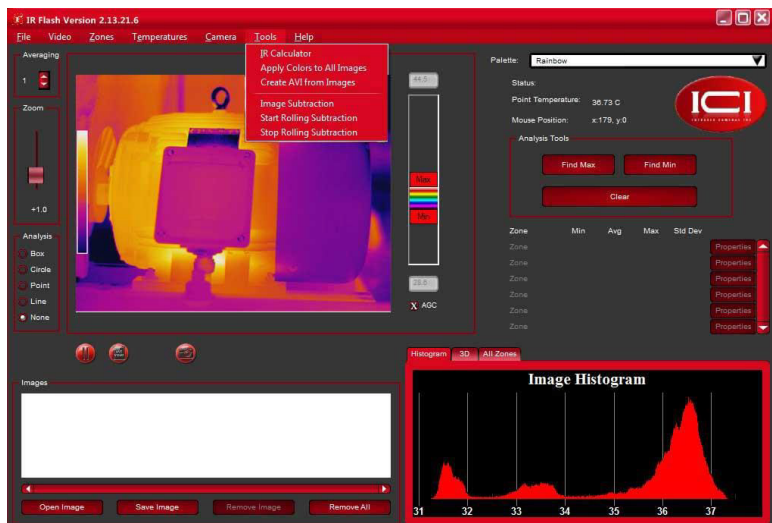


IR FLASH VERSION 1.0

PROFESSIONAL THERMAL IMAGE ANALYSIS SOFTWARE

USER MANUAL

PLEASE READ THIS MANUAL BEFORE LAUNCHING THE SOFTWARE.
IMPORTANT SAFETY INFORMATION INSIDE.



**THIS SOFTWARE IS INTENDED FOR ADJUNCTIVE USE.
NOT MEANT FOR STANDALONE DIAGNOSTICS.**

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THE CAMERA IS CONTROLLED BY THE SOFTWARE APPLICATION AND SHOULD NEVER BE UNPLUGGED FROM THE COMPUTER WHILE THE SOFTWARE IS RUNNING. THE USER SHOULD EXIT THE SOFTWARE PROGRAM NORMALLY BEFORE THE CAMERA IS UNPLUGGED. THIS WILL SAFELY SHUT THE CAMERA DOWN. THIS IS ANALOGOUS TO

TURNING YOUR COMPUTER OFF THROUGH THE WINDOWS SOFTWARE VERSUS JUST HITTING A SWITCH TO TURN IT OFF. FAILURE TO FOLLOW THIS PROCESS MAY RESULT IN THE NEED FOR THE MANUFACTURER TO RE-CALIBRATE THE CAMERA SYSTEM AND THIS FAILURE IS NOT COVERED UNDER THIS WARRANTY.

Technical support is offered free of charge to all registered users of Infrared Cameras, Inc. system for one year from date of invoice. Whenever you require technical support you may be asked to provide the serial number of your package before support is granted. We suggest you thoroughly read the User's Manual before you call for assistance. If the User's Manual does not answer your questions please call Infrared Cameras, Inc. If you are having problems with the software please note any errors messages you receive and have them available at the time of your call.

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1. General Description

IR Flash version 1.0 is a professional software used to capture infrared images and videos for thermal analysis. The software has features for correcting radiometric data and imaging parameters. Supports the USGlobalsat Corporate model BU-353S4. It is widely used in the following fields and applications: industrial, petrochemical, aerial, etc.

2. Safety Information

Do not attempt to install the software without following the installation instructions provided in this manual. Improper installation may cause the program to become unresponsive, crash, or not function properly.

- User must not tamper with files or alter the program in any way. Altering the program may cause the software to become unresponsive, crash, or not function properly.
- Any software application provided in this package is provided “as is” without warranty of any kind, expressed or implied. The entire risk lies with the user for the accuracy and performance of the program.
- The camera is controlled by the software application and should never be unplugged from the computer while the software is running. The user should exit the software program normally before the camera is unplugged. This will safely shut the camera down. Failure to follow this process may result in the need for the manufacturer to re-calibrate the camera system. Failure to adhere to this tenant may void the camera warranty.
- Infrared Cameras, Inc. reserves the right to determine, at its sole discretion, the extent of user support made available to any user.
- ICI excludes and disclaims any warranty that the product is fit for that use. Infrared Cameras, Inc. accepts no liability in the use and application of the camera.
- It is the responsibility of the user to obtain proper training in the use of the camera for their particular application including a working knowledge and understanding of any inaccuracy that is typically attributed to radiometric measurements.
- The software package is self-contained and requires no maintenance beyond maintaining the viability of the machine on which it resides, etc. Future updates for the software may or may not be made available to users at ICI's discretion.
- We suggest the user thoroughly read this manual before calling for assistance.

3. Features

- Thermal image analysis
- Select IR color mapping
- Image averaging
- Zoom
- Manual image capture
- Image display control
- IR calculator
- Apply palette to all images
- GPS meta-data
- Alarm zoning
- Video options
- Export options
- Radiometric corrections
- Image touch-ups

4. Intended Use

IR Flash version 1.0 is a professional software intended to be used by trained thermographers to capture as well as analyze thermal images, videos, and data.

