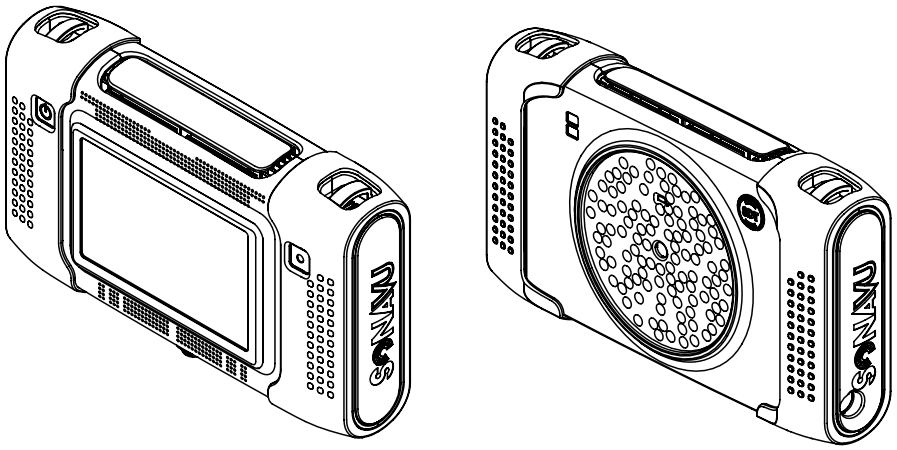
SONAVU
Powered by SDT



Acoustic Imaging Camera

Users Manual

Version 1.0

SDT International sa-nv • Bd de l'Humanité 415 • B-1190 Brussels (Belgium) • Tel: +32(0)2 332 32 25 • email: info@sdtultrasound.com
SDT North America • 7677 County Road 2, Cobourg, ON • Phone: 1-800-667-5325 | 1-905-377-1313 • email: hearmore@sdtultrasound.com
www.sonavu.com

Table of Contents

Precautions and Safety Statement

- **Read this manual in its entirety prior to operating your SonaVu™ acoustic imaging camera.**
- Follow all instructions for safe operation, care, and maintenance of your SonaVu™
- Never leave the instrument powered on while stored in the closed case or other enclosure. Doing so could cause the instrument to overheat. Overheating increases the risk of damage to the instrument or the possibility of a fire.
- Avoid subjecting SonaVu™ to high levels of vibration or shock which could damage the electronics and impact the highly sensitive sensor microphones.
- Do not drop your SonaVu™ nor expose it to any sudden impacts.
- When charging your SonaVu™ take care to avoid creating a tripping hazard from the power cord by maintaining a safe and neat workplace. This is both a personnel safety and an instrument care issue.
- Your SonaVu™ should only be stored in a cool, dry area. Avoid storage rooms that are hot, humid, dirty, dusty, or in direct sunlight. Also avoid storing your SonaVu™ in rooms where other chemicals are kept.
- Avoid using your SonaVu™ in environments outside the prescribed temperature ranges listed on the specification section (-20°C to 50°C or -4°F to 122°F).
- Keep your SonaVu™ away from powerful magnets, power meters, and other similar sources.
- Use care when connecting and disconnecting cables and cords from the main body of your SonaVu™. When disconnecting, grip by the connector – never by the cable itself – and gently pull in a direction perpendicular to the plug. When connection, grip by the connector, align the plugs, and gently insert in a direction perpendicular to the plug. This will avoid unnecessary damage to the cable connection pins.
- Use caution in dirty environments. Avoid the introduction of foreign matter to your SonaVu™, especially around the sensor array, camera lens, and heat shield.
- Never disassemble or modify your SonaVu™ Acoustic Imaging Camera. Doing so automatically voids the warranty.
- In the unlikely event that your SonaVu™ does not work as expected, accurately document the details of the failure and contact SDT Ultrasound Solutions or an authorized service representative.
- Your SonaVu™ contains electronic components and lithium ion batteries. SDT encourages its consumers to properly dispose/recycle unwanted batteries and end-of-life products in accordance with local Federal and state regulations. One solution is to contact MRM E-Cycling Management. Their mission is to bring manufacturers together to help provide convenient, environmentally responsible recycling opportunities to consumers: www.mrmrecycling.com.

Welcome Message

Dear SonaVu™ Customer,

Thank you for entrusting your acoustic imaging camera needs to SonaVu™… Powered by SDT Ultrasound Solutions. This leading-edge technology is in its infancy and you have invested in the finest technology available today.

SDT is the world's favourite ultrasound company. In business nearly a half century, we manufacture ultrasound solutions for the world's biggest and best companies. Our mission is to give you a better understanding about the health of your assets and the reliability of your facility. SonaVu™ helps accomplish your reliability and sustainability goals in many ways.

To get the most from your investment in SonaVu™ I urge you to read this manual in its entirety. It contains many tips for the safe, trouble-free operation and long-life of your product. Additionally, visit our website (www.sonavu.com) often for new content including case studies, operational guidance, and news releases about SonaVu™.

Sincerely,

Allan Rienstra
SDT Ultrasound Solutions,
Division of SDT North America Inc.

General Overview

SonaVu™… Powered by SDT Ultrasound Solutions, is a multi-frequency acoustic imaging camera that takes airborne ultrasound inspection to a new level. Equipped with 112 highly sensitive sonic sensors and a precision optical camera, SonaVu™ brings the power of super-human hearing to focus on its vibrant, color touch screen. It unlocks limitless applications for asset reliability, energy conservation, and safety including compressed air leak management, electrical asset reliability, and much more.

Within these pages you can find information about the safe operation of your SonaVu™ acoustic imaging camera as well as resources on caring for the product so that you may enjoy its benefits for many years.

