

vlRalert 2

Human Body Temperature Measurement System

USER GUIDE

PUBLICATION N°

814117

LANGUAGE: ENGLISH

ISSUE 4: 1st May 2020





IMPORTANT INFORMATION - PLEASE READ

AMETEK
PROCESS & ANALYTICAL INSTRUMENTS

Health and Safety Information



Read all of the instructions in this booklet - including all the **WARNINGS** and **CAUTIONS** - *before* using this product. If there is any instruction which you do not understand, **DO NOT USE THE PRODUCT**.

Safety Signs



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or personal injury.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to the user or users, or result in damage to the product or to property.

NOTE

Indicates a potentially hazardous situation which, if not avoided, could result in damage or loss of data.

Signs and Symbols used on equipment and Documentation



Caution, risk of electric shock.



Caution, attention to possibility of risk of damage to the product, process or surroundings. Refer to instruction manual.



Caution, hot surface.



Protective Conductor Terminal.



Observe precautions for handling electrostatic discharge sensitive devices.

Equipment Operation

Use of this instrument in a manner not specified by AMETEK Land may be hazardous. Read **and understand** the user documentation supplied **before** installing and operating the equipment.

The safety of any system incorporating this equipment is the responsibility of the assembler.

Protective Clothing, Face and Eye Protection

It is possible that this equipment is to be installed on, or near to, machinery or equipment operating at high temperatures and high pressures. Suitable protective clothing, along with face and eye protection must be worn. Refer to the health and safety guidelines for the machinery/equipment before installing this product. If in doubt, contact AMETEK Land.

Electrical Power Supply

Before working on the electrical connections, all of the electrical power lines to the equipment must be isolated. All the electrical cables and signal cables must be connected exactly as indicated in these operating instructions. If in doubt, contact AMETEK Land.

Storage

The instrument should be stored in its packaging, in a dry sheltered area.

The maximum storage temperature is 10 °C (18 °F) higher than the maximum operating temperature.

The minimum storage temperature is 10 °C (18 °F) lower than the minimum operating temperature.

Refer to the Technical Specification for details of the operating temperature limits.

Unpacking

Check all packages for external signs of damage. Check the contents against the packing note.

Lifting Instructions

Where items are too heavy to be lifted manually, use suitably rated lifting equipment. Refer to the Technical Specification for weights. All lifting should be carried out in accordance with local and national regulations.

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Return of Damaged Goods

IMPORTANT If any item has been damaged in transit, this should be reported to the carrier and to the supplier immediately. Damage caused in transit is the responsibility of the carrier not the supplier.

DO NOT RETURN a damaged instrument to the sender as the carrier will not then consider a claim. Save the packing with the damaged article for inspection by the carrier.

Return of Goods for Repair

If you need to return goods for repair please contact our Customer Service Department for details of the correct returns procedure.

Any item returned to AMETEK Land should be adequately packaged to prevent damage during transit.

You must include a written report of the problem together with your own name and contact information, address, telephone number, email address etc.

Design and Manufacturing Standards

The Quality Management System of Land Instruments International is approved to BS EN ISO 9001 for the design, manufacture and on-site servicing of combustion, environmental monitoring and non-contact temperature measuring instrumentation.

Registered ISO9001 Management System approvals apply in the USA.

UK Calibration Laboratory: UKAS 0034.

USA Calibration Laboratory: ANAB Accredited ISO/IEC 17025.

National Accreditation Board for Testing and Calibration Laboratories approvals apply in India.

Operation of radio transmitters, telephones or other electrical/electronic devices in close proximity to the equipment while the enclosure doors of the instrument or its peripherals are open, may cause interference and possible failure where the radiated emissions exceed the EMC directive.

The protection provided by this product may be invalidated if alterations or additions are made to the structural, electrical, mechanical, pneumatic, software or firmware components of this system. Such changes may also invalidate the standard terms of warranty.

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1 Introduction

The vIRalert 2 is AMETEK Land's accurate thermal imaging system for human body temperature measurement.

The **vIRalert 2** fixed temperature monitoring system provides remote measurement of human body temperature (typically the face) to an accuracy of within 0.5 °C enabling the detection of the small changes in temperature induced by a fever.

Using simple and intuitive software, this point-of-entry system provides automatic on-screen and audible alarms to alert the operator so that early action can be taken to protect the premises against the risk of spreading the infection.

A typical detection distance of 1 metre, provides a field of view of 70 x 55 cm so that checks can be made without any contact with the operator

Disclaimer:

Human skin temperature is affected by a wide number of environmental and physiological factors. Elevated facial skin temperature may signify a raised body core temperature; correspondingly, an elevated core temperature may not be accompanied by a raised facial skin temperature.

vIRalert systems are accurate scientific systems that must be operated strictly in accordance with the manufacturer's operating manual.

Skin temperature can be affected by environmental factors like ambient temperature and moisture on the skin. If in doubt any measurements should be validated with appropriate medical equipment.

vIRalert systems are not intended, nor designed, to diagnose or detect medical conditions including, but not limited to, viruses or other illnesses.

AMETEK Land thermal imaging products should only be used to detect variations of surface temperature. If elevated skin temperature is detected, the finding should be confirmed by other means, for example, an approved medical thermometer. The absence of an elevated skin temperature does not exclude a fever.

2 System Overview

A typical viRalert 2 System is shown in Fig. 2-1.

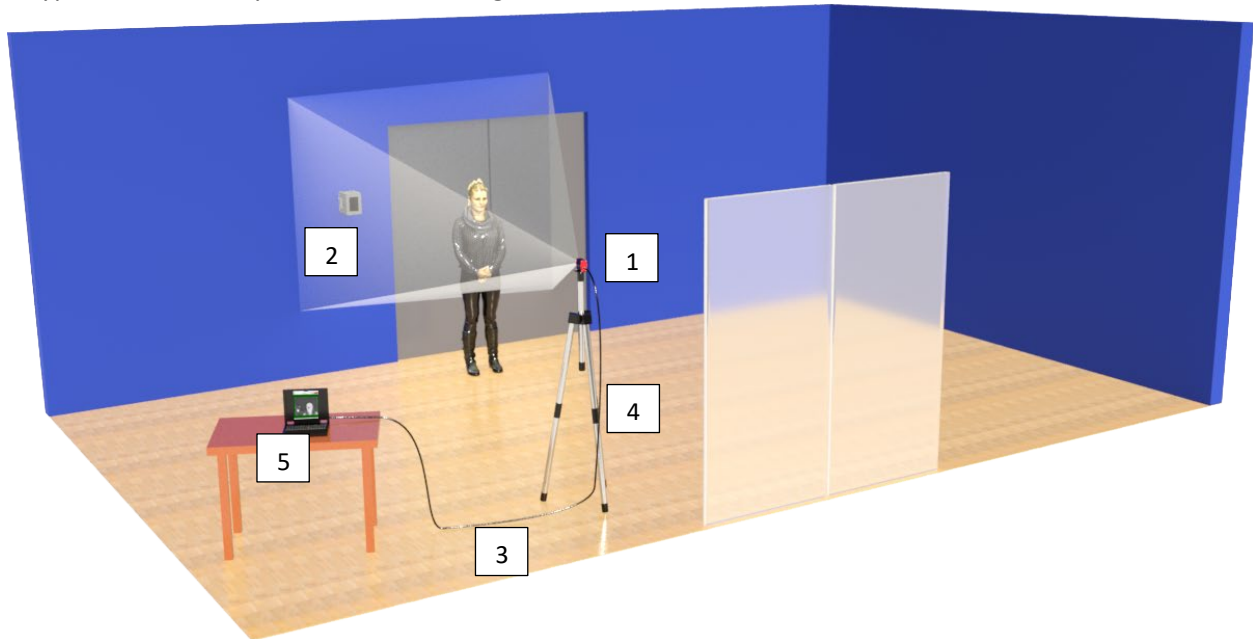


Fig. 2-1 Typical viRalert 2 System

The system comprises:

1: Thermal Imaging Camera

Continuously measuring 30 to 45 °C / 86 to 113 °F, with a 39 x 31° field of view and 80 x 64 resolution gives 5,210 temperature data points per frame, at a rate of 9 Hz.

