

# Thermographic Scanning System (TSS)

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User guide / Reference manual



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# Introduction

The Thermographic Scanning System is an integral component of the NIGHTINGALE toolkit, specifically designed to be utilized by first responders for initial triage operations within the context of emergency interventions. Within the framework of the NIGHTINGALE project, the TSS application empowers first responders to effectively address emergency situations involving victims. By harnessing this tool, first responders can seamlessly share crucial information, such as the patient's location, photos, and vital parameters. This data is then communicated across various interconnected components of the system. Central to the operation of the TSS application is the capture of thermal images using the Thermographic Scanner, from which the skin temperature of the patient is deduced. Moreover, through the integration of an Artificial Intelligence module, driven by machine learning algorithms, the application predicts essential physiological parameters, i.e., the heart rate and the respiratory rate. This predictive capability facilitates rapid assessment even when direct measurements are challenging. The application employs the phone's GPS capabilities to accurately determine the patient's location.

The primary objective of this guide is to offer users a comprehensive understanding of the capabilities and applications of the TSS tool. To this end, the manual encompasses answers to common queries regarding the tool's functionalities. Additionally, it provides a user-friendly, step-by-step walkthrough replete with descriptive instructions and illustrative images, enabling users to efficiently harness the potential of the tool in diverse emergency scenarios.

## TSS structure

*The Thermographic Scanning System is composed by the following sub-components;*

- an Android APP to acquire data and show the results;
- a thermal imaging rugged smartphone (Cat S62 Pro);
- a backend application that includes a machine learning model for the detection of heart rate, respiratory rate and skin temperature.

## Initiating Triage

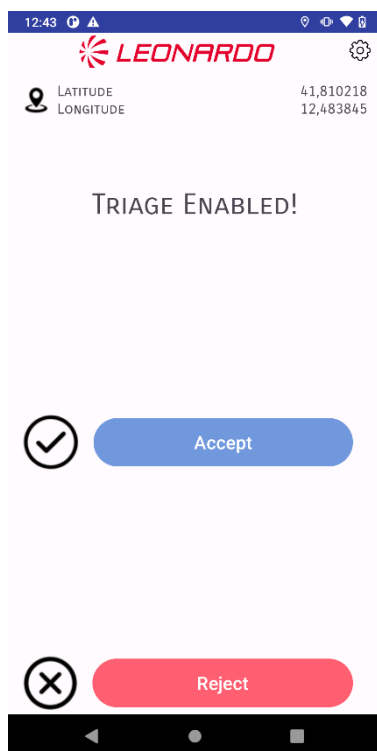
The TSS App tool is the one that allow first responders to initiate the triage of a victim parameters in a non-contact manner, particularly useful in cases were is not possible or not safe to use medical devices that need to be physically applied to casualties

# How to use: step-by-step guideline

## 1. Main screen



The first screen that appears on the application is the main screen, as shown in picture on the left, and it indicates the waiting of the activation command from the central system.

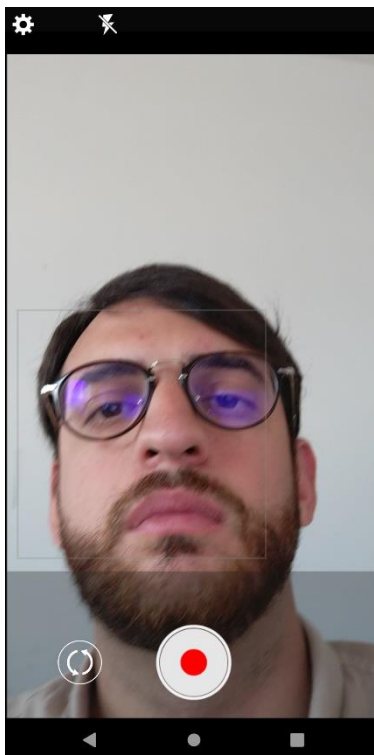


When triage is enabled, the first responder user can see the screen on the left. He/she can either accept the task and proceed with the next phases (or reject the triage and return to the previous screen.

## 2. Scanning process

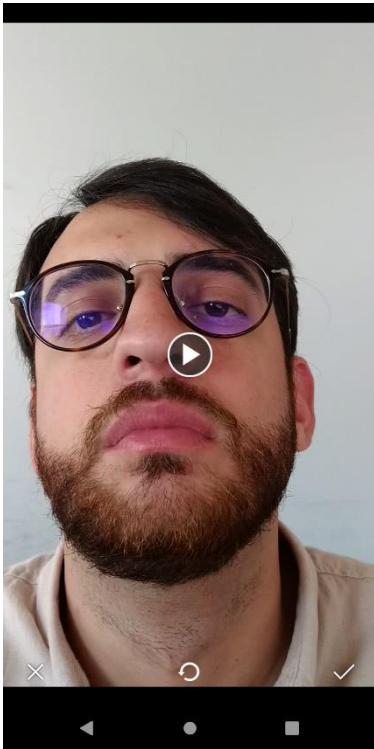


Having pressed the “accept” button, the “Triage Enabled!” write appear on the screen and the first responder can start scanning the patient by clicking the “SCAN” button on the low part appears on the screen, as shown on the picture on the left.