Product Configuration

SonaVu™ is available in two configurations. SonaVu™ BASE and SonaVu™ PRO:

SonaVu™ BASE

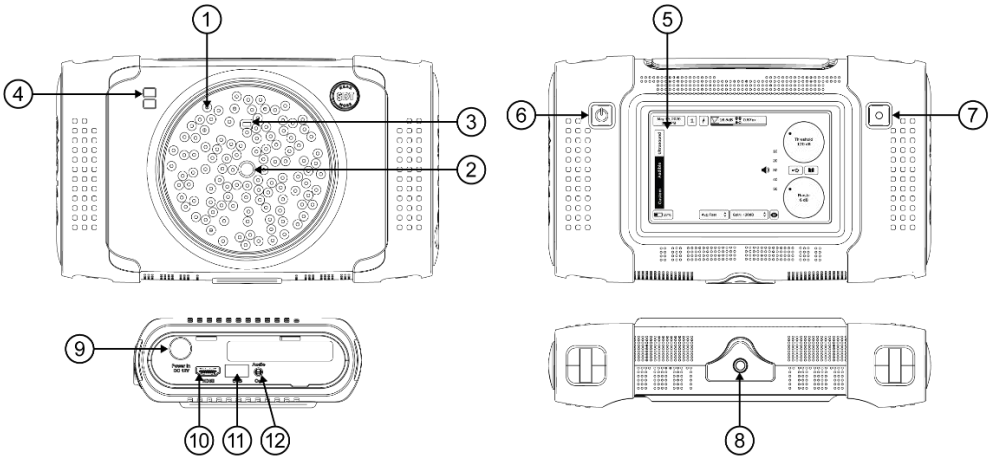
Qty	Article Code	Description
	FS.SVU.STN.001	**SDT SonaVu Base Kit**
1	FU.SVU.001-01	SonaVu Acoustic Imaging Camera w/ Hand Strap and Rubber Grip
1	FU.SVU.PWR.001	SonaVu Power Supply w/ Adapters
1	FU.SVU.CLN.001	SonaVu Cleaning Kit
1	FU.HDPH.ADT.001	Headphone Adapter, 1/4" to 1/8"
1	FUHDPH-21	Headphones, Neckband
1	FU.CA930.CBOX.001-01	SDT930 Custom Carrying Case

SonaVu™ PRO

Qty	Article Code	Description
	FS.SVU.PRO.001	**SDT SonaVu Pro Kit**
1	FU.SVU.001-01	SonaVu Acoustic Imaging Camera w/ Hand Strap and Rubber Grip
1	FU.SVU.PWR.001	SonaVu Power Supply w/ Adapters
1	FU.SVU.CLN.001	SonaVu Cleaning Kit
1	FU.HDPH.ADT.001	Headphone Adapter, 1/4" to 1/8"
1	FU.LKC.001-01	SDT LEAKChecker Receiver w/ 16mm Tip
1	SIBAT1,5VALK-AA	Battery Alkaline 1,5V AA, 2 Pack
1	SIRUBSENS18MMSI	Rubber Tip
1	FUHDPH-21	Headphones, Neckband
1	SICABUSBAUSBBM	USB Cable
1	FUTOOLSCRDRIV	Screwdriver for Battery Cover
1	FU.CA930.CBOX.001-01	SDT930 Custom Carrying Case

Hardware Features and Configuration

SonaVu™ was designed with efficiency, ergonomics and simplicity as the top priorities. The table below describes the main features of the instrument and illustrates where they are located.



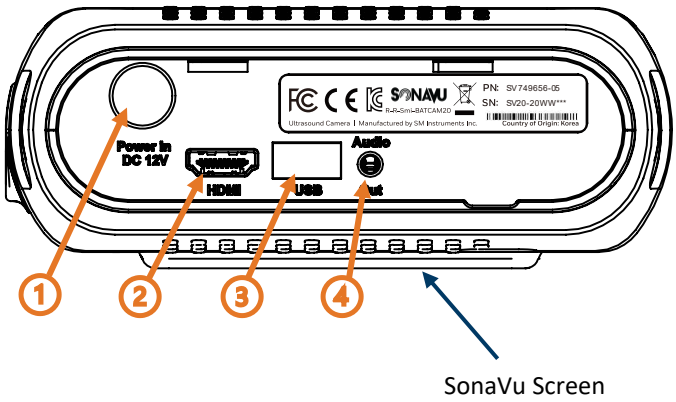
ID	Name	Description	Quantity
1	Microphone/Sensor	Ultrasound sensor array	112
2	Camera	Camera to capture both still and video	1
3	Distance Sensor	Sensor measures distance from source to sensor	1
4	Dual Light	LED lighting for using SonaVu™ in dark situations	2
5	5” LCD Screen	5” colour touch display	1
6	Power Button	Hold for 3 seconds to power SonaVu™ on/off	1
7	Record Button	To capture images and record video	1
8	Tripod Mount	Threaded insert to fix SonaVu™ to a tripod	1
9	Charging Port	For connecting SonaVu™ to battery charger or supplemental battery supply	1
10	HDMI	Connect SonaVu™ to external display/projector	1
11	USB Port	Export images/video; Upgrade/Update firmware	1
12	Audio Jack	1/8” audio jack. Live listen to SonaVu™ sounds	1

Operation

Connection Port Overview

All connection ports are located on the left side of the device under the yellow rubber SonaVu protective cover. Open the cover from the top while the screen is facing you. The side cover is hinged at the bottom.

1	**Power Port**	LEMO Power Connector for DC power supply
2	**Video Port**	HDMI port for video output to external display
3	**USB Port**	USB 2.0 for transferring data and updating device firmware
4	**Audio Jack**	Standard 1/8” audio jack for headphones or external speaker

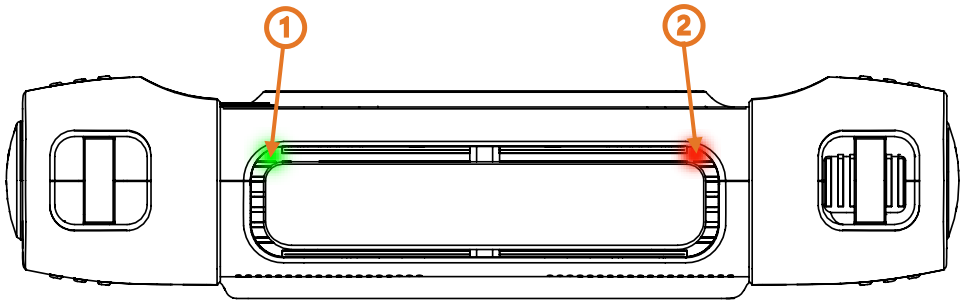


Connecting the Charger/Power Adaptor

Connect the LEMO cable by aligning the red dot on the LEMO connector with the red dot on the power port on the side of the device.

