



UNCOOLED FPA Infrared

Thermal Imaging Camera

TV302

Operator's manual

CAUTION

TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK).

NO USER-SERVICEABLE PARTS INSIDE.

REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

ATTENTION

- Avoid aiming the lens at extremely high-temperature radiation source in any cases (start/shut down), or the camera may work improperly or even been damaged.
- Do not hit the camera when in use or in transport.
- The ambient temperature should not be less than -15 °C during the transport and storage, the original packing must be used in transport.
- Avoid damping the camera. The camera should be stored in shady, dry and draughty environment without intense electromagnetic field.
- Avoid contaminating and damaging the lens surface by oil stain or other chemicals. Cover the lens cap after use.
- Keeping well the lens cap during use.
- Backup is recommended to avoid latent loss of data. Please copy (back up) the data regularly.
- Please take out the battery when leave camera unused for long time, otherwise it will cause damage on the camera.

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1 Introduction

TV302 Infrared Camera adopts the uncooled FPA infrared detector, displaying infrared thermal image with clear definition, high sensibility and pseudo-color, while saving image and voice data into FLASH for filing and computer analysis. Its non-contact measurement matches your requirements of analyzing the surface temperature in different sectors.

1.1 Application

- ✧ **Power Supply:** Thermal condition checking, fault & defect diagnosis on transmission lines and power equipment.
- ✧ **Petrol-Chemical:** Inspection on oil pipeline, detection on material surfaces, heat spilling, as well as on heat-preservation structure, power equipment, etc.
- ✧ **Fire fighting:** Forest-fire prevention, searching for latent source of ignition, preventive detection on specific material auto-ignition, and safety detection on electrical device for fire-prevention.
- ✧ **Medical treatment:** Body temperature measurement and analysis on temperature distribution.
- ✧ **Others:** Multiple-purpose for railway industry, construction industry, scientific research, etc.

1.2 Accessories

The TV302 system is delivered in a transport case. The system comprises the standard accessories as following:

- ✧ TV302 Infrared camera
- ✧ HYL-550 lithium batteries (2)
- ✧ Battery charger
- ✧ USB cable
- ✧ Operator's manual
- ✧ Adumbral cover
- ✧ Carry case
- ✧ Lens cap
- ✧ Video cable
- ✧ 0.5X lens
- ✧ High temperature attenuation lens
- ✧ Power Cable
- ✧ Headphone
- ✧ Analysis and reporting Software (CD)

2 Functional keys

2.1 Direct access button



- **Shortcut key [1]**

User can define for operating function. The default function is laser locator switch.

- **Frozen/save key [2] (Marked S)**

Used for frozen or save an image. Press the S (frozen/save) button shortly to freeze the image, press again to save the image, or to store the image into the FLASH storage media by pressing the button for more than 3 seconds.

- **Indicator light [3]**

Power supply indicator. It will turn on when power on the camera.

- **Power switch [4]**

Press the power switch [4] button for 3 seconds to power on/off the camera.

- **OPERATES [5]**

The OPERATES [5] include up button, down button, left button, right button and confirm button (central), have various functions in different mode.

- CONFIRM button activates the main menu of the system. You make the menu choice by press CONFIRM button. In the menu mode, UP/DOWN buttons are used to select same level menu and LEFT/RIGHT buttons are used to select different level menu.
- When doing spot measure, press CONFIRM button can activate the spot's attribute box, and use the four direction keys to move the spot.
- When doing line measure, press CONFIRM button can activate the line's attribute box. If chose the horizontal line, UP/DOWN buttons are used to move the horizontal line, and LEFT/RIGHT buttons are used to move the reference line; if choose the vertical, LEFT/RIGHT buttons are used to move the vertical line, UP/DOWN buttons are used to move the reference line
- When doing area measure, press CONFIRM button can activate the area's attribute box, and use the four direction keys to move the area, or change the size of the area. It depends on the setting in the area's attribute box.

- **Cancel [6] (Marked C)**

The C (cancel) button [6] is used to clear, quit or cancel the current operation. Besides, you can return to the real-time measurement mode by pressing this button when images are replayed or frozen.

Note: Press the C (cancel) button will delete the measure object when doing the object measurement.

