



LS[®] Series

Operator's Manual



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This product is protected by patents, design patents, patents pending, or design patents pending.

If you have questions that are not covered in this manual, or need service, contact FLIR Systems, Inc. customer support at 805.964.9797 for additional information prior to returning a camera.

This documentation is subject to change without notice.

Proper Disposal of Electrical and Electronic Equipment (EEE)



The European Union (EU) has enacted Waste Electrical and Electronic Equipment Directive 2002/96/EC (WEEE), which aims to prevent EEE waste from arising; to encourage reuse, recycling, and recovery of EEE waste; and to promote environmental responsibility.

In accordance with these regulations, all EEE products labeled with the “crossed out wheeled bin” either on the product itself or in the product literature must not be disposed of in regular rubbish bins, mixed with regular household or other commercial waste, or by other regular municipal waste collection means. Instead, and in order to prevent possible harm to the environment or human health, all EEE products (including any cables that came with the product) should be responsibly discarded or recycled.

To identify a responsible disposal method where you live, please contact your local waste collection or recycling service, your original place of purchase or product supplier, or the responsible government authority in your area. Business users should contact their supplier or refer to their purchase contract.

Important Instructions and Notices to the User:

Modification of this device without the express authorization of FLIR Commercial Systems, Inc. may void the user's authority under FCC rules to operate this device.

Note 1: 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 the 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 off and on, 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 the separation between the equipment and receiver;
- Connect the equipment into an outlet on a circuit different from that of the receiver; and/or
- Consult the dealer or an experienced radio/television technician for help.

Industry Canada Notice:

This Class B digital apparatus complies with Canadian ICES-003.

Avis d'Industrie Canada:

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada

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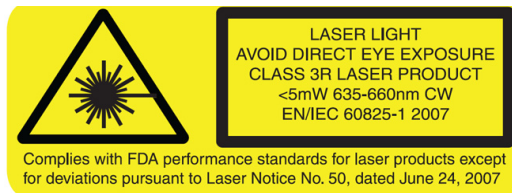
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Class 3R Laser Safety Statement



LASER LIGHT
AVOID DIRECT EYE EXPOSURE
CLASS 3R LASER PRODUCT
<5mW 635-660nm CW
EN/IEC 60825-1 2007

This laser device complies with International Standard EN/IEC 60825-1: Ed. 2, 2007-3, Class 3R Laser Product and also complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

1. Emission of a parallel beam of visible light;
2. Maximum Power of < 5mW CW, wavelength 635-660 nanometers;

Important Safety Instructions

- DO NOT DISASSEMBLE THE DEVICE.
- Read and follow all instructions
- Heed all warnings
- Only use the attachments/accessories specified by the manufacturer
- All service must be provided by the manufacturer
- Use extreme caution when the laser pointer is on
- Do not point the beam toward anyone's eye or allow the beam to strike the eye from a reflective surface
- Do not use the laser near explosive gases or in other potentially explosive areas
- Do not modify or remove the front end cap that encloses the camera lens and laser assembly
- Do not operate the laser if the unit is defective or the cover or seal is damaged.
- Caution – use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Laser Safety Information

The LS Series camera includes a built-in laser pointer. As with any laser pointer, it is important to adhere to the following warnings and safety instructions to prevent injury. If the included instructions are not followed, there is a potential hazard of eye exposure to laser radiation. A beam reflected off mirror-like surfaces can act like a direct beam on the eye.

Never shine a laser pointer into a person's eyes, or stare into the laser beam. Pointing a laser pointer into a person's eyes, or staring directly at the laser beam, can cause instant temporary vision dysfunction such as flash blindness, disorientation or glare.

In some states and provinces, it is illegal to aim a laser pointer on a law enforcement officer or on any other person. The purchaser/user is responsible for ensuring that his or her use of the laser pointer conforms with all applicable federal, state or local laws.

This Laser Product is designated as Class 3R during all procedures of operation. Refer to "Laser Emission Parameters" on page 16 for laser specifications.

