

## Diagnostics (continued)

- **Send log** - On selecting the send log button, the device will send diagnostics logs and system logs to the server.

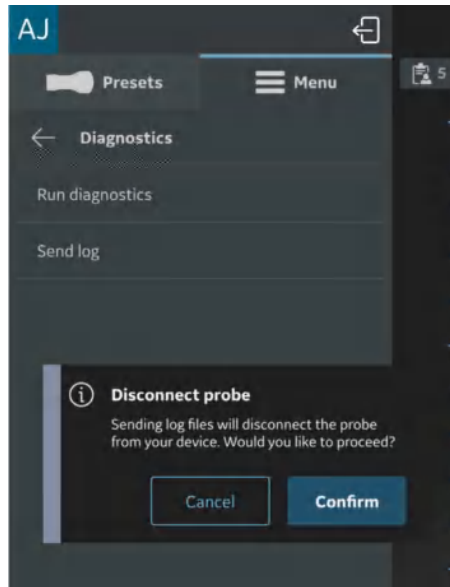


Figure 4-60. Send log warning - iOS

- NOTE:** *Android devices do use WiFi-direct and the display device will stay connected to the Vscan Air probe while sending the logs.*
- NOTE:** *iOS devices might need to disconnect from the Vscan Air probe to send the logs depending on the availability of a mobile data connection.*
- NOTE:** *If the iOS display device has a mobile data connection and mobile data is enabled, it will not need to disconnect from the Vscan Air probe.*

## About

The **About** option displays - Registered devices, Probe subscription details, App version info, Probe version info, Regulatory, Probe upgrade label, Account information, Acknowledgements and Export audit logs.

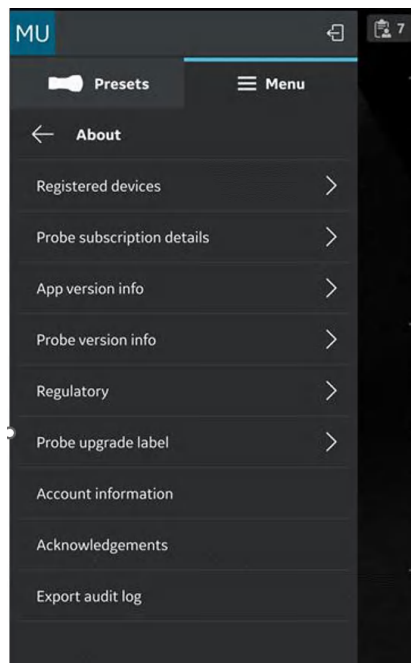
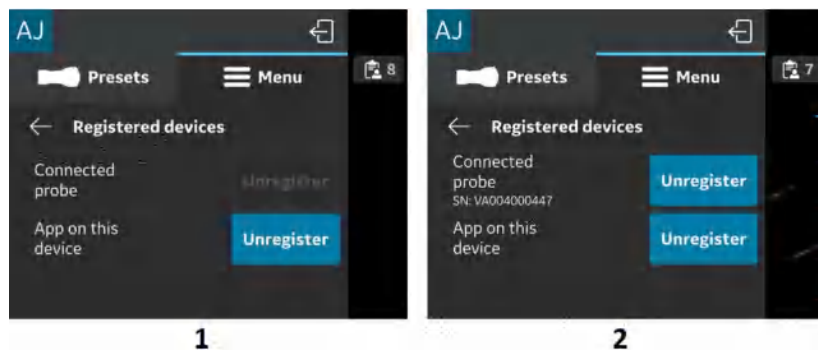


Figure 4-61. About

## About (continued)

- **Registered devices** - Displays status for the Vscan Air app registration and the connected Vscan Air probe.  
Vscan Air probe serial number - The probe serial number identifying the connected probe is displayed.



1. Probe not connected
2. Registered Probe

Figure 4-62. Registered devices

### Unregister:

To unregister the Vscan Air probe or the Vscan Air App, please select "**Unregister**" and confirm.

When unregistered, the Vscan Air probe will be disconnected. To re-register, you must connect and complete registration.

When unregistered, the Vscan Air App current registration and any connected probe will disconnect. The app will still be available. To re-register, a new registration will be required.

## About (continued)

- **Probe subscription details** - Displays subscription to digital tools.  
Click '**Probe subscription details**' > Tap on **Get Latest** to apply subscription information.

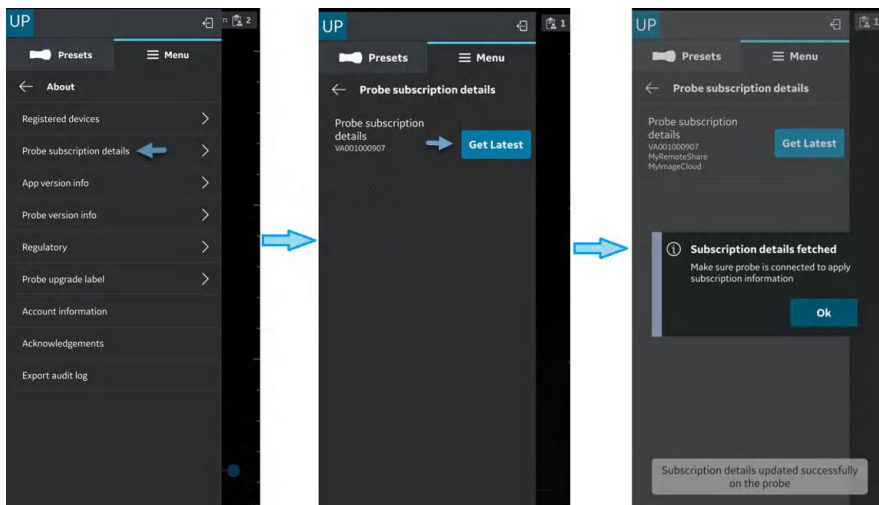


Figure 4-63. Probe subscription details

The subscribed digital tools appear.

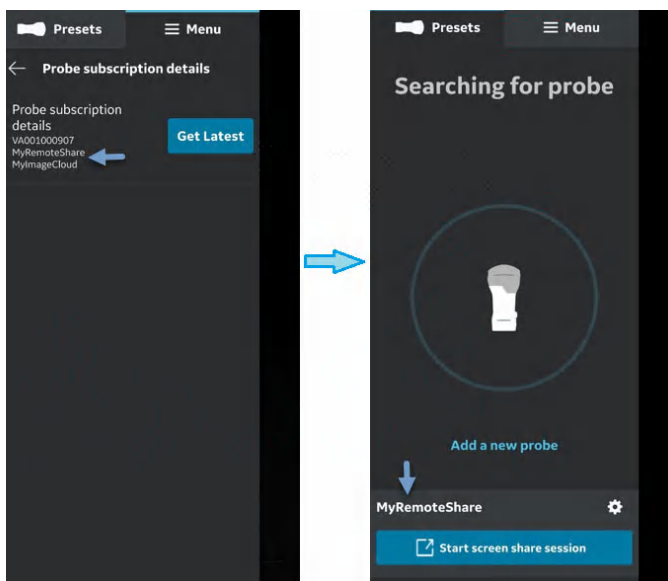


Figure 4-64. Subscribed Digital tools available

## About (continued)

- **App version info** - Displays App software version, App software revision and the unique identifier of the installed Vscan Air app.

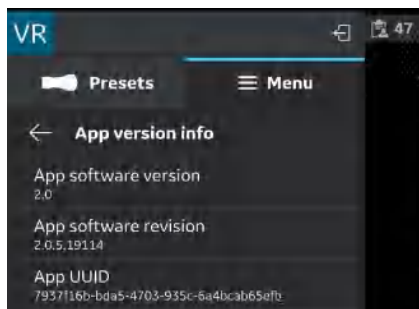
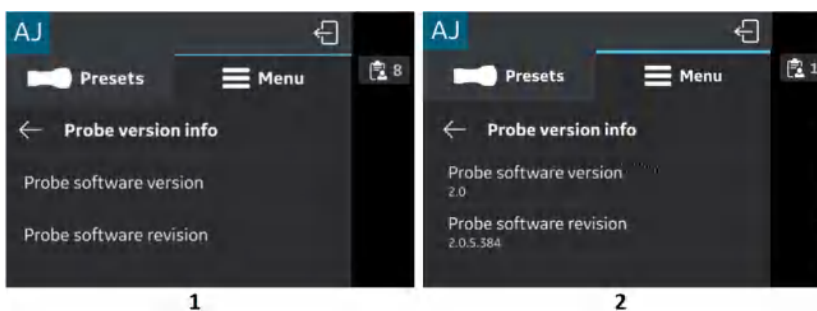


Figure 4-65. App version info (example)

- **Probe version info**  
Probe version info - Displays Probe software version and Probe software revision



1. Probe not connected
2. Registered Probe

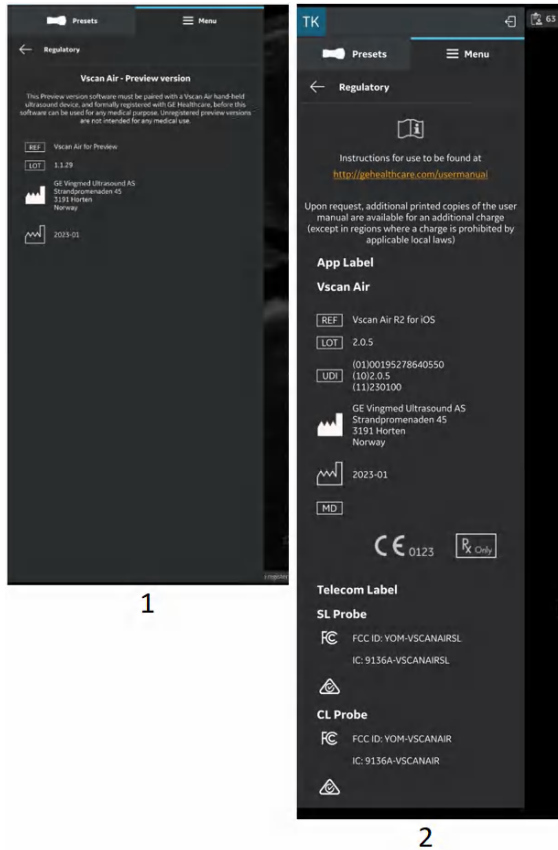
Figure 4-66. Probe version info (example)

**NOTE:** The UDI information and the separate listing of the probe serial number can be found as part of the probe label.

**NOTE:** The UDI information relating to the App can be found on the Regulatory page.

## About (continued)

- **Regulatory**



1. Before registration
2. After registration

Figure 4-67. Regulatory

About (continued)

The "Regulatory" options defines the entire Regulatory page application.

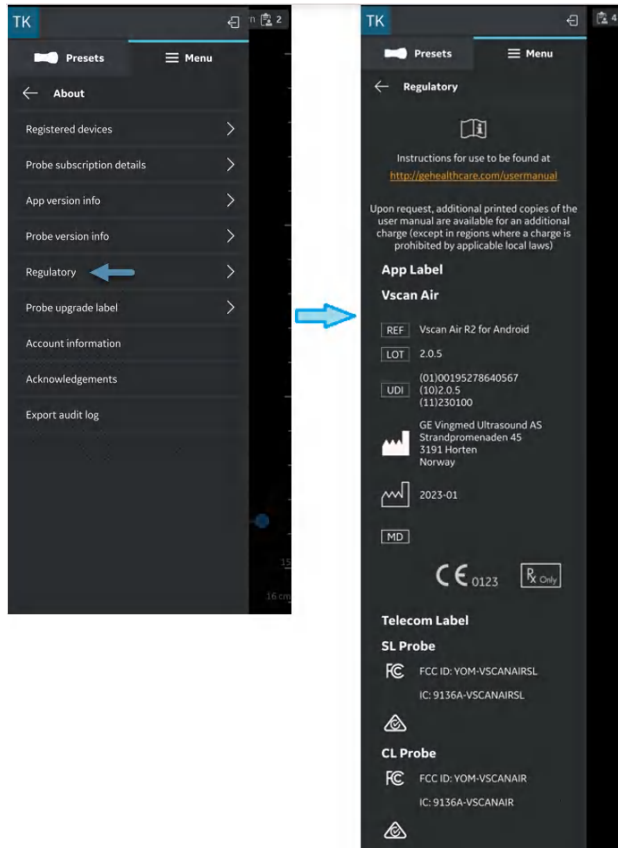


Figure 4-68. Entire Regulatory page

## About (continued)

- **"Probe upgrade label"** lists the Regulatory information related to the Vscan Air CL upgrade.

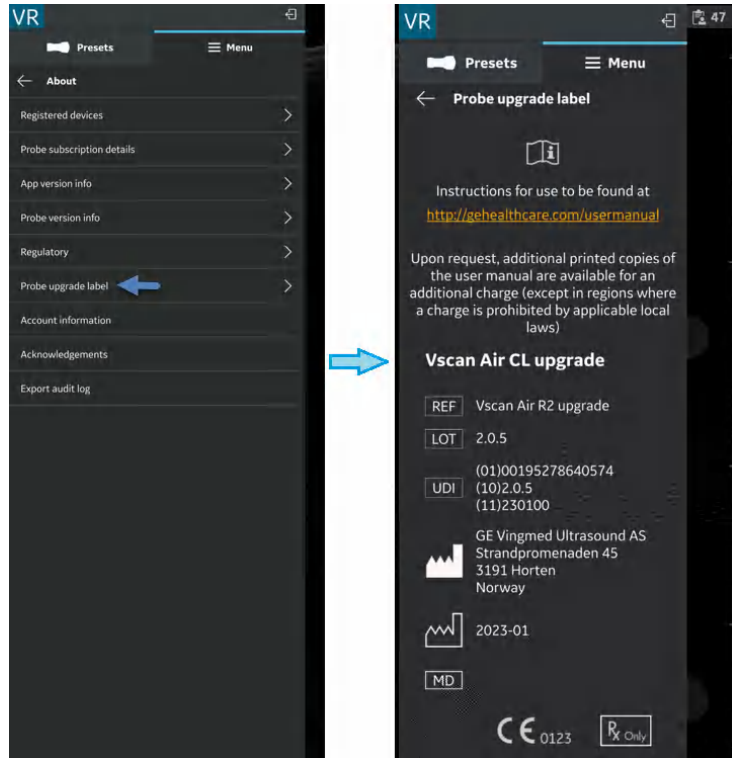


Figure 4-69. Probe upgrade label



## About (continued)

- **Account information**
  1. Press the '**Account information**' tab.

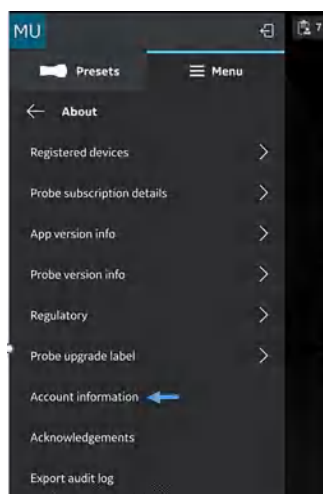


Figure 4-70. Account Information

2. Update the account details if needed.

 Two side-by-side screenshots of a mobile application's 'Account details' form. The left screenshot shows the 'User information' section with fields for 'First name (owner/contact)\*', 'Last name (owner/contact)\*', 'User', 'Department', 'Administration', 'Role', 'Choose role', 'Phone number', and 'Country\*'. Below this is the 'Company / Institution' section with a field for 'Name of Institution / Hospital / Business / Government Entity' and a 'Submit' button. The right screenshot shows the 'Company / Institution' section with fields for 'Name of Institution / Hospital / Business / Government Entity', 'Street address\*', 'City\*', 'Zip\*', and 'State / Province\*'. Below these fields are three checkboxes for terms and conditions, and a 'Submit' button. A blue arrow points from the left screenshot to the right one.

Figure 4-71. Account details

### About (continued)

3. Check to confirm the given information.
4. Press **Submit**, to update the Account details.

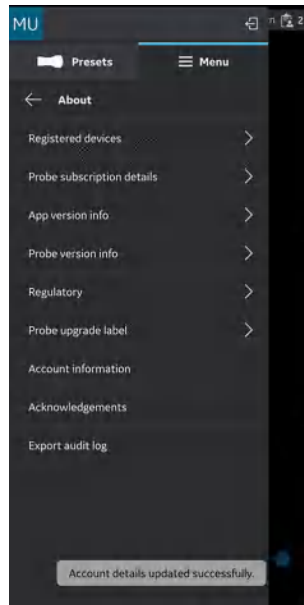


Figure 4-72. Account details Updated

- **Acknowledgements** - Displays the third party software license.

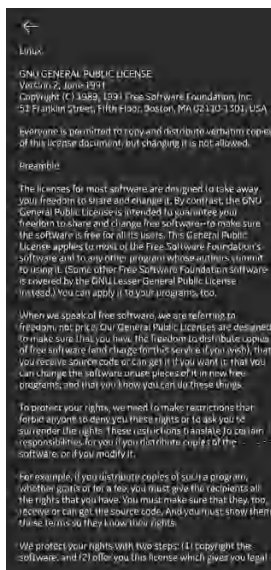


Figure 4-73. Acknowledgements

## About (continued)

- **Export audit logs** - Audit log data can be stored to an internal storage destination. Refer the 'Audit logs' on *page 5-96*.

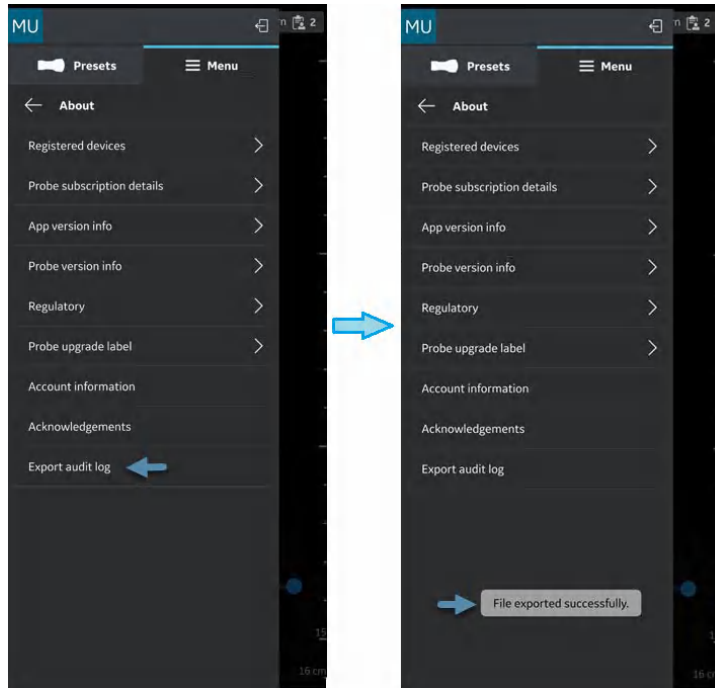


Figure 4-74. Export audit logs



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# Chapter 5

## Using Vscan Air

### *Contents:*

*'Display features' on page 5-2*

*'Scanning' on page 5-5*

*'Measurements' on page 5-73*

*'Annotations' on page 5-84*

*'Review and recall of stored data' on page 5-94*

*'Export data' on page 5-99*

*'Using Vscan Air' on page 5-122*

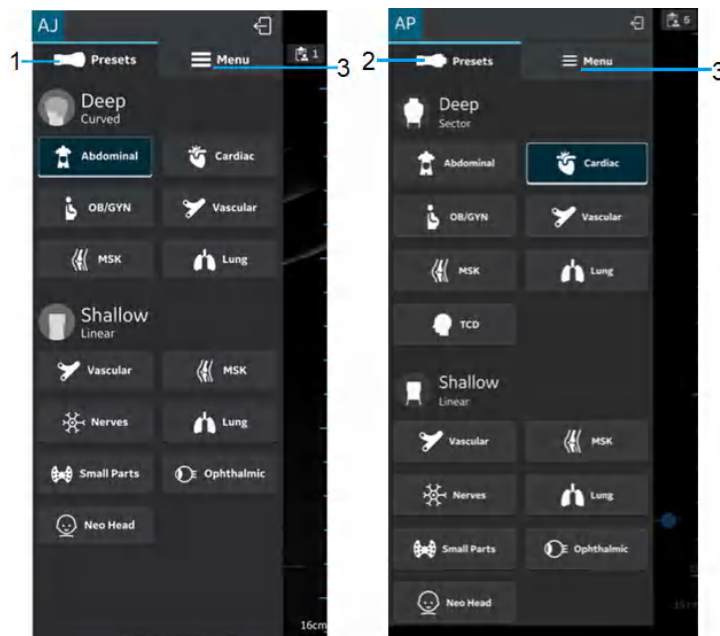
*'Preparing for a guided procedure with Vscan Air' on page 5-126*

*'Digital tools' on page 5-131*

# Display features

## Left panel

Swipe left to right or tap on the Vscan Air probe icon on left hand top corner to access presets and menu options.



1. Vscan Air CL Presets
2. Vscan Air SL Presets
3. Menu

Figure 5-1. Left panel

See 'Probe and Presets' on page 5-13 for more information.

## Right panel

Swipe right to left or tap on the **Exam** icon on the right hand side top corner to create a new exam, access current exam and data from previously saved exams.



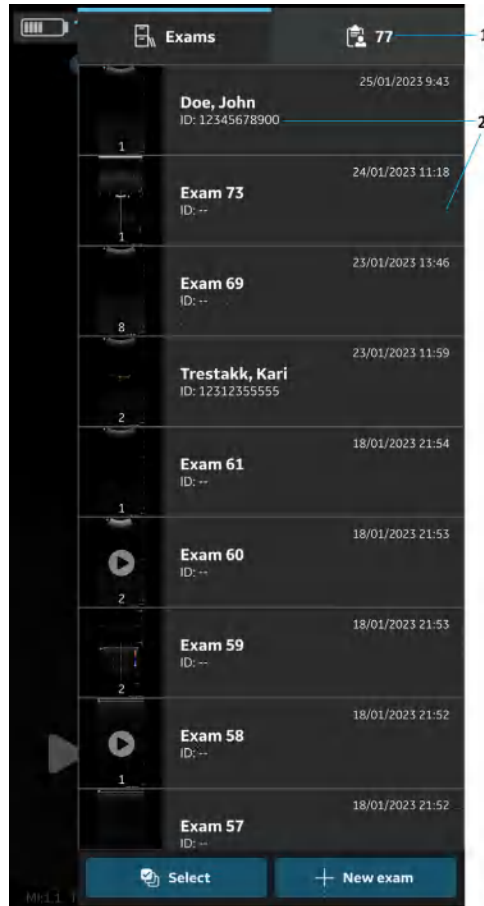
1. Start new exam
2. Current exam
3. Previous exams

Figure 5-2. Right panel

- Start a new exam - Press **New Exam** on right corner at the bottom of the screen to start a new exam.

## Right panel (continued)

- Current exam - Displays the current exam number
- Exams - Displays a list of previously saved exams that can be selected to access stored images and videos.



1. Current exam
2. List of saved exams

Figure 5-3. Exam ID



# Scanning

## General scanning recommendations

### Before each use:

Inspect the Vscan Air probe (see 'Inspection' on *page 6-3*).

### After Each Use

- Inspect the Vscan Air probe (see 'Inspection' on *page 6-3*)
- Clean the Vscan Air probe (see 'Cleaning and disinfection' on *page 6-6*).
- If required, disinfect the Vscan Air probe (see 'Cleaning and disinfection' on *page 6-6*).

Ensure that the Vscan Air probe is properly cleaned and disinfected after each use and before storing in the protective case.



If any damage is found on the Vscan Air probe, do not use it. Contact GEHC service.

### Use of Gel

In order to ensure optimal transmission of energy from the transducer to the patient, a conductive gel must be applied on the transducer lens.





If the gel comes in contact with the eye, consult the gel manufacturer's instructions.

## Use of Gel (continued)

The following gels have been tested to be compatible with the Vscan Air CL and Vscan Air SL probes..

Table 5-1: Compatible Gels

|  |  |
|---|---|
| Aquasonic   | Parker Laboratory Inc.  |
| Clear Image   | Sonotech Inc.   |
| Scan  | Parker Laboratory Inc.  |
| Sonogel   | Sonogel Vertriebs GmbH  |
| Wavelength  | National Therapy Products Inc.  |
| EcoVue Ultrasound Gel   | HR Pharmaceuticals Inc  |

For more information regarding probe care, refer to the website:  
<https://gehealthcare.com/probecare> or <https://www.gehealthcare.com/products/ultrasound/ultrasound-transducers>

## Other recommendations

Like most high frequency computing devices, the electronic components of the Vscan Air probes will generate some heat while operating normally and as intended. Vscan Air probes are equipped with safety mechanisms which will automatically reduce computing speed (frame rate), and ultimately shut down the device, before any risk of overheating occurs. The Vscan Air probes are verified to comply with harmonized safety standards (see 'Conformance Standards' on *page i-3*) under any operating condition described in this user manual (see 'Environmental requirements for Vscan Air probe' on *page 3-6*). To help keeping the Vscan Air probe operating temperature at an optimal functional level, and to ensure longer scanning time with maximum frame rate, it is recommended to hold the Vscan Air probe such that there is good contact between the device and the hand.



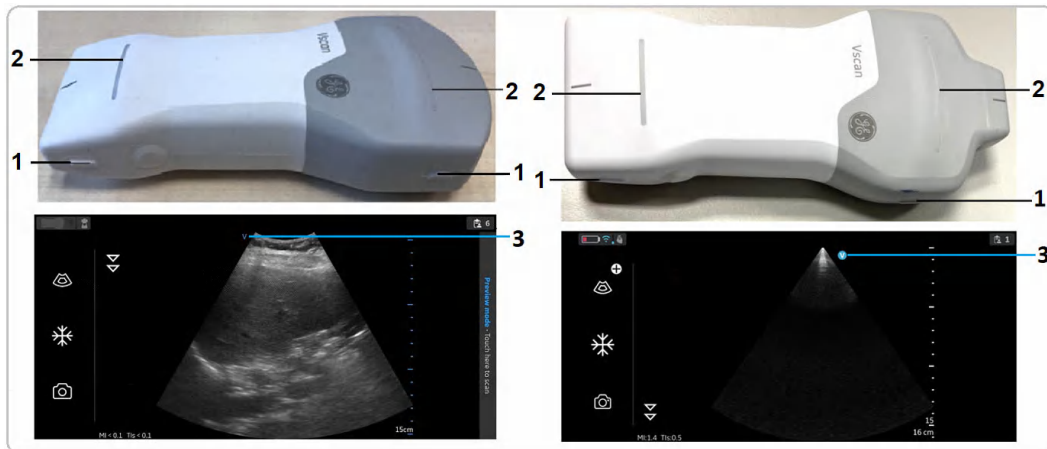
For patient and personnel safety, be aware of biological hazards. To avoid the risk of disease transmission:

- Use protective barriers (gloves and transducer sheaths) whenever possible.
- Follow all infection control policies established by your office, department or institution as they apply to personnel and equipment.

## Vscan Air probe orientation

Vscan Air probe is provided with an orientation mark on both the transducer heads. This mark is used to identify the side of the Vscan Air probe corresponding to the side of the image having the orientation 'V' mark on the scanning screen.

A steady blue LED light on one end of the Vscan Air probe indicates which transducer head is active.



### Vscan Air CL Orientation

1. Orientation marking on Vscan Air CL
2. LED light
3. Orientation marking on screen

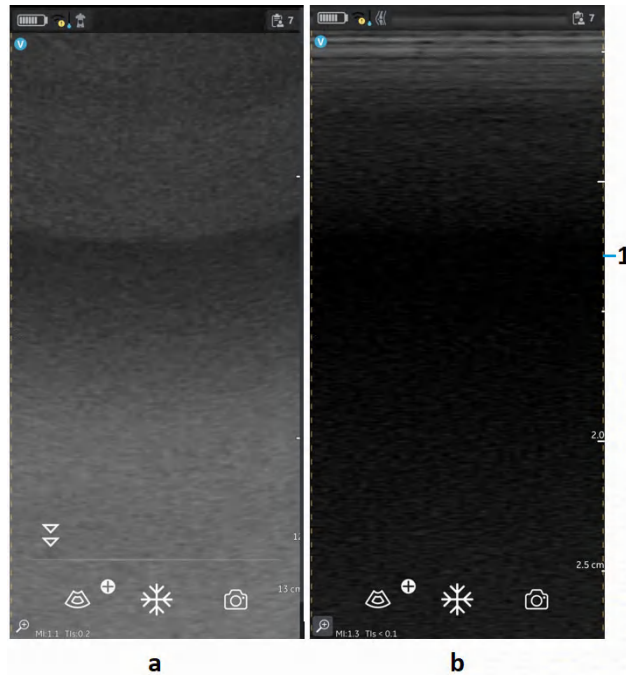
### Vscan Air SL Orientation

1. Orientation marking on Vscan Air SL
2. LED light
3. Orientation marking on screen

Figure 5-4. Vscan Air probe orientation

## Image crop indicator

Vscan Air maximizes the image display on the screen in the portrait mode. As a result, at certain depths, image corresponding to the entire transducer width may not be visible on screen in portrait mode. Image crop indicators are displayed in such cases to make the user aware of this.

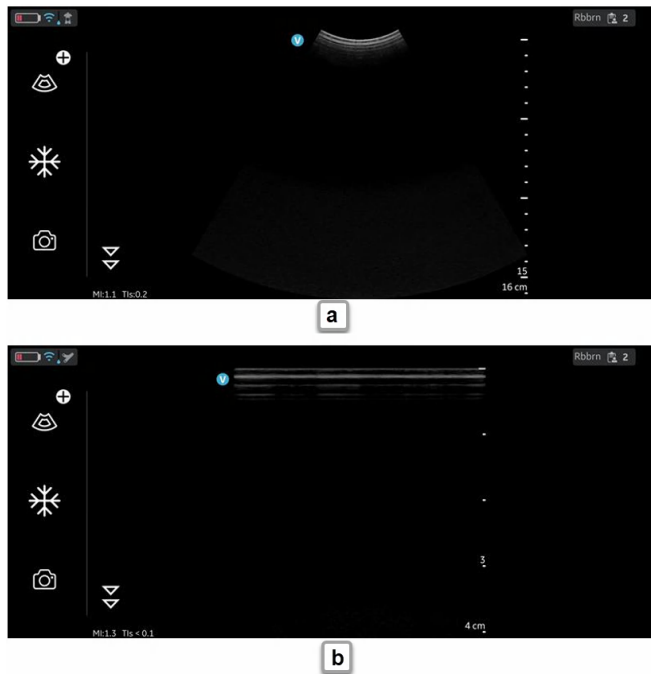


1. Image crop indicator
  - a. Curved array (deep scanning) transducer
  - b. Linear array (shallow scanning) transducer

Figure 5-5. Image crop indicator (portrait mode)

## Image crop indicator (continued)

**NOTE:** When the screen is rotated from portrait to landscape, depth remains unchanged, refer Figure 5-6.



- a. Curved array (deep scanning) transducer
- b. Linear array (shallow scanning) transducer

Figure 5-6. Image crop indicator (landscape mode)

If it is important to visualize the entire width, it is possible to do one of the below:

1. Rotate the display device to visualize the image in landscape orientation.
2. If portrait mode is preferred:
  - The depth can be increased until the whole width is displayed, and image crop indicators no longer appear.
  - Zoom and pan to visualize the edge of the image on the desired side.

## Patient examination

### Creating a new exam

A new exam can be created in two ways:

1. Automatically - A new exam will be created every time the Vscan Air probe pairs successfully with the Vscan Air app and also every time the Vscan Air App is started.
2. Manually - A new exam can be created manually at any time by selecting new exam from the right panel.
  - Swipe from right to left or tap the 'icon' on the right upper corner to bring out the right panel.
  - Press **New Exam** on the bottom right corner of the screen.

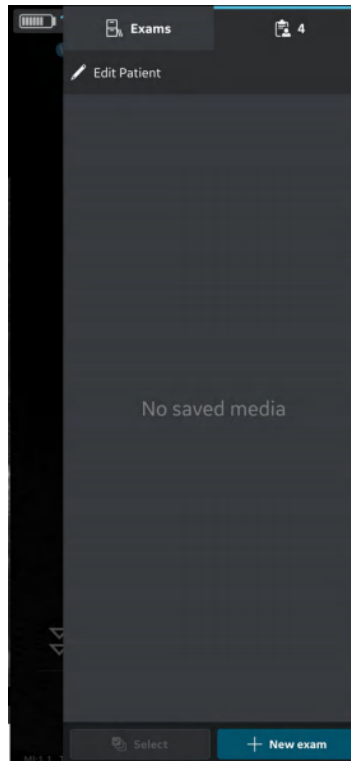


Figure 5-7. New exam

### Creating a new exam (continued)

*NOTE: A new exam also gets created every time a Vscan Air probe connects with the app.*

*NOTE: An exam will get saved when an image or video is stored for that exam.*

*NOTE: The maximum number of stored exams is limited to <500. The Vscan Air app will inform the user to export and/or delete exams as needed once the number of stored exams is 480 or higher.*



Create a new exam before starting the examination of a new patient to minimize the risk of mixing images from different patients.

### Storing an image/video

Refer to sections 'Storing an image' on *page 5-53* and 'Storing a video' on *page 5-54*.









## Probe and Presets

### Use of presets








To ensure optimal image quality, the Vscan Air ultrasound system has predefined scanning settings optimized for different applications. Refer to the tables below to select the correct Vscan Air CL or Vscan Air SL transducer and preset combination before scanning.

Table 5-2: Curved array (deep scanning) transducer presets

| Curved array transducer Preset  |           | Optimized for  |
|---|-----------|--|
|    | Abdominal | <ul style="list-style-type: none"> <li>• Liver</li> <li>• Gall bladder and biliary tree</li> <li>• Pancreas</li> <li>• Spleen</li> <li>• Kidneys</li> <li>• Urinary Bladder</li> <li>• Prostate</li> <li>• Bowel</li> <li>• Fluid detection</li> </ul>   |
|    | Cardiac   | <ul style="list-style-type: none"> <li>• Heart</li> <li>• Fluid detection</li> </ul>   |
|   | MSK       | Musculoskeletal (conventional) <ul style="list-style-type: none"> <li>• Joint</li> <li>• Long bones</li> <li>• Muscles, large tendons</li> <li>• Deeper soft tissue structures</li> </ul>  |
|  | OB-GYN    | <ul style="list-style-type: none"> <li>• Obstetrics               <ul style="list-style-type: none"> <li>• Uterus</li> <li>• Fetus</li> <li>• Placenta</li> <li>• Amniotic fluid</li> </ul> </li> <li>• Gynecology               <ul style="list-style-type: none"> <li>• Uterus including cervix</li> <li>• Ovaries and adnexa</li> </ul> </li> </ul> |
|  | Vascular  | <ul style="list-style-type: none"> <li>• Abdominal aorta</li> <li>• IVC</li> <li>• Other veins and arteries</li> </ul>   |
|  | Lung      | <ul style="list-style-type: none"> <li>• Thoracic/Pleural motion</li> <li>• Lung tissue</li> <li>• Fluid detection</li> </ul>  |
| OB-GYN: Obstetrics and gynaecology, MSK: Musculoskeletal                            |           |  |








**Use of presets (continued)**

Table 5-3: Linear array (shallow scanning) transducer presets

| Linear array transducer Preset  |             | Optimized for   |
|---|-------------|---|
|    | Vascular    | <ul style="list-style-type: none"> <li>• Veins</li> <li>• Arteries</li> </ul>   |
|    | Nerves      | Peripheral nerves   |
|    | Small Parts | <ul style="list-style-type: none"> <li>• Small organs</li> <li>• Pediatric (recommended minimum weight: 4 kg)</li> <li>• Soft tissue</li> </ul>                         |
|    | MSK         | Musculoskeletal superficial <ul style="list-style-type: none"> <li>• Joints</li> <li>• Long bones</li> <li>• Muscles</li> <li>• Tendons</li> <li>• Ligaments</li> </ul> |
|    | Lung        | <ul style="list-style-type: none"> <li>• Thoracic/Pleural motion</li> <li>• Fluid detection</li> </ul>  |
|   | Neo Head    | Neonatal cephalic   |
|  | Ophthalmic  | Ophthalmic  |

## Use of presets (continued)

Table 5-4: Sector array (deep scanning) transducer presets

| Sector array transducer Preset  |           | Optimized for  |
|---|-----------|--|
|    | Abdominal | <ul style="list-style-type: none"> <li>• Liver</li> <li>• Gall bladder and biliary tree</li> <li>• Pancreas</li> <li>• Spleen</li> <li>• Kidneys</li> <li>• Urinary Bladder</li> <li>• Prostate</li> <li>• Bowel</li> <li>• Fluid detection</li> </ul>   |
|    | Cardiac   | <ul style="list-style-type: none"> <li>• Heart</li> <li>• Fluid detection</li> </ul>   |
|    | MSK       | Musculoskeletal (conventional) <ul style="list-style-type: none"> <li>• Joint</li> <li>• Long bones</li> <li>• Muscles, large tendons</li> <li>• Deeper soft tissue structures</li> </ul>  |
|    | OB-GYN    | <ul style="list-style-type: none"> <li>• Obstetrics               <ul style="list-style-type: none"> <li>• Uterus</li> <li>• Fetus</li> <li>• Placenta</li> <li>• Amniotic fluid</li> </ul> </li> <li>• Gynecology               <ul style="list-style-type: none"> <li>• Uterus including cervix</li> <li>• Ovaries and adnexa</li> </ul> </li> </ul> |
|  | Vascular  | <ul style="list-style-type: none"> <li>• Abdominal aorta</li> <li>• IVC</li> <li>• Other veins and arteries</li> </ul>   |
|  | Lung      | <ul style="list-style-type: none"> <li>• Thoracic/Pleural motion</li> <li>• Lung tissue</li> <li>• Fluid detection</li> </ul>  |
|  | TCD       | Cranial vascularity  |
| TCD: Transcranial Doppler   |           |  |

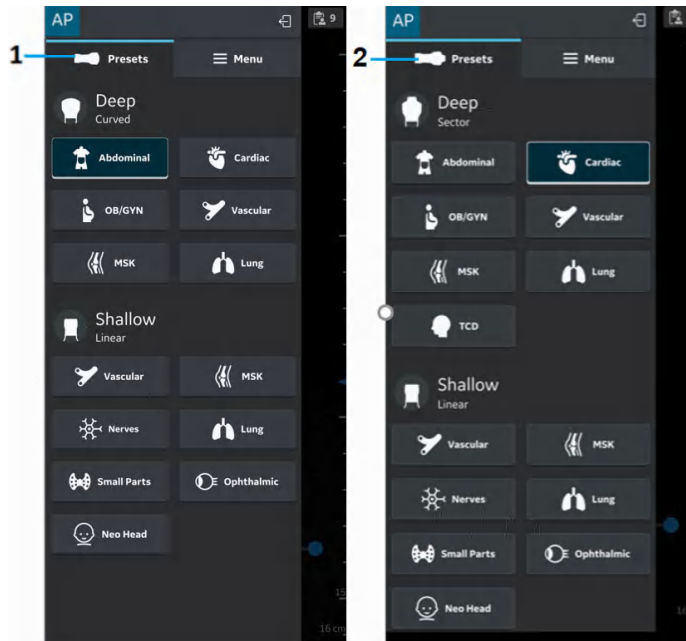
**NOTE:** *Ophthalmic is not cleared for use in Japan and China.*

### To change the preset and probe

1. Slide from left to right or tap the preset icon on the leftmost top corner of the scan screen.

All presets available for the Vscan Air CL or the Vscan Air SL are displayed.

Presets are grouped according to the deep scanning (Curved array/Sector Array) and the shallow scanning (Linear array) ability of the Vscan Air probes.



1. Preset menu Vscan Air CL
2. Preset menu Vscan Air SL

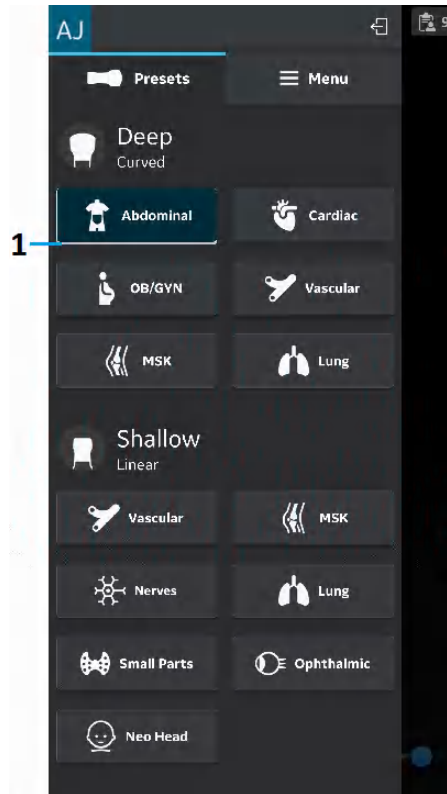
Figure 5-8. Preset menu Vscan Air probe

2. Select the desired preset.  
The preset selected automatically activates the transducer for that preset.
3. To change the preset, swipe from left to right again. Choose the desired preset.
4. Selected preset is highlighted in blue.

**To set a preset as default**

Press and hold the preset which needs to be set as default.

A small white bar displays on the bottom of the preset indicating that it is set as default.



1. White Bar

Figure 5-9. Preset as default

## Black/white imaging (B-mode)

**NOTE:** *Scanning does not start if the Vscan Air probe is not connected to a Vscan Air app.*

Black and white imaging is intended to provide two-dimensional images and measurement capabilities concerning the anatomical structure of soft tissue.

Black and white imaging is the default scanning mode.