2: Certified Blackbody Heat Source

Providing a trusted reference temperature value calibrated at 38 °C / 100.4 °F at $\pm 0.2^{\circ}\text{C}$ / $\pm 0.3^{\circ}\text{F}$ combined accuracy/stability for the thermal imaging camera with a large plate for viewing at longer distances. Each system is calibrated at our ISO17025 accredited facility in the UK.

3: Connecting Cable

Combined Ethernet and Power Cable between camera and laptop (4 m / 13 ft).

4: Flexible Mountings

Camera supplied with wall mounting bracket and standard 1/4-20 UNC thread for use with alternative mounting option, for example tripod. Wall mounting lugs on calibration source enable easy fitting with wall hooks or can be installed on a stable flat surface or tripod with the adaptor supplied.

5: Screening Software

Continuous image showing normal temperature in black and white with user configured traffic light system, amber for warning and red for alarm. As well as on screen alarm, in the event of an alarm an audio alert is triggered, and an optional image is recorded. The occurrence of a warning and alarm can also be configured to trigger an I/O module or Modbus digital interface. Supply of Windows 10 laptop and I/O modules are optional.

3 Installation

Refer to Fig. 2-1 for the system overview. The system is designed to be used in indoor environments. The main considerations when installing and setting up the system is the location of the Blackbody Heat Source and the camera so that the camera can simultaneously view both the source and the subject whose temperature is being measured

To achieve the best accuracy the camera and heat source should both be mounted at the same height as the subject being measured, this is typically head height.

Where possible the heat source should be installed at the same distance from the camera as the subject being measured (recommended 1m / 3.3ft)

Care should be taken to avoid sources of heat or sunlight sources in the view of the camera (e.g. windows, radiators, piping).

3.1 Black Body Heat Source



Fig. 3-1-1 Blackbody Heat Source

The installation drawing for the Blackbody Heat Source is shown in Fig. 3-1-2.

It is recommended that the Blackbody Heat Source is wall mounted via slots at the rear of the instrument however it can also be mounted on a flat surface or using a suitably rated tripod and the tripod adaptor supplied.

If using the tripod adaptor this is pre-fitted into the large slot on the bottom of the housing and secured in place with two grub screws. This allows connection to a standard 1/4-20 UNC tripod fitting.

The Source comes with 12 VDC power adaptor, which requires a 100-240 VAC, 2A power supply.

To start using the system ensure power is connected then turn on using the switch on the side, the source should be powered up for a minimum of 10 minutes prior to use to ensure it is stabilised at 38°C/100.4°F. The table in figure 3-1-2 shows the meaning of different colours of the Power LED.

LED Colour	Status	Action
Green	Heat source at correct temperature and stable	Ready for use
Amber	Power is on and heat source has not yet reached temperature	Ensure that ambient temperature is within specified range and wait for LED to turn green.
Red	Power is on and heat source is above temperature	Ensure that ambient temperature is within specified range and wait for LED to turn green.

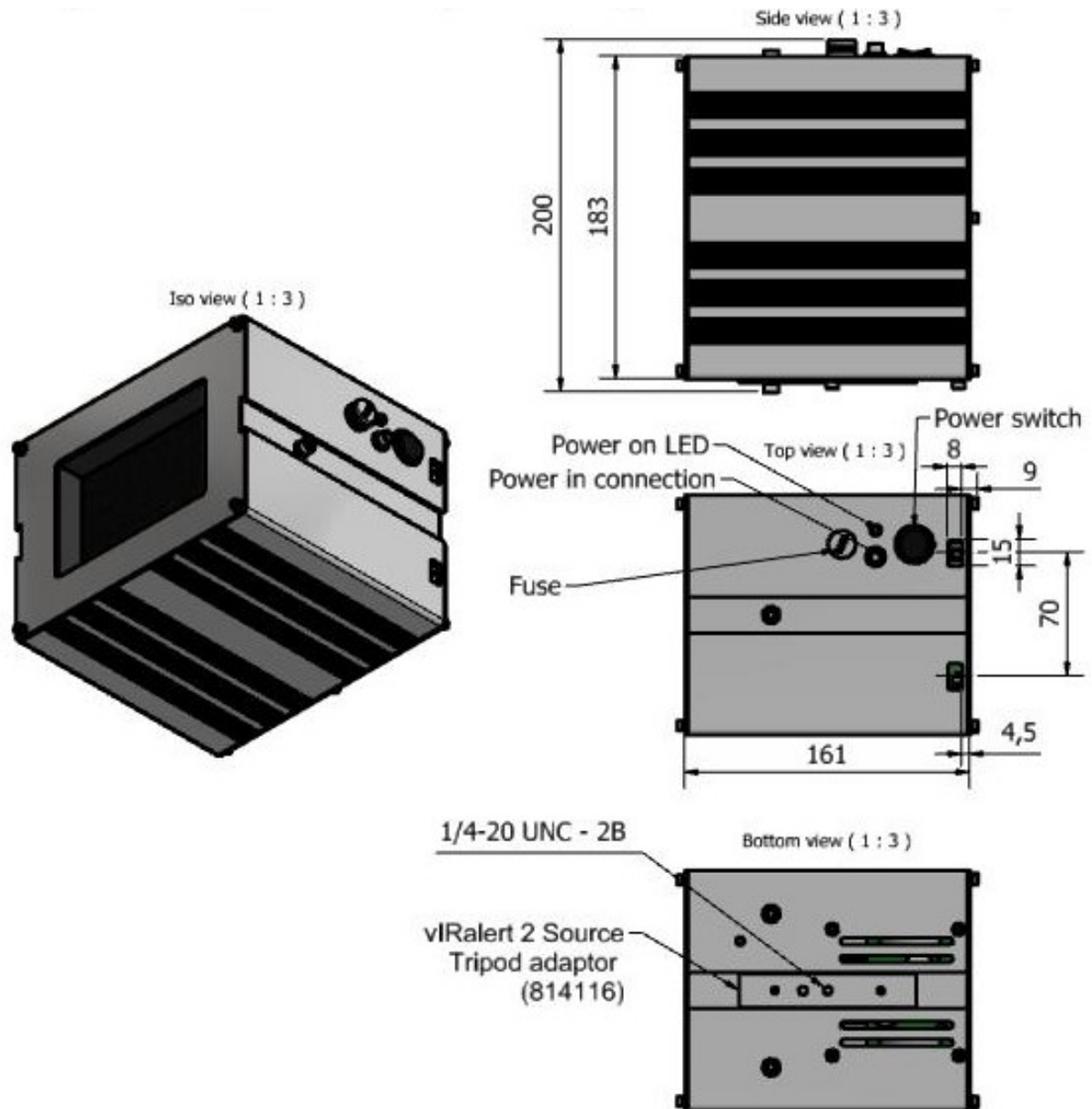


Fig. 3-1-3 Blackbody Heat Source Installation Drawing

**WARNING**

If mounting the heat source to a wall you must ensure that both the fixings and wall structure are capable of supporting a load of 3.2 kg/7.1 lbs

**WARNING**

If installing onto a tripod or flat surface, then the tripod or furniture used must be suited to support a load of 3.2 kg/7.1 lbs and the heat source must be securely attached. The tripod or furniture must also be secured to the floor or another suitable method used to avoid any risk of tipping.