Battery Safety Information

The LS Series camera is a sealed unit with sensitive electronics and contains no user-serviceable parts. Service or repair is to be performed only by the manufacturer. The camera unit must not be opened or modified by the user or owner in any manner or for any reason.

The battery used in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble the camera, store above 60°C, or incinerate. The battery is factory replaceable only; return the camera to the manufacturer for battery replacement.

1 Introduction

The FLIR LS Series thermal handheld camera gives law enforcement personnel the ability to see clearly in total darkness, giving them the information they need while making quick decisions, enhancing mission effectiveness, maximizing operational capabilities, and improving officer safety.

The LS Series camera provides a Vanadium Oxide (VOx) micro bolometer giving excellent, high-fidelity thermal imagery with the detail necessary for cutting edge performance. You will detect and recognize threats at improved distances, in total darkness, as well as through smoke, dust, and light fog.

You can see better through camouflage and foliage in any lighting conditions. Because LS Series cameras see heat, not light, they are not fooled by suspects wearing dark clothes or hiding in bushes.

You can see more—and see farther—than with other night vision technologies because LS Series cameras see clearly without any light whatsoever. You can see farther at night than with technologies that need ambient light to work and you can see heat sources that these other cameras could never find.

The LS Series camera makes images from heat, not light, a task not possible for the naked eye or even image intensified (I^2) night vision devices, which means you can see clearly even without any visible light at all. People, animals, and objects all make their own heat and their own contrast, and are clearly seen by the LS Series camera in even the most adverse conditions.

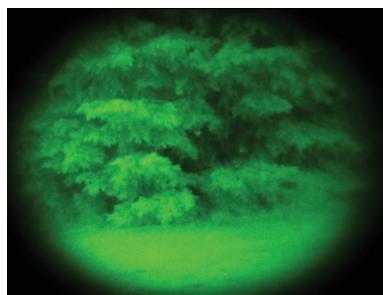
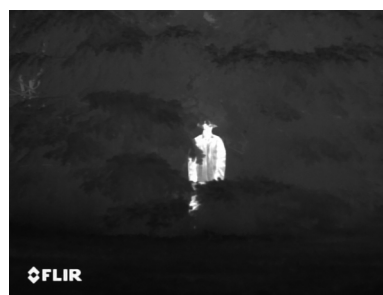


Image Intensifier Image



Thermal Camera Image

1-1 LS Series Camera Features



Camera Features

- Rugged design—Built to withstand the demands of outdoor use.
- Advanced microbolometer sensor array with 320×240 resolution for excellent image quality and clarity, or 640×480 resolution for superior image quality and clarity
- LS-X: 336×256 pixel resolution, 19 mm lens with 17° field of view
- LS-XR: 640×512 pixel resolution, 35 mm lens with 18° field of view
- Palm-Sized Portability and Light Weight—Only 12 Ounces
- Embedded Laser Pointer
- USB Cable for battery charging
- USB/Video Adapter Cable for analog video output to a monitor or video recorder.
- Rechargeable Internal Li-Ion battery—Provides up to 5 hours of camera operation on a single charge.

Caution!

Do not disassemble the camera enclosure. Disassembly can cause permanent damage and will void the warranty.

