



TPI 9050 UltraVision

Industrial Acoustic Imager

User Manual V2.6



Warranty and Calibration

WARRANTY

This product is warranted to the purchaser against defects in material and workmanship for one year from the date of purchase.

Covered by Warranty: Repair parts and labor; or replacement of the product at company's option. Normal transportation charges to the purchaser are also covered.

Not Covered by Warranty: Damages to the product which are the result of abuse, improper use or maintenance are not covered. Any other expense, consequential damages, incidental damages, or incidental expenses including damages to property are not covered. Transportation expenses to the company are not covered.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

To Obtain Warranty Performance: Include with the product: your name, address, phone number, written description of the problem and proof of purchase date. Carefully package and return to:

TPI, Inc.
9615 SW Allen Blvd.
Beaverton, OR 97005
USA
503-520-9197
www.testproductsintl.com

TPI Canada
342 Bronte Rd. S., Unit 6
Milton, Ontario L9T 5B7
Canada
905-693-8558
www.tpicanada.com

TPI, Europe Ltd..
Unit 6
Rutherford Way Industrial Estate
Rutherford Way
Manor Royal
Crawley
West Sussex
RH10 9LN
44 (0) 1293 53019
www.tpieurope.com

Implied Warranties: Any implied warranties, including implied warranties of merchantability and fitness for a particular purpose, are limited in duration to three years from date of purchase. To the extent any provision of this warranty is prohibited by federal or state law and cannot be preempted, it shall not be applicable. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Calibration

Calibration is recommended once per year. Please contact TPI for service and calibration.

Overview

The TPI 9050 UltraVision Industrial Acoustic Imager supports audible and ultrasonic frequencies.

The 9050 uses microphone array beam forming technology to acquire sound source distribution data, and collect video images in real time with a high-definition camera. By integrating the sound source distribution data with the video image, the changing sound source is dynamically presented on the display screen.

The UltraVision Industrial Acoustic Imager helps you quickly detect potential pressurized gas leaks and vacuum leaks in noisy industrial environments. Used in power systems, it can help you quickly identify potential partial discharge fault points.

The 9050 acoustical imager is made of an aluminum alloy shell, which is strong and durable and can adapt to the complex and changeable working environment.

The UltraVision is simple and convenient to operate and can be used to quickly find faults. Only two parameters need adjustment, the test frequency range and test dynamic range, to meet the vast majority of test requirements.

The 9050 supports camera mode, video mode, and data recording to provide job site flexibility. The large capacity TF data memory card can be expanded, and test results can be exported and reported quickly.

Safety



To prevent possible product damage or personal injury, please note:

Read these safety instructions carefully before using the product.

- Use the product only for the purpose it was designed.
- Do not disassemble. There are no user serviceable parts.
- In case of equipment malfunction, terminate use and contact TPI.
- Please contact TPI for maintenance and calibration.
- Do not place the 9050 near a heat source, flame or in a high temperature environment.
- Please do not charge the device in a high temperature environment (over 113°F / 45°C).
- If internal lithium-ion battery leakage occurs, stop using the device and contact TPI.
- If contact with battery leakage occurs, wash with water immediately and seek medical attention.
- If the 9050 is going to be stored for a month or more, please keep the instrument in an environment where the ambient temperature is below 104°F / 40°C. Storage at higher temperature may result in battery leakage and may cause damage to the device.

Terminology

USB Power Delivery (USB PD)

A power delivery protocol based on USB3.1, which is often used to transmit more power in USB interface.

Sound Pressure Level (SPL)

A physical quantity used to express the magnitude of sound waves, the unit of measure is decibels (dB). It is also used as dBSPL.

Audible domain

The frequency range of sound that can be perceived by human ears generally refers to the sound in the frequency band of 20Hz-20kHz.

Ultrasonic

Generally refers to the frequency of more than 20kHz sound, the human ear cannot perceive.

Sound image

Refers to the two-dimensional data table representing the intensity distribution of sound sources in the space plane after the signal collected by microphone array is calculated by the sound source location algorithm.

Palette

The color data used in the color mapping of the sound cloud charts.

Sound cloud image

The sound pressure level data of each resolution point on the sound image is mapped to a certain color number on the palette according to a certain conversion formula to form a color image, and then it is fused with the visible image to form a sound cloud image.

Test frequency range

When a frequency range is selected within the full frequency range supported by the device, the device will only measure and display a sound cloud image that is within this frequency range. Sound outside this frequency range will not be displayed.

Frequency peak

A peak in the spectrum, denotes a strong sound energy distribution at this particular frequency.

Dynamic range




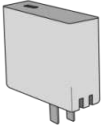



The scale of the intensity of the sound source that can be shown on the sound cloud image.

Field of view

For a camera, it is an angle formed by the camera and the two diagonal points of the rectangular picture which is captured by the camera.

For a sound cloud image, it is the angle formed by the microphone array and the two diagonal points of the rectangular sound image which is captured by the microphone array.

Device and accessories


Part	Part Number	Description
	9050	UltraVision industrial acoustic imager
	A9050	Hand straps
	A9051	Shoulder strap
	A9052	Power adapter charging
	A9053	Charging cable
	A9054	Connect to 9050 to monitor ultrasonic wave, etc
	A9055	Carrying case for the 9050 and accessories

Battery and Charging

Battery information

Built-in lithium-ion battery nominal capacity 6600mAh@7.2V.

Charging information:

Please charge the device through the USB Type-C port marked with the charging logo 

The 9050 supports USB PD quick charging protocol. It is recommended to use a power adapter or power bank that supports 12V to 20V voltage output and the minimum output power is not less than 15W to charge the device.

Charging and Battery Endurance:

Keep the 9050 turned off while charging. After inserting the charger, the charging indicator will turn on, indicating that the 9050 is charging; The 9050 is fully charged when the charging indicator turns off.

When the battery is fully charged, the device displays 4 grids of level when turned on and can be used for about 4 hours; 3 grids can be used for about 2.5 to 3 hours; 2 grids can be used for about 1.5 to 2 hours; 1 grid can be used for about half an hour to 1 hour.

When the battery's charge gets low, you'll see the low battery warning on the screen. Please charge in time.

