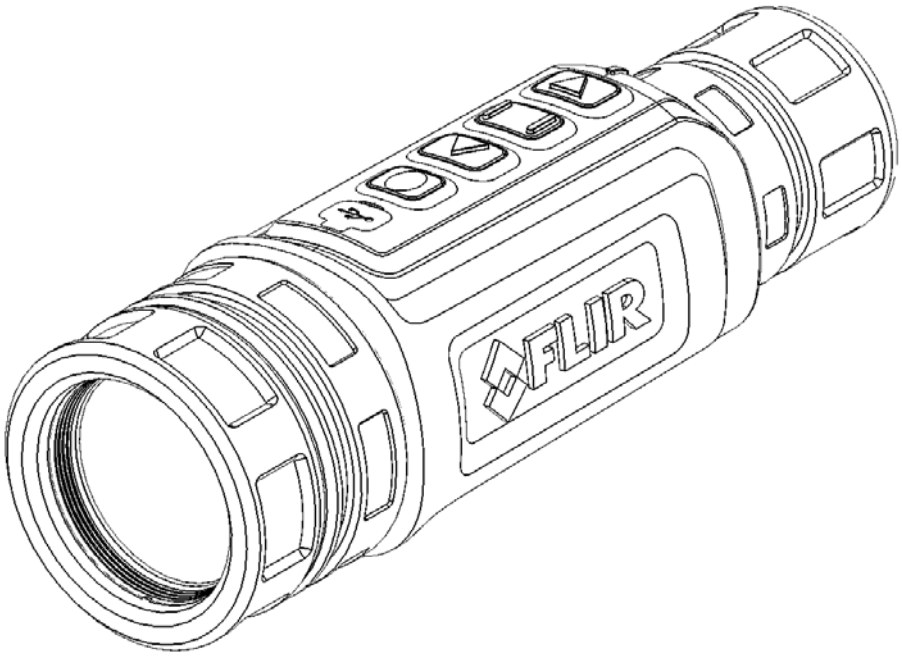
ThermoSight® R-Series

Operator's Manual



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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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SAFETY STATEMENT

Be sure to observer all local, state and federal laws. Shooting a gun at night is highly dangerous and can lead to lethal consequences.

Know and understand your shooting field. Bullets travel farther than the range of thermal detectors so care must be taken to insure there are no unintended targets beyond the actual target.

Be sure you identify your target - to hunters unfamiliar with thermal technology, hogs and farm animals and even people might appear similar in an IR image.

WARNING: DO NOT DISASSEMBLE THE DEVICE.

Important Safety Instructions

- 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
- Caution – use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Battery Safety Information

The R-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.

ThermoSight® R-Series Thermal Scope

The ThermoSight® R-Series thermal imager is used as a scope or a viewer, and does not have the ability to save an image or a video clip. Nevertheless, in the industry, and throughout this manual, this type of device is also referred to as a camera.

1 Introduction

The FLIR R-Series thermal handheld camera gives hunters and outdoor enthusiasts the ability to see clearly in total darkness, giving them the information they need while making quick decisions, maximizing operational capabilities, and improving safety.

The R-Series camera uses Vanadium Oxide (VOx) microbolometer sensors to give excellent, high-fidelity thermal imagery with the detail necessary for cutting edge performance. You will detect and recognize animals and people at improved distances, in total darkness, as well as through smoke, dust, and light fog. The user can also see better through foliage and in uneven lighting conditions. Because R-Series cameras see heat, not light, the camera can find animals hiding in bushes.

The user can see more—and see farther—than with other night vision technologies because R-Series cameras see clearly without any visible 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 R-Series camera makes images from radiant heat, not light, a task not possible for the naked eye or even image intensified (I^2) night vision devices, which means the user 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 R-Series camera in even the most adverse conditions.