5. Technical Specifications, Accessories, and Documentation

Camera specifications, accessories, and documentation can be found on-line:

<https://infraredcameras.com/ir-flash-version-1.0/>

5-1 Recommended System Requirements

Processor: i5 or above

RAM: 4 GB or above

OS: Windows XP/7/8/8.1/10

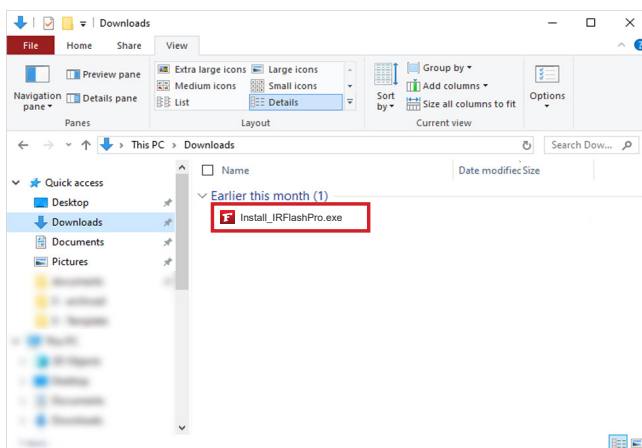
Hard Drive: 256 GB or above

6. Operation Instructions

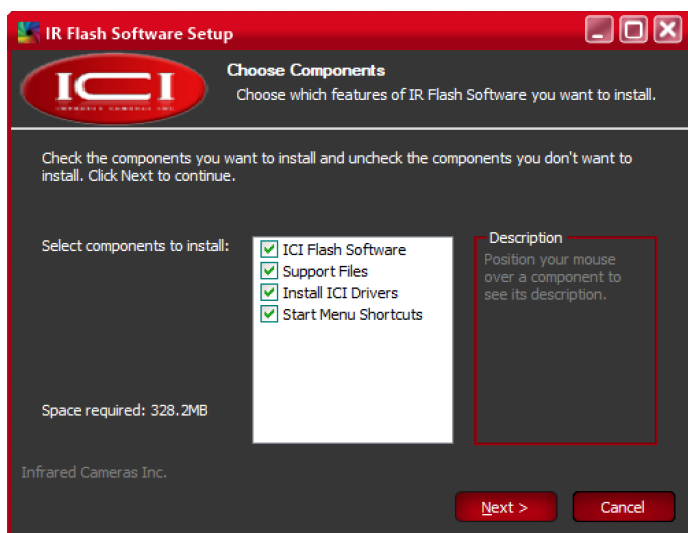
6-1 Software Installation

IR Flash version 1.0 software should be provided on a USB drive. If a USB is not available, users can obtain a download link from customer support; however, ICI recommends upgrading to the most current version of IR Flash Pro as ICI does not plan to support the version represented in this manual indefinitely.

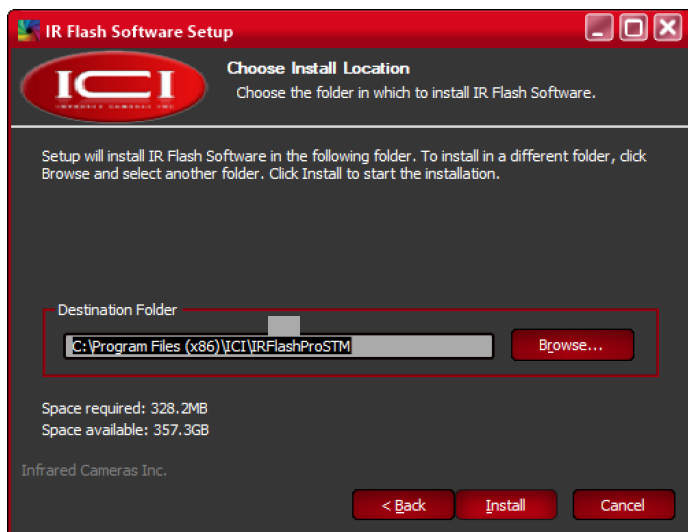
1. Launch .exe by double-clicking file.



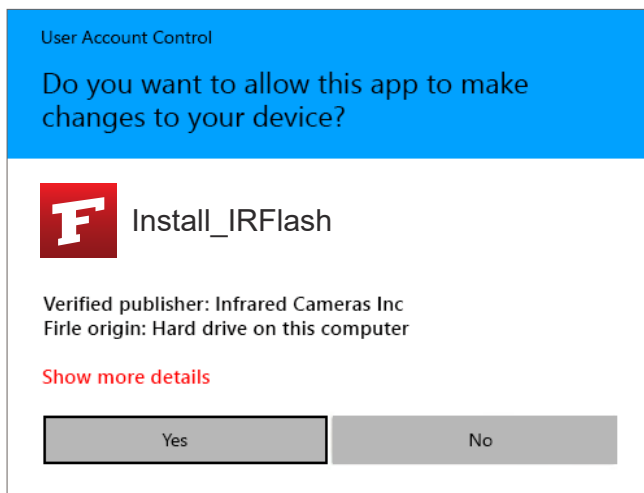
2. Choose components. Click Next.



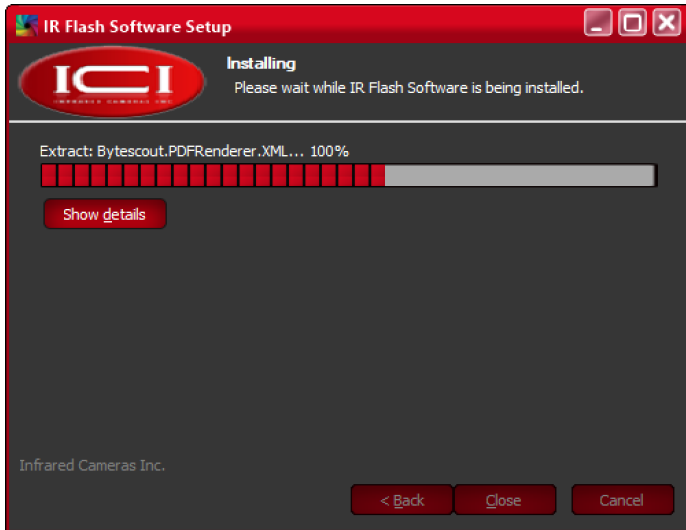
- Optionally change installation location by clicking Browse. Click Install.