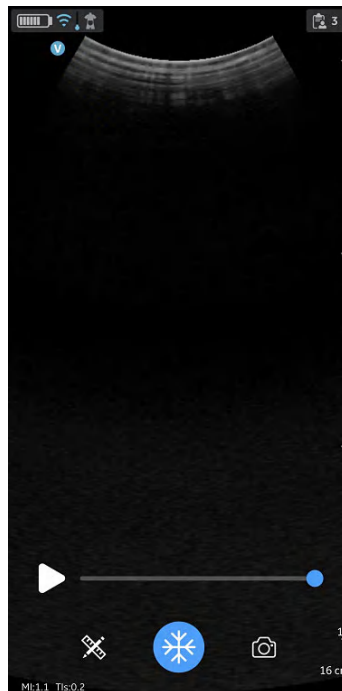


Figure 5-10. Black/ white (B-mode) scan screen

**NOTE:** *As a safety precaution, scanning is not possible when charging the Vscan Air probe.*

## Black and white imaging adjustments

### Gain

Black and white gain increases or decreases the amount of echo information displayed in an image. It may have the effect of brightening or darkening the image if sufficient echo information is generated.

1. Swipe at least half a centimeter from the left or right on the scan screen to initiate a gain change.

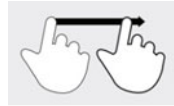


Figure 5-11. Drag

**NOTE:** *Small movements will be ignored to avoid unintentional activation of the gain control.*

2. Move your finger to the right or left to increase or decrease gain.



Figure 5-12. Gain

The adjusted gain value is seen with the icon on the top of the screen.

### Time Gain Compensation (TGC)

TGC amplifies returning signals to correct for the attenuation caused by tissues at increasing depths.

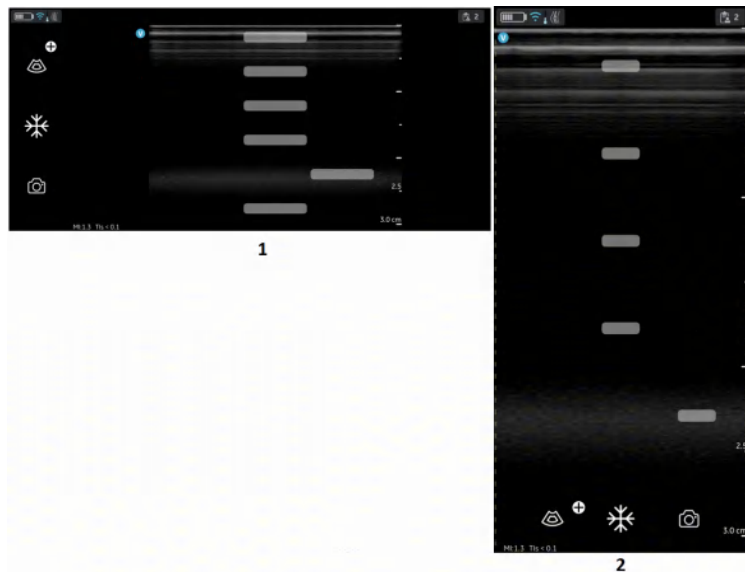
TGC sliders are spaced proportionately to the depth. The area each slider amplifies varies as well.

Turn ON or OFF the TGC Controls from the Menu screen.

The TGC controls are displayed on the scan screen as soon as you start adjusting gain by sliding your finger on any part of the image.

Adjust individual TGC sliders to adjust the intensity of echoes in a particular depth of the image.

The TGC sliders will disappear from screen after a timeout period.



1. Landscape mode
2. Portrait mode

Figure 5-13. TGC

**NOTE:** *The Gain control is disabled as long as the TGC controls are active.*



## Depth

Depth adjusts the field of view. It increases the field of view to look at larger or deeper structures; it decreases the field of view to look at structures near the skin line.

1. Swipe your finger up/down on the screen at least half a centimeter to initiate depth



Figure 5-14. Depth adjustment

**NOTE:** *Small movements will be ignored to avoid unintentional activation of the Depth control.*

At the start of the swipe, the depth indicator shows the depth change.

2. Change depth per cm from 5-24 cm.

OR

Change depth per 0.5 cm from 2-5 cm.

**NOTE:** *When the screen is rotated from portrait to landscape, depth remains unchanged.*

## Zoom and pan

Pinch on the image with two fingers to zoom.

To pan or move the zoomed area, slide your finger on the image in the direction where you want the zoomed area to move.

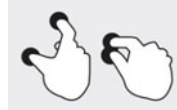
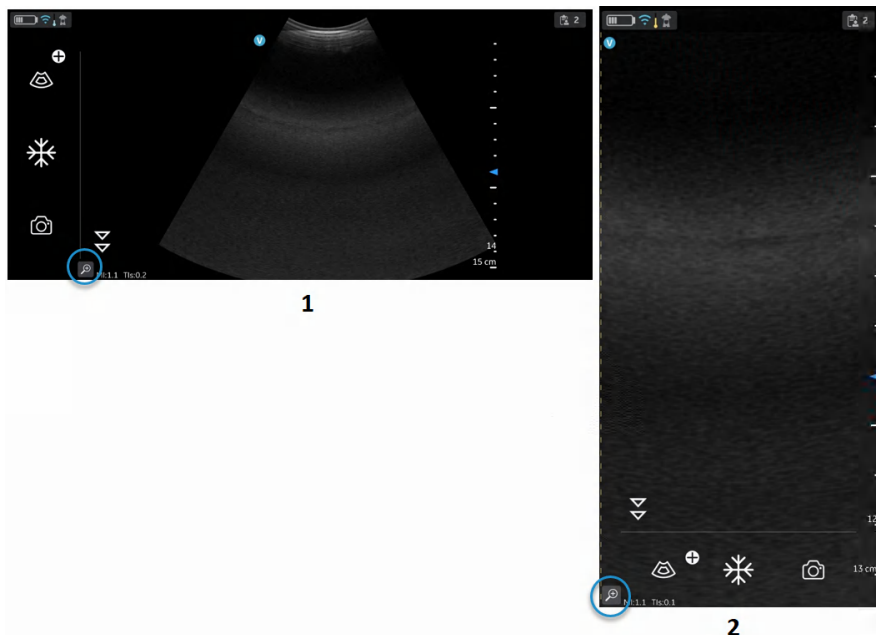


Figure 5-15. Pinch

An indicator will be displayed on the image whenever Zoom is activated to help recognize a zoomed image easily.

Zooming will be disabled if clicking the on screen Zoom indicator when in Zoom.



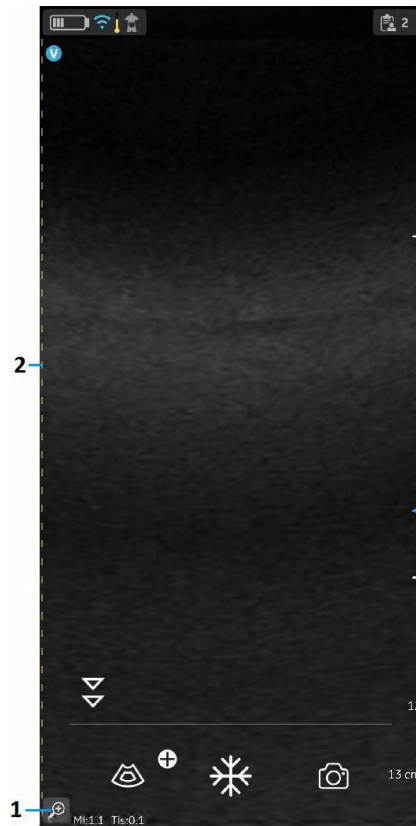
1. Landscape mode
2. Portrait mode

Figure 5-16. Zoom indicator

**NOTE:** *The images can be zoomed only before saving.*

**Zoom and pan (continued)**

**NOTE:** While zooming, one or both edges of the image may go out of the field of view on the screen. In such cases, you will see 'Image crop indicators' appear on the sides where the image edge is not visualized (Refer 'Image crop indicator' on page 5-9).



1. Zoom indicator
2. Crop indicator

Figure 5-17. Curved array transducer

### Resolution and Penetration setting

For a few presets, there is a control available in the black and white mode for alternating between **Resolution** and **Penetration** settings.




Resolution setting is the default setting optimized for high resolution imaging balancing adequate penetration for average sized patients.

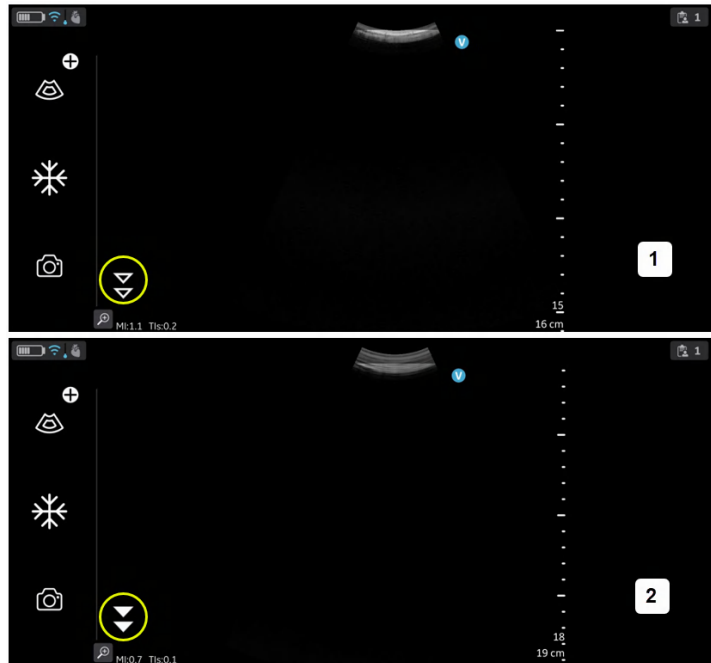
Penetration setting is useful for imaging at greater depths by optimizing visualization of structures in the far-field in larger than average or difficult to scan patients. An increase in penetration is obtained at the expense of decreased resolution.

The presets that support selection of Penetration setting are listed below.

| Curved array | Sector array | Linear array |
|--------------|--------------|--------------|
| Abdominal    | Abdominal    | Vascular     |
| Cardiac      |              |              |

### Resolution and Penetration setting (continued)

To switch between the 'Resolution' (default) and 'Penetration' settings, tap on the . The  icon indicates that the 'Penetration' setting is selected and  icon indicates default or 'Resolution' setting is selected. Depth is maintained while alternating between the two settings.



1. Resolution setting (default)
2. Penetration setting

Figure 5-18. Resolution and penetration setting

### Color flow (Color Doppler)

The Color flow (Color Doppler) mode is adding color coded qualitative information concerning the relative velocity (in m/s) and direction of fluid motion within the black and white image.

1. Press the Color icon.

A color flow area displays on top of the black and white image.

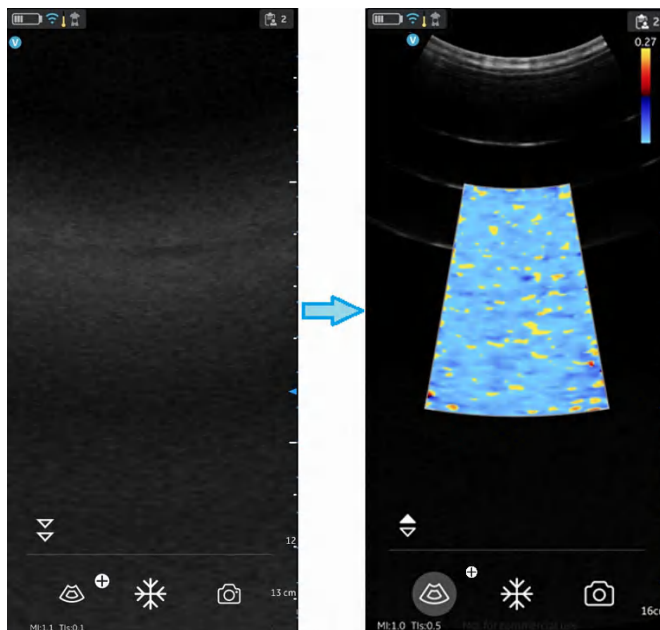


Figure 5-19. Color icon

2. Drag the color Region of Interest (ROI) to the desired area. The color ROI outline becomes blue when active.

### Color imaging scanning adjustments

*NOTE: The color images can be zoomed by pinching the images with two fingers.*

*NOTE: The active gain control is disabled as long as the TGC controls are active.*

### Color gain

Color gain amplifies the overall strength of echoes processed in the color area.

1. Swipe at least half a centimeter from the left or right on the scan screen to initiate gain.

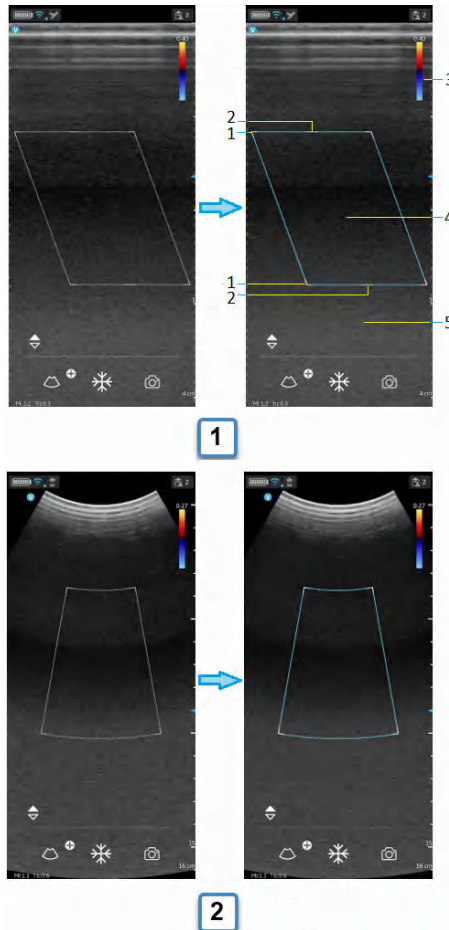
*NOTE: Small movements will be ignored to avoid unintentional activation of the color gain control.*

2. Move your finger to the right or left outside the color ROI to increase or decrease color gain.

### Position and resize ROI

The size of the Region of Interest (ROI) has an effect on the frame rate. The width of the ROI has a significant effect on frame rate even more than the height of the ROI. Keep the box sized just to the anatomy of interest and as close to center as possible.

Drag your finger inside the ROI to move and position. The box turns blue indicating that the controls for adjusting the ROI are activated. Use the controls on the corners to adjust size.



- a. Flat linear array color flow
- b. Curved linear array color flow

1. Resize ROI
2. Steer ROI
3. Nyquist/velocity bar
4. Move ROI
5. Color flow gain (left/right gesture)

Figure 5-20. Position and resize ROI



## Color steer

Slant the ROI (Region of Interest) of the Color Flow linear image left or right to get more information without moving the Vscan Air probe.

Use the controls on the center top and bottom to steer the angle.

**NOTE:** *Color steer applies only when using the linear array transducer of the Vscan Air probe.*

## Color aliasing

If the blood flow velocity exceeds the Nyquist limit indicated by the number displayed with the velocity bar aliasing may occur.



When blood flow velocity exceeds the max velocity range covered by the device, color aliasing may occur, which results in incorrect velocity estimates.

Aliasing appears as a shift in color from the color representing positive velocity to color representing negative velocity or visa versa.

Positive velocity indicates flow towards the transducer and negative indicating flow away from the transducer.

The maximum velocity or Nyquist limit is displayed on top of the velocity bar.





**Fast and slow flow (High and low velocity scale)**

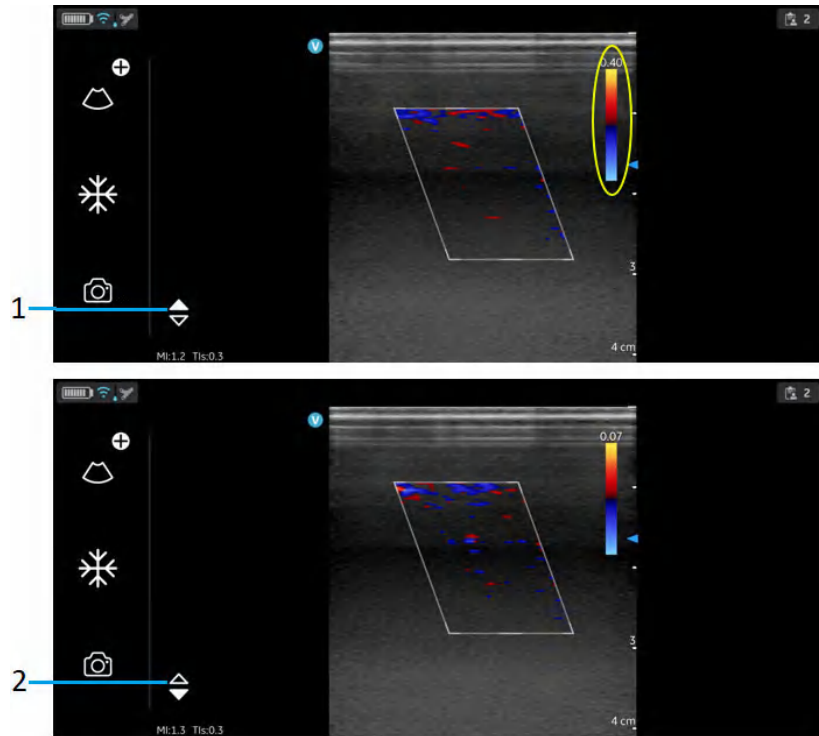
For a few presets, there is a control available in the color flow mode for alternating between high and low velocity scales. A higher velocity scale is needed to avoid aliasing while imaging of faster (arterial) flow. A lower velocity scale optimizes the imaging of slow flow (venous).

The presets that support selection between high and low velocity scale are the following:

| <b>Curved array</b> | <b>Sector array</b> | <b>Linear array</b> |
|---------------------|---------------------|---------------------|
| Abdominal           | Abdominal           | Vascular            |
| OB-GYN              | OB-GYN              | MSK                 |
| Vascular            | Vascular            | Small Parts         |
| Cardiac             | Cardiac             |                     |
|                     | MSK                 |                     |
|                     | TCD                 |                     |

**Fast and slow flow (High and low velocity scale) (continued)**

To change the velocity scale, tap on the  to alternate between the velocity scales. The  indicates that the higher velocity scale is selected and  indicating the lower scale. The velocity setting corresponding to both scales can be seen at the top of the velocity bar .



1. High velocity setting
2. Low velocity setting

Figure 5-21. Fast and slow flow

## Freeze

### To freeze an image:

Press the Freeze button.



Figure 5-22. Tap or press

When in freeze mode, you can store an image or review frames in the available video buffer.

### To reactivate the image:

Press Freeze icon again.

## Video buffer

Video buffer displays with an ability to scroll, play and pause the frames in the video buffer.

The indicator is placed on the last frame.

To jump frames:

1. Tap on the video buffer bar to view any frame.
2. Scroll to jump multiple frames.

## Auto freeze

If Vscan Air probe is idle for a period of time, the device enters freeze mode to minimize risk of overheating and battery drainage. Press the display to unfreeze the image and continue scanning.

### **Pulsed wave (PW) spectral doppler**

PW Doppler is typically used for displaying the speed, direction, and spectral content of blood flow. This allows the user to perform measurements concerning the velocity of moving fluids. PW Doppler lets you examine blood flow data selectively from a small region called the sample volume.

### **Typical use - PW doppler**

In Pulsed Wave Doppler (PW) mode, energy is transmitted from the ultrasound probe into the patient, as in B-mode. However, the received echoes are processed to extract the difference in frequency between the transmitted and received signals. Differences in frequencies can be caused by moving objects in the path of the ultrasound signal, such as moving blood cells. The resultant signals are presented graphically on the system display. The X-axis of the graph represents time while the Y-axis represents velocity in either a forward or reverse direction.

PW Doppler is typically used for displaying the speed, direction, and spectral content of blood flow at selected anatomical sites.


The site where PW Doppler data is derived (Sample Volume Gate) appears graphically on the B+ Color image. The sample volume gate can be moved anywhere within the B-mode image.

### **Spectral Doppler display**

The start of the trace appears on the left side of the screen. As time progresses, the trace moves to the right. The baseline of the graph (representing zero velocity, zero frequency shift), appears as a solid line running horizontally across the display. By convention, movement toward the probe is positive and movement away from the probe is negative. Positive frequencies or velocities appear above the baseline. Negative frequencies or velocities appear below the baseline. Typically, blood flow is not uniform but is composed of a mix of blood cells moving at different velocities and in different directions. Strong signals are displayed as bright while weak signals are displayed as less bright.

### Typical exam protocol

Using PW Doppler mode might proceed as follows:

1. Select the preset and probe to be used.
2. Locate the anatomy to be examined. Get a good B-mode image. Enable color to help locate the vessel you wish to examine.
3. Press  icon to access the additional modes to enter PW. The PW-mode is then activated and the PW cursor appears on the frozen B+ Color image.

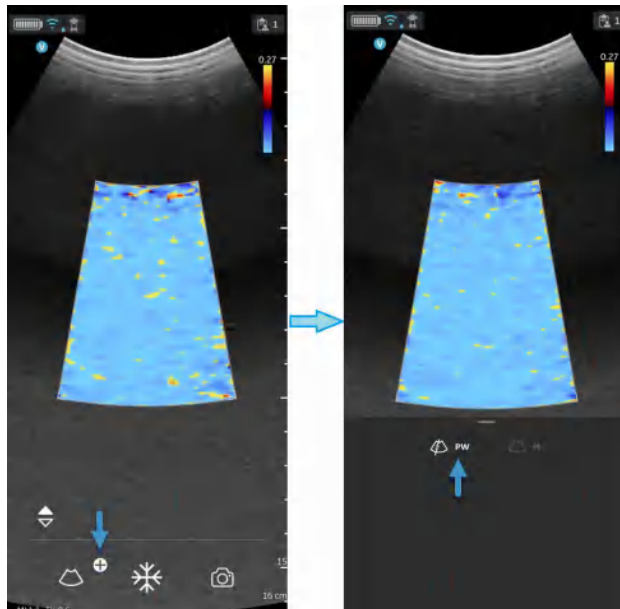
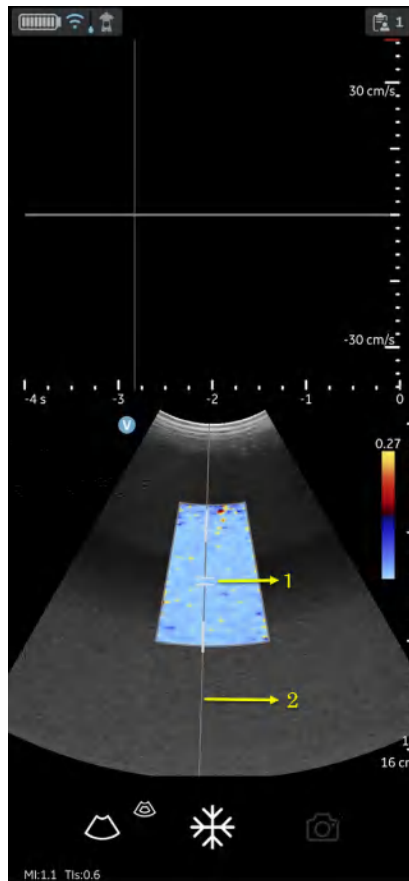


Figure 5-23. PW-mode activation

4. Position the PW cursor as necessary.

**Typical exam protocol (continued)**

5. To change the sample volume position touch anywhere in the B+color display area to activate positioning of the PW sample gate.

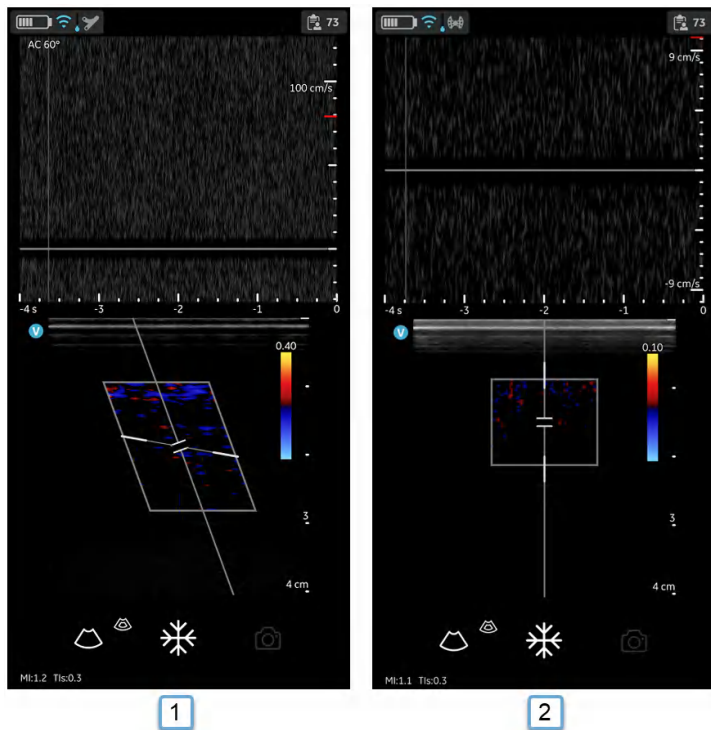


1. PW Sample volume/Sample gate
2. PW cursor

Figure 5-24. Sample volume positioning

Typical exam protocol (continued)

6. Adjust angle correct (AC) by touching one of the ends of the angle correct line passing through the sample volume gate.



1. AC 60 degree
2. AC 0 degree

Figure 5-25. Angle correct value

Angle correct defaults to 60 degree for Vascular presets and to 0 degree for all other presets.

The angle correct value displayed in the upper left corner of the PW spectrum is different from 0 degree.



**Typical exam protocol (continued)**

7. The PW Doppler spectrum appears, and the system operates in Doppler mode.

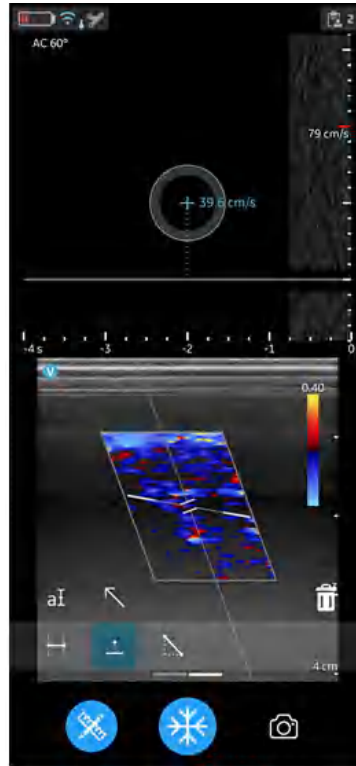
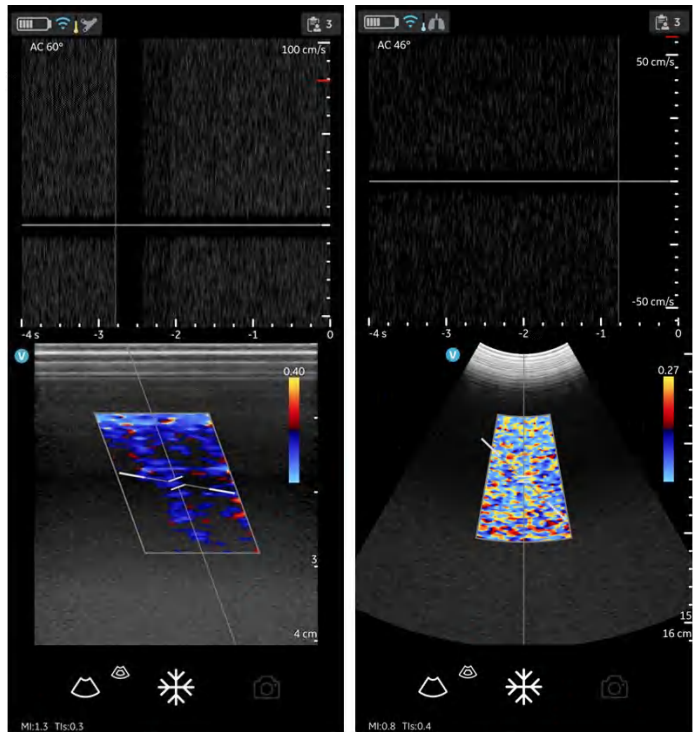


Figure 5-26. PW Doppler spectrum

Typical exam protocol (continued)

8. Optimize the PW Doppler spectrum, as necessary. Refer “Optimizing the Image’ on *page 5-40* section of this chapter for more information.





1

2

1. Linear array preset
2. Curved array preset

Figure 5-27. PW Doppler Optimization

**Typical exam protocol (continued)**

- To exit PW Doppler and return to B-mode press the  icon.
- To exit PW Doppler and return to B+Color mode press the  icon to exit PW Doppler.

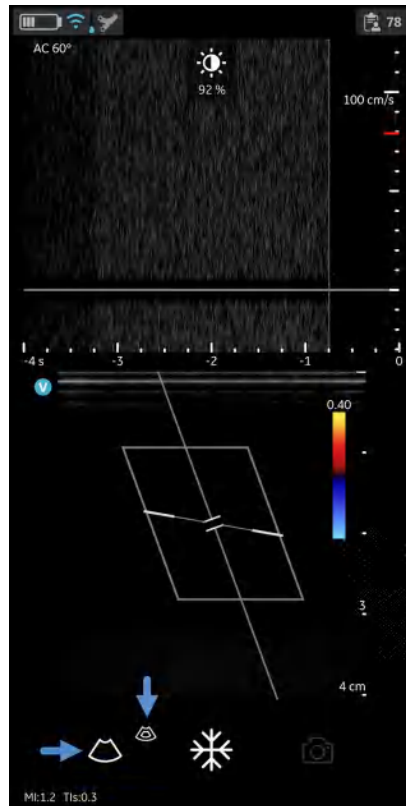


Figure 5-28. PW gain

## Optimizing the Image

### 1. Doppler gain

Move your finger to the right or left to in the PW doppler display area to increase or decrease gain. Refer Figure 5-28 on page 5-39.

### 2. Toggling

- Toggle between live Doppler (color-mode frozen) and live color-mode (Doppler spectrum frozen) is available in PW modes.
- Freeze icon can freeze both color-mode and Doppler spectrum simultaneously.

### 3. Doppler sample volume gate position

- Move the sample volume gate on the color-mode cursor. The gate is positioned over a specific position within the vessel.
- To move sample volume gate position, tap the cursor then move it in any direction until it is positioned inside the vessel of interest.

**Optimizing the Image (continued)****4. Velocity scale**

- Scale adjusts the velocity scale to accommodate faster/ slower blood flow velocities.
- To increase or decrease velocity swipe your finger up/ down on or close to the on screen velocity ruler. Swipe at least half a centimeter to initiate Velocity scale adjustments. The display updates the velocity scale after adjusting.

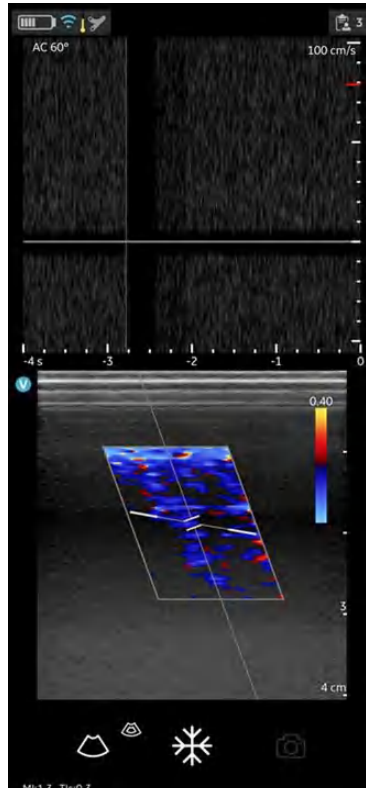


Figure 5-29. Velocity scale

## Optimizing the Image (continued)

### 5. Sweep speed (time scale)

- Sweep speed adjusts the time scale to optimize the display (time) resolution.
- To increase or decrease sweep speed swipe your finger left/right on or close to the on time scale ruler. Swipe at least half a centimeter to initiate Sweep speed adjustments. The display updates Sweep speed after adjusting.

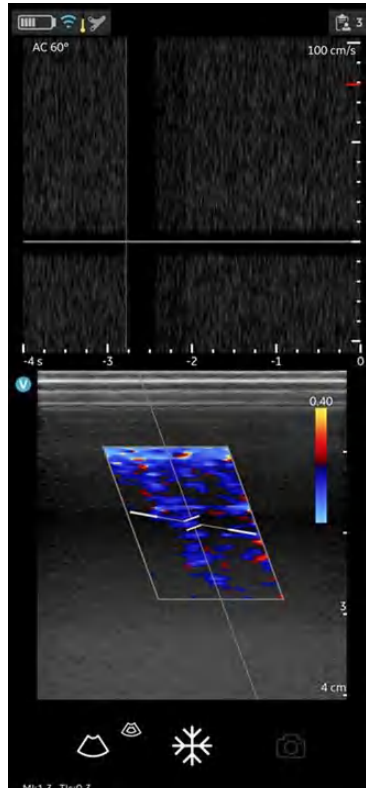


Figure 5-30. Sweep speed

**Optimizing the Image (continued)****6. Angle Correct**

Angle correct represents angle in degrees between the PW-mode cursor and angle correct indicator.

*NOTE:* When the Doppler mode cursor and angle correct indicator are aligned (the angle is 0), the angle correct indicator as a blue line on top of PW cursor line can be seen.

*NOTE:* The angle correct number in degrees displays as long as the angle correct is not set to zero (0).

*NOTE:* The Doppler Angle displays in red when the angle exceeds 60°. Angle correct values are limited to 80° since values greater than 80° are not accepted by the Vscan Air app.

**7. Baseline**

- Baseline rearranges the velocity scale without changing the velocity scale. Readjusts the positive and negative velocities limit without changing the total velocity range.
- Baseline adjusts the point in the spectrum where the velocity trace is at zero. To shift the baseline, drag Baseline up down directly on the spectral image.

**8. PW Cursor**

- PW cursor displays the Doppler mode cursor on the live color-mode image.
- Drag the cursor on the image to position it over the desired target before you activate the Doppler spectrum. The cursor can also be adjusted on the live color-mode image when spectral display is frozen.

**9. Steer**

The PW Cursor steer will align to the color steer. Color steer is only available for the linear transducer. If needing to change the PW cursor steer, then leave PW-mode, adjust color steer as desired and return to PW.

## PW-mode measurements

The following basic measurements can be made in Doppler mode:

- Velocity
- Time interval
- Slope

## Velocity

To measure velocity:

1. On a frozen image, press **Measure**.
2. The measurement display 'Velocity' being activated by default.
3. Position the velocity caliper on the PW-mode trace.
4. The system displays the velocity measurement.

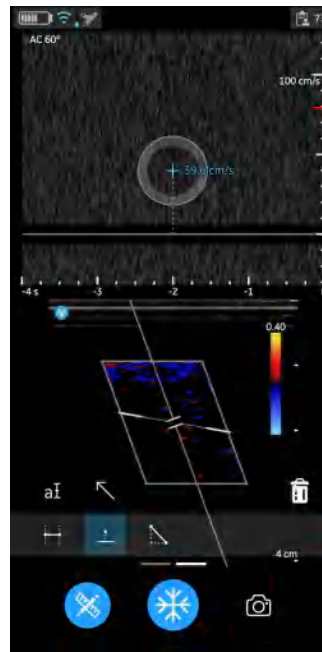


Figure 5-31. Velocity measurement

5. To store the image with a measurement, press **store**.  
For more information refer 'Measurements' on *page 5-73*



## PW-mode measurements (continued)

### Time Interval on PW-mode

To measure a time interval:

1. On a frozen image, press **Measure**.
2. Select the Time measurement tool.
3. Position the calipers on the PW doppler waveform to measure the desired time interval.
4. The system displays the time measurement and the corresponding calculated heart rate. The number of beats used for the heart rate calculation is listed with the calculated heart rate. Example 60 bpm (2) refer Figure 5-32

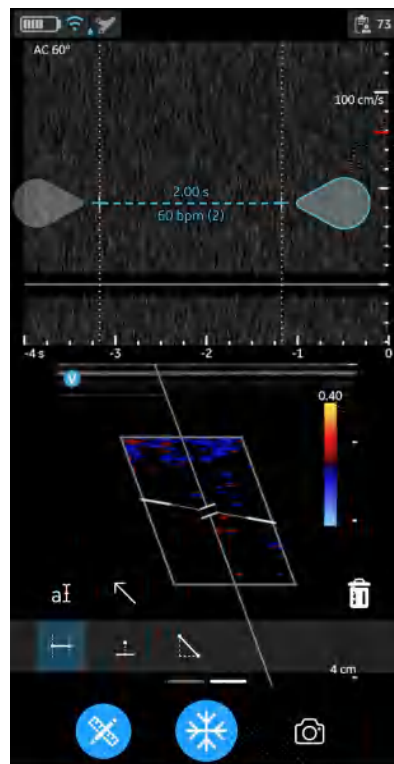


Figure 5-32. Time interval - PW-mode

5. To store the image with a measurement, press **store**.  
For more information refer 'Measurements' on [page 5-73](#)

### Slope on PW-mode

To measure slope between two points:

1. On a frozen image, press Measure.
2. Select the Slope measurement tool.
3. Drag to position the calipers on the PW-mode trace.

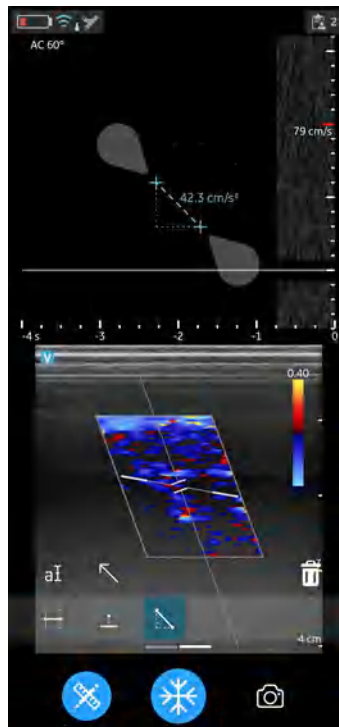


Figure 5-33. Slope measurement

4. The system displays the slope measurement result.
5. To store the image with a measurement, press **store**.

For more information refer 'Measurements' on *page 5-73*


## M-mode (Motion mode)

M-mode (Motion mode) provides a display format and measurement capability that represents tissue motion occurring over time. Data is acquired along one direction indicated by the M-mode cursor.

It is used to determine patterns of motion for objects within the ultrasound beam. The most common use is for viewing motion patterns of the heart.

## Typical exam protocol

Using M-mode might proceed as follows:

1. Select the preset and probe to be used.
2. Select a good B-mode image. Survey the anatomy and place the area of interest near the center of the B-mode image.
3. Press  icon to access entry to M-mode and tap M-mode. M-mode is then active with the cursor appearing on the frozen B-mode image.

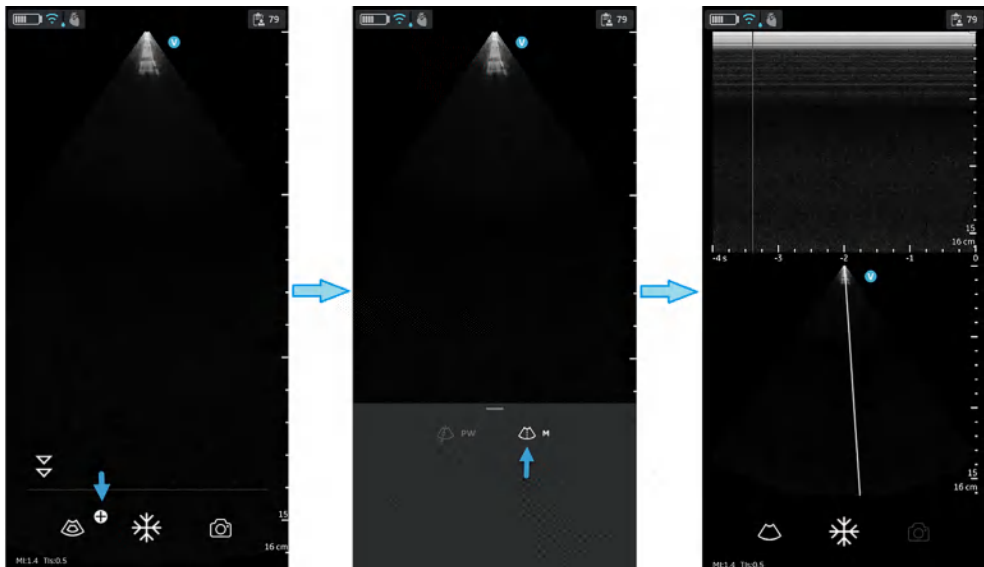



Figure 5-34. M-mode activation

4. To optimize the M-mode cursor position on the B-mode image touch anywhere in the B-mode display area to activate positioning of the M-mode cursor.

**Typical exam protocol (continued)**

5. Adjust the sweep speed and gain as needed.
6. Press **Freeze** to freeze the M-mode.
7. Tap **Store** to save image to archive.
8. Press **Freeze** to continue imaging.
9. To exit M-mode, press the  icon to exit M-mode and enter B-mode.

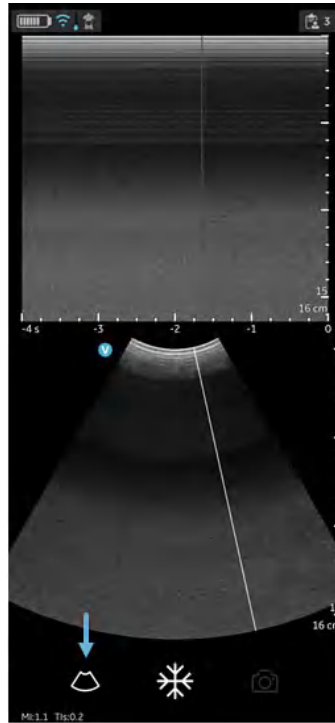


Figure 5-35. Exit M-mode

---

## M-mode Display & Controls

### M Cursor

To position the M-mode cursor, touch the M cursor with your finger and drag it right or left to reach proper position.

### Gain

M-mode gain increases or decreases the amount of echo information displayed in an image. It may have the effect of brightening or darkening the image if sufficient echo information is generated.

To increase or decrease gain swipe your finger left/right in the M-mode display area.

*NOTE: Changing the M-mode gain while in live M-mode and frozen B-mode does not affect the B-mode image gain.*

### Sweep Speed

Sweep speed changes the speed at which the timeline is swept.