1–1 R-Series Camera Features

1.0.1 Camera Features

- Rugged design—Built to withstand the demands of outdoor use.
- Advanced microbolometer sensor array with choice of 240x180, 320×240, or 640x480 resolution for superior image quality and clarity
- Wide range of models with various resolution and field of view choices
- Portable and Light Weight—Only 775 grams (1.71 lbs)[1]
- USB connection for battery charging, or for viewing video on an external monitor via the custom USB-to-RCA cable (not available with RS24 model; Note, it is not possible to view video and charge the camera at the same time)
- Rechargeable Internal Li-Ion battery—Provides more than four 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.

Consult your state and local hunting resources for Thermal Camera hunting regulations.

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



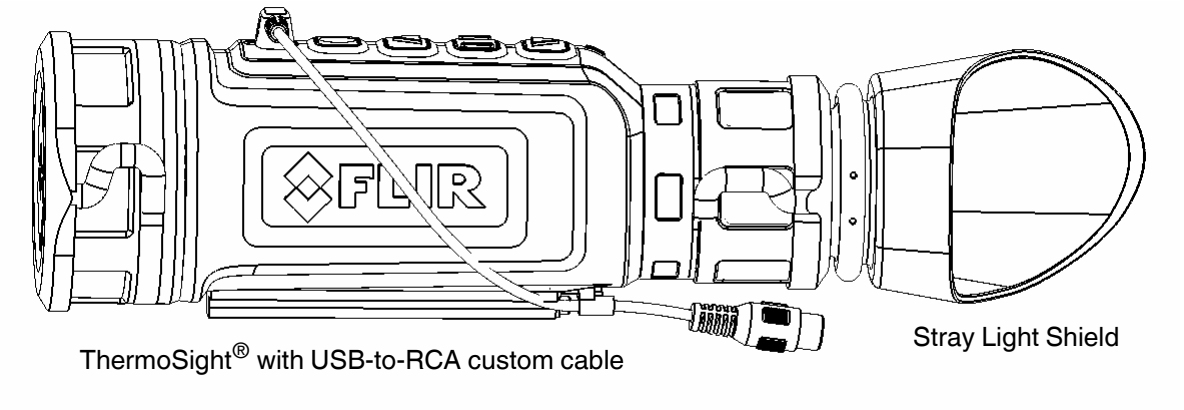
1. Weight shown is for the camera only and does not include the MIL-STD-1913 Tactical Rail mount which is provided with the camera.

2 Getting Started

The ThermoSight® R-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 and Quick Start Guide, the following items are included in the camera package:

- Lens covers (one for the eye piece and one for the front lens objective)
- Stray light shield
- USB charging cable
- USB wall charging plug (US 120VAC)
- MIL-STD-1913 Tactical Rail mount and adjustment wrench
- Lens Wipe
- Custom USB-to-RCA cable[1] - Allows the camera to be plugged into an external video monitor.
- R-Series Hard-shell Carrying Case



ThermoSight® with USB-to-RCA custom cable

Electronic Zoom

The R-Series camera supports electronic (or digital) zoom according to the following table. Refer to “Control Buttons” on page 5 for a description of the two zoom modes, discrete and continuous.

Table 1: Electronic Zoom

Camera Resolution	Electronic Zoom
240 x 180	No Zoom
320 x 240	Up to 4X
640 x 480	Up to 8X

1. The Custom USB-to-RCA cable is included with all cameras except the RS24 model.

2–1 Charging the Camera

Caution!

> To charge more quickly, the R-Series cameras should be turned off throughout the charging cycle. Charging MUST only be done when the camera temperature is in the range of 0 to 40°C (32 to 104°F), or battery damage may occur.