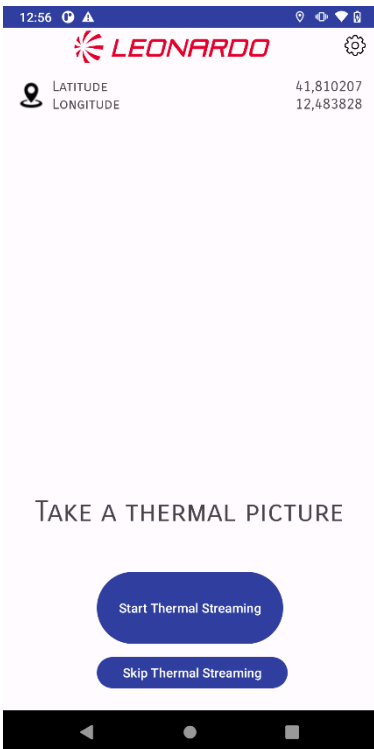
After the “SCAN” button is clicked, the video camera of the device allows to “scan” the patient face by positioning at about 1 meter form it.

Then, the user have to start recording by clicking the REC button and clicking stop when finished. The ideal duration of the video should be at least 10 seconds.



Once the video is done, there is also the possibility to do it again (for example in case the patient moved frequently the face during the recording) by pressing the button at the centre.

To go to the next step the user has to press the ✓ button in the lower-right side of the screen.



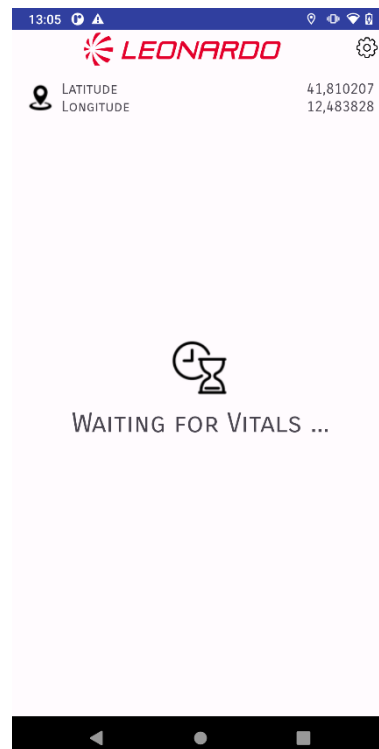
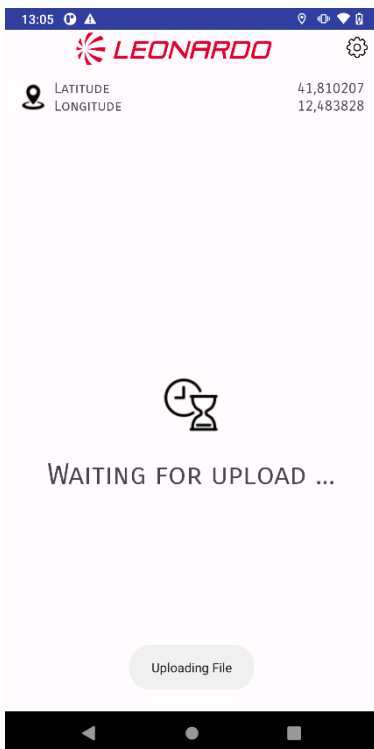
Next, the user is requested take a “thermal” picture of the patient as reported in the screen.

To take the thermal picture, the user must click the “Start Thermal Streaming” button.

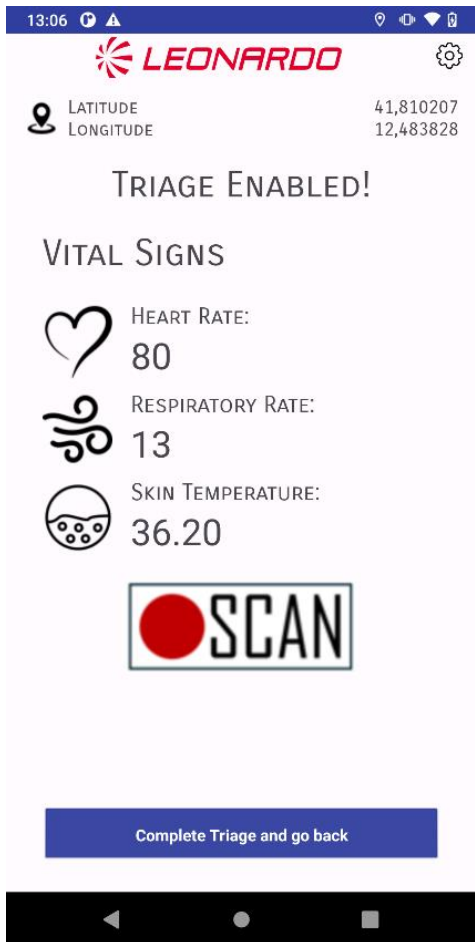


When the patient is in frame, the picture can be taken by clicking the “Take Thermal Picture” button.

### 3. Prediction and result



Once both the video and the thermal picture have been taken, the user can first see a screen indicating that the device is sending the acquired data to the central system, and then another screen indicating that the system is calculating patient vital parameters.



When the process finishes successfully, the vitals will appear on the screen.

At this point, the user can decide to scan another patient with the “SCAN” button and proceed with all the previously mentioned steps or complete the task by pressing the “Complete Triage and go back” button in the low part of the screen and return to the first screen presented in this manual.