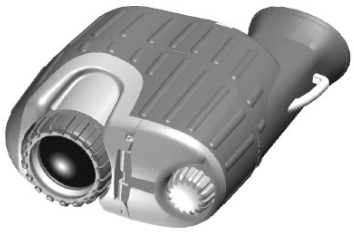
User Manual

L3 communications
Infrared Products

THERMAL-EYE®
X-150



See the Unseen™

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase separation between equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

- Changes or modifications not expressly approved by L-3 Communications Infrared Products could void the user's authority to operate this equipment.
- For continued FCC Compliance, use only accessories approved by L-3 Communications Infrared Products

User Manual P/N 1000548-1 Rev B

Patents
This product is covered by one or more of the following patents: U.S. Patent Nos.: 5,288,649; 5,367,167; 6,267,501; 6,586,831; 6,521,477; 6,690,014; 6,479,320 and under license to 5,196,703. Euro.Pat.Appln. 1159591.
Additional Patents Pending.

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CE Manufacturers Declaration of Conformity
Product Identification: Thermal Infrared Camera
Model/Type: X200 Camera / (X2)
Version: 7070410 (7070415)

Manufacturer: L-3 Communications Infrared Products
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Dallas, TX. 75243
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4 allée du Cantal – 91018, EVRY CEDEX. FRANCE (33 - (0) 1 60 79 59 55)

A sample of this product has been tested:
To demonstrate compliance with: EN61000-6-1 & EN61000-6-3
Using the following test standards: EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-11

Means of conformity:
The product is in conformance with the above standards according to 89/336/EEC

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1. Introduction

Thank you for choosing the X150 Thermal Imaging Camera. With its small size, rugged design, and simplicity, you can now focus on the job at hand, rather than the camera in your hand.

Before using this camera, please read these instructions carefully, and retain them for future reference.

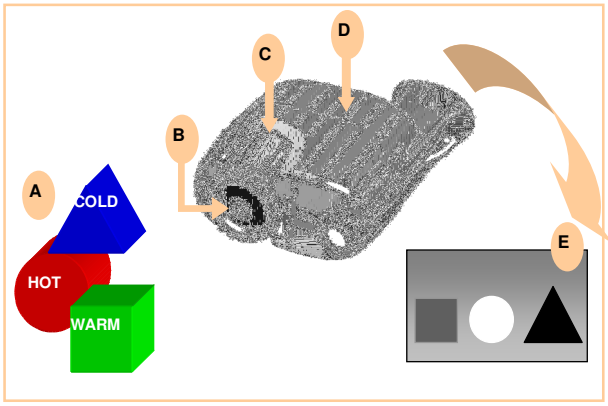
Welcome to Infrared

L-3 Infrared Products (L-3 IP) has long been a leader in the production and development of military products based on infrared thermal imaging. In an effort to make this technology more widely available, L-3 IP's engineers and scientists developed many unique ways of translating infrared energy into visible imagery. Now L-3 IP is providing affordable thermal imaging solutions for fire, law enforcement, marine, security, and other commercial uses.

Infrared energy, often referred to as *infrared* or *IR*, is electromagnetic radiation that travels in a straight line through space, similar to visible light. Although infrared shares some of the properties of visible light, its different wavelength has several unique characteristics. For instance, materials that are opaque to visible light may be transparent to infrared, and vice–versa.

Also, unlike visible light, which is given off by ordinary objects only at very high temperatures (e.g. light bulbs), long wavelength infrared (7–14 µm) is emitted by all objects at ordinary temperatures. This means infrared is all around us all the time, even in the dark. Different objects give off varying amounts of infrared, depending on the temperature of the object.

The X150 was designed to sense differing amounts of long wavelength infrared coming from the various areas of a scene and to convert them to corresponding intensities of visible light on a display. This allows true see–in–the–dark capability, as well as the ability to discern additional information—differences in temperature—by observing the thermal properties of objects in any light condition.



Infrared energy is emitted proportionally to the temperature of an object **A** . The warmer the object, the more energy it emits. The infrared energy from the objects is focused by the optics **B** , onto an infrared detector **C** . The information from the infrared detector is passed to electronics **D** for image processing. The signal processing circuitry translates the infrared detector data into an image **E** that can be viewed on the built-in video monitor.