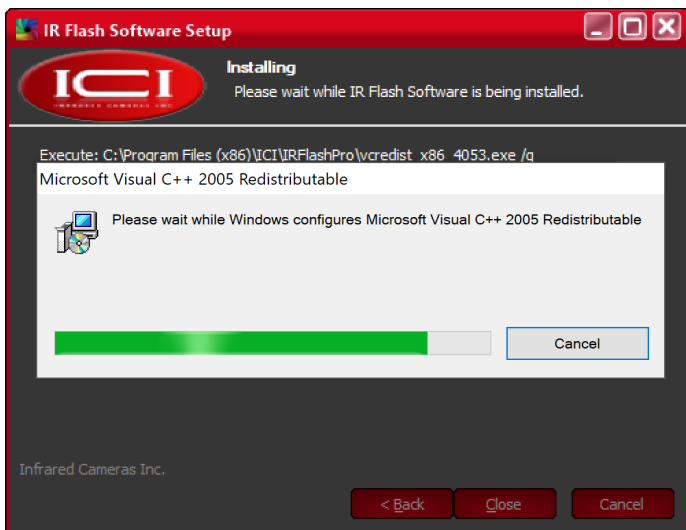
- Grant system permission. Click Yes.



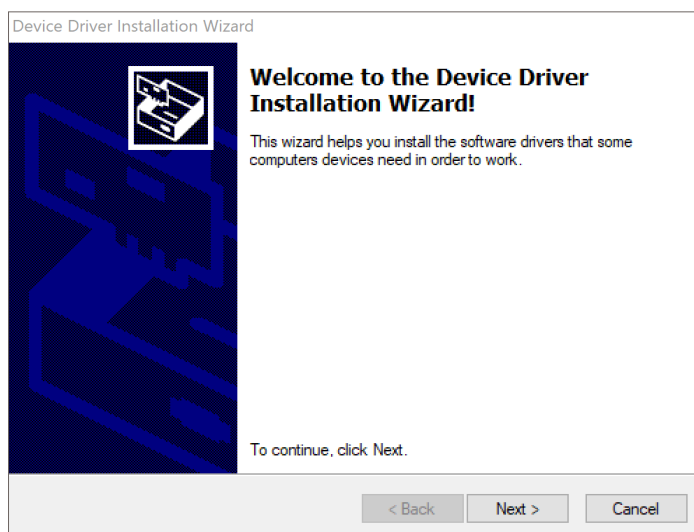
5. Please wait while IR Flash software installs. Pop-ups will occur. Do NOT close or cancel.



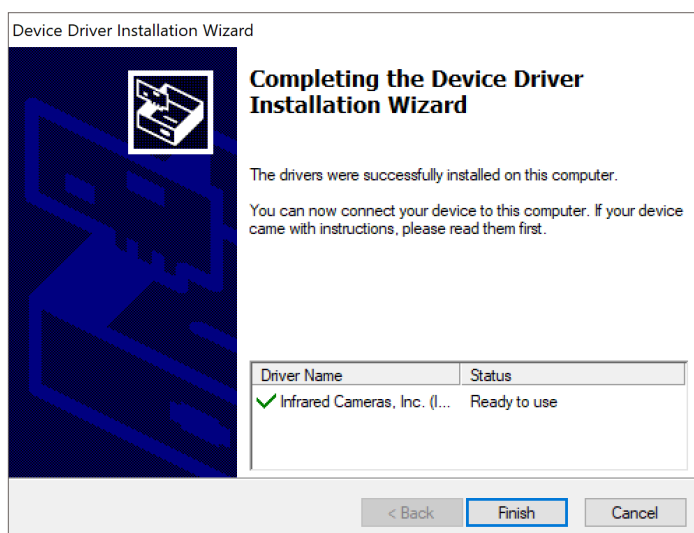
6. Please wait while C++ configures. Pop-ups may occur. Do NOT close or cancel Redistributables.



7. Device Driver Installation Wizard will open. To continue with installation, click Next.

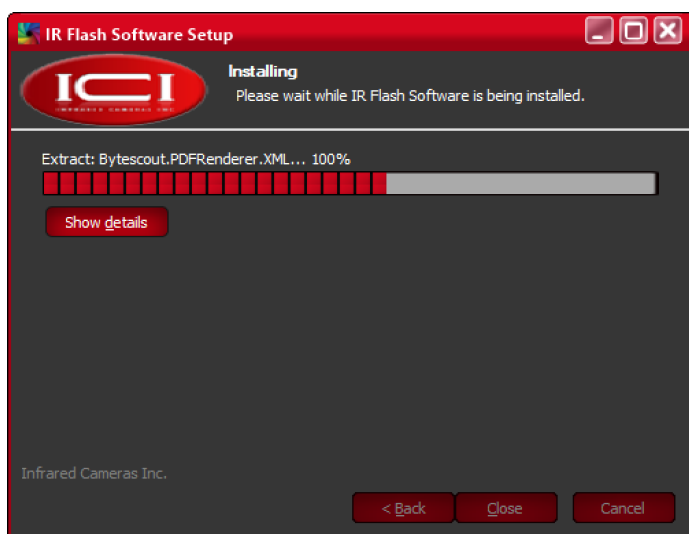


8. Click Finish.

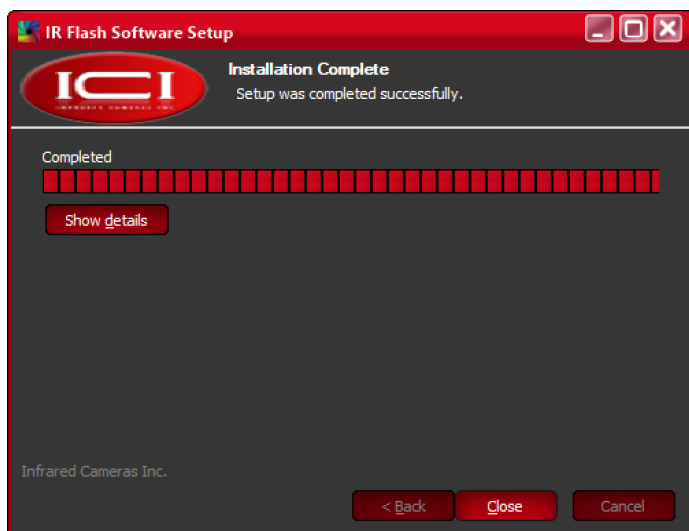


**MORE THAN ONE DRIVER MAY NEED TO BE INSTALLED.
REPEAT STEPS 7 AND 8 AS REQUIRED.**

- Allow IR Flash software to finish installing.