To increase or decrease sweep speed swipe your finger left/right on or close to the on time scale ruler. Swipe at least half a centimeter to initiate Sweep speed adjustments. The display updates Sweep speed after adjusting.

### M-mode measurements

Basic measurements that can be taken in the M-mode portion of the display are:

- Distance
- Time Interval
- Slope

*NOTE: The following instructions to be performed:*

1. Scan the anatomy of interest in live B-mode.
2. Activate live M-mode.
3. Position the M-mode cursor over the tissue of interest.
4. Press **freeze**.

### Distance on M-mode

Distance measurements in M-mode is vertical distance from one caliper point to the next caliper point.

1. On a frozen image, press **Measure**.
2. Select Vertical distance.
3. Position the calipers.

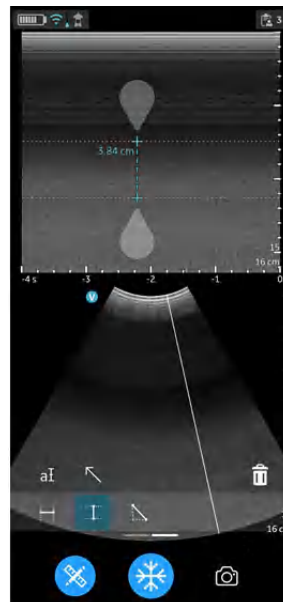


Figure 5-36. Positioning Calipers

4. The system displays the vertical distance.
5. To store the image with a measurement, press **store**.

### Time interval on M-mode

To measure a horizontal time interval:

1. On a frozen image, press **Measure**.
2. Select the Time measurement tool.
3. Position the calipers in the M-mode window to measure the desired time interval.

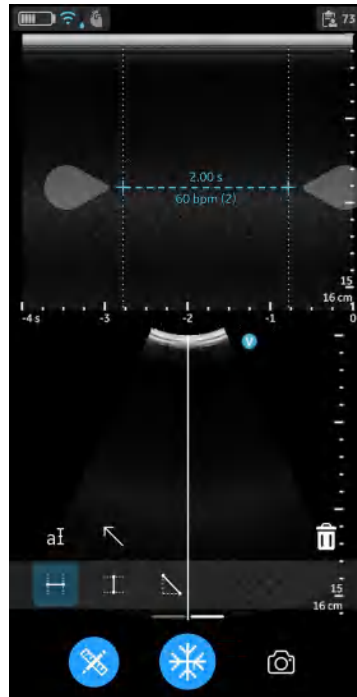


Figure 5-37. Time interval - M-mode

4. The system displays the time measurement and the corresponding calculated heart rate. The number of beats used for the heart rate calculation is listed with the calculated heart rate. Example 60 bpm (2) refer the Figure 5-37
5. To store the image with a measurement, press **store**.

### Slope on M-mode

To measure slope between two points:

1. On a frozen image, press **Measure**.
2. Select slope measurement.
3. Position the calipers to measure slope.

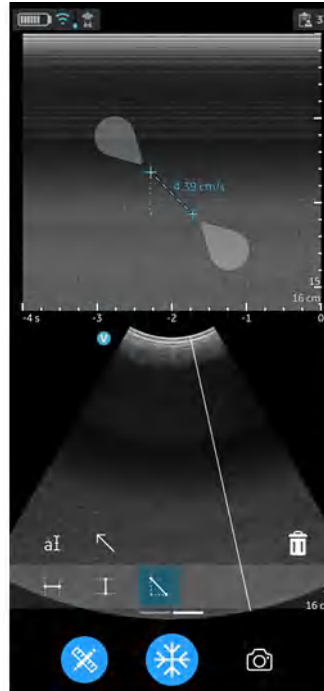


Figure 5-38. Positioning Calipers

4. The system displays the slope measurement result.
5. To store the image with a measurement, press store.



## Storing an image

Press **Store** button on the scan screen when the image is frozen to store a still image.



Figure 5-39. Store still image

## Storing a video

To store a video:

1. Press the '**Store**' button on the scan screen when the image is live.  
OR
2. Play the video buffer by using the '**Play**' button on the video scroll bar and then press **Store**.

Press **Store** button on the scan screen to store a video.



Figure 5-40. Store video

## Protected Health Information

Protected Health Information is the data that helps in identifying a patient. It is possible to either manually enter patient details/patient data in the Vscan Air application or assign patient/Study information from a scheduled exam retrieved from the Modality Worklist Server.

### Assign Patient data manually to the current exam

To assign patient details manually to the current exam in Vscan Air application, follow the procedure below.

1. Swipe from right to left.  
OR  
Press **Exam** icon on the top right corner.

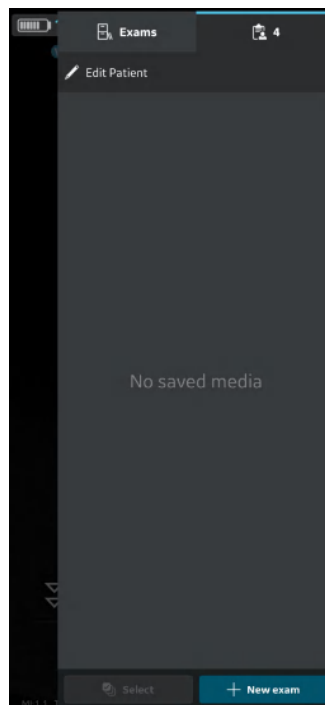


Figure 5-41. Exam icon

**NOTE:** *Patient data can be assigned to an individual exam only. The Patient data cannot be assigned to more than one exam simultaneously.*

**Assign Patient data manually to the current exam (continued)**

2. Press **"Edit Patient"** and enter the required information in the respective fields under **"New Patient"** screen. Press **"Save"** button to assign Patient data to the current exam. After successful assignment of Patient data, application takes you to the scan screen.

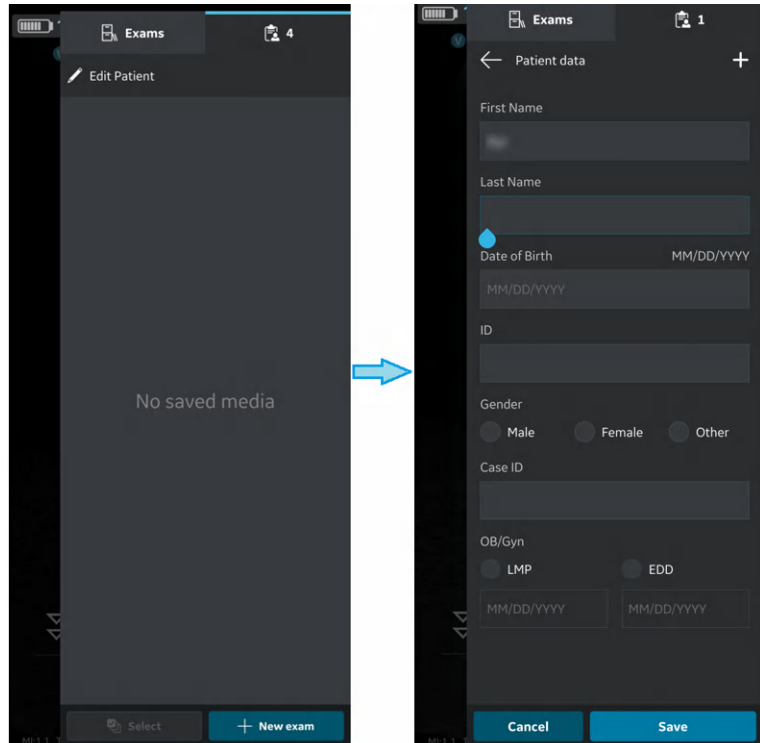


Figure 5-42. Edit Patient

**NOTE:** *Once an export of exam images/videos has been initiated, the patient details assigned to that particular exam can not be edited in the app.*

**Assign Patient data manually to the current exam (continued)**

3. Patient's Last Name, First Name and ID are shown on the scan screen header.



1. Patient last name and first name
2. Patient ID

Figure 5-43. Scan screen with patient data

4. Press **Exam** icon to view the images/videos under current exam.

### Assign Patient data manually to an existing Exam

To assign patient details manually to an existing exam in Vscan Air application, follow the procedure below.

1. Swipe from right to left.  
OR  
Press **Exam** icon on the top right corner.

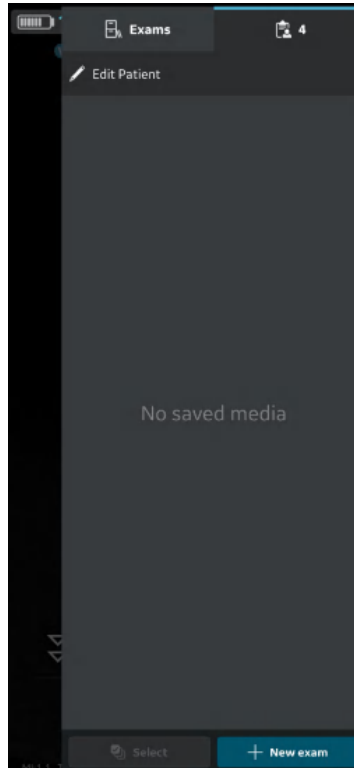


Figure 5-44. Exam icon

**Assign Patient data manually to an existing Exam (continued)**

2. Press **Exam** tab.

Press the desired Exam for which you wish to assign Patient data.



Figure 5-45. Exam Tab

**NOTE:** *Patient data can be assigned to an individual exam only. The Patient data cannot be assigned to more than one exam simultaneously.*

### Assign Patient data manually to an existing Exam (continued)

3. Press **"Edit Patient"** button at top right corner and enter the required information in the respective fields under "New Patient" screen.

Press **"Update"** button to assign Patient data to the existing exam. After successful assignment of Patient data, application takes you to the scan screen.

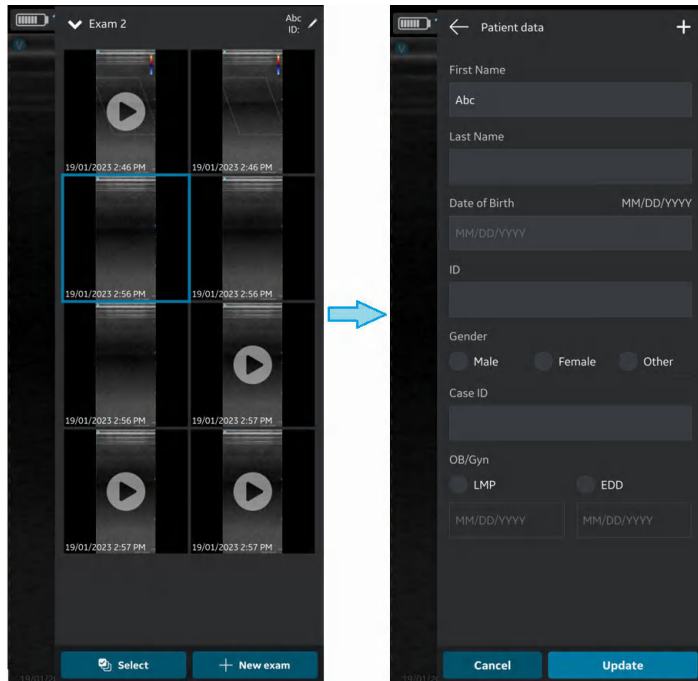


Figure 5-46. Edit exam

**NOTE:** *Once an export of exam images/videos has been initiated, the patient details assigned to that particular exam can not be edited in the app.*



**Assign Patient data manually to an existing Exam (continued)**

4. Patient's Last Name, First Name and ID are shown on the top of the scan screen.



1. Patient Last name and first name
2. Patient ID

Figure 5-47. Scan screen with Patient data

5. Press **Exam** icon to view the images/videos under the existing exam.

### Assign Patient data from Modality Worklist Server to the current exam

Vscan Air can download and refresh a DICOM modality worklist. An exam can be linked to an existing patient pulled from the worklist, prior to exporting to the DICOM image server.

To assign Patient data from a modality worklist server to the current exam in the Vscan Air application, follow the procedure below.

1. Swipe from right to left.  
OR  
Press **Exam** icon on the top right corner.

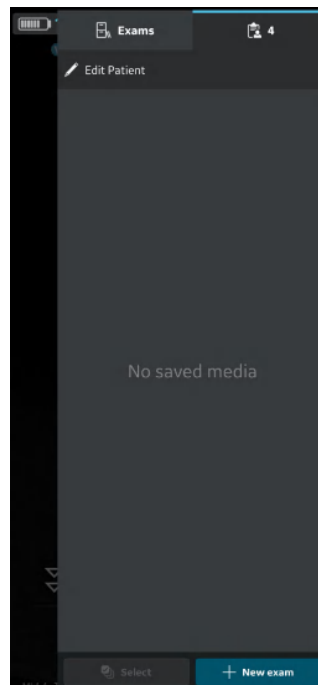


Figure 5-48. Exam Icon

**NOTE:** *Patient data can be assigned to an individual exam only. The Patient data cannot be assigned to more than one exam simultaneously.*

**Assign Patient data from Modality Worklist Server to the current exam (continued)**

2. Press **"Edit Patient"** and then Press the **+** symbol at top right corner of "New Patient" screen.

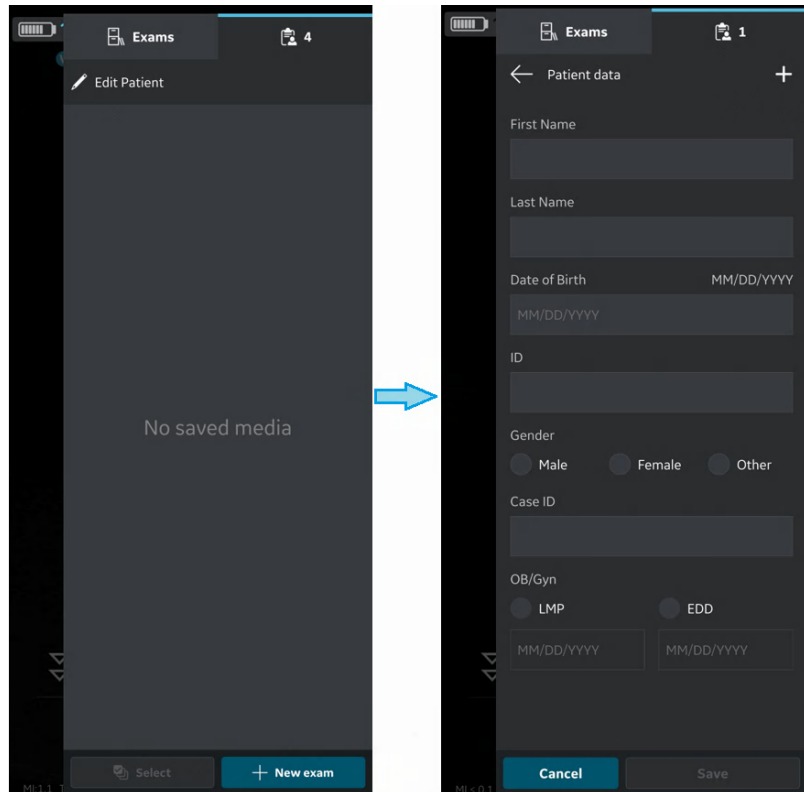


Figure 5-49. Edit Patient

**Assign Patient data from Modality Worklist Server to the current exam (continued)**

3. Press the refresh button on the “Worklist” screen to import the list of patients from Modality Worklist Server. Patient data can be added to current exam in one of the following ways:
  - a. Tap on the desired Patient Name / Patient ID from the imported list of patients OR
  - b. Make a local search to find the details of a particular patient from the imported list of patients - by entering Patient Name / Patient ID in the “Filter” field on the screen OR
  - c. Make a remote search to find the details of a particular patient from selected Modality Worklist Server – by entering Patient ID in the “Patient Query” field on the screen.

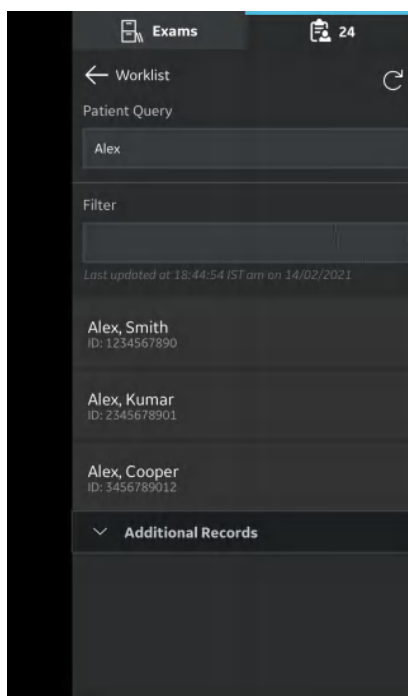


Figure 5-50. Search Patient

## Assign Patient data from Modality Worklist Server to the current exam (continued)

**NOTE:** When a remote search is initiated, only the records matching the search criteria will be displayed on the screen. If user moves away from the worklist screen and comes back, the worklist screen will display the imported list of records and clears the remote search results.



Figure 5-51. Worklist

**NOTE:** Make sure that the display device hosting Vscan Air app and the PC in which server is configured are connected to same network.

**NOTE:** When you refresh the patient details in “worklist” screen, the connection between Vscan Air Probe and display device may be temporarily interrupted.

**NOTE:** For any patient, if details are missing in Modality Worklist server, import of those patient records will be rejected in the application and it will be displayed in the patient list as “Rejected”.

**Assign Patient data from Modality Worklist Server to the current exam (continued)**

4. Press **"Save"** button to assign Patient data to the current exam. After successful assignment of Patient data, application takes you to the scan screen.

Patient's Last Name, First Name and ID are shown on the top of the scan screen.

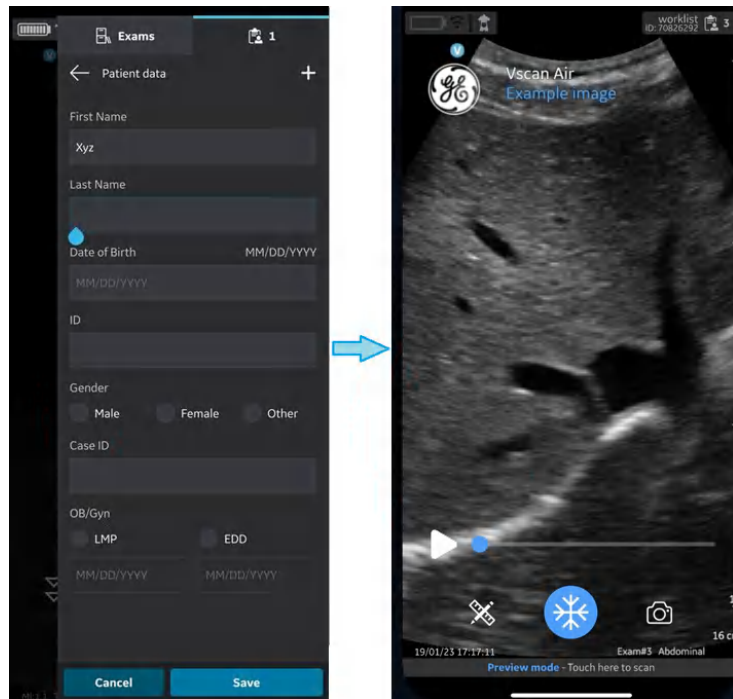


Figure 5-52. Add patient

5. Press **Exam** icon to view the images/videos under current exam.

**NOTE:** Once the patient from the Modality Worklist server is assigned to an exam, the patient details assigned to that particular exam can not be edited in the app.

### Assign Patient data from Modality Worklist Server to an existing exam

Vscan Air can download and refresh a DICOM modality worklist. An exam can be linked to an existing patient pulled from the worklist, prior to exporting to the DICOM image server.

To assign Patient data from a modality worklist server to an existing exam in the Vscan Air application, follow the procedure below.

1. Swipe from right to left.  
OR  
Press **Exam** icon on the top right corner.

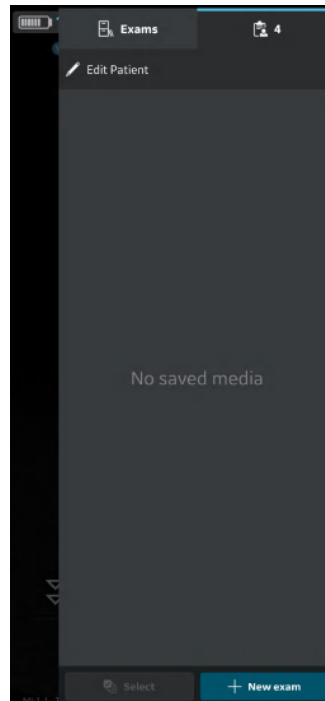


Figure 5-53. Exam Icon

**NOTE:** *Patient data can be assigned to an individual exam only. The Patient data cannot be assigned to more than one exam simultaneously.*

**Assign Patient data from Modality Worklist Server to an existing exam (continued)**

2. Press **Exams** tab.

Press the desired Exam for which you wish to assign Patient data.

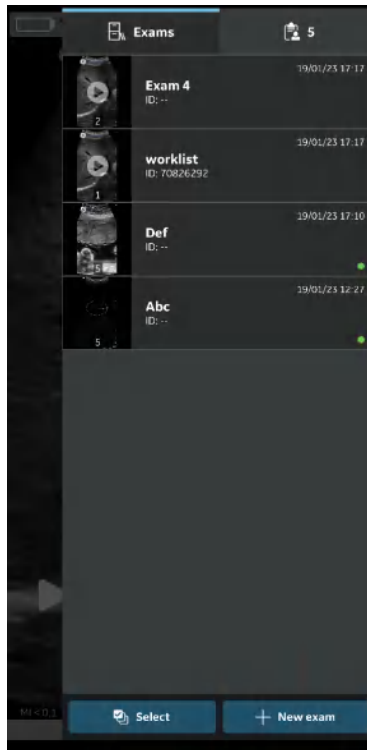


Figure 5-54. Exam tab



**Assign Patient data from Modality Worklist Server to an existing exam (continued)**

3. Press **"Edit Patient"** button at top right corner.  
Press the **+** symbol on **"New Patient"** screen.

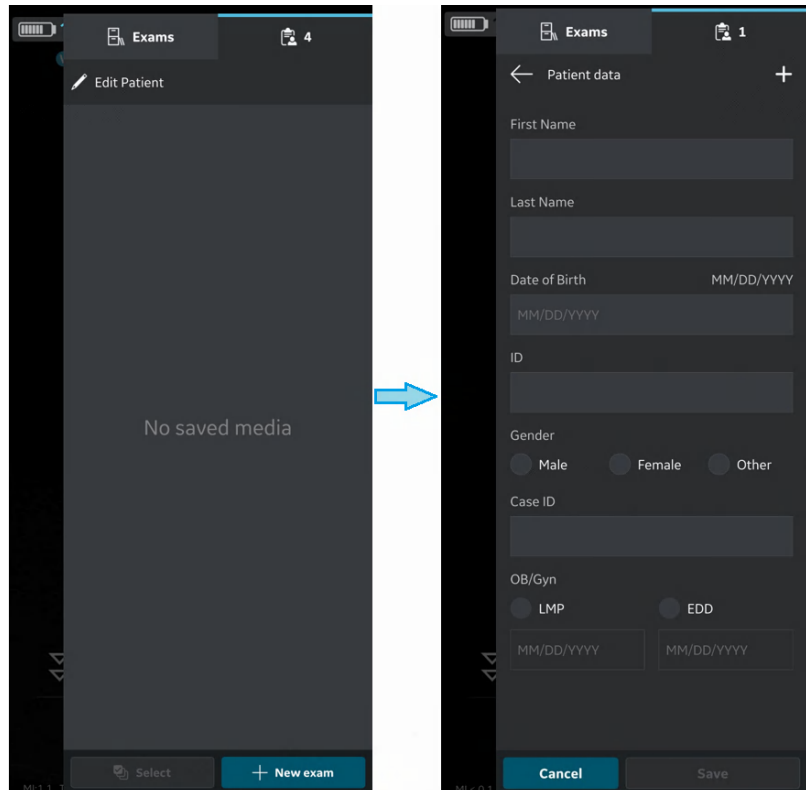


Figure 5-55. Edit Patient

**Assign Patient data from Modality Worklist Server to an existing exam (continued)**

4. Press the refresh button on the “Worklist” screen to import the list of patients from Modality Worklist Server. Patient data can be added to current exam in one of the following ways:
  - a. Tap on the desired Patient Name / Patient ID from the imported list of patients OR
  - b. Make a local search to find the details of a particular patient from the imported list of patients - by entering Patient Name / Patient ID in the “Filter” field on the screen OR
  - c. Make a remote search to find the details of a particular patient from selected Modality Worklist Server – by entering Patient ID in the “Patient Query” field on the screen.

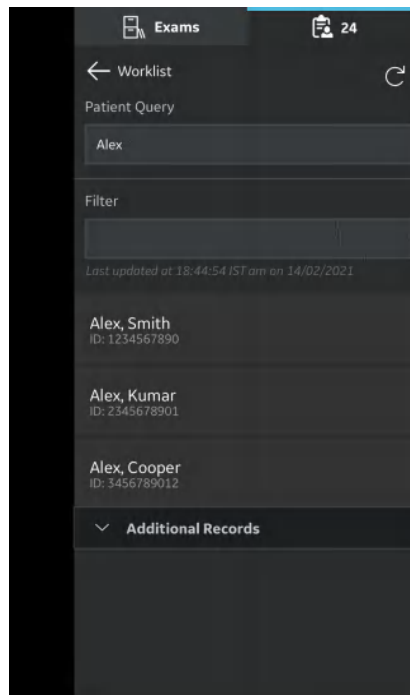


Figure 5-56. Search patient

## Assign Patient data from Modality Worklist Server to an existing exam (continued)

**NOTE:** *When a remote search is initiated, only the records matching the search criteria will be displayed on the screen. If user moves away from the worklist screen and comes back, the worklist screen will display the imported list of records and clears the remote search results.*



Figure 5-57. Worklist

**NOTE:** *Make sure that the display device hosting Vscan Air app and the PC in which server is configured are connected to same network.*

**NOTE:** *When you refresh the patient details in “worklist” screen, the connection between Vscan Air Probe and display device may be temporarily interrupted.*

**NOTE:** *For any patient, if details are missing in Modality Worklist server, import of those patient records will be rejected in the application and it will be displayed in the patient list as “Rejected”.*

**Assign Patient data from Modality Worklist Server to an existing exam (continued)**

5. Press "**Update**" button to assign Patient data to the existing exam. After successful assignment of Patient data, application takes you to the scan screen.

Patient's Last Name, First Name and ID are shown on the top of the scan screen.

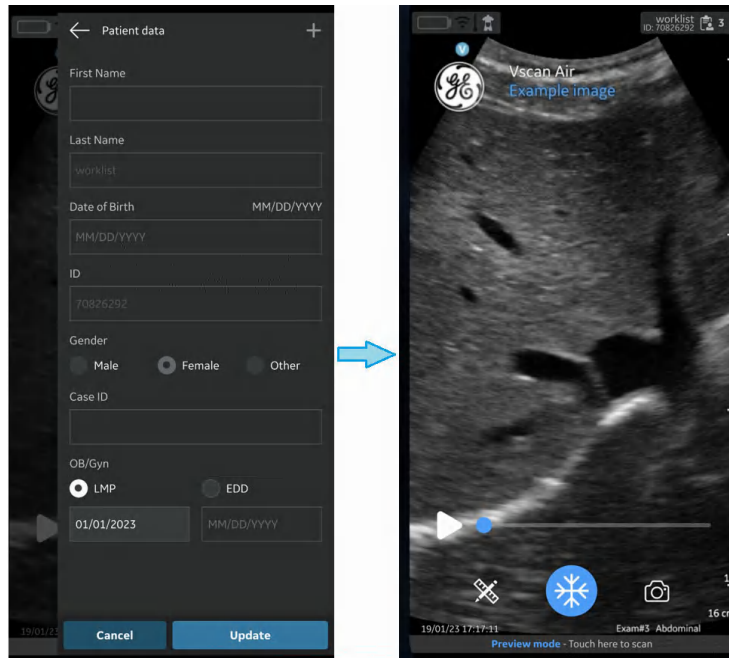


Figure 5-58. Add patient

6. Press **Exam** icon to view the images/videos under the existing exam.

**NOTE:** *Once the patient from the Modality Worklist server is assigned to an exam, the patient details assigned to that particular exam can not be edited in the app.*

# Measurements

## Taking measurements

The Vscan Air app enables distance, time, velocity, angle and ellipse circumference measurements. Measurements can be taken during image review or on recalled images.

To perform a distance measurement:

1. On a frozen image, press the **Measure/Annotate** button. The '**Distance**' and '**Ellipse**' measurements options are available with distance being activated.

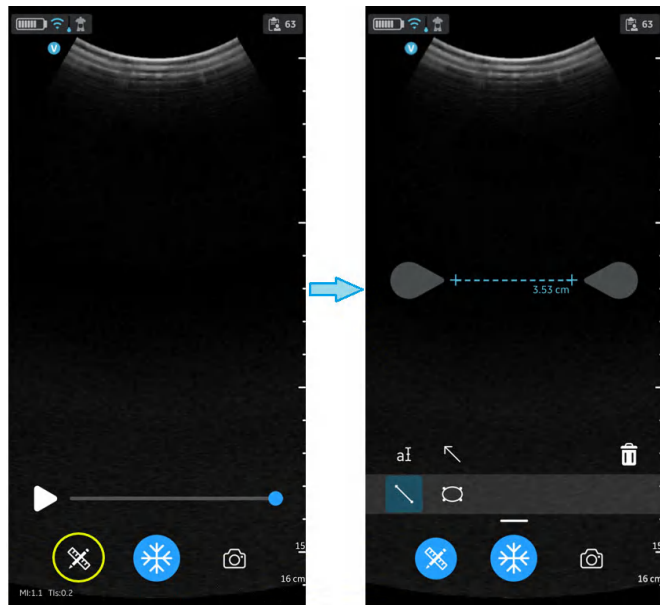


Figure 5-59. Select measurement

## Taking measurements (continued)

2. Drag to position the caliper to obtain the desired distance measurement.
3. To store the image with a measurement, press **store**.

To make additional measurements:

1. Press the distance measurement icon again to make additional measurements on the displayed image.

To delete a distance measurement:

1. Select the measurement you wish to delete.
2. Press '**Bin**' icon to delete the selected measurement.

To perform an ellipse measurement:

1. On a frozen image, press the **Measure/Annotate** button.  
The ellipse measurement tool displays.



Figure 5-60. Select Ellipse measurement

## Taking measurements (continued)

2. Drag to position the calipers to obtain the desired ellipse circumference measurement.
3. To store the image with a measurement, press **store**.

*NOTE: Only a single ellipse measurement can be performed on the displayed image.*

To delete an ellipse measurement:

1. Select the measurement.
2. Press the '**Bin**' icon to delete the selected measurement.

To exit the **Measure** mode select the '**Measure**' icon or press '**Freeze**' icon or switch frame with Video buffer slider.

## OB (Obstetric) measurement

- OB measurements is a module used for OB measurement functionalities.
- A report will be generated on the Report Button Clicked which will show the measurements taken, Gestational age (GA) calculated values, Average Ultrasound Age (AUA), Estimated Fetal Weight (EFW) , Last Menstrual Period (LMP) or Estimated Date of Delivery (EDD) from the patient information.

*NOTE: The Vscan Air obstetric measurements module is supporting measurements and reporting for one fetus per exam. If needing to measure and report multiple fetus development a separate Exam will need to be created for measuring and reporting each of the fetuses.*

## OB Distance measurement

Biparietal Diameter (BPD), Femur Length (FL) and Crown Rump Length (CRL) are among the basic distance measurements used to assess fetal size.

1. Navigate to OB measurement screen. Select the BPD, FL or CRL measurement tool.
2. Make a distance measurement. The system displays the BPD, FL or CRL measurement value.
3. Press the store button to store the result in the OB worksheet.

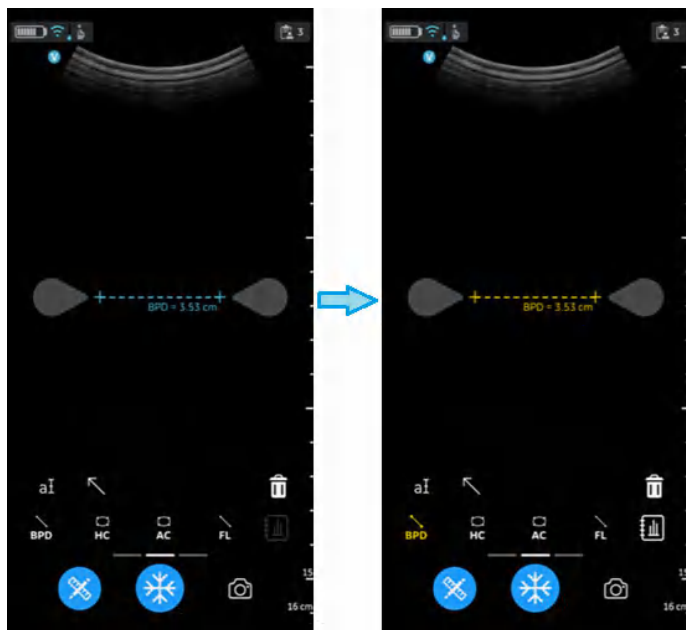


Figure 5-61. Biparietal diameter value



## OB Ellipse measurement

Abdominal circumference (AC) and Head Circumference (HC) are among the basic parameters used to assess fetal size.

To measure a circumference use the ellipse tool:

1. Navigate to the OB measurement screen, and select HC or AC.
2. Make an ellipse measurement. The system displays the HC or AC circumference value.
3. Press the store button to store the result in the OB worksheet.

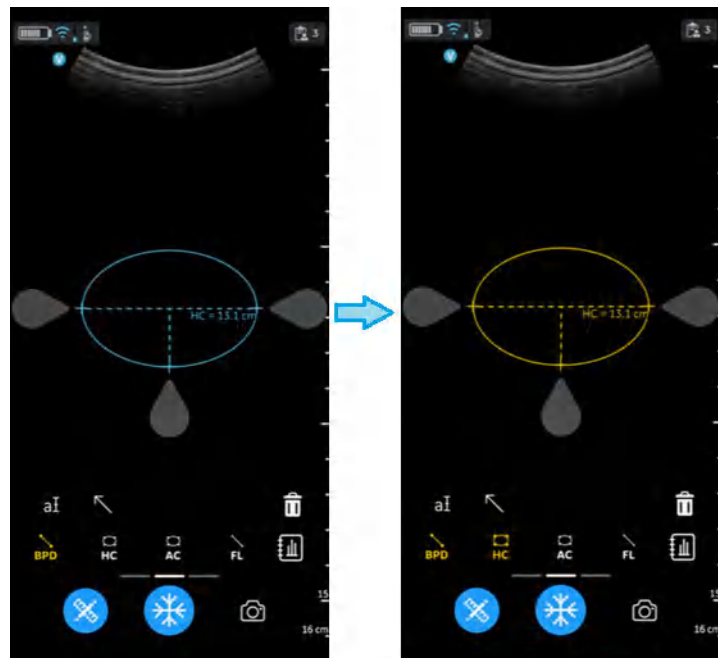


Figure 5-62. Head circumference

## AFI – Amniotic Fluid Index Q1, Q2, Q3, Q4

AFI measurement. AFI is the sum of deepest depth of amniotic fluid in each quadrant of ultrasound images. Here, Q1, Q2, Q3, and Q4 indicate each quadrant.

To calculate the amniotic fluid index, make one or four distance measurements.

To make a AFI (Q1, Q2, Q3, and Q4 Caliper) measurement:

- Navigate to OB measurement screen, and select AFI for the required quadrant (Q1, Q2, Q3, and Q4 Caliper).
- Make a distance measurement. The system displays the AFI respective quadrant value in the results window as shown in the below figure.
- Press the store button to store the result in the OB worksheet.

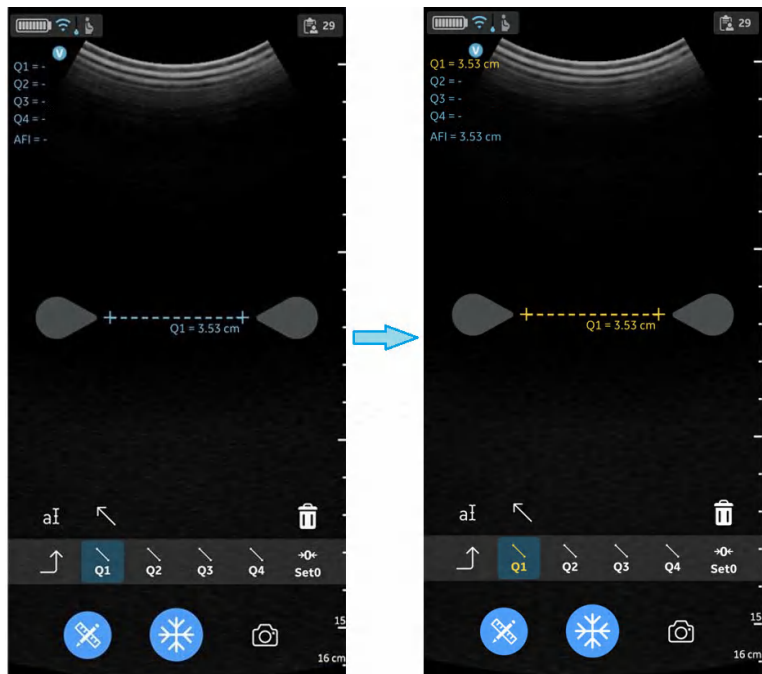


Figure 5-63. AFI Q1 Caliper

**Set >0<**

Set >0< is used to set the current quadrant value to zero.



Figure 5-64. Set >0<

## DVP - Deepest Vertical Pocket

User can measure DVP using a pre-assigned measurement caliper. The deepest (maximal) vertical pocket depth is considered a reliable method for assessing amniotic fluid volume on ultrasound. It is performed by assessing a pocket of a maximal depth of amniotic fluid which is free of an umbilical cord and fetal parts.

1. Navigate to OB measurement screen, and select DVP.
2. Make a distance measurement. The system displays the DVP value.
3. Press the store button to store the result in the OB worksheet.

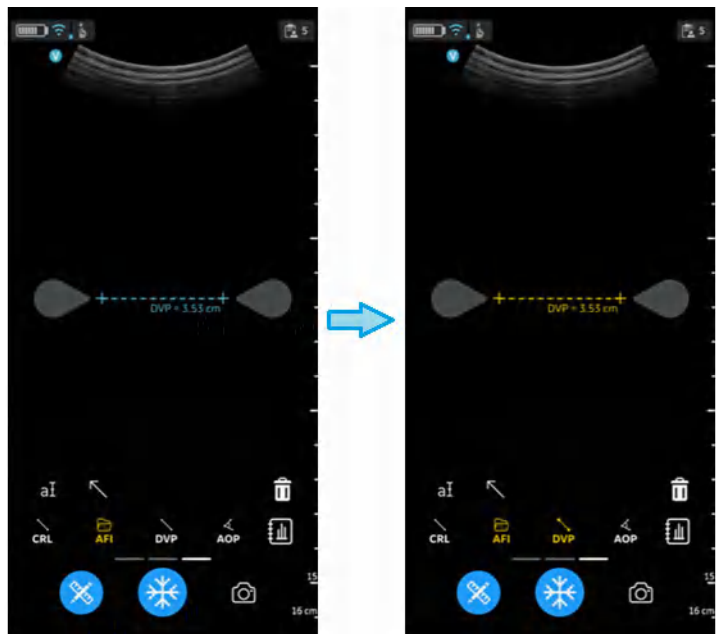


Figure 5-65. Deepest vertical pocket

## AOP- angle of progression

The AOP is a simple and reliable ultrasound parameter for the assessment of the descent of the fetal head.

1. Navigate to the OB measurement screen, select AOP.
2. Perform the angle measurement. The system displays the AOP value.
3. Press the store button to store the result in the OB worksheet.

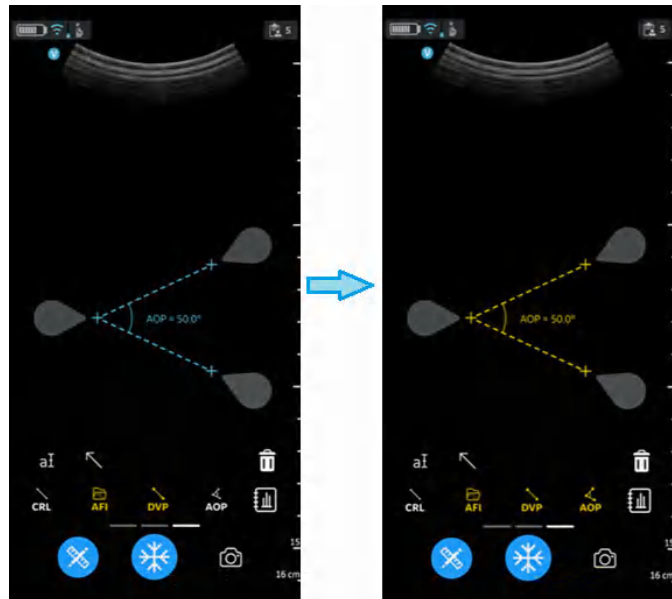


Figure 5-66. Angle of progression

## EFW – Estimated Fetal Weight

To calculate EFW several options are available:

- EFW (AC, BPD)
- EFW (AC, FL)
- EFW (BPD, AC, FL)
- EFW (HC, AC, FL)
- EFW (BPD, HC, AC, FL)

The system displays each measurement and the estimated fetal weight in the OB report.

## OB Worksheet/Report

### View and store Worksheet/Report

To review the OB measurement results and their corresponding calculation results select the Worksheet icon available in the OB measurement. The Worksheet icon is dimmed (not active) until a measurement has been stored. See Figure 5-61 on page 5-76.

Fetal biometry measurement results and calculations are available in the OB worksheet/report.