**WARNING**

The ventilation slots on the outside of the case should not be covered.

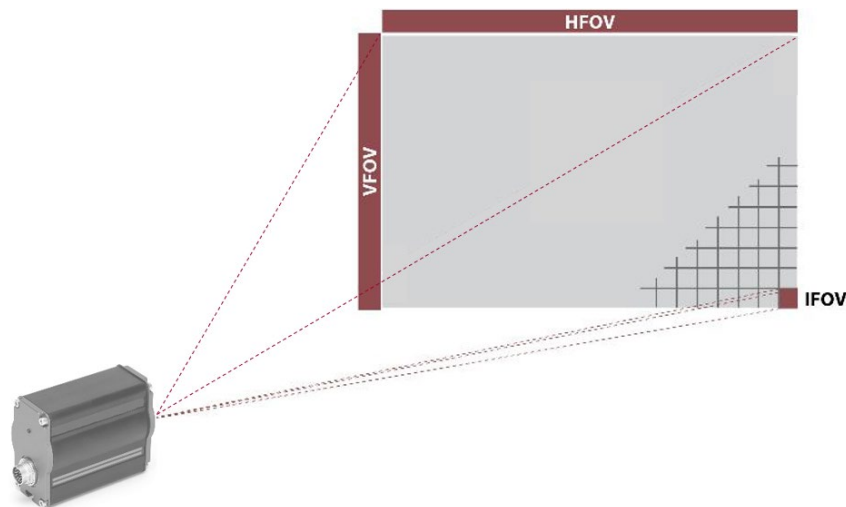
3.2 Thermal Imaging Camera



Fig. 3-2 Thermal Imaging Camera

The Thermal Imaging Camera is designed to be wall or tripod mounted. A simple wall mounting bracket is included with the system and attached via the mounting thread on the bottom of the camera. This is ¼-20 UNC which is also compatible with most commercially available tripods. The camera is pre-focussed.

The camera connects to the computer running the **viRalert** temperature screening software via a single 4 metre (13 ft) Ethernet and Power cable. The camera is powered by the 5V DC USB interface on the PC and all communications are through the ethernet connection.



Distance	1m			1.5m			2.0m		
HFOV x VFOV	HFOV	VFOV	IFOV	HFOV	VFOV	IFOV	HFOV	VFOV	IFOV
39° x 31°	0.7m	0.56m	8.8mm	1.06m	0.83m	13.3mm	1.41m	1.13m	17.7mm

⚠ Temperatures should be taken at the same distance every time to ensure repeatable measurements

3.3 Connection Cable



Fig. 3-3 Camera Connection Cable – 4 Metre length

3.4 Computer Hardware & Software

A laptop PC, running Windows 10 software and installed with **viRalert** temperature screening software, is available from AMETEK Land.

Connect the Thermal Imaging Camera to the laptop/PC using the 4 m / 13 ft Ethernet and power cable.

⚠ Please make sure the WINDOWS® energy saving settings are switched off for the USB interface used with the camera.

If you are using your own PC/laptop, download the software from the **viRalert** product page on the AMETEK Land website www.ametek-land.com.

3.5 Network Adapter Settings

So that your PC can communicate with the Thermal Imaging Camera, the correct Network Adapter Settings must be specified.

From your computer's Start menu, open the Control Panel and select the Network Connections option (or similar, depending on your version of Microsoft Windows).

Right-click on the required Network name and select the Properties option. Select the Internet Protocol Version 4 option and click on Properties. Select the Use the following IP address option and enter the values:

- IP address: 192.168.10.100
- Subnet mask: 255.255.0.0

Click on OK to save these settings.

3.6 Technical Data

General Specifications

System accuracy:	$\pm 0.5^{\circ}\text{C}$ / $\pm 0.9^{\circ}\text{F}$ (at 1m distance)
Environmental rating:	Indoor use only
System measurement range:	30 to 45°C / 86 to 113°F
Thermal Imager Detector:	Uncooled Thermopile Array, 80x64 pixels operating at 9Hz.
Operating temperature range:	10 to 50°C / 50 to 122°F
Storage temperature:	0 to 60°C / 32 to 122°F
Relative humidity:	10 to 95%, non-condensing
Weight:	300g Thermal Imaging Camera, 3.2Kg Blackbody Heat Source
Cable length:	4m / 13 ft Ethernet and Power Combined

Electrical Specification:

Power Supply:	5 VDC to Camera (powered via USB 2.0 interface)
	12VDC to Blackbody Heat Source, Fuse 5A T 250V, 5mm x 20mm (powered by mains power adaptor power adaptor, 230/115VAC, <2A)

**WARNING**

The Blackbody source should only be powered using the adaptor provided.