- Click Close.



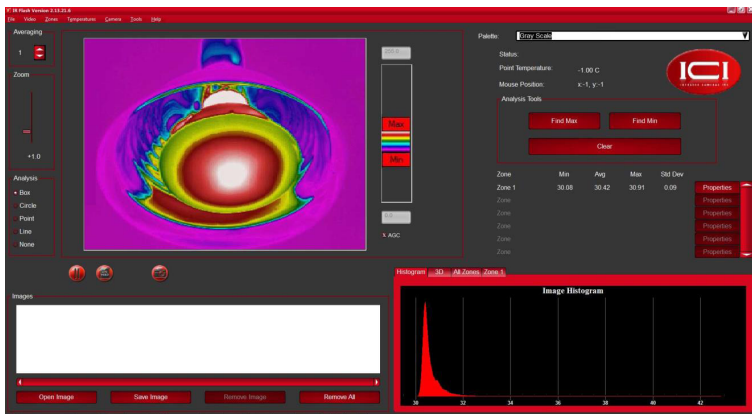
11. Launch IR Flash from the start menu or the desktop icon.



6-2 Software Interface

The main operating screen will be referred to as the “Main Menu Screen” throughout this manual. The Main Menu and Control Bar options were organized to break the program into several logical functional groups. These groups will be introduced in detail in subsequent sections.

The layout of the software is based on one main screen shown below.

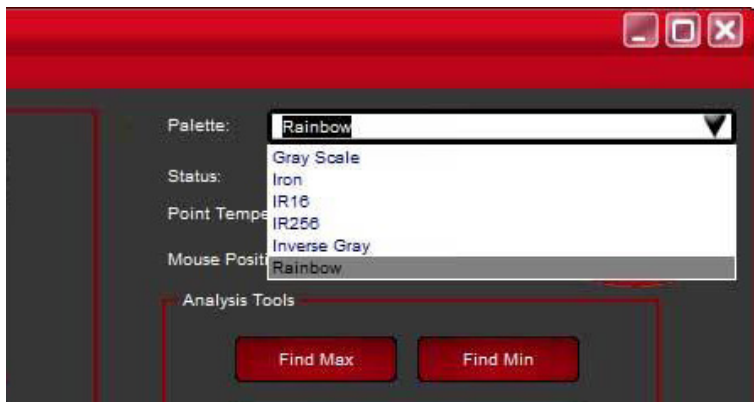


USERS MUST LOAD AN IMAGE INTO THE SOFTWARE SYSTEM OR HAVE THE CAMERA RUNNING IN LIVE VIDEO MODE FOR ALL MENU OPTIONS TO BE UNLOCKED AND ACCESSIBLE. SEE FILE SECTION.

6-3 Selecting Image Polarity (Color Palette)

The Palette section allows the user to control the image polarity by which the current image is displayed, saved, and printed. To change the polarity, select the desired palette from the drop down menu.

6-4 Image Averaging



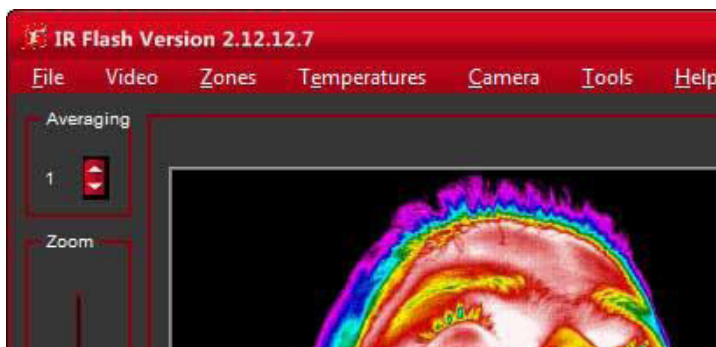
MOST USERS PREFER THE RAINBOW PALETTE.

The Averaging button will average all the images from the camera into a single displayed image.

The users can press the ▲ or ▼ buttons to adjust the number of frames they want averaged.

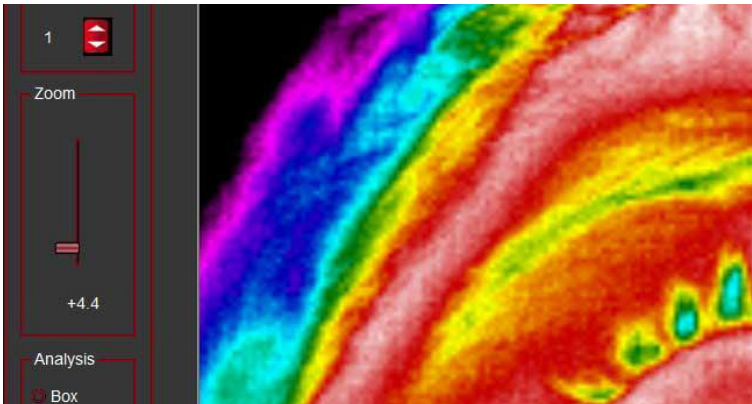
6-5 Zoom

The Zoom function allows the zooming of the image currently on screen. Change the zoom rate by employing the slider control.



6-6 Manual Capture

Along the bottom of the Image display screen, the user will find a Pause button and a Capture button.



Pause: pauses the continuous image display and shows the image where the Pause button was pressed.

Capture: captures an image from the live display and moves it to the captured image group shown at the bottom of the main screen.

Users can capture as many images as needed and save them once imaging is complete. Use the slider controls located under the capture image group to scroll through the captured images. Additionally, images in the captured group can be moved to the main image display by clicking the desired image.

To return to live video, select the Live Video Icon at the bottom of the main image display.