OR

Status Indicator Lights



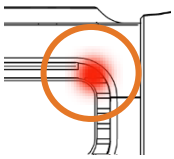
Power Status Indicator (1)

After powering ON the SonaVu™, a Green LED indicator will light on the top left corner of the casing.

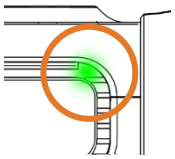
Charging Status Indicator (2)

When the power adapter is connected the SonaVu™ will automatically start charging the internal battery and a Red LED indicator will light on the top right corner.

A **Red LED** light indicates the device is charging.



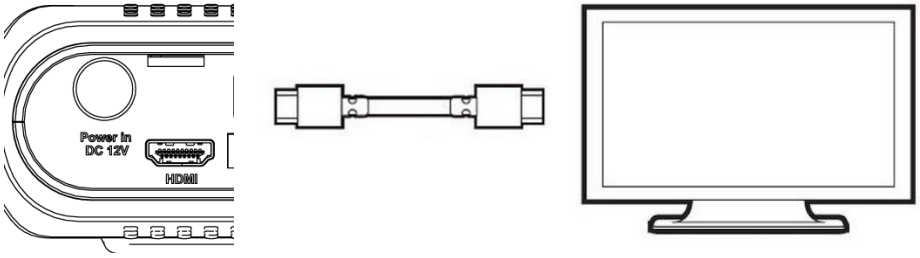
A **Green LED** light indicates the device is fully charged.



External Interface Connections

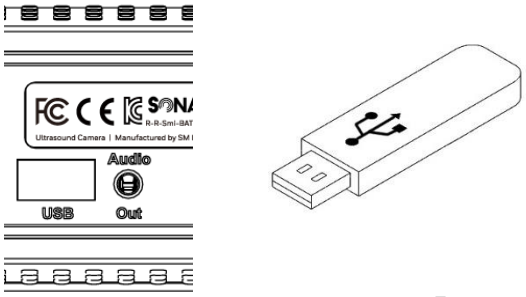
① HDMI Port

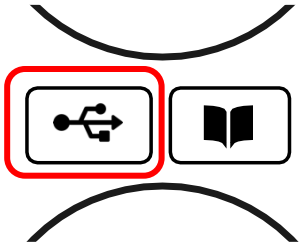
The SonaVu™ can be connected to an external monitor with an HDMI cable.



② USB Port

Image and video files stored in SonaVu™ can be transferred to a USB drive (FAT 32 format) via the USB port.





To copy data*:

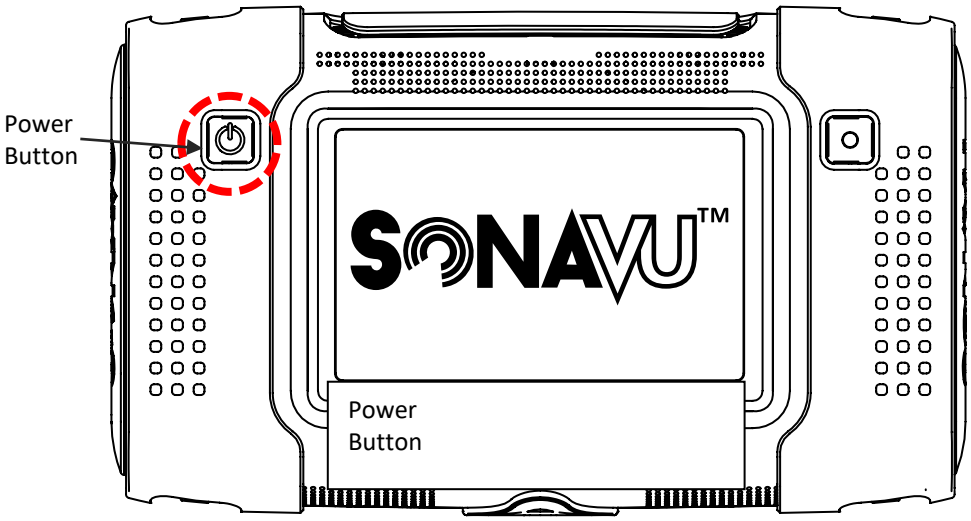
Connect the USB memory device to the USB port located on the left.

Connect the USB memory device and press the USB icon on the right side of the SonaVu™ main screen.

* *The amount of time that is transferred may vary depending on the number and capacity of the files stored. (There is no USB memory device available on the device.)*

Using the Power Button

Press the power button on the left side and hold for 2 seconds to power the SonaVu™ on. The green LED power status indicator on the top left side of the device will light.



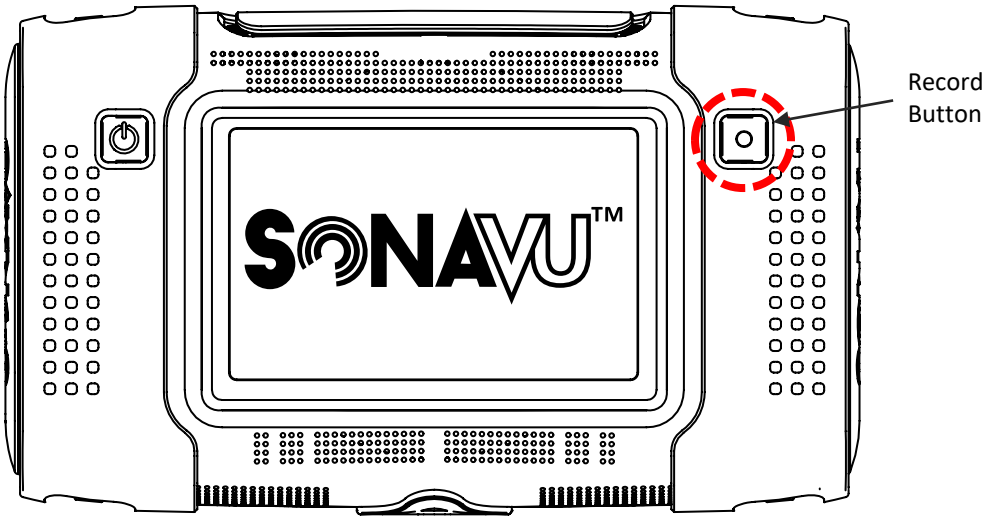
To turn off the power, press the power button again and hold for 2 seconds. The green LED power status indicator lamp will turn off.