The OB Worksheet lists:

1. To view the OB worksheet/report tap the worksheet/report icon as illustrated in Figure 5-67
2. To save the OB worksheet/report tap the Save button in the OB worksheet/report as illustrated in Figure 5-67

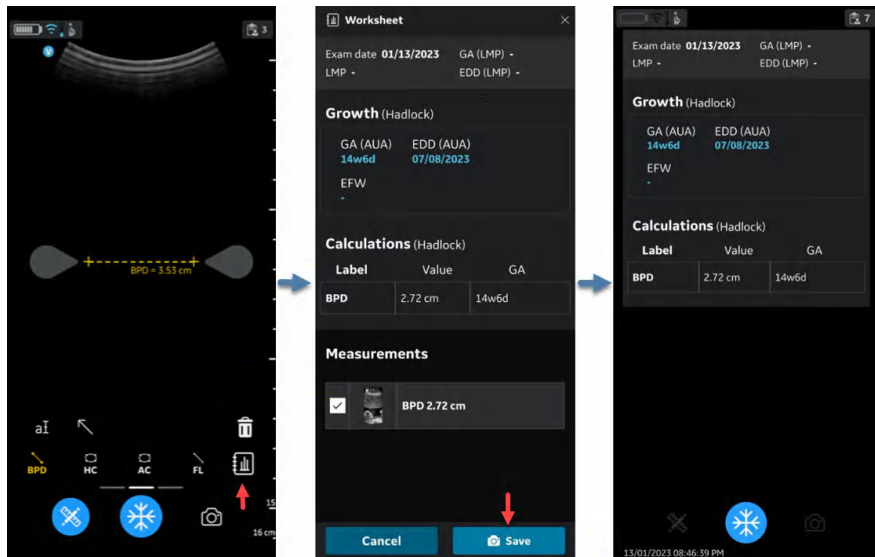

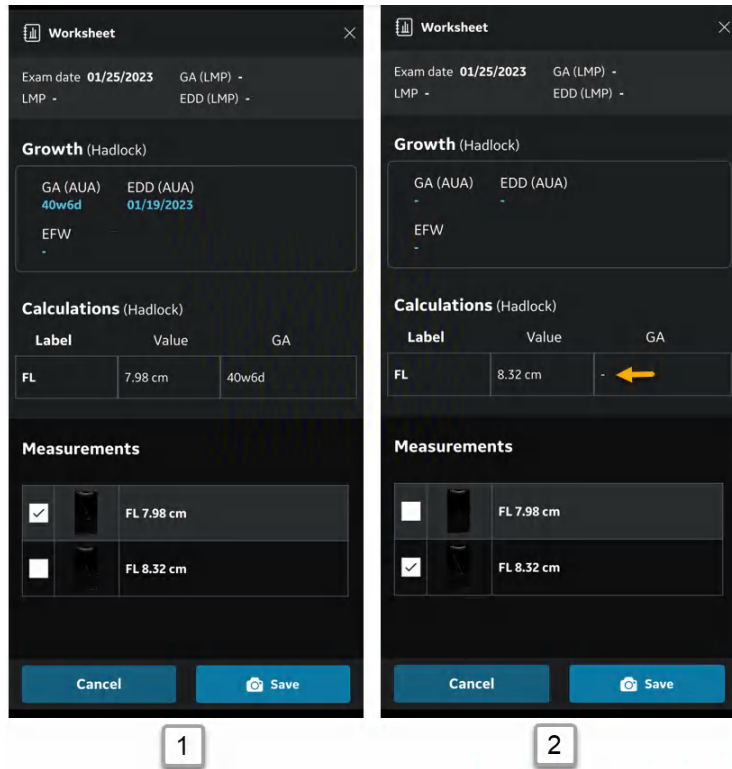


Figure 5-67. OB worksheet/report

**Measurement out of range**

If a measurement used for calculating fetal age is outside the range accepted as input for the calculation, meaning that the measurement is either less than or greater than the range allowed, a 'hyphen'  will be shown as the Gestational Age (GA) result. See Figure 5-68.




1. FL (Hadlock) < 8.2cm
2. FL (Hadlock) > 8.2cm

Figure 5-68. FL (Hadlock)

# Annotations

## Introduction

Select Annotation  icon to activate Annotation mode available via Measurement/Annotation button. The Annotation function provides the capability to type comments of free text and/or add pointer(s)/arrow(s).

Text annotations may be inserted anywhere in the image area.

- Annotation features are available for all presets and modes for both CL and SL probes.
- Annotation features are available in Freeze and for data recalled for review.
- The Vscan Air app supports a maximum of 5 annotation texts on a frozen or recalled image.



## Annotating an image

1. Select the desired preset and tap Annotation **aI** icon.

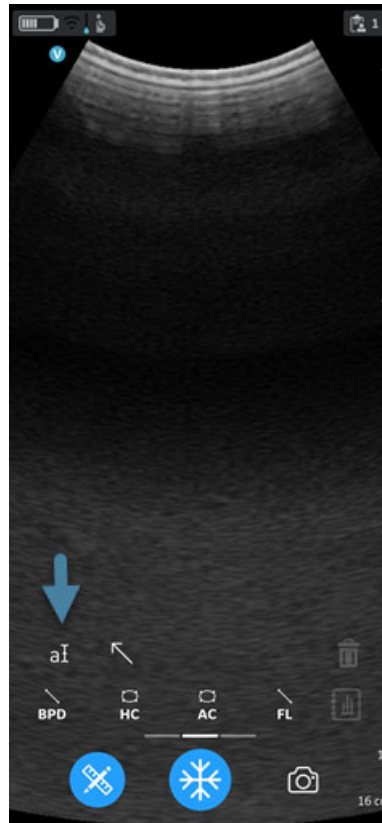


Figure 5-69. Tap annotation icon

## Annotating an image (continued)

2. Use the keyboard to type comments.

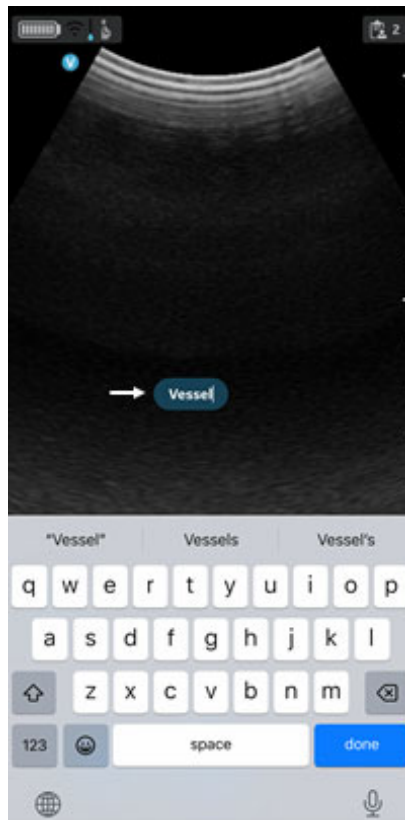


Figure 5-70. Type comment

3. Default position for annotations on the image screen is middle.

**Annotating an image (continued)**

4. Move the annotation box to the desired location. Tap the annotation text to edit the text.

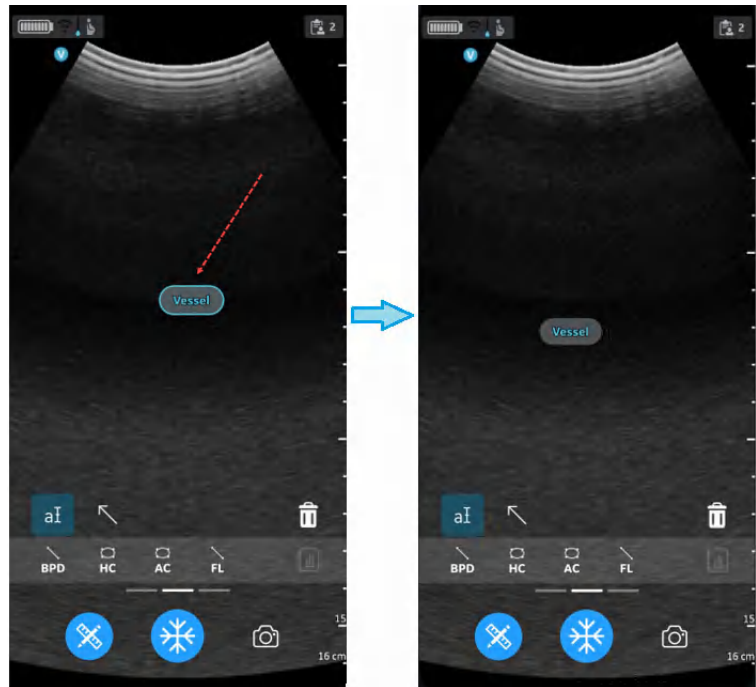
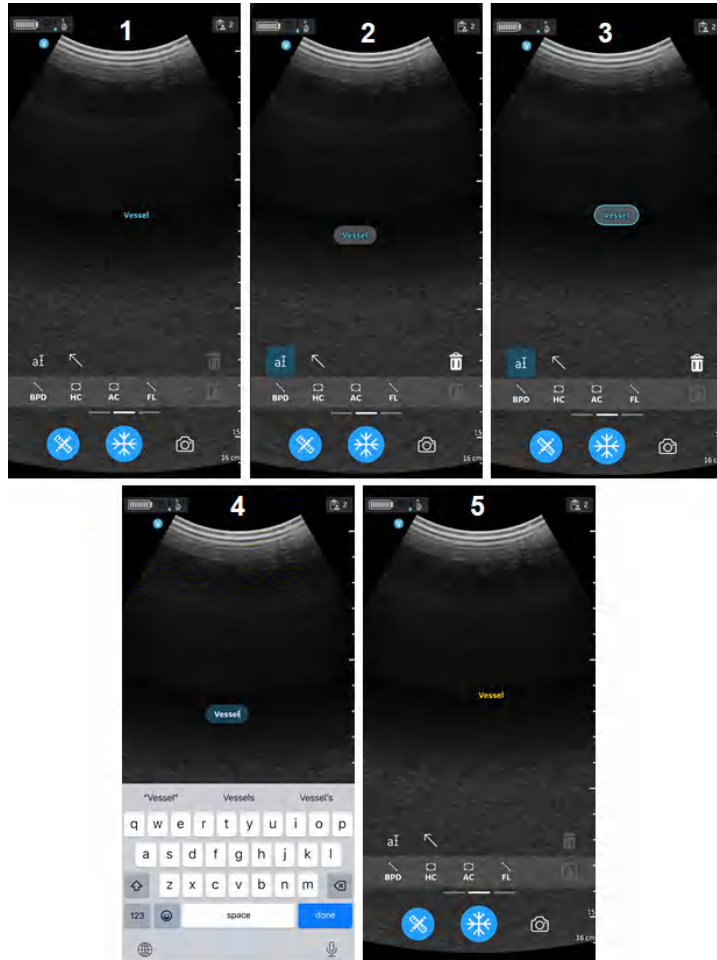


Figure 5-71. Edit or clear annotation

**NOTE:** *A maximum of five arrows and five text annotations can be added to a frozen or a recalled image.*

### Annotations states



- 1. Inactive
- 2. Selected
- 3. Interactive
- 4. Editing
- 5. Stored

Figure 5-72. Annotations states

## Edit an Annotation

Double tap the annotation text to edit. Press **'done'** on the keyboard or tap outside the annotation text field to exit the annotation edit mode.

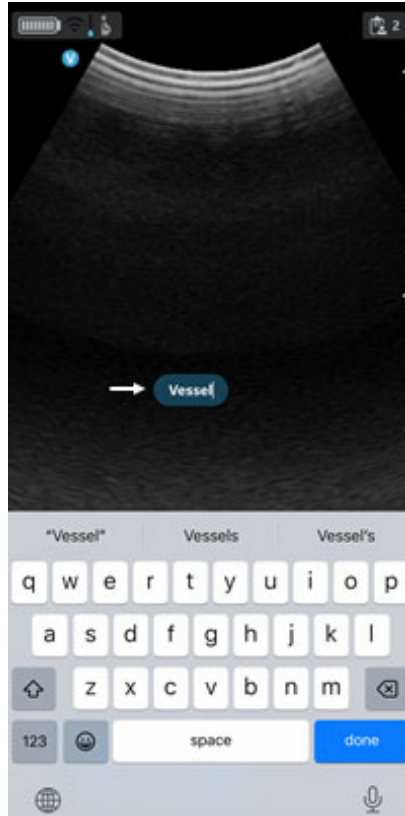


Figure 5-73. Edit annotation

## Annotation Reposition

Select Annotation and single tap on it and drag to reposition. Tap outside to deselect or tap on another tool/another action to deselect it.

**NOTE:** *User can position the annotations anywhere on the image.*

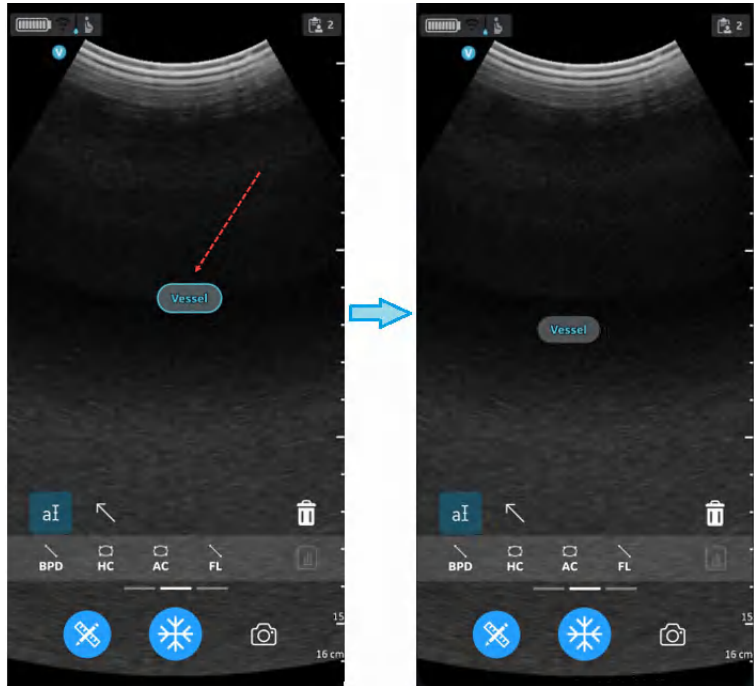


Figure 5-74. Repositioning annotation

## Delete Annotation

1. Select Annotation and single tap to enter selected mode.

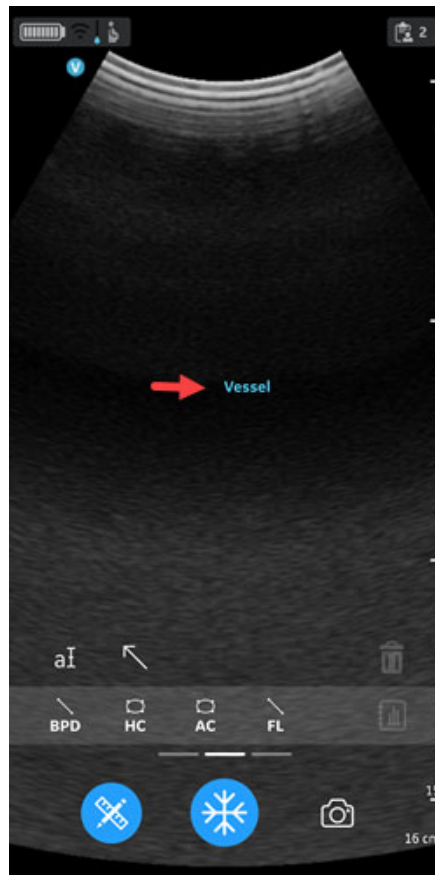


Figure 5-75. Select annotation

## Delete Annotation (continued)

2. Tap on **Trash** icon to delete (deleting logic is same as that of measurements). When the trash icon is tapped, the selected item is deleted and the last entered gets selected. Last in first out (applies to annotations, measurements and arrows).

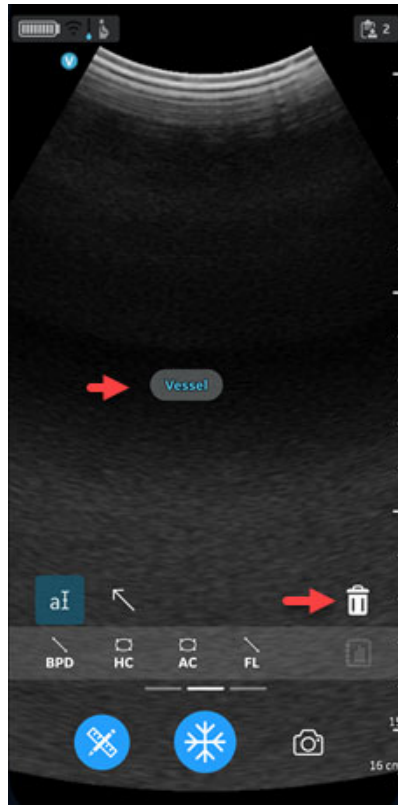


Figure 5-76. Deleting annotation



## Arrow Pointer

1. Tap **Comment** and select **Arrow**.
2. Select the desired arrow pointer and move it to the target position on the screen.

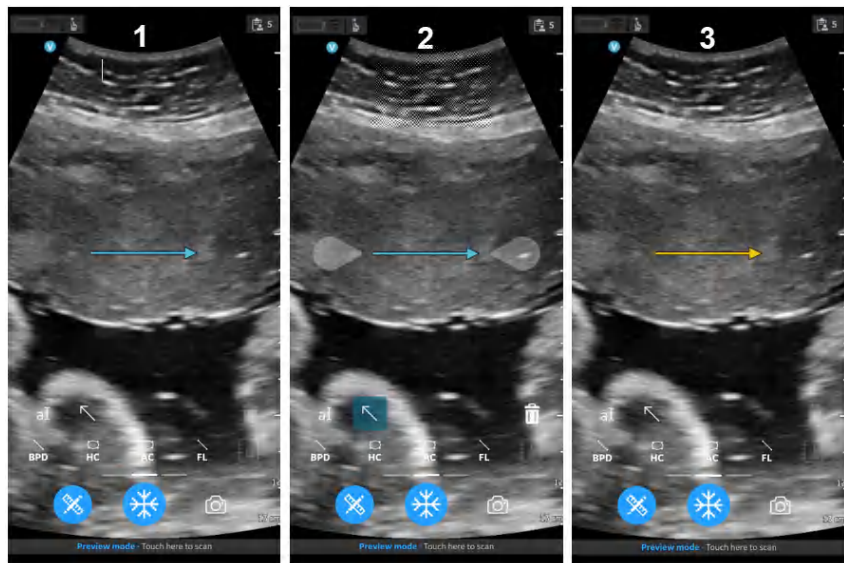
**NOTE:** *The size of the arrow pointers can be changed by stretching the arrow.*

3. Press anywhere on the scanning screen to set the arrow pointer or press to delete it.

User to lengthen, position, rotate the arrow pointer anywhere on the image.

The Vscan Air app supports a maximum of 5 pointers/arrows on a frozen or recalled image.

## Arrow states



1. Inactive
2. Selected and interacting mode
3. Stored

Figure 5-77. Arrow states

# Review and recall of stored data

## Review Current Exam

1. Swipe from right to left.  
OR  
Tap on **Exam** icon on the top right corner.  
Images and video loops captured in current exam is shown.
2. Select to activate and review stored images.



1. Image orientation marker
2. Recalled image preset icon
3. Recalled image exam number
4. Recalled image depth
5. Recalled image preset
6. Recalled image date and time

Figure 5-78. Recalled stored image

## Review Saved Exams

1. Swipe from right to left.  
OR  
Tap on **Exam** icon on the top right corner.
2. Tap **Exams** on top tab.

Saved exams will be shown in a list. Most recent exams are shown on top.

**NOTE:** *When accessing Exam list, select the desired image to go to the viewer. The viewer opens with selected image and the Exam list closes. The freeze button becomes active. You can unfreeze to continue scanning using the current exam.*

## Delete images/videos

You can delete images or videos individually or from an exam list.

### Delete images/videos from an exam list

The steps describe deleting entire exams from the list.

1. Open **Exam List**.

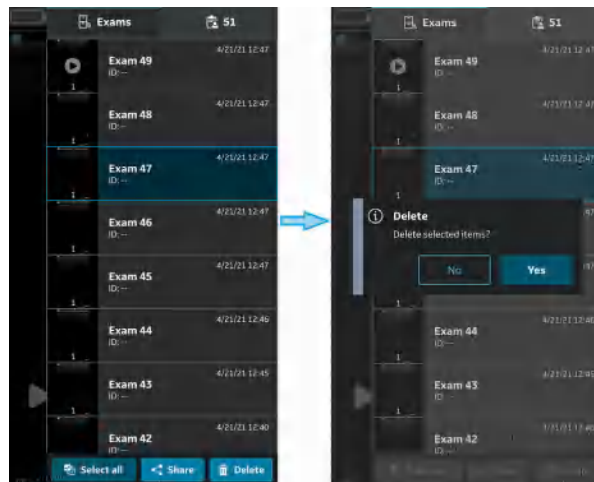


Figure 5-79. Delete image or video

2. Select the desired Exam you wish to delete.
3. Press **Select** or Press and hold.
4. Press the **'Bin'** icon to delete.

### Delete individual images/videos

1. Press **Select**.
2. Tap Select box on the image/video.
3. Press the '**Bin**' icon to delete.

### Clear selection

1. Press **Select All**.
2. Press **Clear all** to clear the selection if you do not wish to delete.

*NOTE: If deleting the Vscan Air App from the display device, the App data, including all exam data including the images and videos will be deleted.*

### Audit logs

An audit log is essentially a record of events and changes. Audit logs typically capture events by recording who performed an activity, what activity was performed, and how the system responded.

Audit logs are anonymous with regards to patient details. The Audit log captures the user ID (e-mail).

Examples: Logging events related to Exam Data as for instance Add, Delete, Date/Time of data access.

In addition there are DICOM events being logged.

For exporting the audit log for review select «About | Export audit log».

The Audit log will then be available as a text file stored internally on the display device as the shown below.

- Internal storage:/Documents/AuditLog.txt (Android 12).
- Files/On my iPad/Vscan Air/AuditLog.txt (iOS 14 on iPad).

## Audit logs (continued)

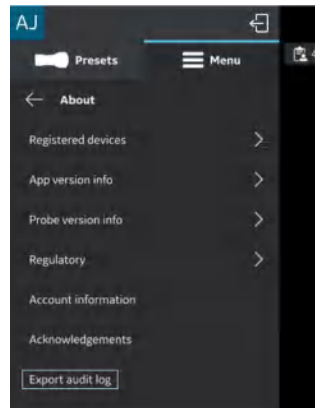


Figure 5-80. Export audit log

**NOTE:** When storing the audit log file using an Android device the user will be given the option to choose the path and edit the file name before storing the file. This can be utilized to avoid overwriting the old audit log file.

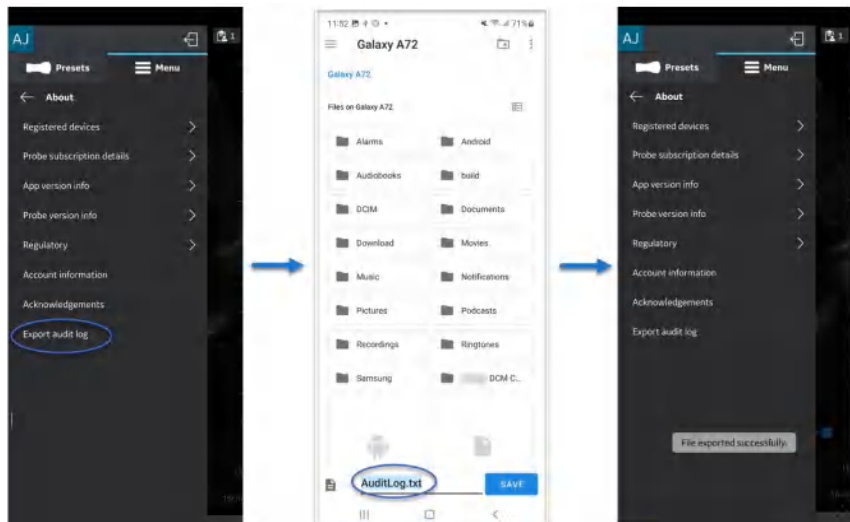


Figure 5-81. Android audit log export

## Audit logs (continued)

**NOTE:** When storing the audit log file using an iOS device (iPhone or iPad) it will replace any already stored audit log file. If the audit log file or the Vscan folder is kept open in the background, the new file appears as another file with same file name. When the folder is refreshed (closed and opened again) the latest file will be displayed.

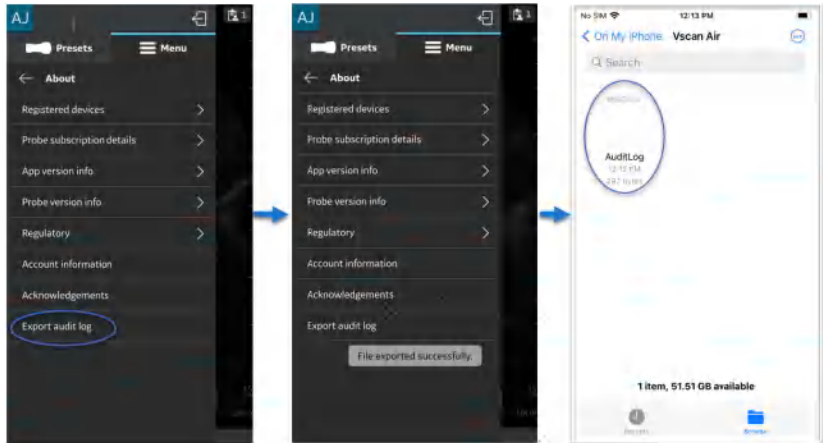


Figure 5-82. iOS audit log export

# Export data

The Vscan Air is regarded an imaging acquisition device and not an image storage device or image archive.

The maximum number of stored exams is limited to <500. The Vscan Air app will inform the user to export and/or delete exams as needed once the number of stored exams are 480 or higher.

The user should make sure to export images, videos (loops) or exams to an external storage device via the share function or the export to DICOM functionality available in the Vscan Air app.

***Disclaimer:*** *When sharing data from the Vscan Air app, data can be shared to other apps including anonymized images and movies/loops.*

Use the Share function on the display device to share data.

## Share individual images/videos

1. Swipe from right to left.  
OR  
Press **Exam** icon button on the top right corner.  
A list of stored images or videos for the current exam display.

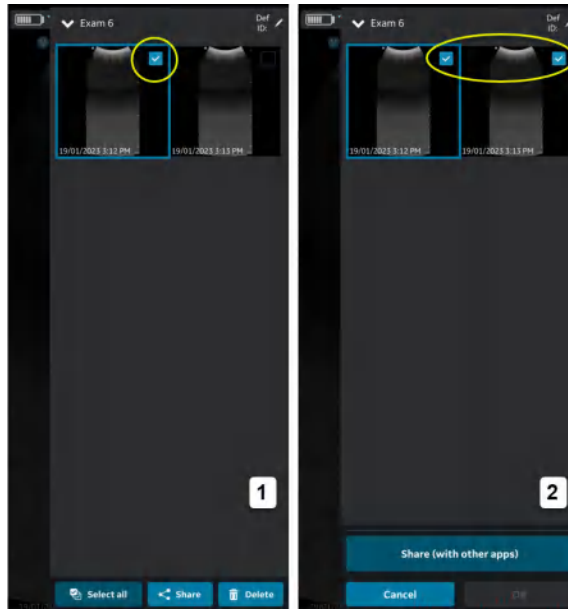


Figure 5-83. Current exam images/videos



## Share individual images/videos (continued)

2. Select the desired exam or video you wish to share.



1. Select one OR
2. Select all

Figure 5-84. Select desired Exam

## Share individual images/videos (continued)

3. Press **Share** icon.



Figure 5-85. Share with other apps

## Share individual images/videos (continued)

4. Choose the Share function on your display device to share the images/videos.

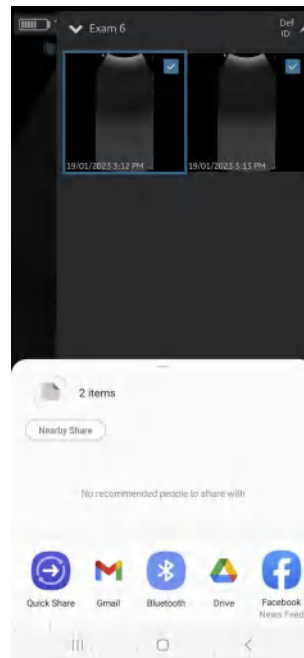


Figure 5-86. Select app

## Share all images/videos from an exam

In the same way as illustrated in the Share individual images/videos section it is also possible to select and share Exams.

1. Press **Exams** tab on the right panel.
2. Select the desired exam from which you wish to share images/videos.
3. Press **Select**.
4. Press **Select All**.  
OR  
Press **Clear all** if you wish to clear the selection.
5. Press **Share** icon.
6. Choose the **Share** function on your display device to share the Exams.

## Share Exams

1. Press **Exams** tab on the right panel.
2. Select the desired single/multiple Exam/Exams from the Exams list.
3. Press **Share** icon.
4. Choose the Share function on your display device to share the entire single/multiple Exams.

## Export data to the DICOM Image Server

To export images/videos/exams from Vscan Air application to a configured DICOM image server, follow the procedure below.

1. Swipe from right to left.  
OR  
Press **Exam** icon on the top right corner.

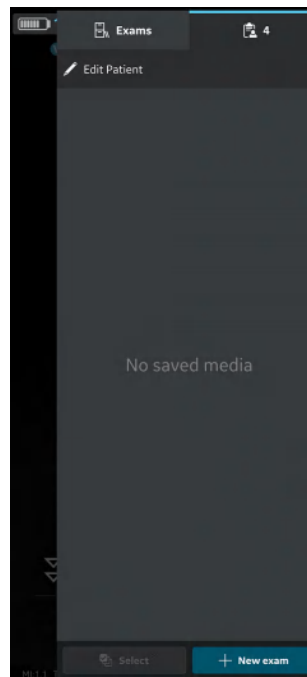


Figure 5-87. Exam icon

## Export data to the DICOM Image Server (continued)

2. Press “**Exams**” tab and select the desired Exam from which you wish to share images/videos.

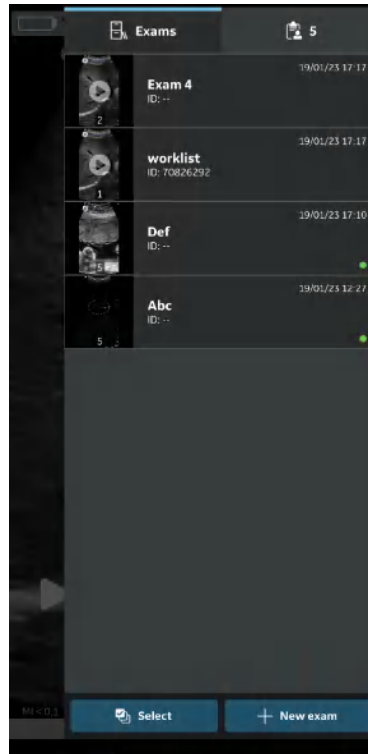


Figure 5-88. Exams Tab

## Export data to the DICOM Image Server (continued)

3. Select the desired image or video you wish to export and Press the Share icon. See 'Share individual images/videos' on *page 5-100* for more information.

OR

Select all images or videos you wish to export and Press the Share icon. See 'Share all images/videos from an exam' on *page 5-103* for more information.

OR

Select the desired single/multiple exams you wish to export from Exams list and Press the Share icon. See 'Share Exams' on *page 5-104* for more information.

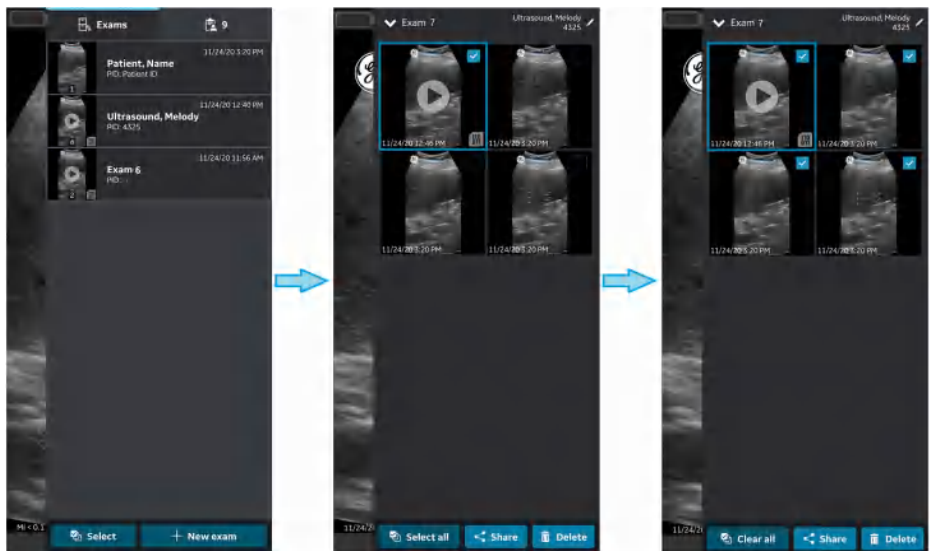


Figure 5-89. Select Images/Videos

## Export data to the DICOM Image Server (continued)

4. Select the DICOM Image Server as storage destination and Press OK button to initiate the export.

If there are more than one DICOM Image servers, select the desired DICOM Image Server as storage destination.

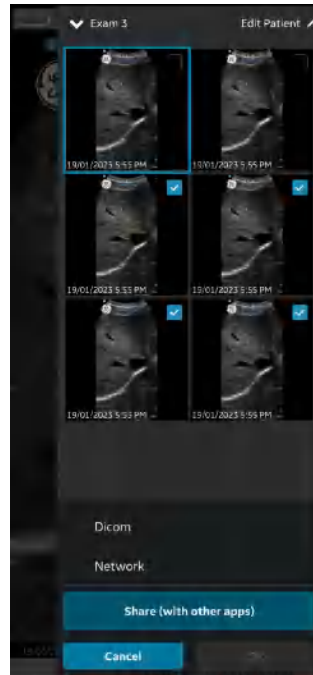


Figure 5-90. Share Images/Videos

**NOTE:** *You can also select all the configured servers simultaneously, if you wish to share the data with all the servers that supports data export.*

**NOTE:** *To export Images/videos/Exam to a DICOM Image Server, you need to assign Patient information to that particular Exam*

## Export data to the DICOM Image Server (continued)

5. You can see the image queue at the bottom with items remaining to be exported.

In addition to image queue you can also view export status for each image/video/ exam, where a green dot indicates it is successfully exported and a red dot indicates the export is failed.

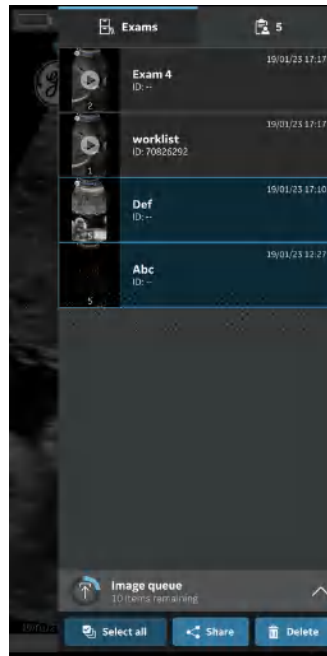


Figure 5-91. Image Queue



## Export data to the DICOM Image Server (continued)

In one attempt you can export maximum of 200 images. When you try to export more than 200 images in a single attempt, application throws the following warning message.

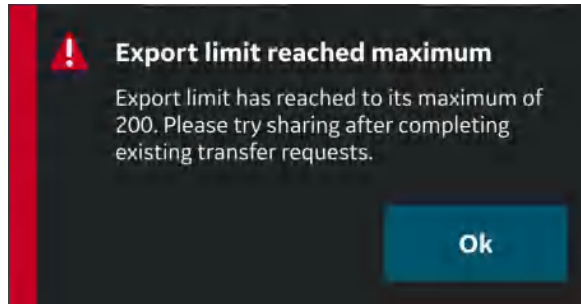


Figure 5-92. Export limit warning message

- NOTE:** *The application initiates an Auto Retry in case of a failed export due to various reasons including network interruption.*
- NOTE:** *Once an export of exam images/videos has been initiated, the patient details assigned to that particular exam can not be edited in the app.*

## Secure DICOM

Secure DICOM enables a secure connection between the Vscan Air application and a server over the Internet.

Trusted certificates are typically used to make secure connections. You can get a certificate from your system administrator or download it from sites that require authentication.

To enable Secure DICOM in the Vscan Air app, follow the procedure below:

1. While configuring DICOM Image Server or Modality Worklist Server, to enable Secure DICOM, select the check box Secure DICOM on “Add New Server” screen.

See ‘Configure DICOM Image Server’ on *page 4-22* for more information.

See ‘Configure Modality Worklist Server’ on *page 4-17* for more information.

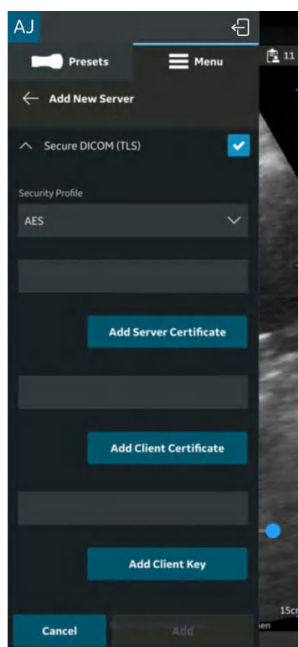


Figure 5-93. Select secure DICOM

## Secure DICOM (continued)

2. Under Secure DICOM select the desired Security Profile.

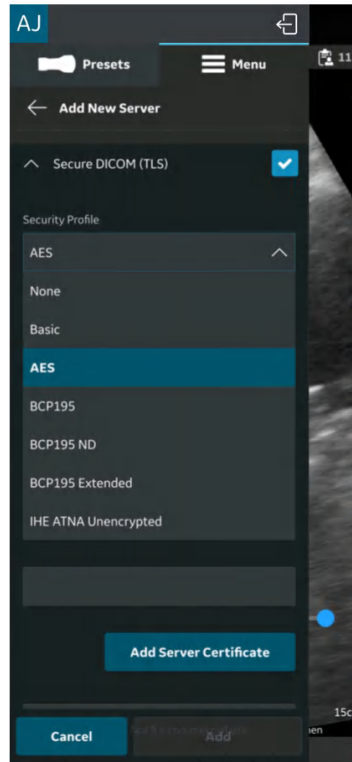


Figure 5-94. Select security profile

## Secure DICOM (continued)

3. Press the **Add Server Certificate** button, to upload the server certificate.

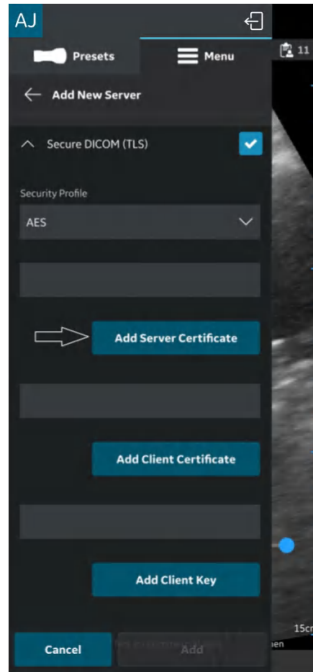


Figure 5-95. Add server certificate

## Secure DICOM (continued)

4. Press the **Add Client Certificate** button, to upload the Client certificate.

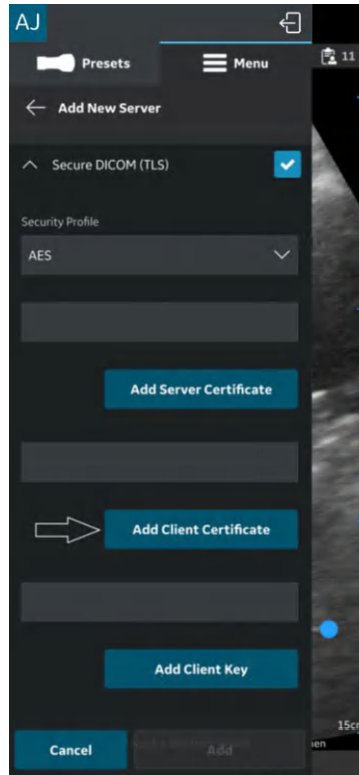


Figure 5-96. Upload client certificate

## Secure DICOM (continued)

5. Press the **Add Client Key** button, to upload the Client Key.

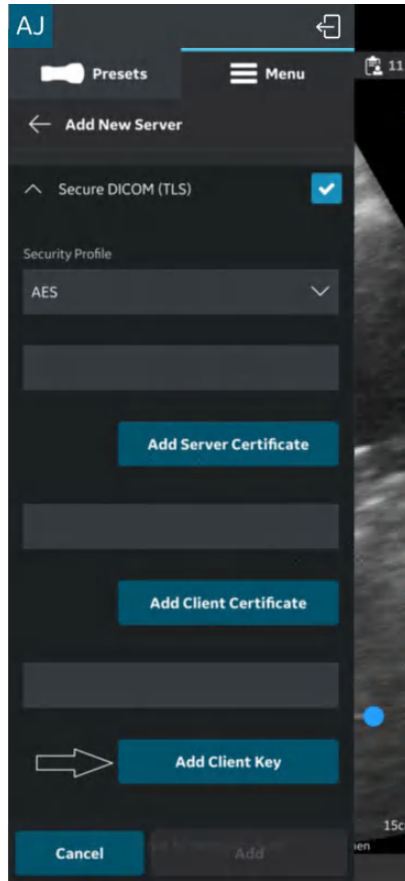


Figure 5-97. Upload client key

6. After successful uploading of the certificates, you can verify the server.

## Export data to the Network Shared Folder

To export images/videos/exams from Vscan Air application to Network Shared Folder, follow the procedure below.

1. Swipe from right to left.

OR

Press **Exam** icon on the top right corner.