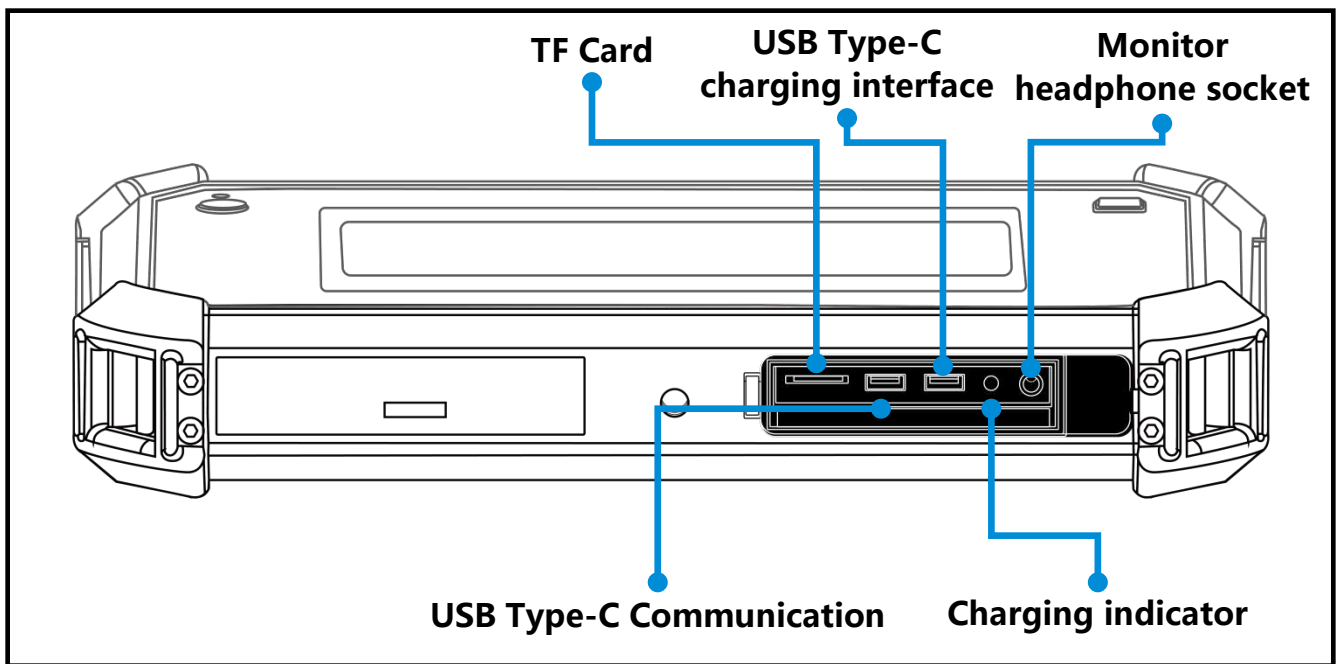
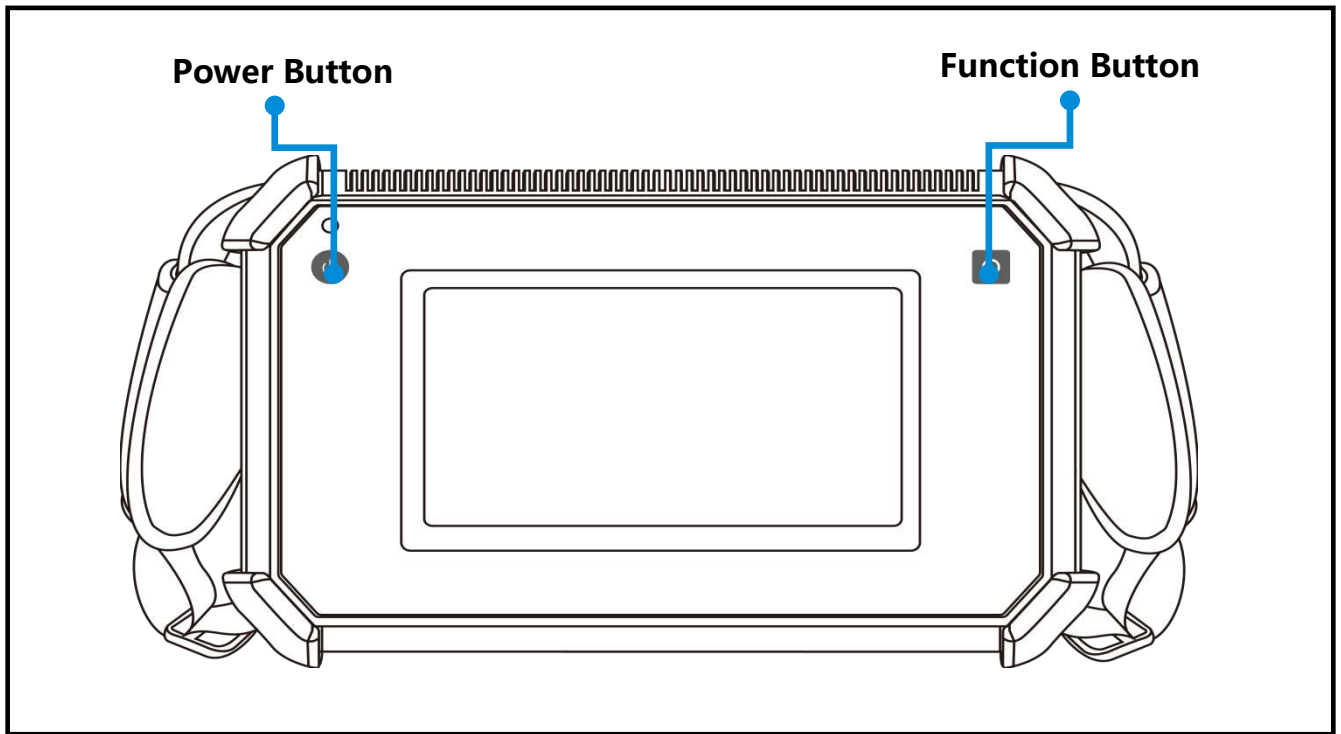
To extend battery life:

- Please do not charge the 9050 for more than 24 hours.
- Charge the battery regularly when stored for long periods of time.
- Store the 9050 at temperatures of 4°F to 104°F (-20°C to +40°C)