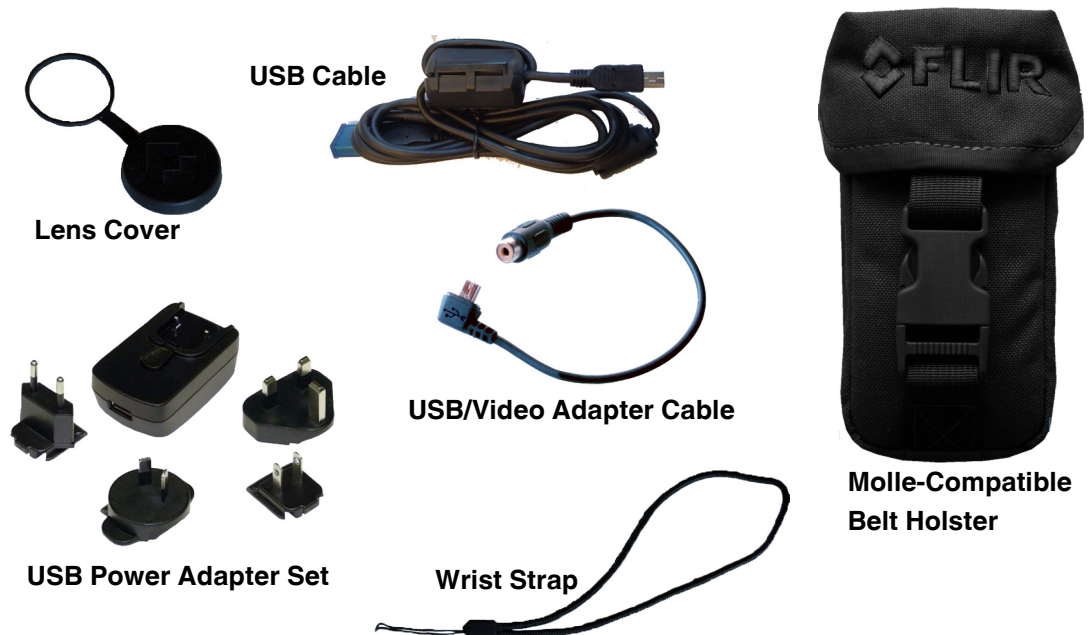
Do not point the camera directly at extremely high-intensity radiation sources, such as the sun, lasers, arc welders, etc.

Be careful not to leave fingerprints on the camera's infrared optics. Clean only with low pressure fresh water and a lens cloth.

2 Getting Started

The LS Series camera is available with the features, options, and accessories described in this manual. Refer to the packing list enclosed with your camera shipment to determine the actual contents of your camera package.

In addition to the camera, Quick Start Guide, and Documentation CD; the following items are included in the camera package:



The following optional accessories are available for the LS-Series camera:



2-1 Charging the Camera

Caution!

To assure proper charging, LS Series cameras should be turned OFF throughout the charging cycle. Charging **MUST** only be done when the camera temperature is from 0 to 40°C (32 to 104°F), or battery damage may occur.

The camera battery should be fully charged prior to use. To charge the camera, lift the cover from the USB port, plug in the USB cable provided with the camera, and plug other cable end into a USB power source.

- When charging correctly, the charging indicator will be lit orange.
- When fully charged, the charging indicator will light solid green. The initial charge time is approximately 5 hours.



USB port



2-2 LS Series Power Management

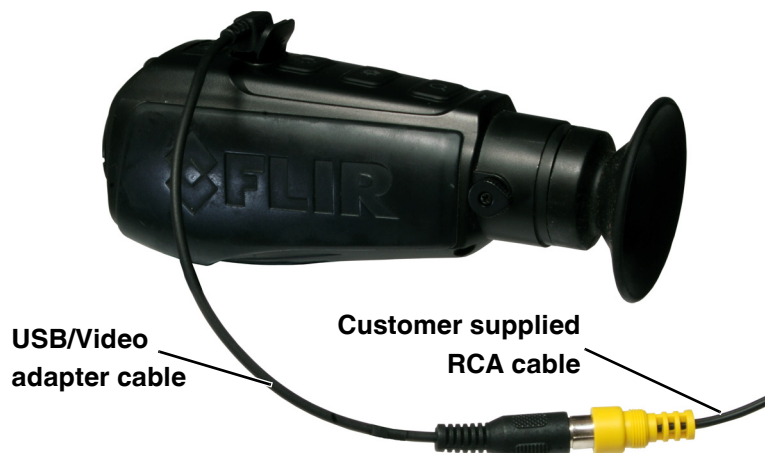
Your LS Series camera is equipped with a power management system that provides up to five hours of continuous operation. When left in the Off state the battery will hold a charge for up to two months. To make the best use of the camera it is important to understand the basic power states of the camera.

