

**FireFLIR® FF131 Operator's Manual**  
**PN 3207769**

**FLIR Systems, Inc.**

16505 SW 72nd Avenue  
Portland, Oregon 97224, USA  
Phone: (503) 684-3731  
Fax: (503) 684-5452

Copyright by FLIR Systems, Inc. All rights reserved. This publication, or any parts thereof, may not be reproduced in any form without the express written permission of FLIR Systems, Inc.

29 September, 2003

**Revision A**

## IMPORTANT NOTICE

By order of the United States Department of Commerce Bureau of Export Control, do not ship or carry this Thermal Imaging Camera outside the owner's country of residence without proper export licensing either from the government of that country, or the United States Department of Commerce. Violation of this provision may result in fine or imprisonment pursuant to U.S. Export Regulations, 15 CFR, Parts 730-774.

### Radio Interference Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

#### NOTE

If your system is equipped with the optional video transmitter, it is the purchaser's responsibility to register this equipment with the Federal Communication Commission (FCC). Use Form FCC 600 Main Form, Schedule D, Schedule E, and Schedule G. Forms are available from your regional FCC office or from their web site at [www.fcc.gov/forms](http://www.fcc.gov/forms). The forms must be submitted to ensure proper licensing with the FCC.



#### WARNING

---

***The FireFLIR<sup>®</sup> FF131 is a navigational aid for firefighters. FireFLIR<sup>®</sup> FF131 is not designed for, and should not be used to, illegally invade people's privacy. Do not use the FireFLIR<sup>®</sup> FF131 to invade people's privacy.***

---

# Table of Contents

Section 1	
Safety Warnings .....	1
Section 2	
Overview .....	7
Introduction to the FLIR Systems FireFLIR® FF131 .....	7
FLIR Systems and FireFLIR® FF131 .....	7
Features and Benefits .....	8
Protecting The FireFLIR® FF131 .....	8
FireFLIR® FF131 Applications .....	9
Size Up .....	9
Search and Rescue .....	10
Fire Attack .....	10
Overhaul .....	10
Packing List .....	11
Battery Charger Unit .....	12
Battery Packs .....	12
DC Power Cable .....	13
AC Power Adapter .....	13
FireFLIR® FF131 .....	14
FireFLIR® FF131 Specifications .....	14
FireFLIR® FF131 Environmental Specifications .....	15
Section 3	
Operation .....	17
Infrared Basics .....	17
Thermal Imaging .....	17
Thermally Opaque Objects .....	17
Effects of Smoke .....	18
Preparation For Use .....	19
Inspecting FireFLIR® FF131 and Components .....	19
Operating The FireFLIR® FF131 .....	21
Charging the Battery Pack .....	21
Installing the Battery Pack .....	24
Initialization and Power-Up .....	26
Symbology Overlay .....	26

<b>Symbology Descriptions .....</b>	<b>27</b>
Battery Charge Level Indicator .....	28
Temperature Indicator .....	29
Temperature Warning Indicator .....	29
<b>FireFLIR® FF131 Control Buttons .....</b>	<b>30</b>
Color Palette .....	31
Calibration .....	33
Radiometry (System Option).....	33
Video Transmitter (System Option) .....	33
Using The FireFLIR® FF131 .....	34
Video Direct Output .....	35
<b>Section 4</b>	
<b>Battery Charging .....</b>	<b>37</b>
Operating The Charger .....	37
Functional Overview .....	37
Features and Specifications .....	38
Charger Installation Guidelines .....	39
Charging Battery Packs .....	40
Charger Precautions .....	40
<b>Section 5</b>	
<b>Scheduled Maintenance .....</b>	<b>41</b>
Maintaining The FireFLIR® FF131 .....	41
General .....	41
Cleaning Methods .....	41
Inspections .....	42
12 VDC Adapter .....	43
<b>Section 6</b>	
<b>After Sale Support And Service .....</b>	<b>45</b>
Getting Service For The FireFLIR® FF131 .....	45
Warranty .....	45
Warranty Repairs .....	46
Extended Warranties .....	46
Product Repair And Service .....	46
Replacement Spare Parts .....	46
Repair Procedures .....	47
Authorized Service Locations .....	47

## Section 1

---

### Safety Warnings



Fire fighting and other emergency operations are inherently hazardous and can result in serious injury or death.

The FireFLIR® FF131 is neither a life support nor a personal protection device and cannot be used as such.

Do not use the FireFLIR® FF131 unless and until you understand this Operator's Manual fully and have been authorized by your Department as FireFLIR® FF131 trained.

Throughout this manual you will see the following symbols:



**WARNING**

---



**WARNING**

---

***The Warning Heading consists of the WARNING heading and WARNING symbol in the margin of the warning text. THE WARNING HEADING PRECEDES CONDITIONS THAT COULD RESULT IN SERIOUS INJURY OR DEATH.***

---

The FireFLIR® FF131 is a powerful and compact infrared vision system. Used properly, the FireFLIR® FF131's features can enhance firefighter's ability to see through smoke and darkness. Fire fighting, however, is inherently hazardous. The FireFLIR® FF131 is an accessory for firefighters that must be used and maintained as directed in this Operator's Manual. From time to time, FLIR will revise and update this manual. Do not use the FireFLIR® FF131 before studying and understanding this Manual (including any FLIR revisions and updates) fully.



**WARNING**

---

***FireFLIR® FF131 is designed to enhance, not replace standard fire fighting operating procedures. If the image display in the FireFLIR® FF131 fails while you are in a smoke-filled and hazardous environment, you will no longer see the infrared images. In that event, visibility will be as if you did not have the FireFLIR® FF131. Do not substitute FireFLIR® FF131 use for standard fire fighting operation procedures. FAILURE TO FOLLOW STANDARD FIREFIGHTING OPERATING PROCEDURES COULD RESULT IN SERIOUS INJURY OR DEATH IF the FireFLIR® FF131 STOPS OPERATING, OR OPERATES INCORRECTLY.***

---

The following WARNINGS relate to potential situations that could be dangerous if the user deviates from standard fire fighting operation procedures.

**WARNING**

*This Manual contains important information regarding system messages and warnings about operation that the FireFLIR® FF131 signals to its user. It is important to study the system messages, warnings, and FLIR's recommended responsive actions. Failure to learn and properly respond to FireFLIR® FF131 system messages and warnings could result in serious injury or death.*

**WARNING**

*The Manual specifies the temperatures in which FireFLIR® FF131 is designed to function. Do not use FireFLIR® FF131 without adequate cool down times. Failure to comply could result in malfunctioning and serious injury or death.*

**WARNING**

*Modification or alteration (including painting and labeling) of FireFLIR® FF131 could cause it to malfunction. Do not modify or alter FireFLIR® FF131. Failure to comply could result in operational malfunction and serious injury or death.*

**WARNING**

*If the FireFLIR® FF131 stops operating or operates incorrectly, immediately stop attempts to use it and return it to FLIR for repair. Failure to stop using a malfunctioning FireFLIR® FF131 could lead to serious injury or death.*

**WARNING**

*The FireFLIR® FF131 is a highly technical product that must be cared for properly as directed in the Manual. Compliance with FLIR service recommendations is important to the continued proper performance of FireFLIR® FF131. FireFLIR® FF131 must be serviced by FLIR authorized personnel only. Failure to properly care for FireFLIR® FF131, or unauthorized servicing and repair, could result in system failure and serious injury or death.*

**WARNING**

*FireFLIR® FF131's life span is dependent in part upon use, environmental conditions, maintenance and care in storage. Frequent lengthy use may shorten the useful life of a FireFLIR® FF131. Failure to use, maintain and store FireFLIR® FF131 as directed in this Manual could cause operational failure or impairment and result in serious injury and death.*

**WARNING**

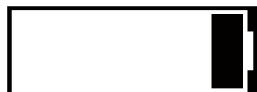
***Do not try to use FireFLIR® FF131 on a fire scene before completely initializing and properly responding to all system symbols, messages and warnings. Failure to comply could lead to serious injury or death.***

**WARNING**

***FireFLIR® FF131 is powered by batteries with a limited life. Failure to properly charge, install and store batteries as directed in this Manual could result in system malfunction or failure and serious injury or death.***

**WARNING**

***Do not attempt to remove or replace the batteries when you are in a hazardous area. Such exposure could impair operation of the FireFLIR® FF131 unit and result in serious injury or death.***