① Power ON
When powered on, the company logo ('SDT') and product logo ('SonaVu') appear in order on the LCD screen while the device boots.

② Power OFF
When you turn off the power, the product logo ('SonaVu') appears on the LCD screen until the power shuts down.

Using the Record Button

The Record button allows you to save the screen you are measuring as an image (JPG) or a video (AVI).



① Save Image

A short press of the Record button saves the screen you are measuring as an image (JPG format).
The saved images can be viewed by clicking the library icon on the right side of the main screen.

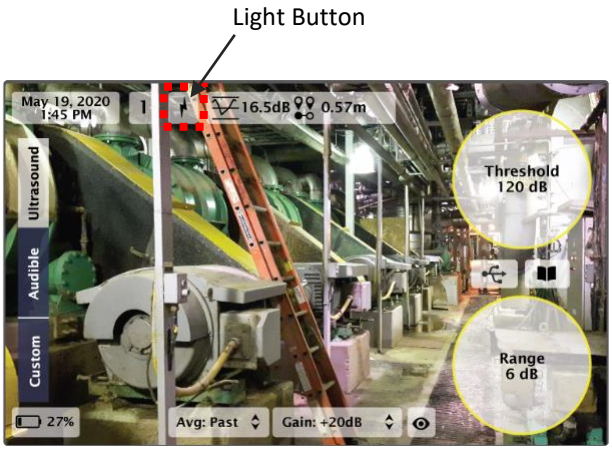
② Save Video

Press and hold the Record button for 2 seconds to start recording video (AVI format). A flashing red icon will appear at the top right of the screen to indicate that you are recording. Press and hold the record button for 2 seconds to stop recording (video is automatically saved).
The saved videos can be viewed by clicking the library icon on the right side of the main screen.

Using the Light Feature

The light icon on the top of the screen allows you to activate two lights mounted on the front of the device. Pressing the icon toggles the light on or off.

The lights aid in brightening dark areas and make it easier to capture images and video.



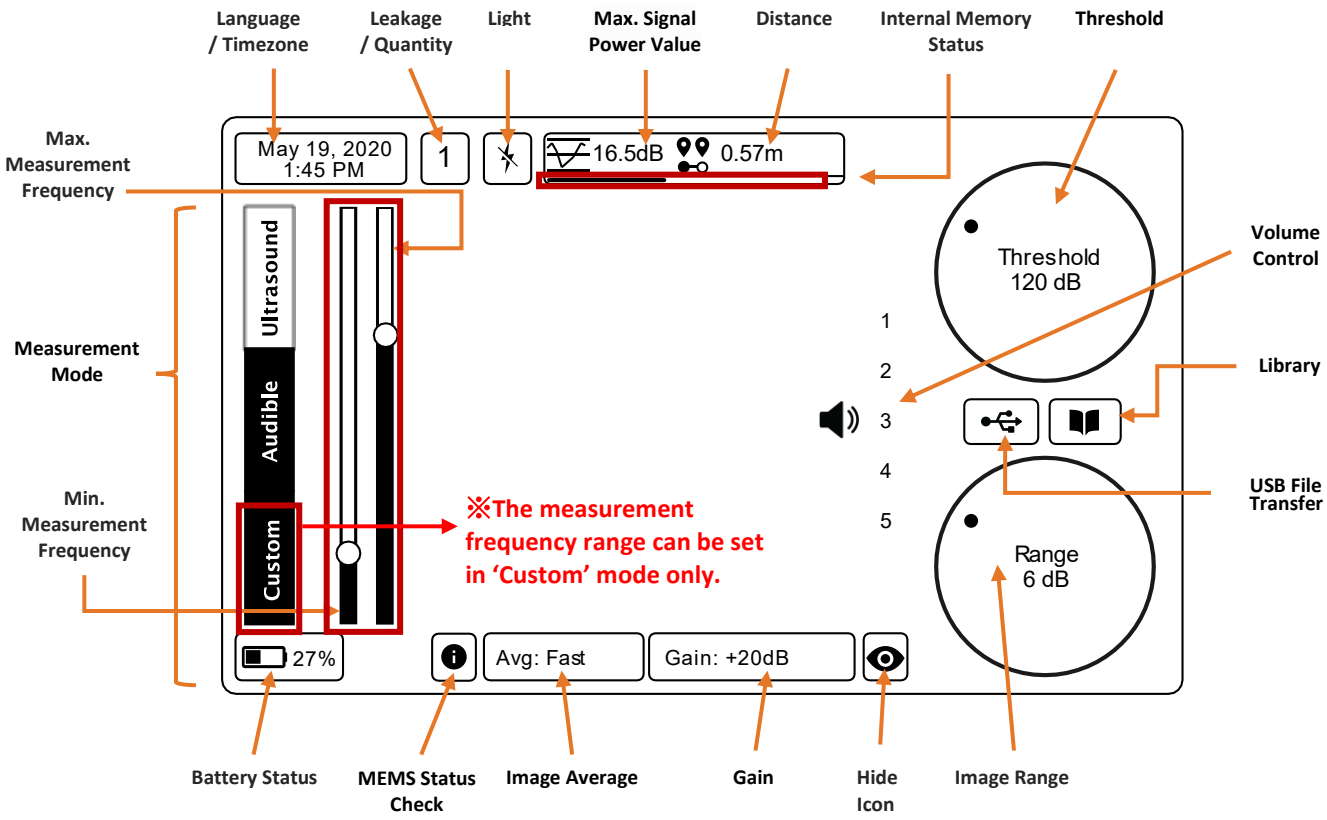
Light ON

Light OFF

SonaVu™ Firmware

Main Screen (User Interface)

The main screen for the SonaVu™ software is shown below. Users can set and view various measurements parameters on the main screen without having to connect to a PC.



