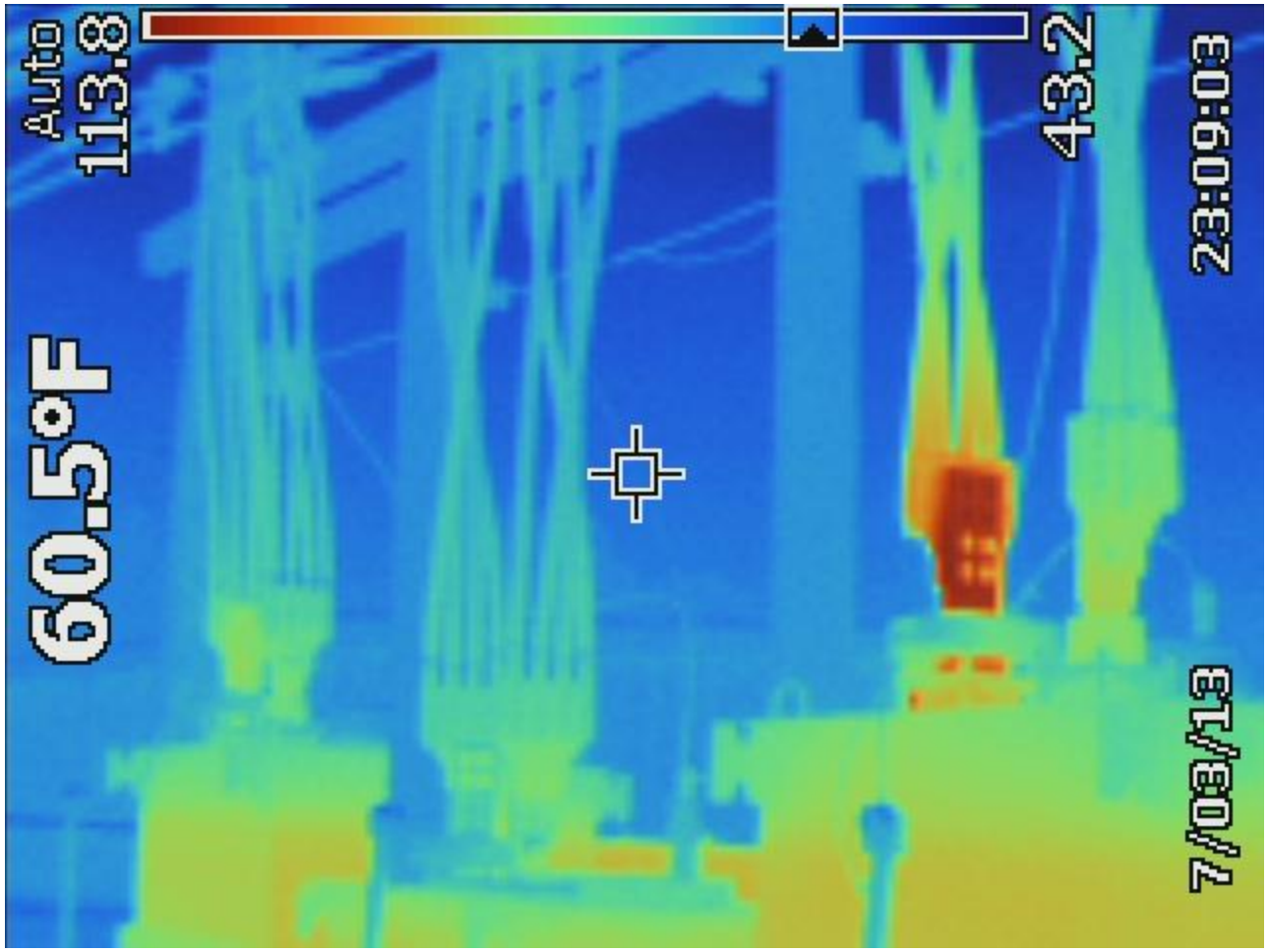
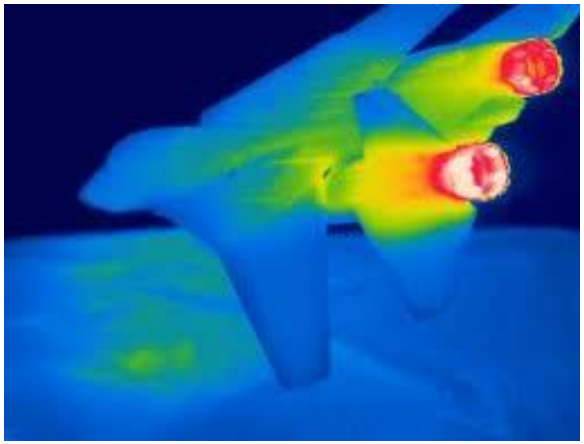
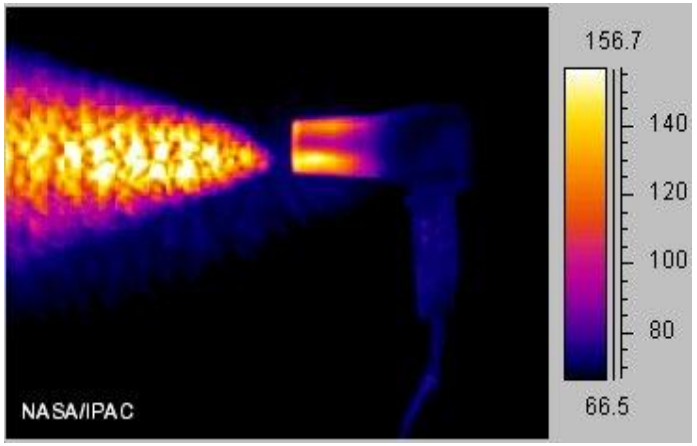
Infrared For The Meter Shop