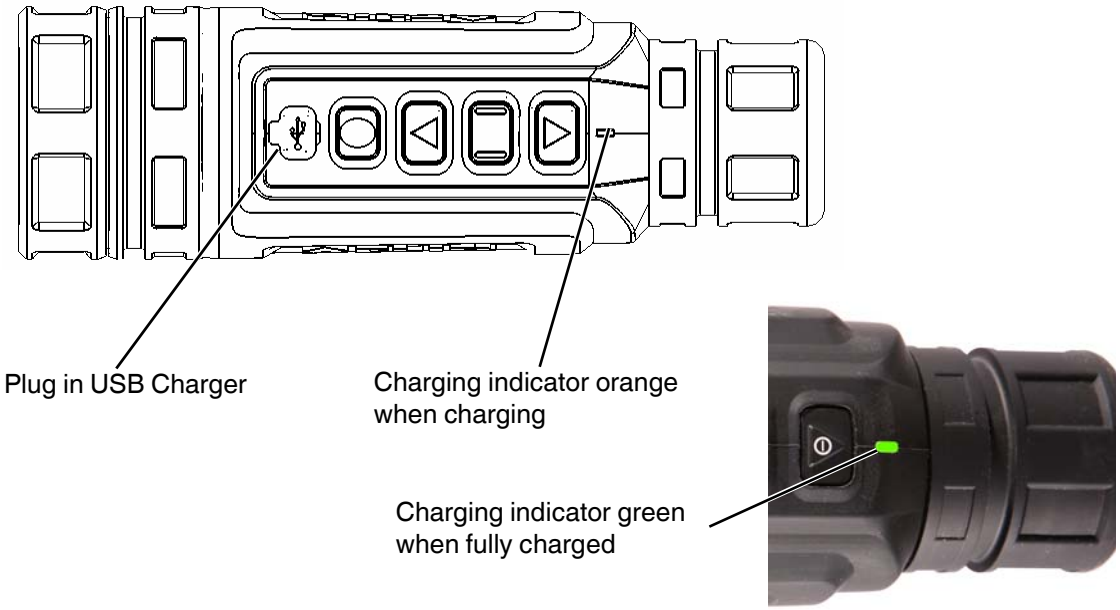
The camera battery should be fully charged prior to use. To charge the camera, lift the cover from the USB port, plug in the USB cable provided with the camera, and plug the other cable end into a USB power source.

- When charging correctly, the charging indicator will be lit orange[1].
- When fully charged, the charging indicator will light solid green. The initial charge time is approximately 5 hours.

The battery can be charged through any USB power source (including a car adapter) as long as it provides the standard 5V and 1 amp output. Note, it is not possible to charge the camera and view video (via the custom USB-to-RCA cable) at the same time.

Caution!

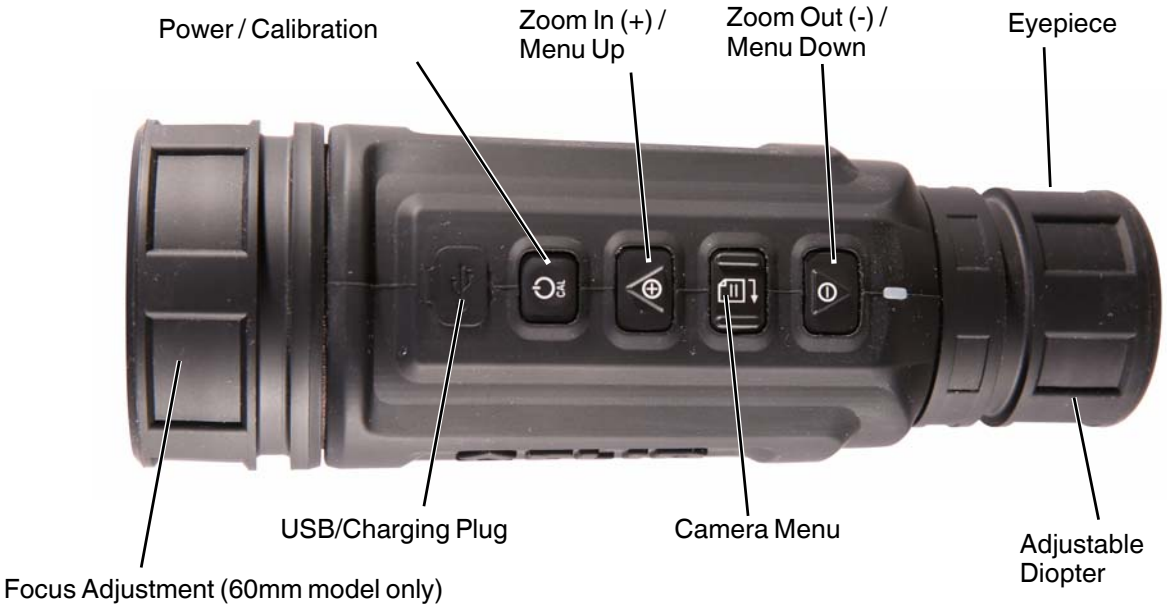
> Prior to connecting the scope to a power source, make sure the USB connector is completely dry and free of water or debris. After the scope has been used in a wet environment and exposed to the elements, if this precaution is ignored, the camera will be damaged when it is plugged into a power source and the damage will not be covered under warranty.



