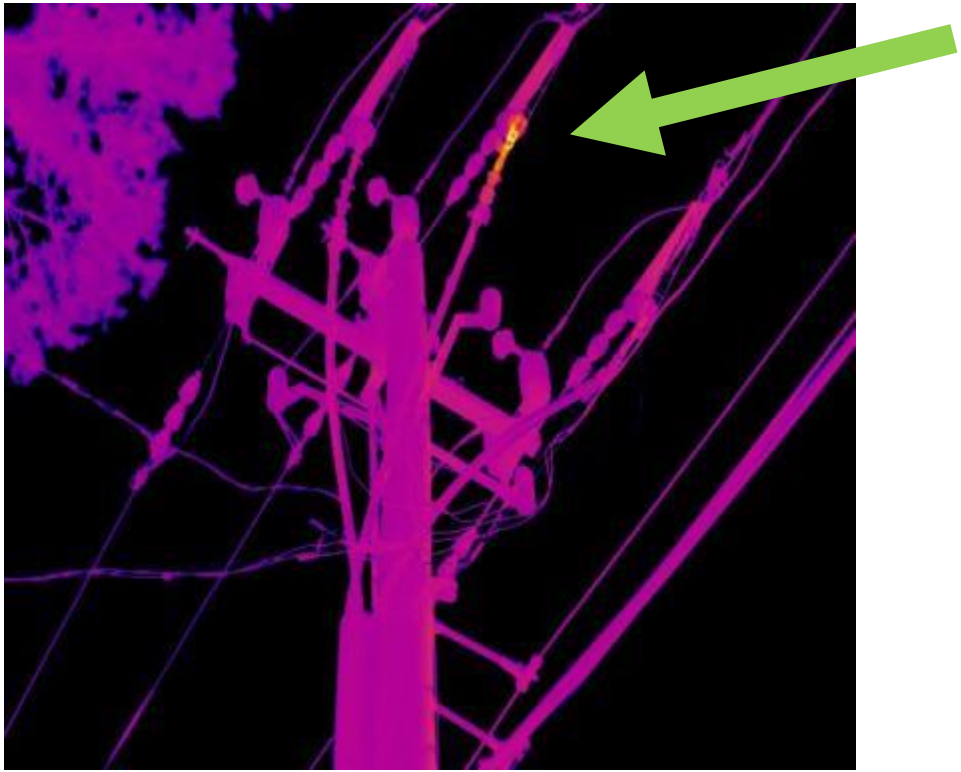
# Disconnect Switch



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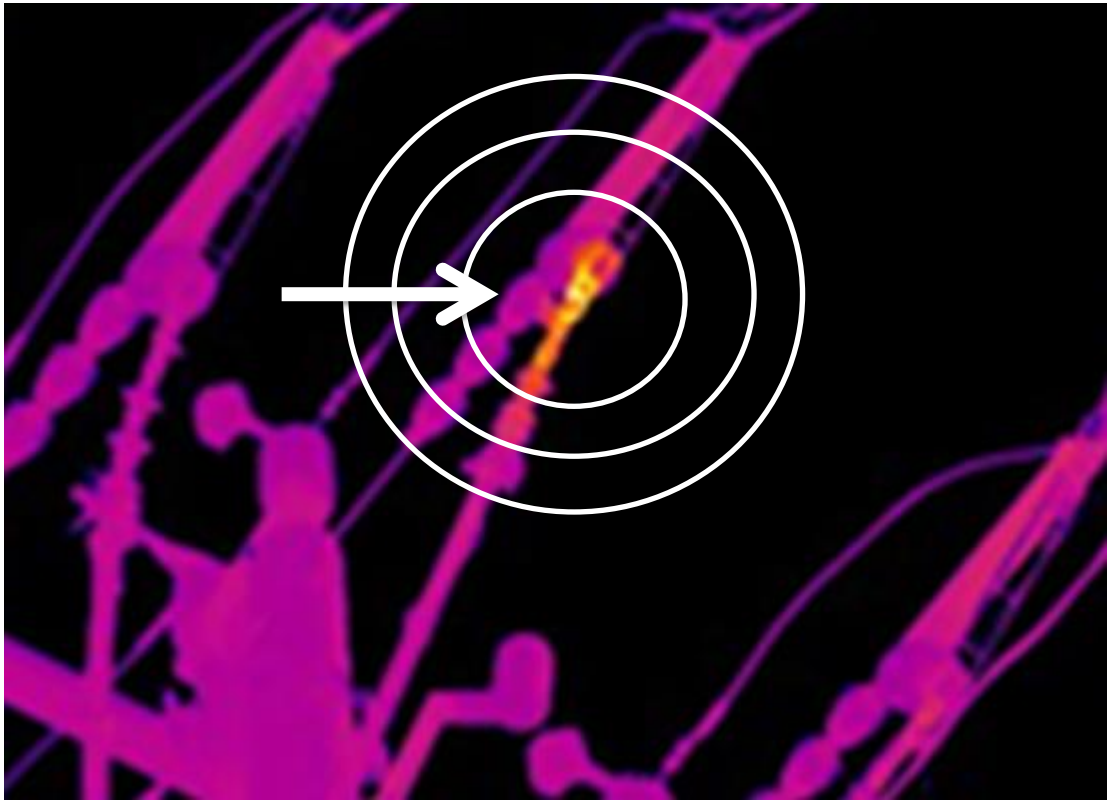
# Disconnect Switch