**WARNING**

***Be aware of battery charge indicator signals. THE SIGNAL INDICATES WHEN THE BATTERY IS LOW ON CHARGE AND HAS A LIMITED PERIOD REMAINING FOR THE SYSTEM TO PROVIDE IMAGERY. Batteries support limited duration operation of FireFLIR® FF131. The actual time that FireFLIR® FF131 operates on a charged battery pack varies in different circumstances. When using FireFLIR® FF131, pay attention to battery charge indicator symbols and adhere to standard operating procedures. Failure to comply may result in serious injury or death.***

**WARNING**

***Only use batteries or battery chargers FLIR provided with the FireFLIR® FF131 And install them only as directed. Failure to comply may result in system impairment or failure and may result in serious injury or death.***

**WARNING**

***FireFLIR® FF131 has internal temperature indicators. Do not use an FireFLIR® FF131 unit that displays an internal temperature warning symbol. Failure to comply may result in system impairment or failure and serious injury or death.***

**WARNING**

***FireFLIR® FF131 does not correct impaired vision. People with impaired vision need to use FireFLIR® FF131 in conjunction with their usual corrective lenses. Failure to comply may result in serious injury or death.***

**WARNING**

***FireFLIR® FF131's system interface configuration enables the user to change the settings for image color. Do not attempt to access switches used for these tasks while you are in a hazardous area.***

---

**WARNING**

***Failure to clean FireFLIR® FF131 to remove contaminants and deposits as directed in this Manual could impair its performance and cause malfunctioning which, in turn, could lead to serious injury or death.***

---

**WARNING**

***Do not assume that FireFLIR® FF131 makes all persons and objects in a hazardous environment visible at all times. FireFLIR® FF131's imager may not penetrate smoke if the temperature of the smoke becomes close to the temperature of the objects in the environment. In those circumstances, the user will see gases moving downward from the ceiling environment, such as in a flashover situation. Those gases can obscure objects behind them. Objects may be obscured by smoke in some circumstances. Failure to follow standard operating procedures could result in serious injury or death.***

---

**WARNING**

***Always inspect and test FireFLIR® FF131 before using it in a hazardous environment. Follow all Manual directions. Failure to comply could result in serious injury or death.***

---

**WARNING**

***Seeing through infrared cameras is different from seeing with natural vision. Infrared images are thermal interpretations of objects and those interpretations do not appear the same as the objects appear when you look at them with the naked eye. To maximize the benefits and safety of using FireFLIR® FF131, users must study the contents of this Manual and complete any FLIR authorized FireFLIR® FF131 training. Do not try to use FireFLIR® FF131 to see through opaque objects or objects with reflective surfaces. Failure to comply could result in serious injury or death.***

---



**WARNING**

*Fogging of the Thermal Imager display, and (or) optic lens, may occur. Do not use FireFLIR® FF131 without defogging either the display or optic lens. Failure to comply will impair image quality and can lead to serious injury and death.*

**WARNING**

*Failure to use and maintain FireFLIR® FF131 as directed in this Manual (including all FLIR revisions and updates) could result in serious injury or death.*

**WARNING**

*Cleaning of the FireFLIR® FF131 is part of proper maintenance.*

**WARNING**

*FireFLIR® FF131 does not work underwater.*

**WARNING**

*FireFLIR® FF131 is not intrinsically safe to use in any environment in which static electricity or sparks could trigger an explosion. Do not use FireFLIR® FF131 in explosive environments.*

**WARNING**

*FireFLIR® FF131 is neither a personal protection device, nor life support equipment. Do not rely on or use FireFLIR® FF131 as either. FireFLIR® FF131 is an ensemble accessory and should be used as a navigational aid only.*

**WARNING**

*In some circumstances, exposure to radio frequency electromagnetic fields may interfere with FireFLIR® FF131's imagery.*

**WARNING**

*Do not provide or loan FireFLIR® FF131 to untrained persons. Failure to restrict use of FireFLIR® FF131 to firefighters who completed FireFLIR® FF131 training could result in serious injury or death.*

**WARNING**

---

*The InfoTherm, and Radiometry functions require the FireFLIR® FF131 system to measure temperatures. Precise temperature measurements require prior knowledge about the object being measured and its environment, so absolute temperature measurement accuracy cannot be guaranteed. Do not rely on FireFLIR® FF131 temperature measurements to make decisions about your personal safety. Failure to comply with this warning could result in serious injury or death.*

---

## Section 2

---

# Overview

## Introduction to the FLIR Systems FireFLIR® FF131

---

### FLIR Systems and the FireFLIR® FF131



Thank you for choosing the FireFLIR® FF131, from FLIR Systems, Inc. (FLIR), the leading manufacturer of thermal imaging systems.

FLIR worked closely with active firefighters to produce FireFLIR® FF131 the optimal thermal imaging system for fire fighting applications. FireFLIR® FF131 is built by the industry leader in infrared imaging specifically for the demanding fire fighting environment.

Applying 25 years of imaging experience, FLIR designed FireFLIR® FF131 using cutting edge technologies to provide reliable, high-definition imaging. FLIR then turned to the experts in fire fighting, firefighters themselves, to understand and address their ergonomic and functional needs in a thermal imaging solution.

The result of this combined effort is a fire fighting tool that helps firefighters to see in total darkness and smoke. This helps firefighters save lives and property.

FireFLIR® FF131 is a completely Self Contained Viewing Apparatus (S.C.V.A.®) with no external cables or components to catch or to impair movement. Internal sensors automatically adjust the system during use for optimal operation. The operator simply installs the battery, turns the system on, and the system is ready to use with no need for further adjustment.

The FireFLIR® FF131 thermal imager from FLIR is a revolutionary new piece of equipment in the fire fighting arsenal, and sets a new standard in the fire market.

FireFLIR® FF131 is neither a personal protection nor a life support device.

## Features and Benefits

### FireFLIR® FF131 Features and Benefits

Feature	Benefit
State-of-the-art, uncooled microbolometer detector	Unsurpassed thermal imaging quality
Very high temperature sensitivity (NETD)	< 0.05° C
True staring Focal Plane Array (FPA)	No blurring, halo-effects, smearing, or other motion artifacts
Better resolution	Quality imagery
Fast image update	60 frames/second
Fully self-contained	No cables to catch or restrict movement
Ergonomic Design	Lightweight and well-balanced
Large display	Forgiving of eye location; Eliminates squinting

## Protecting the FireFLIR® FF131



### **WARNING**

***Looking directly at the sun or objects with temperatures at or above 1500° C (2732° F) can cause damage to the detector which in turn can lead to system failure and result in serious injury or death.***

The detector in the FireFLIR® FF131 product is a device designed to detect and amplify sources in the infrared spectrum. The detector can be damaged by exposure to extremely high temperature sources.

While a normal structure fire may reach temperatures up to 1200° C (2192° F), some types of fires may exceed the design of the detector (1500° C/2732° F), causing permanent damage to the detector.

Avoid looking directly at the following items while using the FireFLIR® FF131:

- Burning or molten metals
- Molten glass
- High voltage electrical arcs
- The sun

Damage to the detector will be noticed by an environment created on the viewed scene that is always white.

## FireFLIR® FF131 Applications

The FireFLIR® FF131's design is based on active firefighters' feedback, so that it is engineered for the applications in which firefighters will use FireFLIR® FF131. The following four applications are examples of the revolutionary way in which the FireFLIR® FF131 can augment current standard operating procedure.



### WARNING

---

***FireFLIR® FF131 is designed to enhance, not replace standard fire fighting operating procedures. If the image display in the FireFLIR® FF131 fails while you are in a smoke-filled and hazardous environment, you will no longer see the infrared images. In that event, visibility will be as if you did not have the FireFLIR® FF131. Do not substitute the FireFLIR® FF131 use for standard fire fighting operation procedures. Failure to follow standard fire fighting procedures could result in serious injury or death if the FireFLIR® FF131 stops operating or operates incorrectly.***

---

## Size Up

First arriving units can use the FireFLIR® FF131 to size up the structure and locate the fire floor, the side of the structure involved, and the extent of the fire. With the help of the FireFLIR® FF131, officers can quickly and accurately survey the structure as they arrive at the scene. FireFLIR® FF131 can effectively scan exposures to determine the actual thermal load and probable risk to adjoining structures. The color palette can be used during size up to ensure quick recognition of particularly warm objects or areas. After initial size up, incident commanders can quickly hand the FireFLIR® FF131 to search and rescue, or attack crews.