1. In some cases, the indicator light may still show orange when the camera is fully charged. After 5 hours of charging, turn on the camera and check the battery indicator in the viewfinder to determine the actual charge level.

3 Operating Your R-Series Camera

3–1 Camera Features and Controls



3–2 Control Buttons

Focus Adjustment

On the 60mm model, it is possible to focus the thermal imager by rotating the focus adjustment on the front of the camera. If the camera appears to be out of focus, the Diopter may require adjustment, rather than the focus (refer to “Diopter Controls” on page 7 for more information). Note, the 60mm model is able to focus no closer than 15 feet (4.6 meters).

Power (CAL) Button



Press this button momentarily (short press) to turn the camera On. Press and hold this button (long press) to turn the camera Off. When the camera is on, a short press will cause the camera to perform a flat field calibration (FFC, refer to “Calibration” on page 10 for more information about this operation).

Note: When the camera is first powered on, it is likely the FFC operation will occur several times in the first 3-5 minutes while the camera electronics warm up.

Zoom In (+) Button



Normally, the Zoom In (+) and Zoom Out (-) buttons are used to perform digital zoom[1] of the video image. When the on-screen menu is enabled, the Zoom In (+) and Out (-) buttons are used to navigate up and down within the menu.

There are two zoom modes. The default zoom mode is discrete (2X all at once); the camera can also zoom in or out in a gradual way (continuous mode). Each momentary

press of this button (short press) causes the camera to zoom in (discrete zoom), doubling the magnification factor by 2, until the maximum is reached (the maximum zoom available depends on the camera model). The central part of the image is magnified twice its normal size when zoom level 2.0 is selected and four times the normal size when 4.0 is selected. To zoom out, use the Zoom Out (-) button.



Zoom level 1.0



Zoom level 2.0

The zoom level is displayed in the lower right part of the screen (for example, 2.0). The zoom level of 1.0 indicates the camera is zoomed all the way out (no zoom). The Continuous E-zoom feature, described below, allows the user to zoom to intermediate levels in between the discrete 2x levels describe above.

When the Camera Menu is enabled, the Zoom In button moves up within the menu to the next menu entry, or it can be used to increase an adjustment (for example, Brightness). Pressing the button when at the top of the list will cause it to wrap around and select the entry at the bottom of the list.

Continuous E-zoom

When either zoom button is pressed momentarily (quick press), the camera behaves as described above. On some models, a Continuous E-zoom feature is enabled by pressing and holding either zoom button (long press). Pressing and holding the Zoom In (+) button will cause the camera to zoom in gradually, until the button is released or until the maximum magnification is reached. The zoom level is displayed in the lower right part of the screen (for example, 1.7).

When the Zoom Out (-) is pressed (long press), the camera will zoom out continuously until the button is released or until the normal size (no magnification) is restored.

When the camera is zoomed to an intermediate level, using a quick press of either zoom button will cause the camera to zoom in or out to the next discrete level.

Camera Menu/Select Button



Use this button to enable the Camera Menu. If the menu is not displayed, pressing this button will enable the menu and cause it to be displayed in the viewfinder.

If the menu is already enabled, pressing this button will select (or accept) whichever menu item is highlighted.

Refer to “Camera Menu” on page 7 for information about the Camera Menu.

1. Cameras with 640x480 resolution - up to 8X zoom; 320x240 resolution - up to 4X zoom, 240x180 -no zoom.

Zoom Out (-) Button



Use this button to zoom out; each momentary press of this button causes the camera to zoom out (digital zoom) to the next discrete level, reducing the effective magnification factor by 2, (for example, 4.0 to 2.0). Note: 4x zoom is available on some models only.