**Tmax =173**

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# SAFETY



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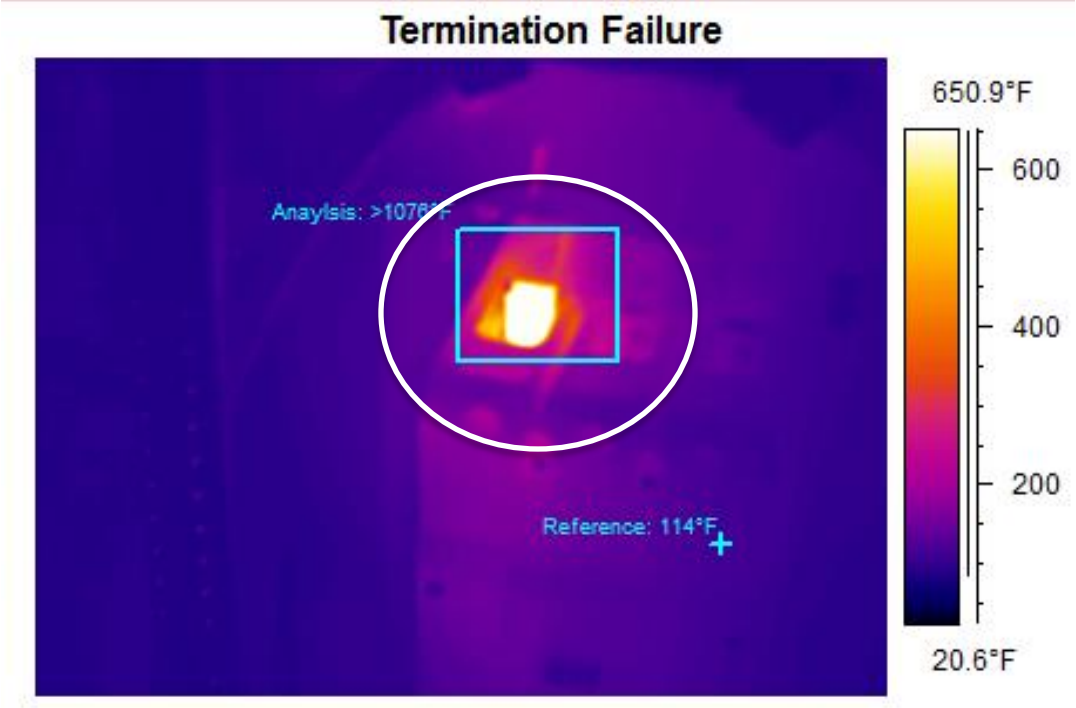
# Safety

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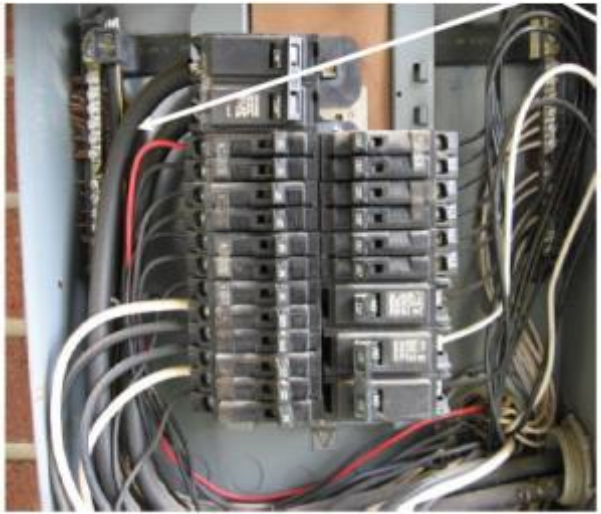
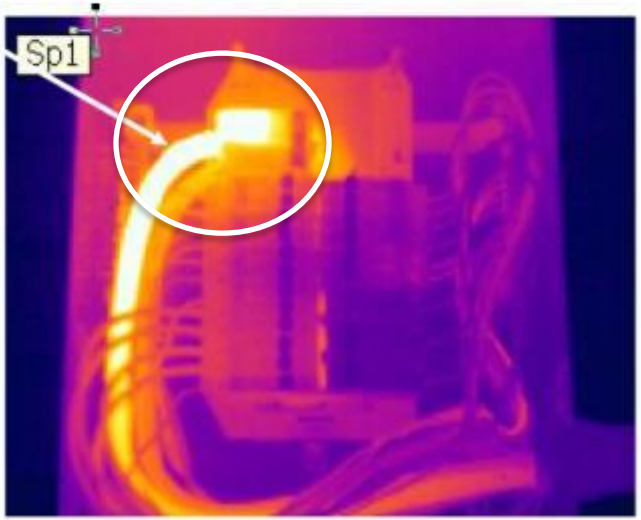
# Load effect on Temperature

This main conductor over-heated to more than 220° with only a nominal load.



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# Documentation


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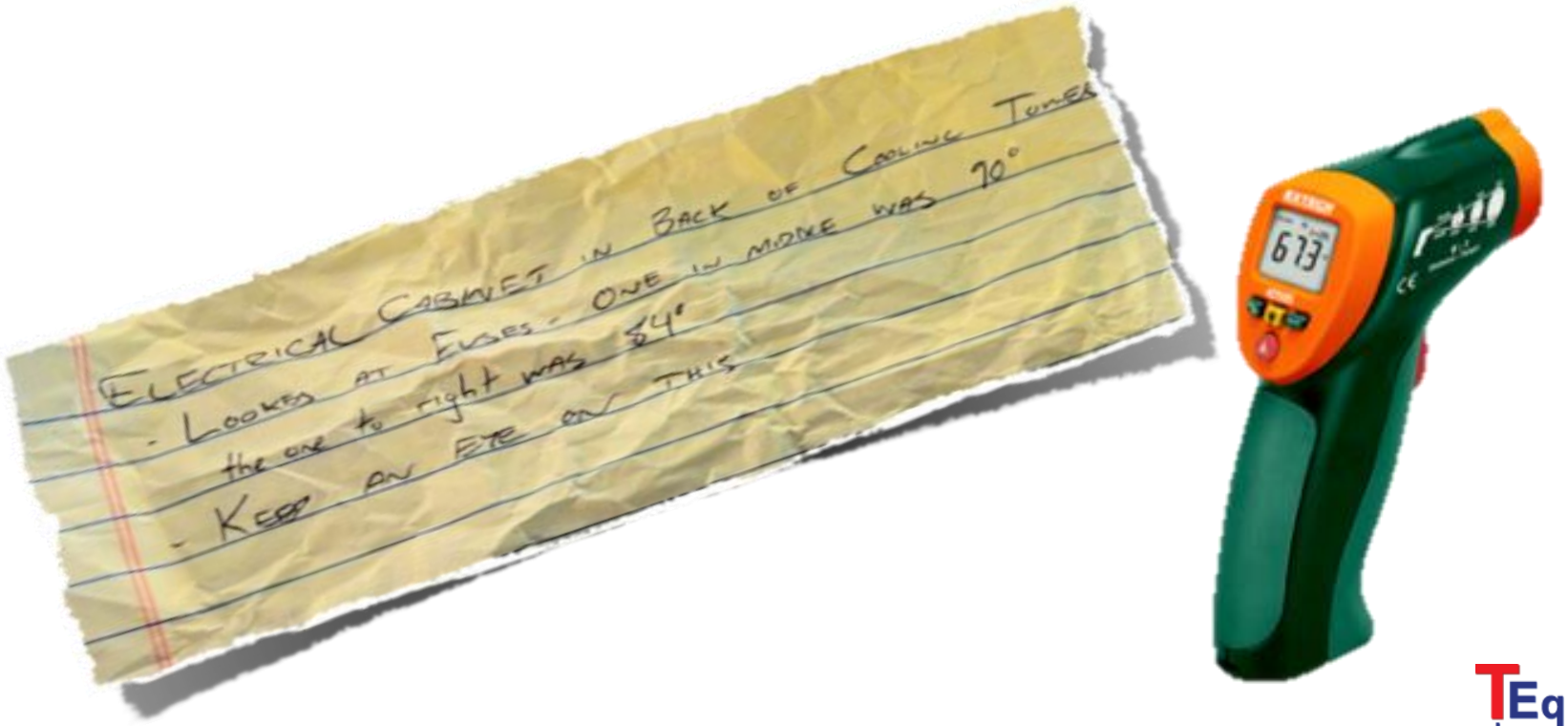