Handling & Precautions ⚠

⚠ *All batteries can cause property damage or bodily injury if a conductive material such as jewelry or keys touch exposed terminals. Exercise care when placing batteries inside a pocket, case, or other container with metal objects.*

⚠ *Do not replace batteries in a potentially explosive atmosphere, such as a gas station or any place where you might normally be advised to turn off your vehicle engine. Contact sparking may occur and cause an explosion.*

⚠ *Do not remove power – removing batteries or disconnecting optional external power supply – without first turning the camera off using the on/off switch.*

⚠ *Do not permanently attach this camera to dynamic–mount applications, such as on vehicles or heavy machinery, in which transmitted vibration is continuously sustained.*

⚠ *Never point this camera directly into the sun, welding arcs, or any other extreme intensity objects that you would not view with your eyes. Doing so will damage the camera.*

Contacting L-3 Communications Infrared Products

The Customer Service Department is available to assist with questions about this product. When you contact us, please have the following information available:

⇒ Camera part number

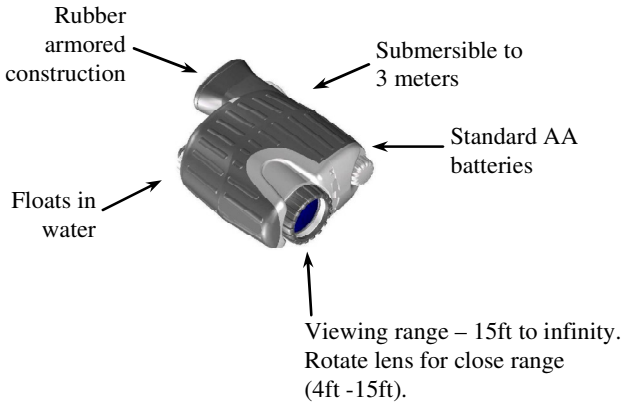
⇒ Camera serial number

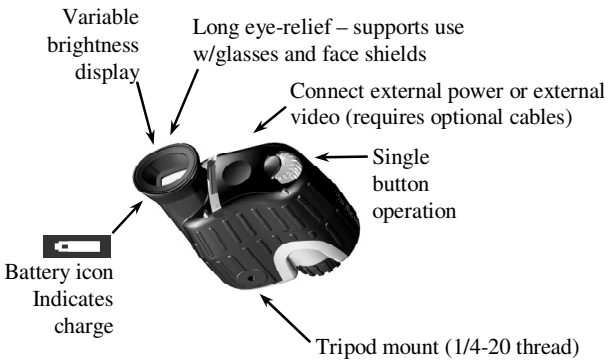
Part and serial numbers are located under the rear door/plug.

L-3 Communications Infrared Products Customer Service Department: 800-990-3275 (US) or 972-528-1528 (Int'l)

2. Operation

X150 Features

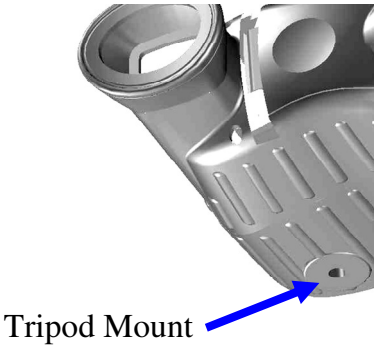




Model & serial number behind the external connections plug

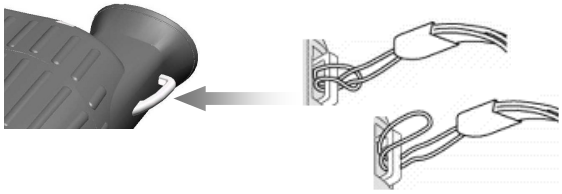
Holding the Camera

The camera can be mounted to a tripod using the 1/4-20 insert.

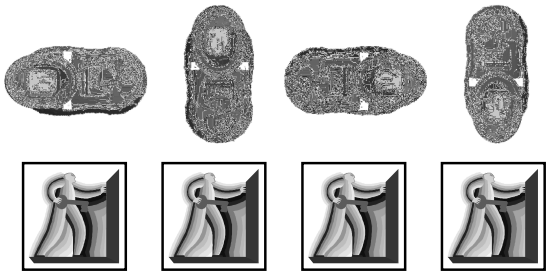


The camera can be held either right-, or left-handed.