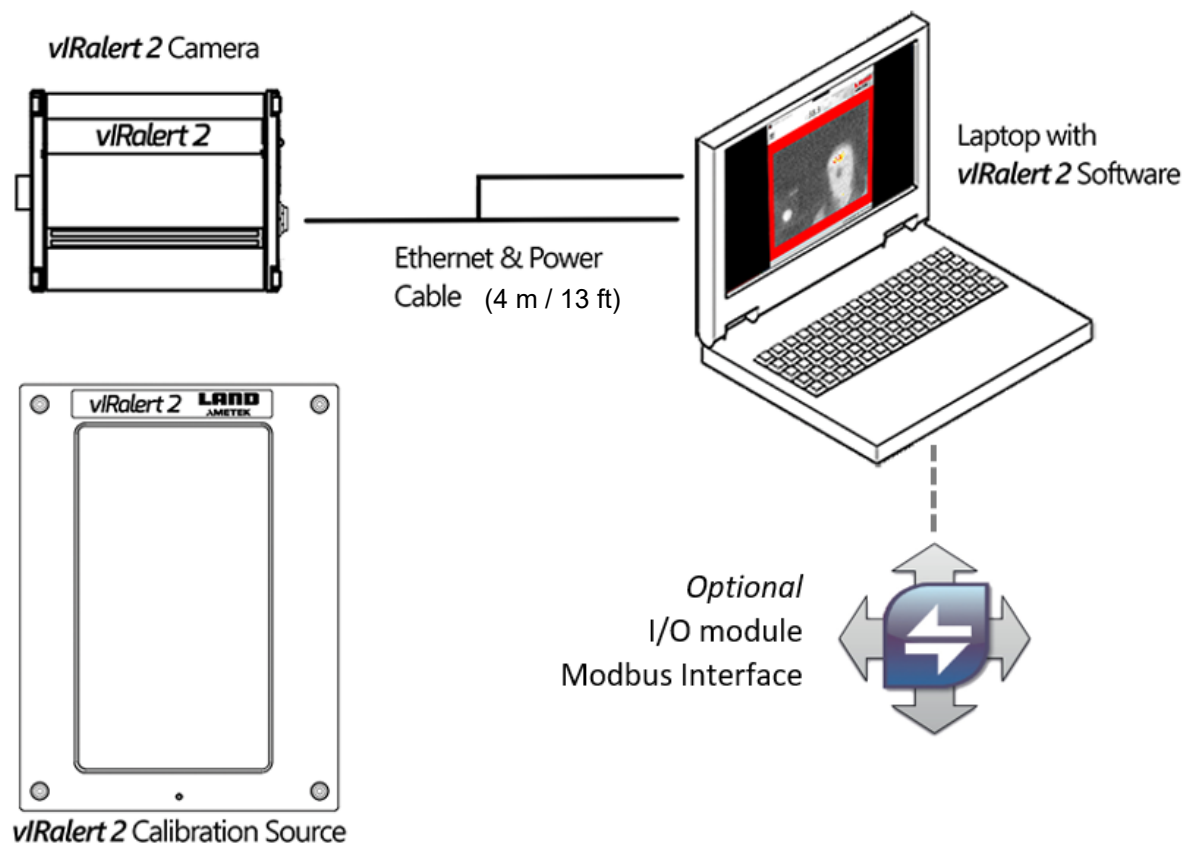
4 Using the Software

The **viRalert** software is simple and intuitive. It is designed as a point-of-entry system providing automatic on-screen and audible alarms to alert the operator and external alarms via an optional I/O-module or the Modbus digital interface enabling automation of access control to protect your premises against the risk of spreading an infection.

The software provides a continuous image showing normal temperature in black and white with abnormally high temperatures in amber and red. On screen and audio alarms are triggered if a high temperature is detected.

4.1 Settings

1. To start the software, click on the **viRalert** icon on your PC desktop. 



2. The **viRalert** software interface opens, as shown in Fig. 4-1. In this example, the white area on the left of the thermal image is the location of the Blackbody Heat Source. *(The image ensures that no people will be recognized in order not to violate applicable data protection rules. No image is recorded or stored by the system.)*
3. To access the Settings screen, click on the hamburger menu button. 

4. The **Settings** screen is displayed, as shown in Fig. 4-1.

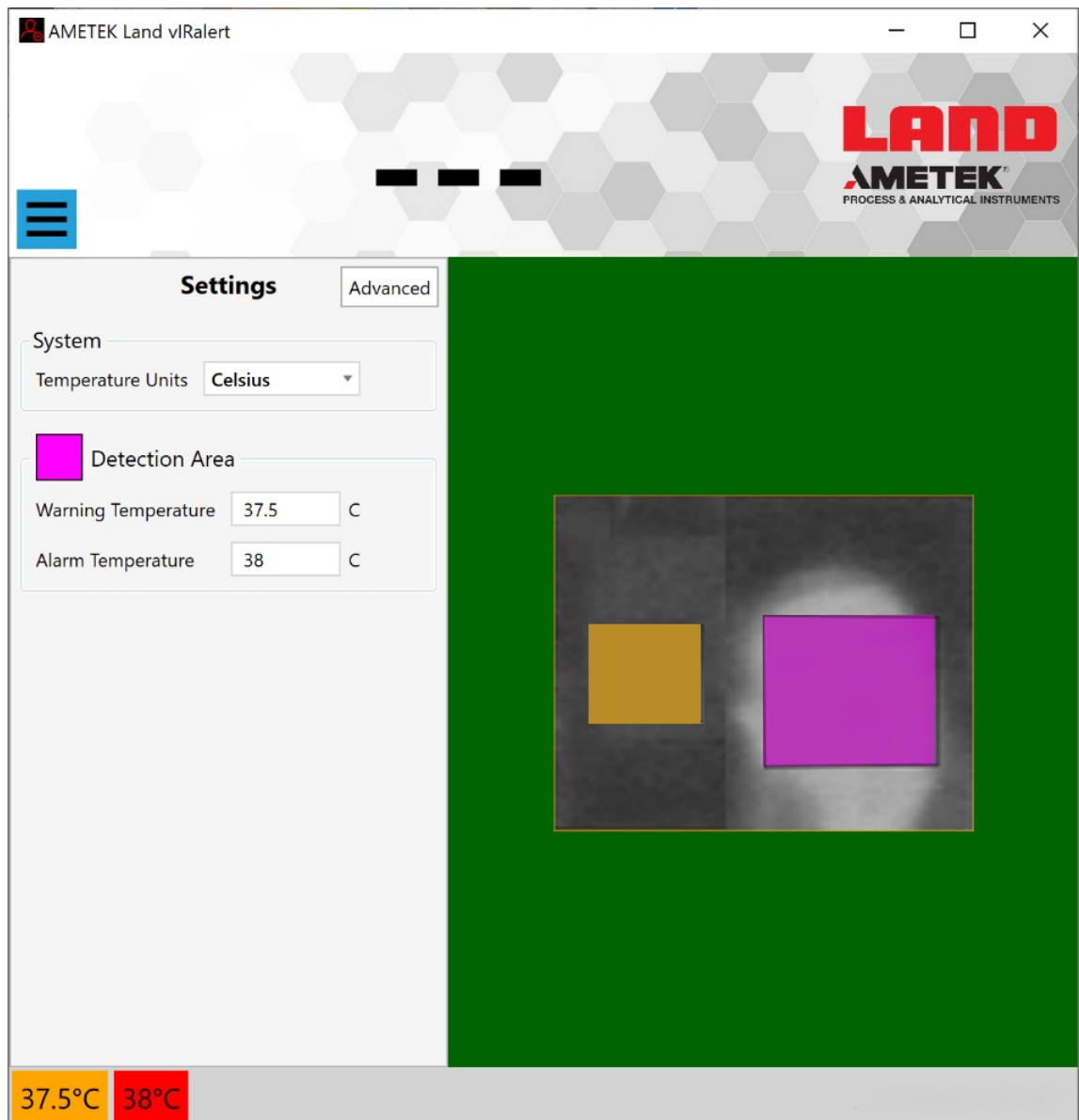


Fig. 4-1 vIRalert Software Settings

5. The **Detection Area** is denoted by a purple rectangle. Use your mouse to click and drag the corners of the rectangle to cover the face of the person being measured, as shown in Fig. 4-2. It is important that the detection area is configured at setup so that it does not include the calibration source and will limit any potential background sources of heat.
6. You can select the required **Temperature Units** (Celsius or Fahrenheit).
7. Set the **Warning Temperature** and **Alarm Temperature** to the values you require. Areas of the target at the warning value will be displayed in yellow pixels, and alarm temperatures will be displayed as red pixels on the thermal image.
8. For guidance on comparing temperature measurements of the forehead with those taken with oral, rectal and in-ear thermometers, refer to the Appendix of this User Guide.