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# Why Replace Your Spot Gun

- Speed
- Accuracy
- Documentation

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# Typical Electrical Applications

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# How Hot is too Hot?

| Temperature difference (ΔT) based on comparisons between similar components under similar loading. | Temperature difference (ΔT) based upon comparisons between component and ambient air temperatures. | Recommended Action |
|---|---|---|
| 2°F - 5°F | 2°F - 18°F | Possible deficiency; warrants investigation |
| 5°F - 27°F | 18°F - 36°F | Indicates probable deficiency; repair as time permits |
| - - - - - - | 36°F - 72°F | Monitor until corrective measures can be accomplished |
| >27°F | >72°F | Major discrepancy; repair immediately |

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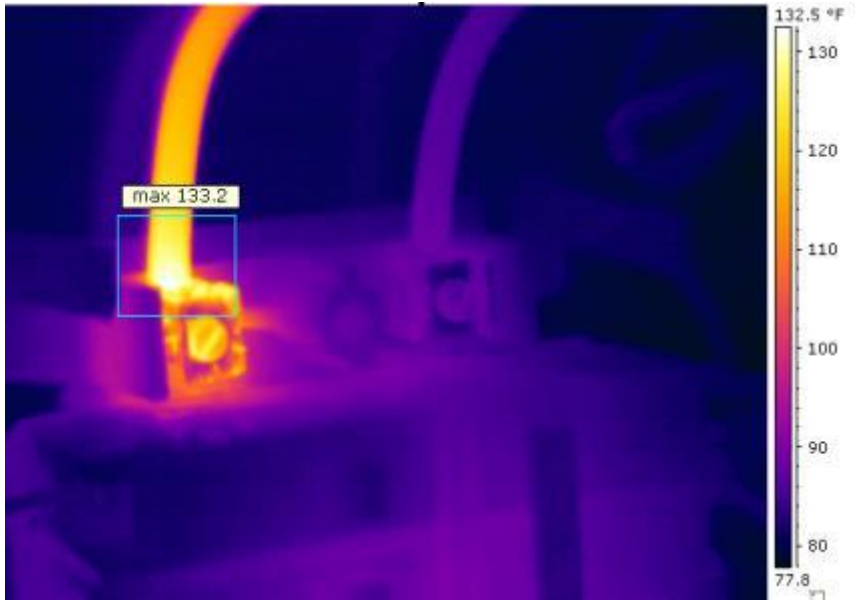
# Termination




**Problem= 133**

**Reference=87**

**Or…**

**Delta = 46**

**Make this a monitor.**

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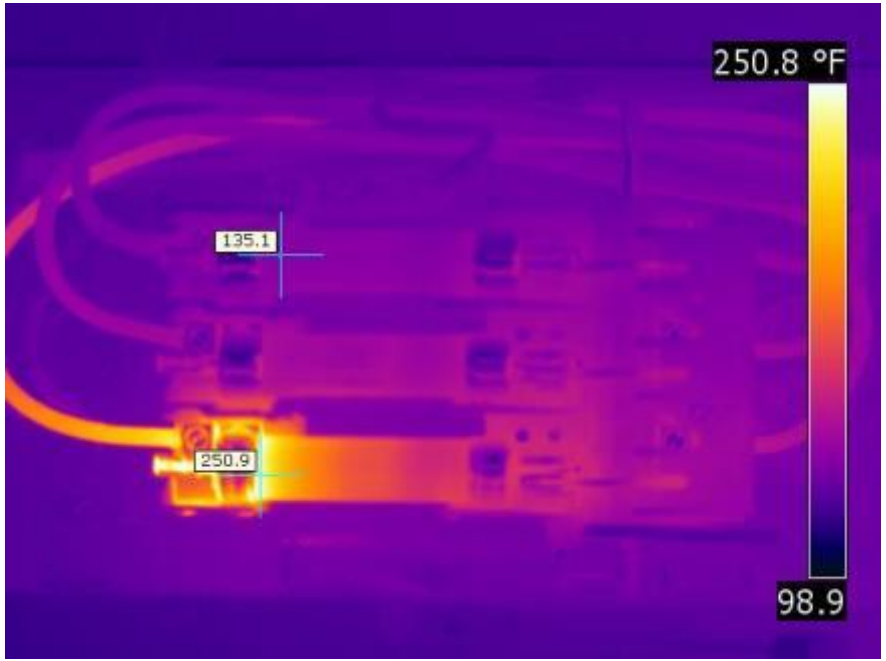
# Fuse Clips