---

## Search and Rescue

The FireFLIR® FF131 greatly augments fire scene search operations. Since it is essential that the primary search be carried out as quickly as possible, FireFLIR® FF131 provides search and rescue crews with situational awareness in totally dark, smoke filled environments. When crawling through the fire scene, search crews will find FireFLIR® FF131 helpful in identifying and avoiding dangerous conditions like holes in the floor, hanging wires, and open doorways. FireFLIR® FF131's ability to recognize thermal signatures on doors, walls, floors, chairs, beds, and other furniture provide search crews with vital information. The FireFLIR® FF131's broad dynamic range helps search crews see objects of vastly differing temperatures simultaneously. After the primary search is complete, the FireFLIR® FF131 is quickly and easily handed off to secondary search, or attack crews. Rescue crews may choose to use the FireFLIR® FF131 in the monochrome mode for easier object recognition.

---

## Fire Attack

FireFLIR® FF131 will help attack crews identify potential flashover or back draft conditions, determining where ventilation and hose lines are needed. Using FireFLIR® FF131, attack crews can constantly scan entire rooms, looking for victims, fire fighters in trouble, fire extension, and ceiling-level heat wave build-up. Attack crews may choose to use FireFLIR® FF131 in the monochrome mode for easier object recognition.

---

## Overhaul

FireFLIR® FF131 is an excellent aid in scanning spaces around the seat of a fire to identify possible fire extension. Suspicious areas can then be opened, quickly inspected, and extinguished if necessary. Before and after knockdown, the FireFLIR® FF131 is also useful for checking for fire extension. When FireFLIR® FF131 is used to view all the burned material and look for hot spots, the possibility of quick, complete extinguishment and early release of companies is increased. Fire fighters may opt for a color palette in the overhaul mode to aid in quick "hot spot" identification.

## Packing List

Your FireFLIR® FF131 is enclosed in a shipping box. The contents of the box are listed below. Check the contents of your shipping box with this list to verify proper shipment and to familiarize yourself with the nomenclature of each component.

The hard shell carrying case has a black screw used for pressure relief. Enclosed in the black hard case should be the following items:.



Black Hard Case Parts List

Item	Part Number	QTY
Hard Shell Carrying Case (Black)	3203838	1
FireFLIR® FF131 Imager Unit	FF131-X-	1
Battery Charger Unit	3203545	1
FLIR Systems Inc. NiMH Battery Packs	3203312	2
12 VDC Battery Charger power cable	7500061	1
FireFLIR® FF131 Operator's Manual (CD)	3207770	1
Shoulder Strap Kit	3205380	1
Window Guard	3204533	1
Front Rubber Foot Protector	3203581	1
Rear Rubber Foot Protector	3203582	1

---

## Battery Charger Unit

The Battery charger unit is a single bay, 12 VDC input battery charger that will charge one FLIR Systems battery pack from 25% charge to full charge in approximately 4 hours. The battery charging unit can be mounted at the station house, or within the responding vehicles (if vehicle mounted, be sure to secure the battery).



---

## Battery Packs

Two NiMH (Nickel Metal Hydride) battery packs are included with the FireFLIR® FF131 unit.





---

## DC Power Cable

The 12 VDC battery charger power cable enables the use of the battery charger from any 12 VDC auxiliary power source.

This enables the mounting of battery chargers in command and response vehicles.



DC Power Cable

---

## AC Power Adapter

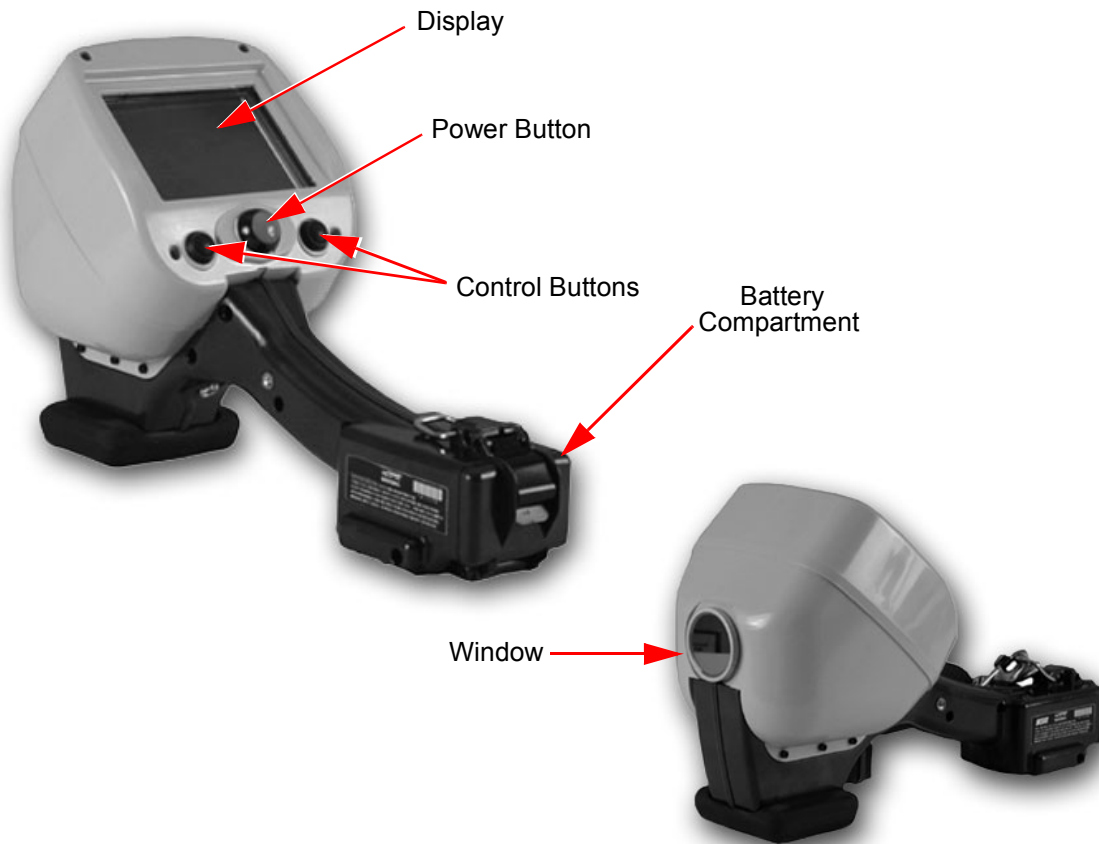
The 115/220 VAC to 12 VDC battery charger cable is the normal power supply used with the battery charger.

This unit converts 115/220 VAC to 12 VDC used by the battery charger.



## FireFLIR® FF131

The FireFLIR® FF131 infrared imaging device designed to assist firefighters during the course of their duties, assisting the firefighter in navigating smoke-filled and burning buildings while accomplishing search and rescue.



### FireFLIR® FF131 Specifications

Category	Specification
Weight	< 4.94 lbs. (without battery)
Spectral Range	8 to 14 microns
Viewable scene temperature imaging range	-40° C to 600° C
Time to change battery	< 15 seconds
Display Indicators	Battery level Temperature Measurement (optional) Button Indicators

## FireFLIR® FF131 Specifications (Cont.)

Category	Specification
Battery Life (ambient temperature)	3 hours (nominal)
Battery Cycling	Expected life of 365 charge/discharge cycles
Lens	f/0.8 germanium, fixed focus
Display	5.0" (diag) Color LCD
IR imaging resolution	160 x 120 pixels
Time to Operation	< 30 seconds at -10° C (14° F) to 70° C (158° F)
Video output connector	Fisher Connector, with NTSC (or PAL) composite video

## FireFLIR® FF131 Environmental Specifications

Category	Specification
Humidity (Battery Pack, IR Viewer and RF Transmitter)	Protected against the ingress of water to a depth of 1 meter (30 minute exposure).
Vibration (Shipping)	0.015 g <sup>2</sup> /Hz Max 10-50Hz, declining to 0.0002 g <sup>2</sup> /Hz at 500Hz for 1 hour/axis
Nominal operating time at elevated ambient temperatures (after 1 hr. 40° C/104° F pre-soak)	20 minutes at 80° C (176° F) 5 minutes at 150° C (302° F) 2 minutes at 315° C (599° F)
Storage (non-operating) Temperature	
IR Viewer and RF Transmitter	-30°C (-22° F) to 70° C (158° F)
Battery Pack	-20°C (-4° F) to 30° C (86° F)
Battery Charger	-20°C (-4° F) to 70° C (158° F)
Altitude	0 to 10,000 ft. (operating) 0 to 40,000 ft. (storage)

# **FireFLIR™**



## Section 3

---

# Operation

## Infrared Basics

The FireFLIR® FF131 system is an infrared imaging device that enables the user to see thermal interpretations of objects emitting, reflecting, or conducting infrared energy (heat).