Signal Power Settings

- Threshold (display reference value)
- Image Range
- Image Average

Measurement Environment Settings

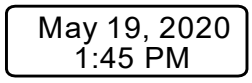
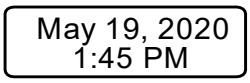
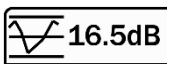
- Measurement mode
- Distance (Source to SonaVu™)
- Gain
- Max Signal Power

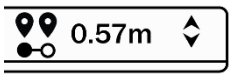
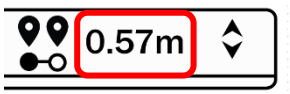
System Settings

- Language/Time Zone
- Hide Icon
- USB Transfer
- Library (Check/Delete Files)
- Battery Status
- Internal Memory Status

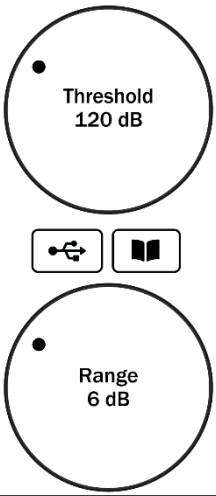
Icon Functions

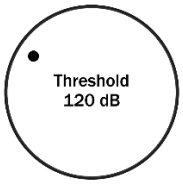
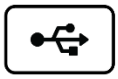
At the top left of the main screen a total of four icons are shown, each icon's function, definition, and description are shown in the table below.

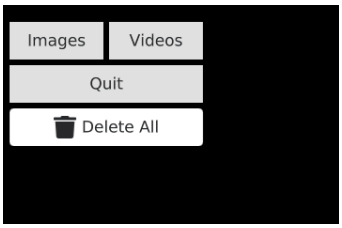
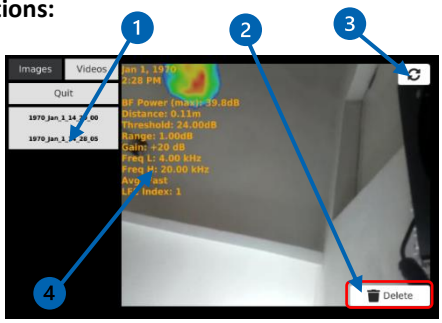
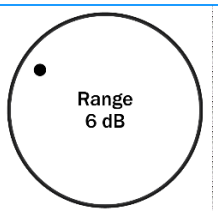
Icon	Function	Description
	Language/Timezone Check and Setting	Displays the current date/time. To change the language or the Time Zone press and hold the icon:   Touch the arrows in the red box to select the language/time zone you want *Languages: Korean, English, Chinese and French *Time zone: Support for all countries Press 'Apply' to save the changes. Press 'Discard' to cancel the changes.
	Leak Strength Index	Indicates the estimated strength of the Leak: 1. Less than 200cc/m 2. Excess 200 Less than 400cc/m 3. Excess 400 ~ Less than 600cc/m 4. Excess 600 ~ Less than 800cc/m 5. More than 800cc/m
	Light ON/OFF	Press the icon to toggle the light on or off on the front of the device.  Light ON  Light OFF
	Signal Indicator	Displays the current signal level of the sound being measured. Signal Power is the rainbow color scheme on the measurement screen, which indicates the amount of sound pressure being measured.

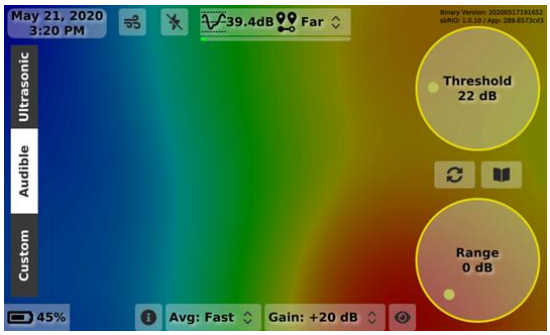
	Distance Setting	Set the distance between the measurement target and the ultrasonic camera. **Options:** *Near Distance:* Target is less than 5m *Far Distance:* Target is more than 5m *Automatic Distance Setting:* For more precise measurements. Target MUST be less than 3m With the Auto option, the distance between the sound source and the ultrasonic camera displays in real time (up to 3 m). 
	Internal Memory Status Indicator	Displays the amount memory available on the SonaVu™ The internal memory capacity of SonaVu™ is 53GB. The status bar has three sections: *Green:* less than 98% used *Orange:* more than 98% used *Red*:* more than 99% used *Saving video is not available in the Red zone

Next, icons on the right side of the main screen. There are four icons on the right side of the screen, each icon's function, definition, and description are shown in the table below.



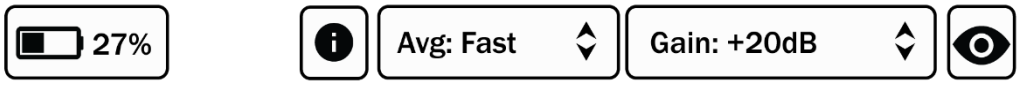
Icon	Function	Description
	Threshold (Display Reference Value) Setting	The sound shown on the screen depends on the set Threshold reference value. The sound you are measuring must be greater than or equal to the Threshold value before the sound appears on the screen. The Threshold value can be set between 0 dB and 120 dB, depending on the characteristics of the sound being measured and the measurement environment.
	Transfer to USB - Measurement Files (Image/Video)	Copies all measurement images and videos to an attached USB drive: **1.** Insert a USB drive in the USB port located on the left side of SonaVu™ **2.** Press the icon to start the copy process **3.** All measurement images and videos will transfer to the USB drive. Icon states:  *USB Memory Device is not connected*  Transfer in progress  Transfer complete