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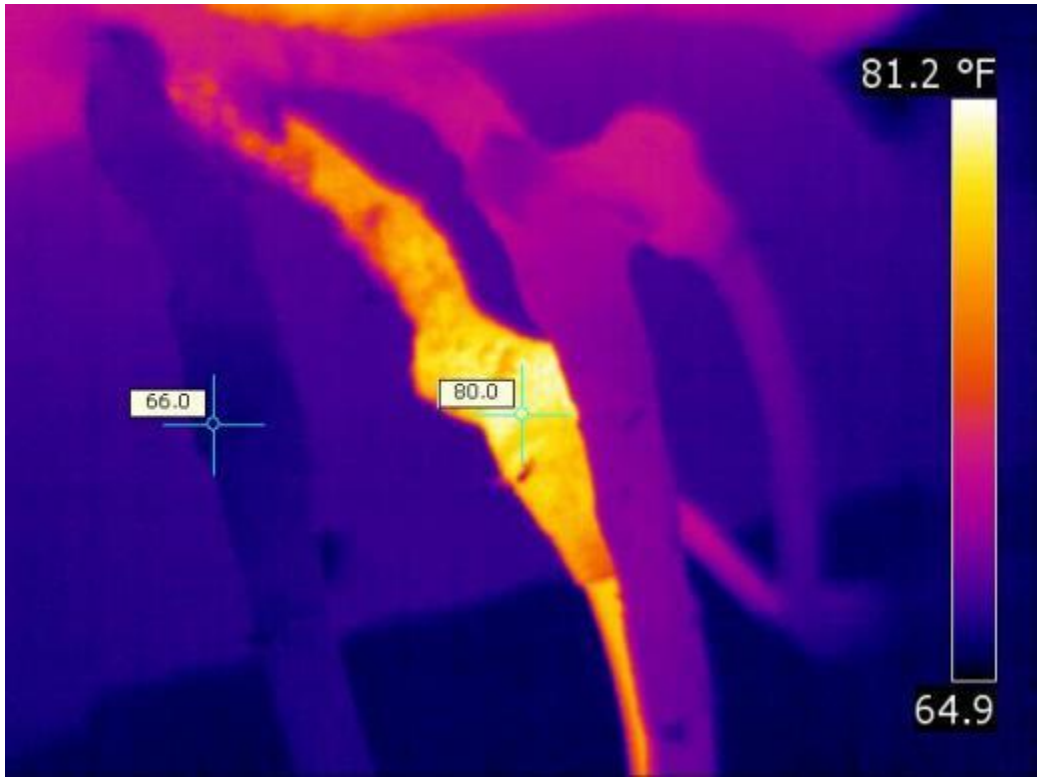
# Conductors / Terminations

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# Conductors / Terminations

## Improper Tightening


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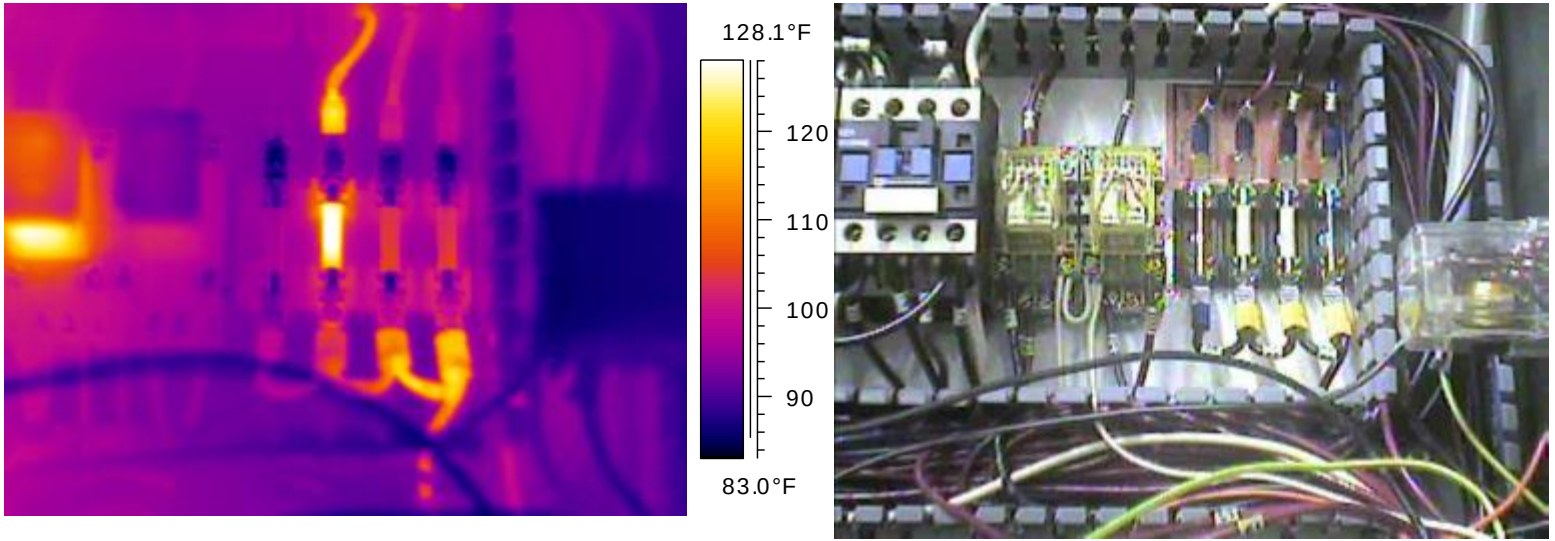
# Control Panels