6-7 Image and Auto Gain Control

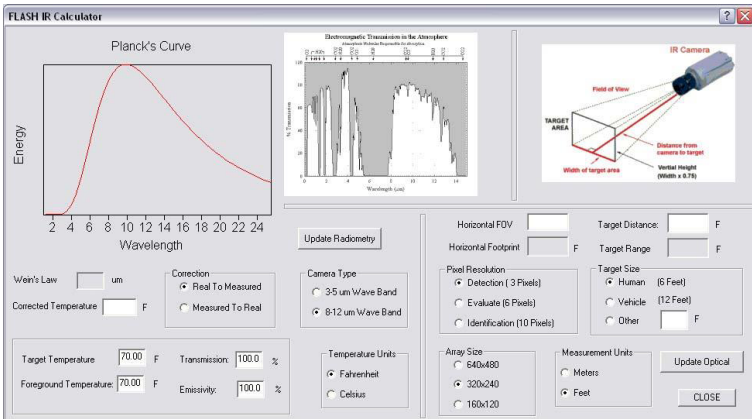
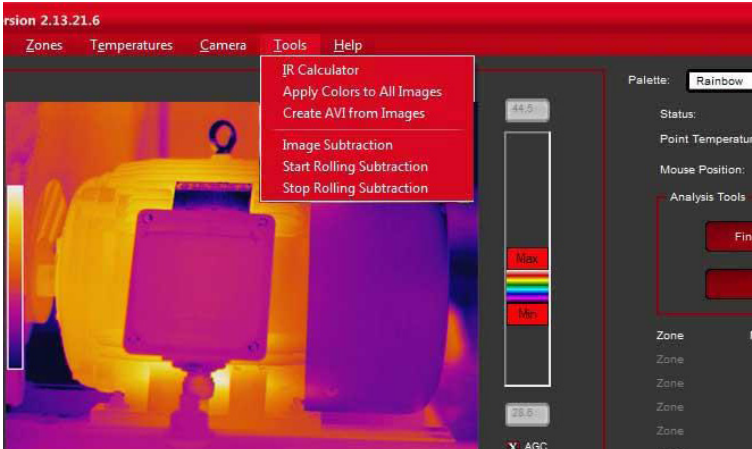
The image display controls and Auto Gain Control (AGC) functions assist the user in fine-tuning the way images are presented on screen. If the AGC button is selected, the program will automatically adjust image contrast. If unselected, the Level and Span Slider control will activate. The user will then have complete control of how this image is displayed. Temperatures will not change although the color for a temperature may change.

6-8 IR Calculator

IR Flash includes a calculator that provides thermographers with a resource to determine the theoretical radiometric effects of Emissivity, Reflection, and Transmission on radiometric temperature values. Additionally, the second half of the Calculator allows the user the ability to adjust imaging parameters from a non-IR point of view.

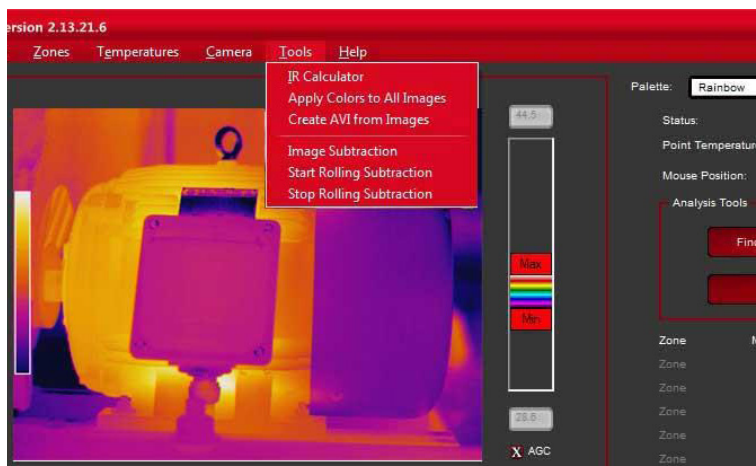
The IR Calculator is found under the Tools main menu choice:

The right half of the Calculator screen provides the input and output controls for Radiometry including Wiens Law values and the Planck Equation plot. The right side contains the input and output controls for the optics portion of the calculator.



6-9 Apply to All Images Function

Under the Tools menu option is a setting to Apply Color to All Images. This will apply any changes made to the image polarity via the Max/Min Level and Span settings to all of the images in the image capture window.



6-10 GPS Meta-data

IR Flash software currently supports the USGlobalsat Corporate model BU-353S4 USB GPS receiver to record GPS meta-data (longitude, latitude, and altitude at the time the image is taken).

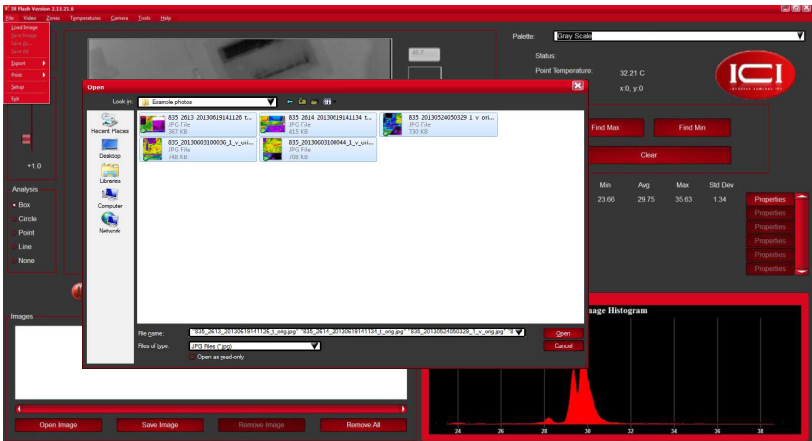
Recording the GPS meta-data is enabled as soon as the device is plugged in and recognized by the computer. When recognized, a notification will temporarily appear in the IR Flash window to confirm. After being enabled, the longitude, latitude, altitude, and direction of travel will be automatically recorded and added to the saved images.

6-10-1 North-Up Image Rotation

On the Loading and Saving tab of the File → Setup menu option is Automatically rotate images if GPS information is found. When enabled, images that include GPS location data will automatically be rotated with North facing the top of the image display window.