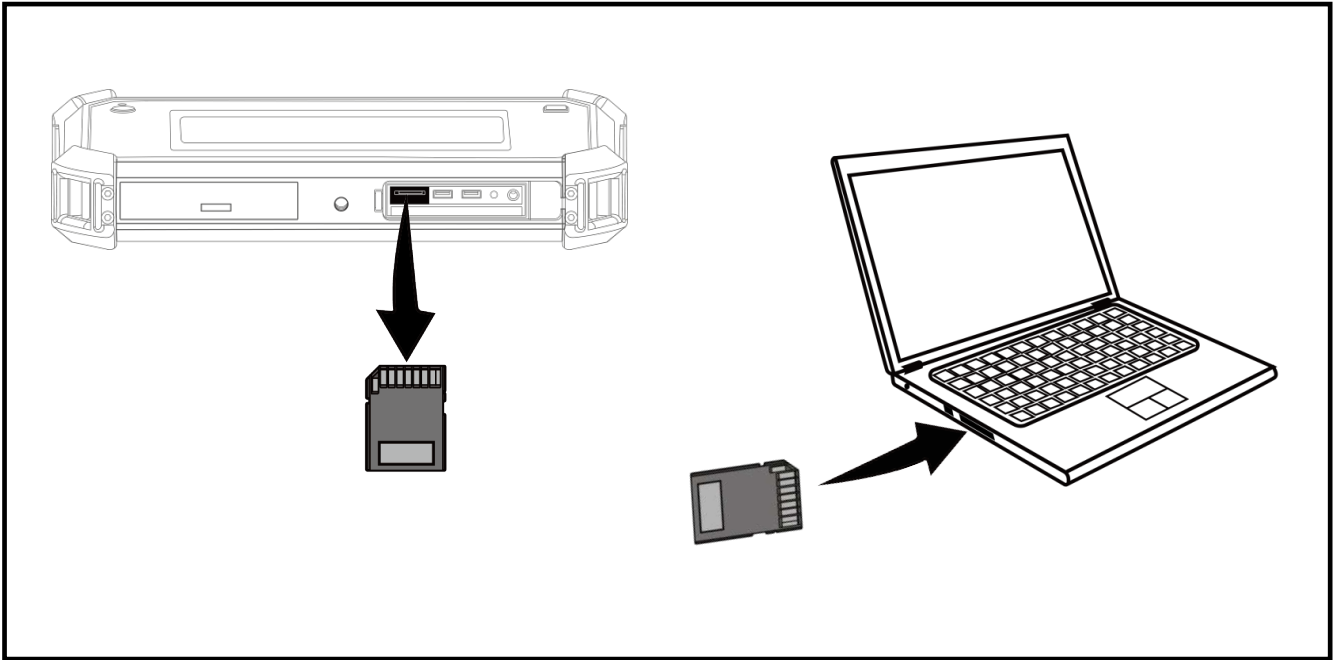


Note: When the battery will no longer take a charge and requires replacement, please contact TPI for service. Do not disassemble the 9050 as the battery is not user replaceable.