- **Selections / Auto [7] (Marked A)**

The A (auto) button [7] is used to get the best image automatically, and to seriatim select the spot temperature measurement / line measurement/ area measurement / palette selection. The chosen item will show in yellow, the number will change to '✱' mark, and the temperature result shows in the top right corner will be highlighted in yellow..

- When choosing the object measurement, press the confirm button to

activate the current measured object's attribute box. Press the C (cancel) button to delete current measured object.

- When choosing the palette, use LEFT/RIGHT buttons to change the palette. System will automatically store the current palette and switch to this palette automatically when user starts the camera next time.

Note: Press A (auto) button for more than 3 seconds, camera will make automatic correction to get the best thermal image.

2.2 Connections



- **Audio output connector [1]**

Audio connector is used for audio output, connecting headphone or ¹ sound box.

- **Video connector [2]**

Video connector can be used as standard video output.

- **DC connector [3]**

12V DC connector is for connection to the power cable from external power supply.

- **USB connector [4]**

USB connector is used for data transmission with computer.

3 Getting started

3.1 To get an image

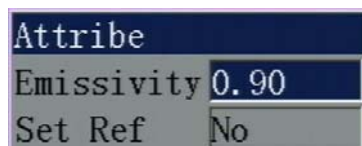
- Insert the battery into the battery compartment.
- Press the power switch for about 3 seconds to power the camera until the power indicator is on.
- Remove the lens cover from the camera. Adjust the focus of lens to get the clear image.
- Press the A (auto) button to get the best image while pointing the camera at a target object.

3.2 To measure a temperature

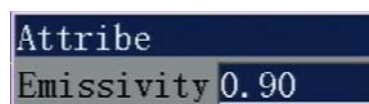
- Use the spot measurement as example. First, add a spot, and then keep the spot meter crosshair on the spot in the image of object that you try to measure. The temperature data will be displayed at the upper right of the LCD. Press the A (Auto) button before measurement for more accurate result.

Press the S (frozen/save) button to freeze the image and analyze the result by using spots. Please refer to operation guide for detail.

- When the temperature of the target object is higher or lower than the value of corresponding camera temperature range, the temperature value shown on the screen will be in the form of <XXX°C or >XXX°C.
- If the modification of measurement property is needed, activate the measurement and press “confirm” button, the attribute box will popup for modification. The property of spot, line and area is slightly different, show as below:



Property of spot



Property of line

Attribute	
Emissivity	0.90
Set Ref	No
Area Type	Max Temp
Area Move	Position

Property of area

The property of spot will allow user to modify the emissivity. When “YES” is selected in the “Set Ref”, all other measurement data will show as the temperature difference with reference measurement.

In property of line, only the emissivity can be modified.

In property of area, the emissivity, type of measurement, area size and position can be modified. When “YES” is selected in the “Set Ref”, all other measurement data will show as the temperature difference with reference measurement.

Note: Only one reference temperature can be set in the camera.

3.3 To save an Image

There are 3 ways to save a thermal image:

- Choose to save in the file mode, system will automatically save the data
- Press S button to freeze the image, and press again to save.
- Press S button for more than 3 seconds to save the image directly.

3.4 To recall a stored image

- Press the Confirm button (Central) to activate the main menu.
- Go to the file menu to active the dialogue box.
- Select “OPEN” and press Left/Right button to choose the preview/last image.
- Press C button to exit