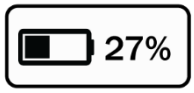
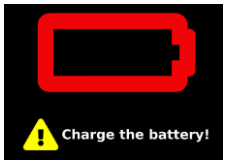
	Library (Check/Delete measurement file)	Press this icon to check or delete a measurement file (image/video) from the SonaVu™ internal memory.  Press 'Images' or 'Videos' to view the measurement files. **Actions:**  ① Select a single file from the list ② Press 'Delete' (bottom right) to delete ③ Press  - transfer the file to a USB drive Press 'Quit' - return to the main screen Press 'Delete All' - delete all files. ④ Image measurement details* for the selected image are shown: *Date/Time* of measurement *Amplitude* (dB) *Display Base* (dB) *Image Range* value (dB) *Amplification* value (dB) *Frequency Band* (kHz) set *Image Mean Setting* *Estimated Flow Rate* (LFE) index value (*This will not be recorded for videos.)
	Image Range Setting	This function sets the range of the minimum (blue) and maximum (red) values of the signal power displayed on the screen. This means that the width of the signal power can be adjusted. User can set a minimum of 0 dB (full range) to a maximum of 10 dB, and the higher the value, the greater the width of the signal power.

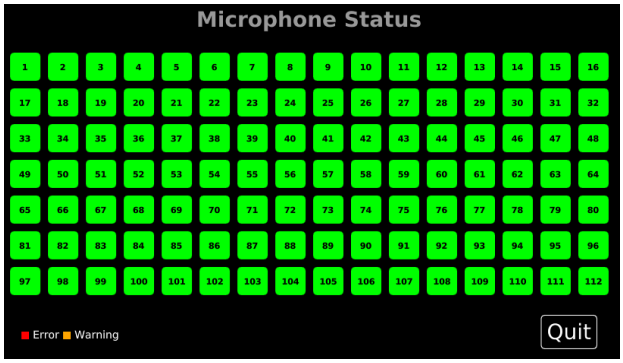
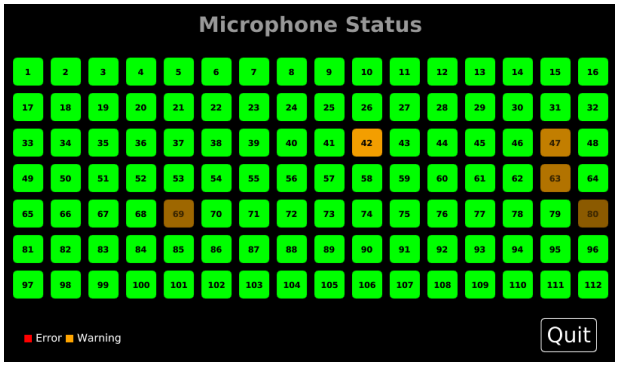
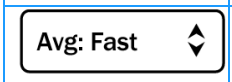
		If the image range is set to 0 dB, signal forming is applied throughout the screen (Full Range). 

※ For a detailed description of the display threshold and image range, refer to the 'Signal Forming Setting' section.

At the bottom of the main screen, there are five icons shown below. The function, definition and description of each icon are as below.



Icon	Function	Description
	Battery Status Check	Displays the current battery charge level. Fully charged, the SonaVu™ operates for approximately four hours.  *Battery Capacity 2 ~ 9 %*  *Battery Capacity 10 ~ 29 %*  *Battery Capacity 30 ~ 72 %*  *Battery Capacity 73 ~ 97 %*  *Battery Capacity 98 ~ 100 % (Full Charged)*  If the battery is below 1%, this warning message will appear.  When the battery level reaches more than 15% the icon will change and the SonaVu™ can be used again.

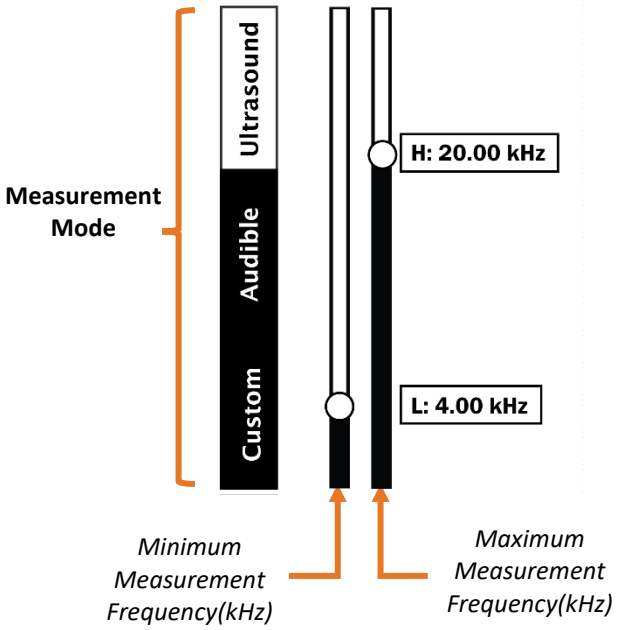
	MEMS Status Check *Only Visible In Audible Mode	Press to check the operation of the 112 MEMS sensors mounted on the front of SonaVu™. (only visible in audible mode) The Operating States are as follows:  Green Normal Orange Dangerous Red Abnormal  Ex) All 112 sensors are normal  Ex) Sensors 42,47,63,69,80 are blocked by foreign substances. See the section on 'Cleaning the Sensor Array' for details on how to clean the debris.
	Image Average Setting	Image average sets the refresh rate for the image range display. Options: **Fast:** Updates every 3 frames captured **Slow:** Updates every 10 frames captured The Slow settings is useful for fast changing sound signals to determine the location of the sound source. For a detailed description of the image average, see 'Signal Power Setting'.

Gain: +20dB	Gain Setting	Selectable values: 0, +10, +20, or +30 dB A reasonable gain value for normal-sized noise measurements: +20 dB *The smaller the sound, the better it is to increase the gain value.
	Hide Icon	Toggle this to hide/display the four parameters on the right side- 'Threshold', 'Image Range', 'USB Transfer' and 'Library'. In custom mode, the frequency setting sliders will be hidden too.