4.2 Advanced Settings

1. In the **viRalert** interface, click on the **Advanced** button to display further settings options, as shown in Fig. 4-2.

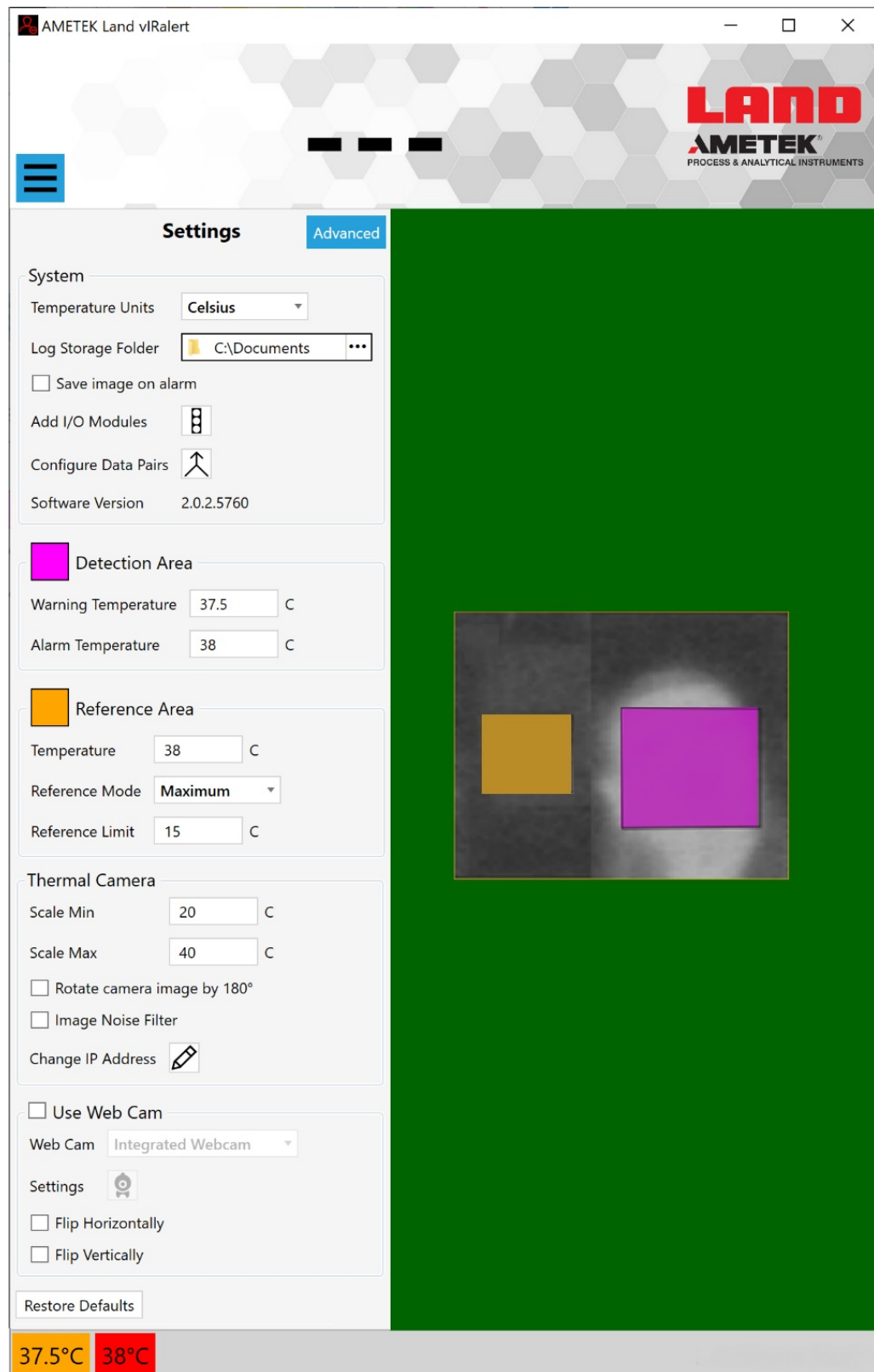


Fig. 4-2 viRalert Software Advanced Settings

2. **Log Storage Folder** allows you to change the storage location of the temperature and camera image log files (see logging below).
3. **Save image on alarm** will save a thermal image combined with a web cam image (if connected) whenever the system goes into alarm. This is enabled by default.
4. **Add I/O Modules** allows you to search for connected Moxa I/O modules and add them to the system.
5. **Configure Data Pairs.** When an I/O module has been registered, the data outputs from the system need to be mapped to the required I/O module pin.
6. **Software Version** shows the build version of the viRalert software.
7. The **Reference Area** is displayed as an orange rectangle. Use your mouse to click and drag the corners of the rectangle to cover the hot area of the Blackbody Heat Source, as shown in Fig. 4-2.
8. Set the **Temperature** value of the Reference Area to the known temperature of the Blackbody Heat Source (38°C / 100.4°F as standard).
9. Chose the required **Reference Mode** for the Reference Area:
 - a. Maximum – takes the maximum temperature detected in the reference area to use as a reference (default)
 - b. Average – takes the average temperature of the blackbody area to use as a reference.
10. Adjust the **Reference Limit** if required. This is the maximum temperature difference allowed between the temperature read by the camera in the Reference Area and the temperature stated in step 6, this will tell the system at which point to assume that the heat source is not present or has been obscured and alert the operator.
11. Adjust the **Scale Min** and **Scale Max** settings to alter the temperature range visible in the camera image.
12. Check the **Rotate camera image by 180°** if the camera image is upside down.
13. The **Image Noise Filter** can be used to reduce the level of noise in the image.
14. Click on the **Change IP Address** button to adjust the IP address of the connected camera if required.
15. Enable the **Use Web Cam** checkbox to enable web camera support in the software.
16. If there are multiple web cams connected to the computer (e.g. an internal laptop camera and a USB camera) then select the one required for use within the software. The image feed from the camera will appear beside the thermal image.
17. Click on the **Settings** button to change the settings of the web camera. These settings will differ depending on the model of camera connected and allow changes such as brightness, contrast and exposure. These settings are stored directly to the camera, they are not stored within viRalert.

18. Check the **Flip Horizontally** and **Flip Vertically** if the image from the web cam needs to be adjusted.
19. The **Restore Defaults** button will reset all of the settings on this page to their factory settings.

4.3 Logging

All logged data is stored to the Log Storage Folder specified in the advanced settings. The default folder for this "Documents\Viralert Logs".

4.3.1 Temperature Data Logging

vIRalert logs a record of the maximum temperature data once a second when the temperature is above 30°C / 86°F. This data is stored as a comma separated text file (CSV) named "PeriodicTemperatureLog.csv" in a folder with the date of recording.

4.3.2 Image Data Logging

When enabled through the Advanced settings, vIRalert will log an image showing the thermal scene and the maximum temperature to disk whenever a human is detected. If a web camera is enabled on the system, then an image from the camera will be stored alongside the thermal image.