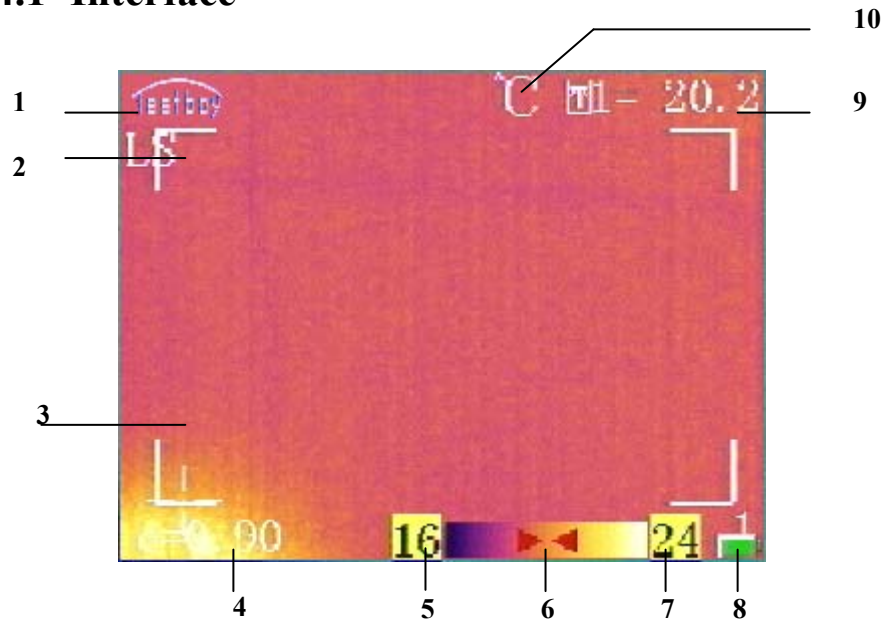
3.5 Transfer image to PC

The camera can be connected to the PC with the USB cable and can format, delete and transfer the data in the camera FLASH.

Note: See also >> Report software manual. We recommend using the built-in FLASH format function to format FLASH.

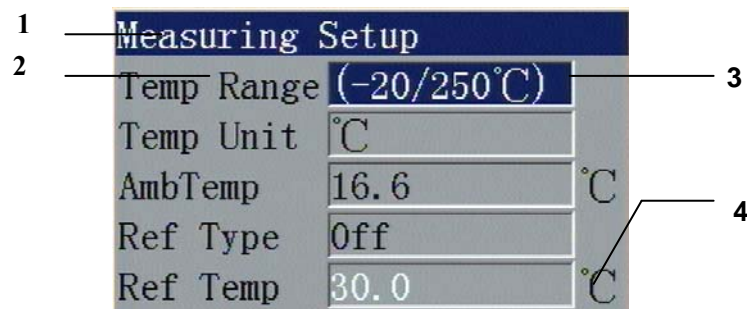
4 Operation guide

4.1 Interface



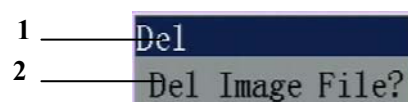
No	Item	Description
1	Company logo	To display the company logo
2	Working status	To display the status of system
3	Area temperature measurement	Area temperature measurement
4	Emissivity	To indicate the current value of emissivity
5	Minimum temperature	Indicate minimum value of the palette
6	Palettes	To show the scale of the thermal image
7	Maximum temperature	Indicate maximum value of the palette
8	Battery status	To indicate the battery status
9	Result	To show the value of area measurement result
10	Temperature units	Current temperature unit, have 3 options: °C, F and K

Dialogue box



- **Confirm dialogue box title:** Display the dialogue box title. Such as the example shows: 'Temperature measurement setup'
- **Confirm dialogue box contents:** Display the dialogue box contents. Show the example is: 'Temperature range' is the contents.
- **Confirm dialogue box entity:** Every Confirm dialogue box contents is corresponding to a dialogue box entity. The black character figures that the content is efficient or changeable; the white character figures that the content is inefficient (normally because correlative item doesn't turn on. For example, the reference temperature measurement is off, so the reference temperature is inefficient).
- **Measure Unit:** Show current measurement unit used. Such as uses °C for temperature.

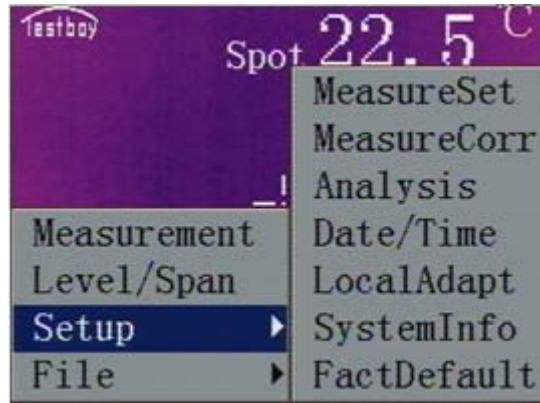
Prompt interface



- **Dialogue box:** Show the title of the dialogue box
- **Dialogue box content:** Show the content in the confirm box. 'Delete the file?' is the content of this box.

