SAN FRANCISCO FIRE DEPARTMENT
DIVISION OF TRAINING

TRAINING BULLETIN

TRAINING BULLETIN 19-1

THERMAL IMAGING CAMERAS (TIC)

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Thermal Imaging Cameras (TIC) have been purchased by the San Francisco Fire Department to assist with field operations.

Thermal Imaging Cameras help Firefighters see in a zero-visibility environment. They can be used to help locate downed Firefighters, find victims during search and rescue operations, and identify hidden fire. TICs can also be used to see damaged structural members and warn of potential collapse. They have various investigative uses during hazardous materials operations. The key issue with Thermal Imaging Cameras is that they are a "behavior-altering" device. Like few other new technologies to the fire service, the TIC changes the way we view a fire situation. The result is that we must understand how it changes a Firefighter's behavior so as not to increase danger to them when used.

The responsibility for use and operation of the FLIR K-65 Thermal Imaging Cameras lies with the Company Officer. Responsibility for daily inspection and operational checks, as with any other apparatus equipment, lies with the apparatus operator (drivers/tillers), Incident Support Specialists, or Chief Officer.

The TIC shall be utilized at all box alarms. The TIC shall be used to assist in size-up, search and rescue efforts, fire attack, ventilation, overhaul, hazardous materials incidents, and any other incident the Company Officer identifies a need for its use. TIC's are useful tools in Wildland firefighting incidents as well.

Firefighters must not become overconfident when using the cameras and remember the basic firefighting fundamentals such as staying low below superheated gases and smoke. If a Firefighter can not see the floor when standing, they should crawl. Firefighters should orient themselves to a wall, rope, or hose line to maintain orientation. While moving through the structure the Officer should share the image with their crew and look back to orient for eventual egress. Using the Thermal Imaging Camera may also tend to give Firefighters a false sense of security due to the TIC's limited view area.

Always take the spare battery with you when using the camera. The batteries are the tool's weakest link. There are no user serviceable parts on the camera. If the unit fails to operate, the only option the user has is to change the battery. Therefore, make sure you always have a charged spare battery with you when operating the camera at an incident.

There are different ways to use the camera. You can lead the search, or you can direct the search. If you are leading the search with the TIC, there may be a tendency to get caught up in the technology and leave the search team. The TIC operator should scan the high, middle, and low portions of the room then lower the camera and move in contact with their orientation landmark. This can cause further Firefighter injuries and negate the team concept of the search operation. You may also choose to direct a search team by having the Firefighters out in front of the member with the camera. Do not allow Firefighters conducting the search to get out of range or view of the camera. **While searching with the camera, the two-personnel team concept must be adhered to**.

The basic concept of the TIC is that there must be thermal contrast for it to properly function. If there is no contrast, the camera will not work. In areas where everything is the same temperature, the TIC will not work. Objects with different mass and density absorb and give off energy at different rates. This release of Infrared Energy is called emissivity. Emissivity is what gives us contrast and allows the TIC to function properly. Gasses have very little or no emissivity and are not visible to the TIC. The temperature displayed on the TIC is not necessarily an accurate measure of the gas temperature but is an average of the surface temperature in the green target box.

The camera can also be used to search for hot spots at a fire during overhaul. The camera will detect the variation in heat and allow hot spots behind walls, etc. to be seen on the viewer. However, the TIC is not a substitute for normal overhaul procedures. It can **assist** with overhaul by detecting hot spots in a room or area. Void spaces must be exposed if they are suspected to contain fire. The TIC does not see through solid surfaces.

It is essential that companies drill with the TIC to ensure proper, safe operation. If you do not know where you are and what you are looking at, it will be difficult to interpret the viewer. The TIC can give an individual a false sense of security and cause them to have tunnel vision with the camera. Sometimes during fireground operations, our lack of visibility has kept us safe. Firefighters may not have advanced quickly because of the lack of visibility. The TIC will assist to give you better vision in smoke-filled situations. The operator must be aware of their surroundings and proceed cautiously. Continue to scan the area and take reference points. In the past, the sofa or bed was not there until the Firefighters felt them. With the TIC, we will have visual indicators and it will be easy to get overconfident and develop tunnel vision. Continue to scan the areas and note visual and physical indicators.

BACKGROUND INFORMATION

The lack of visibility on the fireground is caused by products of combustion, primarily smoke and smoke particles. Smoke is composed of two elements: fire gases and soot. Heavy smoke causes all the light to be scattered or blocked since the light waves cannot penetrate the smoke and smoke particles. This zero-visibility condition is what limits the effectiveness of lighting for interior firefighting operations. Infrared (IR) energy is not visible to the human eye, but Firefighters can feel the heat. The Thermal Imaging Camera allows Firefighters to see an IR view of the surroundings. The TIC will take a thermal picture and translate this into an electrical picture and then into a visual image for the human eye. This is possible because the TIC relies on the thermal energy emitted by all objects and not on reflected visible light. The TIC provides vision capability with zero light present since IR energy is characterized by its long wavelength which allows it to travel through smoke and mist. The TIC will then provide a visual view similar to a black and white television to the Firefighters through the smoke and darkness. When viewing an area through a TIC, hot objects appear white, hotter objects appear brighter white, and colder objects appear gray to black. The whiter the object, the more heat present in the object. The FLIR K-65 has multiple settings. The default NFPA Firefighting mode adds color from yellow to red as the temperature increases.