Function



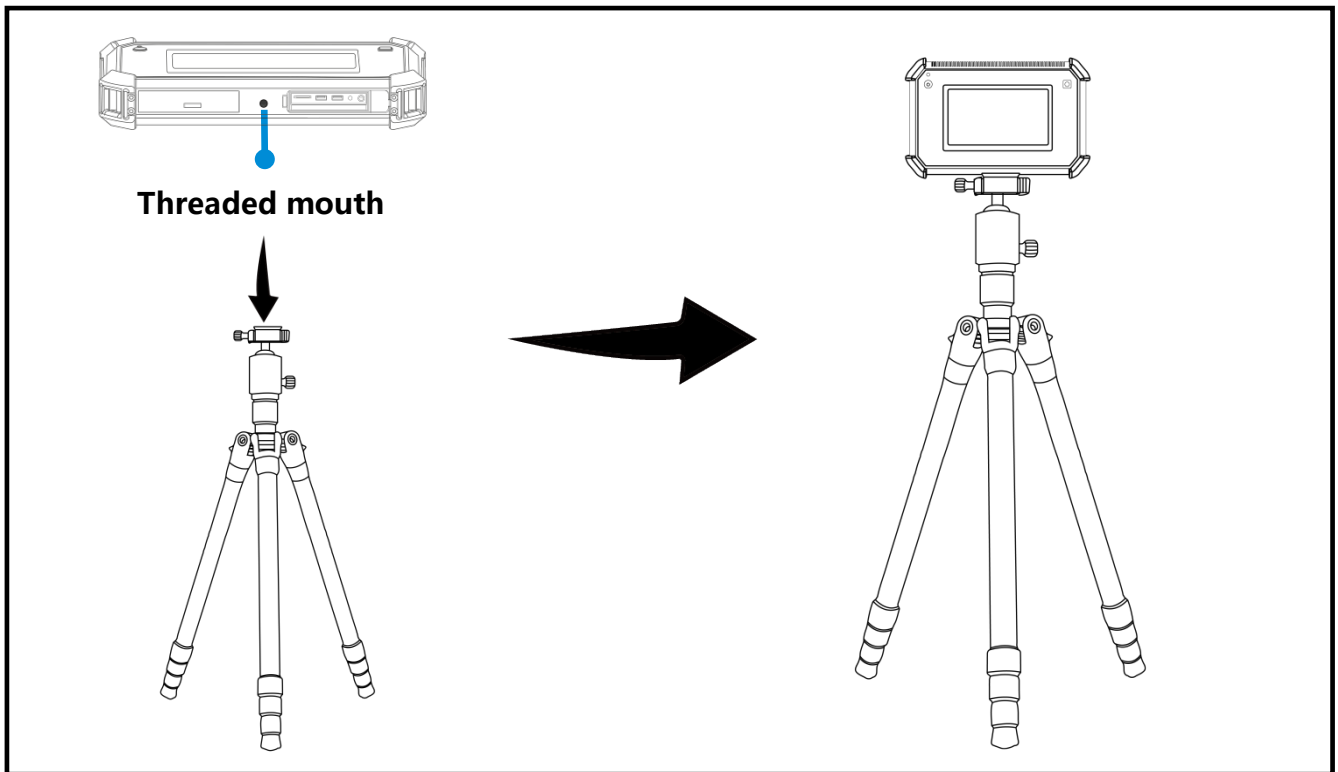
Expandable TF card



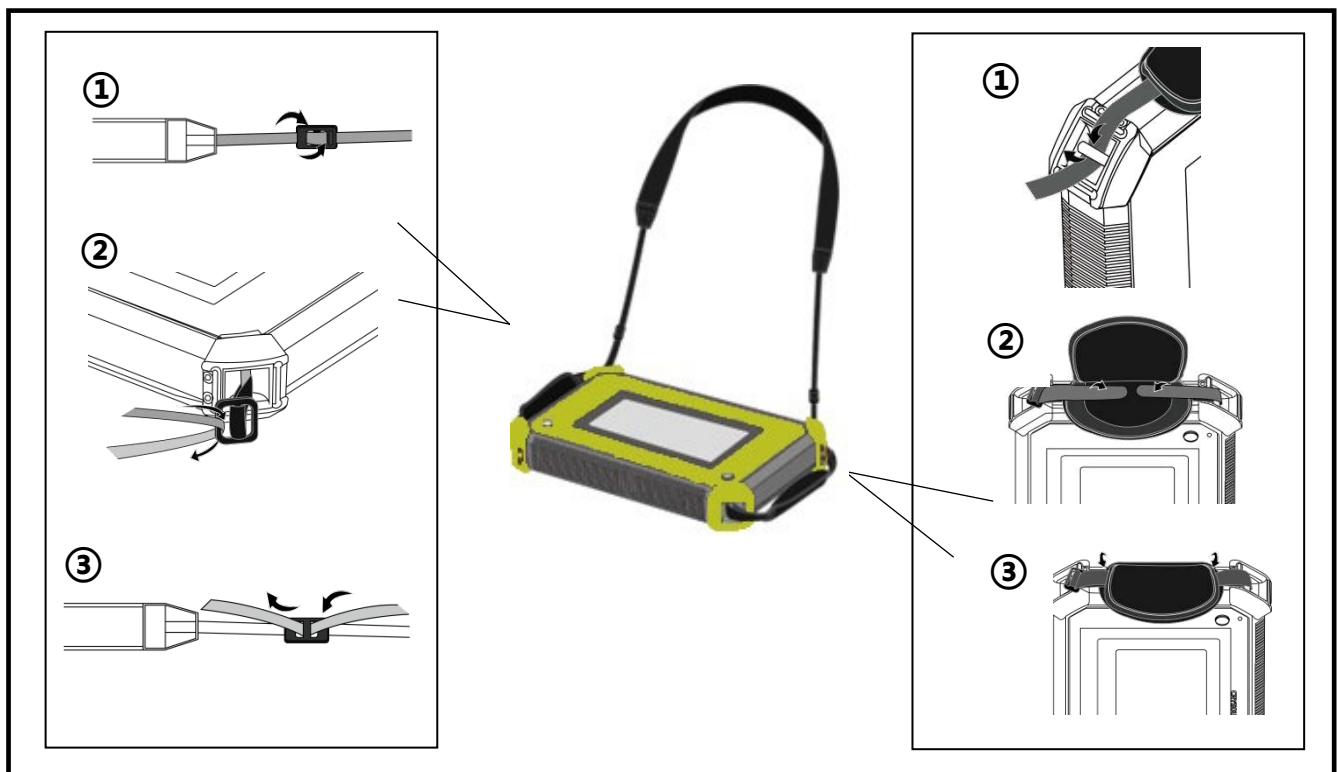
Notes for the use of TF Card

- Do not remove or insert the TF card when video recording.
- After taking photos and recording videos, please wait until the data is saved successfully before inserting and removing the TF card.
- Do not remove or insert the TF card when browsing and marking data under the playback menu.
- When reading TF card data on the PC, do not change the names of files and folders in the TF card, otherwise, test data may not be correctly identified and displayed in the playback menu.