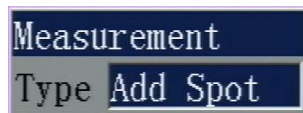
4.2 Menu functions

The menu system is organized into four main groups: temperature measurement mode, Level/Span, setup, File. When there is submenu it will show to convenient operate.



4.2.1 Temperature measurement mode

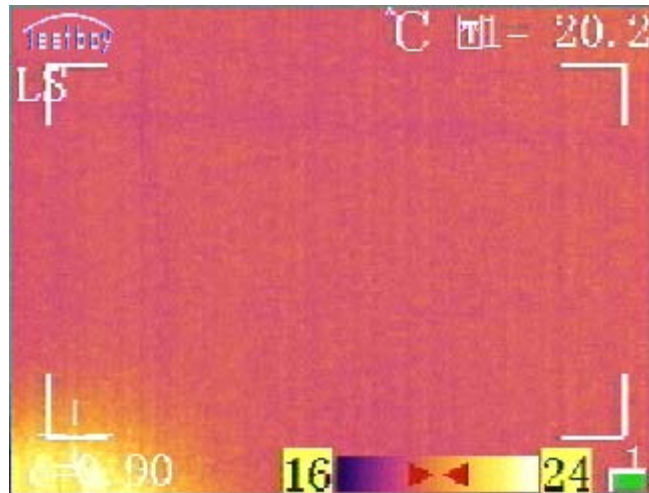
This function is used to add or delete object measurement. Choose and confirm will show the following dialogue box.



If choose 'no', then press confirm button, it will delete all the measurement.

Note: To delete single object measurement, user can press "A" button to activate it, and then press C button to delete it.

4.2.2 Level/Span



User can observe the more colorful and better quality image via adjusting the relationship of temperature and color.

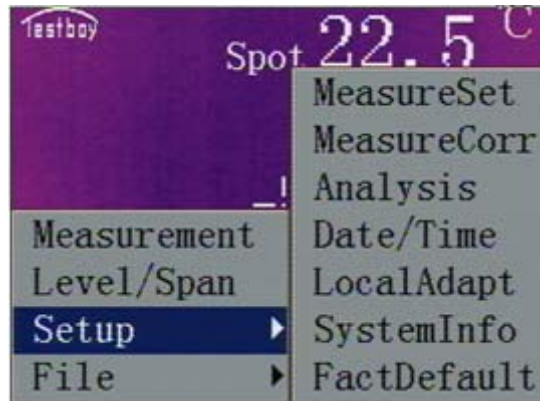
Press **Confirm** key to activate the main menu and select Level/Span. It can switch auto mode and manual mode. Press **A** key to select palette and adjust the image manually.

If Level selected, camera will adjust image layout automatically.

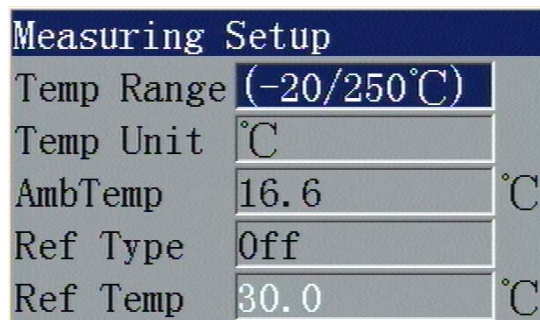
If Span selected, user can adjust image layout by changing the palette max and min values. Press **Up** key to increase the max and min values of palette; press **Down** key to decrease the max and min values of palette; press **Left** key to decrease the max value but increase the min value; press **Right** key to increase the max value but decrease the min value.

Note: In Span mode (Manual), press **C** key to exit the Span mode and enter into Level mode (Auto).

4.2.3 Setup



4.2.3.1 Temperature measurement setup



Press **Confirm** key to activate the main menu. Select Setup->MeasureSet and press **Confirm** key to pop up the Measuring Setup dialog box. User can set temperature range, lens type, temperature unit, ambient temperature, reference type and reference temperature. Press **Up** and **Down** keys to choose different items, **Left** and **Right** keys to modify the item contents.

- **Temp Range:** Set measurement temperature range.
- **Temperature unit:** Three options: °C, F and K.
- **Ambient temperature:** When start-up, camera will detect ambient

temperature automatically.

