ONSIGHT CUBE

ONSIGHT CUBE – Human Body Temperature

Screening Guidelines

2611 D-05

LIBRESTREAM

BODY THERMAL SCREENINGS

Librestream's Onsight Connect software and Onsight external Cube camera can be utilized as an effective method for initial temperature screenings for employees and visitors at industrial and commercial facilities.

By closely following the guidance detailed in this document, relative body temperature can be determined and individuals with elevated body temperatures can be identified for further screening. This solution enables the initial screening to take place remotely such that screening personnel can be isolated from the individuals being screened.

HUMAN FACTORS

NORMAL AND ABNORMAL BODY TEMPERATURE

Normal core body temperature for adults is commonly stated as 37°C (98.6°F) on average. Normal variation is +/-0.6°C (+/-1°F) and can change throughout the day based on sleep/wake cycles, exercise, and external factors.

When using the Onsight Cube in Human Skin emissivity mode, the user interface will show a stepped color spectrogram that attempts to represent normal temperature in the middle of the spectrogram. Each step in the spectrogram is equivalent to a 0.6°C (1°F) change in temperature. The scale was chosen to give the highest contrast possible between significant changes in temperature, enabling the easy recognition of these changes by the operator.

Abnormal body temperatures can be either below or above the average range, with common indicators of fever being an oral temperature above 37.6°C (99.7°F). Historically, a core body temperature of 38°C (100.4°F) was used to screen travelers during the SARS pandemic of 2003. If you are intending to measure skin temperature for the purpose of screening, please consult regional health authorities for guidance on choosing a threshold temperature and proper implementation of a test system.

This solution enables the initial screening to take place remotely such that screening personnel can be isolated from the individuals being screened.

SKIN EMISSIVITY

The Onsight Cube has a selectable Emissivity setting for human skin. Emissivity refers to how effective a material emits infrared radiation from its surface. The emissivity of wet or dry human skin is 0.98 as accepted by international standards (ISO) and this applies to all colors and shades of skin.

SKIN TEMPERATURE AND BODY CORE TEMPERATURE

A thermal imaging device such as the Onsight Cube measures the infrared radiation being emitted by the skin. With human subjects, the goal of this type of measurement is often to make an accurate estimation of body core temperature. There is always a difference between these two temperatures and this should be accounted for when using skin temperature measurements. The best correlation between skin temperature and body core temperature occurs at the canthus of the eye, which is the small area between

the inner eye and the nose. {figure 1} It is important to capture this area of the face when trying to make an estimation of body core temperature.