To avoid dropping the camera, attach the strap provided. Both a neck strap, and a wrist strap are provided for your convenience. Attach the strap to the camera by looping it through the attachment point as shown below.



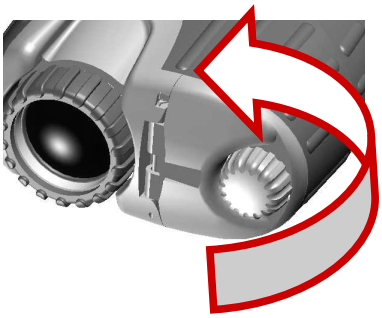
The camera can be held in any orientation and the image in the LCD display will remain upright.



Loading the Batteries

Opening the Battery Compartment Door

Unscrew battery compartment door knob counterclockwise.

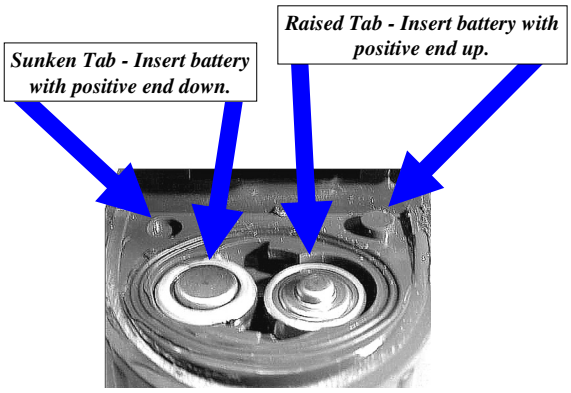


Open the door to install batteries.

Installing 2 AA Batteries

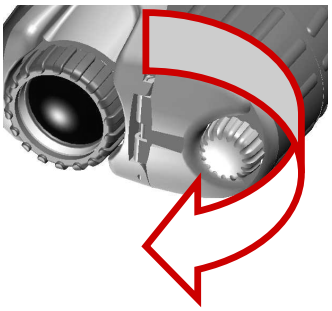
+ & **−** symbols inside the battery compartment indicate the direction to install batteries.

*Notice the raised tab next to the **+** sign, and the sunken tab next to the **−** sign. Use these to install the batteries in complete darkness by feel without having to see the battery symbols.*



Closing the Battery Compartment Door

Close the battery compartment door by screwing the knob clockwise.



Acceptable Battery Types

The camera will operate from the following types as long as they are AA size:

⇒ Alkaline

⇒ Nickel-Metal-Hydride (NiMh) rechargeable

⇒ Lithium

The camera does not have an internal battery charger. If using rechargeable batteries, they must be charged with a separate external charger.

Replacing Batteries

⚠ *When replacing batteries, always replace BOTH batteries. Mixing a fresh battery with a partially discharged battery is potentially hazardous.*

⚠ *Never mix battery types (alkaline, rechargeable, lithium, etc). Both batteries must be of the same type.*

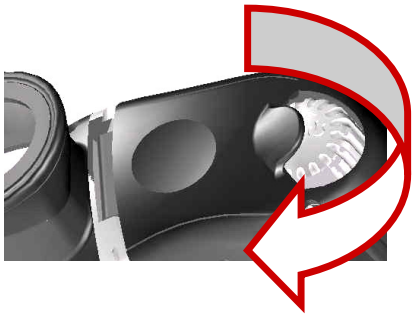
⚠ *Remove batteries if the camera is to be stored for extended periods (2 weeks or more).*

⚠ *Always follow the battery manufacturers' directions for proper disposal of batteries.*

⚠ *Before removing/replacing batteries, always ensure the camera is first turned off. Failure to first turn the camera off may result in a flickering or ghost-image display the next time the camera is turned on. The display will correct itself after a 5-10 minute waiting period. This waiting period can be with the camera either on (operating) or off (stored).*

Turning on the Power

Rotate the power knob clockwise to turn on the camera.