- **Reference type:** When Ref Type is “On”, the temperature of the measured object displayed on the screen is the difference against the reference temperature.
- **Reference temperature:** When **Ref Type** is enabled, this item is valid. Fixed temperature or the object temperature can be reference temperature.

Note: when the temperature range is 400°C to 1000°C, the high temperature attenuation lens must be used to prevent the sensor from being damaged.

4.2.3.2 Temperature measurement correction

MeasureCorrect	
Emissivity	0.96
TCorrect	0.0 °C
Distance	2.00
Humidity	60
TReflect	Close
	26.2 °C

Press **Confirm** key to activate the main menu. Select Setup->MeasureCorr and press **Confirm** key to pop up the Measure Correct dialog box. User can set emissivity, temperature correct, distance, humidity and temperature reflect. Press Up and Down keys to choose different items, **Left** and **Right** keys to modify the item contents.

- **Emissivity** Since different objects have different emissivities, it can set different emissivities for different spots. If not set manually, system will use the default one. Appendix A provides emissivities of common materials.

- **TCorrect:** Set correction temperature.
- **Distance:** Set the distance between the camera and the target object. If the distance is less than 10 meters, try to use the practical distance (accuracy is 0.5m).
- **Humidity:** Set ambient humidity when using the camera.

4.2.3.3 Analysis setup

Analysis Setup	
Temp Alarm	Close
Alarming Temp	50.0 °C
Alarming Color	Auto
Isotherm Color	Auto
Isotherm Temp	50.0 °C
Isotherm Width	1.0 °C

Press **Confirm** key to activate the main menu. Select Setup->Analysis and press **Confirm** key to pop up the Analysis dialog box. User can set temperature alarm, alarming temperature, alarming color, isotherm color, isotherm temperature and isotherm width. Press **Up** and **Down** keys to choose different items, **Left** and **Right** keys to modify the item contents.

- **Temp Alarm:** Only valid in area measurement. When set as Open, if the target temperature is higher and lower than the alarming temperature, the camera will alarm automatically by voice and color. Alarm color is set by item Alarm Color.
- **Alarming Temp:** Set alarm temperature. Only valid when Temp Alarm is set to Open.

- **Alarming Color:** When target temperature is higher than the alarming temperature, the alarming area will display the alarming color. There are 9 colors. If set to Auto, it indicates it will not change the screen's color.
- **Isotherm Color:** Display the image in the set temperature range by isotherm color. There are 9 colors. If set to Auto, it indicates it will not change the screen's color.
- **Isotherm Temp:** Indicate the temperature of the isothermal central point.
- **Isotherm width:** Used for setting range of isothermal area. For example, if isotherm temperature is set to 50°C and isotherm width is 1°C, the isotherm range is 49.5°C ~ 51.5°C.

4.2.3.4 Date & Time

Date Time	
Year	2008
Month	01
Day	02
Hour	04
Minute	55
Second	34

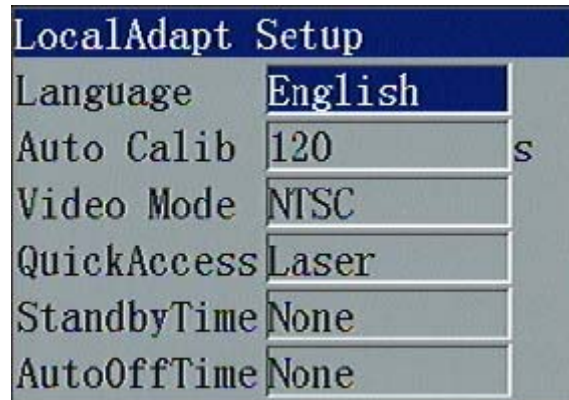
User can set the system date and time. After setting, the camera will save the current setting.

Press **Confirm** key to activate the main menu. Select Setup->Date/Time and press **Confirm** key to pop up the Date/Time dialog box. User can set Year,

Month, Day, Hour, Minute and Second. Press **Up** and **Down** keys to choose different items, **Left** and **Right** keys to modify the item contents.

Note: without using for a long time, it needs to reset the system time since the internal battery will not have enough electricity.