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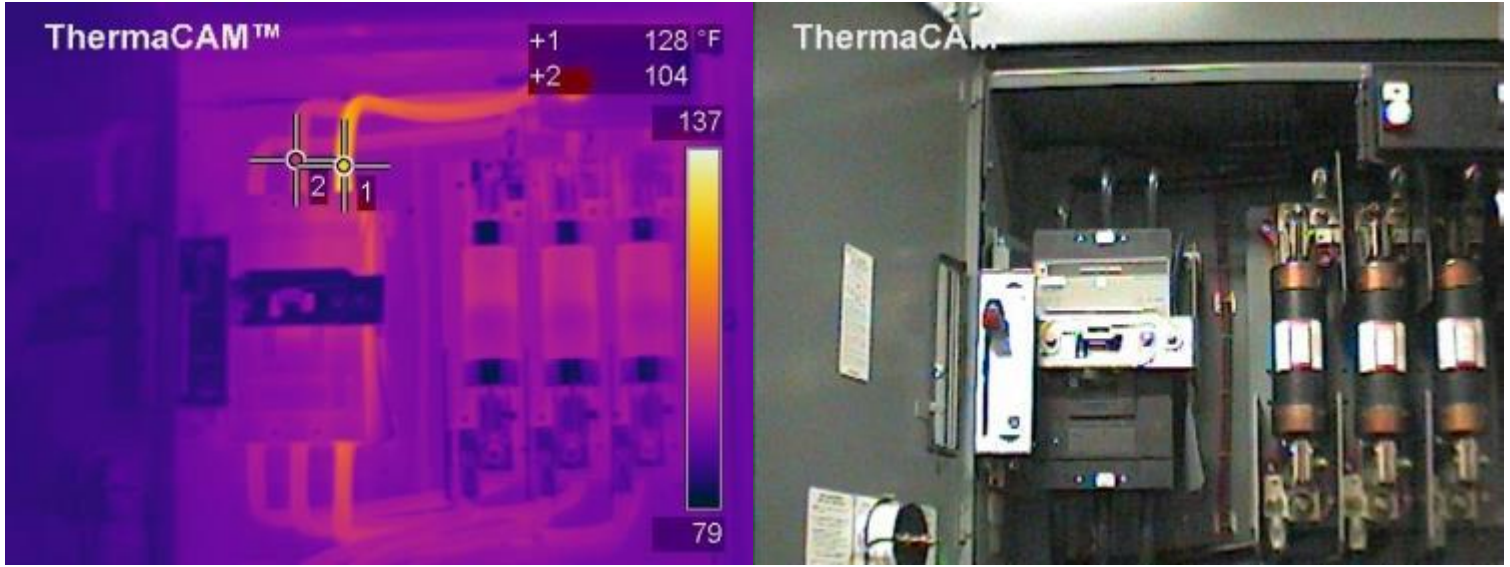
# Circuit Breakers

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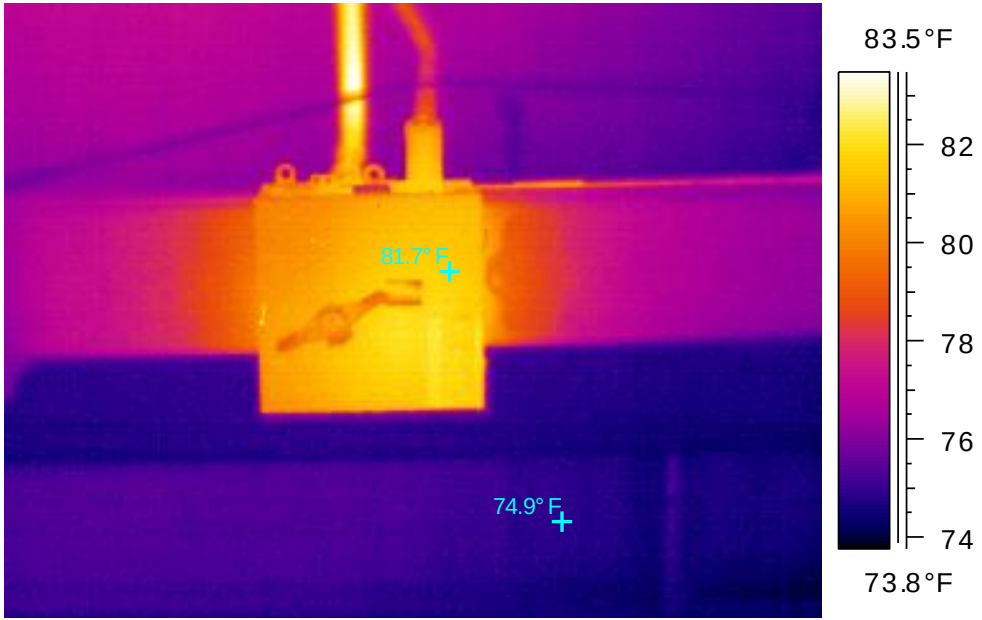
# Bus ways / Bus duct

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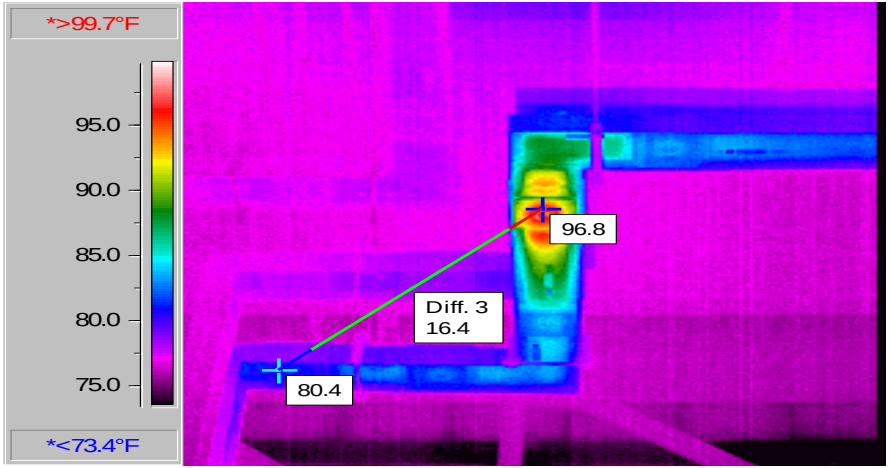
# Bus Ducts

