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Most of the itc staff are attending the InfraMation conference in Orlando the beginning of this month, learning from and enjoying the company

of our fellow thermographers. We miss seeing those of you who couldn't make it. We will have a full report in next month's issue. ♦

## INFRARED CAMERA VS. THE THERMOCOUPLE

By Robert J. Rogers  
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For years, the electronics industry and its segments have been performing temperature measurements utilizing the thermocouple, thermistor or RTD (resistance temperature device).

The temperature displayed by a thermocouple is in fact the temperature of the thermocouple. A thermocouple is made from two dissimilar twisted wires that when heat is applied, produces a small voltage related to temperature. There are different thermocouple types, each with a specific temperature measuring capability hopefully in a linear curve of the desired measured temperature range.

Problems:

### Bonding or adhering to the material to be measured.

One of the most difficult items to realize is the bonding or adhering of the thermocouple to the part whose temperature

is desired. Improper bonding will cause a lower temperature to be displayed of the component that you are attempting to measure. An infrared camera is a non-contact measurement instrument where this problem does not exist.

### Altering electrical characteristics of the circuit.

When thermocouples are used to measure the temperature of components in high frequency radio circuits, it will alter the electrical characteristics of the circuit. Capacitive coupling or inductive coupling will drastically cause misalignment of the circuit. This will cause the operation of the circuit to shift in frequency etc and the temperature measurement will be inaccurate in its correlation to its desired operating point.

### Removes the temperature from small, surface-mounted components

On small electronic components, a thermocouple will actually remove heat from the component and the resulting temperature display will be lower in value

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# INFRARED CAMERA VS. THE THERMOCOUPLE

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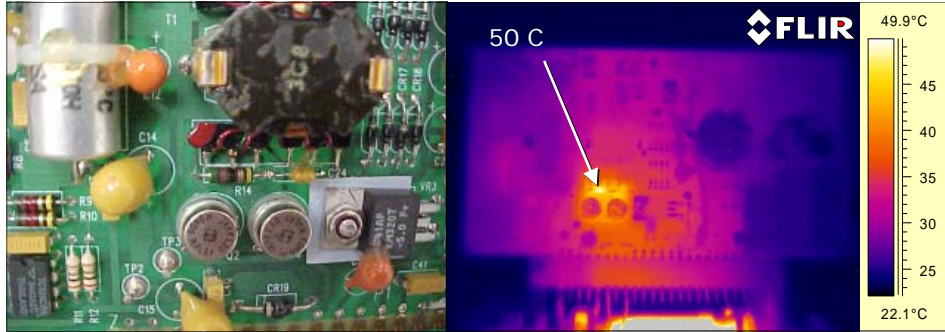
than the actual value before the thermocouple was attached.

The following example illustrates this effect.

The emissivity of the 50 Ohm resistor, R14 (Figure 1) was determined to be 0.95. A thermal image was

observed using a PM595 Infrared camera and displayed a temperature of 50.0°C on the resistor. A thermocouple was attached to the resistor and a temperature was displayed on

the thermocouple digital display unit of 40.5°C. A reduction of 9.5°C over the infrared camera! A thermal image of the resistor with the attached thermocouple was made and an infrared temperature of 43.5°C was observed. This temperature was reduced by 6.5°C due to thermal conduction away from the resistor into the thermocouple!



## Open thermocouple junction, and decalibration can result in an error in measurement.

Decalibration can be obtained by reading excessive temperatures or by cold-working the thermocouple wire which can happen if the thermocouple wire is pulled through an

electrical conduit. This operation will alter the electrical characteristics, thus make the reading of the thermocouple inaccurate. An open thermocouple junction will result in errors in temperature measurement.

## Freedom from choosing a linear Thermocouple temperature range.

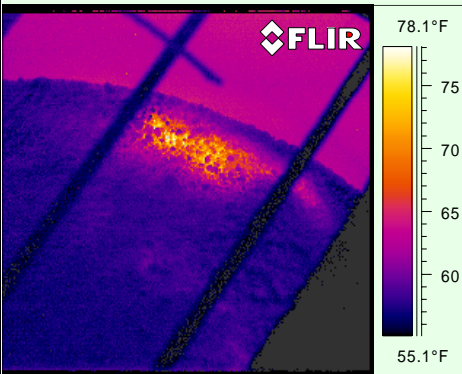
The infrared camera's operating temperature measurement is calibrated to provide accurate non-contact temperature measurement over its entire range. So there are no specific operating temperature ranges related to thermocouple types to be concerned with by using an infrared camera. All these problems can be eliminated by the using an infrared camera instead of a thermocouple to obtain accurate, meaningful, temperature measurements. ♦