Camera Warm-Up

The camera requires approximately three seconds of warm-up time during which a logo appears on the camera display. After three seconds, the logo is replaced by the thermal image.

Automatic Camera Shutter

The X150 uses an automatic shutter to optimize the amount of IR energy reaching the detector. While the shutter is adjusting (at 30 to 90 second intervals), the display freezes for approximately ½ second and a faint *click* may be heard inside the camera.

Automatic Contrast

The X150 constantly adjusts video contrast based upon the informational content in the scene.

When viewing people, automobiles, boats, and other warm objects at close range, the video gain is automatically decreased resulting in more detail on facial features and flat surfaces.

When viewing a scene with low informational content, such as a park, field, or roadway, the video gain is automatically increased to provide more detail in the background of the scene for objects such as trees, bushes and roadway edges.

Determining Remaining Battery Power

A battery icon is displayed in the LCD display indicating the approximate amount of charge remaining in the batteries. New alkaline batteries generally provide enough charge for approximately 2 hours of operation, while new lithium batteries typically provide enough charge for approximately 5 hours of operation.

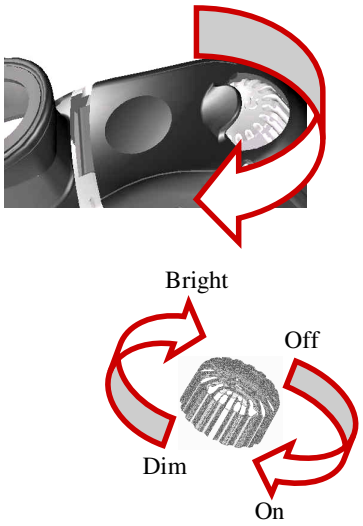
FULL EMPTY

The length of time the X150 will operate on a set of batteries is based on setting the camera's display to minimum brightness (night-time setting) for a camera operating at room temperature. Very low or high temperatures with the camera display operating at maximum brightness can reduce the expected time of operation by as much as 50%.

The battery icon is most accurate when using alkaline batteries, and slightly less accurate when using NiMh or lithium batteries.

Adjusting the Display Brightness

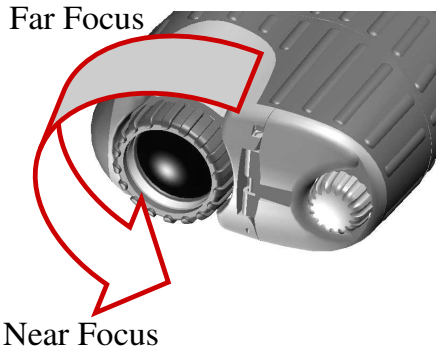
Turn the on/off knob clockwise past the on/off detent to increase the LCD display brightness. Turn counterclockwise to decrease the brightness.



To maximize battery life, set the LCD display to the minimum practical brightness setting.

Focusing for Close-Up Operation

The X150 has overall viewing range from 4 feet to infinity. In the *far focus* position, objects from 15 feet to infinity are in focus. By rotating the lens, objects as close as 4 feet can be brought into focus.



The lens may feel difficult to turn. This is normal, and is due to the tight seal required to make the camera waterproof.

Cleaning

⚠ *Do not apply any chemicals to the camera.*

Clean as follows:

⇒ Clean the body of the camera using a water-moistened cloth.

⇒ Clean the lens with a cleaner/cloth that has been specially formulated for cleaning camera lenses (**one is provided**). If additional cloths are needed, they may be purchased from any camera retailer.

3. Accessories

Contact L-3 Communications Infrared Products, for accessories that are approved for use with your X150 camera.