When the Camera Menu is enabled, this button moves down within the menu to the next menu entry, or is used to decrease a value (for example, Brightness). Pressing the button when at the bottom of the list will cause it to wrap around and select the entry at the top of the list.

Diopter Controls

The diopter adjustment allows a user to alter the viewfinder to accommodate that individual's eyesight for optimum image sharpness. Rotate the eyepiece to adjust the diopter level for the sharpest image in the viewfinder. It is best to do this while viewing a scene with high contrast.

3–3 Camera Menu

When the Menu button is pressed, the following menu is displayed in the upper left part of the viewfinder. By default, the Brightness option will be highlighted to indicate it is currently selected. The Zoom In (+) and Zoom Out (-) buttons can be used to move up and down in the menu, and the Menu button can be used to accept the current selection. The Power button can be used to cancel the menu and remove it from the screen.

```
Color
Brightness
Setup
Exit
  Menu to Accept
  Power to Cancel
```

Color

The **Color** menu option allows the image "color palette" to be adjusted. White hot is perhaps the most commonly used method of viewing thermal imagery; black hot can often enhance contrast of certain objects or provide better visual perspective in some conditions. It is also possible to select other color palettes, including one of 4 Instalert™ color palettes, a variation of the white hot palette that uses red for the hottest temperatures. Toggle through the various color options to determine which one is preferred for a given situation. When switching between palettes, one of the following icons may display for approximately 3 seconds.



Instalert™

White hot Black hot Instalert™ 1 – 4



Brightness

The **Brightness** menu option allows the brightness of the viewfinder to be adjusted. Pressing the Zoom In (+) or Zoom Out (-) button will cause the camera to toggle to the next setting. Use either button to cycle through the five levels of display brightness. Each press of the button advances to the next level of brightness.

When the highest brightness level is reached, pressing the Zoom In (+) again will select the lowest brightness level. When the lowest brightness level is reached, pressing the Zoom Out (-) again will

select the highest brightness level. One of the following icons is displayed for approximately 3 seconds after either button is pressed indicating the current brightness level:

Lowest Highest



Setup

Selecting the **Setup** option takes the user to the Setup menu:

```
Reticle Color
Reticle Style
Zero Adjust
Advanced
Back
  Menu to Accept
  Power to Cancel
```

The **Reticle Color** toggles between green, white, black and red.

The **Reticle Style** toggles between 4 reticle styles (including no reticle).

Zero Adjust is used to adjust the reticle, a step that would ordinarily be done ahead of time during the day when it is possible to calibrate with a known target at a known distance. The stray light shield is especially useful when viewing the camera during the day. Adjust the reticle to the point of impact. Refer to section 3–4 below for more information about adjusting the reticle.

Advanced

Selecting the **Advanced** option takes the user to the Advanced menu:

```
Power Saver
Scene Presets
Save User
Recall User
Cal Mode
Back
  Menu to Accept
  Power to Cancel
```

The **Power Saver** option allows the user to set the amount of time before the camera enters Auto Shutdown mode. The value can vary between 5 and 60 minutes or can be set to Never (Auto Shutdown disabled).

The **Scene Presets** option allows the user to toggle the camera through a range of three different settings which affect the image brightness and contrast. The current setting (S1, S2, S3) is indicated at the bottom of the image. Use the Zoom In (+) and Zoom Out (-) buttons to find the setting which is preferred for a given situation. The preferred setting will vary, depending on time of day, weather conditions, and so on. In most situations the S1 setting will be preferred, but under certain conditions the other settings may provide an improved image based on user preferences.

The **Save User** option allows the user to save the current camera settings (all settings that can be changed, including the current level of zoom, the color palette and brightness settings, and the reticle zero adjust value) as one of three User Presets. This allows the unit to be used on multiple weapons or at multiple ranges. Use the +/- buttons to select one of the presets and then press the Menu button to save the settings.