The rules for logging an image are as follows:

- Wait until a stable temperature above 30°C / 86°F has been reached for half a second.
- If the system is in an alarm state, then log immediately.
- Otherwise log every 3 seconds while the temperature remains above 30°C / 86°F

Images are stored as JPG files in a folder with the date of the recording. The format of the file name is [temp time].jpg. For example, "36.4C 13-05-19.jpg" means the image was stored with a maximum temperature of 36.4°C at 13:05:19.

4.4 Communications

4.4.1 Modbus TCP Communications

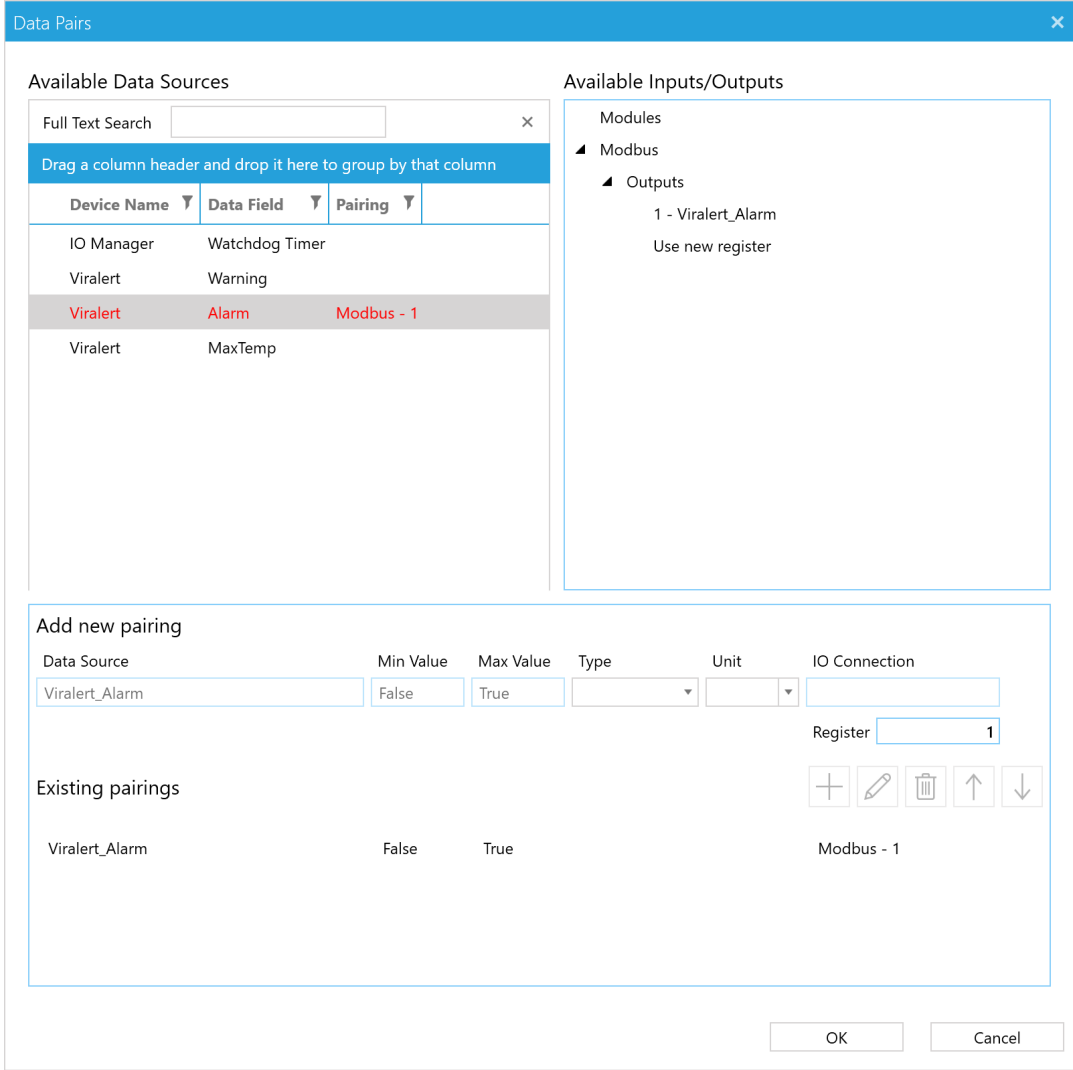
Modbus TCP is a standardised protocol built on top of TCP and is widely used for data communications. **vIRalert** will act as a Modbus TCP Server when connected from a Modbus TCP Client. For more information please visit <http://www.modbus.org/>

4.4.2 Modbus Data Pairing

To configure data for input or output via Modbus, first open the Data Pairs window (Hamburger menu > Advanced > Configure Data Pairs).

First select the **vIRalert** data that you wish to input or output. Only output options will be available.

Once the data source is selected, select a Modbus register to map the data pair to and press the  button to register the pairing.



Available Data Sources

Full Text Search

Drag a column header and drop it here to group by that column

Device Name	Data Field	Pairing
IO Manager	Watchdog Timer	
Viralert	Warning	
Viralert	Alarm	Modbus - 1
Viralert	MaxTemp	

Available Inputs/Outputs

Modules

- Modbus
 - Outputs
 - 1 - Viralert_Alarm
 - Use new register

Add new pairing

Data Source: Min Value: Max Value: Type: Unit: IO Connection:

Register:

Existing pairings

Data Source	Min Value	Max Value	IO Connection
Viralert_Alarm	False	True	Modbus - 1

OK Cancel

Fig. 4-4-2 viRalert Software Data Pairs Window

4.4.3 Supported I/O Modules

The I/O modules supported by **viRalert** are listed below:

- MOXA ioLogik E1214 - 6 relay outputs
- MOXA ioLogik E1241 - 4 analogue outputs (0 to 10 V or 4 to 20 mA via software configuration)
- EL4014 - 4 Analogue Outputs (0 to 20 mA or 4 to 20 mA via software configuration)
- EL2624 - 4 Relay Outputs

A total of 16 modules, comprising any combination of the above modules can be added. For more information on the MOXA ioLogik modules, refer to the user documentation supplied with each MOXA unit.

4.4.4 Adding I/O Modules

From the Settings page, select Advanced and then Communication then Add I/O Modules. Any modules detected on your system will be displayed on the left-hand column of the I/O Modules screen, as shown in Fig. 4-4-4.