What is Infrared?

Infrared Radiation is emitted by all objects – we commonly refer to Infrared Radiation as “heat”.





Infrared Radiation is produced by the motion of atoms in an object. The higher the temperature, the more the atoms move and the more Infrared Radiation they produce. Said simply, the “hotter” an object is the more Infrared Radiation it emits.

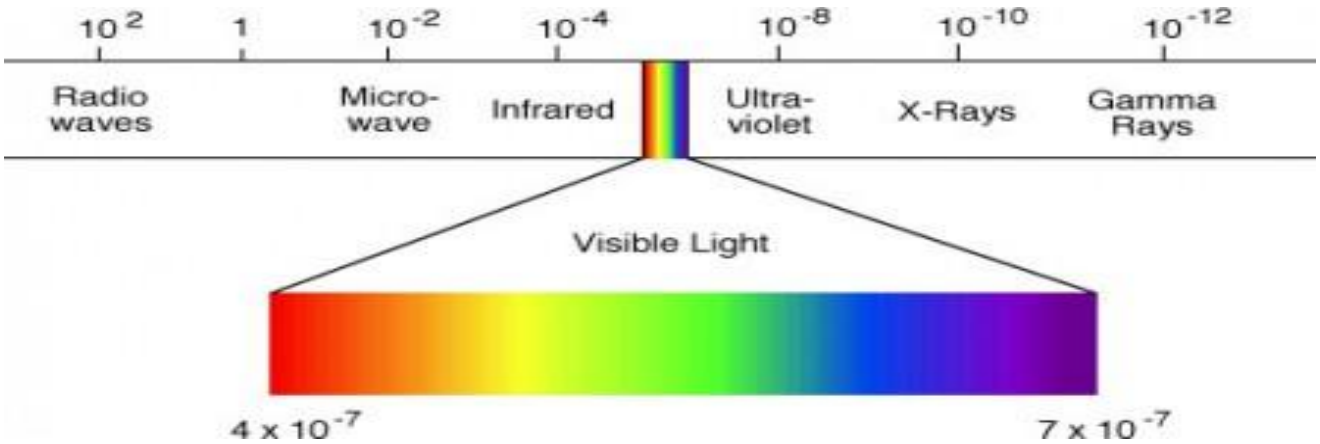
Infrared Energy Is All Around Us

Natural sunlight is comprised of three basic types of energy:

- 53% Infrared Radiation – felt as heat
- 44% Visible Light - sunlight that we see
- 3% Ultraviolet Radiation – can cause sunburn

Infrared vs Visible Light

The human eye is sensitive to only a very narrow portion of the Electromagnetic Spectrum – visible light, the colors of the rainbow.