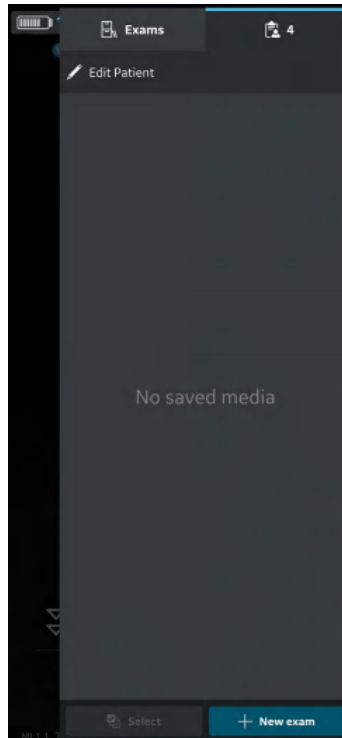


Figure 5-98. Exam icon

## Export data to the Network Shared Folder (continued)

2. Press “**Exams**” tab and select the desired Exam from which you wish to share images/videos.

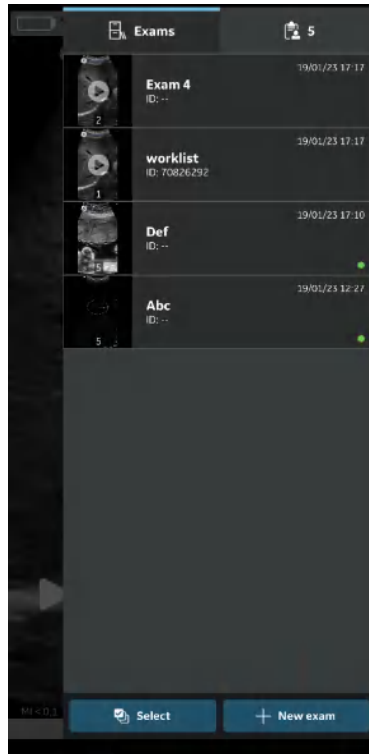


Figure 5-99. Exams tab



## Export data to the Network Shared Folder (continued)

3. Select the desired image or video you wish to export and Press the Share icon. See 'Share individual images/videos' on *page 5-100* for more information.

OR

Select all images or videos you wish to export and Press the Share icon. See 'Share all images/videos from an exam' on *page 5-103* for more information.

OR

Select the desired single/multiple exams you wish to export from Exams list and Press the Share icon. See 'Share Exams' on *page 5-104* for more information.

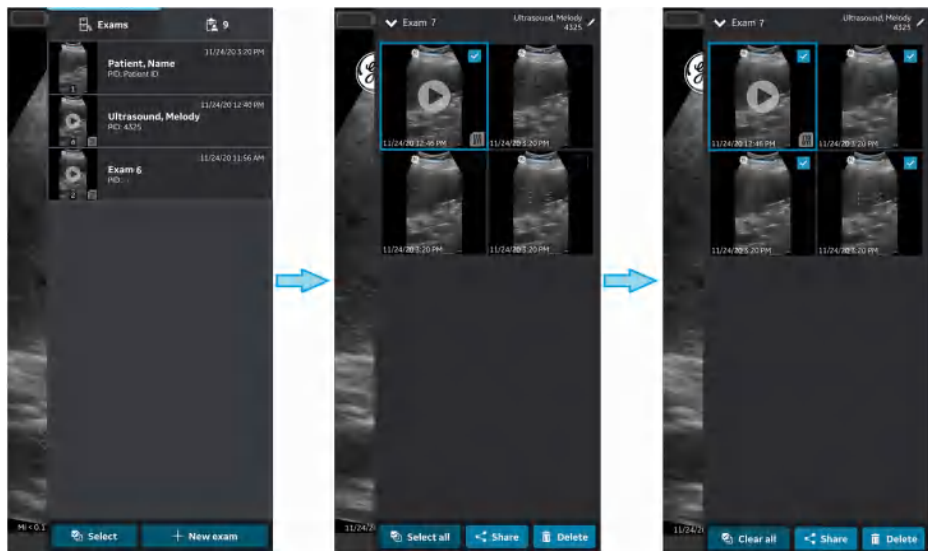


Figure 5-100. Select images/videos

## Export data to the Network Shared Folder (continued)

4. Select the configured Network Shared Folder as storage destination and Press **OK** button to initiate the export.  
If there are more than one configured Network Shared Folders, select the desired Network Shared Folder as storage destination.

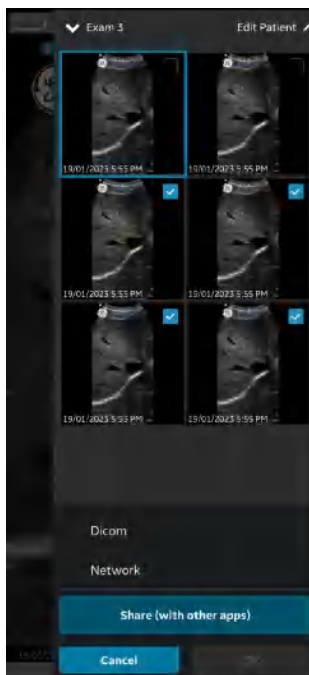


Figure 5-101. Share images/videos

**NOTE:** You can also select all the servers simultaneously, if you wish to share the data with all the servers that supports data exporting.

**NOTE:** You can export images/videos/exams to Network Shared Folder without assigning the patient details.

5. You will find Image Queue with remaining items in the Queue.

In addition to image queue you will also find export status of image/video/exam, where a green dot on the image/video/exam indicates it is successfully exported and a red dot indicates the export is failed.

## Export data to the Network Shared Folder (continued)

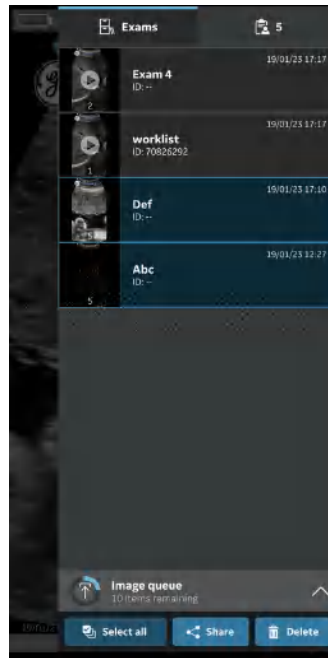


Figure 5-102. Image queue

In one attempt you can export maximum of 200 images. When you try to export more than 200 images in a single attempt, application throws the following warning message.

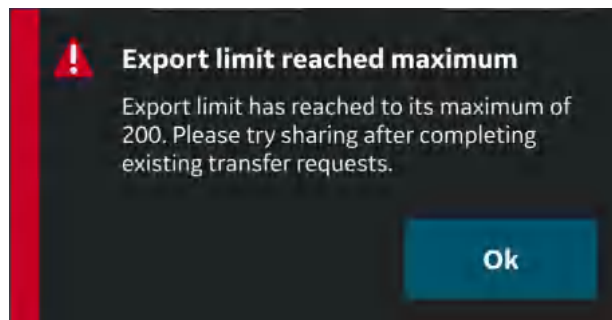


Figure 5-103. Export limit warning message

**NOTE:** *Once an export of exam images/videos has been initiated, the patient details assigned to that particular exam can not be edited in the app.*

## Comprehensive exam info

While configuring network shared folder, you can optionally configure to export the below mentioned exam data along with images and videos. See 'Configure Network Shared Folder' on page 4-28 for more information.

The exam data that can be exported to network shared folder along with the images and videos is the exam number, the patient's first name, the patient's last name and the patient ID.

## Network shared folder structure

Network shared folder structure is as follows in different scenarios:

### 1. If only "Patient ID" is assigned to an exam

If only "Patient ID" is assigned to an exam, the network shared folder structure appears as below after exporting to your PC. The images and videos are stored in a series of folders.

**Folder:** Shared folder created by customer in PC

**Sub Folder:** Patient ID

**Sub-sub Folder:** Exam creation date and time(YYYYMMDDHHMMSS)

**Image and video file:** Image and video creation date and time(YYYYMMDDHHMMSS)

### 2. If only "Patient ID" and "First Name" are assigned to an Exam

If only "Patient ID" and "First Name" is assigned to an exam, the network shared folder structure appears as below after exporting to your PC. The media files are stored in a series of folders.

**Folder:** Shared folder created by customer in PC

**Sub Folder:** Patient ID\_First Name

**Sub-sub Folder:** Exam creation date and time(YYYYMMDDHHMMSS)

**Media file:** Media creation date and time(YYYYMMDDHHMMSS)

---

**Network shared folder structure (continued)****3. If only “Patient ID” and “Last Name” are assigned to an exam**

If only “Patient ID” and “Last Name” is assigned to an Exam, the Network Shared Folder structure appears as below after exporting to your PC. The media files are stored in a series of folders.

**Folder:** Shared Folder created by customer in PC

**Sub Folder:** Patient ID\_Last Name

**Sub-sub Folder:** Exam creation date and time(YYYYMMDDHHMMSS)

**Media file:** Media creation date and time(YYYYMMDDHHMMSS)

**4. If “Patient ID”, “First Name” and “Last Name” are assigned to an exam**

If “Patient ID”, “First Name” and “Last Name” are assigned to an Exam, the Network Shared Folder structure appears as below after exporting to your PC. The media files are stored in a series of folders.

**Folder:** Shared Folder created by customer in PC

**Sub Folder:** Patient ID\_Last Name\_First Name

**Sub-sub Folder:** Exam creation date and time(YYYYMMDDHHMMSS)

**Media file:** Media creation date and time(YYYYMMDDHHMMSS)

**5. If Patient details are not assigned to an exam**

If Patient details are not assigned to an Exam, the Network Shared Folder structure appears as below after exporting to your PC. The media files are stored in a series of folders.

**Folder:** Shared Folder created by customer in PC

**Sub Folder:** Exam number

**Sub-sub Folder:** Exam creation date and time(YYYYMMDDHHMMSS)

**Media file:** Media creation date and time(YYYYMMDDHHMMSS)

# Using Vscan Air

## Using Vscan Air in home healthcare or pre-hospital emergency medical services environment

The Vscan Air system is qualified for use in pre-hospital emergency environments including road- and air ambulances. Vscan Air is also qualified for use in home healthcare environments.

A wireless probe has a limited inherent risk of a disrupted connection due to various factors that could lead to loss of real time imaging.



If a temporary, unexpected disruption to real time imaging is determined to have a severely negative adverse effect on the patient's health outweighing the benefits of using an ergonomic wireless probe in a pre-hospital emergency environment, it is recommended to consider using a wired ultrasound device.

**NOTE:** *The Vscan Air probe is not certified for being charged inside a road- or air ambulance.*

## Configure the device for the pre-hospital emergency environment

The following considerations should be made regarding the configuration of the Vscan Air for use in pre-hospital emergency environments.

- The **Auto-freeze** time can be adjusted to keep device scanning for a longer period if exam is expected to be performed with no or infrequent user interface interactions but note that freezing the image when image acquisition finishes will reduce battery drainage and minimize device heating when device is not being used. It can be configured from the Menu -> Configuration -> Auto freeze time
- The **probe button** can be configured for additional functionality (Store or Freeze) that can be helpful during an emergency exam to minimize interaction with the display device. It can be configured from the Menu -> Configuration -> Probe button. Note that accidentally pressing the button for 3 seconds or more could lead to an unintentional shut down of the probe.
- To avoid additional delays when starting the Vscan Air probe and app the display unit should if possible be configured to not accept automatic app updates. If an app and/or a probe update is to be performed the availability of the device for scanning might be delayed by up to 3 to 5 minutes.
- An internet connection will be required for a user to sign in. Be aware that an **automatic sign out** configuration setting will give users an option to control the duration of a signed in session. Configuration is available via Menu -> Configuration -> Automatic sign out. The default value is 24 hours.

## When time is critical and charging options are limited or unavailable

The following considerations should be made if the Vscan Air system is used in home healthcare or pre-hospital emergency environments where time is critical and the options to charge the Vscan Air probe or the display devices are unavailable or limited.

### General considerations:

- Make sure that both the Vscan Air probe and Vscan Air app selected for use has been registered and are prepared as described in section 3.
- It is recommended for users to get comfortable with handling the Vscan Air prior to taking the device into a home healthcare or pre-hospital emergency environment.
- To help uncover any unexpected challenges with a stable connection between the Vscan Air probe and Vscan Air app, the selected Vscan Air probe and the preferred display device should be tested in an environment as close as possible to the environment where the service is to be provided.
- If an internet connection is not available and/or a user cannot sign in because of other reasons selecting Guest on the Sign in page will give the access to scan and store functionality. Review of images stored while using the guest option is available.

### Before taking the device for use in a pre-hospital or home healthcare environment:

- Check the display device charge level.
- Check the Vscan Air probe battery charge level according to the description in the “Vscan Air probe is **OFF**” section.

### After each use in pre-hospital or home healthcare environment:

- Check the display device charge level.
- Check the Vscan Air probe battery status according to the description in the “Vscan Air probe is OFF” section.
- If needed charge the Vscan Air probe to a 90-100% level as described in the “How to charge the Vscan Air probes” section.
- If needed charge the display device to a 90-100% charge level.



## Storing devices in between uses:

- Keep the Vscan Air probe OFF when storing the probe.
- Re-charge the Vscan Air probe on a weekly basis if storing the probe for 7 days or more without use.
- Keep the display device in standby/sleep or keep it OFF when storing.
- Re-charge the display device at the intervals required to make sure that the device will be able to keep the Vscan Air app actively running for a minimum of 2 hours. Follow the display device manufacturer recommendations regarding the display device battery, battery charging and battery health.
- Perform a monthly check for display device OS updates if the display device is configured to NOT accept automatic OS updates.
- Perform a monthly check for Vscan Air app updates if the display device is configured to NOT accept automatic app updates.

**NOTE:** *If an App update is installed then make sure to connect all the Vscan Air probes used together with that display device to secure that these probes are updated as required or to confirm that the relevant update is already installed. Make sure that all the display devices connecting to any of the updated probes, are also updated and that all display devices are using the same Vscan Air app software revision.*

- Check if the Vscan Air app and probe works as intended after upgrading either the display OS or upgrading the Vscan Air app e.g. probe connecting to app, wireless connection quality indicator indicating good quality, image updates without lags and interruptions, B-mode and color display free from noise issues.

# Preparing for a guided procedure with Vscan Air

A wireless probe has a limited inherent risk of a disrupted connection due to various factors that could lead to loss of real time imaging.



If a temporary, unexpected disruption to real time imaging is determined to have a severely negative adverse effect on the patient's health outweighing the benefits of using an ergonomic wireless probe at the point of care, it is recommended to consider using a wired ultrasound device for the specific procedure guidance.



When performing a guided procedure or a freehand biopsy, i.e. without a biopsy guide, it is the user's responsibility to use appropriate equipment. Ensure that the needle (especially the needle tip) is always visible in the ultrasound image during the whole procedure.



Always use only B-mode when performing guided procedures or a freehand biopsy.

## Assessing Display Device Wi-Fi Performance with Vscan Air probe

Prior to setting up for a guided procedure, it is recommended to check if the display device being planned for use during the procedure supports a stable connection with the Vscan Air probe, by following the below steps.

| Step | Step name                | Description  |
|------|--------------------------|--|
| 1    | Configure app settings   | Set the Video duration to 1 second from Menu -> Configuration. This will help to visualize discontinuities in loop playback which indicate lost frames.  |
| 2    | Connect probe and app    | Connect the probe with the app   |
| 3    | Select preset with color | Select Small Parts from the Shallow (Linear) presets menu. Enter color flow mode by pressing the ROI button. Adjust the color gain to 100% to visualize noise inside the color ROI.  |
| 4    | Confirm/Verify           | Observe the noise pattern inside the color ROI. The randomness of the pattern should not appear to pause occasionally.   |
| 5    | Review cine              | Press freeze. Then press the Play button to the left of the scroll bar.  |
| 6    | Confirm/Verify           | Observe the blue cine position indicator as it moves from left to right along the position indicator. It should move in a consistent fashion from left to right (the distance it moves with each increment appears equal). |

If the display device does not pass the above criteria successfully, using an alternate display device is recommended for supporting guided procedures.

### General considerations

- There may be differences in the physical characteristics of a wireless probe (shape, design, weight etc.) and the way it might be handled during a scan or a procedure when compared to a probe attached to a console. Hence, it is recommended for users to get comfortable with handling the Vscan Air device prior to performing a procedure to minimize accidental dropping or slipping of the probe during the procedure.
- Wherever possible, prior use of the probe and preferred display device in the network environment where the procedure is expected to be performed will help uncover any unexpected challenges with a stable connection between the probe and app before the actual procedure.
- Make sure to follow the disinfection protocol to prepare the probe and display device for the procedure being performed. More information on cleaning and disinfection methods and approved agents can be found in the 'Cleaning and Disinfection' section of the user manual. Use probe sheaths for procedures where a sterile field needs to be maintained or infection is a concern.
- In order to make the interventional part of the procedure more efficient, and if this is not an emergency procedure, you may want to perform a preliminary scan to familiarize yourself with anatomical landmarks around the target and procedural planning like the anticipated entry point, needle path and tracking method. It might be helpful to mark transducer location, anticipated needle entry point and trajectory, whenever possible and appropriate.

## Setting up device for procedure

Please read and follow the below instructions to prepare the device before performing a dynamic ultrasound guided procedure with Vscan Air.

| Step | Step name              | Description  |
|------|------------------------|--|
| 1    | Configure app settings | <ul style="list-style-type: none"> <li>• If working with a display device for the first time, use an example image to adjust the brightness level for optimal visualization of the image based on the ambient environment where the procedure is expected to be performed. Consider dimming ambient lights for better image visualization, wherever possible.</li> <li>• Adjust/maximize the Auto-freeze time to avoid image freeze during the procedure if there are no user interface interactions. Note that freezing the image when device is not being used will minimize device heating and battery drainage.</li> <li>• Centerline marker can be turned on from the Menu -&gt; Configuration, if desired. Please note that Vscan Air supports only free hand biopsy and needle procedures so the centerline marking should not be confused with biopsy guidelines indicating needle path on the image.</li> <li>• The probe button can be configured for additional functionality (Store or Freeze) that could be helpful during procedure to minimize interaction with the display device. It can be configured from the Menu -&gt; Configuration. Accidental long press (3 secs or more) of this button during scanning can lead to unintentional shut down of the probe.</li> <li>• The video duration should be set to save cine clips of a length appropriate for documentation requirements.</li> </ul> |
| 2    | Use a cool probe       | <p>Make sure the probe is sufficiently cooled down after any previous scanning. Disruption may occur due to the probe getting warm if a lengthy procedure is anticipated. Leaving the probe on a desk (outside the pocket or the case) after it off will help cooling down faster. It should take about 30-60 minutes to get to a reasonably cool state depending on how warm it was from the previous scan and the ambient temperature. If accelerated cooling of the probe is required, place the probe, while turned off, in front of a fan, run under cold water, or apply cooling pack.</p>   |

| Step | Step name  | Description   |
|------|--|---|
| 3    | Minimize lost connection between probe and mobile device during scan | <p>The probe without a cable can be very helpful to support sterile procedures. At the same time its use depends on bandwidth and stability of the wireless connection between probe and mobile device.</p> <p>Following are the recommendations for minimizing loss of real time images due to connection instability:</p> <ol style="list-style-type: none"> <li>a. The probe and mobile device should be within 1 m to each other during pairing, and less than 1.5 meters while in use.</li> <li>b. Avoid congested Wi-Fi network environments, if possible.</li> <li>c. In cases where multiple Vscan Air probes and display devices with the app are available, make sure               <ul style="list-style-type: none"> <li>- the app is closed on all other devices except the one to be used and</li> <li>- all other probes are turned off and moved away from the vicinity of the device.</li> </ul> </li> </ol> |
| 4    | Check battery levels of probe and display device                     | <p>Ensure that the probe and display device have enough charge before starting a procedure. Charge levels of 50% and above are recommended before starting, and above 30% during procedure. Battery levels of the probe can be checked on the top left corner of imaging screen after connecting with the app. Please refer to the user manual for the detailed description of the battery level indicator bars.</p>  |
| 5    | Confirm 'Wireless connection quality' and 'Probe temperature'        | <p>Ensure that the connection between the probe and app is stable by checking the connection quality indicator on the top left corner of the imaging screen.</p> <p>The probe temperature indicator is also visible in the same place for confirming the use of a cool probe.</p>   |
| 6    | Select appropriate preset  | <p>Choose the correct preset based on the anatomy being visualized and the planned procedure. Details of the presets and the optimized anatomy are available in the user manual.</p>  |
| 7    | Image crop-guidance / Choose display device orientation              | <p>Image size is maximized in the portrait mode. As a result, at certain depths, image corresponding to the entire transducer width may not visible on the screen. Image crop indicators are displayed on the sides in such cases. It is recommended to rotate the display device to landscape orientation for visualizing the whole image including the edges and needle entry point.</p> <p>Alternatively,</p> <ol style="list-style-type: none"> <li>1. The image can also be zoomed to pan it sidewise if portrait mode is preferred. OR</li> <li>2. The depth increased until the crop indicators on the side of the image disappear indicating that the edges are visible in the field of view.</li> </ol> <p>Refer 'Image crop indicator' on <i>page 5-9</i> for a more detailed description.</p>  |
| 8    | Position display device  | <p>Position the display device in such way that it is comfortable to visualize the image during the procedure (for e.g. Imaging features such as orientation marker is clearly visible, ambient lighting is optimal, display device is in the line of sight and no straining is required). Consider using a cart or stand to mount the display.</p>   |

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# Digital tools

Vscan Air supports some digital features which are optional and enabled if purchased. Digital tools are not available in every country.

## 1. MyDeviceHub

MyDeviceHub is a device management tool for enterprises who have multiple Vscan Air devices and would like to manage them centrally. It is accessed by enterprise administrators via a dedicated web-based portal and provides functionality such as registration for probes, set up of user access lists, DICOM server settings, etc.

MyDeviceHub can be purchased as part of the Vscan Air Fleet digital solution.

**NOTE:** *Probes with Fleet solution enabled cannot be registered or unregistered by anyone other than an administrator. The administrator can register a probe from the app or the MyDeviceHub portal. Unregister probe option is only available via the app.*

a. User access

Enterprise administrators can restrict usage of Fleet enabled probes to certain named users.

## 1. MyDeviceHub (continued)

When attempting to connect to a Vscan Air probe, the app checks existing access restrictions. If the signed in user is not authorized to use the connected probe, the following error will be displayed. In this case, the user may choose to use a different Vscan Air probe or contact the Enterprise administrator to update the access control list.

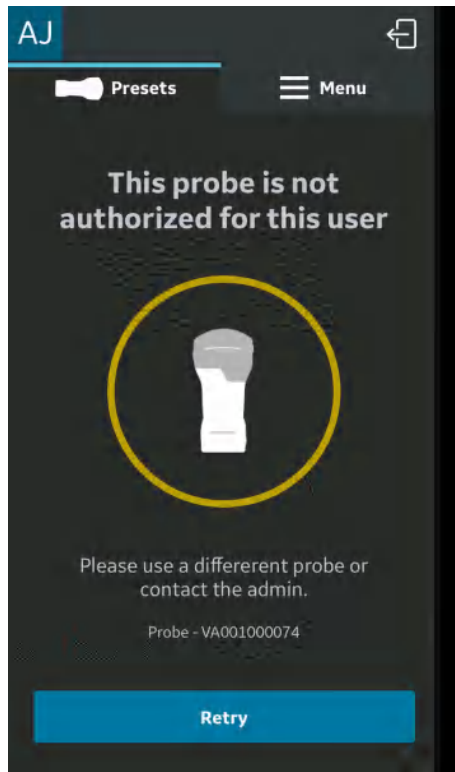


Figure 5-104. Error message

**NOTE:** *After access rights for a probe are updated by an administrator, the user must sign out of the app and sign back in for the changes to be reflected in the app.*



## 1. MyDeviceHub (continued)

### b. Importing server configurations

The app is able to import any DICOM server settings that have been entered by the Enterprise administrator via the MyDeviceHub portal. The first time a user connects to a Fleet enabled probe, the app provides the user an option to import these settings as shown below.

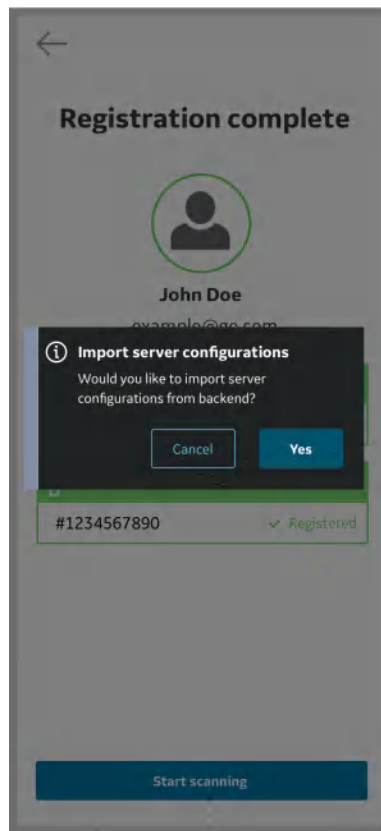



Figure 5-105. Auto-import of server configuration

## 1. MyDeviceHub (continued)

User can choose to accept or deny the configuration settings from backend. If user chooses to accept the configuration, the server settings will be updated in the application.

The user can also download server configurations from the backend whenever desired from the menu.

Click on the button , on the Server Settings page to the import settings.

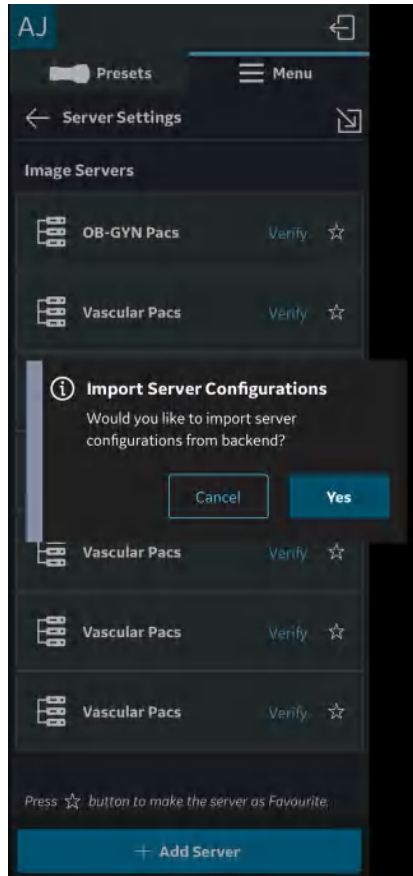


Figure 5-106. Manual import of server settings

## 1. MyDeviceHub (continued)

### DICOM Server Configuration

If DICOM server configurations are received from the MyDeviceHub, they will be added to Menu -> Configuration -> Server Settings

Mandatory fields for each DICOM server will be displayed as received from backend, but user will need to enter secure information like Username, Password, Certificates & key (if Secure DICOM is enabled) for each received server entry to complete its configuration.

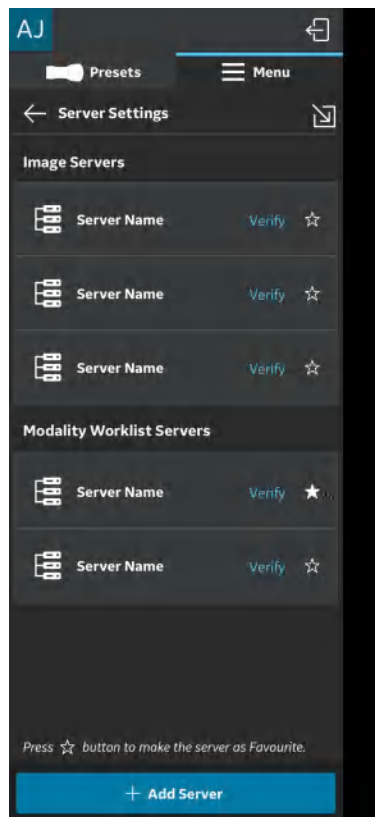
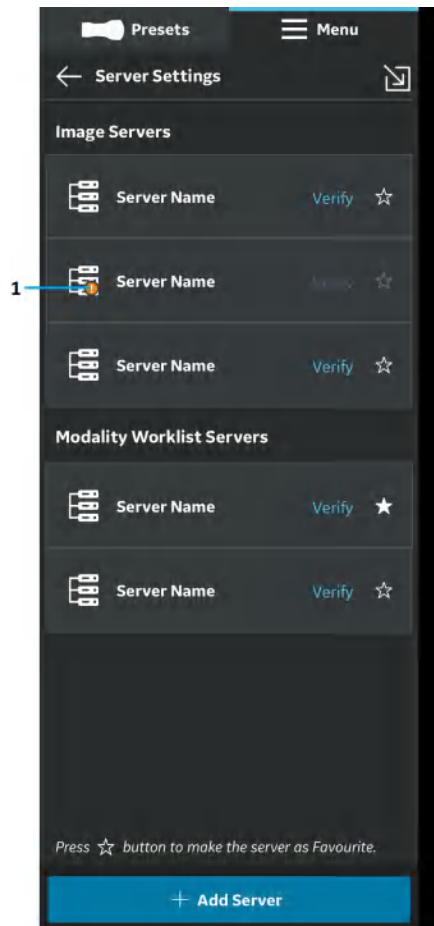


Figure 5-107. Server configuration complete

## DICOM Server Configuration (continued)

If the received configuration is incomplete, then the following indication will be shown to user.



1. Error indicator

Figure 5-108. Server configuration incomplete

## 2. MyRemoteShare, powered by Zoom

MyRemoteShare is a tool which enables the Vscan Air user to initiate a collaboration session with one or more remote participants, during which the user can optionally share the scan screen and camera feed from their mobile device and have an audio conversation. This tool is powered by Zoom and utilizes the Zoom for healthcare application. It is compliant for use in healthcare environments (e.g. HIPAA compliant in USA).

If purchased, this feature will be accessible via the Preset Menu (left panel menu) of the app.

**NOTE:** *MyRemoteShare is provided for education, training, and support purposes. It is not intended for diagnostic use since the quality of the image feed seen by the remote participant will depend on the user's and participant's network connection as well as the display device used by the participant, and as such cannot be guaranteed.*

**NOTE:** *The user of the Vscan Air app is responsible for the remote participants selected, the content shared, and for obtaining appropriate patient consents if applicable.*

**NOTE:** *Since MyRemoteShare uses the secure version of the Zoom platform, remote participants must have the Zoom app installed on their mobile device or computer in order to join a MyRemoteShare session. Participants will not be able to join just via a web browser.*

**NOTE:** *The MyRemoteShare session is limited to 45 minutes, after which the session will be terminated.*

## 2. MyRemoteShare, powered by Zoom (continued)

*NOTE: To enable key functionality like screen share, audio and video sharing, during MyRemoteShare sessions, the user must give the following permissions to the Vscan Air app when prompted by their mobile device:*

1. Access to the microphone and camera.
2. Permission to overlay (Android only).

*NOTE: Annotation feature for MyRemoteShare feature on Vscan Air is available only on the Android platform. The annotation option needs to be enabled on the host side to ensure that the annotations on the remote participant side are available.*

*NOTE: Please refer to the below link for system and network requirements from ZOOM for MyRemoteShare feature.*

[https://support.zoom.us/hc/en-us/articles/201179966-System-requirements-for-iOS-iPadOS-and-Android?\\_\\_cf\\_chl\\_captcha\\_tk\\_\\_=Wm.YZcuP4p4zRndI26oIRQICtCJYo.iOil..axXQS\\_o-1638101273-0-gaNycGzNDT0](https://support.zoom.us/hc/en-us/articles/201179966-System-requirements-for-iOS-iPadOS-and-Android?__cf_chl_captcha_tk__=Wm.YZcuP4p4zRndI26oIRQICtCJYo.iOil..axXQS_o-1638101273-0-gaNycGzNDT0)

*NOTE: iOS devices need to enable cellular data prior to starting the MyRemoteShare session since the Wi-Fi channel will be used for communicating with the probe.*

## Usage of MyRemoteShare

1. Press the Menu -> Select **“Start screen share session”** from MyRemoteShare tab on the Preset menu.

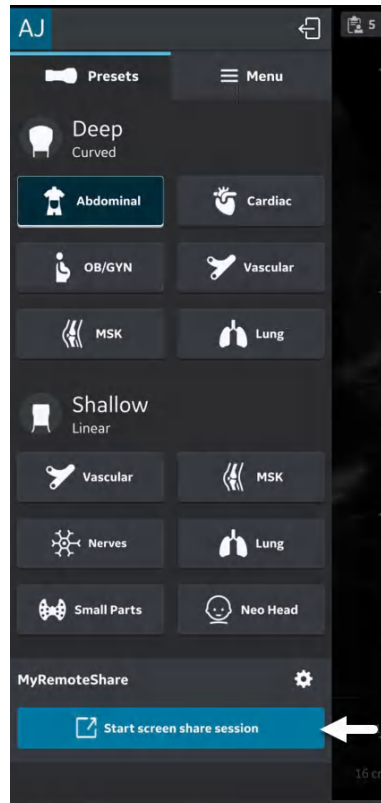


Figure 5-109. Activate MyRemoteShare

## Usage of MyRemoteShare (continued)

2. Click on Start Session -> Warning message will be displayed on the screen stating that the feature is not intended for diagnostic use. The user must confirm to proceed.

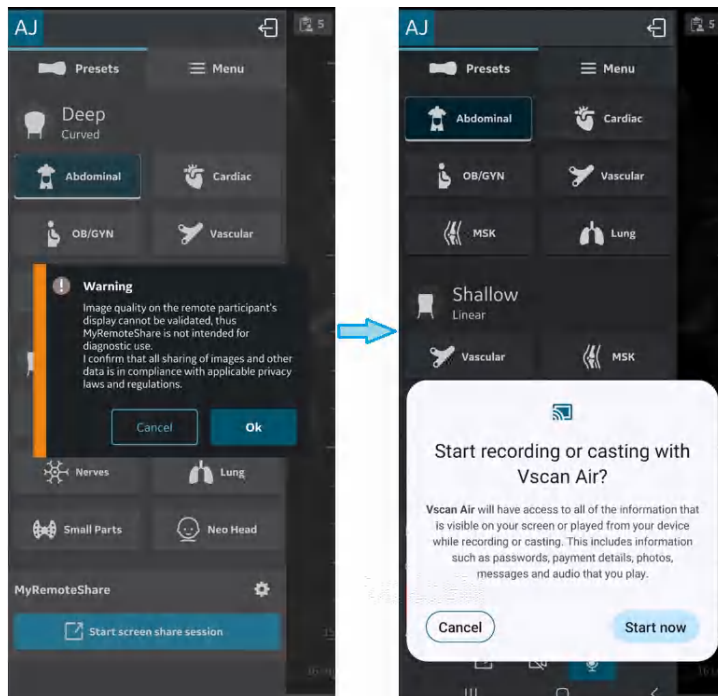


Figure 5-110. Warning message



## Usage of MyRemoteShare (continued)

3. Send the invitation link to one or more desired participants using any third-party messaging apps from the mobile device. There is also an option to copy the link if needed.



Figure 5-111. Share/copy link to invite

## Usage of MyRemoteShare (continued)

4. During a session, click **"Invite Participants"** and send to one or more desired participants using any third-party messaging apps via mobile device.

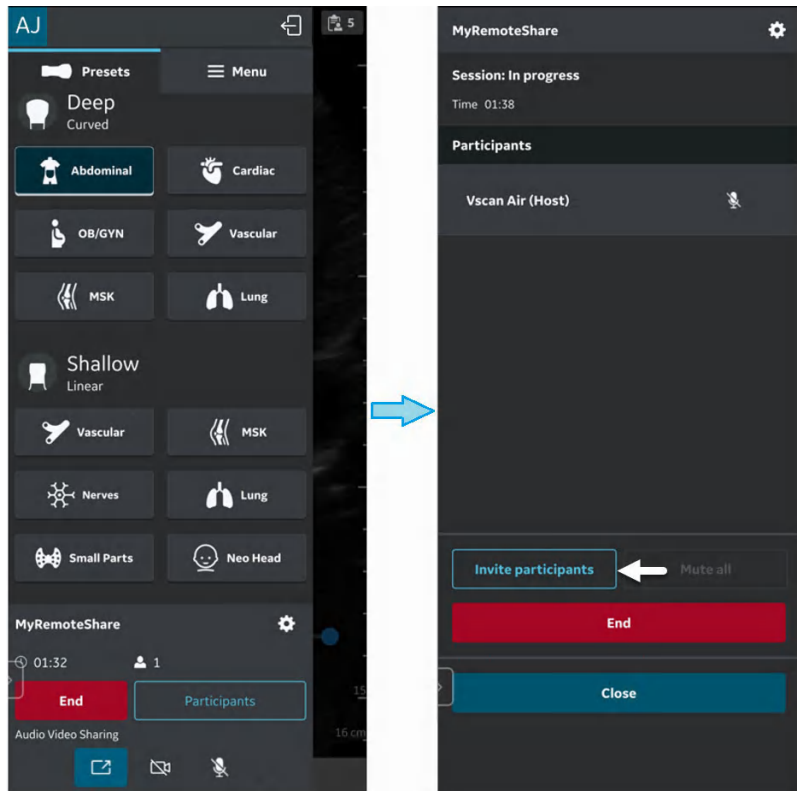


Figure 5-112. Invite participants

## Usage of MyRemoteShare (continued)

5. Invitation is sent to the participant(s).

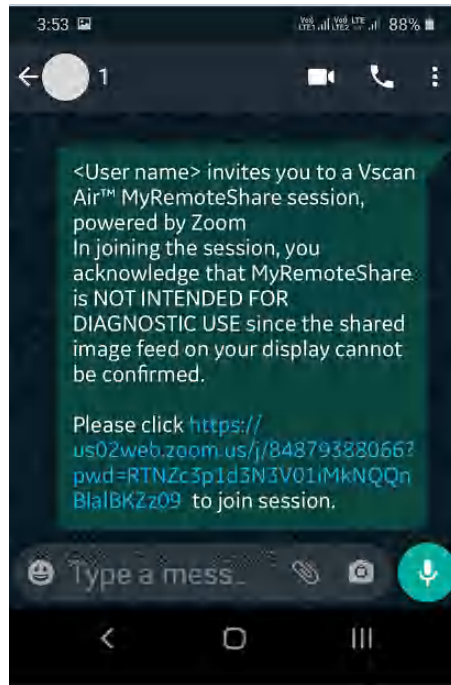


Figure 5-113. Participant invite

6. The participant(s) must click on the URL in the invitation link to join the session.
7. MyRemoteShare session is initiated.

## Usage of MyRemoteShare (continued)

8. On the participant side, there is a static banner throughout the screen share session which indicates that screen share is intended for non-diagnostic use.

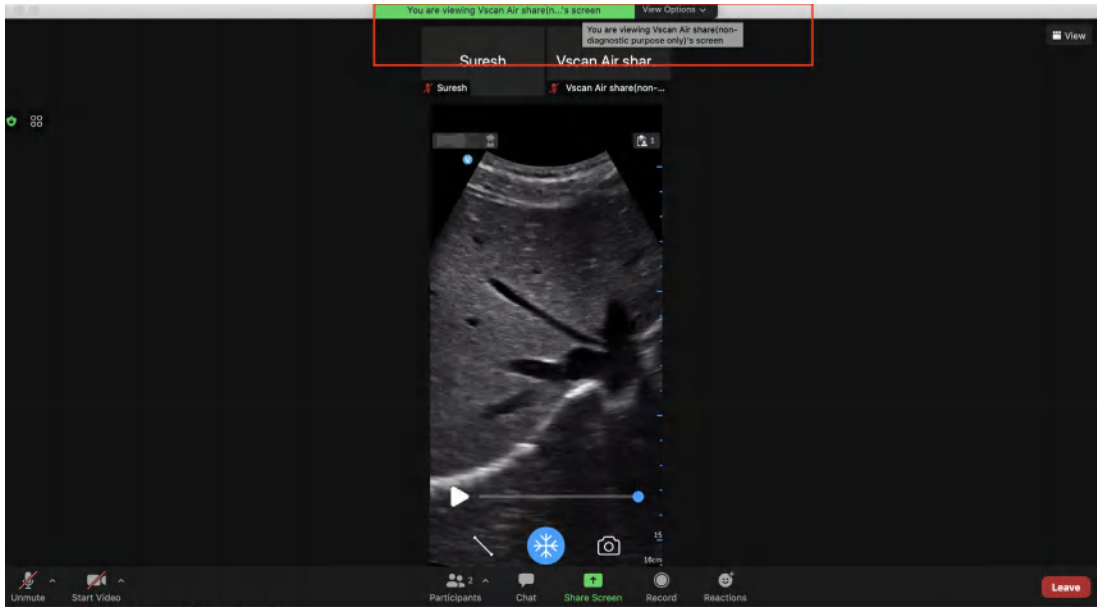
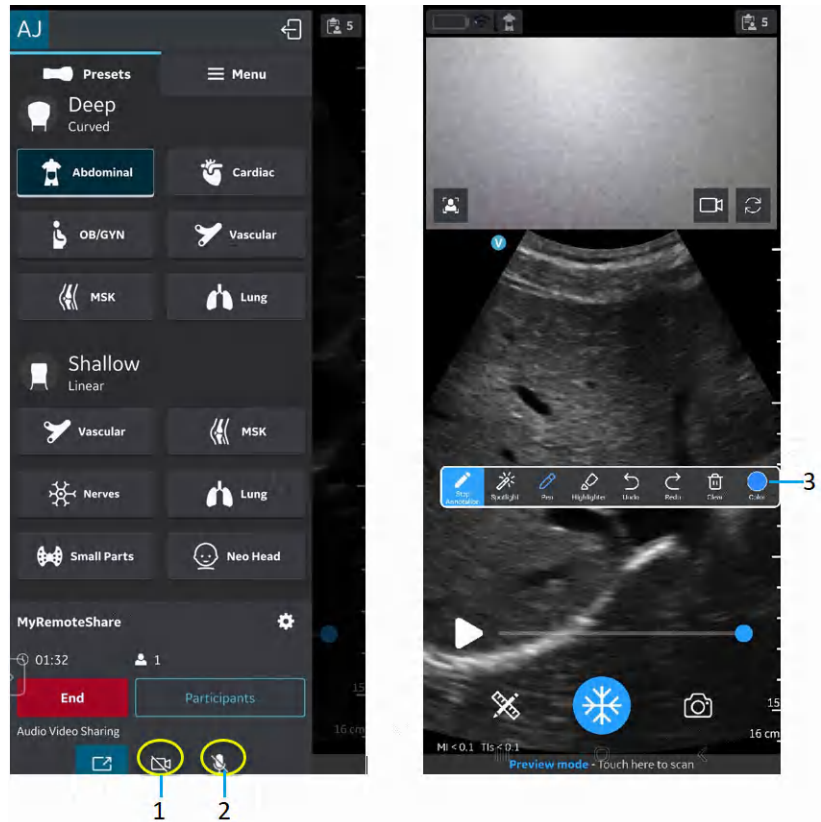


Figure 5-114. Non-diagnostic banner on the participant side (not a Vscan Air screen)

**NOTE:** *The screen is a sample shot from participant side (this may vary depending on Zoom client version).*

## Usage of MyRemoteShare (continued)

- The host can enable/disable audio/video during the remote session.