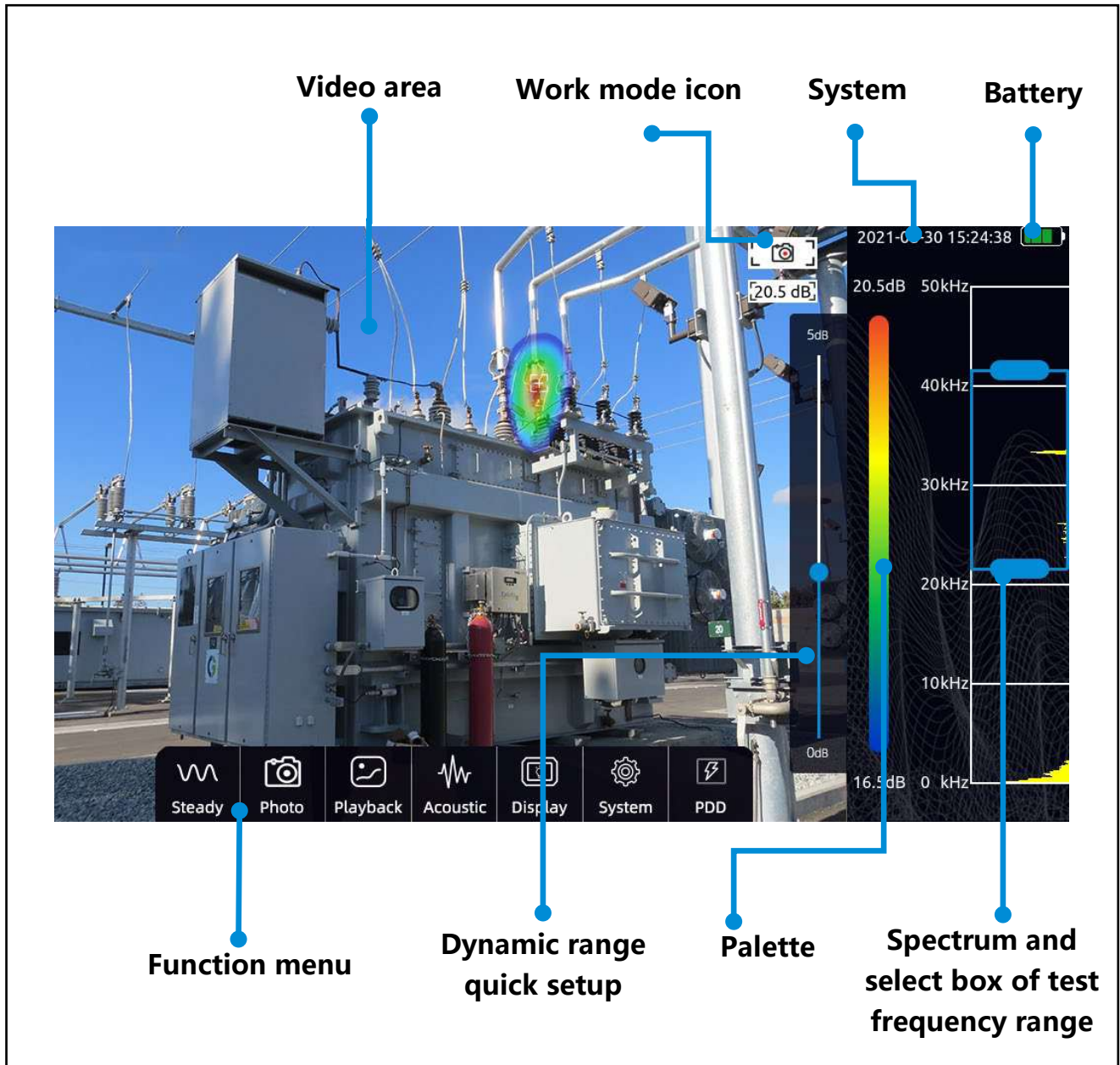
Tripod



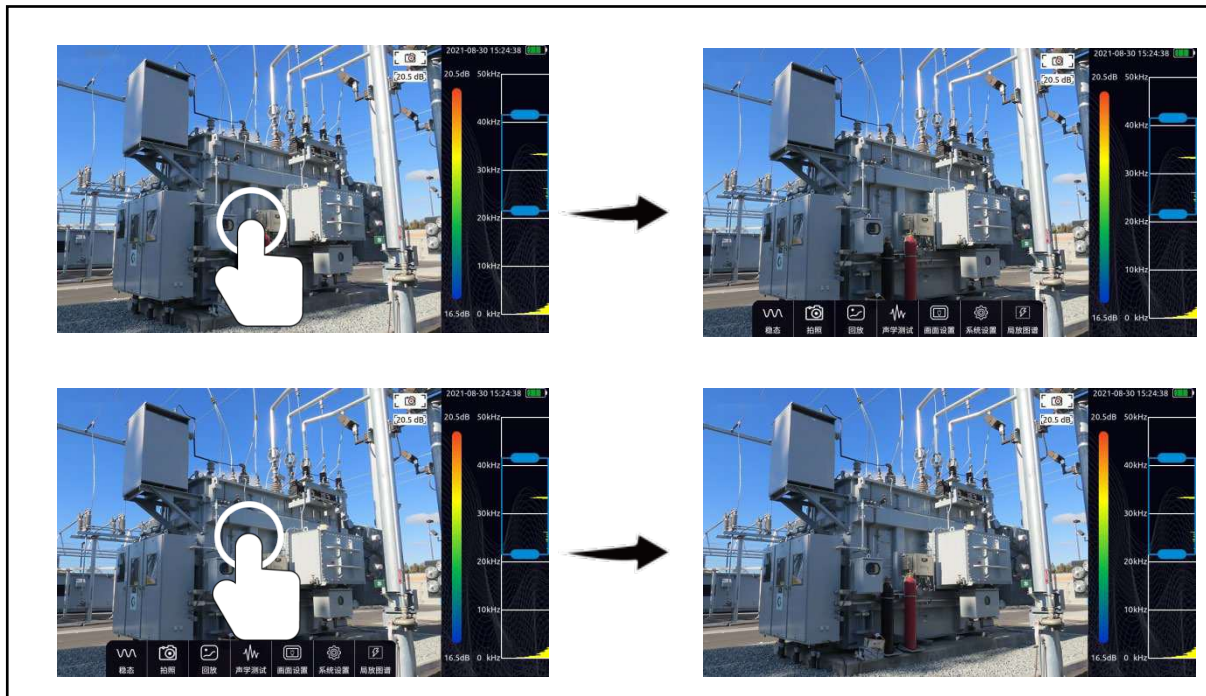
Hand straps and shoulder strap



Software interface



Function menu

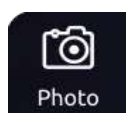


- Click in the video area of the screen to call out the menu bar
- Click again or do nothing for a few seconds, the menu will be hidden automatically

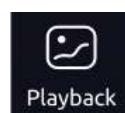
The Function menu include



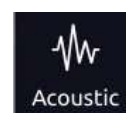
steady-state



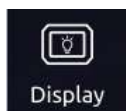
**Work mode
switch button**



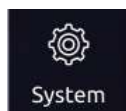
Acoustic



Playback



Display



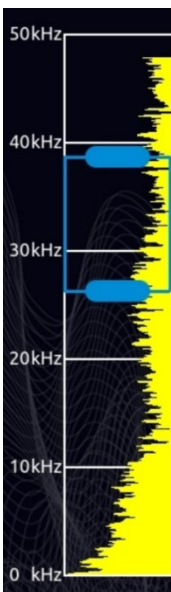
System

Palette and dynamic range



- Click the palette on the main interface to call out the dynamic range dialog
- Click the area outside the dynamic range dialog to hide
- Dynamic range parameter can be adjusted into this dialog

Test frequency range



- Press on select box to move it
- Press on a single side of select box to adjust up limit or down limit

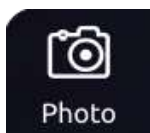
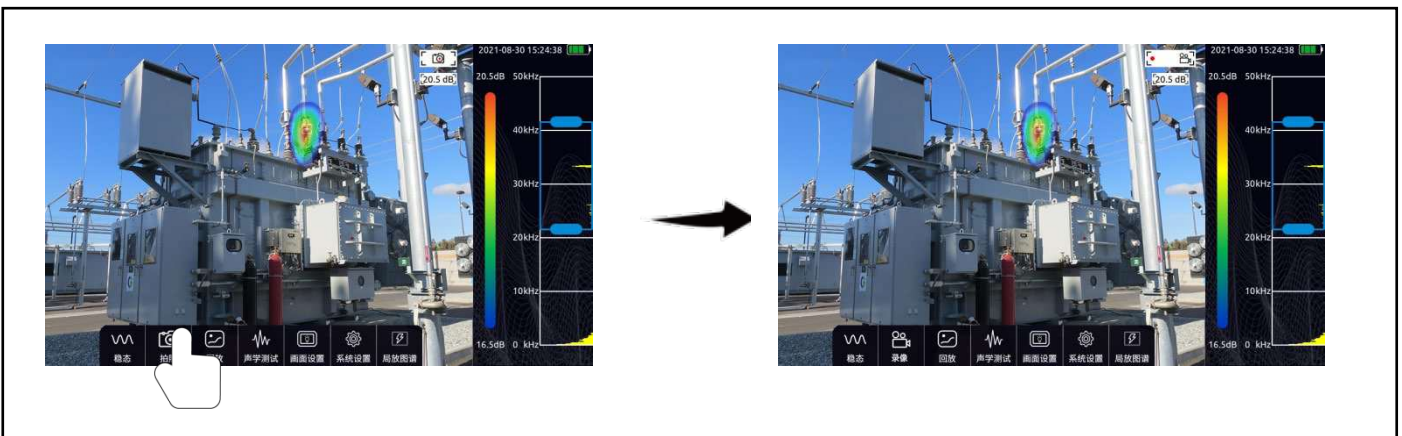
Transient and steady state modes

Click the transient / steady state mode button to switch the working mode of the equipment.

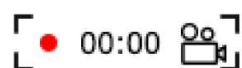
In the transient mode, the equipment has a very fast response speed to the transient signal and can quickly respond to the change of sound source. It is suitable for locating rapidly changing sound source models, such as partial discharge sound source.

In the steady-state mode, the equipment will reduce the response speed to the signal, and the cloud image will be relatively stable. It is suitable for the observation of stable signals.

Video and photo



Click the button on the left of the menu bar to switch between camera mode and video mode.



The icon in the upper right corner of the video area will remind you of the work mode which the device is currently in.