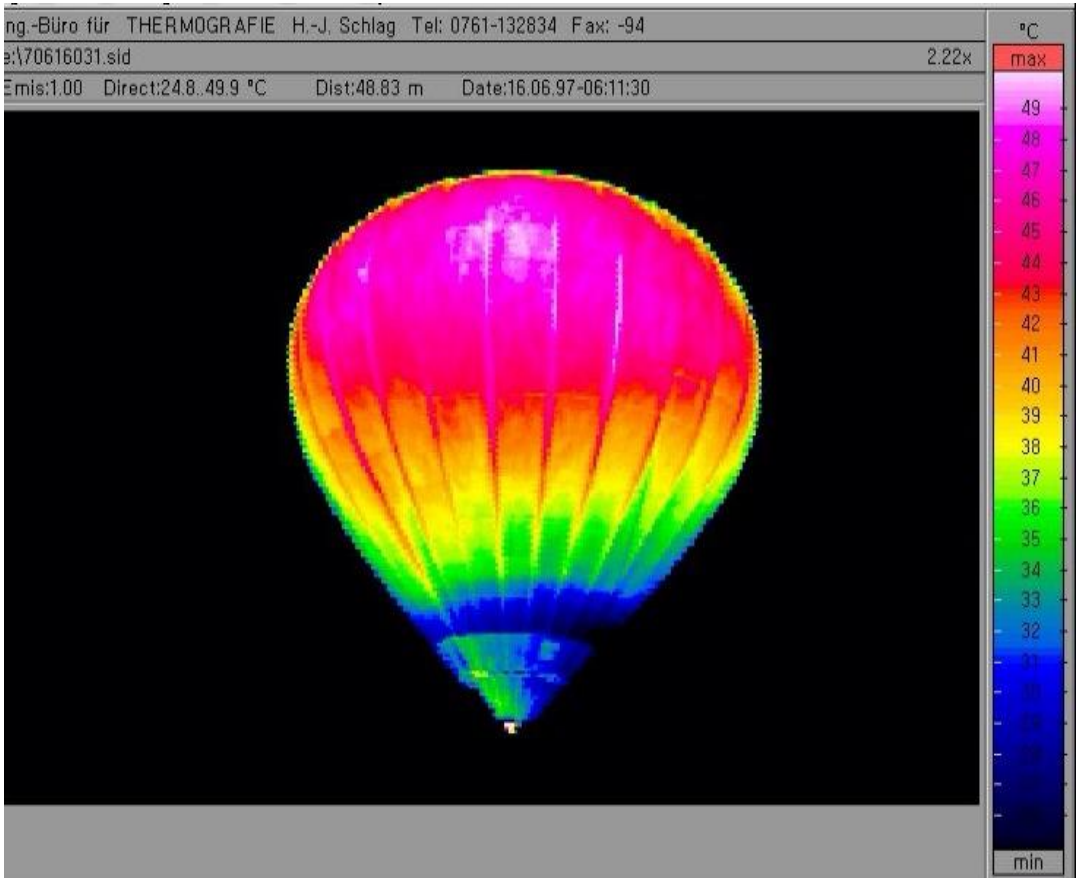
Infrared Radiation lies between the visible and microwave portions of the electromagnetic spectrum. Infrared Radiation cannot be seen with the human eye. Special equipment is necessary in order to be able to “see” Infrared Radiation.

Infrared (Thermal) Imaging

By using equipment designed to sense and display Infrared Radiation the Meter Shop technician can “see” the heat signature of issues and problems that the human eye cannot detect. These “thermal cameras” capture Infrared Radiation as visible images.

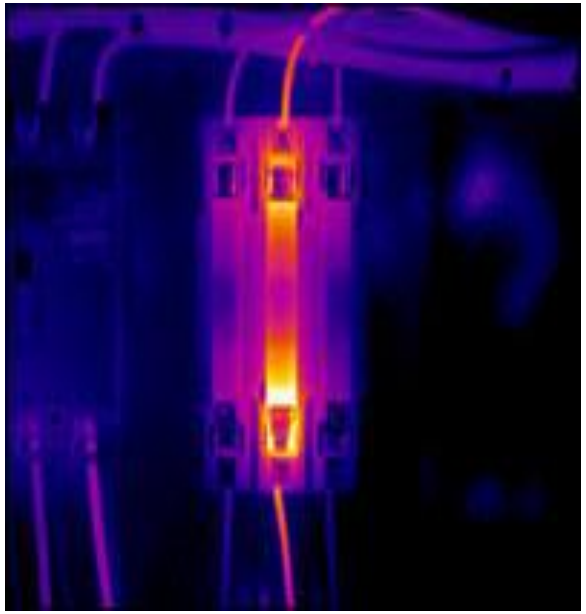
Thermal Imaging Cameras “SEE” Heat

The heated air in this Hot Air Balloon can clearly be seen in this Infrared image - Thermal Imaging allows us to easily see to see why it floats.