### LAST MONTH'S BRAINTEASER

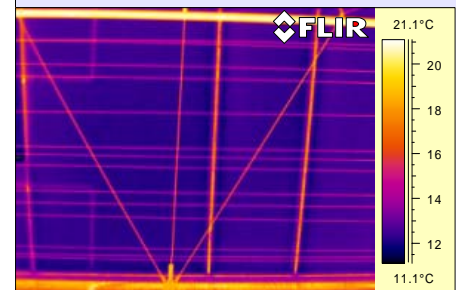
**C**ongratulations to our September Brainteaser winner, Jim Zelch from Ameren Corporation. Here is Jim's explanation "The image in the September newsletter appears to be similar to what I see here at the power plant all the time. It's the same as my view down into one of our coal hoppers only in this case the hopper is round. The bars look like grating with a section of the floor in the image. The hotspot is similar to the hotspots that we see in our coal. When it gets too hot we put water on just that spot alone to prevent a fire from occurring. Though at the 70-75 degrees that this material is at, it is much lower that my coal. So I can't

tell what the material is but somehow some minor amount of heat is being generated because the remaining material is 60 degrees or below. To me this suggests dry material and it is material that may not have moved in a while since it is near the silo wall rather that out near the center where more movement would occur."

Thanks to Thomas Lewis of Reliant Energy for the thermogram. ♦



### BRAINTEASER OF THE MONTH



**H**ere is this month's brainteaser. First reader to email me with the correct explanation wins \$20 in Infrabucks. Please put "Brainteaser" as the subject of the message. ♦

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## About the Infrared Training Center

The Infrared Training Center offers training and certification in all aspects of infrared thermography use. Our world-class training facilities are located near Boston, Massachusetts, USA and Stockholm, Sweden and have the world's most extensive hands on laboratories for infrared applications. Please join us in exploring the fascinating world of infrared!



## Delivering world-class training and knowledge about thermography



Your comments and suggestions about this newsletter are welcomed and encouraged. If you have an interesting application or case study to share, we encourage you to submit it for publication.

Please e-mail

mailto:[Gary.Orlove@infraredtraining.com](mailto:Gary.Orlove@infraredtraining.com) or regular mail to the USA office

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### Upcoming Classes - Americas

Remember we also teach customer site training courses at your convenience. Please contact us for more information.

#### October 2002

- 7-11 – Level I – Chile
- 14-18 – Level I – Boston, MA
- 14-17 – Level II – San Diego, CA
- 14-18 – Level I – Mexico
- 21-24 - Level I - Vancouver, BC
- 22-24 – R&D – Boston, MA
- 22-25 - Level I - Anchorage, AK
- 28-11/1 – Level I – Venezuela

#### November 2002

- 4-8 – Level I – Boston, MA
- 5-8 – Level I – Seattle, WA
- 4-8 – Level I – Brazil
- 18-22 – Level II – Boston, MA
- 19-22 – Level I – Atlanta, GA

#### December 2002

- 2-6 – Level I – Boston, MA
- 2-5 – Level I – Dallas, TX
- 10-12 – Level III – Boston, MA

#### January-2003

- 13-16 – Level I New Orleans, LA
- 13-17 – Level I Boston, MA
- 27-30 – Level I Phoenix, AZ

### Upcoming Classes - International

#### October 2002

- 14-18 - Level II - Malaysia
- 28-Nov 1 - Level I - Denmark (Danish)

#### November 2002

- 11-15 - Level I (Swedish)
- 18-22 - Level II - South Africa
- 25-29 - Level I - Norway (Norwegian)

#### December 2002

- 2-6 - Level II - Italy (English -> Italian)
- 9-13 - Level I

#### February 2003

- 24-28 - Level I - Denmark (Danish)

### Upcoming Classes - Germany

#### October 2002

- 8-10 - R&D
- 21-23 - Operator CM
- 21-26 - Level I EN 473

#### November 2002

- 18-20 - Operator CM
- 18-23 - Level I EN 473

#### December 2002

- 3-5 - R&D
- 9-11 - Operator CM
- 9-14 - Level I EN 473

### Upcoming Classes - France

#### October 2002

- 14-16

**Infrared Camera Rentals**

Rent an infrared camera from **FLIR Systems** to locate electrical and mechanical problems, schedule repairs, and avoid costly plant shutdowns. Whether you have a temporary testing/inspection requirement or need to evaluate an IR camera before purchasing, renting from **FLIR** can help you solve problems.

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