THE BU-353S4 USES THE SIRF STAR IV CHIP FOR GPS COMMUNICATION. WHILE OTHER USB GPS DEVICES WITH THE SAME CHIP MAY POSSIBLY WORK, THIS MODEL IS THE ONLY ONE GUARANTEED TO BE COMPATIBLE WITH IR FLASH.

- The Load function automatically knows if the user is loading a single image or a series of images.



[illegible]

The Printing option allows the user to print the current active image. Printing will be accomplished using defined parameters specified in the configuration section for the user's printer.

- ## 7-7 Altering IR Flash Setup

1. Click File.
2. Click Setup.
3. Adjust settings.
4. Click Ok.

There are several sub-menu options found under the Video section of the main menu. These functions are ordered by their ability to manage or manipulate the live video data.

This menu sub-option allows you to capture an image from the video display and place it in the Captured Image Group (labeled 'Images') shown at the lower left of the main image display.

8-2 Capture Image Series

IR Flash allows the user to capture a series of images. To capture a series:

1. Click Video.
2. Click Capture Image Series.

Once this selection is made a red Record Button is displayed under the main image display. When this button is pressed a series of images will be captured to the Capture Image Group (labeled 'Images'). When the user is finished they can press the black Stop Button under the main image display and recording will stop.

Users can play back the series by selecting the Playback option button under the series sub-menu choice. The control buttons are displayed at the bottom of the main image display, use these control buttons, as shown in the below image, to move through the series as desired.



8-3 Real-time Filtering

The Real-Time Image Filtering features of the program offers users a basic capability in Digital Image Processing. Convolutions are a special case of image enhancement techniques known as spatial filtering. Spatial filtering is typically used for edge or boundary enhancement, noise reduction prior to edge or object detection, or to simply make the image look better. When this sub-menu option is chosen a dialog box will be displayed from which you can pick what filters you want applied to the live video images.

- Low Pass - the image is smoothed by decreasing the disparity between pixel values by averaging nearby pixels.
- Gaussian Smoothing - smooths the image by down-sampling. It is common to apply a low-pass filter to the image prior to using Gaussian smoothing.
- Laplacian 1 - enhances edges by computing the second derivatives of an image, measuring the rate at which the first derivatives change.
- Median - used to remove noise from an image. It is common to use this filter after Laplacian to improve image processing.
- Laplacian 2 - a second, stronger edge enhancer.

8-4 Display Resolution

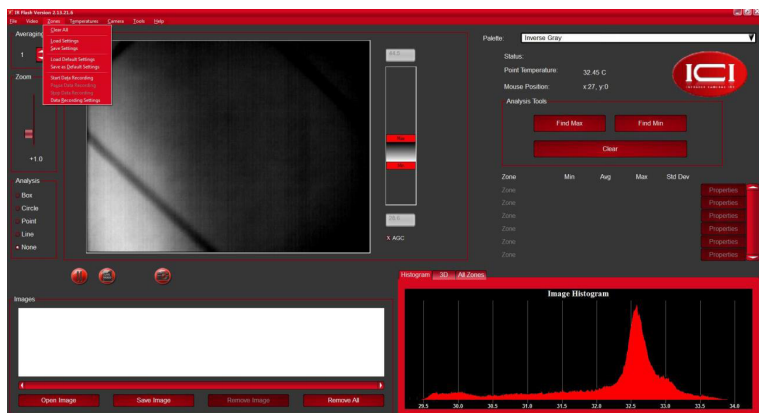
The resolution of the data coming from the camera is at an array count of 320 pixels stored in 240 lines. Under Standard Resolution the image display takes from the data directly from the camera.

The Double Resolution options converts the image to a 640 x 480 smoothed array. While the displayed image is still shown at 320 x 240, the display takes the data from an image array 4 times as large. This, in many cases, greatly improves the quality of the image display.

The Quad Resolution doubles the image array again.

9. Generating Zones

The third main menu choice is the Zones selection which provides a series of sub-menu options to manage the Zones on the images as shown on the next page. Zones are regions of interest within or on the user's image data that are marked and configured by the user. Users can add, delete, and set-up each zone to function in variety of ways. The area at the bottom left of the screen provides the user interface for each zone for a total of 48 possible. The statistics are shown in this interface dialog as well as a "Properties" button. Users can thumb through the zones in place by using the scroll bar next to the three Zone Display panels shown at the bottom left of the main screen.



9-1 Clear All

The Clear All sub-menu choice simply clears all the Zones currently residing on the image.

9-2 Load Setting

The Load Settings sub-menu choice allows the user to load the last Saved Zone settings.

9-3 Save Settings

The Save Settings sub-menu choice allows the user to save the current Zones set-up parameters to a file for future retrieval.

9-4 Load Default Settings

The Load Default Settings sub-menu choice allows the user to load the last Saved Default setup parameters. This is different than the Load Settings in that the Load Settings parameters are established local settings and not default. Default Settings will load upon a new startup of the program.

9-4 Save as Default Settings

The Save Default Settings sub-menu choice allows users to Save the current Zone set-up parameters as the Default parameters.

10. Zone Management

10-1 Adding a Zone

To add a zone to an image:

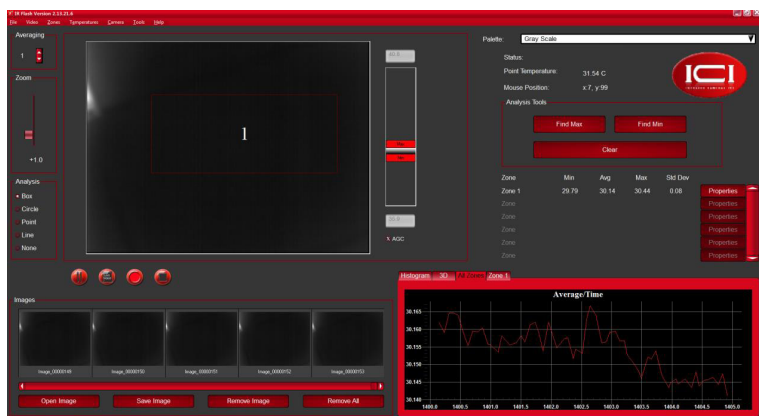
1. Choose zone type (under Analysis to the left of the image display area).
2. Click inside the image display area where you want to set the zone.