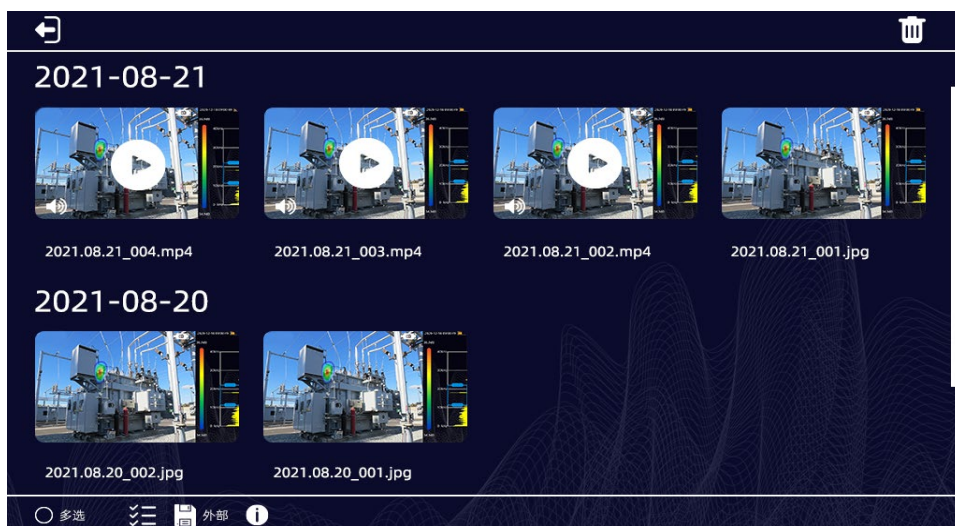
a. In camera mode, press the function button to take a picture.


b. In video mode, press the function button to start recording, press again to stop or it will automatically stop when video exceeds 5 minutes.

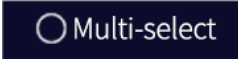
During video recording, you can know the duration of current recording through the icon in the upper right corner of the video area.


Playback


Pictures and recorded video data can be viewed in the playback window.



a.  Click a picture or video to check full size image or play a video.

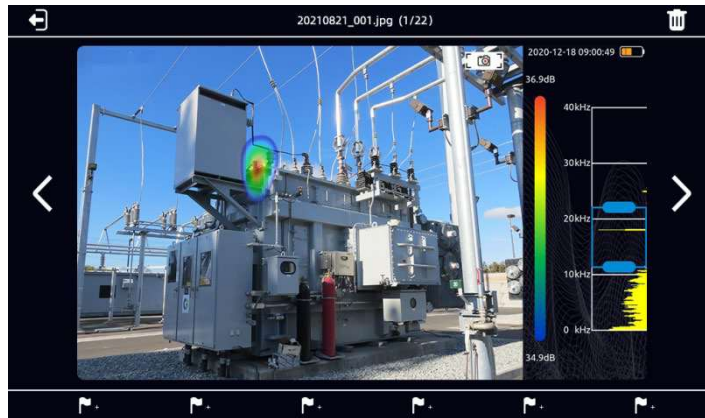
b.  Click Multiple-select to select multiple videos or photos for deletion.

c.  Click the select all button to select all.

d. After selecting a video or photo, click the upper right corner  " to delete the data.

e. Press button  " to check usage information of current storage space.

Picture Playback



Double click the picture to enlarge and play back the picture. After enlarging the picture, you can drag the picture with your finger, and double-click the picture again to restore the original size.

Press the " < " and " > " or touch and sliding left and right to view the next or before.

Video playback



Click the video thumbnail to zoom in and play the video.

Press on " ⏪ " to playback a video.

Press the video to stop.

Press the " < " and " > " or touch and sliding left and right to view the next or before.

Drag the progress bar below the video to adjust the playback progress.



Picture, audio, text Tags

In "Playback," click a video or an image and six white flag ICONS appear at the bottom of the screen. You can click the icon to mark a video or picture. The video or picture can be tagged with image, audio, and text. A total of six tag contents can be added for the three tag types.

Picture tag can take a picture as the tag content, the picture content can be nameplate, character tag, etc. Click the icon to select image markers, press the function button on the right to take a photo with the camera, click the save icon in the upper right corner to save the marked content, click the button on the right to cancel the picture taken, click the lower right corner to select the photo resolution, the marked picture supports 1920*1080, 1280*720 and 640*480 resolutions.

Audio tag can record a piece of audio as the tag content, the audio can be a human voice or other live voice. Click the icon to select the audio mark, and press the function button on the right to record an audio with the microphone in the microphone array. The audio is single channel. To improve sound recording, microphone arrays can be placed close to the source or speaker. After recording, press the function button on the right to stop recording. Click the save button to save the recording.

Text tag can input a paragraph of text as the markup content, it also supports keyboard input and two-dimensional code scanning. Click the mark icon to select the text mark and then click the keyboard icon. Click in the pop-up input box and the input keyboard will pop up. You can use the keyboard to input words, symbols, English and so on. After typing, click Save to save the text markup.

Click the icon to select the text mark and then click the two-dimensional code icon. The device will start the camera to scan the two-dimensional code

automatically. Identify to the two-dimensional code will display its contained text information, press the save button to save the text information, press "re-identify" to re-identify the code again.

Acoustic

Dynamic range

Sliding the slide to adjust dynamic range.

Or click the palette bar on the right of the software interface to call out the dynamic dialog and quickly adjust it.

Cursor sound pressure level

The cursor function can be turned on or off.

When the cursor sound pressure level function is enabled, the cursor will be displayed on the video screen, and the cursor number will be displayed below the cursor. And the image energy of the position indicated by the cursor will be displayed below the photo and frequency recording status indicator in the upper right. If three cursors are set, the sound pressure level shown by the cursor 1, 2 and 3 will be displayed from top to bottom. The number of cursors can be set in System Settings > Tools > Number of cursors. A maximum of three cursors can be set.

Record sound while recording video

Press button to enable record sound while recording video.

When it is enabled, if you record video, the sound will be recorded as well.

Ultrasonic monitoring

The equipment can modulate the signal in the ultrasonic frequency band to the audible frequency band, and can monitor the signal with headphones.

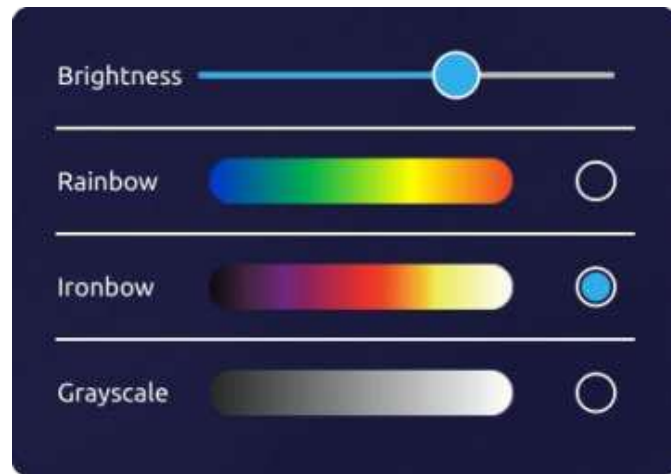
Ultrasonic modulation is realized by superheterodyne. The reference frequency of modulation can be set. It is recommended to use a frequency band of about 38.6 kHz for near modulation and monitoring.