- When the camera is turned on from the Off state, it takes about five seconds to become operational. During the Bootup process, the FLIR splash screen is shown and then the software version is displayed briefly. Pressing the Power button will toggle the camera between On and Off.
- The camera shuts down after about five minutes if no buttons are pushed. **Auto shutdown 30s**, is shown in the display, and after counting down for 30 seconds the camera will shutdown.

Camera State	How do you know?
Off	The display is off and the Laser Pointer comes on when the Brightness button is pressed.
On	The display is on. If the image appears blank, make sure the lens cover is removed.

2-3 Using USB/Analog Video Adapter Cable

To obtain analog video out, insert the adapter cable into the USB connector. The camera will detect the adapter cable and provide the video stream. Use an RCA cable to connect to a monitor or a video recorder.



When using the USB/Analog Video Adapter cable to record video or supply video to a remote monitor, it may be useful to turn off the Auto Shutdown feature of the camera.

2-4 Scout II/LS-X/LS-XR/Ocean Scout End User Tool

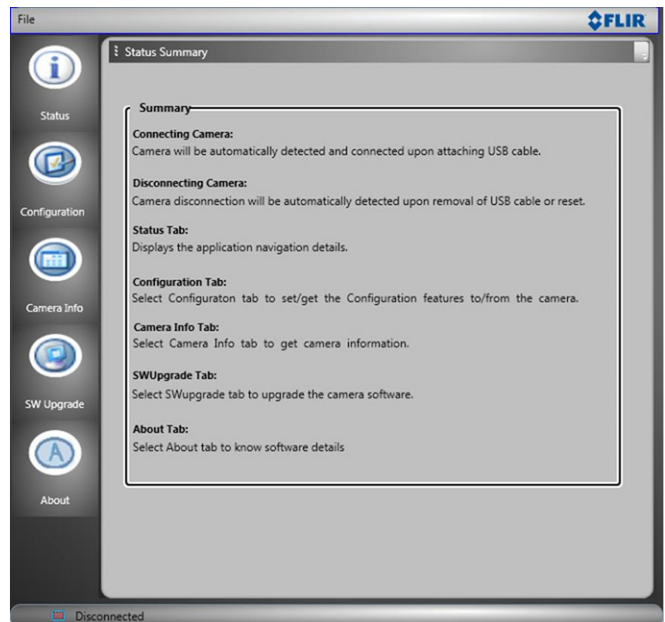
The FLIR PS/MS/TH/LS End User Tool is a graphical user interface (GUI) that is used with the following FLIR handheld thermal imaging cameras:

- Scout II Series
- LS Series
- Ocean Scout

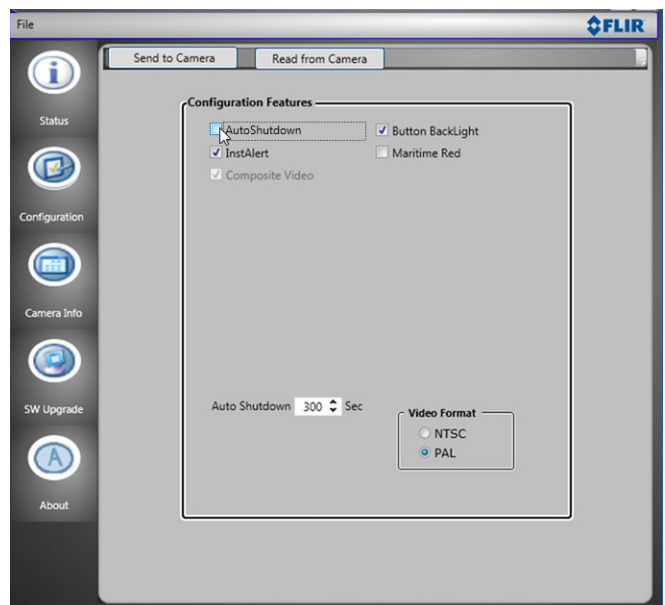
These cameras are similar in design and may be referred to generally as “Cayman” cameras.