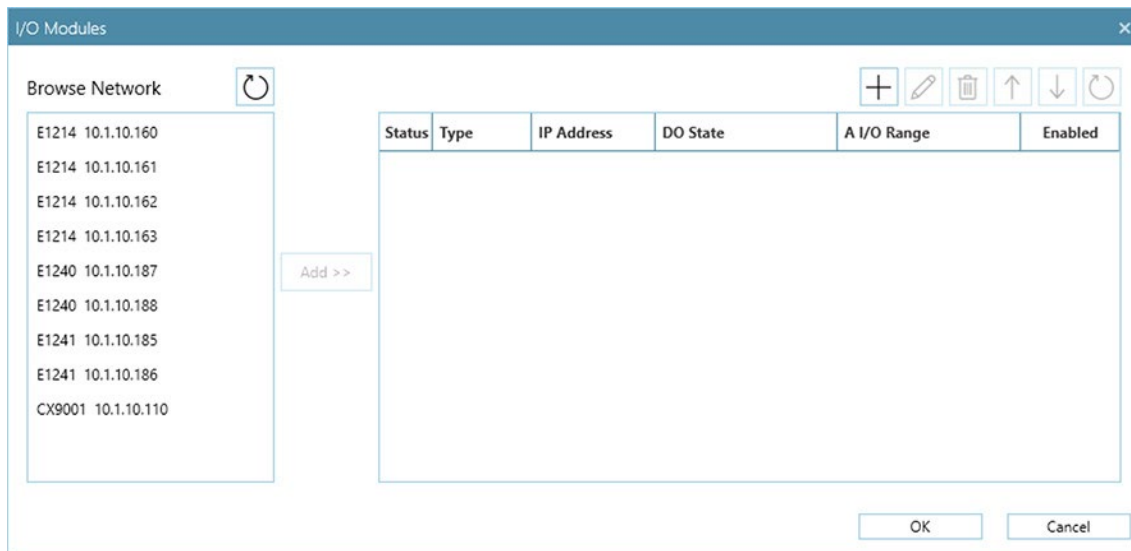


Fig. 4-4-4 viRalert Software I/O Modules Window

To add an individual module, click on the required module in the list then click the **Add** button to add it.

You can change the order of the modules in the list, for example, to reflect the order in which your modules are fitted on a DIN rail. Click on a module and use the Move Up or Move Down buttons to arrange the modules in the required order.

The **Remove** button allows you to select a module and delete it from the list. Multiple modules can be selected for removal.

If a module you require is not listed, you can use the **Add New...** button to enter the details of the required module.

When you have listed all the required modules, click on OK.

The I/O Modules screen now displays a list of the modules connected.

4.3.5 I/O Module Data Pairing

When you have configured your Modules, you can then assign a data source in **viRalert** to the output of a module. This is called 'configuring pairs'.

Click on the **Configure Data Pairs** button.

The Configure Pairs screen displays a list of Available Data Sources and a list of Available Outputs.

The following outputs are available from **viRalert**:

- The **Watchdog Timer** is a signal which is transmitted at a user-defined interval to check that the system is functioning correctly. The loss of the Watchdog Timer could indicate a problem with the system.
- The **Warning** signal is active whenever the warning temperature threshold is triggered within **viRalert**.
- The **Alarm** signal is active whenever the alarm temperature threshold is triggered within **viRalert**.

- The **MaxTemp** signal sends the maximum temperature value registered within the detection area. This is the same temperature as that displayed at the top of the screen in **viRalert**.

To configure a data pair:

- 1) Select the required output from the Available Data Sources table (for example “Alarm”).
- 2) The list of Available Inputs/Outputs is expanded to show the corresponding available Digital Outputs that can be paired to the highlighted data source.
- 3) Click on the required output to highlight it e.g. E1214-1 D0 0.
The details of the New Pairing will be displayed.
- 4) Check that this pairing is correct, then press the **Add Pair** button .
The new pairing is added to the Existing Pairings list.
- 5) When you have configured the pairings, click OK.

5 System Operation

Once the **viRalert** software has been set up to your requirements, operation is simple and intuitive.

1. Switch on Blackbody Heat Source and ensure it is left running for approximately 10 minutes to stabilise prior to use, the led should turn green when ready to use.
2. Once the system is setup a subject measurement position should be established in front of the Thermal Imaging Camera, such that the Camera can see both the face of the subject and the Blackbody Heat source, as shown in Fig. 4-5-1, at a distance of approximately 1 metre / 3.3 ft. This should be marked on the ground.

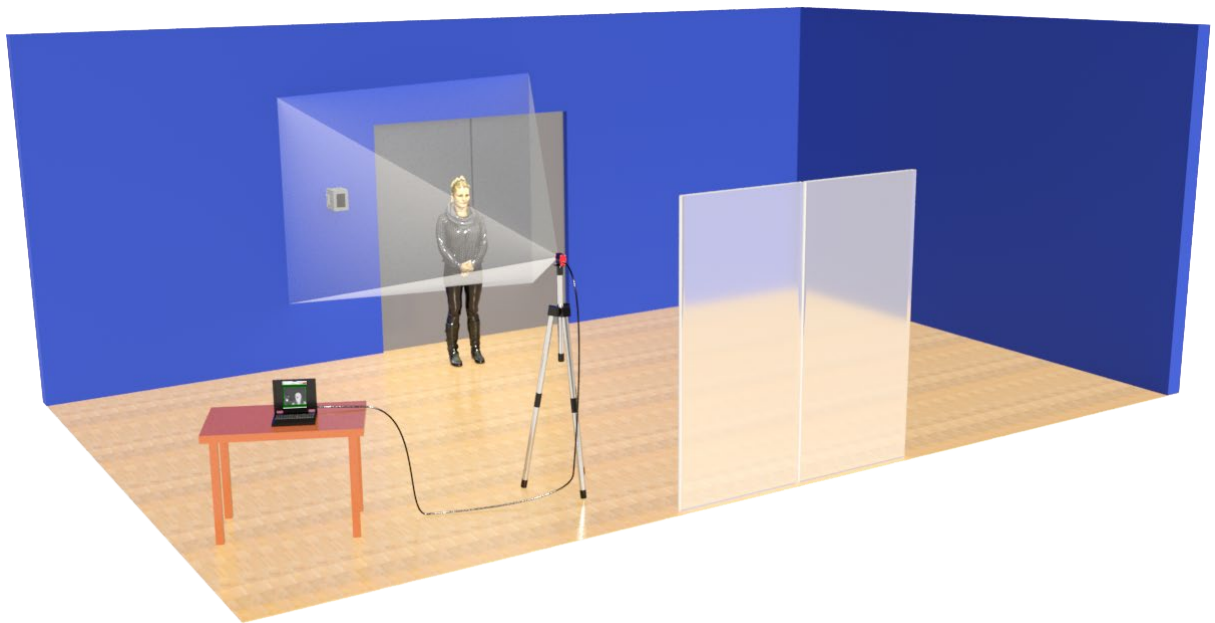


Fig. 5-1 Typical viRalert 2 System Setup

3. Make sure the background is not warmer than 25°C / 77°F, the background needs to be a non-reflective surface, like a wall (no metallic or reflecting surfaces should be visible to the thermal imager).
4. The target should move to the marked measurement location maintaining appropriate social distancing.
5. Observe the viRalert software display on the PC/Laptop. If the subject is at normal body temperature, the display will be similar to that shown in Fig. 5-2 otherwise the system will present a warning shown in Fig 5-3 or alarm shown in Fig 5-4.

Note: The factory software settings will be suitable for most office environments however it is recommended that a minimum of 3 people known to be at normal temperatures should be screened at initial setup prior to operation in order to establish site specific warning and alarm settings.

If the subject does not have elevated skin temperature the operator will see a similar display to that shown in Fig. 5-2.