Measurement Mode

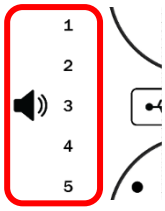
On the left side of the main screen, select the measurement mode:

- Ultrasonic
- Audible
- Custom



Measurement Mode	Frequency Range	Remark
Ultrasonic	25 kHz ~ 40 kHz	Auto Set
Audible	4 kHz ~ 20 kHz	Auto Set
Custom	Set up by user	In 'Custom' mode the upper and lower measurement frequency range can be set by user

Measurements taken in either 'ultrasonic' or 'audible' mode can be played back from the 'Library'.



To adjust the volume, touch the screen to the left side of the 'USB Transfer' icon and swipe up or down to set the value (from 0 to 20). Volume control will slide to the right side of the screen if the 'Hide Icon' has been activated.

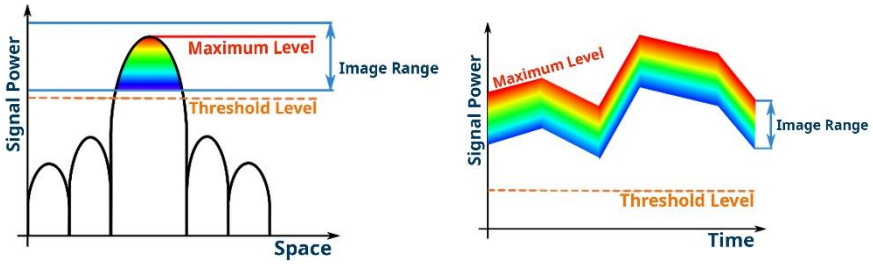
Signal Power Setting

The Signal Power settings control the display of the measured sound wave in a rainbow-shaped color scheme. Parameters include the Threshold (Display Reference Value), Image Range, and Image Average. The Signal Power visually shows the amount of sound pressure produced in the direction of measurement on the ultrasonic camera. The signal power displayed on the screen can show both the size and distribution of the sound generated. It is dependent on the Threshold (Display Reference Value).

The signal power is calculated at 25 frames per second and will be visible on the screen at a resolution of 640 x 480.

Threshold (Display Reference Value)

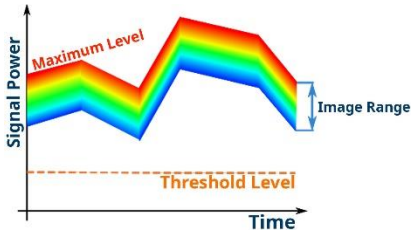
The Signal Power that appears on the screen depends on the Threshold setting. The sound you are trying to measure must be greater than or equal to the Threshold before the signal appears on the screen. For accurate measurements, it is recommended that you set the Threshold before measurements, depending on your measurement environment. The Threshold value can range from a minimum of 0 dB to a maximum of 120 dB.



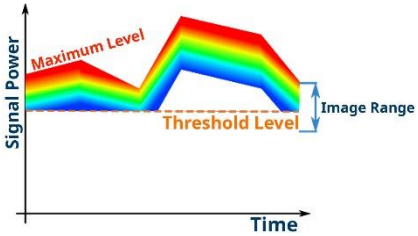
a. The Threshold setting is set as the minimum value of the sound source you want to measure.
b. Only sound levels above the Threshold setting are displayed on the screen. Values below the Threshold setting are ignored.

Image Range

The Image Range sets the width of the Signal Power displayed. The minimum (Blue) and maximum (Red) values can range between a minimum of 0 to a maximum of 10 dB. The higher the value, the greater the width of the Signal Power.



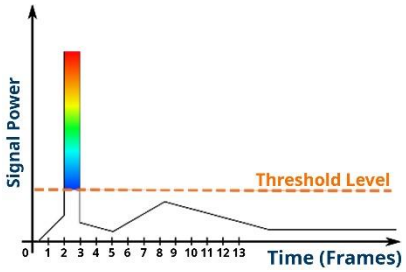
The Image Range varies with the peak (maximum value). As the sound pressure changes , the minimum value changes with the maximum value depending on the width of the Image Range.



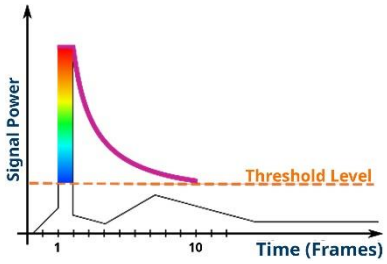
Raising the Threshold affects the Signal Power displayed on the screen regardless of the set values of the Image Range. For example, if the minimum value for the Image Range is less than the Threshold, as shown in the graph on the left, then the Threshold is set to the minimum value and displayed on the screen.

Image Average

Image Average setting adjusts the response time of the image range.



FAST - The Image Range is calculated every 3 frames captured (default setting)



SLOW - The Image Range is calculated every 10 frames captured.

The SLOW setting makes visualizing short bursts easier to see. The image takes longer to dissipate on the screen.

Additional Settings

Software update

The software information in SonaVu™ currently in use is displayed in the upper right corner of the main screen.

To update to the latest software in SonaVu™, you can proceed in sequence below. The update will take up to 5 minutes to complete. Be careful that an error may occur if SonaVu™ is turned off while the update is in progress. Update files can be obtained at a later notice (E-mail or Website).

*SonaVu™ Software Update Procedure

① Connecting USB Memory Devices to a PC or laptop

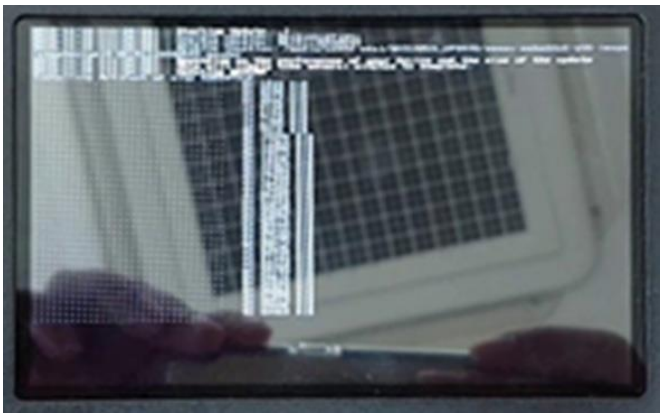
② Creates a folder named 'SONAVU_UPDATE' inside the USB memory device. All must be capitalized in English and does not matter if there is a folder with a different name inside the USB

③ Download latest software files to your PC or laptop. The file extension is .mender

④ Copies downloaded files into the 'SONAVU_UPDATE' folder created in 2.