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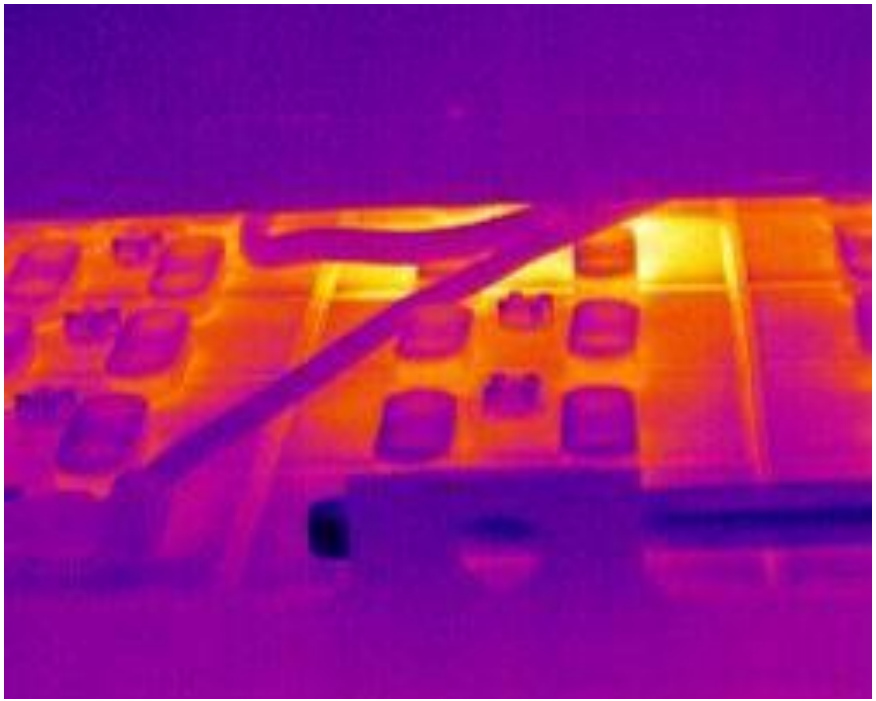
# Capacitors / Batteries



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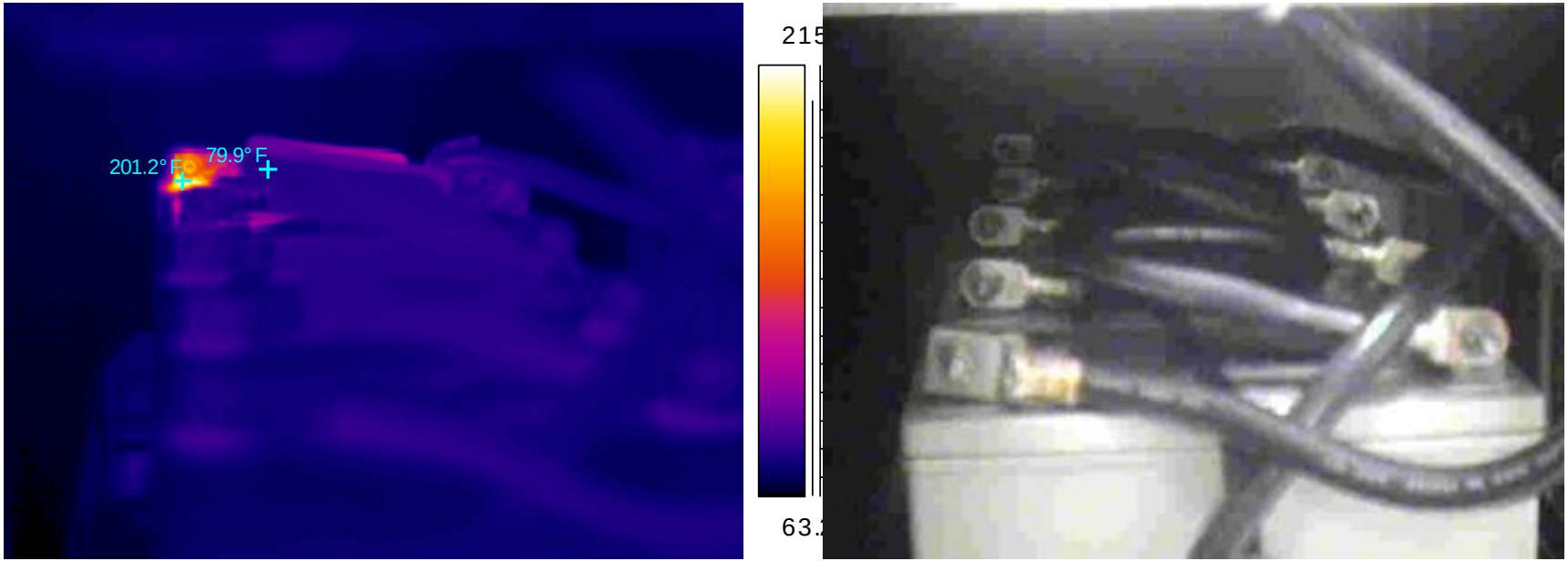
# Batteries

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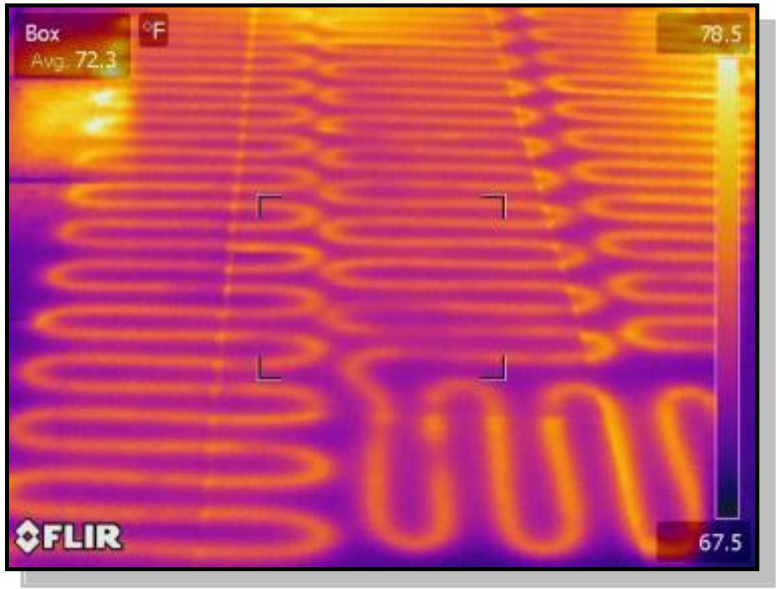
# Subsurface Heating

