Viper Elevated Body Temperature Measurement Info Sheet
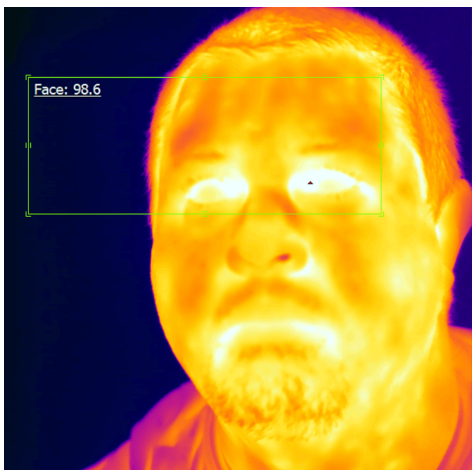
What is the best way to measure a person's internal or core body temperature?

The best and most common way to measure a person's internal body temperature is with the use of a contact thermometer, usually administered underneath the tongue. A healthy persons internal body temperature normally register's 97.5°F (36.4°C) to 98.8°F (37.1°C).

What is Infrared and how does it work?

Thermal imaging cameras measure the radiated infrared energy of an object and convert that mathematically to a temperature based on the radiance of an object being measured. Each pixel on the camera has a calibrated temperature reading.

How do we screen for elevated body temperature?

Thermal imaging can be used as a great first screening tool to detect people with elevated body temperature if used correctly. When screening for body temperature on the face, the most reliable focal point for temperature measurement is the eye canthus (or tear duct). This is the only area on the face that provides reliable results that correlate to the body's core temperature if the subject is in normal ambient conditions.

What is the accuracy of a thermal imaging camera on its own?

The standard specification for most thermal imaging cameras, is +/- 2°C or (+/- 3.6°F) or +/- 2% when calibrated and looking at a black body calibration furnace.   This does not mean when you take a camera out of the box, power it up and point it at an object, that you are within that camera specification.
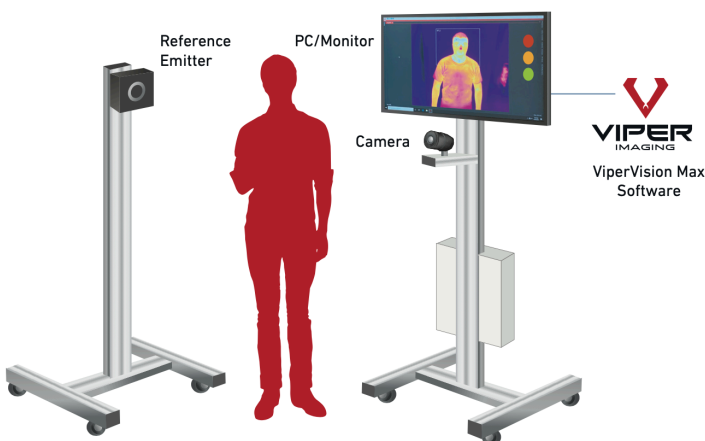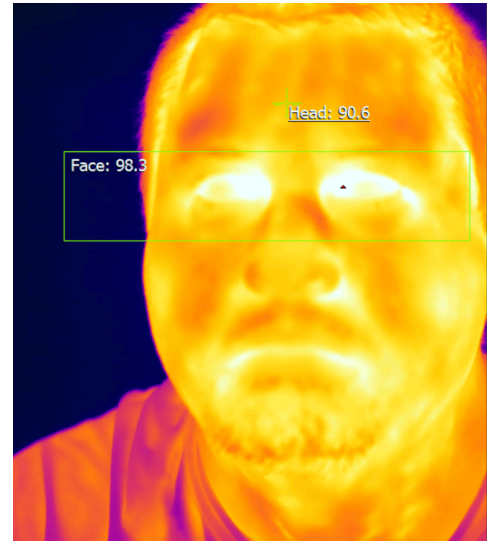
These factors go into making thermal temperature reading reliable and accurate, such as:

- **Emissivity** the measure of an object's ability to emit infrared energy. Emitted energy indicates the temperature of the object. Emissivity can have a value from 0 (shiny mirror) to 1.0 (blackbody).
- **Spatial Resolution (Spot Size)** based on the number detector pixels and the field of view (FOV) of the lens being used. This combination defines the area the imager sees at any given moment. Spatial resolution can be used to help define the smallest object size that can be detected
- **Detector/Camera Noise**
- **Camera Drift**

Many people are making the claim that they can measure large groups of people.   Can we do this with infrared?

NO!   Best practices dictates that you should measure the tear duct.   No other region on the face can offer reliable measurement. Note the image to the right, where we are measuring in the tear duct region and getting a reading of 98.3°F (36.8°C).   At the same time, a reading on the forehead is measuring 90.6°F (32.6°F) - a full 7.7°F lower.   Forehead readings also are not consistent from person to person.   Testing has shown that the forehead is anywhere on average from 2°F to 10°F lower than the body's core temperature.

This makes it impossible to look at mass groups of people to randomly take readings of the face and get accurate results. When looking at large groups, you cannot have a spot size small enough to capture the tear duct.   It is also important to note thermal imaging also cannot "see through" glasses. Standard glass is opaque to infrared.

