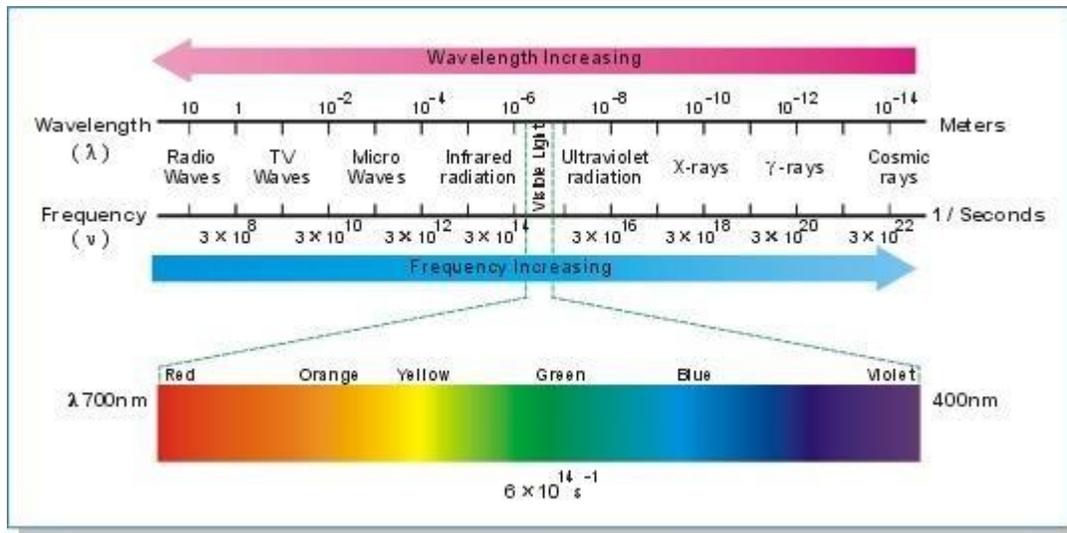


## INFRARED THERMOMETERS BASICS

By: Douglas Wright, President

[Infrared thermometers](#) measure reflected infrared light, which just like any light ray is Electromagnetic Radiation, with lower frequency (or longer wavelength) that is used to correlate a specific surface temperature of the product measured. Anything above absolute zero (-273.15 degrees Celsius or 0 degrees Kelvin) radiates in the infrared. Even ice cubes, snow, & your refrigerator emit infrared.



IR sensors collect the low amounts of energy (usually 0.0001 watt) from the target, amplified by a precision amplifier, and convert it into a voltage output. The CPU then converts this to a digital temperature reading after compensating for the ambient temperature and emissivity effect; you then get the temperature of the target within seconds after you push that switch.

### Can IRT measure air temperature?

**No**, because Air does not emit infrared, the emissivity is too low to be detected.

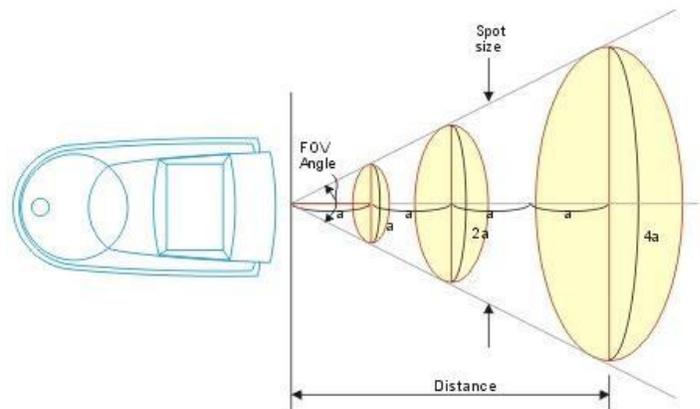
**Yes**, because you can by pointing the IRT at anything that has the SAME temperature as the air: The key to get "Air temperature" is to measure "anything that has the same temp as the air"

### Can I measure the body temperature of an Ant?

You can point the IRT to an Ant on your desk, but what you get is an average temperature of the Ant & the Desk because the Field of View of the IRT is much larger than the Ant.

But, if you can get 10,000 clustered ants on your desk, which can cover the whole FOV of the IRT, then YES, you can measure the body temp of the Ants.

This FOV issue is a key to get correct reading from IRT.



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### **Are Infrared Thermometers Harmful?**

[I.R. thermometers](#) do not emit any Infrared radiation (present everywhere anyway) they only measure it. However, Laser guided models although normally harmless should not be targeted near the eyes as even low power lasers can damage the eyes. Therefore, for medical applications we advise non-laser guided models for reasons of safety.

### **Why can't I see IR?**

Your eyes are designed for Sunlight, 2 kinds of species have been identified to be able to detect IR: some rattle snakes & beetles. But you still can sense the IR by your skin: Beside a campfire, you can feel the warmth from the IR.

When your car is baked by sun, you start the car, turn on Air-Conditioner, the air is cooled, But you still feel Baking-Hot, that's IR radiating from the interior of the car, reaching your sensor (skin). You may use IR to learn that the radiation temperature in your car can reach 80degC!

### **How far?**

Can I measure the temperature of a wall from 5 meters? The temperature of a mountain from 1km? We are using the 8um to 15um infrared; the atmosphere is almost totally transparent for this band. At 100 meters, no rain, no fog condition, IR can be very accurate. But as you measure father away the F.O.V gets larger and the potential for interference (pollution moisture etc.) increases thus increasing the potential error.

### **Can the IRT operated in complete darkness?**

Yes, that's why DOD & military are so interested in IR.  
In fact, the early IR technology was developed with military funding.

### **Can the IRT penetrate an object & measure what's inside?**

Internal temperatures cannot be measured using I.R. sensors. At best if the internal temperature is consistently relative to surface temperatures, then the surface reading can be used as a rough indicator of internal temperature but we do not advise this method. In this case use one of our models with both I.R. and a fold out probe to allow you to correlate surface temperatures to internal temperatures

### **What Can IR penetrate?**

IR can penetrate PE film (for example: a complete dark garbage bag), Silicon, Germanium.  
You can hide something warm behind a PE film (your hand); the IRT can detect the presence of the object.

### **Internal Temperature Readings**

Can IR thermometers take internal readings? Not really. The IR is measuring reflected SURFACE light. In some controlled conditions an IR might be used to indicate that the internal temperature is incorrect. The principle here is that the entire product at a certain point in production has cooled or heated to a certain temperature. If the core temperature is incorrect then the surface temperature MAY be out as well. This is something that QA and engineering would need to work on, on a case-by-case basis. Again, if variances are noted then steps should be taken to take true internal temperature readings. If done properly with the correct checks and balances, this can be a valuable option.



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