4.2.3.5 Local Adapt



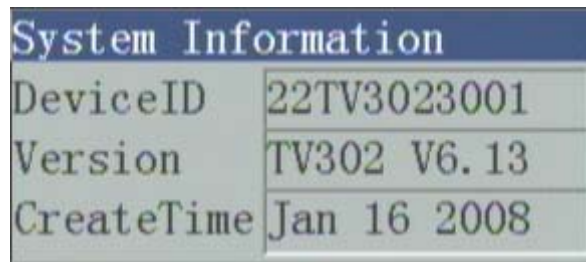
Press **Confirm** key to activate the main menu. Select Setup->LocalAdapt and press **Confirm** key to pop up the Local Adapt Setup dialog box. User can set language, Auto calibration interval, video mode, quick access, standby time and auto off time. Press **Up** and **Down** keys to choose different items, **Left** and **Right** keys to modify the item contents.

- **Language:** Select system language.
- **Auto Calib:** Set the time interval of auto calibration in order to get better image and improve the measurement accuracy. Unit is second.
- **Video Mode:** Two options: PAL and NTSC.
- **QuickAccess:** User can self define the key functions: laser, SpotTemp, Area Temp and Save key.

➤ **Laser:** turn on or turn off the laser indicator;

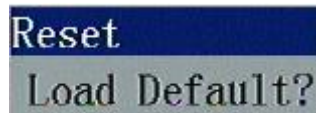
- **Spot temperature measurement:** increase or delete spot;
- **Area temperature measurement:** increase or delete area;
- **Save key:** save the current image.
- **StandbyTime:** If no any action during the set time, the camera will turn off the screen automatically to save the battery. Press any key except power key to reactivate the screen. If set to None, the function is disabled.
- **AutoOffTime:** If no any action during the set time, the camera will turn off the main power automatically to save the battery. If set to None, the function is disabled.

4.2.3.6 System information



Press **Confirm** key to activate the main menu. Select Setup->SystemInfo and press **Confirm** key to pop up the System Information dialog box. It displays the Device ID, Version number and Software release date (Note: it is not manufacture date).

4.2.3.7 Default Factory



It is used to reset factory default. Press **Confirm** key to activate the main

menu. Select Setup->FactDefault and press **Confirm** key to pop up the Factory default dialog box. Press **Confirm** key to reset the factory default. Press **C** key to cancel the reset operation. Appendix B indicates the detailed factory default parameter table.

Note: Reset function will delete all parameters defined by user.

Default parameter table

Temperature measurement parameter

Parameter	Value
Temperature range	-20/250°C
Temp unit	°C
Reference temperature measurement	OFF
Reference temperature	30.0

Temperature measurement correction

Parameter	Value
Emissivity	0.90
Calibrated parameter	1.00
Calibrated temperature	0.0
Distance	5
Humidity	60

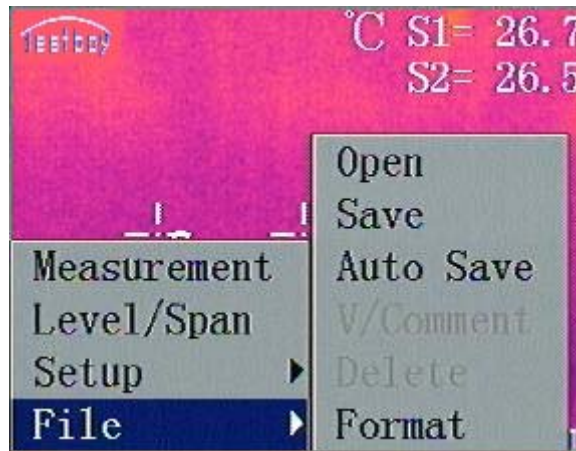
Analysis setup

Parameter	Value
Alarm	OFF
Alarm temperature	50.0°C
Alarm color	Auto
Isotherm color	Auto
Isotherm temperature	50.0°C
Isotherm width	1.0°C

Local Adapt

Parameter	Value
Language	ENGLISH
Auto adjust	600S
Video output	NTSC
Shortcut key	laser pointer
Shortcut key	laser pointer
Screen Turn off time	None
Battery turn off time	None