Users can grab the graphic control on the feature and re-size or move the Zone around the image.

10-2 Deleting a Zone

To delete a zone from an image:

1. Highlight the zone.
2. Click and drag the zone off the image



10-3 Zone information

The plotting area shown on the bottom right corner of the screen allows users to plot image information in the form of a 3-D rendering and/or as an image histogram. It also allows users to plot the temperature data over time for any/all of the Zones placed on the image. The image above shows this plot for one of the two zones set.

10-3 Zone Properties

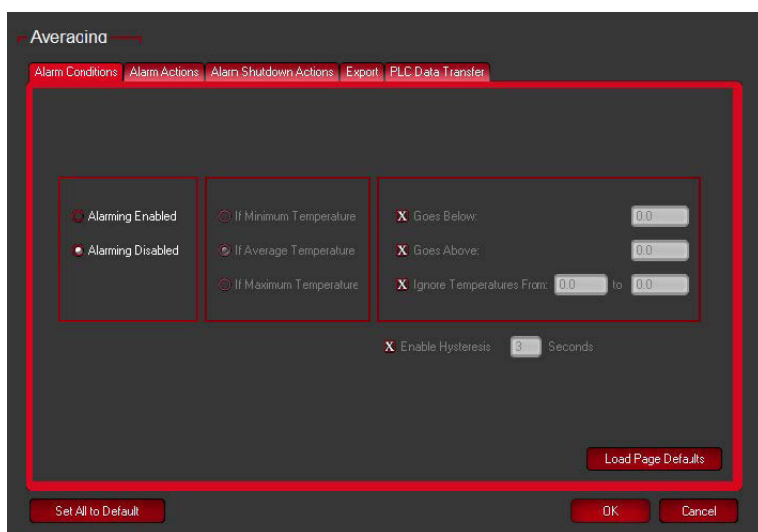
Once users have placed Zones on the image display, detailed management of the Zones can be accomplished using the "Properties" button found at the bottom of each active Zone panel. Once this button has been pressed a dialog worksheet will appear by which this management will be carried out.

There are two main features that can be set from within this dialog: Alarms and Export.

10-3-1 Alarms

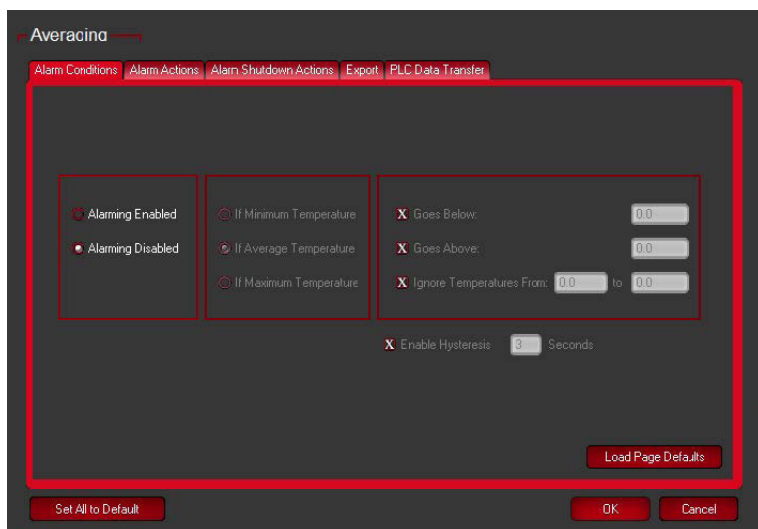
The Alarms configuration for each Zone allows users to set up the system to continuously monitor the analysis points discussed for the Zones and alarm if any of the Zones' average temperature value exceed the temperature limits specified by the user within this worksheet.

Graphic on next page.



10-3-2 Export

Export allows users to export the data within a Zone in three different formats as shown on the next page. This dialog box is invoked through the Zone Properties button found in each Zone interface box.



11. Radiometry

11-1

The basic reason for employing image processing programs when analyzing IR images is to have an easy and fast, yet comprehensive means to determine the information content of an image in numerical terms. Radiometry is considered the base from which to conduct this analysis.

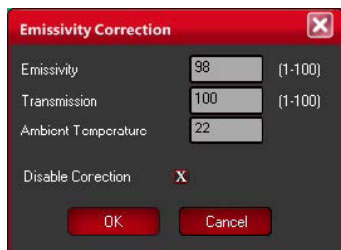
Typically, converting the gray scale values to values of temperatures requires either a calibration of individual cameras or field calibration data. The method for calibrating images provided in this program is camera dependent because temperature calibration data is provided by an advanced calibration process at the factory and installed in this software program.

This program looks for a very specific file in its structure and mates that with the camera serial number automatically read by the program. If this software cannot match the camera to the calibration file, the user cannot perform temperature analysis on the data.

IF YOUR SPECIFIC PACKAGE INCLUDES ADDITIONAL OPTIONAL LENSES A SEPARATE CALIBRATION IS REQUIRED FOR EACH LENS. SEE THE CAMERA MENU CHAPTER FOR SELECTING THE LENS YOU ARE CURRENTLY USING.

11-2 Radiometry Correction

The accuracy of temperature conversion is also dependent on the physics of the scene. These physical properties include emissivity and reflection of the target, the transmission in the intervening atmosphere, and the background/foreground temperature within the scene. The dialog box shown below allows the user to offset potential errors by defining precise parameters.



The image shows a dialog box titled "Emissivity Correction" with a red header bar and a close button (X) in the top right corner. The dialog has a dark gray background. It contains three input fields, each with a label to its left and a range in parentheses to its right:

- Emissivity**: The input field contains the value "98" and the range "(1-100)".
- Transmission**: The input field contains the value "100" and the range "(1-100)".
- Ambient Temperature**: The input field contains the value "22".