The software allows a user to make minor configuration changes to one of these cameras. For example, a user can turn camera sounds on or off, or change the amount of time before the camera shuts down automatically. The tool can also be used to perform a camera firmware upgrade if one becomes available in the future.

To download the GUI, go to <http://www.flir.com/law-enforcement/display/?id=50727>, select the end user tool under Software to download.

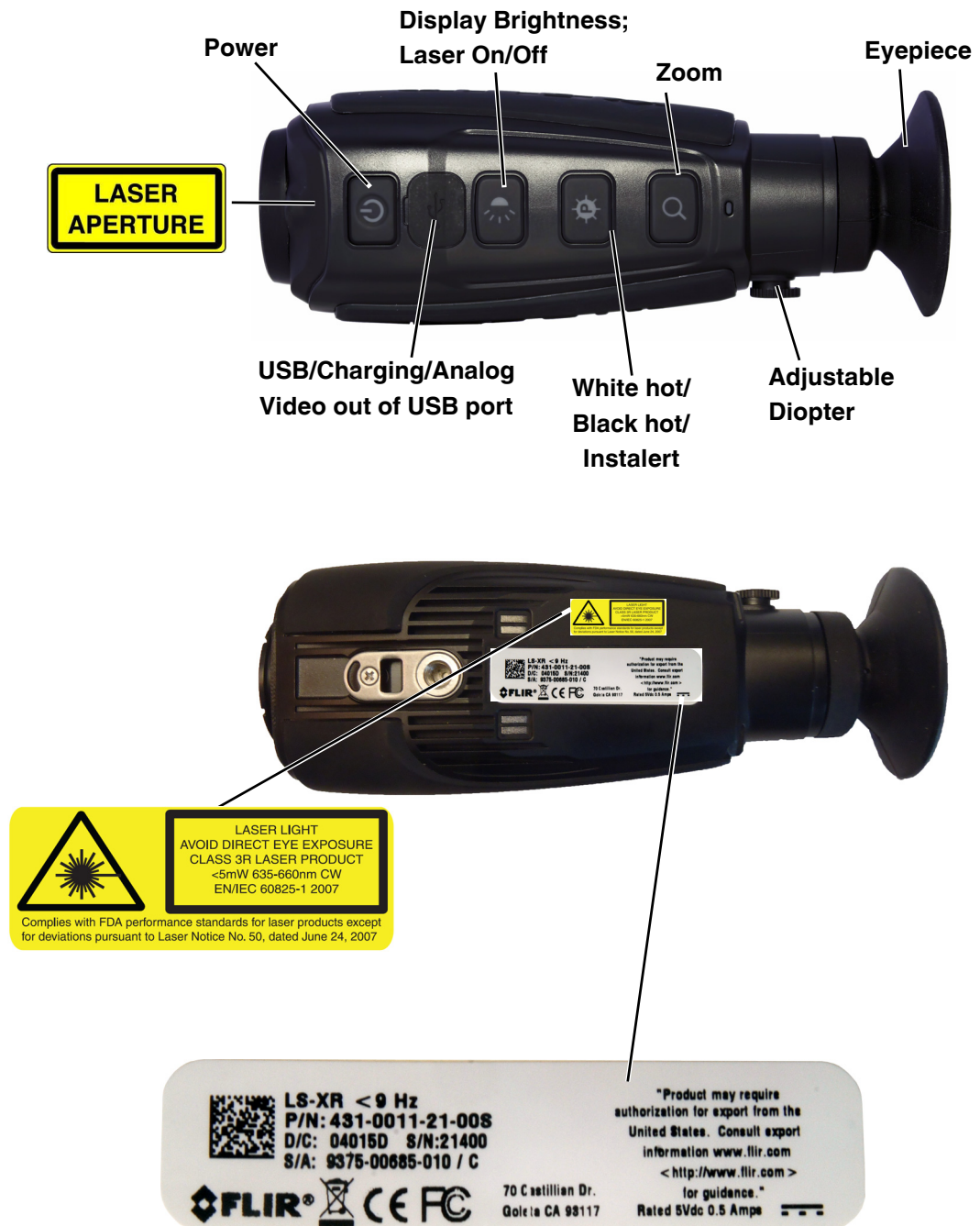


Select Configuration to read camera setting and make changes to available camera features.