---

## Thermal Imaging

The human eye is responsive only to the visible light spectrum. That is, without light or when light is attenuated through smoke or fog, we cannot see clearly, or we may not see at all.

Infrared thermal imagers are used to detect and present a thermal image of the viewed scene. Unlike night vision goggles, thermal imagers do not rely on light sources or light amplification.

In general, all objects have a thermal representation. This representation is dependent upon the objects properties (its ability to emit, conduct, reflect, or generate a heat source).

When an object's thermal properties vary from the surrounding environment, a visual interpretation or presentation of the thermal environment is produced by the thermal imager.



### WARNING

---

***Seeing through infrared cameras is different from seeing with natural vision. Infrared images are thermal interpretations of objects and those interpretations do not appear the same as the objects appear when you look at them with the naked eye. To maximize the benefits and safety of using FireFLIR® FF131, users must study the contents of this Manual and complete any FLIR authorized FireFLIR® FF131 training. Do not try to use FireFLIR® FF131 to see through opaque objects or objects with reflective surfaces. Failure to comply could result in serious injury or death.***

---

## Thermally Opaque Objects

Some visibly transparent materials (glass, water or Plexiglas for example) are not transparent to infrared. For example, an object that is normally visible through a window may not be visible to the thermal imager because the window is opaque. Instead, the window will appear to act much like a mirror, reflecting sources of heat within the room.

These infrared opaque objects, as well as walls, doors, and other normally obstructed views, will only exhibit their own thermal properties unless the object is affected by the conduction of heat from the opposite side. This can be illustrated by viewing a window with the thermal imager. The window will normally only show a reflection of the thermal sources on the viewed side. However, if a person on the other side of the window places their hand on the glass, the image of the hand will be visible on the window since the window's temperature is changed by contact with the hand.

---

## Effects of Smoke

The smoke and hot gases generated by a fire have their own thermal and attenuating properties.

While heat sources can be seen through smoke, as the smoke itself becomes hot, it may attenuate the sources of heat behind the smoke. This is caused by the relative temperature difference between the smoke and the objects beyond the smoke. As the relative temperature differences narrow, the object can become obscured by the smoke.

When smoke from a fire becomes increasingly dense, the infrared energy emitted from an object is increasingly attenuated by the smoke particles.

These factors will vary depending upon the thermal source, the distance of the thermal source, and the properties of the smoke.



---

### **WARNING**

***FireFLIR® FF131's imager may not penetrate smoke if the temperature of the smoke becomes close to the temperature of the objects in the environment. In those circumstances, the user will see gases moving downward from the ceiling environment, such as in a flashover situation. Those gases can obscure objects behind them. Objects may be obscured by smoke in some circumstances. Failure to follow standard operating procedures could result in serious injury or death.***

---

## Preparation for Use

The FireFLIR® FF131 and accessories should be inspected prior to operation.

---

### Inspecting the FireFLIR® FF131 and Components

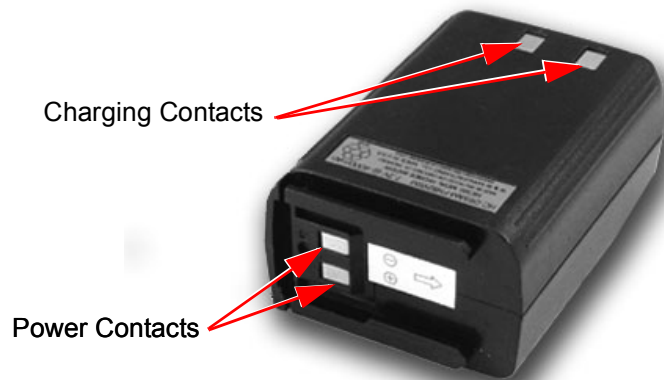
1. Verify that the FireFLIR® FF131 case is in serviceable condition.
2. After opening the case, verify that the following items are present:
  - FireFLIR® FF131 (1)
  - Shoulder Strap (1)
  - Ni-MH Battery Packs (2)
  - Operator's Manual (1)
  - Battery Charger (1)
  - Rear Foot Gaurd (Rubber) (1)
  - Front Foot Gaurd (Rubber) (1)
  - Window Gaurd (Rubber) (1)



3. Remove the FireFLIR® FF131 from the case and inspect the following:
  - No cracks or obvious deformations in case
  - No loose or missing hardware
  - Strap is in place and in serviceable condition
  - Battery Slot contacts are clean
  - Power and Control Buttons are intact and free from debris
  - Display optics are clean and free of scratches, cracks, dust and contaminants
  - Optic Window is clean and free of scratches, cracks, dust and contaminants.



4. Remove and inspect the battery packs for the following:
- No cracks or obvious deformations in battery pack case
  - Battery packs are fully charged
  - Battery contacts are clean





## Operating FireFLIR® FF131

### Charging the Battery Pack

Power for the FireFLIR® FF131 is provided by a single Nickel Metal Hydride (Ni-MH) Battery. Always use a fully charged battery when placing the camera in service to obtain the longest possible duration from the camera.

#### NOTE

*Consult Federal, State, Or Local Regulations Regarding Disposal Of Rechargeable NI-MH Batteries.*



#### WARNING

***The Battery Can Explode, Leak, Or Catch On Fire If Directly Exposed To High Temperature, Water, Or Fire, Or If Opened, Dissembled, Or Tampered With. Refer To The Battery Manufacture's Instructions Included With The Battery. Failure To Handle The Battery Properly May Result In Serious Injury.***

1. Locate the battery charger in a cool dry place close to a suitable power source. Sufficient air circulation must be available around the battery charger. Protect the battery charger when not in use.

#### CAUTION

*Never Attempt To Charge Batteries In A Moving Vehicle Unless The Charger Used Is Specifically Designed For The Purpose. Charging Batteries In A Moving Vehicle May Result In An Incomplete Charge And Reduced Available Power To Operate The Camera. Charge Batteries Only In A Stationary Environment Free From Vibrations That Might Interfere With The Charging Process.*

2. Plug the battery charger power supply into a suitable power source. Use either of the following methods of power to the charger base:
  - (a.) Plug the 115/220 VAC charger adapter into a suitable power source with the AC power cord provided and plug the adapter supply cord into the charger base.
  - (b.) Plug the 12 VDC charger adapter into an active automobile cigarette lighter socket or similar 12 VDC outlet (see **CAUTION** below) and plug the adapter supply cord into the charger base.