Below these fields is a checkbox labeled "Disable Correction" which is currently checked with a red 'X'.

At the bottom of the dialog are two buttons: "OK" and "Cancel".

11-2-1 Emissivity

Users are provided the capability to select any value of surface optical property of the target surface deemed appropriate to the analysis. To set the emissivity enter a value from 1.0 to 100.0 in the input box.

The accompanying table gives the typical emissivity of important materials:

Material	Emissivity
Water	96
Stainless steel	14
Aluminum plate	09
Asphalt	96
Concrete	97
Cast iron	81
Rubber	95
Wood	85
Brick	75
Tape	96
Brass plate	06
Human skin	98
PVC plastic	93
Polycarbonate	80
Oxidized copper	78
Rust	80
Paint	90
Soil	93

AS THE EMISSIVITY VALUE BECOMES LOWER THE ERROR BETWEEN THE ACTUAL SURFACE TEMPERATURE OF THE OBJECT AND THAT SHOWN BY THE CAMERA BECOMES GREATER. A GREAT DEAL OF ERROR CAN BE INTRODUCED INTO THE CALCULATION PROCESS IF YOU ARE NOT CAREFUL WITH THE EMISSIVITY SPECIFICATION.

11-2-2 Transmission

This value is the percentage of energy lost due the transmission of the energy from the target surface to the camera. This loss can be a result of any intervening medium such as atmosphere, IR windows, etc. This loss is entered as a percentage value for 1.0 to 100.0.

11-2-3 Ambient Temperature

The Ambient Temperature, which is often referred to as the background, is the temperature of the surfaces surrounding the imaged object. These surfaces are those whose energy will hit the face of the imaged object and reflect from it into the camera's field of view.

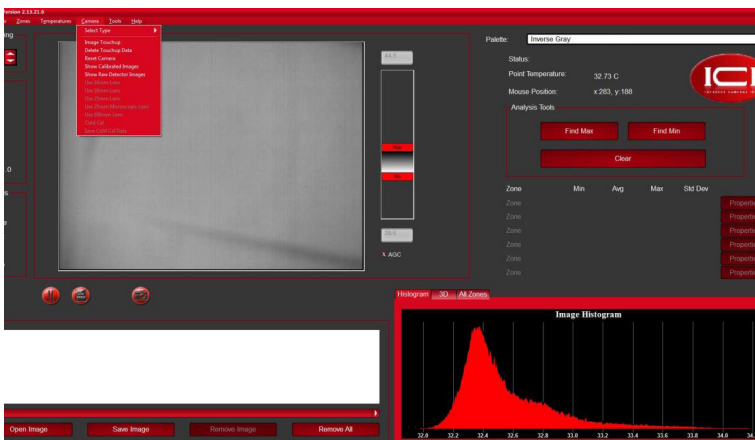
12. Camera Menu Choice

12-1 Image Touch-up

The Image Touch-Up function performs a Non-Uniformity Correction (NUC), setting all pixels in the camera to the same average reading. Certain cameras need to either have the lens cap placed on or to be looking at a surface with a consistent temperature, e.g. facedown on a table or against a solid surface. Other infrared devices have an internal shutter that will automatically perform a NUC operation every 3 minutes. Documentation for the user's monitoring device(s) can be found online:

<https://infraredcameras.com/product-resources/>

Selecting the Image Touch-Up option manually triggers the internal NUC.



12-2 Delete Touch-up Data

The Touch-Up function saves the Touch-Up data in a file and will be used at subsequent boot-up of the camera. This data file can be deleted by simply selecting the Delete Touch-Up sub-menu choice.

12-3 Reset Camera

If for any reason the computer's USB port is disrupted at any time and proper communication with the camera is disturbed, hit the Camera Reset sub-menu choice and the camera will reboot and reestablish USB communication, providing the USB port on the computer is functioning properly.

12-4 Lens Choice

Some models offer multiple lenses; multiple calibration files are saved to the program and selecting the appropriate lens option causes IR Flash to adjust accordingly. Currently, the 9000 series cameras (9320 and 640) do not have this capability.

13. Maintenance

The software package is self-contained and requires no maintenance beyond maintaining the viability of the machine on which it resides, etc. Future updates for the software may or may not be made available to users at ICI's discretion.

14. Troubleshooting

If the user encounters any problems while using the imager, refer to the following table. If the problem persists, disconnect the power and contact the customer support department.

14-1 Camera(s) not showing, camera(s) lagging, or software crashing

- Close and reopen software
- Reconnect power & USB cables
- Ensure that camera has been powered on for a few minutes
- Restart computer

- Verify that correct software is installed
- Uninstall & reinstall software, running as administrator
- Verify that firewall is not blocking software
- Try newer or different version of IR Flash

14-2 Camera out of focus

- Adjust distance between camera and subject.

14-2 Temperature readings are incorrect

- Close and reopen software
- Camera has to be powered on for 15 minutes
- Ensure camera is away from direct sunlight
- Try newer version of IR Flash software

15. About ICI

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You may reach a representative by phone or email Monday – Friday 8:00AM - 5:00PM CST.

ICI manufactures complete systems and software. We can provide complete engineering, software, and OEM solutions. Our Fortune 500 clients rely on us for infrared equipment and thermography training (which we offer through the Infrared Training Institute).

In addition to providing custom germanium, silica, and sapphire optics, we also build windows for enclosures, as well as custom pan and tilt units. We can even provide customizable explosion proof systems.

Our knowledge and experience stems from years of using infrared imaging and temperature measurement instruments to provide solutions to: managers, engineers, scientists, inspectors and operators in space, power companies, medical, pulp and paper, food industry, research and development, and various process industries. You can see our products and services used in industrial, commercial, and government applications worldwide. Additionally, our ICI 7320 was awarded “Product of the Month” by NASA*. Originally named Texas Infrared (still DBA), Infrared Cameras, Inc. has been in business since March, 1995.

Thank you for your dedicated and continued support.

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