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# Building Energy and Moisture Images

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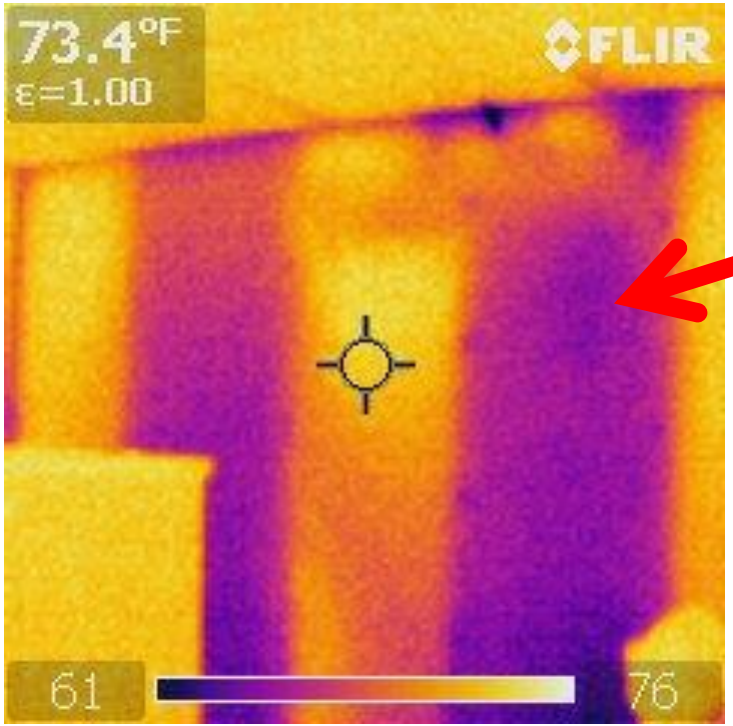
# Why do we want to see the lack of heat?




Missing insulation

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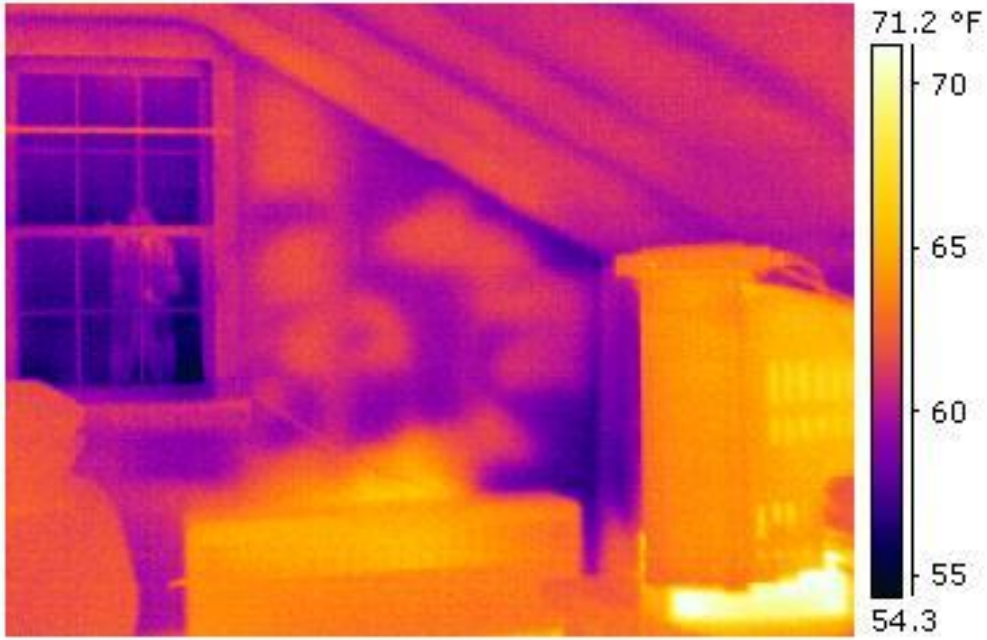
# Blown Insulation- Poorly done

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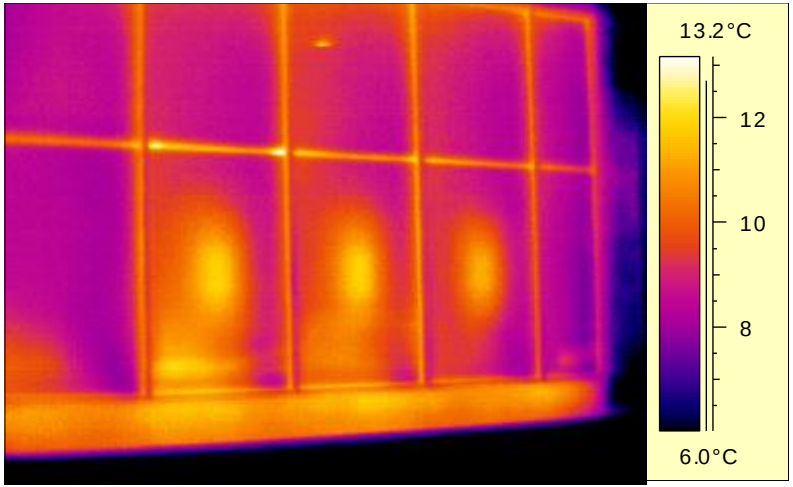
# Argon Leaks




- Argon has leaked out of the three windows in the center
- Heat transfer by convection is occurring inside the window