- Enable/disable video
- Enable/disable audio
- Annotation bar


Figure 5-115. MyRemoteShare session

- The host can annotate on the scan screen during the remote session (Android only).

## Usage of MyRemoteShare (continued)

11. The host can toggle between front and rear camera feed during the remote session.

Click on  icon to open participant camera.

Click on  icon to rotate camera feed.

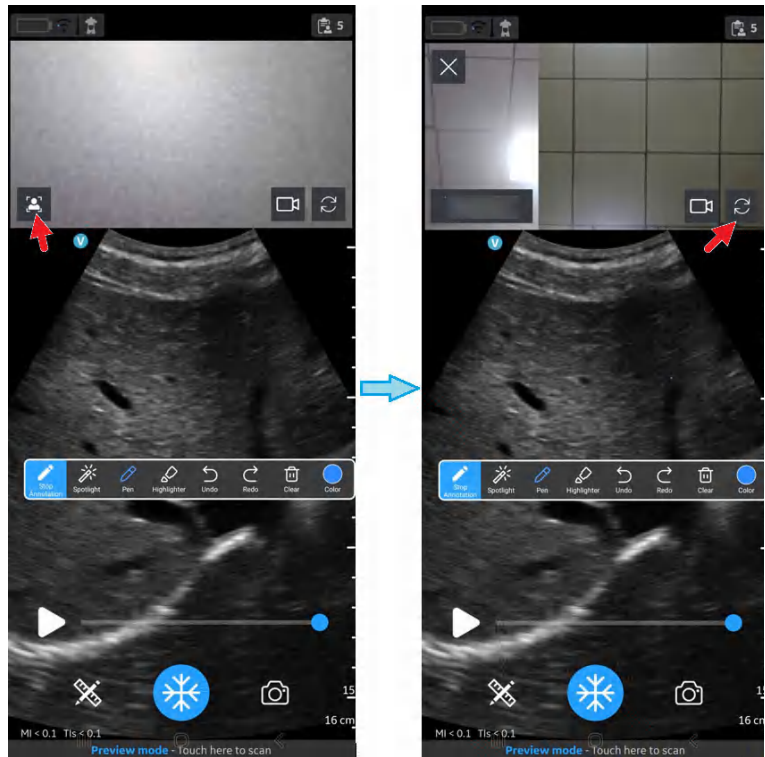
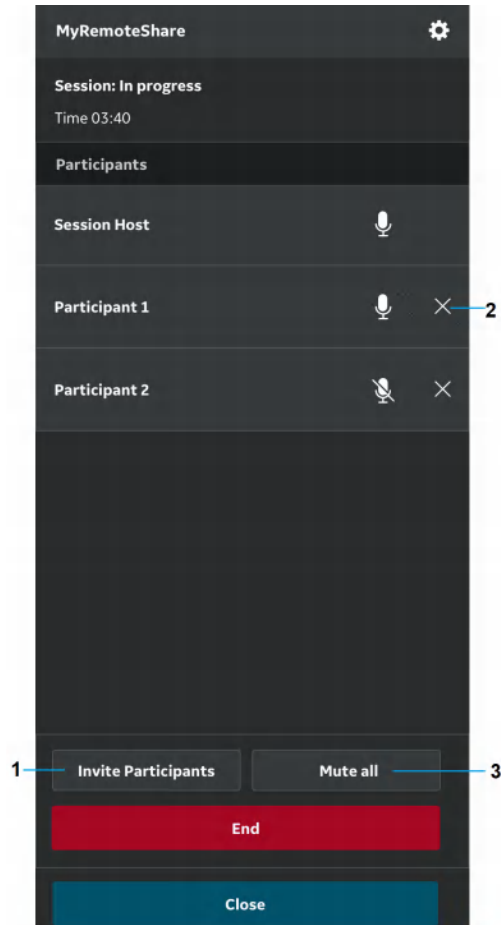


Figure 5-116. Front and rear camera feed

## Usage of MyRemoteShare (continued)

12. The host can add/remove participant(s) during the remote session via the menu accessed by swiping in the left panel.

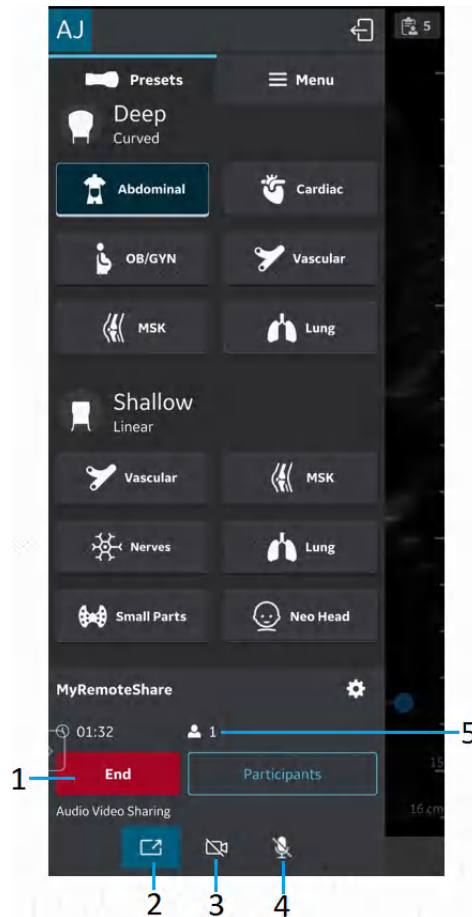


1. Add participant
2. Remove client (participant)
3. Mute all (other than Host)

Figure 5-117. Add/Remove participants

## Usage of MyRemoteShare (continued)

13. The host can end the remote session.




1. End call
2. Toggle screensharing on/off
3. Toggle Host camera on/off
4. Mute Host
5. Session duration and number of participants

Figure 5-118. End the session



## Usage of MyRemoteShare (continued)

- Settings and preferences for MyRemoteShare can be configured by clicking on the Settings button  on the MyRemoteShare tab.

The available settings include a choice to allow participants to join automatically or approve each one, as well as choices for the camera and microphone to be on or off when starting a session. Note that screen sharing is enabled by default when starting a MyRemoteShare session.

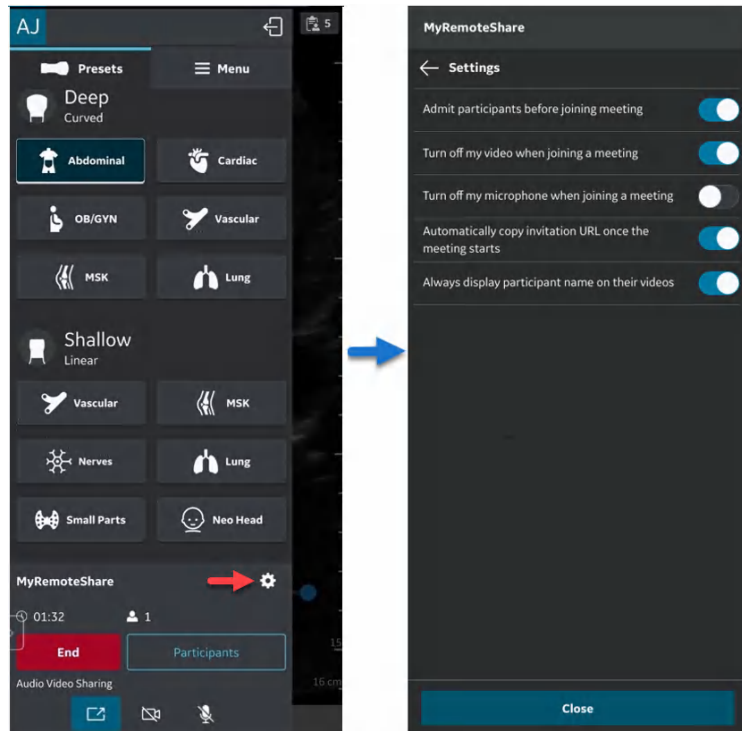


Figure 5-119. MyRemoteShare Settings configuration

### 3. MyImageCloud Solution

GEHC offers a cloud-based exam management solution, MyImageCloud. Exams and images from Vscan Air can be exported to MyImageCloud if this solution is purchased. If available for use with your Vscan Air, the option will be visible as a pre-configured export destination on the Server Settings page accessed via Menu-> Configurations.

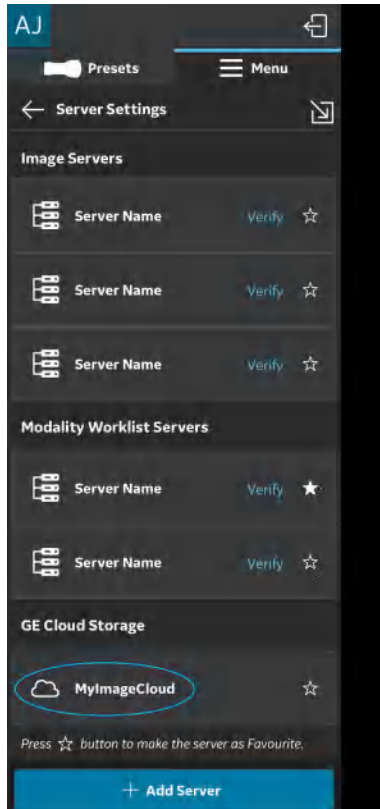


Figure 5-120. MyImageCloud option

## Regional Instance Support

To comply with regional data privacy regulations such as HIPAA and GDPR, GEHC supports regional cloud servers (e.g. USA, EU) for the MyImageCloud solution. Prior to the first export of exams to MyImageCloud, go to the Server Settings page in the Menu and select the regional instance for MyImageCloud appropriate to your location. Until this selection is made, the MyImageCloud export option will not be enabled. Once selected, this setting will be remembered until it is changed.

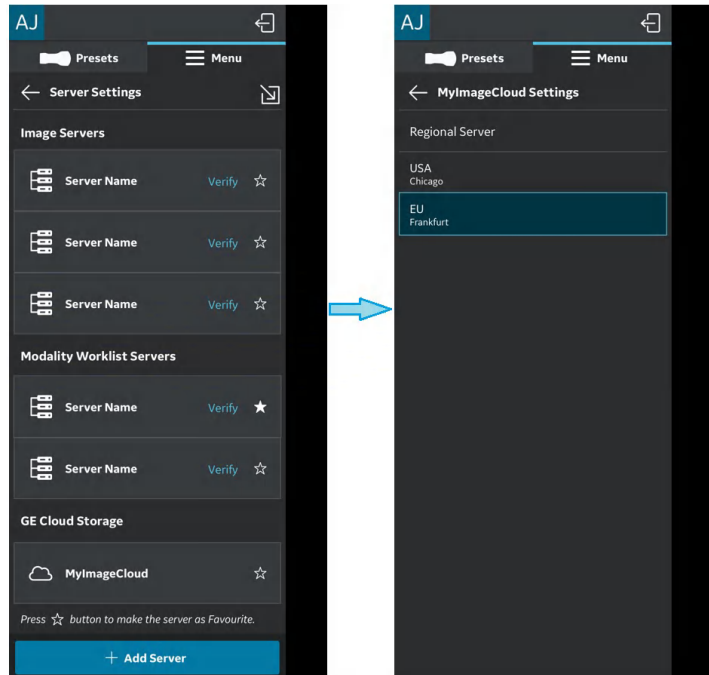


Figure 5-121. Selecting relevant MyImageCloud region

## Regional Instance Support (continued)

An error message pops up when the destination server is not selected.

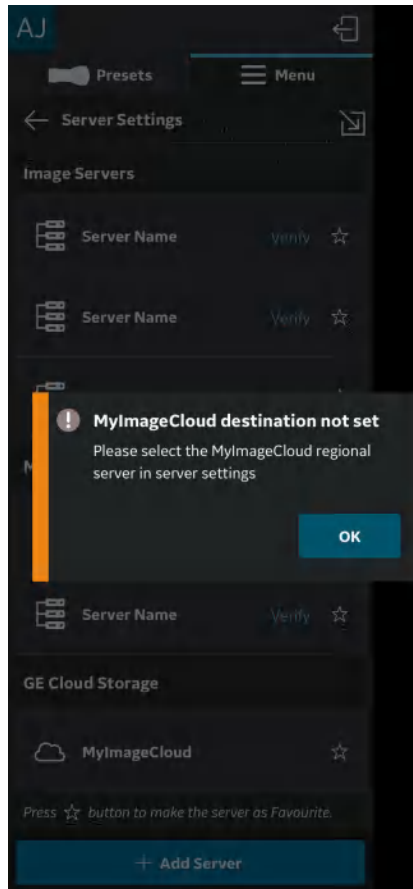


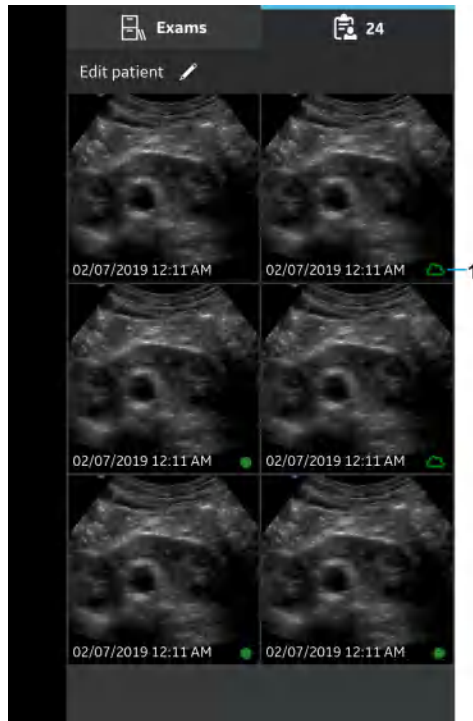
Figure 5-122. Error message

### 3. MyImageCloud Solution (continued)

The exported exam/image data can be accessed by visiting [myvscan.gehealthcare.com](http://myvscan.gehealthcare.com) and signing in using the same account credentials used for the Vscan Air application.

An indication will be shown in the gallery against images or exams that have been exported to MyImageCloud.

**NOTE:** *An error message pops up, if an attempt is made to re-export images/exams that are already exported MyImageCloud.*



1. MyImageCloud

Figure 5-123. Exams exported to MyImageCloud



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## Chapter 6

# Vscan Air Maintenance

### *Contents*

*'System care and maintenance' on page 6-2*

*'Cleaning and disinfection' on page 6-6*

*'Upgrades' on page 6-20*

*'Troubleshooting' on page 6-24*

*'Diagnostics' on page 6-40*

*'Probe warning messages' on page 6-49*

# System care and maintenance

## Overview



### CAUTION

Only trained persons should perform the safety inspections.

The Vscan Air probes requires regular care and maintenance to function safely and properly.

The expected service life of the Vscan Air probes is 5 years.

To ensure that the Vscan Air constantly operates at maximum efficiency, we recommend that the following procedures be observed as part of the customer's internal routine maintenance program.

**NOTE:** *The user must ensure that safety inspections are performed at least every 12 months according to the requirements of the patient safety standard EN/ES/IEC 60601-1 and its national deviations or according to the requirements of the IEC62353 standard, medical electrical equipment – recurrent test and test after repair of medical electrical equipment.*

Special attention shall be paid to the following:

- Safety related marking / labels are legible and complete for the Vscan Air probe.
- The integrity of the probe e.g. is there any observed damage to the Vscan Air probe.
- Assess the accessories for damage (AC adapter, USB cable, wireless charger).
- Assess if the required documentation is available and reflects the current revision and/or configuration of the Vscan Air.



## Physical Attributes that Indicate End of Service Life of Vscan Air probes

- a. Probe body: cracks, abrasions, or evidence of impact.
- b. Acoustic lens: cuts, tears, gouging, abrasion, swelling, bubbling, or delamination.

## Inspection

### Inspecting the Vscan Air



If any defects or damages are found on the Vscan Air probe, do not use it. Contact GEHC.

Examine the following on a monthly basis (or whenever there is a reason to assume that any issue may have occurred):

- Equipment for cracks, loose or missing hardware.



To avoid electrical shock hazard, do not remove covers from the Vscan Air CL or the Vscan Air SL probe.

### Before each use

1. Inspect the lens and the probe housing.
2. Look for damage that might allow liquid into the probe.
3. Test the functionality of the probe.

### Quality assurance

A good Quality Assurance Evaluation program consists of periodic systematic actions that provide the user with adequate confidence that their diagnostic ultrasound system will produce consistently high-quality images and quantitative information. Therefore, it is in the best interests of every ultrasound user to routinely monitor equipment performance.

### Typical Tests to Perform

Quality assurance measurements provide results relating to system performance. Typically, these are:

- Axial Measurement Accuracy
- Lateral Measurement Accuracy
- Axial and Lateral Resolution
- Penetration
- Functional and Contrast Resolution
- Gray Scale Photography.

With these tests, a performance baseline can be set at installation with the phantom in your department. Future test results can be compared to the baseline in order to maintain a record of system performance trends.

### **Leakage current and dielectric strength tests**

The Vscan Air probes are completely sealed. All data communication to and from the probe, and all energy transfer to the probe is performed wirelessly. The probe does not have any connectors, metal-parts, or live parts accessible to the operator or the patient. The biocompatible probe handle plastic material is fully encapsulating the internal electronics, and also serves as dielectric protection against any live parts. The dielectric strength was tested during product approval as well as testing for IP67 compliance. Design in combination with the tightness test performed on all manufactured units guarantees the safety of the operator and/or patient. A hazardous electrical circuit could only be created if two live parts were exposed to the patient or the user in such a way that a closed electrical circuit could be created. For the operator or patient to gain access to one or two live parts, the plastic housing of the Vscan Air probe would need to be cracked open, first in one location, then in a second location. The two cracks would next need to be large enough for the operator or patient to insert one left hand finger and one right hand finger, both being live, to create a closed loop. The likelihood of this to occur is not reasonably foreseeable.

The Vscan Air probe is an internally powered ultrasound device and it does not have any electrical closed loop during intended patient or operator use, therefore no electrical hazard applies. It is not possible to conduct standard high-voltage tests, leakage current tests, dielectric strength tests without destroying the product due to the isolated/enclosed design of the Vscan Air probe. The Vscan Air risk assessment does not identify a necessity of leakage current and dielectric tests to be performed as routine tests.

# Cleaning and disinfection

## Reprocessing recommendation (Frequency)

### After Each Use

1. Inspect the Vscan Air probe (See 'Inspecting the Vscan Air' on page 6-3).
2. Clean the Vscan Air probe.
3. If required, clean the display device.

**NOTE:** *The display device should be cleaned and/or disinfected according to the device manufacturer's recommendations. Example: <https://support.apple.com/en-us/HT204172>. Please be aware that medical grade display devices often support a wider range of cleaners and disinfectants compared to display devices for the consumer market.*

4. If required, disinfect the Vscan Air probe.

Ensure that the Vscan Air probe is properly cleaned and disinfected after each use and before storage in the protective case.



If any defects or damages are found on the Vscan Air probe, do not use it. Contact GEHC service.



Risk of Infection. ALWAYS clean and disinfect the probe between patients to the level appropriate for the type of examination.

**Cleaning and disinfection**

Adequate cleaning and disinfection between patient cases are necessary to prevent disease transmission. All probes must be thoroughly cleaned prior to disinfection. The level of disinfection required is based on patient contact. Use the following guidance to determine the appropriate level of disinfection based on system use.

| Use                          | Method  |
|------------------------------|---|
| Contact with non-intact skin | Cleaning followed by High-Level Disinfection  |
| Contact with intact skin     | Cleaning followed by Intermediate-Level Disinfection<br>Cleaning followed by Low-Level Disinfection |

Vscan Air is not intended for intra-operative use, it is also not intended for intra-cavitary use. It may be used during interventional procedures such as biopsy which based on proximity of the probe to the needle injection site it could get contaminated with blood or bodily fluids during use.

**Chemicals Used for Efficacy Validation**

The table below lists the products and intended use (cleaning, Intermediate-level disinfection, high-level disinfection) that were validated with the Vscan Air CL and Vscan Air SL probes.

Table 6-1: Chemicals used for Efficacy Validation with Vscan Air CL and Vscan Air SL

| Product Type                           | Trade Name                                  | Manufacturer                          | Active Ingredients   |
|--|---|---------------------------------------|--|
| Cleaning (Wipe)                        | Sani-Cloth Prime Germicidal Disposable Wipe | PDI                                   | Isopropanol, Ethyl Alcohol (Ethanol), Didecyl dimethyl ammonium chloride |
| Intermediate-level Disinfection (wipe) | Sani-Cloth Prime Germicidal Disposable Wipe | PDI                                   | Isopropanol, Ethyl Alcohol (Ethanol), Didecyl dimethyl ammonium chloride |
| High-Level Disinfection (Solution)     | Cidex OPA Solution                          | Advanced Sterilization Products (J&J) | Ortho-Phthalaldehyde   |

**Special Label Designations, Warnings and Precautions**

Never use thinner, benzene, abrasive cleaners, or other strong solvents, as these may cause damage to the Vscan Air probe.

**Special accessories**

Special accessories are not applicable.

## Probe Reprocessing

### Vscan Air probe Pre-Treatment at the Point of Use (Required for all Vscan Air probes)

The pre-treatment step is for removal of gel and to minimize risk for cross contamination.

1. After each use,
  - remove the protective sheath from the Vscan Air probe if used.
  - gently remove all coupling gel from the Vscan Air probe by wiping with a soft, low lint cloth.



Do not use abrasive paper products when cleaning or wiping a GEHC ultrasound probe. The use of abrasive wipes can damage the soft lens (acoustic window).

To extend the life of the Vscan Air probe lenses, pat dry only.

2. Wipe the Vscan Air probe with one of the wipes (listed in the website: <https://gehealthcare.com/probecare> or <https://www.gehealthcare.com/products/ultrasound/ultrasound-transducers>) from the lens of one transducer to the other. Dispose the cloth, wipe and gloves in the clinical trash.
3. After each use, inspect the lenses and housing of the Vscan Air probe. Look for any damage that would allow liquid to enter the Vscan Air probe.



If the Vscan Air probe is damaged, do not place it into any liquid (e.g. for disinfection) and do not use it until it has been inspected and repaired/replaced by a GEHC Service Representative.



Avoid processing procedures and chemicals that may damage the probe, such as: Do not steam autoclave or subject or the probe to Ethylene Oxide (ETO).

## Manual cleaning Instructions

Manual cleaning is required to ensure the Vscan Air probes are cleaned to the extent necessary for further processing.

When cleaning select one of the cleaning methods described below, cleaning using wipes or cleaning using a cleaning solution.

### Cleaning using Wipes

1. Dispense a cleaning wipe from the wipe canister.
2. Hold the Vscan Air probe with the large lens facing away from your body.
3. Gently wipe the Vscan Air probe with a cleaning wipe along the length of the Vscan Air probe. Gently wipe the Vscan Air probe large lens.
4. Rotate the Vscan Air probe and wipe the surface of the Vscan Air probe. As the wipe becomes visibly soiled, discard the wipe into clinical trash and dispense fresh wipes as needed.
5. Wrap a clean wipe around a soft nylon bristle brush to access crevasses on the surface of the Vscan Air probe. Do not use the brush on the Vscan Air probe lenses.
6. Turn the Vscan Air probe so that the small lens is facing away from your body.
7. Gently wipe the Vscan Air probe with the cleaning wipe along the length of the Vscan Air probe. Gently wipe the Vscan Air probe small lens.
8. Rotate the Vscan Air probe and continue wiping until the entire surface of the Vscan Air probe has been wiped.
9. Visually inspect the Vscan Air probe for any remaining soil and, if necessary, repeat steps 2 through 8 until the Vscan Air probe is visibly clean.

**NOTE:** *Pay special attention to lenses, edges and groves.*

## **Cleaning using a cleaning solution**

1. Prepare a basin with enzymatic cleaner per the manufacturer's instructions.
2. Immerse probe in the cleaning solution and ensure no air bubbles are trapped.
3. Use a soft nylon bristle brush to clean the probe. Do Not use the brush on the probe lenses as this can damage the soft acoustic lens.
4. Ensure the probe remains in the cleaning solution for the minimum contact time listed on the enzymatic cleaner label. Make sure to follow manufacturers' recommendations.
5. Visually inspect the probe and probe components for soil. Repeat steps 4 - 6 until all visible soil has been removed from the surface of the probe.
6. Thoroughly rinse the probe to remove traces of the cleaner solution. Follow the cleaner manufacturers' instructions.
7. Visually inspect the device in a well-lit area to ensure all surfaces are free from residual cleaning solution. Repeat Step 6 if visible cleaning solution is observed.
8. Thoroughly pat dry the probe using a clean low-lint soft, dry disposable cloth or wipe. Do not use abrasive paper products.



## **Low-level/Intermediate level disinfection with wipes**

1. Use a clean set of gloves.
2. Hold the Vscan Air probe with the large lens facing away from your body.
3. Wipe the Vscan Air probe from the large lens to the small lens, slightly rotating the Vscan Air probe after each wiping pass.
4. Turn the Vscan Air probe so that the small lens is facing away from your body.
5. Use a new wipe and apply to the small lens. Now, wipe the Vscan Air probe from the small lens to the large lens, slightly rotating the Vscan Air probe after each wiping pass.
6. Wrap a clean wipe around a soft nylon bristle brush to access crevasses on the surface of the Vscan Air probe. Do not use the brush on the Vscan Air probe lenses.
7. Once the Vscan Air probe has been completely wiped, use additional wipes and continue wiping the Vscan Air probe as needed to ensure all surfaces remain wet for the required exposure time listed on the disinfectant manufacturer's label.
8. Dry all surfaces of the Vscan Air probe using a sterile, lint-free, soft wipe or cloth. Blot or pat the lenses dry.
9. After each use, inspect the lenses, and housing of the Vscan Air probe. If the Vscan Air probe is damaged, do not place it into any liquid (e.g. for disinfection) and do not use it until it has been inspected and repaired/replaced by a GEHC Service Representative.

## High-level disinfection – Soak

High-Level Disinfection is required for devices that contact non-intact skin.

In order for cleaner to be effective, all visible residues must be removed during the cleaning process. Follow the cleaning instructions as given in 'Manual cleaning Instructions' on page 6-9 to clean the probe before performing disinfection.

Do not soak probes in cleaner for longer than stated by the chemical manufacturers instructions for use. Extended soaking may cause probe damage and early failure of the enclosure, resulting in possible electric shock hazard.

1. Prepare a basin with the high-level disinfectant per the manufacturer's instructions for use. Be sure to follow all precautions for storage, use and disposal. Observe specifically soak times and dilution rates.
2. Immerse cleaned and dried probe in the disinfectant for the time specified by the chemical manufacturer and ensure no air bubbles are trapped.
3. Thoroughly rinse the probe to remove traces of the disinfectant. Follow the disinfectant manufacturers instructions.
4. Thoroughly dry all surfaces of the device using a sterile, lint-free wipe or cloth, changing wipes/ cloths when necessary to ensure the device is completely dry.

**NOTE:** *High-level disinfectants may be available as powder products. Follow the manufacturer's instructions for use for preparing the disinfecting solution from the powder product.*



**DO NOT** soak probes in cleaner for longer than is stated by the chemical instructions for use. Extended soaking may cause probe damage and early failure of the enclosure, resulting in possible electric shock hazard.

## Choosing a Disinfectant

When choosing a disinfectant, determine the required level of disinfection. If the possibility of cross-contamination or exposure to unhealthy or non-intact skin exists, then high level disinfection should be performed. Good hand hygiene practice is highly recommended to help further reduce the risk of cross-contamination.

*NOTE: For additional information about cleaning and disinfection, refer to the recommendations of the Association for Professionals in Infection Control (APIC), the U.S. Food and Drug Administration (FDA), and the U.S. Centers for Disease Control (CDC). For country-specific disinfection regulations, check with your local regulatory infection control authorities.*

*NOTE: A validated, high-level disinfection process, combined with the use of a sterile gel and a probe cover/sheath is an accepted method of infection control for Ultrasound probes. Adequate records or a logbook detailing the time, date, disinfection method, and verification of disinfectant effectiveness or test results is recommended. For more information about establishing an evidence-based disinfection protocol for your practice, refer to the FDA, CDC, HICPAC, APIC, or the Joint Commission websites.*

## Covering the Vscan Air probe using a Sterile, Protective Sheath



**CAUTION**

Vscan Air probe sheaths should be used in any clinical situation where infection is a concern.

**NOTE:**

1. Place an appropriate amount of gel inside the protective sheath and/or on the transducer face.
2. Insert Vscan Air probe into sheath, making sure to use proper sterile technique. Pull cover tightly over Vscan Air probe face to remove wrinkles and air bubbles, taking care to avoid puncturing the sheath.

*Failure to use imaging gel may result in poor image quality.*



1. Protective sheath
2. Vscan Air probe with the Protective sheath

Figure 6-1. Applying the sheath

3. Secure the sheath in place.
- NOTE:** *If using a rubber band for securing the sheath make sure that it does not affect the probe power button.*
4. Inspect the sheath to ensure there are no holes or tears. If the sheath becomes compromised, stop the procedure and replace immediately.

### **Cleaning the protective case**

The protective case is compatible with the set of cleaners and disinfectants listed for the Vscan Air probe. When cleaning the protective case pay special attention to its edges and grooves. Requirements for the protective case cleanliness will be defined by the way the protective case is implemented in the workflow for storing the Vscan Air probe. Cleaning of the protective case will be required if the Vscan Air probe was not properly cleaned or disinfected before it was storage in the protective case.



Figure 6-2. Protective case

## GEHC ultrasound transducers web site

The GEHC Ultrasound transducers web site contains a list of chemicals that have been tested for compatibility with GEHC ultrasound probes. Verify probe compatibility via the GEHC ultrasound transducers web site. The reprocessing instructions provided in this document have been validated with the chemicals specified in 'Chemicals used for Efficacy Validation with Vscan Air CL and Vscan Air SL' on *page 6-7*.

| GEHC ultrasound transducers web site   |
|--|
| <a href="https://gehealthcare.com/probecare">https://gehealthcare.com/probecare</a><br>OR<br><a href="https://www.gehealthcare.com/products/ultrasound/ultrasound-transducers">https://www.gehealthcare.com/products/ultrasound/ultrasound-transducers</a> |



### Creutzfeldt-Jakob disease

This device is not indicated for neurological use. Neurological contact on patients with this disease **MUST BE** avoided. If the Vscan Air CL or the Vscan Air SL becomes contaminated, there is no adequate means to disinfect it. In this case, the contaminated device/probe **MUST BE** discarded in accordance with local biological waste hazard procedures.

## Chemicals compatible with Vscan Air probe

The table below lists the chemicals that were tested for compatibility with the probes.



Products listed below are compatible with Vscan Air probe materials, but GE has not validated their efficacy. Questions related to these products should be directed to the detergent/ disinfectant manufacturer. Refer to Table 6-1 on page 6-7 to identify products validated by GE. Products listed might not be available in all regions. Check with your local infection control authorities or product manufacturer. GE warranties and service contracts do not cover, and GE is not responsible for, damages caused by cleaning, disinfection or gel products that are not compatible with GE probes.

Table 6-2: Chemicals compatible with the Vscan Air CL and Vscan Air SL probes

| Trade Name                                  | Manufacturer                          |
|---|---------------------------------------|
| Cidezyme/ Enzol                             | Advanced Sterilization Products (J&J) |
| Alcohol 70% Ethanol on a wipe **            | All manufacturer                      |
| Alcohol 70% Isopropanol on a wipe **        | All manufacturer                      |
| Bacillol 30 Foam                            | BODE Chemie GmbH (HARTMANN)           |
| Bacillol AF Tissues                         | BODE Chemie GmbH (HARTMANN)           |
| CaviWipes 1                                 | Metrex                                |
| Cleanisept Wipes forte                      | Dr.Schumacher GmbH                    |
| Sekusept Aktiv                              | Ecolab                                |
| Mikrobac forte                              | BODE Chemie GmbH                      |
| Surfa'Safe Premium                          | Laboratoires Anios                    |
| Matrix Wipes                                | Whiteley Medical                      |
| Mikrobac tissues                            | BODE Chemie GmbH (HARTMANN)           |
| Sani-Cloth Active (Ecolab)                  | Ecolab                                |
| Sani-Cloth Active (PDI)                     | PDI                                   |
| Sani-Cloth AF3 Germicidal Disposable Wipe   | PDI                                   |
| SONO Ultrasound Wipes                       | Advanced Ultrasound Solutions Inc     |
| Super Sani-Cloth Germicidal Disposable Wipe | PDI                                   |
| Tristel Pre-Clean Wipes                     | Tristel Solutions Limited             |

Table 6-2: Chemicals compatible with the Vscan Air CL and Vscan Air SL probes

| Trade Name   | Manufacturer              |
|--|---------------------------|
| Tristel Rinse Wipes  | Tristel Solutions Limited |
| Tristel Trio Wipes System *                                    | Tristel Solutions Limited |
| mikrozyd sensitive or mikrozyd alcohol free (liquid and wipes) | Schulke & Mayr GmbH       |
| mikrozyd universal liquid and mikrozyd universal wipes         | Schulke & Mayr GmbH       |
| Protex ULTRA Disinfectant Wipes                                | Parker Laboratories Inc   |
| Reynard Premier Detergent & Disinfectant Wipes                 | Reynard Health Supplies   |
| Anioxyde 1000  | Laboratoires Anios        |
| Wip'Anios Excel  | Laboratoires Anios        |

**Disclaimer:** \* Disinfection with Tristel Trio Wipes System may cause discoloration of the lightbar, the button and the soft plastic surrounding the battery door. Such color change does not impact the performance, safety or lifetime of the probe. If color change occurs due to disinfection with Tristel Trio Wipes System, Vscan Air probes will not be repaired or replaced under warranty or contract agreements.



**Compatibility with trophon devices**

There are different methods of disinfecting the Vscan Air probe based on its clinical use. When High-Level Disinfection is required, utilizing trophon EPR or trophon2 devices is one disinfection method. A trophon Wireless Ultrasound Probe Holder is required to hold the Vscan Air probe in the trophon chamber. Refer to the manufacturer’s instructions for use when using the trophon EPR or trophon2 devices.

GE offers this holder as an accessory to the Vscan Air. GE HealthCare has not validated the effectiveness of the disinfection process utilizing trophon devices. For questions relating to efficacy testing please visit Nanosonics at [www.nanosonics.com](http://www.nanosonics.com)

Table 6-3: Products compatible with the Vscan Air CL and Vscan Air SL probes

| Trade Name    | Manufacturer |
|---------------|--------------|
| trophon2 *    | Nanosonics   |
| trophon EPR * | Nanosonics   |

**Disclaimer:** \* High usage of trophon devices may cause discoloration of the lightbar, the button and the soft plastic surrounding the battery door. Such color change does not impact the performance, safety or lifetime of the probe. If color change occurs due to disinfection in trophon chamber, Vscan Air probes will not be repaired or replaced under warranty or contract agreements.

# Upgrades

## Upgrade software

Download app software upgrades when available from either Google Play store or Apple Store.

*NOTE: Software upgrades through the Apple app store or Google play may not be available in all markets.*

## Vscan Air probe software upgrade

After downloading an app software upgrade the Vscan Air CL or the Vscan Air SL probe software might need to be upgraded.

Follow the on-screen instructions when connecting the probe to the app to upgrade probe software.

*NOTE: The system reverts to the previous active installation, if a power cycle happens before the probe software upgrade is completed.*

## Vscan Air probe software upgrade

1. Pair the Vscan Air probe to the app. If the probe software needs to be updated it prompts for an upgrade '**probe needs update**'. Click on '**start update**'.

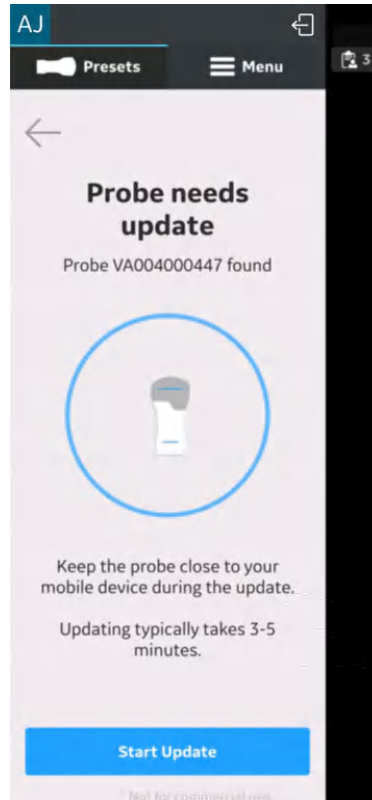


Figure 6-3. Probe needs update

## Vscan Air probe software upgrade (continued)

2. The probe update is in progress.

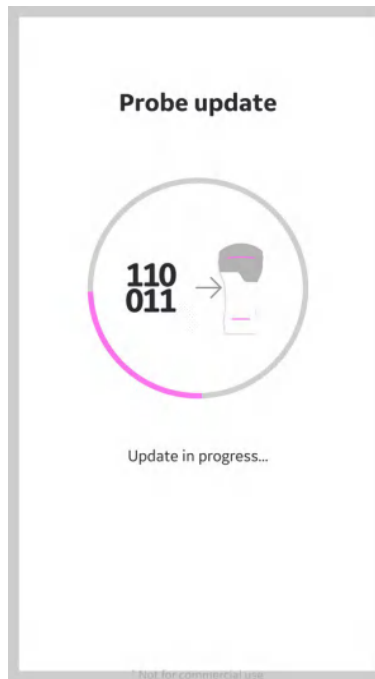


Figure 6-4. Probe update in progress

## Vscan Air probe software upgrade (continued)

3. The probe update process takes around 3 to 5 mins.

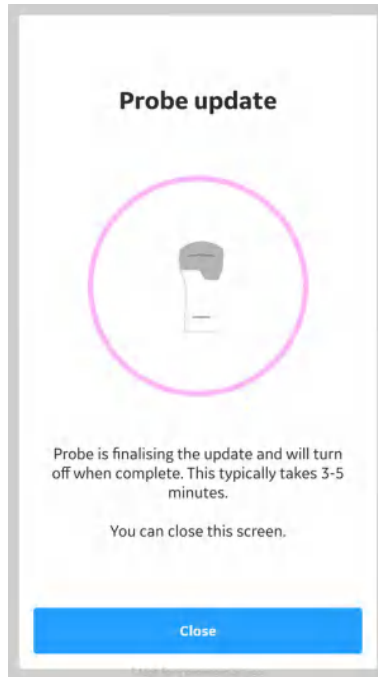


Figure 6-5. Probe update in process

4. When the probe update is complete the probe turns off. The user will need to start the probe whenever probe needs to be used again.

# Troubleshooting

## No connection between the Vscan Air probe and the mobile device

To be able to connect the Vscan Air probe to the mobile device, the mobile device's Wi-Fi should be turned **ON**.

If the connection is broken, try these steps:

- Ensure the Wi-Fi is enabled in the mobile device.
- Ensure that the Vscan Air probe is turned **ON**.