Accessory Video and Power Cables

Common accessories for the X150 camera are:

⇒ AC/DC power adapter

⇒ Power cable

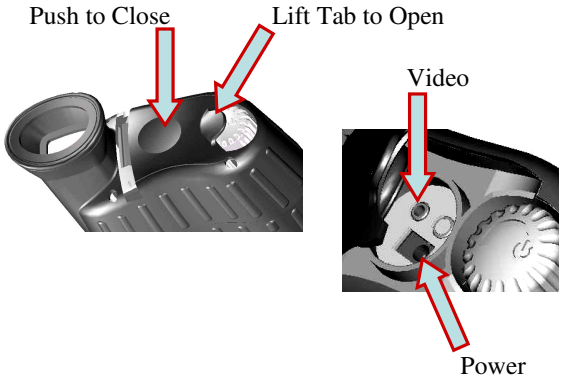
⇒ Video cable

⇒ Hard shell carry case

⚠ *The power and video cables may appear to be the same as those which are commonly available, however, they are actually unique for the X150 camera.* ***DO NOT*** *attempt to use other similar cables as they will not operate the X150 camera, and may cause damage!*

Operating with Video and Power Cables

The X150 external connections are located beneath the rear-plug cover.



AC/DC Power Adapter

Connect the AC/DC power adapter to the X150 connector labeled **Power**, and the other side an AC power wall outlet.

- *Connecting the AC/DC power adapter will disable the batteries, and the X150 will receive its power from this outlet.*
- *The AC/DC power adapter will provide power to the camera, however, it will not recharge batteries installed in the camera.*

Power Cable

Connect the power cable to the X150 connector labeled **Power**, and to any 12 volt DC power source. Operation of the X150 will be the same as described in the section *AC/DC Power Adapter*.

⚠ *The power supply must be capable of supplying at least 500ma.*

The supply voltage should be nominal 12VDC, however, it can range from 8-16VDC without causing harm to the camera.

Video Cable

Connect one end of the video cable to the X150 connector labeled **video**, and the other end to a video monitor. When the video cable is connected to the camera, the video automatically switches from the internal LCD display to the external video monitor. When disconnected, the video switches back to the camera's LCD display.

The X150 may require 3-4 seconds for the video to stabilize when switching between an external video monitor and the internal LCD display.

The X150 camera cannot simultaneously display external video and the internal LCD display.

4. Specifications

Detector	
Type	Amorphous-Silicon Microbolometer
Spectral Response	7 to 14 microns
Thermal Performance	
Time to Operation	~ 3 seconds
Contrast/Level	Automatic (Electronic Image Control)
Image Touch-up	Automatic (mechanical shutter)
Infrared Polarity	White-Hot Black-Cold
Range to Detect Human Activity	1000 feet (305 meters)
Optics	
Field of View	11^0 x 8^0
Focus Range	4 feet to infinity
Video	
Viewfinder Display	Monochrome LCD
Viewfinder Brightness	Adjustable (integral to on/off switch)
Auxiliary Video Out	Output jack on rear. NTSC or PAL (depending on Model)
Power	
Power	2 AA Batteries
Operating Time	2 hrs (alkaline batteries) 5 hrs (lithium batteries)
Auxiliary Power In	12VDC (input jack on rear)

Physical Specifications	
Size	5 ¼ x 4 ½ x 2 (inches) 13.4 x 11.4 x 5.1 (cm)
Weight	13oz. (381g) with batteries
Eye Cup	Integral to camera; with 2” eye relief
Environmental	
Operating Temperature	14^0F to 122^0F (-10^0C to $+50^0$C)
Storage Temperature	-4^0F to 176^0F* (-20^0C to $+80^0$C*) ⚠ *Storage temperature does not include batteries. Always follow battery manufacturers’ recommendations for battery storage.*
Waterproof	Yes, 3 meter submersion with both doors closed
Buoyant	Yes, floats in water
Shockproof	Yes, 2 meter drop
EMC Compliance	FCC: part 15, class B CE Mark: EN61000-6-1 & EN61000-6-3

Features:

- Enhanced DSP image processing
- On-screen battery-level indicator
- Left- or right-hand operation with rugged slip-resistant grip
- Tactile battery loading feature for night-time installations
- Long eye-relief viewfinder for easy use w/glasses, face shields

Standard Equipment:

- 2AA alkaline batteries
- Neck strap & wrist strap
- Lens cleaning cloth

Specifications are subject to change without notice.

5. Frequently Asked Questions

Q1 Can different battery types be used?

A1 You may use alkaline, Nickel-Metal-Hydride (NiMh) rechargeable, or lithium batteries as long as they are size AA. With any of these types, when the batteries fully discharge, erratic camera shutdown may occur (i.e. video flashing, power cycles on & off, etc), however, this behavior is more prevalent with the non-alkaline battery types. If erratic shutdown occurs, allowing the camera to sit in a powered-down mode for 15 minutes will resolve the problem.