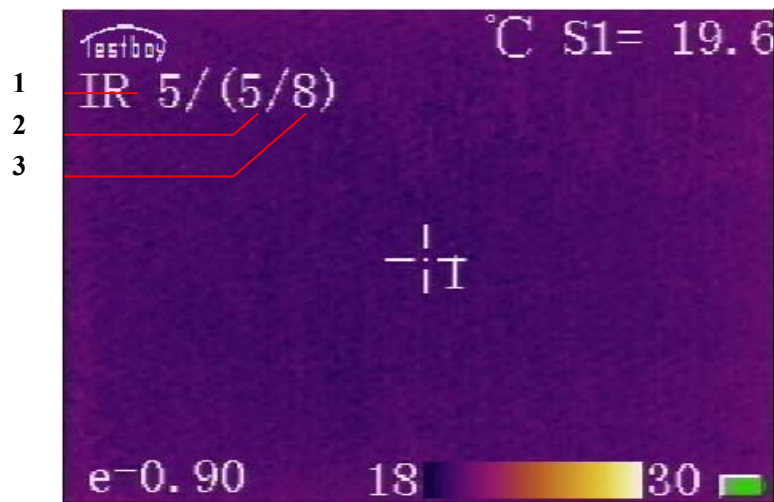
4.2.4 File



The file menu contains all the functions dealing with the digital image, with four submenus of Open, Save, Delete and Format. It contains 6 submenus: open, save, auto save, voice annotation, delete, and format.

4.2.4.1 Open

Press **Confirm** key to activate the main menu. Select File->Open, press **Confirm** key to open the saved images. Press **Left** and **Right** keys to change the images. Press **C** key to exit the opened image and return to measurement status. System automatically records the part number of the opened image last time. It will display this image directly next time.



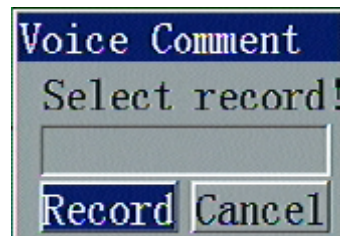
[1] Current file name.

[2] Current file number

[3] Total number of images stored

4.2.4.2 Save

Used for save the image. Press **Confirm** key to activate the main menu. Select File->Save, press **Confirm** key to save the current image into the internal FLASH and pop up the Voice Comment dialog box as below:

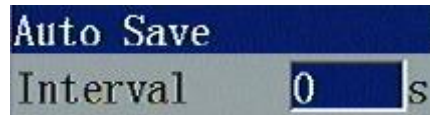


Select **Record**, press **Confirm** key to start recording. If voice comment is not required, press **C** key or select **Cancel** to exit this function.

System auto maintenance and manage the storage method of FLASH memory.

4.2.4.3 Auto save

Press **Confirm** key to activate the main menu. Select File->Auto Save, press **Confirm** key to pop up the Auto Save dialog box. Press **Left** and **Right** keys to set the values. If interval time is 0s, the Auto Save function is disabled.

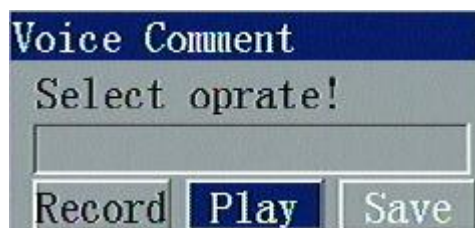


4.2.4.4 Voice annotation

V/Comment

Used for replaying voice comment or recording voice comment again. Press **Confirm** key to activate the main menu. Select File->V/Comment, press **Confirm** key to pop up the Voice Comment dialog box. Select **Play** to replay the voice comment; select **Record** to re-record the voice comment. When record is finished, select **Save** to save or it will not be saved. You can also press C key to finish record when you want to stop.

This function is only valid when the replayed image has voice comment.



Note: if you want to add voice comment to an image without voice comment, open the image firstly and select Save option.

4.2.4.5 Delete

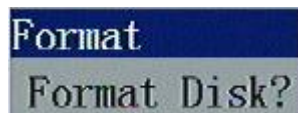
Used for deleting the image. When camera is on image replay status, press **Confirm** key to activate the main menu, select File->Delete, press **Confirm** key to pop out the below prompt box. Press **Confirm** key to delete the current opened image. If it has voice comment, it will be deleted together. Press **C** key to cancel the deletion.