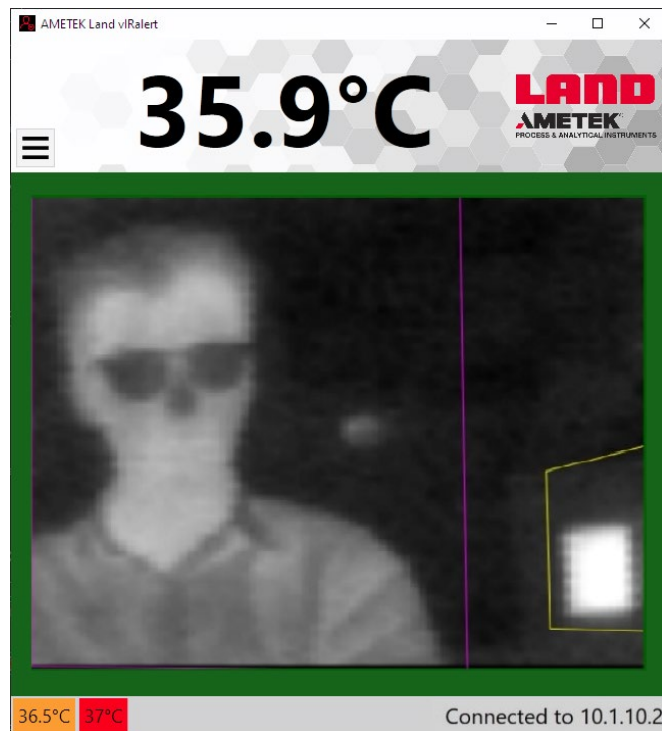


Fig. 5-2 Typical viRalert Display of Normal Body Temperature

If the subject has an elevated skin temperature which is above the warning level but not yet at alarm level, the operator will see a similar display to that shown in Fig. 4-6.

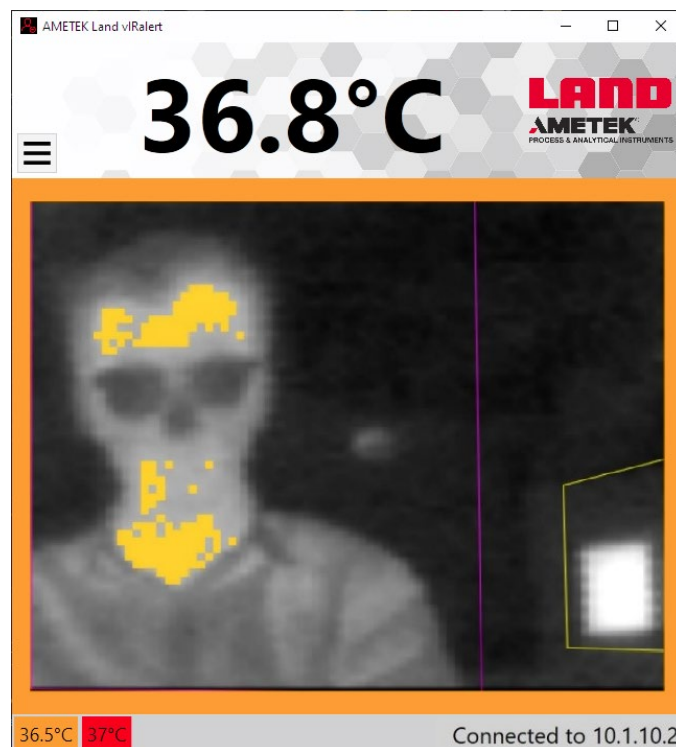


Fig. 5-3 Typical viRalert Display of Subject with Elevated Body Temperature Triggering a Warning

If the subject is at an elevated skin temperature which is above the alarm level, the operator will see a similar display to that shown in Fig. 5-4 and an audible alarm will be generated.

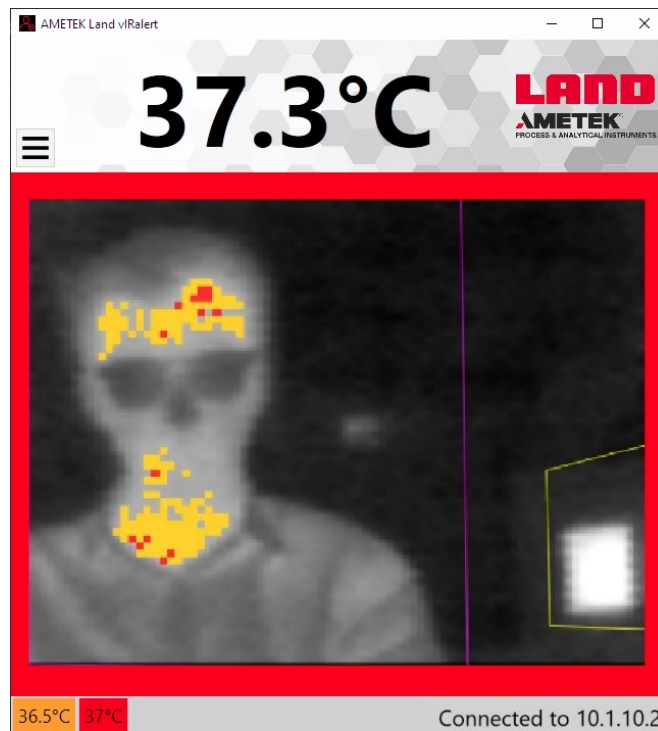


Fig. 5-4 Typical viRalert Display of Subject with Elevated Body Temperature Triggering an Alarm

6 Maintenance, Servicing and Calibration

6.1 Maintenance

Although the viRalert 2 system has been designed specifically to require very little maintenance, it is essential that all parts are kept clean and free from contaminants at all time.

Particular attention must be given to lens of the thermal imager lens cleanliness in order to ensure accurate operation, if cleaning is required, compressed air should be blown onto the lens.



WARNING

No liquid should be used to clean the lens as this could damage the product

6.2 Servicing

viRalert 2 does not incorporate user serviceable parts, therefore in the unlikely event of an instrument malfunction, or an instrument requiring servicing or calibration, contact AMETEK LAND for information regarding the 'return to manufacturer' policy.

6.3 Calibration

viRalert 2 systems are inherently stable with time. However, in line with any local quality assurance procedures, it is highly recommended that they

have their calibration checked every 12 months by an appropriately trained person. This ensures that the instrument operates with accuracy and reliability, contact AMETEK LAND for more information.

Appendix - Comparison of Temperature Measurement Methods

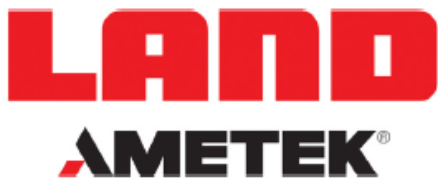
Comparison of temperatures in Fahrenheit by method

Axillary/Forehead (°F)	Oral (°F)	Rectal/Ear (°F)
98.4–99.3	99.5–99.9	100.4–101
99.4–101.1	100–101.5	101.1–102.4
101.2–102	101.6–102.4	102.5–103.5
102.1–103.1	102.5–103.5	103.6–104.6
103.2–104	103.6–104.6	104.7–105.6

Comparison of temperatures in Centigrade by method

Axillary/Forehead (°C)	Oral (°C)	Rectal/Ear (°C)
36.9–37.4	37.5–37.7	38–38.3
37.5–38.4	37.8–38.5	38.4–39.1
38.5–38.9	38.6–39.1	39.2–39.7
39–39.5	39.2–39.7	39.8–40.3
39.6–40	39.8–40.3	40.4–40.9

Sourced from: http://www.healthyheating.com/Definitions/facts_about_skin.htm#.XnsPtYgzZEY
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