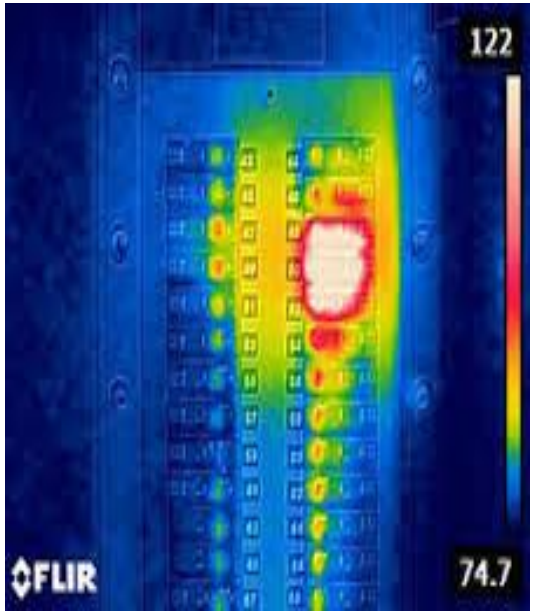


See *Invisible* Issues

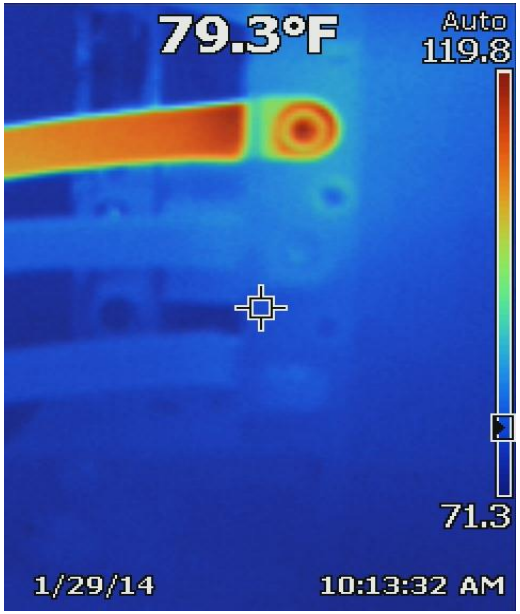
Thermal Imaging Equipment is another tool in the Meter Shop arsenal that can help you find issues BEFORE they become problems.



Heated Fuse



Overloaded Breaker



Loose Connection

Troubleshooting With A Thermal Camera

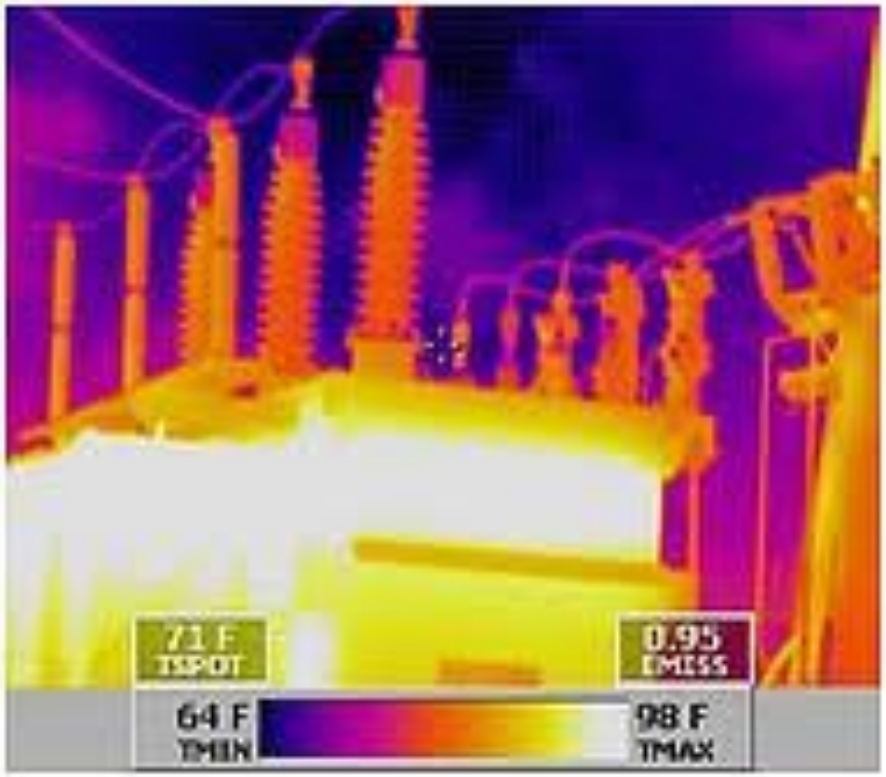
Look For Differences In Temperature – Compare “Normal” Temps To “Abnormal” Temps