Note: before deleting, make sure the file is not needed any more or already backup. It cannot recover after deletion.

4.2.4.6 Format

Used for formatting the internal FLASH. Press **Confirm** key to activate the main menu. Select File->Format and press **Confirm** key to pop up the below dialog box. Press **Confirm** key to do format; press **C** key to cancel the format.



Note: Be careful to use this function. Make sure the file is not needed any more or already backup before format. After format, all the images in the FLASH will be deleted and cannot be covered.

5 Technical Specifications

Item	Technical Specification
Camera model	TV302
Detector type	Focal Plane Array (FPA), uncooled microbolometer 160×120 pixels
Thermal sensitivity	0.1°C @ 30°C
Resolution	160×120
Pixel size	35μm×35μm
Spatial resolution	1.9 mrad
Spectral range	8~14μm
Field of view/ min focus distance	18°×13°/0.3m
Image frequency	50Hz/60Hz
Image display	2.5" color LCD, Full screen pseudo color
Image storage	Built-in memory ,up to 1000 images
Voice annotation of images	40s voice/per piece image
Laser pointer	Class2 ,1mw/635nm red
Temperature ranger	-20°C~+1000°C
Accuracy(% of reading)	±2°C or ±2% maximum of reading whichever is greater
Temperature measurement mode	4 Moveable spots, 3 areas, 1 liners; maximum and minimum, alarming
Interfaces	USB ,audio, video, external power
Operating temperature	— 15°C~50°C
Storage temperature	— 25°C~60°C
Humidity	≤90% none-condensing
Power	10~15VDC; topical 12 V
Battery	Rechargeable Li-Ion, 3h operation
Weight	600g(including battery and lens)
Size	270mm×100mm ×75mm

6 Troubleshooting

In the case that infrared camera may experience problem, please carry through the following examine and repair. If the problem can't be solved, please remove the power and contact our maintenance department.

Symptom	Reason and Resolve
Can't start camera	<ul style="list-style-type: none">● Didn't install battery, or install incorrectly. →install battery or reinstall.● Battery is used up. →Change the battery.● Auto turns off to protect camera →Restart 5 seconds later.
Camera auto turn off	<ul style="list-style-type: none">● Battery is used up. →Change the battery.● Setup the power turn off time. →Deactivated this function.
Battery goes fast	<ul style="list-style-type: none">● Environment temperature is too low● Battery didn't charge completely. →Recharge the battery.● Battery died, and is not rechargeable. →Use another battery.
No thermal image	<ul style="list-style-type: none">● Forgot to remove the lens cover. →remove the lens cover.● Under the image frozen state. →press 'C' button to return to the real-time image.● Battery is used up. →Change the battery.
The thermal image turns to black and white	<ul style="list-style-type: none">● Whether or nor choose the black and white palette.● Restart the camera. Switch video output between NTSC and PAL.

Appendix

Material Emissivity (Only for reference)

Material	Exterior status	Temperature (°C)	Emissivity (ϵ)
Aluminum	Non-oxidation	100	0.20
	Oxygenated	100	0.55
Brass	Brown after grinding	20	0.40
	Dull luster	38	0.22
	Oxygenated	100	0.61
Copper	seriously oxygenated	20	0.78
Iron	Oxygenated	100	0.74
	Rusty	25	0.65
Cast iron	Oxygenated	200	0.64
	Non-oxygenated	100	0.21
Wrought iron	Quarry-faced	25	0.94
	Glazed	38	0.35
	Polished	38	0.28
Nickel	Non-oxygenated	200	0.37
Stainless steel	Oxygenated	60	0.85
Steel	Oxygenated in	200	0.79
Common brick	Surface	20	0.93
Concrete	Surface	20	0.92
Glass	polished plate	20	0.94
Lacquer	White	100	0.92
	Black	100	0.97
Carbon	Smoke black	25	0.95
	Candle soot	20	0.95
	Rough lead surface	20	0.98
Oil Paint	Mean value of 16 colors	100	0.94
Paper	White	20	0.93
Sand & soil	Surface	20	0.90
Timber	Scraped	20	0.90
Water	Distilled water	20	0.96
Pottery & porcelain	Fine	21	0.90
	Coarse	21	0.93



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