## Troubleshooting - mechanical and hardware

Table 6-4: Mechanical and hardware

| Problem   | Possible reason  | Resolution  |
|---|--|---|
| 1. Fluids inside probe                                      | The probe got dropped or collided with some other object and covers could have broken.   | Contact GEHC Service (see 'Contact Information' on page 1-15) |
| 2. Battery door sealing not working                         | Fluids inside probe, cross contamination, water and dust particulate can enter inside the probe, causing degradation in performance. | Contact GEHC Service (see 'Contact Information' on page 1-15) |
| 3. Degrading image quality                                  | Could be due to damaged transducer or dead elements  | Contact GEHC Service (see 'Contact Information' on page 1-15) |
| 4. Bad image quality, cross contamination, electrical shock | Could be due to dropping the probe or wrong cleaning agents used or the probe could have come in contact with sharp edges.           | Contact GEHC Service (see 'Contact Information' on page 1-15) |
| 5. Electric shock from the probe                            | Could be due to dropping the probe.  | Contact GEHC Service (see 'Contact Information' on page 1-15) |
| 6. Not able to disinfect properly                           | Uneven surfaces, cracks, uneven joint parts.   | Contact GEHC Service (see 'Contact Information' on page 1-15) |
| 7. Probe not turning ON                                     | Could be due to hardware issue. Probe power button not working.  | Contact GEHC Service (see 'Contact Information' on page 1-15) |

## Troubleshooting the Vscan Air probe

Table 6-5: Troubleshooting

| Problem  | Possible cause                               | Solution   |
|--|--|--|
| 8. Vscan Air probe has no power.                           | When battery is discharged.                  | Charge the Vscan Air probe for at least 10 minutes and then power on.  |
| 9. Battery defect or end of life.                          | .  | Contact GEHC Service (see 'Contact Information' on <i>page 1-15</i> )  |
| 10. Vscan Air probe is not charging.                       | Defective battery or probe hardware issue    | Contact GEHC Service (see 'Contact Information' on <i>page 1-15</i> )  |
|  | Defective AC adapter.                        | Contact GEHC Service (see 'Contact Information' on <i>page 1-15</i> )  |
|  | Defective wireless charger.                  | Contact GEHC Service (see 'Contact Information' on <i>page 1-15</i> )  |
|  | Defective USB cable.                         | Contact GEHC Service (see 'Contact Information' on <i>page 1-15</i> )  |
|  | Mains power is down.                         | Ensure that the charger is connected to a powered wall outlet.   |
|  | Temperature is outside the specified limits. | Ensure the ambient temperature is within the specified limits (see 'Contact Information' on <i>page 1-15</i> ) |
| 11. Display screen is blank when the device is powered on. | Connection broken during software loading.   | Contact GEHC Service (see 'Contact Information' on <i>page 1-15</i> )  |
| 12. Parts of the image is missing when scanning.           | Channels are missing.                        | Contact GEHC Service (see 'Contact Information' on <i>page 1-15</i> )  |
| 13. No image displayed when scanning.                      | Defective probe.                             | Contact GEHC Service (see 'Contact Information' on <i>page 1-15</i> )  |
| 14. Scan screen is not displayed.                          | Battery may not have sufficient charge.      | Charge the Vscan Air probe for at least 60 minutes.  |

## Troubleshooting in pairing of probe with user app device

Table 6-6: Troubleshooting in pairing

| Issue/Symptom   | Potential Causes   | Recommended Actions   |
|---|--|---|
| <p>1. Probe is powered on and its LEDs indicate searching (waiting to pair) despite having launched the app on mobile device.</p> | <p>This is the first attempt to pair with this probe.</p>  | <p>Press the button on the side of the probe to allow it to pair with a new mobile device.</p>  |
|   | <p>The probe and app mobile device are too far apart.</p>  | <p>Move/orient the probe and app mobile device closer to one another. Watch for the probe LEDs to indicate display found (pairing has been initiated).</p>                                |
|   | <p>The orientation of the probe and app mobile device is not optimal for Bluetooth beacon reception.</p> | <p>Orient the probe and app mobile device with respect to one another (e.g. front/back, left/right). Watch for the probe LEDs to indicate display found (pairing has been initiated).</p> |
|   | <p>The app mobile device is not transmitting advertising beacons.</p>                                    | <p>Close the app and launch again. If the problem persists, reboot the mobile device and relaunch the app.*</p>   |
| <p>2. Not able to pair with probe</p>   | <p>Probe may already be connected to a different instance of the app.</p>                                | <p>Turn ON the probe and press probe button. If issue persists, Contact GEHC Service (see 'Contact Information' on page 1-15)</p>   |
| <p>3. Probe LEDs indicate display found (pairing initiated), but connection fails and the probe shuts down.</p>                   | <p>The probe battery level is too low.</p>   | <p>Place the probe on the charger and try again when sufficiently charged.</p>  |



Table 6-6: Troubleshooting in pairing

| Issue/Symptom   | Potential Causes  | Recommended Actions   |
|---|---|---|
| <p>4. When connecting to an iOS device, the probe LEDs indicate display found (pairing initiated), Join was selected when the Vscan Air Wants to Join Wi-Fi Network “VAXXXXXXXXXX” dialogue was presented, but the connection fails. The probe LEDs may or may not return to indicate searching (waiting to pair) state. Unable to join the network “VAXXXXXXXXXX” dialogue observed.</p> | <p>User failed to select Join in dialogue on iOS device to join the probe network before the probe's 30 second timer expires. †</p> | <p>Dismiss the Unable to join the network “VAXXXXXXXXXX” dialogue. If the app does not retry on its own, present the Join dialogue, and finally connect, close the app and launch again. If the problem persists, reboot the iOS device and try again.*</p>             |
|   | <p>There is an issue with the networking on the iOS device.</p>   | <p>Dismiss the dialogue. Reboot the iOS device and try again.*</p>  |
|   | <p>New from iOS 14 and later, the Vscan Air app has not been given Local Network access permission.</p>                             | <p>Close the app, open Settings, scroll down to the Vscan Air app and select it to see its access permissions. On the right side, ensure that under the list of “ALLOW VSCAN AIR TO ACCESS” the setting for Local Network is enabled. Launch the app and try again.</p> |
| <p>5. When connecting to an iOS device, the probe LEDs indicate display found (pairing initiated), the Vscan Air Wants to Join Wi-Fi Network “VAXXXXXXXXXX” dialogue was presented and a choice was selected, but after the dialogue goes away the connection is not completed.</p>   | <p>User has selected Cancel instead of Join.</p>  | <p>Press Click to retry in the Searching for probe screen.</p>  |
|   | <p>New from iOS 14 and later, the Vscan Air app has not been given Local Network access permission.</p>                             | <p>Close the app, open Settings, scroll down to the Vscan Air app and select it to see its access permissions. On the right side, ensure that under the list of “ALLOW VSCAN AIR TO ACCESS” the setting for Local Network is enabled. Launch the app and try again.</p> |

Table 6-6: Troubleshooting in pairing

| Issue/Symptom   | Potential Causes  | Recommended Actions   |
|---|---|---|
| <p>6. When connecting to an Android device, the probe LEDs had indicated display found (pairing initiated), but connection fails and probe LEDs return to indicate searching (waiting to pair) state.</p> | <p>Failure to create network interface or problems with negotiating group formation when connecting to Android devices.</p>   | <p>If the app does not retry on its own and successfully connect, close the app and launch again.</p>   |
|   | <p>There is an issue with networking on the Android device.</p>   | <p>Close the app, open Settings and navigate to the Wi-Fi Direct panel. Depending on the manufacturer of the Android device the Wi-Fi direct panel is found in different places in Settings. You can use the search capability to find it if it is not obvious. When you are on the Wi-Fi direct panel, if you see a list of Remembered Groups and it contains your probe VAXXXXXXXXX, select it and answer OK when asked to Forget this group? Launch the app again.</p> |
|   |   | <p>If the problem still persists, reboot the Android device and try again.*</p>   |
| <p>7. My probe or app mobile device is connecting to the wrong app mobile device or probe.</p>  | <p>When a probe has been paired with multiple display devices, the timing of when an app was launched on a mobile device and a probe begins searching (waiting to pair) mode can result in the selection of the wrong device when multiple users are attempting to work in proximity.</p> | <p>Close the app on the mobile device and power off the probe. Then move 1.5 meters or more away from the other probes and display devices. Launch the app on the mobile device. After the app display shows Searching for probe, power on the probe and hold it near the mobile device (around 10 centimeters) to ensure it will detect the correct mobile device as being the closest.</p>  |

Table 6-6: Troubleshooting in pairing

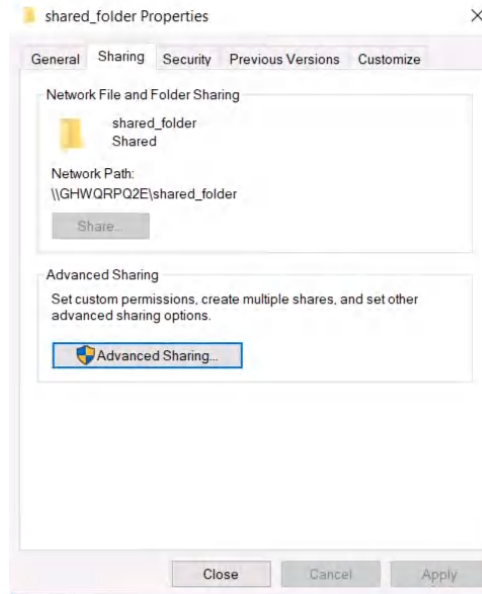
| Issue/Symptom   | Potential Causes  | Recommended Actions   |
|---|---|---|
| <p>8. The app on my mobile devices is in the background or closed, but my probe has not shut off after 5 minutes of inactivity.</p>                 | <p>The network established between the probe and app mobile device is still active.</p> | <p>With an iOS device, open Settings, select Wi-Fi, and if the selected network is the SSID of the probe (VAXXXXXXXX), either select it to see its details and choose Forget This Network or just choose the SSID for a different network.</p>  |
|   |   | <p>With an Android device, open Settings and navigate to the Wi-Fi Direct panel. Depending on the manufacturer of the Android device the Wi-Fi direct panel is found in different places in settings. You can use the search capability to find it if it is not obvious. When you are on the Wi-Fi direct panel, you should see a list of Peer Devices or Available devices or something similar. Select the device that matches your probe (VAXXXXXXXX) to disconnect.</p> |
| <p>9. When attempting to connect to an Android device, the connection fails repeatedly.</p>   | <p>There is a pending software upgrade to the Android device.</p>                       | <p>Close the app, open Settings and navigate to the System update panel. Depending on the manufacturer of the Android device the System update panel is found in different places in Settings. If an update is available, follow the steps to download and install the update.</p>  |
|   |   | <p>After the upgrade finishes, you will likely be instructed to restart the device. After the device restarts and you are able to open the Vscan Air app, attempt to pair again.</p>  |
| <p>* The need to reboot the device to solve this issue is rare.<br/>         † This currently does not behave as expected and will be improved.</p> |   |   |

**Troubleshooting – Network Bandwidth**

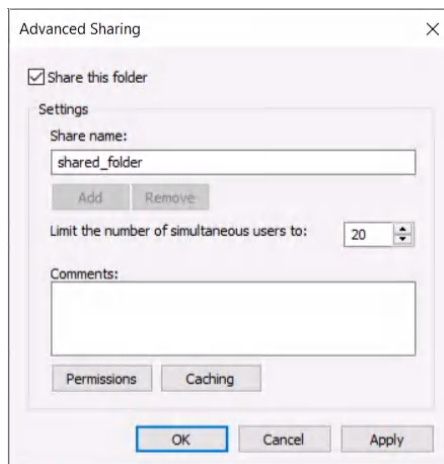
| Issue/Symptom  | Potential Causes  | Recommended Actions   |
|--|---|---|
| <p>1. The Wi-Fi Quality indicator indicates insufficient network bandwidth. It is likely the update of the image display will appear to stutter (pausing and resuming repeatedly).</p> | <p>The primary channel that was chosen by the probe to establish the network is the same as that of one or more networks in the area, and the existing network congestion is limiting the throughput of the Vscan Air network.</p>  | <p>On an iOS device, disconnect from the probe by closing the Vscan Air app. When the probe returns to searching (waiting to pair), launch the app again. The probe randomly selects a primary channel for iOS devices, and choosing a different one may solve the throughput issue.</p>  |
|  | <p>An Android device connected to an existing network prior to pairing with the probe might negotiate with the probe to form the results in a situation where the Wi-Fi module on the Android device becomes inefficient at managing the throughput of both networks.</p> | <p>On the Android device, disconnect from the probe by closing the Vscan Air app. Navigate to the Wi-Fi section of Settings and either “Forget” the network the device was connected to prior to pairing or turn off “Auto-connect” (may also be called “Auto reconnect”) and disconnect from the network. Launch the app again. The new network will be formed on a random selection of the supported channels the probe and Android device have in common. In the event there is still an indication of insufficient network bandwidth, close the app and launch again (a strategy like the one for iOS above).</p> |

## Steps to troubleshoot Network shared folder connectivity challenges

1. Lack of permission for network shared folder on windows PC.
  - Step 1 : Right click on the folder and select Properties. Go to Sharing tab.

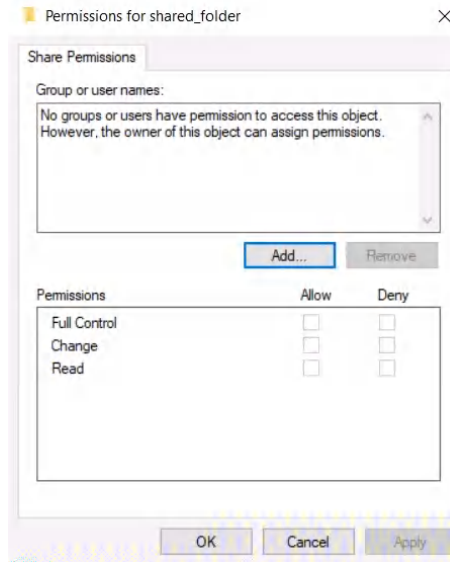


- Step 2: Click on Advanced Sharing. Make sure 'Share this folder' is selected.

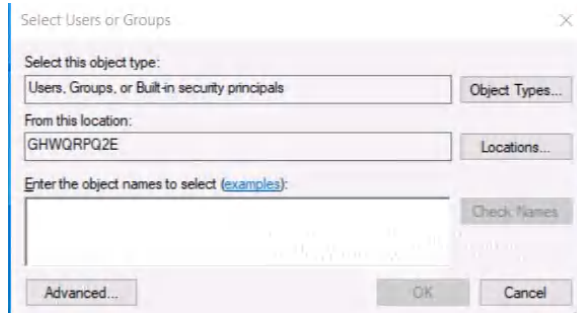


## Steps to troubleshoot Network shared folder connectivity challenges (continued)

- Step 3 : Click on Permissions.

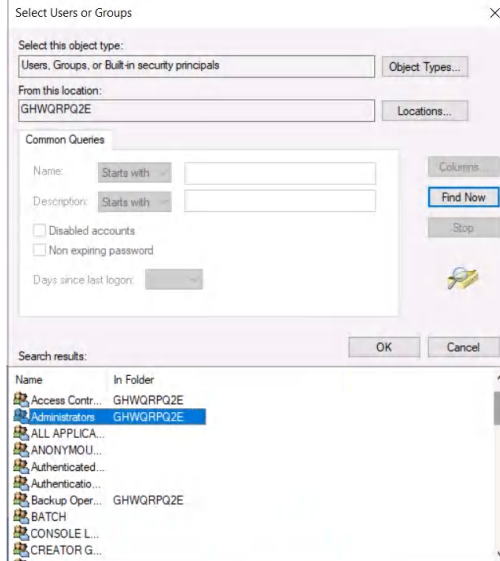


- Step 4 : Click on Add.

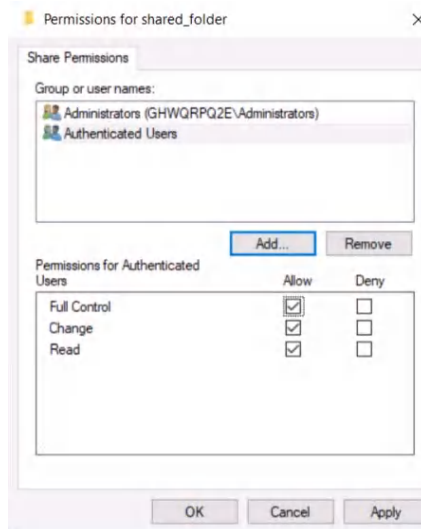


## Steps to troubleshoot Network shared folder connectivity challenges (continued)

- Step 5 : Click on Advanced and click Find now. Observe that list of user group shows up below in Search results.



- Step 6 : Search for your user name and select. Also select Administrators and Authenticated users in the list to provide access to admin group and to all the authenticated users. Click OK. In Permissions window, Select Full Control for all the user group added. Click Apply and Click OK.



## Steps to troubleshoot Network shared folder connectivity challenges (continued)

2. Check in User accounts of PC for the right user name.

Open Control Panel -> User Accounts -> User Accounts ->Manage User Accounts. Make sure the User Name entered in the Network shared folder configuration in Vscan Air is same as the User Name displayed in User Accounts of PC.

## Troubleshooting FAQs for Digital tools

Table 6-7: Troubleshooting FAQs - Digital tools

| Problem                             | Possible reason  | Resolution   |
|-------------------------------------|--|--|
| 1. Not able to create user accounts | <ol style="list-style-type: none"> <li>a. Display device not connected to a network that can access the user account creation server.</li> <li>b. The user authentication server is down.</li> <li>c. Password guidelines are not met.</li> <li>d. User has selected a region/country which is not yet cleared for Vscan Air.</li> <li>e. User is deactivated in the backend.</li> </ol>                     | <ul style="list-style-type: none"> <li>• (a, b) Retry the workflow when the internet connection is available. If issue persists, Contact GEHC Service (see 'Contact Information' on page 1-15)</li> <li>• (c) For password refer 'Password Guidelines' on page 6-35</li> <li>• (d, e) Contact GEHC Service ('Contact Information' on page 1-15)</li> </ul>   |
| 2. User sign in fails               | <ol style="list-style-type: none"> <li>a. The user authentication server is down.</li> <li>b. No Internet connectivity.</li> <li>c. The username/password combination is incorrect.</li> <li>d. The user has forgotten the password.</li> <li>e. The user is not the accessible list for the enterprise probe.</li> <li>f. Difficult to type lengthy, complex usernames, passwords with one hand.</li> </ol> | <ul style="list-style-type: none"> <li>• Guest user option is available to the user.</li> <li>• Answer confirmation e-mail to reset password.</li> <li>• User can ask admin to give access to specific probe.</li> <li>• Guidance text in user manual on the usage of predictive text, swipe keyboard settings on android/iOS devices for ease of usage. If issue persists, 'Contact Information' on page 1-15)</li> </ul> |
| 3. MyRemoteShare failure            | Tried on an iPad without SIM card  | <ul style="list-style-type: none"> <li>• For MyRemoteShare feature to work on iPad's, they need to have SIM card with data enabled.</li> </ul>   |



## **Password Guidelines**

- Password length should be minimum of 8 characters.
- The password should include numbers, uppercase and lowercase letters.
  - It should contain at least one number, one uppercase letter, and one lowercase letter.
- The password should include numbers, uppercase, lowercase letters, and special characters.
  - It should contain at least one number, one uppercase letter, one lowercase letter, and one of the following characters:  
!"#\$%&'()\*+,-./:;<=>?@[\\]^\_`{|}~

**Additional messages**

Table 6-8: DICOM messages

| Problem  | Possible causes   | Solution   |
|--|---|--|
| <p>1. Verification failure of DICOM image server/ MWL Server / Network share folder.</p> | <p>The DICOM end point does not support the initiated service (Echo or Storage or MWL server).</p>                      | <p>Contact hospital IT staff to find the root cause and can resolve the issue by addressing root cause.</p>  |
|  | <p>Configuration details such as IP address, port, AE title can be incorrect for DICOM end points.</p>                  |  |
|  | <p>Firewall restriction in the hospital network.</p>  |  |
| <p>2. Exported image/loops are not transferred or failed in Image queue.</p>             | <p>Network availability for device Wi-Fi to transfer.</p>   | <p>- Contact hospital IT staff to find the root cause and can resolve the issue by addressing root cause.<br/>                     - Ensure configurations and certificates are loaded to device correctly.<br/>                     - Validate the certificate.</p> |
|  | <p>Configurations on DICOM End points ( Storage server/MWL) in case of secure communication over TLS.</p>               |  |
|  | <p>Certificates expiry</p>  |  |
|  | <p>Configuration on DICOM End points for Storage commit with Vscan Air IP address/AE title/ listening port.</p>         |  |
|  | <p>DICOM Encoding support</p>   |  |
|  | <p>Permission for the shared folder to receive the transferred data from Vscan Air in case of Network share folder.</p> |  |
| <p>3. Failed to get scheduled Exam list from MWL</p>                                     | <p>Network availability for device Wi-Fi to transfer.</p>   | <p>Contact hospital IT staff to find the root cause and can resolve the issue by addressing root cause.</p>  |
|  | <p>Incorrect configuration of MWL server on Vscan Air.</p>  |  |

## Troubleshooting – Brazilian Portuguese (iPhone and iPad)

The following needs to be configured when using an iPhone and wanting the app to display texts in Brazilian Portuguese

**Option 1:** Select “*Português (Brasil)*” in the Vscan Air app via Menu > Configuration > Language.

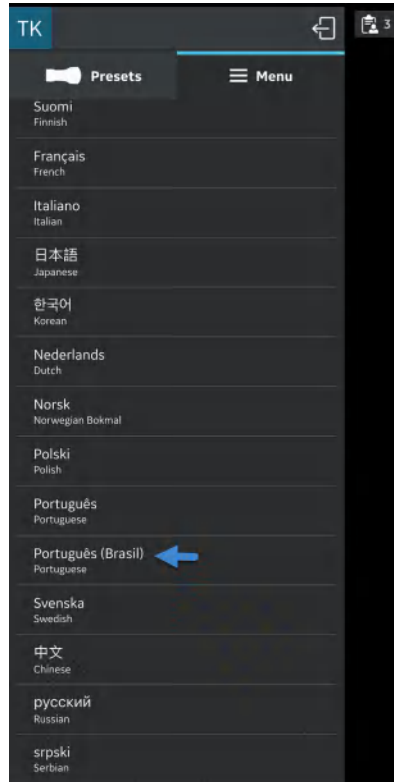


Figure 6-6. Brazilian Portuguese

## Troubleshooting – Brazilian Portuguese (iPhone and iPad) (continued)

**Option 2:** Select “**System language**” in the Vscan Air app via Menu > Configuration > Language.

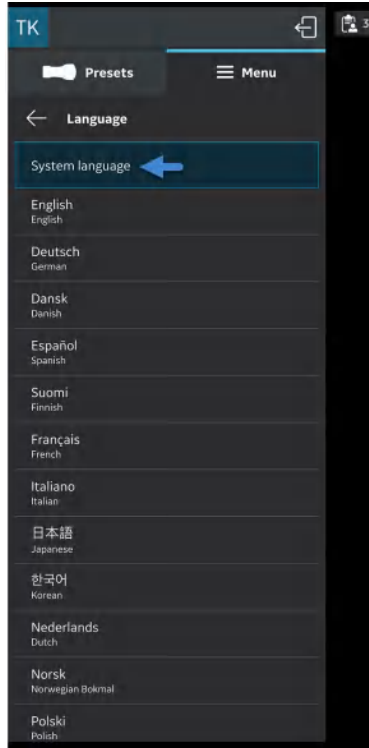


Figure 6-7. System language

## Troubleshooting – Brazilian Portuguese (iPhone and iPad) (continued)

- Via the iPhone or iPad Settings > General > Language and Region, select **“Português (Brasil)”** via your device language selection

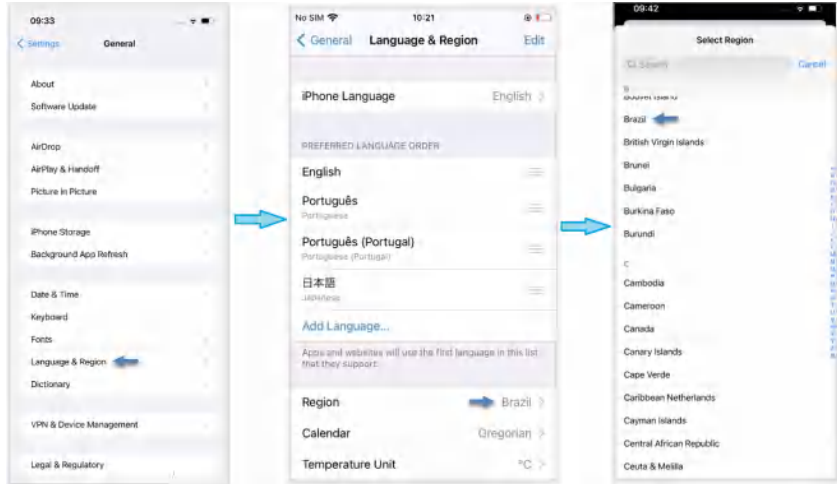


Figure 6-8. Vscan Air application language menu

- Via Select Region > select **“Brazil”**

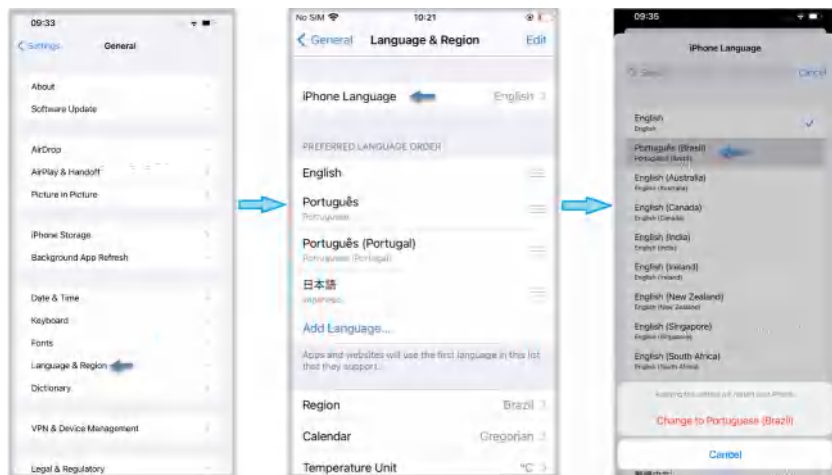


Figure 6-9. Device language and region setting

# Diagnostics

## Diagnostics Test

1. Slide the left panel.
2. Press **Diagnostics** from the Menu.

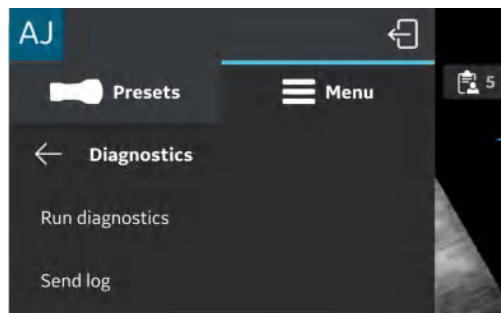


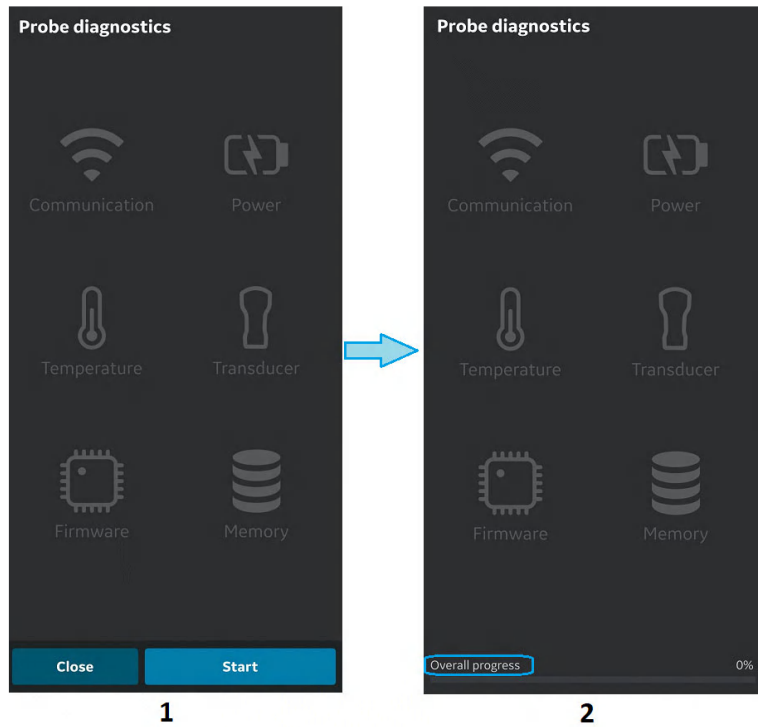
Figure 6-10. Diagnostics menu

3. Press the **Run Diagnostic** button to start the test.

## Diagnostics Test (continued)

4. Press the **'Start'** button to start the diagnostics test. The progress will be shown at the bottom of the screen.

**NOTE:** *The display device must be connected to a probe to be able to start the diagnostics.*



1. Diagnostic screen
2. Diagnostic progress bar

Figure 6-11. Diagnostics in progress

## Diagnostics Test (continued)

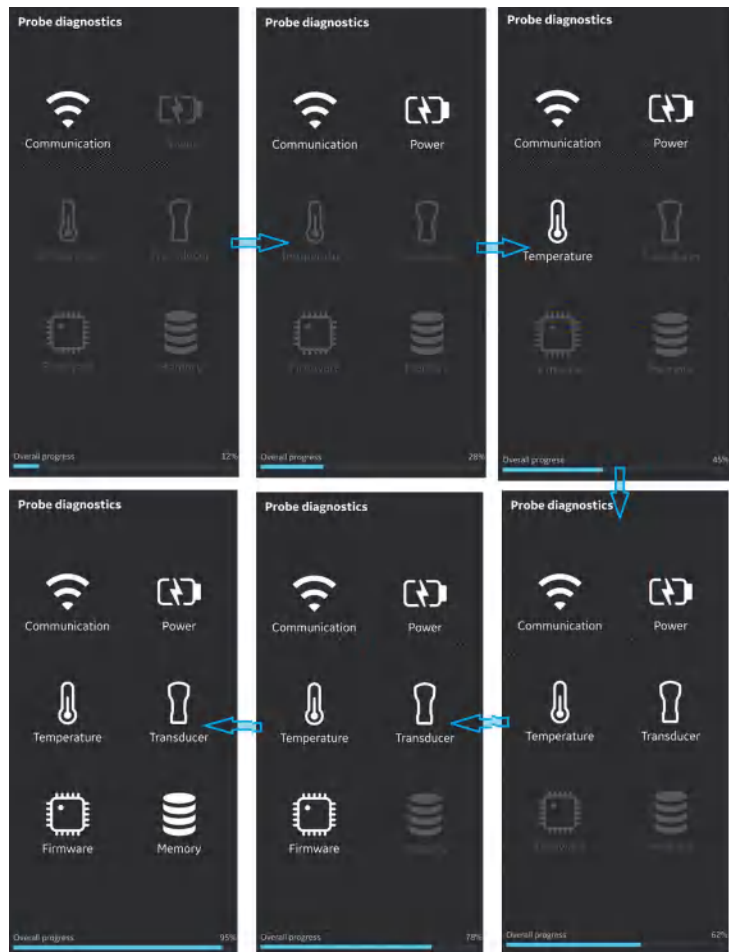


Figure 6-12. Diagnostics process



## Diagnostics Test (continued)

5. If the Diagnostics test passes the below screen displays:

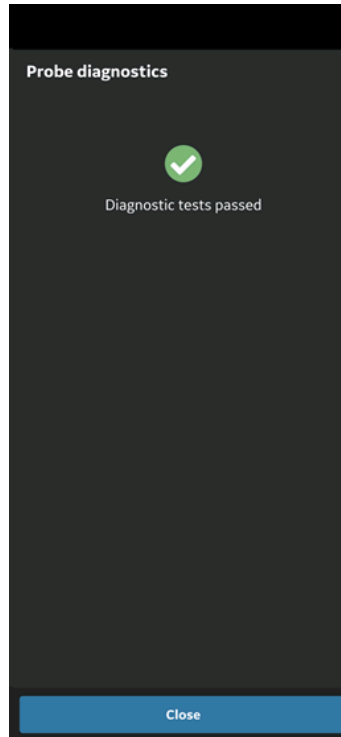


Figure 6-13. Diagnostics passed

## Diagnostics Test (continued)

OR

If the Diagnostics test fails, contact GEHC Service via the hotline number:

You can share device logs with GEHC for instance, if diagnostic test fails.

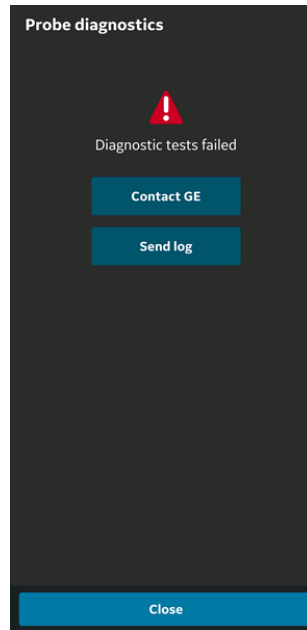


Figure 6-14. Diagnostics failed

6. GEHC service guides the customer through the procedure to upload the system log file.

**NOTE:** *System logs exported from the device will be stored for GEHC service access 1 year before being deleted from the server.*

7. GEHC service runs checklist.
8. GEHC service places the order for the replacement Vscan Air probe and provides shipment details.

## Transducer Element test

The transducer element test transmits/receives on each element to determine if the element is working as intended. If the Element test fails there is an option to export the test results to a local folder. The failing element(s) are listed in this transducer element test results file.

To manually start the transducer check go to Menu -> Diagnostics -> Run Transducers check

The transducers element test is also included as one of the tests being performed when running the diagnostic tests via Menu -> Diagnostics -> Run diagnostics.

**NOTE:** *Please make sure that the transducer surfaces are clean and that excessive gel has been removed before running the probe element test. The element test might incorrectly report failing elements if excessive gel are left on the probe front faces while running the probe element test.*

1. Transducers check is indicated while running.

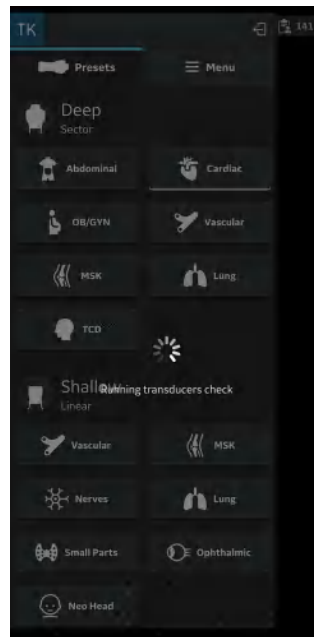


Figure 6-15. Transducers check running

**NOTE:** *There is no indication given when the transducer element test is successful.*

## Transducer Element test (continued)

2. Transducer element test failed for CL and SL probe:

**NOTE:** *If the transducer element test fails goto Menu-> Diagnostics and click the Report button for the Run transducers check. Inspect the transducer element test results file.*

**NOTE:** *If needing to contact service please select Menu-> Diagnostics -> Run diagnostics and select Menu-> Diagnostics -> Send log before contacting service. Service will then be able to help identify the failing transducer element(s) and guide on further actions needed.*

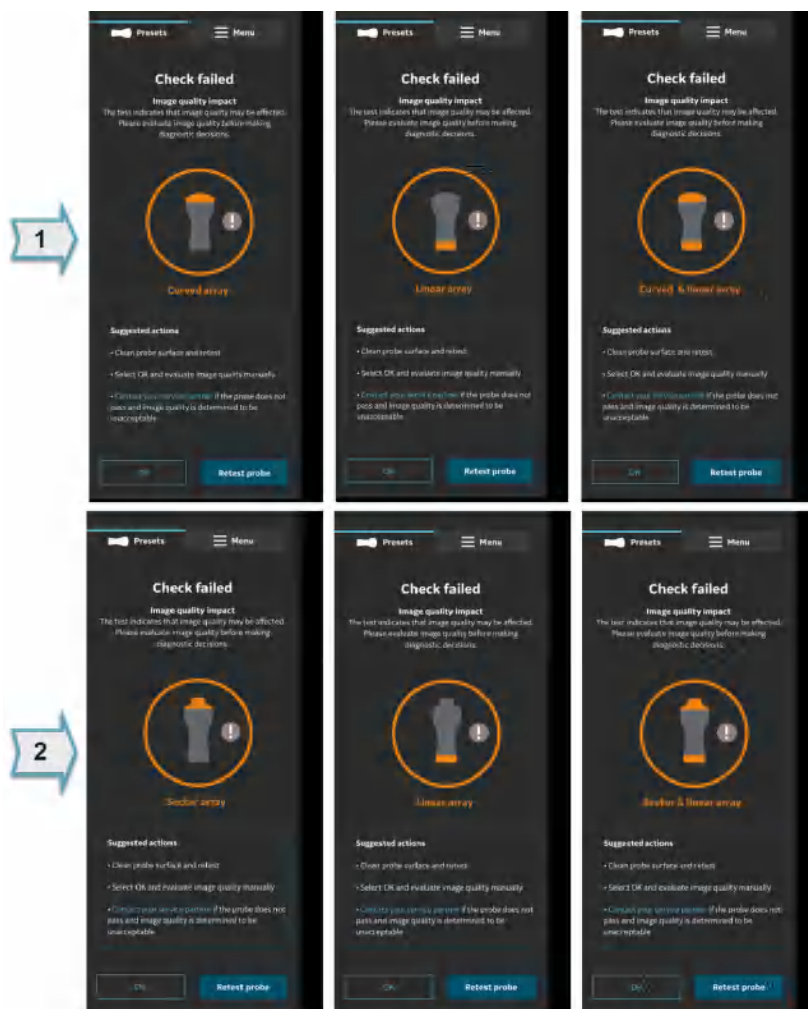


Figure 6-16. Transducer element test failed for Vscan Air CL (1) and SL (2) probe

## Transducer Element test (continued)

3. Configuration: Tap the Menu icon and press the Diagnostics to perform the transducer check.

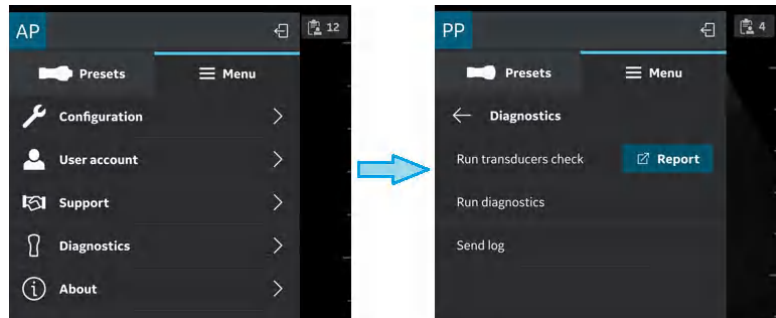



Figure 6-17. Perform probe test

4. Once the transducer check is passed, click on  Report icon for exporting the results and press **OK**.

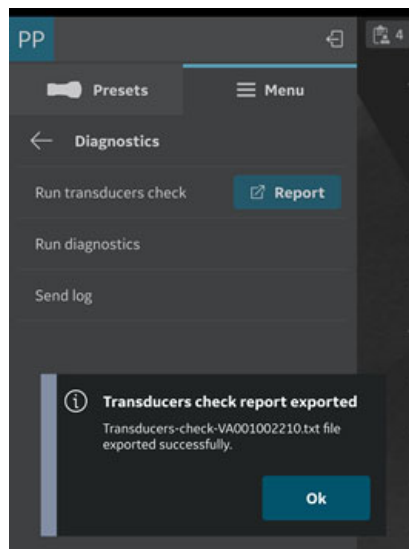


Figure 6-18. Export transducer check results

## Transducer Element test (continued)

5. Navigate to downloads folder in the device and open exported .txt file.

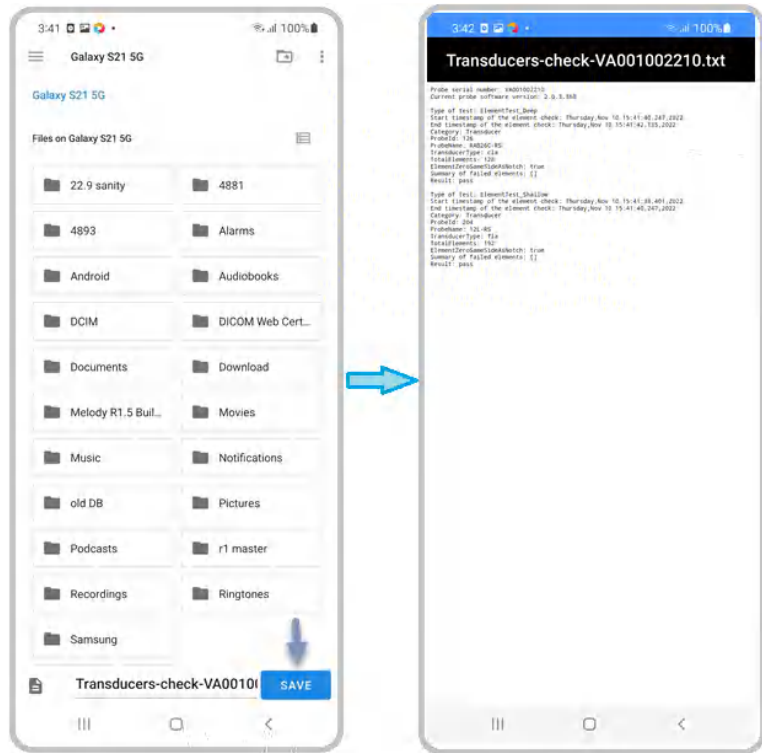


Figure 6-19. Exported log file

# Probe warning messages

## Probe errors

### Probe overheats



Probe is overheating and the system will shut down. If the problem persists, contact GEHC.

### Battery low



Battery critically low. Connect charger immediately.

### Probe voltage critical



Probe voltage is at critical level and will shut down. If the problem persists, contact GEHC.

### Connectivity error



Unable to connect. Check your internet connection and try again.

## Handling a defective Vscan Air probe or battery

If the Vscan Air probe is damaged and needs a replacement, make sure you clean and disinfect the Vscan Air probe, pack it in the packing box, before shipping or returning to GEHC.

If the battery does not charge, or if it is damaged. Contact GEHC for battery replacement.

## Automatic deactivation of the Vscan Air app

### Deactivation soft limit

The Vscan Air app will on a daily basis try to contact the Vscan Air Product Registration server. If the Vscan Air app is inactive and/or not connected to internet for more than 70 days you will see the following message when you try to use the app.

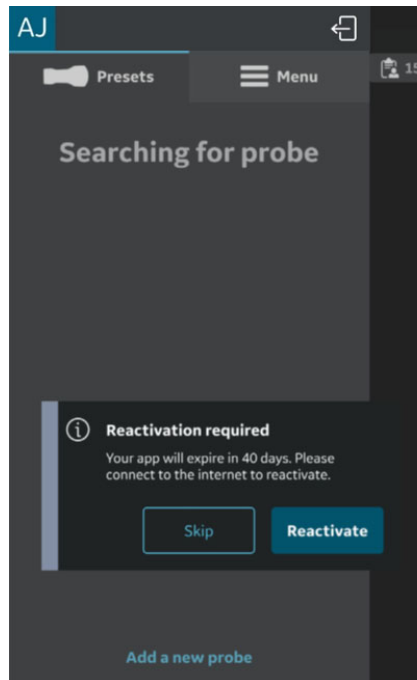


Figure 6-20. Auto deactivated message



## Deactivation hard limit

The Vscan Air app will on a daily basis try to contact the Vscan Air Product Registration server. If the Vscan Air app is inactive and/or not connected to internet for more than 110 days the Vscan Air app is deactivated and you will see the following message when you try to use the app.