Focusing

The focusing function is mainly used to eliminate environmental interference noise, reflection noise, multi-source interference, etc. when the test environment is noisy and the cloud image is more than single one, scattered and chaotic, the focusing function can be turned on to focus the presentation of the audio-visual cloud image within a circle and eliminate other interference sources.

Double click the circle in the center of the main interface to switch the size of the test range. Double click again to restore the initial size.

Display



Brightness: the brightness is adjustable. When used outdoors, it is recommended to increase brightness for better visual clarity. When used indoors, it is recommended to reduce the brightness for a longer battery life.

Rainbow: set palette to use rainbow

Iron bow: set palette to use iron bow

Grayscale: set palette to use grayscale

System

Language

Chinese, English, Korean, French is supported, after selecting the language, the software will switch the language.

Time

Adjust system time.

When system time is changed, press“ update time” to take effect.

Lock

The device can implement a low power strategy. You can turn on the auto sleep function of the device.

After selecting the sleep time, the device will automatically enter the sleep mode if it does not perform any operation during the time. When the device sleeps, the power indicator will flash. By pressing the power button, the device can quickly wake up and be ready for testing.

Only when the auto sleep function is set can the device set auto shutdown. After selecting the shutdown time, the device will automatically shutdown if it does not be awakened during the time.

Tool

Log export function: click and confirm to export the equipment operation log to the TF card. The equipment operation log is generally used by the manufacturer to diagnose the equipment status, and users generally do not need to use it.

The number of cursors is used to adjust the number of dynamic cursor displays, which can support up to 3 dynamic cursor displays.

Sensitivity is used to set the minimum sensitivity of cloud image imaging, which can limit the imaging when the cloud image energy is higher than the

sensitivity value. This function can be enabled when the button is turned on, and the sensitivity threshold can be set by sliding the slider.

About

Display device model, serial number, software version and manufacturer information.

Press "check for update" to install a new version of software. Press "check for update", it will check for available packages from external storage(TF card). You can upgrade the software version by selecting the package you want to install.

Partial discharge spectrum

Click "partial discharge spectrum" to open the partial discharge spectrum setting menu.

Click "switch" to open and display the partial discharge spectrum. The AC frequency can be selected as 50Hz or 60Hz.

The partial discharge spectrum is as follows. Observing the characteristics of the spectrum can help users identify the discharge type.

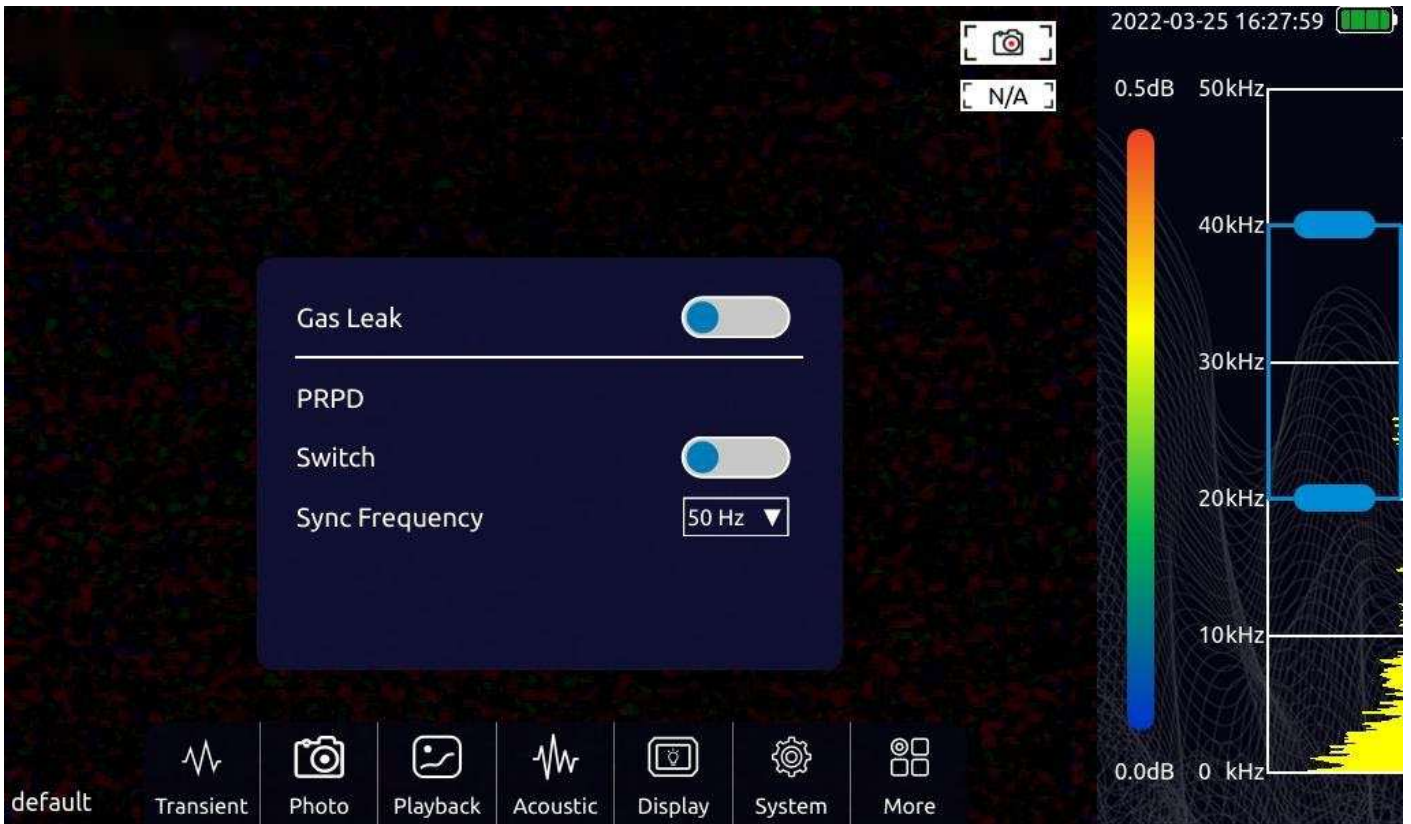
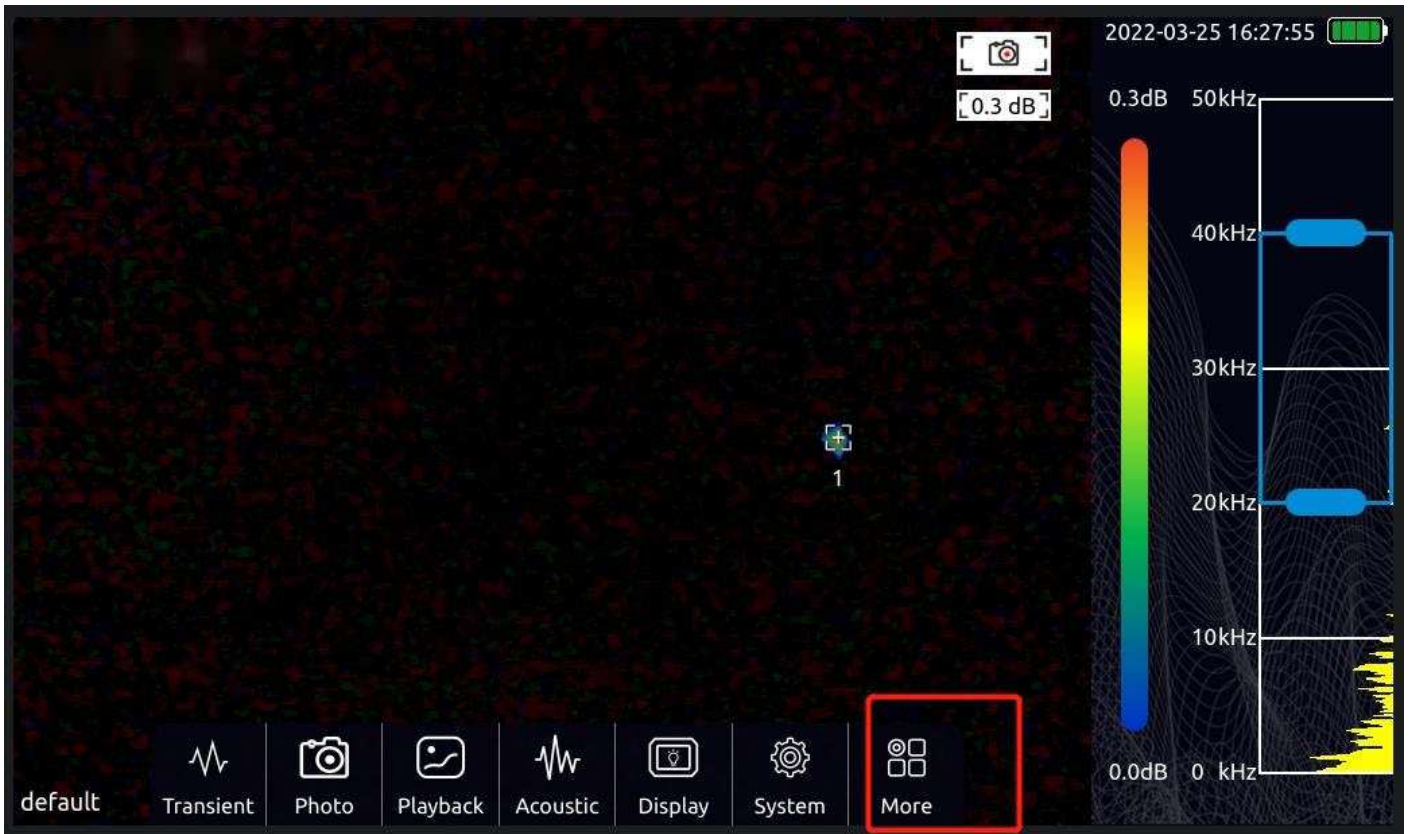