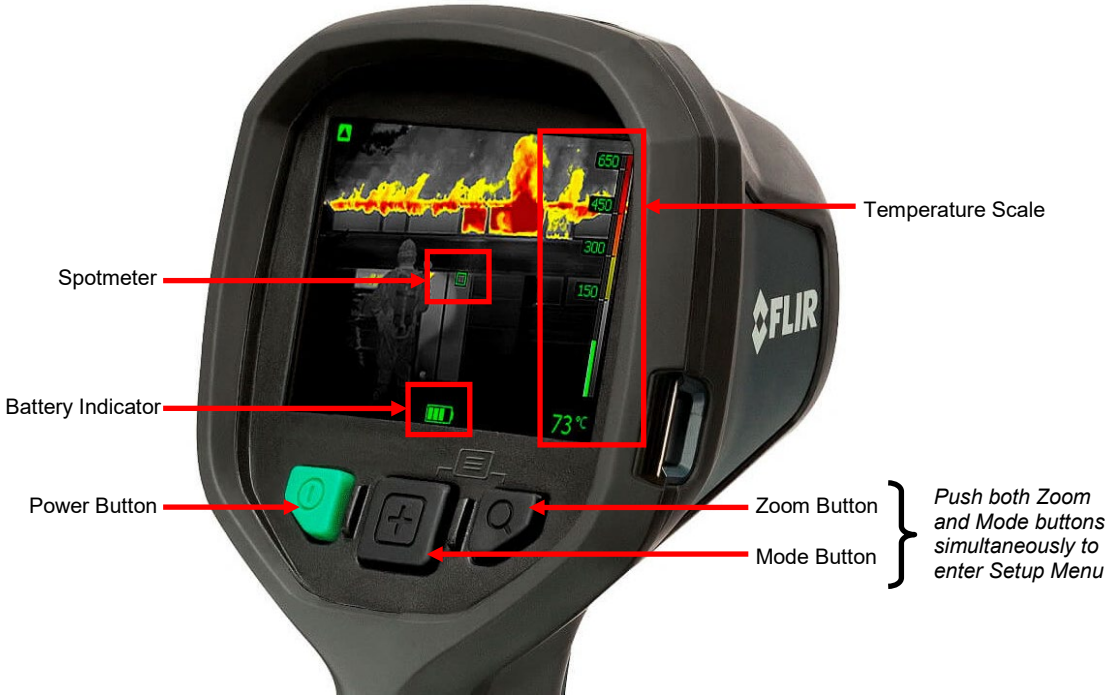
USES OF THE TIC

- Provides safer navigation for Firefighters in zero visibility conditions
- Assists with overhaul and search operations
- Enables Firefighters to see obstacles in buildings which may interfere with firefighting operations
- Effectively locates fire in large open areas especially with low stock or shelves
- May be used as a search tool to locate lost persons in an open wilderness area
- May be used to check for hot spots in a grass fire or dump fire situation
- May be used to determine fluid level in a container during hazardous materials incidents
- Can be used by Rapid Intervention Crew (RIC) companies during search and rescue of downed Firefighters

OPERATION OF THE TIC

1. The TIC (including all accessories) must be completely dry when stored.

2. To turn on the K-65, simply depress and release the large, green power button under the LCD display. Upon pressing the power button, the thermal imager will initiate a calibration sequence. To turn off power, depress and release the power button again.



3. Once the camera is operational, an image will be visible on the screen. Cool areas appear dark while sources of heat appear white.

4. The K-65 is equipped with temperature measurement capability. The right side of the display will show a bar graph or temperature scale. The temperature scale will indicate the approximate temperature of the object viewed within the green box, called a Spotmeter, shown in the middle of the screen. The accuracy of the indicators is dependent on numerous factors including the distance from the object being viewed and its emissivity, which is the object's ability to radiate heat. Units are calibrated with a preset emissivity corresponding with normal construction materials. Objects with emissivities that vary greatly from this, such as metals and shiny objects, will reduce the accuracy of the temperature indication. Additionally, temperature measurement accuracy decreases as the distance from the object in the green box increases.

5. **The TIC has NOT been determined to be intrinsically safe as an ignition source. Therefore, the TIC should not be used in a potentially explosive atmosphere**.

MAINTENANCE OF THE TIC

Daily or After Each Use:

- Ensure unit is working properly
- Insert fully charged battery
- If necessary, recharge previous battery
- Verify all battery chargers and associated cables are functioning properly
- Using a damp cloth, clean off large pieces of debris
- The lens can be cleaned using an alcohol wipe **if necessary**

Weekly:

- Clean lens with soft cloth and mild cleaner
- Clean LCD display cover with soft cloth and mild cleaner
- Verify all hand straps are in usable condition and properly secured
- Check for cracks, holes or other damage to the unit's outer shell
- Verify the batteries do not show physical signs of damage

Monthly:

- Check tightness of all external screws, including those holding on straps, those connecting the LCD display cover and those connecting any bumpers. Do not over-tighten
- Cycle each battery fully. This is accomplished by using a conditioner or by fully charging and draining the battery. Ensure that one battery is always fully charged for use at an incident
- Using a damp cloth and mild cleaner, clean the outer shell of the unit. Do not immerse the unit under water for cleaning
- Verify the battery chargers are corrosion-free on all primary contacts

Consult the user manual for additional maintenance and service information. For more information on TIC use refer to the FLIR K-65 Video in the User Guides folder under Training in SharePoint.


K65
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