The **Recall User** menu option allows the user to recall one of the three User Preset settings.

The **Cal Mode** option determines whether or not the flat field calibration (FFC) occurs automatically (Auto CAL) or not (Manual CAL). Refer to “Calibration” on page 10 for more information about this operation.

3–4 Zero Adjust

Once the camera has been mounted, it is necessary to adjust the reticle/cross hair so that the point of aim coincides with the desired Point of Impact (POI). "Zeroing" the scope is obviously important in terms of improving the accuracy of a shot. If the zero is not adjusted properly it will be difficult to hit the target reliably. The details of how to perfectly adjust (or “zero”) a rifle site are beyond the scope of this manual, but some general guidelines are provided below.

Since this unit is a thermal camera, it will be necessary to adjust the zero while observing a target with some level of thermal contrast. An ordinary paper target, which may be quite visible during the day to the human eye, will likely be same temperature as the background and therefore difficult to see with the thermal camera. The ink on a paper target will be the same temperature as the paper and will likely not be visible as well.

It may be useful to tape one or more disposable hand warmers to the target to get some temperature difference. For longer distances, it may be necessary to use the larger size body warmers, typically available from the same companies as the hand warmers.

The rifle should be secured or held in a steady position. The best way to achieve this is to set the rifle on a stand so that the rifle stock is level (front to back as well as side to side) and square to the ground.

To access the Zero Adjust function, press the Camera Menu button and select Setup and then select Zero Adjust. By default, the reticle will be set dead center at (0,0). The first number represents windage (horizontal adjustment) and the second number represents elevation (vertical adjustment). These adjustments are for POI and the units are in Minutes of Angle (MOA).

Select Horizontal Zero Adjust or Vertical Zero Adjust from the menu and use the +/- buttons to modify the value(s). The + button will adjust the reticle down on the image (and therefore raise the POI), and vice versa for the - button. To modify the adjustment more rapidly, press and hold the + or - button to move the reticle quickly in the vertical or horizontal direction.

The following table is provided for convenience of calculating the zero adjust for the various R-Series camera models.

Model	Lens	MOA
RS24 1x	13mm	0.50
RS32 1.25-5x	19mm	0.75
RS32 2.25-9x	35mm	0.50
RS32 4-16x	60mm	0.25
RS64 1.1-9x	35mm	0.50
RS64 2-16x	60mm	0.25

3–5 Battery

The R-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 estimate of the remaining battery charge.



3–6 Auto Shutdown Operation

Auto Shutdown is a feature of the R-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 a time equal to the **Power Saver** setting
- The Auto Shutdown feature is not disabled in the camera menu

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.

3–7 R-Series Power Management

The R-Series camera is equipped with a power management system that provides up to 4 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 four seconds to become operational. During the Bootup process, the FLIR splash screen is shown and then the software version is displayed briefly. Press and hold the Power (CAL) button to turn the camera Off.
- Various factors can affect how long the camera will operate continuously, including the display brightness, ambient temperature, and the frequency of Flat Field Correction (FFC) operations (refer to “Calibration” below for more information about this operation).
- By default the camera shuts down after approximately five minutes if no buttons are pushed (the shutdown time can be set via the Power Saver menu). **Auto shutdown 30s**, is shown in the display, and after counting down for 30 seconds the camera will shutdown.

3–8 Calibration

By design, the camera image will freeze momentarily on a periodic basis during the Flat Field Correction (FFC) cycle. This operation is also known as a Non-Uniformity Correction (NUC). A shutter activates inside the camera and provides a target of uniform temperature, allowing the camera to correct for ambient temperature changes and provide the best possible image.

Just prior to the FFC, a small green square will appear in the upper left corner of the screen. The square will appear for two seconds and then the FFC will occur, temporarily freezing the video image. It is advisable to not pull the trigger until the FFC has finished.

Pressing the Power (CAL) button briefly (short press) causes the thermal camera to do an FFC operation. When the camera is first powered on, it is likely the FFC operation will occur several times in the first 3-5 minutes while the camera electronics warm up.