Loose Connection On ‘B’ Phase Spade

Loose Connection On ‘B’ Phase CT Terminals

Troubleshooting With A Thermal Camera

Just Because An Object Is “Hot” Does Not Mean There Is A Problem
View, Compare And Use Common Sense



Load = Heat This Transformer Is Hot Because It Is Loaded Up

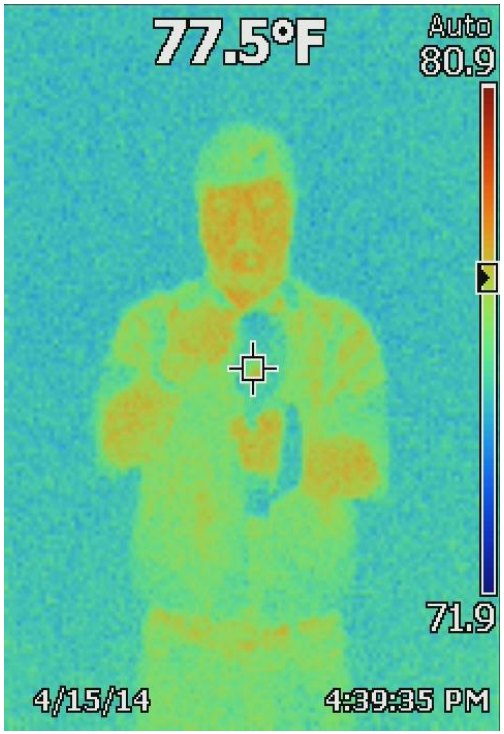
These PTs Are Hot Because They Are “HOT”

Troubleshooting With A Thermal Camera

- Whenever an electric current flows through a conductor, it creates heat
- More current flow, more heat
- No current flow, no heat
- The more resistance, the more heat – loose or damaged connections will be hotter than tight or non-damaged connections at the same load
- Remember – De-energized Services or Services with Light Loads or No Load WILL NOT PRODUCE A HEAT SIGNATURE, Even If There Is A Major Problem
- Thermal Cameras only “see” heat – no difference in heating, no problem…

Reflection Can Cause False Heat Alarms

Heat from the sun or other hot objects (like you) can be reflected off of the object you are scanning and show up as a false heat signature.



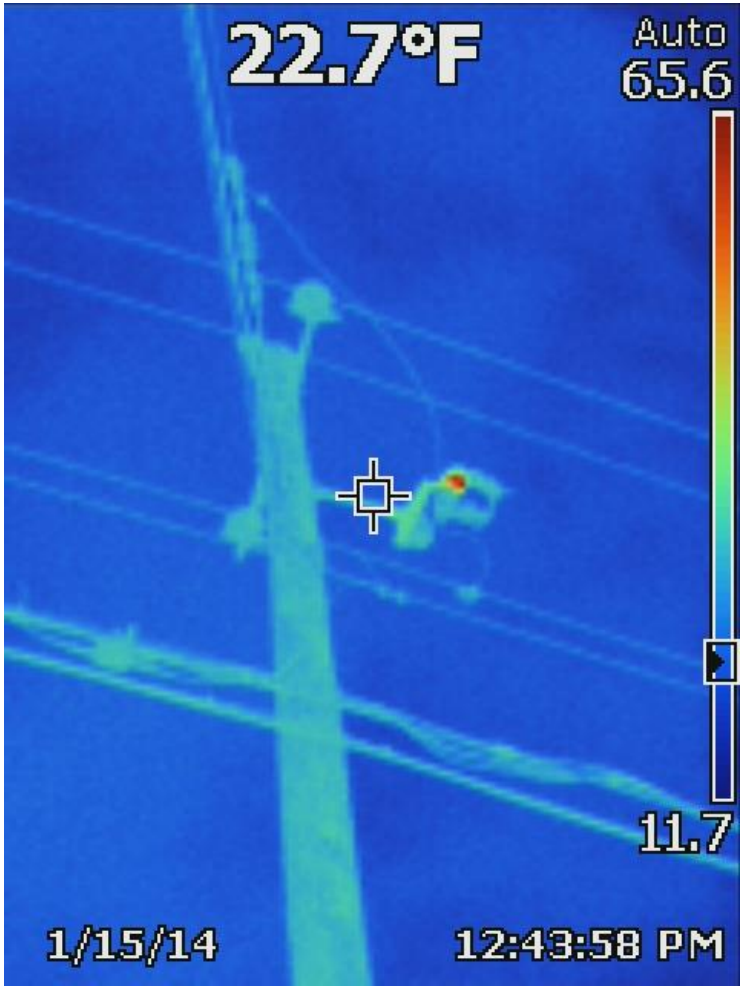
This is an image of my reflection in a mirror, taken in a completely dark room.