Q2 Why does my camera sometimes behave erratically?

A2 When batteries become very low, the camera may behave erratically (i.e. video flashing, power cycles on & off, etc). Replacing batteries is the most common cure to erratic operations. Also, using the camera outside of the operational temperature range may cause erratic behavior. Returning the camera back within the approved operational temperature range and then turning it on and off will restore normal operation.

Q3 Is the lens normally difficult to turn?

A3 Yes, the camera is manufactured with tight seals to make it waterproof, causing the lens to be difficult to turn. This is normal.

6. Troubleshooting Guide

Problem	Possible Cause	Possible Remedy
After waiting the 3 seconds of warm up, the video does not appear, but the logo keeps flashing	Low battery power	Replace batteries
No image in the LCD display (no logo, no battery icon, and no video)	The LCD display brightness is too low	Adjust the display brightness by turning the on/switch clockwise
	Batteries are completely discharged	Replace batteries
	The optional video cable is connected	Disconnect the optional video cable
The internal display is *flickering/ flashing*, has a *ghost-image*, or has horizontal lines.	Batteries were replaced before first turning the camera off.	Always turn off the camera before replacing batteries. Wait 5-10 minutes and the display will clear itself.

7. Warranty

L-3 Communications Infrared Products Warranty

Product(s) will conform to L-3 IP's current drawings and specifications at the time of delivery and be free from defects in material and workmanship under normal use and service for twelve (12) months, beginning on the date the product is delivered to the customer, or beginning on the date product is placed into service; collectively whichever is the shorter period of time, but in no event shall the period become greater than eighteen months (the "warranty"). L-3 IP's sole obligation, buyer's exclusive remedy, under the warranty is for L-3 IP, at its option, to repair or replace any part of the product which fails to meet the warranty or refund buyer's purchase price, in the form of credit. For warranty repairs/replacements, at L-3 IP's cost for shipping, buyer shall return product(s) to L-3 IP's facility designated by L-3 IP, with a written explanation of failure. The warranty shall not apply to products; (i) used for purposes for which they are not designated or intended, or (ii) which have been repaired or altered without L-3 IP's prior written consent, or (iii) which have been subjected to misuse, negligence, accident or improper maintenance or installation, or (iv) upon L-3 IP's examination, do not disclose to L-3 IP's satisfaction nonconformance to the warranty. In the event the product 'warranty card" is not submitted to L-3 IP, proof of purchase shall be required to effectuate the warranty provisions stated herein above.

NO OTHER WARRANTIES, EXPRESS OR IMPLIED, ARE MADE WITH RESPECT TO THE PRODUCT(S) INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY, NON-INFRINGENT OR FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL L-3 IP OR ITS LICENSORS BE LIABLE FOR INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, LOSS OF USE OR DATA OR INTERRUPTION OF BUSINESS, WHETHER UNDER THEORIES IN TORT, CONTRACT OR OTHERWISE, EVEN IF L-3 IP OR ITS LICENSORS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Warranty Registration Card

Complete warranty registration online at www.thermal-eye.com, select **Support** and select **Thermal-Eye Product Warranty Card**.

How To Return Products For Warranty Repair

1. Return the product to your Authorized Dealer. The Dealer will notify the service department by telephone at 800–990–3275 (US) or 972-528-1528 (Int'l) **before** returning any product.

2. A Return Authorization (RA) number will be assigned by the service department. This number must be marked clearly on the outside of the package being returned.

3. Service department will provide a shipping address.

4. The following information must be included on the packing slip:

    a. Camera model number
    b. Camera serial number
    c. Reason for return
    d. Date and place of purchase
    e. Description of problem
    f. Return Authorization number

Camera model and serial numbers are clearly marked on the camera. Refer to the section titled X150 Features on page 11 for the location.

Proof of purchase may be required.

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Infrared Products

L-3 Communications Infrared Products

Customer Service Department
13532 North Central Expressway, MS 37
Dallas, Texas 75243
800-990-3275 (U.S.)
972-528-1528 (International)