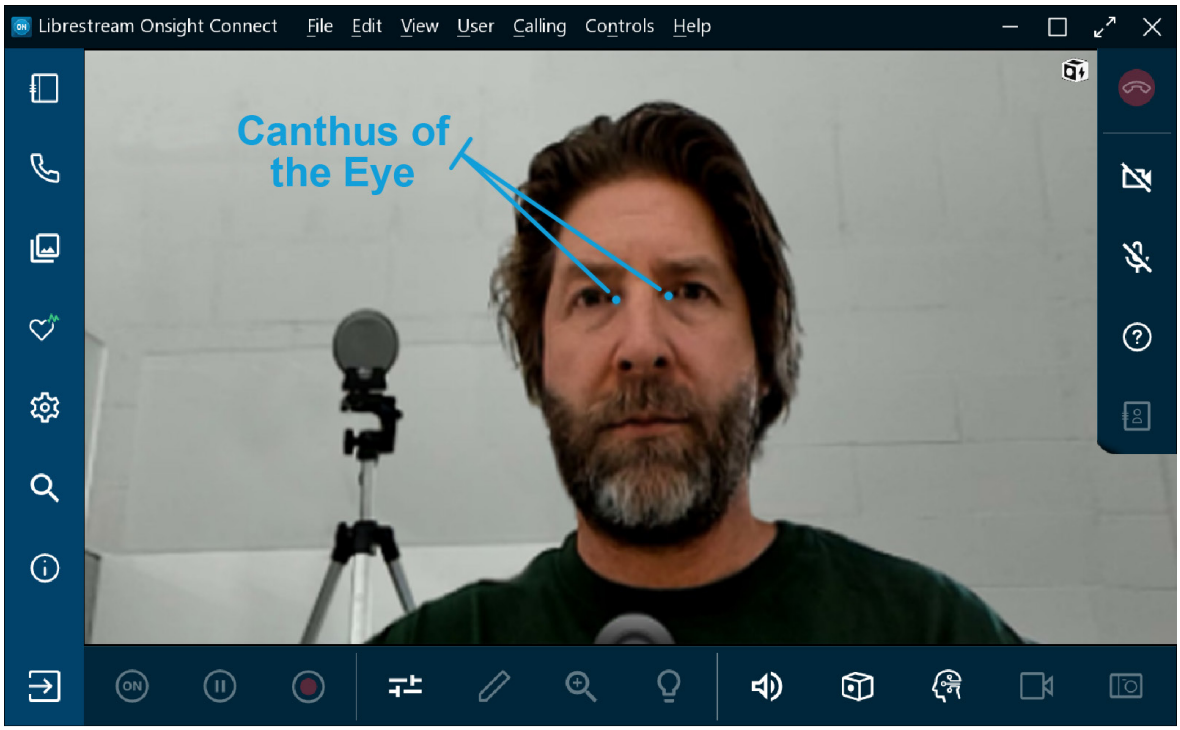

Figure 2-1 Canthus of the Eye

EFFECTIVE THERMAL IMAGING

ENVIRONMENT

The humidity and temperature of the immediate environment has a significant impact on the skin temperature of humans. Thermal imaging should take place in a controlled indoor environment with a regulated temperature between 20°C to 24°C (68°F to 75°F) and a humidity level below 50%. This will minimize environmental effects which can alter skin temperature or induce sweating in human subjects. The subject imaging area should also be free from strong convective airflow such as that from directed heating or air conditioning ducts.

Temperature and body core temperature occurs at the canthus of the eye, which is the small area between the inner eye and the nose. {figure 1} It is important to capture this area of the face when trying to make an estimation of body core temperature.

HUMAN SUBJECTS

There are some simple but critical guidelines that must be followed when attempting to accurately measure skin temperature on human subjects.

- The position of the thermal camera should be adjusted as necessary to capture the face of the subject while filling as much of the frame as possible. This increases the effective resolution of the measurement system.
- Subjects should not wear hats, glasses or masks of any type during thermal imaging. The eyes must

be visible and unobstructed so that the canthus can be captured by the thermal camera.

- Subjects should face the thermal camera directly without looking up, down or to the side.
- Subjects that are exposed to high ambient temperatures or intense exercise prior to thermal imaging should take sufficient time to acclimatize in a room temperature environment (i.e. stop sweating). Subjects should not be heavily clothed such as with an insulating jacket.

CREATING A SCREENING SYSTEM

Creating a system to sequentially capture thermal images of individuals for the purpose of screening requires a systematic approach. It is most effective to create a gating area where subjects can stage and enter the thermal imaging zone one by one.

The thermal imaging zone should be chosen such that the environmental factors referenced in this guide are controlled. When using the Onsight Cube to take thermal images of faces, a separation distance of 1 meter between the Cube and the subject is ideal. Here are some additional important guidelines:

- The screening zone should always be indoors in a controlled temperature environment regulated between 20°C to 24°C (68°F to 75°F).
- Do not place transparent material between the Cube and the subject. Materials such as glass and plastic are transparent to light but will block infrared radiation.
- Do not set up a measurement zone directly under forced air ducts or high intensity lighting that would either cool or heat the subject. Strong sources of light should be avoided, especially sunlight.
- Ensure that there are no heat sources directly behind the subject. A flat, opaque wall at room temperature is ideal. Do not place the subject in front of a metallic or reflective wall as this can reflect infrared radiation toward the thermal camera and may construe the image of the subject. Do not place the subject in front of a window.
- Ensure that other subjects cannot enter the frame of view when capturing a thermal image. Screening should be conducted one subject at a time in a single file operation.
- Ensure that equipment operators are adequately trained for their assigned tasks.
- Screening is only a preliminary step in determining body temperature. Any pre-selection should always be followed by an assessment using medical equipment such as an oral thermometer.
- Consult regional health authorities and infectious disease agencies for guidance and assistance with best practices.

USING A NON-HUMAN REFERENCE SOURCE

The best way to get stable and consistent measurement results with a thermal imager is to integrate a thermal reference with your test system. A thermal reference is a fixed-point source of infrared radiation with a known temperature and emissivity.

When used to assist with thermal imaging of human subjects, the thermal reference should be included in the field of view with each image. {figure 2} The reference temperature can be selected according to case-by-case requirements, but the most universal reference recommended for human skin temperature measurement is 35°C (95°F).

By comparing the color of the reference source with the color of the human subject, the operator can make an accurate assessment of the subject's body temperature relative to the known reference source temperature.