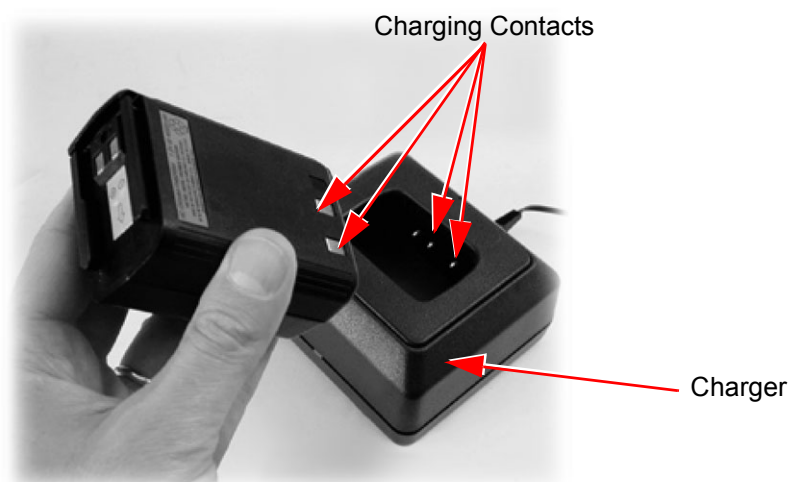
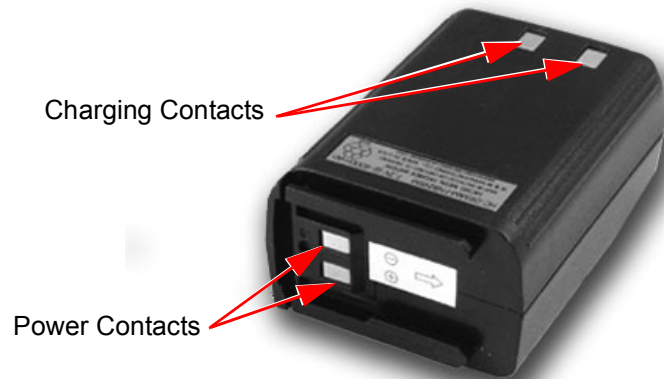
**CAUTION**

*Some Power Sources On Vehicles Are Not Active All The Time. Be Sure That The Power Source Chosen Will Provide The Necessary Power For The Time Required To Charge A Battery. The 12 VDC Adapter Will Not Provide Power If The Power Source To The 12 VDC Adapter Is Not Active. Consult The Builder Of Your Vehicle If You Have Any Questions About Its Available Power Sources Before Using The 12 VDC Adapter.*

**NOTE**

*The 12 VDC Charger/Adapter Is Equipped With An In-Line Fuse. See The Maintenance Section Of This Manual For Fuse Replacement Instructions And Special Information On The Use Of This Adapter Outside North America.*

3. The battery has two sets of contact pins: Charging Contacts and Power Contacts. Identify the location of the Charging Contacts on the side of the battery. Verify that they are clean and not damaged.



4. Slide the battery into the charger bay. The battery case is shaped to prevent incorrect installation. Do not force battery into charger. Slide the battery in until it seats in bottom of charger bay.
5. The LED light on the front of the charger will light RED when the battery is charging. At full charge, the LED will change to GREEN.
6. If the LED does not go on as stated, check the following:
  - (a.) Make sure the charger is properly connected to a power source.
  - (b.) Make sure the battery is properly installed in the charger.
  - (c.) Make sure the contacts are clean and undamaged.
  - (d.) Make sure ambient temperature has not exceeded 104° F (40° C) around the charger.
7. Batteries must be charged a minimum of 4 hours prior to initial use [based on new battery charged at 77° F (25° C)].
8. **When fully charged, remove battery from charger. When a battery is removed from the charger, allow 15 seconds before re-inserting the same, or a new battery.**
9. After each use of camera, batteries should be recharged for a minimum of 4 hours.
10. Batteries should be recharged on a regular basis of 4 hours once a week to maintain a full charge ready for use.

NOTE

*There Are No User Serviceable Parts In The Battery Charger. If The Battery Charger Does Not Perform As Described, Consult Your FLIR Systems Health And Safety Service Representative.*

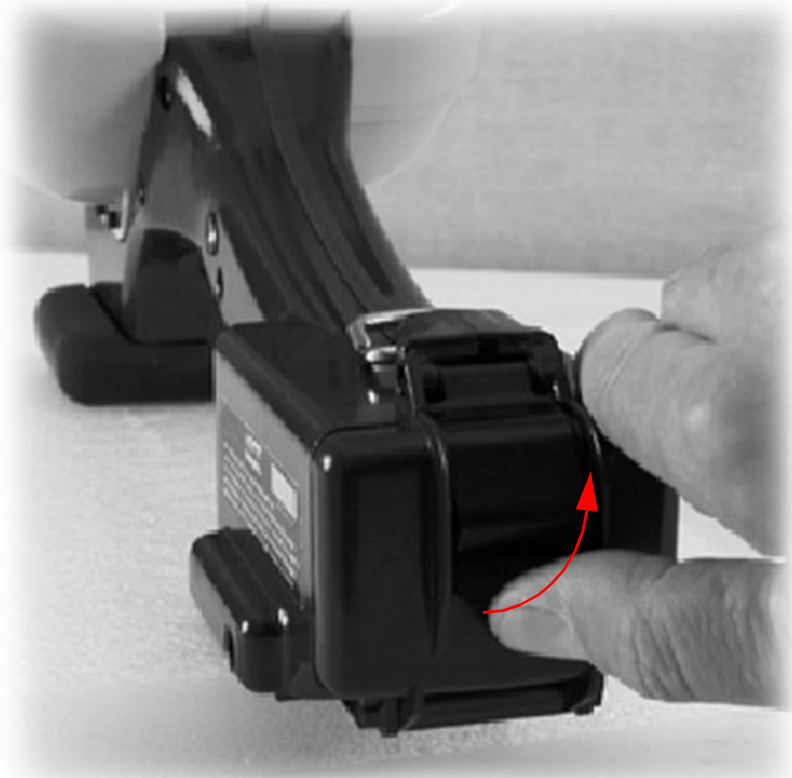
---

## Installing the Battery Pack

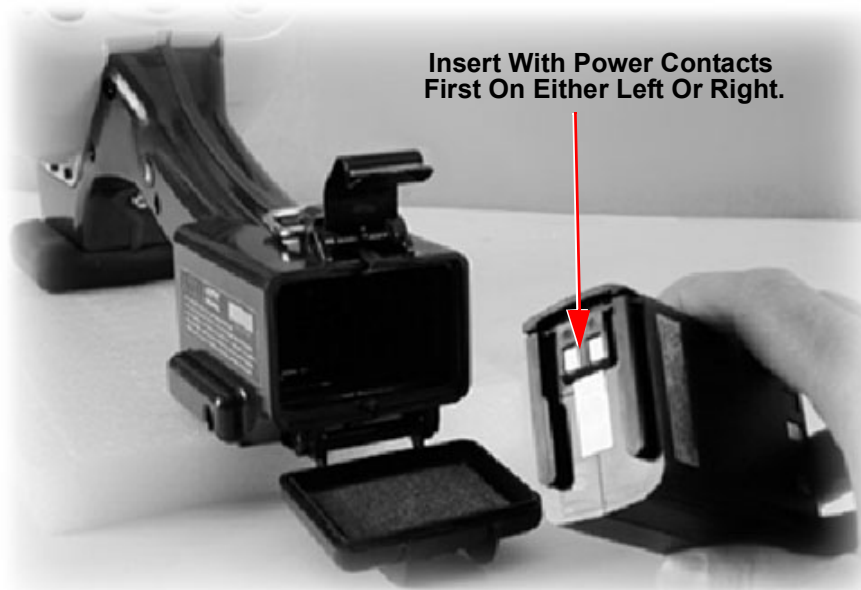
The battery has two sets of contact pins, Charging Contacts and Power Contacts. Identify the location of the Charging Contacts on the side of the battery. Verify that they are clean and not damaged.



Open the battery compartment door by lifting the battery compartment latch.



Insert a fully charged battery into the battery compartment with the Power Contacts first. The Power Contacts may be on either the left or right side when inserted. As long as the battery is inserted with the Power Contacts **first**, the battery will make proper connection to the contact pins in the FireFLIR® FF131.



Close the battery compartment door and secure the latch. Do not force battery compartment door. If door will not close, verify that battery has been installed properly.



---

## Initialization and Power-Up

1. When power is applied to the FireFLIR® FF131 (press and hold the red power button until the screen responds, and then release), the system will automatically perform a self diagnostic test. Once the system passes the initial power on test (this will take approximately 15 seconds or less), the power-up screen will clear and the thermal image will appear.
2. To power down, press and release the Power Button.

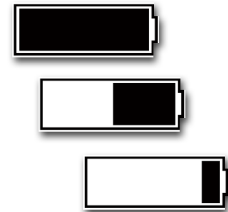
---

## Symbology Overlay

A symbology overlay containing various system status indicators is viewed over the scene image.

1. Battery Level/Low Battery:

- (a.) The Battery Level icon will appear in the upper right corner of the display screen. When the battery is fully charged, the battery shaped icon will appear completely white. As the battery is used, the icon will change incrementally to “transparent”.