3 Operating Your LS Series Camera

3-1 Camera Features and Controls



3-2 Control Buttons

Power Button

Press and hold to turn the camera On or Off.



Display Brightness Button / Laser Pointer

When the camera is on, use this button to cycle through the five levels of display brightness. Each quick press of the button advances to the next level of brightness.



When the highest brightness level is reached, subsequent button presses advance to the next lower brightness levels. When the lowest brightness level is reached, subsequent button presses advance to the next higher brightness level. One of the following icons is displayed for approximately 3 seconds after the button is pressed indicating the current brightness level:



When the camera is Off, press and hold this button to turn on the laser pointer. If the camera is On, press and hold to turn on the laser symbol in the viewfinder, followed by the laser pointer turning on approximately 1 second later. When the button is released, the laser pointer is turned off and the laser symbol is removed from the display.

White Hot/Black Hot/Instalert™ Button

Use this button to toggle between the two video and the four Instalert color palettes. In the default White Hot palette, hotter objects appear as white or light gray. Black Hot, hotter objects appear as black or dark gray. In the Instalert™ palettes the hottest objects in the scene are highlighted in red to simplify detection of animals, people, and objects. There are four pre-set levels of Instalert that you can select based on the specific scene being viewed. All of the Instalert palettes are based on the white hot palette.



While white hot is the most commonly used and visually intuitive method of viewing thermal imagery; black hot can often enhance contrast of certain objects or provide better visual perspective in some conditions. When switching between palettes, the appropriate icon is displayed for approximately 3 seconds.

White hot Black hot



Instalert™ 1 – 4



Instalert™

Zoom Button

Use this button to switch the camera between no zoom (full resolution), 2x, 4x, and 8x zoom (Note: 8x zoom available on LS-XR models only). The central part of the image is magnified twice its normal size when 2x is selected, four times its normal size when 4x is selected, and eight times its normal size when 8x is selected.



When zoom has been selected the appropriate icon is continuously shown in the display:



Continuous E-zoom (LS-XR models only)

When the zoom button is pressed momentarily (quick press), it behaves as described above. On LS-XR models, a Continuous E-zoom feature is enabled by pressing and holding the zoom button (long press). Once the Continuous E-zoom mode is enabled, the camera will zoom in gradually, until the button is released or until the 8X magnification is reached.



When the button is pressed again, the camera will zoom out continuously until the button is released or until the normal size (no magnification) is restored.

When Continuous E-zoom has been selected the E-zoom icon is continuously shown in the display. The Continuous E-zoom mode can be disabled by pressing any of the other buttons. When the Continuous E-zoom mode is disabled, the camera will stay at the last zoom setting until the zoom button is used again.



Diopter Controls



The diopter adjustment lever allows you to adjust for optimum image sharpness in the eyepiece. When the diopter adjustment lever is pointing straight away from the front of the camera, it is in the neutral position.

Adjust the diopter setting for the sharpest image in the viewfinder.

3-3 Battery

Your LS Series camera is equipped with a sophisticated power system using a rechargeable internal Li-Ion battery.

Battery Status Indicator

While the camera is On, a battery status indicator is always shown in the corner of the display image. This indicator provides an estimation of the remaining battery charge.



3-4 Auto Shutdown Operation

Auto Shutdown is a feature of the LS Series camera that helps to guard against draining the battery prematurely by inadvertently leaving the camera on. Auto Shutdown turns the camera off if the following conditions are met:

- The camera is On
- No buttons have been pressed for about five minutes.