- Place the thermal reference in a position such that the subject cannot move between the reference and the thermal camera. Positional guidelines such as floor markings or a stool may be useful in positioning subjects correctly.
- The thermal reference temperature is recommended to be accurate to +/-0.3°C (+/-0.5°F) or better, with stability/drift of less than +/-0.1°C (+/-0.18°F).
- The thermal reference target should have a known emissivity greater than 0.95.

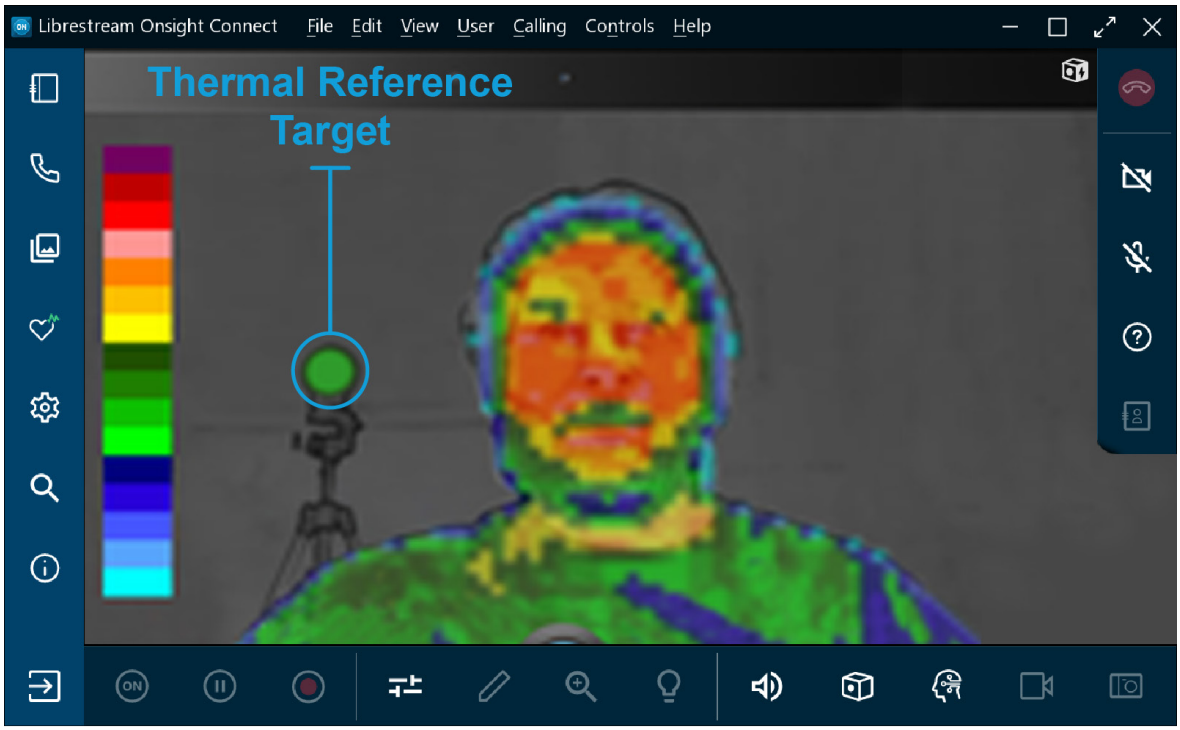

Figure 2-2 Thermal Reference Target

BODY THERMAL MODE SPECIFICATIONS

When the Cube is in Thermal or Fusion mode, selecting Skin as the emissivity setting puts the Cube into Body Thermal mode. Body thermal mode displays an onscreen color bar indicating the body temperature range to guide relative temperature comparisons.

- Capabilities
  - + Long Wave Infrared (LWIR) imager sensitive from 5-14µm
  - + 0.1°C (0.18°F) Minimum Resolvable Temperature Difference (MRTD) (relative temperature readings)
  - + 80 x 60-pixel array
  - + +/-5°C (+/-9°F) accuracy (absolute temperature readings)
  - + Fusion mode combining real images with thermal data
- Skin Emissivity Mode
  - + Automatically configures the Cube for Body Thermal imaging
  - + Thermal focus – removes background radiation from the display and shows color on the subject skin
  - + High contrast color scale with 0.6°C (1°F) differentiation

- Wireless Connectivity
  - + Stream thermal images to a paired smartphone, tablet, PC, or wearable with remote view finding anywhere in network range
  - + Allows separation between operator, Cube, and subject
  - + Remote collaboration through Onsight Connect allows live streaming of temperature measurements to experts