- (b.) The Flashing Low Battery icon will appear near the center of the display screen when the battery requires recharging. The icon is a triangle with an empty battery shape inside.



2. Core Temperature: the Core Temperature warning icon will appear if the temperature of the internal electronic rises above 160° F (71° C). A yellow triangle with an exclamation point will appear near the center of the display screen. If the internal temperature reaches a critical level, this icon indicates that prolonged exposure to extremely high ambient temperatures may cause the unit to shut down and may cause damage to the unit.



### WARNING

***If The Flashing Temperature Warning Appears In The Display Screen, Remove The Camera From The High Temperature Environment Immediately. Prolonged Exposure To Extremely High Ambient Temperatures Sufficient To Raise The Temperature Of The Internal Electronics Above 160° F (71° C) May Cause The Unit To Shut Down And May Cause Damage To The Unit. Shutdown Of The Camera In A Critical Situation May Result In Serious Injury Or Death.***

---

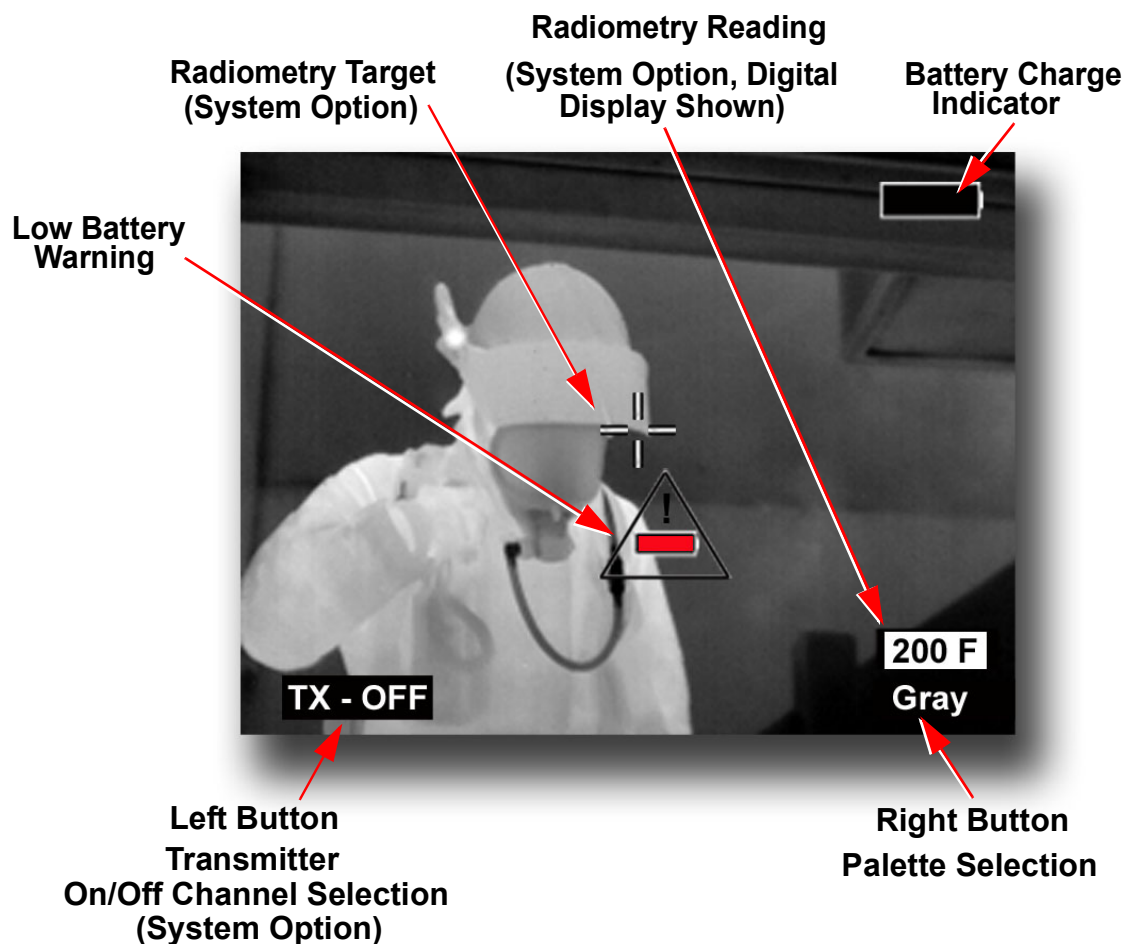


## WARNING

**Failure To Study And Properly Respond To Status Indicator Symbols Could Result In Serious Injury Or Death.**

## Symbology Descriptions

The symbology overlay consists of Battery Indicator, Low Battery Indicator, Internal Over Temperature Warning, and Control Button functionally, and temperature (on systems with the optional radiometry feature).



## Battery Charge Level Indicator

This is the normal icon that will show the battery's charge level.



Full is shown as 100% white, the battery will become transparent as the charge is used.

The indicator consists of a graduated battery symbol representing the battery pack charge level, from 0% to 100%.

As the battery charge is used, the icon will change incrementally to "transparent".



The Flashing Low Battery icon indicates that the charge level of the battery pack is dangerously low and power failure is imminent.






**WARNING**

***Be aware of battery charge indicator signals. When the Low Battery icon, is displayed the battery is low on charge and has limited period remaining for the system to provide imagery.***


**WARNING**

***Batteries support limited duration operation of FireFLIR. The actual time that the FireFLIR® FF131 operates on a charged battery pack varies in different circumstances. When using FireFLIR® FF131, pay attention to battery charge indicator icons and do not deviate from standard operating procedures. Failure to comply may result in serious injury or death.***

## Temperature Indicators

The FireFLIR's® FF131 internal temperature indicators are not normally viewed in the symbology, as they represent temperature warnings and errors.

### Temperature Warning Indicator:

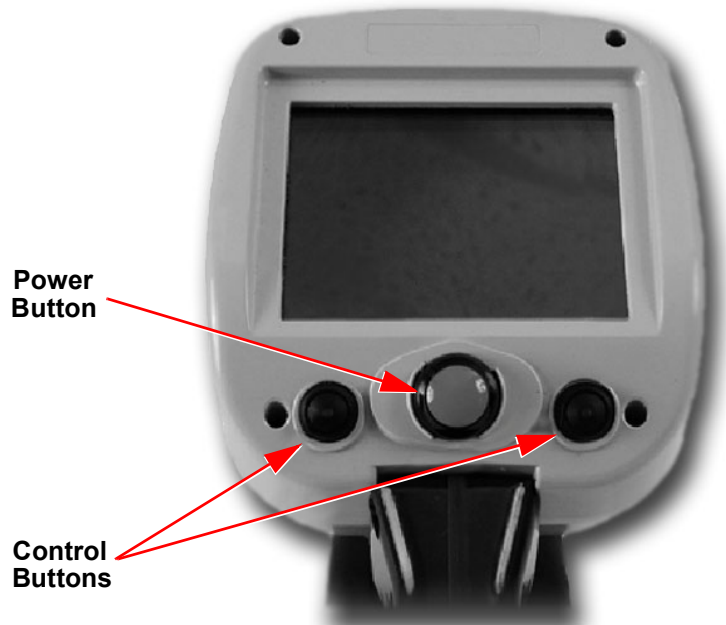
The flashing temperature warning indicator is displayed when the internal temperature is reaching an unsafe level.

It is recommended that the operator remove the FireFLIR's® FF131 system from service until adequately cooled.



## FireFLIR® FF131 Control Buttons

The FireFLIR® FF131 is provided with two user Control Buttons on the left and right of the Power Button. The assignment for each Control Button appears on the display screen just above the Control Buttons.



### Left Button:

The left button is used to control the optional transmitter. Pressing the button will change the transmitter channel (1, 2, 3, 4) and then turn the transmitter Off following channel 4 (pressing it again will turn the transmitter on at channel 1, the cycle will then repeat).

### Right Button:

The right button is used to select the display palette. Each depression will cycle to the next palette:

**Gray, Info** (Infotherm, system option), **Autumn** and then **Color**.

### Both Buttons (Simultaneously):

If the optional RADIOMETRY feature is installed, pressing both buttons simultaneously will activate (turn **On**) the feature, change the display units (**F** Fahrenheit or **C** Centigrade) and then turn the transmitter **Off**.