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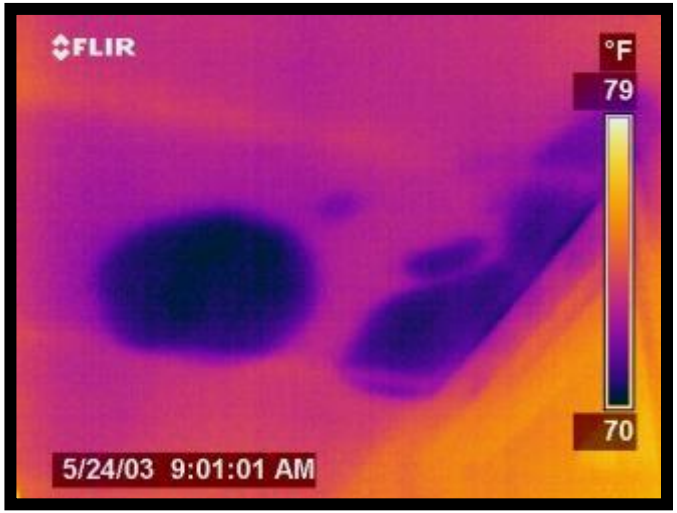
# Water, Invisible to the Eye

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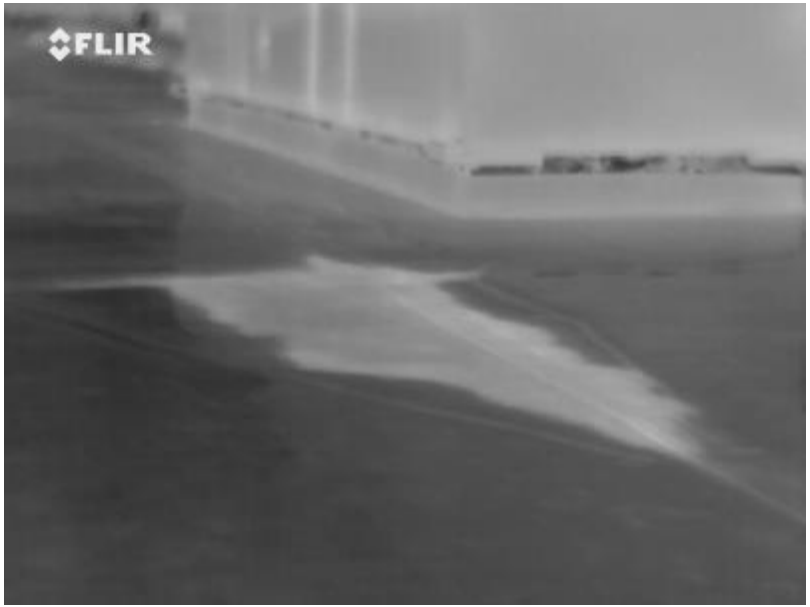
# Roof Moisture

Water in the insulation from a seam leak

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# So What Camera is Right for You

New Ex Series

New Exx Series

New T Series

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# Questions you should ask?

- How far from the target?
- How hot is the target?
- What other applications?
- How often will you use the camera?
- What camera features do I need?
- Who will use the camera or cameras?
- What type of reporting and trending will I do?

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# FLIR Ex Series – Spot Gun Replacement

- Radiometric JPEG image storage
- MSX Technology
- Fixed Focus (focus free)
- 3” Color LCD
- -4°F to 482°F Temperature Range
- Cost $995 to $3,995

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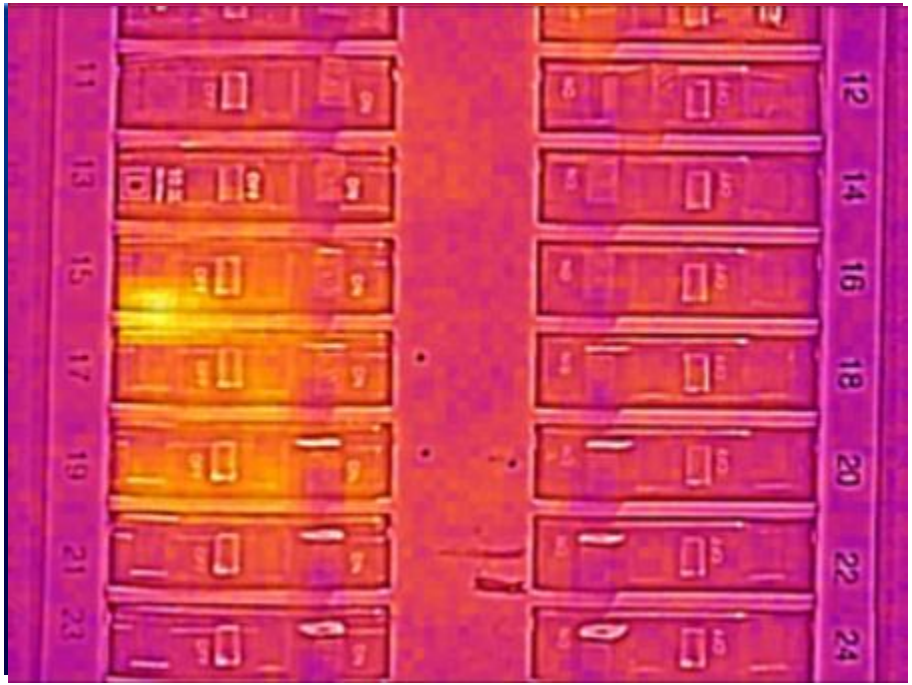
# MSX




$995

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# FLIR Exx-Series- Performance Cameras

- Large Touch screen
- Wi-Fi  and Blue Tooth for remote viewing/reporting
- MSX Technology
- Laser, video light
- Accessory Lenses, wide angle, telephoto
- Temp ranges up to 650C
- Cost $3,995 to $7,995

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# FLIR T Series- High Performance

- Ergonomics/Outdoor App’s
- High Temperature, up to 2000c
- High Resolution up to (640 x 480)
- Remote Controls
- $8,750 to $26,950

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# Q & A
# Thank You

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