Once these conditions are met you will see the following message in the display: **Auto shutdown 30s**, and after counting down for 30 seconds the camera will shutdown. Press any button during this countdown to terminate Auto Shutdown and resume normal operation.

Note

Pressing any button during an Auto Shutdown countdown will only terminate the countdown and abort the shutdown. The normal function of the button will not occur.

3-5 Maintenance

The LS Series camera requires no maintenance, other than charging the batteries. If necessary, it is possible to gently clean the lens with a soft lens cloth and water or Isopropyl alcohol. Avoid scratching the lens and/or leaving fingerprints on the optics.

No maintenance is needed or allowed on the laser pointer. If it is damaged, do not operate the laser as exposure to laser emissions can occur. Immediately return the camera to FLIR for repair.

3-6 Service

The LS Series camera is a sealed unit with sensitive electronics and no user-serviceable parts. Service or repair is to be performed only by the manufacturer. The camera unit must not be opened or modified by the user or owner in any manner or for any reason.

The battery present in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble the camera, store above 60°C, or incinerate.

The camera battery carries a 2 year standard, 3 year with registration warranty from the date of purchase. After expiration of the warranty, it may be possible for FLIR to replace the batteries at the factory for a nominal fee. Contact your FLIR dealer or distributor for information about battery replacement.

4 Technical Data

LS Series Model Features

Camera Model	
LS-X	LS Series Handheld Thermal Camera with video resolution of 336x256 pixels and 2x and 4x digital electronic zoom.
LS-XR	LS Series Handheld Thermal Camera with video resolution of 640x512 pixels and 2x, 4x, and continuous electronic zoom.
Included with all camera models	Lens Cover, USB Cable, USB Power Adapter, USB/Video Adapter Cable, Wrist Strap, Quick Start Guide, and Molle Belt Holster

Feature	
Start up	< 5 seconds
Thermal Sensitivity, Waveband	< 50 mK @ f/1.0, 7.5 - 13.5 μ m
Detector Type	VOx Microbolometer LS-X—336x256 pixels LS-XR—640x512 pixels
Resolution / Display	640x480 pixels LCD LS-X—NTSC 60Hz or <9Hz Refresh rate; LS-XR—NTSC 30Hz or <9Hz Refresh rate
Video Output	NTSC composite video out through USB port via USB/Video Adapter Cable to RCA cable. NTSC/PAL switchable using GUI available from FLIR website.
Image Processing	FLIR Proprietary Digital Detail Enhancement
Focus, Zoom	Fixed focus; 2x, 4x electronic zoom (and 8x on LS-XR models only)
Display Palettes	White Hot, Black Hot, InstAlert™; selectable

Power

Battery Type	Internal Li-Ion
Battery Life Operating (Stand-By)	Approximately 5 Hours at 25°C, (120 hours)

Environmental

	LS-X and LS-XR
Camera Operational Temp.	-4°F to 122°F (-20°C to 50°C)
Laser Operational Temp.	4°F to 122°F (-10°C to 50°C)
Storage Temp.	-40°F to 140°F (-40°C to 60°C)
Ingress Protection Rating	IP-67, submersible up to 1 meter
Drop Test Rating	1 meter drop

Physical

LS-X, LS-XR	
Weight	12 oz. (340 g) with battery
Size (L × W × H)	6.70" × 2.31" × 2.44" (172 × 58.7 × 62 mm)

Field of View

LS-X, LS-XR	
Field of View (FoV)	LS-X: 17° × 13° NTSC LS-XR: 18° × 14° NTSC

Range Detection¹

Detect Man (1.8 m × 0.5 m)	
LS-X	570 m (623 yd)
LS-XR	1140 m (1247 yd)

Laser Emission Parameters

Wavelength	635-660nm, red laser
Laser Power for classification	< 5mW CW (3.5mW typical)
Beam Diameter	< 3mm at aperture
Divergence	< 1mrad
Transverse Beam Mode	TEM00

1. Actual range may vary depending on camera set-up, environmental conditions, and user experience.



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