**WARNING**

**Do not attempt to access switches while you are in a hazardous area.**

## Color Palette

The FireFLIR® FF131 is equipped with a Color Palette control to optimize the display image for different situations. The three standard settings are as follows:

- (a.) Gray monochrome displays the infrared information as a monochrome image with black to dark gray representing cool to light gray and white representing hot;
- (b.) Autumn monochrome displays the infrared information as dark red/ cool to bright yellow/hot;
- (c.) Full Color displays the infrared information as a color image with blue/ cool to bright yellow/hot.

**NOTE**

*When The FireFLIR® FF131 Thermal Camera Is Powered Up, The Unit Will Always Return To The Setting That Was Being Used When It Was Powered Down (Expect For The Transmitter, if installed, Which Will Always Be OFF At Power-Up).*

Pressing the Right Control Button will toggle the display from Gray monochrome to Autumn monochrome to Full Color and back to Gray.

If the InfoTherm option is installed, it will appear between the Gray monochrome and the Autumn monochrome displays.

**WARNING**

***Do Not Point The FireFLIR® FF131 Thermal Camera Directly At The Sun. Do Not Point The Camera At Heat Sources In Excess Of 2700° F (1500° C) For Extended Periods Of Time. Doing So May Result In An After Image On The Display That Could Cause A Temporary Reduction In The Performance Of The Camera. If This Occurs, DO NOT USE The Camera Until The Performance Has Returned To Normal.***



Gray Monochrome (White Hot)



Full Color



InfoTherm



Autumn

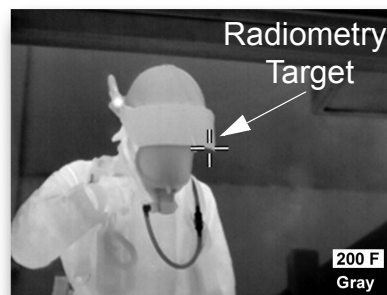
**Calibration**

The FireFLIR® FF131 automatically adjusts the image quality periodically while the camera is being used.

## Radiometry (System Option)

The RADIOMETRY Option provides a small target area in the center of the display screen and either a digital readout, or temperature scale showing the temperature of the object under the target area. The digital readout appears in the lower right corner of the display, and the Coarse Temperature Indication (CTI) display appears along the left side of the display. Pressing the left control button will cycle through the radiometry functions:

(On, F° , C° and Off).



**Digital Readout**



**CTI Readout**

### NOTE

*When The FireFLIR® FF131 Thermal Camera Is Powered Up, The Screen Will Display Whatever Color Mode The Unit Was In When It Was Powered Down.*

## Video Transmitter (System Option)

The FireFLIR® FF131 may be equipped with an optional four (4) channel transmitter to transmit the images as seen in the display to a receiver attached to a video monitor (monitor not included). When the Transmitter option is installed, the Control Button has five steps as follows:

1. Transmitter ON, Channel 1 (2456 MHz)
2. ON Channel 2 (2463 MHz)
3. ON Channel 3 (2470 MHz)
4. ON Channel 4 (2477 MHz)
5. Transmitter OFF.

---

## Using The FireFLIR® FF131 Thermal Camera

Hold the FireFLIR® FF131 Thermal Camera to view the display screen while pointing the lens forward. Camera will be close to level.

### NOTE

*The Images In The Display Screen Will Appear Sharper When Viewing A Scene Where The Objects Have A Greater Temperature Differential.*



### WARNING

---

**Never Become Wholly Dependent On The FireFLIR® FF131 Thermal Camera For Personal Navigation. Always Maintain Awareness Of Your Location And Escape Routes When Using This Device. Failure To Do So May Result In Injury Or Death.**

---

When crawling with the FireFLIR® FF131 Thermal Camera, the housing will support the weight of a three-hundred pound person.



---

## Video Direct Output

The images produced by the FireFLIR® FF131 thermal camera can be output directly to a video monitor for remote viewing, however, it requires an optional connector that mates the camera Fisher connector to a RCA connector. Using a color video monitor will show the same image as seen on the display screen. Connect the video output as follows:

1. Remove the protective cap from the VIDEO OUT/POWER IN connector.



2. Attach a compatible video cable (75 Ohm) to the VIDEO OUT/POWER IN connection on the FireFLIR® FF131 thermal camera.
3. Attach the other end of the cable to the VIDEO IN of a video monitor. Refer to the owners manual for the monitor used for details on monitor set up.



**WARNING**

---

***Do Not Use A Video Cable With The FireFLIR® FF131 If The Cable Will Create A Hazard In The Work Area. Always Secure The Video Cable To Prevent Possible Injury From Tripping Or Entanglement. Failure To Properly Secure The Video Cable May Result In A Hazard Which May Result In Serious Injury Or Death.***

---

**CAUTION**

*Be Sure The Protective Cap Is Securely In Place Over The Video Out/ Power In Connection When Not In Use. Failure To Do So May Result In Damage To This Connection Or To Internal Components.*



## Section 4

---

# Battery Charging

## Operating the Charger

---

### Functional Overview

The battery charger accepts a 12 VDC input to charge from one FireFLIR® FF131 battery.

The 12 VDC source may come from an auxiliary 12 VDC supply in a vehicle, using the 12 VDC power cable (supplied), or the 115/220 VAC to 12 VDC converter (supplied).

This unit is designed to charge one FLIR Systems supplied nickel metal hydride (NiMH) battery pack.



### **WARNING**

---

***FireFLIR is powered by batteries with a limited life. Failure to properly charge, install and store batteries as directed in this manual could result in serious injury or death.***

---

The LED on the front of the charger indicates the battery condition, RED is shown as the battery is charging, changing to GREEN when the battery is fully charged.

The battery charger is capable of providing a full charge in approximately 4 hours.

---


**WARNING**

**Read all instructions and warnings before using the battery charger.**

## Features and Specifications

The following table lists the features and specifications of the FireFLIR® FF131 AC adapter.

Function	Specification
Input Voltage	100-240 VAC (50-60Hz)
EING	1.2A
Output Voltage	~ 12VDC
Output Power	50W Max
Temperature	0 to +40° C Operating -40 to +70° C Non-Operating
Humidity	90% R.H. @ 35° C, Non-Condensing

The following table lists the features and specifications of the FireFLIR® FF131 battery charger.

Function	Specification
Input Voltage	12 VDC Nominal 11 VDC to 16 VDC
Output Voltage	controlled by charger
Output current	~1.0 amps max
Temperature	0 to +40° C Operating -40 to +70° C Non-Operating
Humidity	90% R.H. @ 35° C, Non-Condensing

**WARNING**

***Only use the batteries and battery chargers FLIR provided with FireFLIR® FF131, and install them only as directed. Failure to comply may result in system impairment or failure and serious injury or death.***



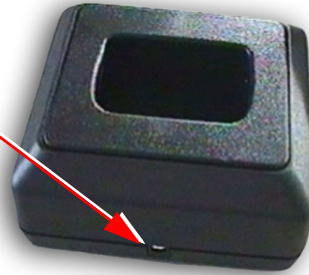
### Charger Installation Guidelines

1. Locate the battery charger near the AC power socket outlet for accessibility.
2. Install the battery charger in an environment that is protected from physical abuse.
3. Install the battery charger where there is free air circulation to all sides and the top of the charging unit enclosure.
4. Do not position the battery charger near a source of heat or where it will be exposed to direct sunlight.
5. Do not install the battery charger near a window that can be opened.
6. Do not place the battery charger near any source of water.

---

## Charging Battery Packs

Indicator  
LED



1. Verify that the green LED for the empty, intended charge bay is illuminated.
2. Align the battery pack slot with the charging bay slot.
3. Slide the battery pack into the charging bay.
4. Verify that the LED changes (RED) indicating that the battery pack is charging.
5. When the battery is fully charged, the LED will change to GREEN.

**NOTE**

*Charging times are based on new battery packs at 25° C (77° F).*

---

## Charging Precautions



**WARNING**

***Failure to comply with the following precautions may result in personal injury and damage to property.***

1. Do not open or remove the cover. There are no user serviceable parts inside. Refer all service requirements to FLIR Systems, Inc. Customer Service Dept.
2. The power supply cord must not be disturbed, abused, or disconnected from the power source while charging.
3. Do not place other objects or substances next to, or on, the enclosure. There must be free air circulation on all sides and the top of the unit.
4. This battery charger is to be used only with the FLIR Systems NiMH battery pack.