Infrared energy can be reflected similar to light. Make sure what you are seeing is a problem and not a false alarm caused by reflected heat.

How JCPB's Meter Shop Uses Infrared Scanning

- BrightRidge Meter Technicians use Thermal Imaging Cameras to scan every meter site that we visit as part of our field maintenance program
- Both Overhead and Underground services are checked – Techs scan all equipment, starting at the primary connections, thru the transformer bank and metering equipment
- Pay particular attention to any splices or terminations – these connections are susceptible to heat damage caused by bad or loose connections
- Capture both Thermal and Visible images of suspected problems and then follow up to determine root cause and the best course of action to make repairs
- Substation crews, Engineering and even Marketing "borrow" our Thermal Imaging Cameras

Real World Examples



Loose Connection On Cut-Out

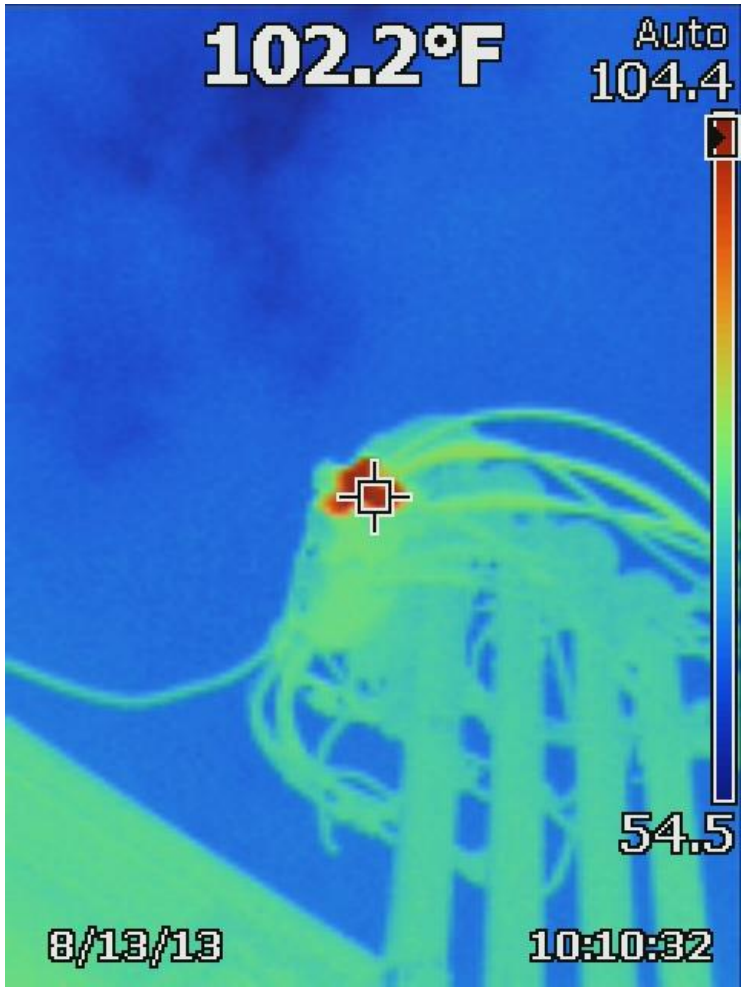
Damage Cut-Out Was Replaced By Service Department **BEFORE** Any Customer Outage Occurred

Real World Examples

Overheating Transformer Lug

Outage Was Coordinated With Industrial Customer And Transformer Was Repaired BEFORE Major Damage Occurred

Real World Examples



Damaged Secondary CT

CTs Were Replaced On A Saturday While Customer Was Shut Down

Questions or Comments???

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