Estimation of gas leakage

Turn on the function of gas leakage level calculation in the equipment. After opening, the software will turn on the focusing function by default to avoid interference. At the same time, the test frequency band will be fixed in the frequency band of 25kHz-40kHz to ensure the accuracy of leakage calculation.

There are options of air pressure and distance on the left side of the software. The user needs to input the air pressure (unit: kPa) and distance (unit: cm) of the leaked gas according to the actual situation of the site. The software will calculate the leakage level and the approximate range of gas leakage according to the gas pressure, distance and calculated leakage energy (for reference). The gas leakage level is divided into levels, and the corresponding leakage direction is shown in the table below:

Leakage Level	Leakage Range (Unit: ml / min, for reference)
0	< 10ml/min
1	> 10ml/min, < 200ml/min
2	> 200ml/min, < 500ml/min
3	> 500ml/min, < 1000ml/min
4	> 1000ml/min, < 1500ml/min
5	> 1500ml/min, < 2000ml/min
6	> 2000ml/min



Equipment use skills

Capture sound source

a) Observe whether there are prominent spectral signals or spectral spikes in the spectrum diagram. If there is, move the select box include the frequency range where the prominent spectral signal or frequency spike is, and then observe if any sound source appears.

b) Try to adjust the dynamic range to a larger value, may simultaneously capture more than one sound sources in the screen. When the SPL of multiple sound sources in the picture is very different, a small dynamic range may cause the larger sound source to drown the small sound source.

Exclude fake sound source cause of reflection

When you are unable to determine if the sound source is an actual sound source or a reflection one. Try to capture the sound source in different test position. If the sound source is steady, then it supposes to be an actual sound source. A reflection one will drift or disappear when be captured in different test position.

Exclude interfering noise

a) It is easy to be disturbed by environmental noise in low frequency band. According to the actual situation of sound source, it is recommended to use middle or high frequency to capture the position of sound source.

b) A relatively narrow band range is suggested to be chosen to locate the sound source, which can eliminate interference noise in other bands.

Equipment maintenance

a) Keep acoustic sensor holes clean, prevent of dust accumulation; when the hole has dust, please gently blow air to clean, do not use a wet cloth to clean.

b) When not in use for a long time, put it into the attached package after charging, and store in a room temperature.

c) Regular inspect and charge battery can effectively increase service life of the battery.

Technical specification

Microphone array

Microphone array: 128 channels MEMS microphone

Effective test bandwidth: 2kHz-48kHz

Sound image FOV: 62°

Sound image frame rate: at least 25 FPS

Test sound pressure level range: 30dB-120dB

Leak detection rate: 10m 5bar 0.92ml/s

0.5m 5bar 0.55ml/s

Test Distance: 0.3m-120m

Camera

Camera FOV: 62°

Camera focal length: 3.04mm fixed focal length

Camera pixel: 8million pixel

Display

Resolution: 1024*600

Size: 7 inch

Touch screen: capacitive touch screen

Brightness: adjustable

Storage

Internal storage: about 8G

External storage: expand TF memory card, at least 64G

Data storage format: .jpg (picture) and .MP4 (video)

Battery

Battery capacity: 6600mAH@7.2V

Battery life: about 4 h under full load state

Charge: USB Type-C port, USB PD protocol supported

Power consumption: 15W for battery charge; 29W for maximum power consumption

Interface

USB 3.0 Type-C USB host port

3.5mm headphone socket

Operating environment

Operating environment: -20°C- +50°C, 10%-95% no condensation

Storage temperature: -20°C – +60°C

Charging temperature: 10°C – +45°C

Mechanical

Size: 272mmx174mmx42mm

Weight: 1.7kg

Attention: Operating time of the 9050 in low temperature environment may be reduced.

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