## Section 5

---

# Scheduled Maintenance

## Maintaining the FireFLIR® FF131 System

---

### General

To promote long use and reliability of the FireFLIR® FF131 system, general maintenance, cleaning, and inspection procedures are required.

If FireFLIR® FF131 is exposed to hazardous substances while involved with structural fire fighting operations, these substances can be deposited onto the FireFLIR® FF131 system and interfere with its proper operation.

This section tells you how to clean your FireFLIR® FF131 system to avoid these hazards and maintain operational readiness.

#### NOTE

*The FireFLIR® FF131 Thermal Camera Has No User Serviceable Parts Except As Instructed In This Manual. Any Operational Problems Should Be Referred To An Authorized FLIR Systems Service Center For Repair.*

---

### Cleaning Methods

The following cleaning methods may be used to clean the FireFLIR® FF131 system as well as the battery packs.

#### CAUTION

*DO NOT use abrasive cloths or cleaners on any optic element.*

*DO NOT use high pressure water streams to clean the FireFLIR® FF131.*

*DO NOT use abrasives, solvents, paint remover, acetone, paint thinner, or any other petroleum or chlorinated organic solvents.*

*Excessive cleaning of the coated optics may result in premature degradation of the coating. Only clean the coated optics when required.*

Light deposits on the external lens or the display window can be removed using standard lens cleaning pads. Heavier deposits may be cleaned using a cleaning pad and a mild soap with warm water. Heavily soiled parts may require spraying with a cleaning solution before wipe-down.

Hand washing of the FireFLIR® FF131 should be performed in a utility sink. Protective gloves must be worn during washing. Clean with cleaning solution, or mild soap (no detergents), and warm water. Do not immerse the battery packs. Their outside casing should be wiped down and the electrical battery contacts cleaned with an alcohol swab. Any corrosion or difficult to clean contamination on the case, battery, or battery contacts can be removed with an ordinary pencil eraser.



### **WARNING**

***Failure to clean FireFLIR to remove contaminants and deposits as directed in this Manual could impair its performance and cause malfunctioning which, in turn, could lead to serious injury or death.***

Chemical or biological contamination may require the use of specialized cleansers. This should be done in consultation with the appropriate health department, hazardous material (“hazmat”) team or authority having jurisdiction.



### **WARNING**

***Improper Handling Of Contaminated Objects Could Result In Serious Injury Or Death.***

## Inspections

A daily inspection of the FireFLIR® FF131 system is recommended to evaluate whether the equipment is operating properly. The following items should be verified during an inspection:

1. Optics and view screen is clear and undamaged.
2. Battery packs charged.
3. No cracks or deformations in battery pack or FireFLIR® FF131 enclosures.
4. Check that all warning labels are properly installed.
5. Battery pack electrical contacts clean.
6. FireFLIR® FF131 initializes properly (normal symbology present).
7. Image is normal.

**WARNING**

***FireFLIR® FF131 should be inspected and tested before being used in a hazardous environment. Failure to comply with directions in this Manual could result in serious injury or death.***

## 12 VDC Charger Adapter

The 12 VDC Charger Adapter is equipped with a single in-line fuse. Always replace fuse with the same size and rating fuse as installed. To change the standard fuse proceed as follows:

1. Unscrew the knurled metal collar on the adapter plug.
2. Remove knurled metal collar, metal fuse extension, and fuse.
3. Replace the fuse with a standard ¼" X 1 ¼" 5A/250V fuse. Be sure the spring beneath the fuse is present in the bottom of the fuse holder.
4. Install the new fuse on the spring and place the metal fuse extension over the top end of the fuse.
5. Replace the knurled metal collar with fuse extension protruding through collar. Tighten collar finger tight.

If the 12 VDC Charger Adapter is to be used outside North America, the adapter plug can be modified to fit the metric 5 amp fuse. Replace the standard fuse and fuse extension with the metric fuse 5 X 20mm and longer fuse extension provided with the Battery Charger as follows:

1. Unscrew the knurled metal collar on the adapter plug.
2. Remove knurled metal collar, the standard metal fuse extension, and standard fuse.
3. Replace the standard fuse with the metric fuse 5 X 20mm. Be sure the spring beneath the fuse is present in the bottom of the fuse holder.
4. Install the new metric fuse on the spring and place the longer metal fuse extension over the top end of the fuse.

Replace the knurled metal collar with longer fuse extension protruding through collar. Tighten collar finger tight.

# **FireFLIR™**





## Section 6

---

# After Sale Support and Service

## Getting Service For the FireFLIR® FF131 System

This section discusses the warranty and describes how to obtain service for your system. With the purchase of a FLIR product, the customer receives the assurance that the product will perform to specifications. FLIR strives to maintain the highest standards in the design, manufacturing, and the after-sales service of all its products. This philosophy is part of our commitment to you, the customer.

---

### Warranty

FLIR warrants FireFLIR® FF131 to be free from defects in material, workmanship and design for 12 months from the date of shipment from the factory. Buyer shall report any claimed defect in writing to FLIR immediately upon discovery. Buyer shall ship the subject FireFLIR® FF131 to FLIR's Portland, Oregon facility at Buyer's expense. FLIR, at its sole option, will furnish either a repaired or replacement product or parts thereof, and deliver it to Buyer, ExWorks point of shipment. This warranty is non-transferable.

If Buyer repairs, replaces, alters, services, or adjusts the products and parts, or has another party do so, without FLIR's authorization, FLIR shall have no obligation to Buyer under this warranty. This warranty does not extend to products and parts not manufactured by FLIR and subject to separate manufacturer warranties by their respective manufactures.

FLIR shall have no obligation under this warranty for defects resulting from misuse, neglect or abuse of the Products. Misuse of Product shall include, but not be limited to, uses inconsistent with warnings and directives in the Manual.

FLIR's warranty shall be void if Buyer fails to enroll in FLIR's FireFLIR Service Program and service and maintain the Products as directed in the Manual.

BUYER'S EXCLUSIVE REMEDY UNDER WARRANTY SHALL BE AS STATED HEREIN. THIS WARRANTY IS LIMITED AND FLIR EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

---

### Warranty Repairs

All warranty repairs must be performed at an authorized FLIR Service Center or by factory trained personnel using FLIR recommended replacement parts. The buyer shall prepay all charges returning products to FLIR for warranty service. FLIR shall pay for return of the products to the buyer.

---

### Extended Warranties

FLIR and its sales representatives have a variety of standard service contracts that provide on-site and off-site factory service. These factory service programs can insure the customer quick response time at a fixed cost. If interested in this service, please contact our customer service manager or the local sales representative.

---

### Product Repair and Service

FLIR and its sales representatives provide both in-warranty and out-of-warranty service. Arrangements must be made in advance with the local customer service manager before shipping products for repair. Out-of-warranty service is charged at a fixed hourly rate or on a "per repair" basis. The customer will be given a quotation for the repair costs before work is started.

---

### Replacement Spare Parts

FLIR maintains an inventory of spare parts ready for fast delivery when required. The model number and serial number of the unit for which the parts are required will assure that correct parts are supplied. Normally, parts are shipped within 48 hours. In the event a customer requires quicker turnaround time, special handling services are available to meet emergency needs. All prices are F.O.B. the factory in Portland, Oregon, U.S.A. unless otherwise noted.

---

## Repair Procedures

If any part of the FireFLIR® FF131 should require service, contact the customer service department at **503-684-3731**. If it is ascertained that the defective item must be returned for repair, a return authorization number (RA) will be issued. The defective item should then be packaged and sent prepaid to the appropriate repair facility. A written description of the problem(s) experienced should accompany the return item. The R.A. should be noted on the report and be printed on the address label. For example:

TO: FLIR Systems, Inc.  
16505 S.W. 72nd Avenue  
Portland, OR 97224

Attention:  
Customer Service Department - R.A. ###

No billable repair will be performed without a purchase order or letter of authorization. Written or verbal estimates will be supplied at customer request. For any warranty or service inquiry, call or refer all correspondence to:

Your Local Distributor -or-

FLIR Systems, Inc.  
Customer Service Department  
16505 S.W. 72nd Avenue  
Portland, OR 97224  
Telephone: (503) 684-3731  
Fax: (503) 968-1121