It is possible to disable the automatic FFC by setting the Cal Mode to “Manual Cal” via the Advanced Setup menu. A blue M will appear in the upper left corner of the display when in Manual FFC mode.

Note

In order to avoid an automatic FFC operation while the sight is in use, be sure the camera is powered on for several minutes and is temperature stable. In a stable temperature environment, a press of the CAL button should provide 2-4 minutes before another FFC operation.

3–9 Maintenance

The R-Series camera requires no maintenance, other than charging the batteries.

Rinse the camera housing with low pressure fresh water to remove any deposits and to keep it clean.

Caution!

Do not use ammonia-based cleaning products to clean the lens. Doing so may damage the anti-reflective coating of the lens.

TheR-Series thermal camera lens is designed for the harsh outdoor environment and has a coating for durability and anti-reflection, but it may require cleaning occasionally. Avoid scratching the lens and/or leaving fingerprints on the optics. The camera optics can be damaged by improper cleaning. Clean the lens according to the instructions below when image quality degradation is noticed or excessive dirt or other contaminant is on the lens.

Do not use abrasive materials, such as paper or scrub brushes as this will possibly damage the lens by scratching it. Only wipe the lens clean when there is visible contamination on the surface.

Preferred Method for Cleaning the Lens

Materials:

- Optical-grade tissue (e.g. Edmund Industrial Optics P/N 52105 or any similar product)
- Pure water (de-ionized or other)
- Isopropyl alcohol (IPA)

Saturate a piece of the lens tissue with the water and drape it over the lens. Let the surface tension of the water pull the tissue onto the lens surface and then drag the tissue across the lens surface. Repeat several times with different pieces of tissue.

Repeat the same step using IPA instead of water. Drag the final piece of tissue over the lens several times to prevent pooling, which could leave a residue behind.

3–10 Service

The R-Series camera is a sealed unit with sensitive electronics and no user-serviceable parts. Service or repair should be performed only by the manufacturer or a FLIR-authorized service center. 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 (including the battery) carries a 2 year standard warranty from the date of purchase; 3 years if the camera is registered through the FLIR Support web site (http://support.flir.com)[1]. 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.

3–11 Available For Download

When the R-Series is powered on, the current firmware version is displayed briefly in the upper left of the video image. If a more recent version of firmware becomes available, it can be downloaded from the Resources section of the R-Series web site:

http://www.flir.com/ThermoSightR-Series

In order to install a new version of firmware, it is necessary to use the **R-Series End User Tool** software (also known as the R-Series Graphical User Interface or GUI), which can also be downloaded from the Resources section of the web site. The EU Tool software can be installed on a PC and includes USB drivers that allow the EU Tool to communicate with the R-Series over a USB connection. The EU Tool can be used to determine the current version of firmware, as well as the serial number and other information about the camera. The EU Tool download package includes the software, USB drivers, and instructions for installing the software and performing a firmware update.

1. The uncooled thermal sensor array carries a 10 year warranty.

4 Technical Data

4–1 R-Series Model Features

The R-Series cameras are available with NTSC video output format.

Feature	
Start up time	<5 seconds
Thermal Sensitivity	<50 mK @ f/1.0
Detector Waveband	7.5 - 13.5 µm
Detector Type	VOx Microbolometer
Image Processing	FLIR Proprietary Digital Detail Enhancement
Lens	Fixed focus; fixed focal length
Display Palettes	White Hot, Black Hot, Instalert; on some models, these palettes are also available: Sepia, Iron, Red

4–2 Power

Battery Types	Internal Li-Ion
Operating Battery Life	Approximately 4 hours at 25°C

4–3 Environmental

	All Models
Camera Operational Temp.	-4°F to 122°F (-20°C to 50°C)
Storage Temp.	-40°F to 140°F(-40°C to 60°C)
Ratings	IP-67, 1 meter drop

4–4 Physical

All models	
Weight	1.71 lbs (775 g) - does not include the Tactical Rail mount provided with the camera
Size (L × W × H)	8" x 3.3" x 2.9" (203 × 81.3 × 74 mm)
Eye Relief	3 inches

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