Head: 90.6
Face: 98.3

Reference Emitter
PC/Monitor
Camera

VIPER IMAGING

ViperVision Max Software

What is the process to make this reading correctly?

- The system is used best when put in an environmentally controlled area.
- The subject needs to stand still in front of the camera, typically 2' to 10' away depending on the FOV, or lens being used.
- The region of the tear duct is approximately 5mm large, so the spot size of the camera needs to be smaller than that, depending on how many pixels are used for measurement.
- Glasses need to be removed.
- A Region of interest (ROI) needs to be drawn around the eyes to obtain a maximum temperature in that area.
- Object needs to look towards the camera so the eyes are visible.
- Alarm parameters are set up to trigger body temperature above a certain threshold.

How does Viper have the knowledge to supply EBT Systems to address the COVID-19 Pandemic?

Thermal imaging technology has been used for EBT for over 15 years - since the SARS, Avian Bird Flu and the Swine Flu epidemics. The Viper team has decades of experience applying thermal imaging technology – for EBT measurement, as well as a host of other applications for various industries.

How is the Viper System more accurate than other system's on the market, or by just using thermal imaging cameras on their own?

- First, we understand the application and how to make the measurement correctly.
- We know that following best practices, the only area externally on the face is the tear duct.
- We understand the requirement for cameras that have a small spot size, and utilize the correct optics and distance measurement.
- Infrared cameras can drift when their internal temperature changes.   This can happen as they warm up from start up - or if ambient conditions change.   If this isn't compensated for, temperature readings will be incorrect.
- We utilize Reference Emitters in the scene's (field of view).   That temperature is fed back into the software and compared to what the camera's actual reading.   If there is any error on the camera, the system constantly corrects for that within the software.   For instance, when we use a reference emitter (heated black plate with an embedded thermocouple), we feed that temperature back in to an I/O device.   If the reading from the thermocouple is 90.0°F, and the Thermal Camera is reading 91.2°F, we know the camera is reading 1.2°F high, and the system can adjust the parameters to compensate for this and constantly Re-Calibrate the camera to read correctly based on a known source.
- By using this method, the Viper EBT system can achieve better than .5°C accuracy.
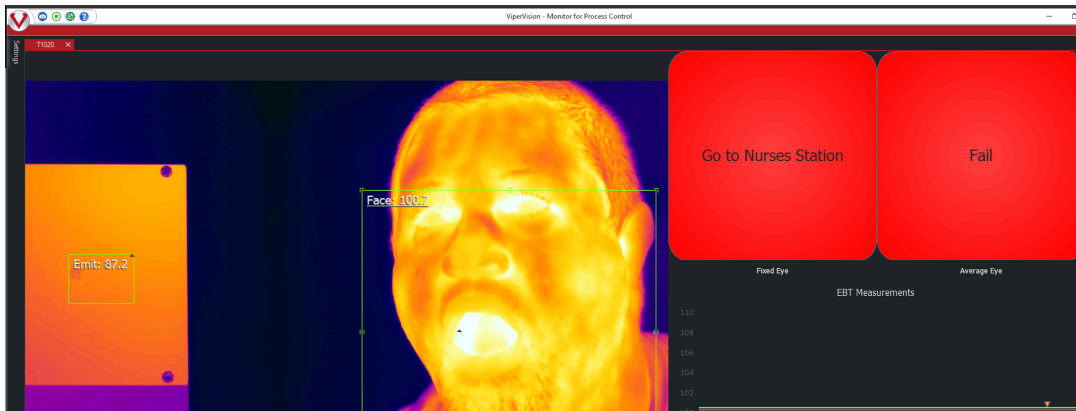
Do environmental conditions affect the temperature measurement reading from the camera?
Yes.   This is apparent when someone comes inside from cold weather conditions.   The body and tear duct region is exposed to the cold, will read colder until the body normalizes and comes back up to temperature. This could take up to several minutes.

What if I do not have time to wait for people to normalize prior to scanning?
There are two common methods that people will use:
1. **Rolling Average:** As you take readings a rolling average will be established.   You can then alarm on an amount above average.
2. **Measure inside the mouth:** A person's core temperature can be measured by looking inside the mouth. Since this is a different measurement than the Tear Duct Method, the settings, including emissivity will be different. With Viper Vision software, you can use different recipes.   Our Viper Vision Max software can save different recipes, for instance, if we get the external or outdoor weather conditions, we can automatically switch over to this method.

Can you personalize the Pass/Fail Messages?
Yes, if someone's reading was above a certain threshold, you might want to give them instructions to "Go to Nurses Station" or "Go get tested at your Doctor's Office"

Is the Viper EBT System Automated?
The EBT Max and Ultra Systems are setup to be automated.   Once a person is standing in front of the camera, we can set a predetermined time to get their reading, typically 1 to 3 seconds. If they are below a certain threshold, then they will get a Pass (or Green Box).   If their temperature is elevated above a certain threshold, then they will get a Fail (Red Box).

Is there a way to save these images and access them on our system?
Images can be saved, either on an input or alarm.   If connected to the customer network, we can use our built in email feature to provide images or reports over email or text alerts.

Can the system be tied in to Access Control?
Yes. Since we use different modes of Communications Protocols (Digital IO, OPC, Modbus, Ethernet IP), we can communicate with external devices (both input and output).