⑤ The downloaded update file name must be in the following structure

└-- SONAVU_UPDATE
└-- SMI-SONAVU-v0.0.0-signed-2020xxxxxxxxx**.mender**
(v0.0.0 : Firmware version, xxxxxxxxxx : Date+Time Format)



Update in progress for SonaVu™

⑥ Safely remove USB memory device from PC or laptop

⑦ Connect USB memory device to SonaVu™ hardware USB port

⑧ When USB memory device is connected, updates are automatic, and progress can be checked on the screen. It can take up to 5 minutes for the update to complete

⑨ Update completed and all procedures completed when SonaVu™ is rebooted

Product Warranty

Standard Warranty

Included in the purchase of your SonaVu™ is a two-year, standard warranty from the date the customer receives the product.

Extended Warranty

Extended Warranty is available after the standard warranty period has expired. Please contact SDT for details and pricing.

Voiding the Warranty

Product Warranty will be void in the following circumstances:

a. Defects caused by customer negligence or careless handling

b. Defects caused by natural disasters, accidents, disasters, etc.

c. Defects caused by external factors other than defects in quality or performance of the main body of the product.

Product Maintenance

Cleaning the Sensor Array

There are 112 microphone sensors in front of SonaVu™. If the microphone is dirty or clogged with debris, etc., it can be cleaned at a distance of approximately 30cm (12 in) under low air pressure from the compressed air injector (squeeze bulb) included in your kit.

* Do NOT use high pressure compressed air or aerosol canned air sprays. The high pressure can damage the MEMS sensors and void your warranty.

1. Keep the squeeze bulb tip at least 15-30cm (6-12in) away from the MEMS sensor array.
2. Squeeze air into the blocked sensors 3-4 times to clear the debris.
3. Check the MEMS sensor status in the Audible mode to verify the debris has been cleared.
4. Repeat the steps as necessary until the status check show the sensors are clear.

Cleaning the Screen

1. Spray the screen with the cleaning solution provided.
2. Wipe the screen gently with cleaning cloth provided.

Cleaning the Instrument

The outer casing of the instrument can be cleaned with a mild detergent on a damp cloth.

Do NOT submerge the instrument in water. The casing is not waterproof.

Keep the product in its case when not in use.

Product Specification

Microphone Array

Item	Specification
Microphone Array	
Microphone Type	Digital MEMS
Number of Microphones	112 EA
Measurement Frequency Range	2 k ~ 48 kHz
Microphone Sensitivity	-41 dBFS
Signal to Noise Ratio (SNR)	66 dB(A)
Camera View Angle	Horizontal 66° , Vertical 54°
Measuring Distance	0.3 m ~ 50m (Varies depending on the measurement environment)
Display Type	5” Color LCD
Data Acquisition and Processing	
Sampling Rate	96 k S/s
Image Frame Rate	25 FPS
Image Resolution	640 x 480
Internal Memory	53GB (About 25 MB for 5 minutes, 7 days for continuous video storage)
Measurement Circumstances	
Operating Temperature	-20 ~ 50 °C
Operating Humidity	10 ~ 85 %
Internal Battery Pack	
Battery Type	Lithium ion battery pack
Battery Capacity	49.5 Watts per hour
Battery Operating Time	+4 hours

Components and other specifications

Item	Specification
External Battery Pack	
Battery Type **Battery Quantity**	 *(TBD)*
USB	
Memory Type / Support Format	2.0 / FAT 32

Product Certifications

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for measurement, control and sensitive electronic equipment used in laboratories. EN 5032:2015/AC:2016

- EN 55035:2017
- EN 61000-3-2:2014
- EN 61000-3-3:2013

FCC Compliance

This product meets the essential requirements of the applicable U.S. Directive as follows:

- FCC Part 15 Subpart B, Class A

CE Compliance

This product meets the essential requirements of the applicable European Directive as follows:

- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

KC Compliance

This product proves that it has been registered in accordance with paragraph 2-3 of Article 58 of the Radio Wave Act.(The Clause 3, Article 58-2 of Radio Waves Art.)

Battery

This product uses lithium ion batteries.

Do not use the product in environments where it can be wet, or corroded. Do not store or place the product in or near a heat source, in a high temperature environment, or in strong direct sunlight. Do not place in a microwave or pressurized container. Also, do not expose to temperatures above 122 °F / 50 °C.

Failure to follow these instructions may result in acid leak, heat, explosion or ignition, causing injury and damage.

Do not drill, open, or disassemble the battery. The battery will not charge at temperatures below 32 °F / 0 °C or temperatures above 113 °F / 45 °C. Do not attempt to remove or remove the battery. If there is a problem with the battery, contact Technical Support at SDT.

※CAUTION: If the battery is not replaced with the correct type, there is a risk of the battery exploding.
The batteries contained in this product must be disposed of in accordance with local laws and regulations.

- IEC 62133:2012
- EN.62133:2013
- UN 38.3(ST/SG/AC.10/11/Rev.6/Amend.1

How to Get Support

If for any reason you require assistance with your SonaVu equipment, contact:

For Support in Europe

SDT International
Bd. de L'Humanité 415
B-1190, Brussels
Belgium

Phone +32 (0) 2 332 32 25
Email: info@sdtultrasound.com

For Support anywhere else in the world

SDT North America, Inc.
7677 County Rd 2
Cobourg, ON K9A 4R5
Canada

Contact us by phone:

1-800-667-5325 – Toll Free in North America
1-905-377-1313 – International Calls

Email: support@sdtultrasound.com

HEAR SDT MORE Ultrasound Solutions