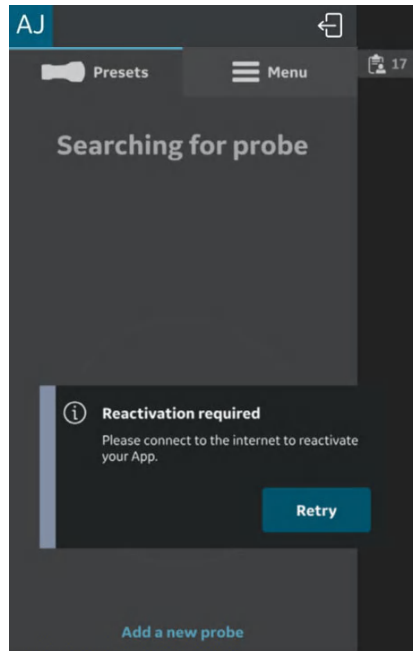


Figure 6-21. Reactivate warning message

**NOTE:** *To avoid deactivation of the Vscan Air app, make sure you use the app while being connected to internet before reaching the deactivation hard limit.*



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# Chapter 7

## Appendix

### *Contents:*

*'Specifications' on page 7-2*

*'Acoustic output' on page 7-3*

*'Appendices' on page 7-33*

*'Measurement accuracy' on page 7-34*

*'OB Tables' on page 7-39*

*'Indications Reference Guide' on page 7-47*

# Specifications

## Vscan Air probe Dimension and weight (maximum)

Table 7-1: Dimension and Weight (maximum)

| Parameters     | Vscan Air CL                             | Vscan Air SL                             |
|----------------|--|--|
| Dimension (mm) | 131 x 64 x 31 mm (length, width, height) | 141 x 67 x 33 mm (length, width, height) |
| Weight (g)     | 205 +/- 3g                               | 218 +/- 3g                               |

## Vscan Air CL and SL transducers

| Parameters                   | Curved array transducer for deep scanning       | Sector array transducer for deep scanning            | Linear array transducer for shallow scanning     |
|------------------------------|---|--|--|
| Broad-bandwidth curved array | from 2 - 5 MHz with center frequency of 3.3 MHz | from 1.6 – 3.7 MHz with center frequency of 2.65 MHz | from 3 - 12 MHz with center frequency of 7.7 MHz |
| Number of elements           | 128   | 64   | 192  |
| Footprint                    | 64 mm x 16 mm (lens)                            | 22 mm x 17 mm (lens)                                 | 40 mm x 7 mm (lens)                              |
| Viewing angle                | 60°   | 90°  | Not applicable                                   |
| Depth                        | up to 24 cm                                     | up to 24 cm  | up to 8 cm                                       |

# Acoustic output

## The real-time display of acoustic output indices

The Vscan Air software have real-time display features according to IEC62359 Ed.2. A thermal (TI) and a mechanical (MI) index is displayed. These two indices are intended to estimate the potential for thermal and mechanical bioeffects induced by ultrasound. Both TI and MI are displayed with increments of 0.1. The displayed (estimated) TI and MI are nominal values.

### Thermal Index

TI is defined as:  $TI = W_0 / W_{deg}$

where:  $W_0$  is the time-averaged acoustic power and  $W_{deg}$  is the estimated power necessary to raise the target tissue 1°C.

The displayed TI is an estimate of temperature increase of soft tissue or bone, presented to make it easier for the operator to implement the ALARA (As Low As Reasonably Achievable) principle. There are three thermal index categories:

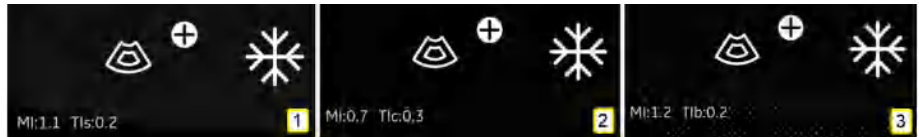
- TIS: Soft tissue thermal index. The main TI category. Used for applications that do not image bone.
- TIB: Bone thermal index (bone located in a focal region). Used for fetal application.
- TIC: Cranial bone thermal index (bone located close to the surface). Used for transcranial application.

The correct category is chosen based on display standard, mode of operation and chosen application, and the relevant TI category presented to the operator. It is therefore important that the operator chooses the right application.

Vscan Air will for each scan setup calculate and limit TI for the chosen index category to 3.0.

## Thermal index display selection

The system provides the ability to select the display of any of the TI categories regardless of the current application while scanning. To switch in between the different thermal indices touch the MI/TI display in the lower left corner of the screen (see 'Black/white imaging mode (B-mode)' on page 3-13). Touching the indices display will circle through displaying the thermal index categories in the following order TIS – TIC – TIB, starting out from the factory selected TI category for the selected preset.



1. TIS
2. TIC
3. TIB

Figure 7-1. Thermal Index display

**NOTE:** *Be aware that Figure 7-1 is illustrating the TI value display utilizing the Curved - Abdominal - Factory default setting. Displayed values can vary dependent on software version/revision.*

## Mechanical Index

MI is the estimated likelihood of tissue damage due to cavitation.

MI is defined as:

$$MI = \frac{p_{r,\alpha}(z_{MI})}{C_{MI} \sqrt{f_{avf}}}$$

equivalent to Track3 MI when the depth  $Z_{MI}=Z_{sp}$ .

The MI will not exceed a value of 1.9 according to Track 3 in the FDA 510(k) guidance of September 9, 2008.

The depth for  $p_{r,\alpha}(z)$  is not limited by the breakpoint depth.

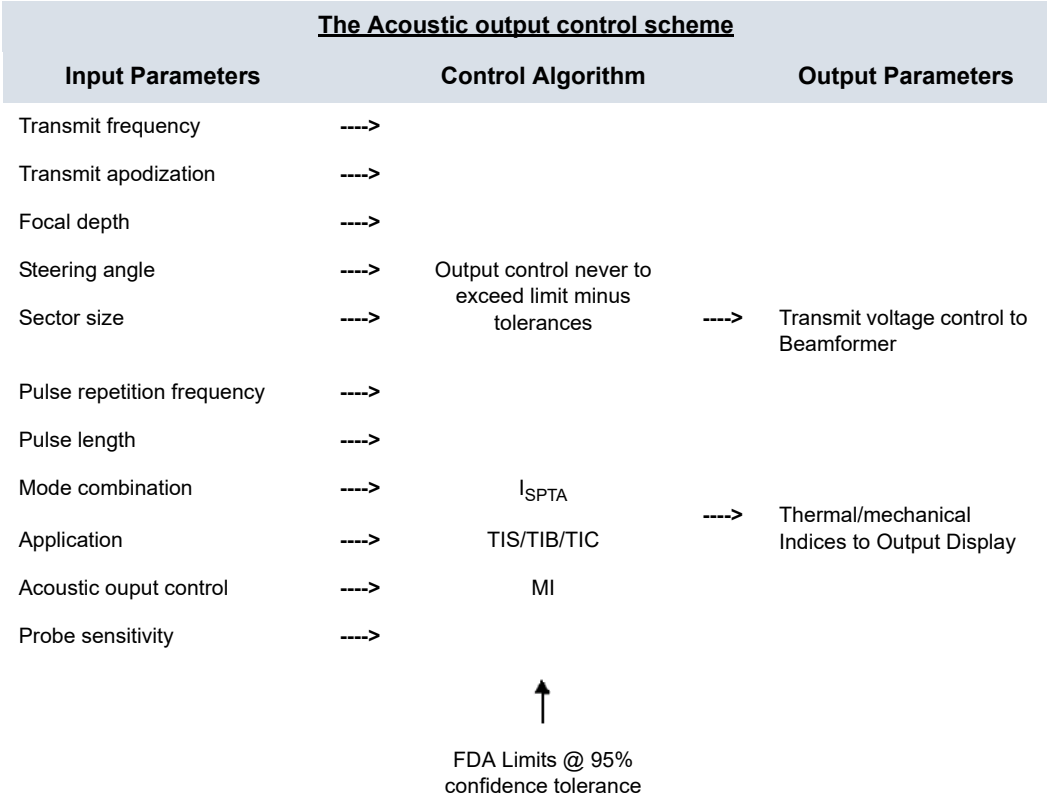
The MI according to IEC62359 Ed2 will not exceed 1.9.

**Controls affecting acoustic output**

The initial means by which the user can affect acoustic output are by 1) selecting a probe, 2) selecting an application (exam category) and then 3) selecting the imaging mode or imaging characteristics (depth, color ROI center position). This is achieved through an acoustic output control scheme in which all parameters that directly or indirectly affect acoustic output are fed to the control algorithm. The algorithm estimates all relevant parameters and compares them to the FDA limits.

Output levels remain below the limits with a 95% confidence margin. The absolute maximum allowable output for all applications is:

- ISPTA less than or equal to 720 mW/cm<sup>2</sup>
- MI less than or equal to 1.9
- TI less than or equal to 6



## Probe surface temperature safety mechanisms

The system has an Probe Surface Temperature Control Algorithm to ensure that each probe is set up and run within temperature limits given by the harmonized safety standard IEC60601-2-37. The Control Algorithm is implemented in the software and calibrated by laboratory measurements of surface temperature on each probe type. A Control Algorithm Input Parameter check is performed during setup of each new scan, and any detected error in the input, and/or malfunction are protected by software error handling that aborts setup and prevents start of scanning. The system has monitoring of voltage and power used by the ultrasound transmits circuitry and probe. If transmit voltage or power exceeds expected values, the transmit voltage will be set to zero and scanning will stop. This mechanism will protect against illegal setup and/or probe defects.

These safety mechanisms are designed to ensure that the lens surface temperature of the two transducers, is kept within values listed in the table 'Maximum probe temperature' on *page 2-26* section in this user manual. The Vscan Air probe is equipped with internal temperature sensors and mechanisms to monitor and limit the probe temperature so that the lens surface temperature is kept <43°C.

No particular user actions are required for the proper functioning of the described safety mechanisms.



## Acoustic Parameters as Measured in Water

### Definitions, symbols and abbreviations

The following definitions, symbols and abbreviations are used in the acoustic output reporting tables in this chapter:

| IEC                  | Meaning—IEC/EN62359 Ed.2                                      |
|----------------------|---|
| MI                   | Mechanical Index  |
| TIS                  | Soft Tissue Thermal Index                                     |
| TISas                | Soft Tissue Index at-surface, scanning or non-scanning        |
| TISbs                | Soft Tissue Index below-surface, scanning or non-scanning     |
| TIB                  | Bone Thermal Index  |
| TIBas                | Bone Thermal Index at surface, scanning or non-scanning       |
| TIBbs                | Bone Thermal Index below-surface, scanning or non-scanning    |
| TIC                  | Cranial-bone Thermal Index                                    |
| $P_{r, \alpha}$      | Attenuated peak-rare-fractional acoustic pressure             |
| $C_{MI}$             | Normalizing Coefficient $1\text{MPa} \cdot \text{MHz}^{-1/2}$ |
| P                    | Output power  |
| $P_{1 \times 1}$     | Bounded square output power                                   |
| $z_s$                | Depth for TIS below surface                                   |
| $z_b$                | Depth for TIB below surface                                   |
| $z_{MI}$             | Depth for MI  |
| $z_{p_{ii}, \alpha}$ | Depth for $I_{pa, \alpha}$ and $I_{spta, \alpha}$             |
| fawf                 | Acoustic working frequency                                    |
| prf                  | Pulse repetition rate   |
| srf                  | Scan repetition rate  |
| $n_{pps}$            | Number of pulses per scan line                                |
| $I_{pa, \alpha}$     | Attenuated pulse average intensity                            |
| $I_{spta, \alpha}$   | Attenuated spatial-peak temporal-average intensity            |
| $I_{spta}$           | Spatial-peak temporal-average intensity                       |

| IEC | Meaning—IEC/EN62359 Ed.2              |
|-----|---------------------------------------|
| pr  | Peak-rare-factional acoustic pressure |

**Operating Conditions**

All table entries are with the operating conditions specified at the end of the table.

## Acoustic Output Reporting Tables for Track 3/EN/IEC 60601-2-37

**NOTE:** These acoustic output reporting tables are produced according to IEC 62359 Ed.2.

**NOTE:** The Acoustic Output tables are in English only.

### Transducer Model: Curved array transducer - Vscan Air CL probe

Operating Mode: black and white (including harmonic)

| Index Label           |   | MI        | TIS        |               | TIB        |               | TIC |
|-----------------------|---|-----------|------------|---------------|------------|---------------|-----|
|                       |   |           | At Surface | Below surface | At Surface | Below surface |     |
| Maximum: Index Value  |   | 1,68      | 0,20       |               | 0,16       |               | #   |
| Index component value |   |           | 0,20       | 0,20          | 0,16       | 0,16          |     |
| Acoustic Parameters   | $p_{r,\alpha}$ at $z_{MI}$ (MPa)  | 2,60      |            |               |            |               |     |
|                       | $P$ (mW)  |           | 73,9       |               | 57,4       |               | -   |
|                       | $P_{1x1}$ (mW)  |           | 17,9       |               | 14,2       |               |     |
|                       | $z_s$ (cm)  |           |            | 2,7           |            |               |     |
|                       | $z_b$ (cm)  |           |            |               |            | 5,2           |     |
|                       | $z_{MI}$ (cm)   | 5,6       |            |               |            |               |     |
|                       | $z_{p_{ii},\alpha}$ (cm)  | 5,6       |            |               |            |               |     |
|                       | $f_{avg}$ (MHz)   | 2,39      | 2,40       |               | 2,35       |               | -   |
| Other Information     | $p_{rr}$ (Hz)   | 1140      |            |               |            |               |     |
|                       | $s_{rr}$ (Hz)   | 12        |            |               |            |               |     |
|                       | $n_{pps}$   | 1         |            |               |            |               |     |
|                       | $I_{pa,\alpha}$ at $z_{p_{ii},\alpha}$ ( $W/cm^2$ )                           | 187,1     |            |               |            |               |     |
|                       | $I_{spta,\alpha}$ at $z_{p_{ii},\alpha}$ or $z_{s_{ii},\alpha}$ ( $mW/cm^2$ ) | 5,8       |            |               |            |               |     |
|                       | $I_{spta}$ at $z_{p_{ii}}$ or $z_{s_{ii},\alpha}$ ( $mW/cm^2$ )               | 14,7      |            |               |            |               |     |
|                       | $p_r$ at $z_{p_{ii}}$ (MPa)   | 4,08      |            |               |            |               |     |
| Operating Conditions  | Depth (cm)  | 13,4      | 13,4       |               | 12,4       |               | -   |
|                       | Width (°)   | 60        | 60         |               | 60         |               | -   |
|                       | Application   | Abdominal | Abdominal  |               | Ob         |               | -   |

Figure 7-2. Curved array transducer - black/white (including harmonic)

**NOTE:** This transducer does not have a preset optimized for Transcranial/Neonatal cephalic use.

**Transducer Model: Curved array transducer - Vscan Air CL probe  
(continued)**

Operating Mode: black and white (including harmonic) and color

| Index Label           |   | MI        | TIS        |               | TIB        |               | TIC |
|-----------------------|---|-----------|------------|---------------|------------|---------------|-----|
|                       |   |           | At Surface | Below surface | At Surface | Below surface |     |
| Maximum: Index Value  |   | 1,70      | 0,75       |               | 0,51       |               | #   |
| Index component value |   |           | 0,75       | 0,75          | 0,51       | 0,51          |     |
| Acoustic Parameters   | $\rho_{r,\alpha}$ at $Z_{MI}$ (MPa)   | 2,60      |            |               |            |               |     |
|                       | $P$ (mW)  |           | 189        |               | 129        |               | -   |
|                       | $P_{ix1}$ (mW)  |           | 69,6       |               | 47,2       |               |     |
|                       | $Z_s$ (cm)  |           | 2,7-2,9    |               |            |               |     |
|                       | $Z_b$ (cm)  |           |            |               | 5,0-5,7    |               |     |
|                       | $Z_{MI}$ (cm)   | 5,1       |            |               |            |               |     |
|                       | $Z_{pII,\alpha}$ (cm)   | 5,1       |            |               |            |               |     |
|                       | $f_{sawf}$ (MHz)  | 2,34      | 2,26-2,40  |               | 2,26-2,35  |               | -   |
| Other Information     | $\rho_{IT}$ (Hz)  | 626       |            |               |            |               |     |
|                       | $s_{IT}$ (Hz)   | 8,6       |            |               |            |               |     |
|                       | $n_{pps}$   | 1         |            |               |            |               |     |
|                       | $I_{pa,\alpha}$ at $Z_{pII,\alpha}$ (W/cm <sup>2</sup> )                        | 139,6     |            |               |            |               |     |
|                       | $I_{opta,\alpha}$ at $Z_{pII,\alpha}$ or $Z_{sII,\alpha}$ (mW/cm <sup>2</sup> ) | 3,8       |            |               |            |               |     |
|                       | $I_{opta}$ at $Z_{pII}$ or $Z_{sII,\alpha}$ (mW/cm <sup>2</sup> )               | 8,5       |            |               |            |               |     |
|                       | $\rho_r$ at $Z_{pII}$ (MPa)   | 3,87      |            |               |            |               |     |
| Operating Conditions  | Depth (cm)  | 13,4      | 13,4       |               | 12,4       |               | -   |
|                       | Width(°) black and white  | 60        | 60         |               | 60         |               | -   |
|                       | ROI center(cm)  | 6         | 6          |               | 6          |               | -   |
|                       | ROI span(cm)  | 5         | 5          |               | 5          |               | -   |
|                       | Width(°) color  | 20        | 20         |               | 20         |               | -   |
|                       | Application   | Abdominal | Abdominal  |               | Ob         |               | -   |

Figure 7-3. Curved array transducer - black/white (including harmonic) and color

**NOTE:** *This transducer does not have a preset optimized for Transcranial/Neonatal cephalic use.*

**Transducer Model: Curved array transducer - Vscan Air CL probe**  
**(continued)**

Operating Mode: M

| Index Label           |   | MI        | TIS        |               | TIB        |               | TIC |
|-----------------------|---|-----------|------------|---------------|------------|---------------|-----|
|                       |   |           | At Surface | Below surface | At Surface | Below surface |     |
| Maximum: Index Value  |   | 1,52      | 0,20       |               | 0,69       |               | #   |
| Index component value |   |           | 0,20       | 0,20          | 0,69       | 0,69          |     |
| Acoustic Parameters   | $p_{r,\alpha}$ at $z_{MI}$ (MPa)  | 2,36      |            |               |            |               |     |
|                       | $P$ (mW)  |           | 28,6       |               | 27,4       |               | -   |
|                       | $P_{1x1}$ (mW)  |           | 28,6       |               | 10,7       |               |     |
|                       | $z_s$ (cm)  |           |            | 2,7-2,9       |            |               |     |
|                       | $z_b$ (cm)  |           |            |               |            | 5,6-5,7       |     |
|                       | $z_{MI}$ (cm)   | 5,9       |            |               |            |               |     |
|                       | $z_{pII,\alpha}$ (cm)   | 5,9       |            |               |            |               |     |
|                       | $f_{awf}$ (MHz)   | 2,39      | 2,40       |               | 2,36       |               | -   |
| Other Information     | $p_{rr}$ (Hz)   | 500       |            |               |            |               |     |
|                       | $s_{rr}$ (Hz)   | -         |            |               |            |               |     |
|                       | $n_{pps}$   | -         |            |               |            |               |     |
|                       | $I_{pa,\alpha}$ at $z_{pII,\alpha}$ (W/cm <sup>2</sup> )                        | 149,6     |            |               |            |               |     |
|                       | $I_{spta,\alpha}$ at $z_{pII,\alpha}$ or $z_{sII,\alpha}$ (mW/cm <sup>2</sup> ) | 60,2      |            |               |            |               |     |
|                       | $I_{spta}$ at $z_{pII}$ or $z_{sII,\alpha}$ (mW/cm <sup>2</sup> )               | 165,1     |            |               |            |               |     |
|                       | $p_r$ at $z_{pII}$ (MPa)  | 3,74      |            |               |            |               |     |
| Operating Conditions  | Depth (cm)  | 14,4      | 14,4       |               | 14,4       |               | -   |
|                       | Application   | Abdominal | Abdominal  |               | Ob         |               | -   |
|                       |   | -         | -          |               | -          |               | -   |

Figure 7-4. Curved array transducer - M-mode

**Transducer Model: Curved array transducer - Vscan Air CL probe  
(continued)**

Operating Mode: PW

| Index Label                  |   | MI        | TIS        |               | TIB        |               | TIC |
|------------------------------|---|-----------|------------|---------------|------------|---------------|-----|
|                              |   |           | At Surface | Below surface | At Surface | Below surface |     |
| <b>Maximum: Index Value</b>  |   | 1,06      | 0,68       |               | 2,75       |               | #   |
| <b>Index component value</b> |   |           | 0,44       | 0,68          | 0,53       | 2,75          |     |
| Acoustic Parameters          | $\rho_{r,\alpha}$ at $Z_{MI}$ (MPa)   | 1,59      |            |               |            |               |     |
|                              | $P$ (mW)  |           | 96,9       |               | 133,4      |               | -   |
|                              | $P_{1x1}$ (mW)  |           | 40,2       |               | 49,0       |               |     |
|                              | $Z_s$ (cm)  |           |            | 2,8           |            |               |     |
|                              | $Z_b$ (cm)  |           |            |               |            | 6,4           |     |
|                              | $Z_{MI}$ (cm)   | 4,8       |            |               |            |               |     |
|                              | $Z_{pii,\alpha}$ (cm)   | 4,8       |            |               |            |               |     |
|                              | $f_{swf}$ (MHz)   | 2,26      | 2,40       |               | 2,27       |               | -   |
| Other Information            | $\rho_{rr}$ (Hz)  | 1153      |            |               |            |               |     |
|                              | $s_{rr}$ (Hz)   | -         |            |               |            |               |     |
|                              | $n_{pps}$   | -         |            |               |            |               |     |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                        | 171,8     |            |               |            |               |     |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 325,1     |            |               |            |               |     |
|                              | $I_{spta}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 700,9     |            |               |            |               |     |
|                              | $\rho_r$ at $Z_{pii}$ (MPa)   | 2,24      |            |               |            |               |     |
| Operating Conditions         | Depth (cm)  | 9,4       | 9,4        |               | 9,4        |               | -   |
|                              | ROlc (cm)   | 4,0       | 6,0        |               | 7,4        |               | -   |
|                              | Application   | Abdominal | Abdominal  |               | Ob         |               | -   |

Figure 7-5. Curved array transducer - PW-mode

## Transducer Model: Linear array transducer - Vscan Air CL probe

Operating mode: black and white (including harmonic)

| Index Label                  |   | MI     | TIS         |               | TIB        |               | TIC      |
|------------------------------|---|--------|-------------|---------------|------------|---------------|----------|
|                              |   |        | At Surface  | Below surface | At Surface | Below surface |          |
| <b>Maximum: Index Value</b>  |   | 1,16   |             |               | #          |               | 0,29     |
| <b>Index component value</b> |   |        | 0,09        | 0,09          | -          | -             |          |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 2,56   |             |               |            |               |          |
|                              | $P$ (mW)  |        | 9,38        |               | -          |               | 8,33     |
|                              | $P_{1x1}$ (mW)  |        | 4,01        |               | -          |               |          |
|                              | $Z_s$ (cm)  |        |             | 0,9           |            |               |          |
|                              | $Z_b$ (cm)  |        |             |               |            | -             |          |
|                              | $Z_{MI}$ (cm)   | 1,2    |             |               |            |               |          |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,2    |             |               |            |               |          |
|                              | $f_{awf}$ (MHz)   | 4,88   |             | 4,83-4,96     |            | -             | 6,77     |
| Other Information            | $p_{rr}$ (Hz)   | 1944   |             |               |            |               |          |
|                              | $s_{rr}$ (Hz)   | 18     |             |               |            |               |          |
|                              | $n_{pps}$   | 1      |             |               |            |               |          |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                        | 319,8  |             |               |            |               |          |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 6,9    |             |               |            |               |          |
|                              | $I_{spta}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 10,3   |             |               |            |               |          |
| $p_r$ at $Z_{pii}$ (MPa)     | 3,01  |        |             |               |            |               |          |
| Operating Conditions         | Depth (cm)  | 5,1    | 5,1         |               | -          |               | 8,1      |
|                              | Width (-)   | 2,2    | 2,2         |               | -          |               | 2,2      |
|                              | Application   | Nerves | Small Parts |               | -          |               | Neo Head |

Figure 7-6. Linear array transducer - black/white (including harmonic)

**NOTE:** This transducer does not have a preset optimized for Obstetric/Fetal use.

**Transducer Model: Linear array transducer - Vscan Air CL probe  
(continued)**

Operating Mode: black and white (including harmonic) and color

| Index Label                  |   | MI     | TIS         |               | TIB        |               | TIC      |
|------------------------------|---|--------|-------------|---------------|------------|---------------|----------|
|                              |   |        | At Surface  | Below surface | At Surface | Below surface |          |
| <b>Maximum: Index Value</b>  |   | 1,35   | 0,45        |               | #          |               | 1,07     |
| <b>Index component value</b> |   |        | 0,45        | 0,45          | -          | -             |          |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 2,91   |             |               |            |               |          |
|                              | $P$ (mW)  |        | 23,2        |               | -          |               | 21,2     |
|                              | $P_{1x1}$ (mW)  |        | 23,2        |               | -          |               |          |
|                              | $Z_s$ (cm)  |        |             | 0,8           |            |               |          |
|                              | $Z_b$ (cm)  |        |             |               |            | -             |          |
|                              | $Z_{MI}$ (cm)   | 1,0    |             |               |            |               |          |
|                              | $Z_{pII,\alpha}$ (cm)   | 1,0    |             |               |            |               |          |
|                              | $f_{awf}$ (MHz)   | 4,63   | 4,58-5,04   |               | -          |               | 4,6-6,7  |
| Other Information            | $prr$ (Hz)  | 3317   |             |               |            |               |          |
|                              | $srr$ (Hz)  | 158    |             |               |            |               |          |
|                              | $n_{pps}$   | 1      |             |               |            |               |          |
|                              | $I_{ps,\alpha}$ at $Z_{pII,\alpha}$ (W/cm <sup>2</sup> )                        | 542,1  |             |               |            |               |          |
|                              | $I_{spta,\alpha}$ at $Z_{pII,\alpha}$ or $Z_{sII,\alpha}$ (mW/cm <sup>2</sup> ) | 60     |             |               |            |               |          |
|                              | $I_{spta}$ at $Z_{pII}$ or $Z_{sII,\alpha}$ (mW/cm <sup>2</sup> )               | 82,5   |             |               |            |               |          |
|                              | $p_r$ at $Z_{pII}$ (MPa)  | 3,22   |             |               |            |               |          |
| Operating Conditions         | Depth (cm)  | 5,5    | 3,4         |               | -          |               | 4,5      |
|                              | Width(-) black and white  | 2,2    | 2,2         |               | -          |               | 2,3      |
|                              | ROI center(cm)  | 1,3    | 1,6         |               | -          |               | 1,3      |
|                              | ROI span(cm)  | 1,0    | 1,0         |               |            |               | 1,0      |
|                              | Width(-) color  | 0,9    | 0,9         |               | -          |               | 0,9      |
|                              | Application   | Nerves | Small Parts |               | -          |               | Neo Head |

Figure 7-7. Linear array transducer - black/white (including harmonic) and color

**NOTE:** This transducer does not have a preset optimized for Obstetric/Fetal use.



## Transducer Model: Linear array transducer - Vscan Air CL probe (continued)

Operating Mode: black and white, Ophthalmic

| Index Label                  |   | MI         | TIS        |               | TIB        |               | TIC |
|------------------------------|---|------------|------------|---------------|------------|---------------|-----|
|                              |   |            | At Surface | Below surface | At Surface | Below surface |     |
| <b>Maximum: Index Value</b>  |   | 0,19       | 0,0009     |               | #          |               | #   |
| <b>Index component value</b> |   |            | 0,0009     | 0,0009        | -          | -             |     |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 0,58       |            |               |            |               |     |
|                              | $P$ (mW)  |            | 0,05       |               | -          |               | -   |
|                              | $P_{1x1}$ (mW)  |            | 0,02       |               | -          |               |     |
|                              | $Z_s$ (cm)  |            |            | 0,9           |            |               |     |
|                              | $Z_b$ (cm)  |            |            |               |            | -             |     |
|                              | $Z_{MI}$ (cm)   | 1,6        |            |               |            |               |     |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,6        |            |               |            |               |     |
|                              | $f_{awf}$ (MHz)   | 9,09       | 8,93       |               | -          |               | -   |
| Other Information            | $p_{rr}$ (Hz)   | 1440       |            |               |            |               |     |
|                              | $s_{rr}$ (Hz)   | 15         |            |               |            |               |     |
|                              | $n_{pps}$   | 1          |            |               |            |               |     |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                        | 12,1       |            |               |            |               |     |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 0,1        |            |               |            |               |     |
|                              | $I_{spta}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 0,2        |            |               |            |               |     |
|                              | $p_r$ at $Z_{pii}$ (MPa)  | 0,95       |            |               |            |               |     |
| Operating Conditions         | Depth (cm)  | 4,1        | 4,5        |               | -          |               | -   |
|                              | Width (-)   | 2          | 2          |               | -          |               | -   |
|                              | Application   | Ophthalmic | Ophthalmic |               | -          |               | -   |

Figure 7-8. Linear array transducer - black/white, Ophthalmic

**NOTE:** *The Linear array Ophthalmic preset is not optimized for Obstetric/Fetal or Transcranial/Neonatal cephalic use.*

**Transducer Model: Linear array transducer - Vscan Air CL probe  
(continued)**

Operating Mode: black and white and color, Ophthalmic

| Index Label                  |   | MI         | TIS        |               | TIB        |               | TIC |
|------------------------------|---|------------|------------|---------------|------------|---------------|-----|
|                              |   |            | At Surface | Below surface | At Surface | Below surface |     |
| <b>Maximum: Index Value</b>  |   | 0,19       | 0,0103     |               | #          |               | #   |
| <b>Index component value</b> |   |            | 0,0103     | 0,0103        | -          | -             |     |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 0,42       |            |               |            |               |     |
|                              | $P$ (mW)  |            | 0,59       |               | -          | -             |     |
|                              | $P_{1 \times 1}$ (mW)   |            | 0,41       |               | -          | -             |     |
|                              | $Z_s$ (cm)  |            |            | 0,8-0,9       |            |               |     |
|                              | $Z_b$ (cm)  |            |            |               |            | -             |     |
|                              | $Z_{MI}$ (cm)   | 1,7        |            |               |            |               |     |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,7        |            |               |            |               |     |
|                              | $f_{awf}$ (MHz)   | 5,15       | 5,15-9,07  |               | -          | -             |     |
| Other Information            | $p_{rr}$ (Hz)   | 5011       |            |               |            |               |     |
|                              | $s_{rr}$ (Hz)   | 162        |            |               |            |               |     |
|                              | $n_{pps}$   | 1          |            |               |            |               |     |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                        | 6,4        |            |               |            |               |     |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ Or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 1,2        |            |               |            |               |     |
|                              | $I_{spta}$ at $Z_{pii}$ Or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 2,0        |            |               |            |               |     |
| $p_r$ at $Z_{pii}$ (MPa)     | 0,58  |            |            |               |            |               |     |
| Operating Conditions         | Depth (cm)  | 4,1        | 4,1        |               | -          | -             |     |
|                              | Width (-) black and white   | 2,2        | 2,2        |               | -          | -             |     |
|                              | ROI center (cm)   | 2,2        | 2,2        |               | -          | -             |     |
|                              | ROI span(cm)  | 1          | 1          |               |            |               |     |
|                              | Width (-) color   | 1,3        | 1          |               | -          | -             |     |
|                              | Application   | Ophthalmic | Ophthalmic |               | -          | -             |     |

Figure 7-9. Linear array transducer - black/white and color, Ophthalmic

**NOTE:** *The Linear array Ophthalmic preset is not optimized for Obstetric/Fetal or Transcranial/Neonatal cephalic use.*

**Transducer Model: Linear array transducer - Vscan Air CL probe  
(continued)**

Operating Mode: M

| Index Label                  |   | MI     | TIS        |               | TIB        |               | TIC      |
|------------------------------|---|--------|------------|---------------|------------|---------------|----------|
|                              |   |        | At Surface | Below surface | At Surface | Below surface |          |
| <b>Maximum: Index Value</b>  |   | 1,06   |            |               | #          |               | 0,04     |
| <b>Index component value</b> |   |        | 0,05       | 0,05          | -          | -             |          |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 2,34   |            |               |            |               |          |
|                              | $P$ (mW)  |        | 2,33       |               | -          |               | 1,2      |
|                              | $P_{1 \times 1}$ (mW)   |        | 2,29       |               | -          |               |          |
|                              | $Z_s$ (cm)  |        |            | 1,1           |            |               |          |
|                              | $Z_b$ (cm)  |        |            |               |            | -             |          |
|                              | $Z_{MI}$ (cm)   | 1,1    |            |               |            |               |          |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,1    |            |               |            |               |          |
|                              | $f_{awf}$ (MHz)   | 4,9    | 4,72-4,93  |               | -          |               | 6,43     |
| Other Information            | $p_{rr}$ (Hz)   | 500    |            |               |            |               |          |
|                              | $s_{rr}$ (Hz)   | -      |            |               |            |               |          |
|                              | $n_{pps}$   | -      |            |               |            |               |          |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                        | 264,7  |            |               |            |               |          |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 35,8   |            |               |            |               |          |
|                              | $I_{spta}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 52,7   |            |               |            |               |          |
|                              | $p_r$ at $Z_{pii}$ (MPa)  | 2,69   |            |               |            |               |          |
| Operating Conditions         | Depth (cm)  | 4,5    | 8,1        |               | -          |               | 8,1      |
|                              |   | -      | -          |               | -          |               | -        |
|                              | Application   | Nerves | MSK        |               | -          |               | Neo Head |

Figure 7-10. Linear array transducer - M-mode

**Transducer Model: Linear array transducer - Vscan Air CL probe  
(continued)**

Operating Mode: PW

| Index Label                  |   | MI     | TIS        |               | TIB        |               | TIC      |
|------------------------------|---|--------|------------|---------------|------------|---------------|----------|
|                              |   |        | At Surface | Below surface | At Surface | Below surface |          |
| <b>Maximum: Index Value</b>  |   | 0,65   |            |               | #          |               | 0,25     |
| <b>Index component value</b> |   |        | 0,18       | 0,18          | -          | -             |          |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 1,39   |            |               |            |               |          |
|                              | $P$ (mW)  |        | 8,42       |               | -          |               | 5,84     |
|                              | $P_{1x1}$ (mW)  |        | 8,42       |               | -          |               |          |
|                              | $z_s$ (cm)  |        |            | 0,9           |            |               |          |
|                              | $z_b$ (cm)  |        |            |               |            | -             |          |
|                              | $Z_{MI}$ (cm)   | 1,7    |            |               |            |               |          |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,7    |            |               |            |               |          |
|                              | $f_{avf}$ (MHz)   | 4,58   | 4,58       |               | -          |               | 4,57     |
| Other Information            | $pr_r$ (Hz)   | 1184   |            |               |            |               |          |
|                              | $srr$ (Hz)  | -      |            |               |            |               |          |
|                              | $n_{pps}$   | -      |            |               |            |               |          |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ ( $W/cm^2$ )                        | 96,1   |            |               |            |               |          |
|                              | $I_{spla,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ ( $mW/cm^2$ ) | 140,5  |            |               |            |               |          |
|                              | $I_{spla}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ ( $mW/cm^2$ )               | 241,7  |            |               |            |               |          |
|                              | $p_r$ at $Z_{pii}$ (MPa)  | 1,77   |            |               |            |               |          |
| Operating Conditions         | Depth (cm)  | 4,1    | 2,5        |               | -          |               | 3,1      |
|                              |   | -      | -          |               | -          |               | -        |
|                              | Application   | Nerves | Vascular   |               | -          |               | Neo Head |

Figure 7-11. Linear array transducer - PW-mode

**Transducer Model: Linear array transducer - Vscan Air CL probe**  
**(continued)**

Operating Mode: M, Ophthalmic

| Index Label           |   | MI         | TIS        |               | TIB        |               | TIC |
|-----------------------|---|------------|------------|---------------|------------|---------------|-----|
|                       |   |            | At Surface | Below surface | At Surface | Below surface |     |
| Maximum: Index Value  |   | 0,18       |            |               | #          |               | #   |
| Index component value |   |            | 0,001      | 0,001         | -          | -             |     |
| Acoustic Parameters   | $p_{r,\alpha}$ at $z_{MI}$ (MPa)  | 0,53       |            |               |            |               |     |
|                       | $P$ (mW)  |            | 0,01       |               | -          |               | -   |
|                       | $P_{1x1}$ (mW)  |            | 0,01       |               | -          |               |     |
|                       | $z_s$ (cm)  |            |            | 0,8           |            |               |     |
|                       | $z_b$ (cm)  |            |            |               |            | -             |     |
|                       | $z_{MI}$ (cm)   | 1,6        |            |               |            |               |     |
|                       | $z_{pij,\alpha}$ (cm)   | 1,6        |            |               |            |               |     |
|                       | $f_{awf}$ (MHz)   | 9,0        |            | 9,0           |            | -             | -   |
| Other Information     | $p_{rr}$ (Hz)   | 500        |            |               |            |               |     |
|                       | $s_{rr}$ (Hz)   | -          |            |               |            |               |     |
|                       | $n_{pps}$   | -          |            |               |            |               |     |
|                       | $I_{pa,\alpha}$ at $z_{pij,\alpha}$ ( $W/cm^2$ )                        | 10,1       |            |               |            |               |     |
|                       | $I_{spta,\alpha}$ at $z_{pij,\alpha}$ or $z_{sil,\alpha}$ ( $mW/cm^2$ ) | 0,8        |            |               |            |               |     |
|                       | $I_{spta}$ at $z_{pij}$ or $z_{sil,\alpha}$ ( $mW/cm^2$ )               | 2,15       |            |               |            |               |     |
|                       | $p_r$ at $z_{pij}$ (MPa)  | 0,86       |            |               |            |               |     |
| Operating Conditions  | Depth (cm)  | 4,1        | 4,1        |               | -          |               | -   |
|                       |   | -          | -          |               | -          |               | -   |
|                       | Application   | Ophthalmic | Ophthalmic |               | -          |               | -   |

Figure 7-12. Linear array transducer - M-mode, Ophthalmic

**Transducer Model: Linear array transducer - Vscan Air CL probe  
(continued)**

Operating Mode: PW, Ophthalmic

| Index Label           |   | MI         | TIS        |               | TIB        |               | TIC |
|-----------------------|---|------------|------------|---------------|------------|---------------|-----|
|                       |   |            | At Surface | Below surface | At Surface | Below surface |     |
| Maximum: Index Value  |   | 0,16       |            |               | #          |               | #   |
| Index component value |   |            | 0,006      | 0,006         | -          | -             |     |
| Acoustic Parameters   | $p_{r,\alpha}$ at $z_{MI}$ (MPa)  | 0,33       |            |               |            |               |     |
|                       | $P$ (mW)  |            | 0,254      |               | -          |               | -   |
|                       | $P_{1x1}$ (mW)  |            | 0,254      |               | -          |               |     |
|                       | $z_s$ (cm)  |            |            | 0,9           |            |               |     |
|                       | $z_b$ (cm)  |            |            |               |            | -             |     |
|                       | $z_{MI}$ (cm)   | 1,8        |            |               |            |               |     |
|                       | $z_{pII,\alpha}$ (cm)   | 1,8        |            |               |            |               |     |
|                       | $f_{awf}$ (MHz)   | 4,57       | 4,57       |               | -          |               | -   |
| Other Information     | $p_{rr}$ (Hz)   | 1184       |            |               |            |               |     |
|                       | $s_{rr}$ (Hz)   | -          |            |               |            |               |     |
|                       | $n_{pps}$   | -          |            |               |            |               |     |
|                       | $I_{pa,\alpha}$ at $z_{pII,\alpha}$ ( $W/cm^2$ )                        | 3,6        |            |               |            |               |     |
|                       | $I_{spta,\alpha}$ at $z_{pII,\alpha}$ or $z_{sII,\alpha}$ ( $mW/cm^2$ ) | 5,5        |            |               |            |               |     |
|                       | $I_{spta}$ at $z_{pII}$ or $z_{sII,\alpha}$ ( $mW/cm^2$ )               | 9,75       |            |               |            |               |     |
|                       | $p_r$ at $z_{pII}$ (MPa)  | 0,44       |            |               |            |               |     |
| Operating Conditions  | Depth (cm)  | 4,1        | 4,1        |               | -          |               | -   |
|                       | ROIcenter   | 2,0        | 2,0        |               | -          |               | -   |
|                       | Application   | Ophthalmic | Ophthalmic |               | -          |               | -   |

Figure 7-13. Linear array transducer - PW-mode, Ophthalmic

## Transducer Model: Sector array transducer - Vscan Air SL probe

Operating Mode: black and white (including harmonic)

| Index Label                  |   | MI      | TIS        |               | TIB        |               | TIC     |
|------------------------------|---|---------|------------|---------------|------------|---------------|---------|
|                              |   |         | At Surface | Below surface | At Surface | Below surface |         |
| <b>Maximum: Index Value</b>  |   | 1,63    | 0,67       |               | 0,65       |               | 0,84    |
| <b>Index component value</b> |   |         | 0,67       | 0,67          | 0,65       | 0,65          |         |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 2,11    |            |               |            |               |         |
|                              | $P$ (mW)  |         | 164,6      |               | 81,2       |               | 52,9    |
|                              | $P_{1x1}$ (mW)  |         | 84,4       |               | 62,5       |               |         |
|                              | $z_s$ (cm)  |         |            | 2,9           |            |               |         |
|                              | $z_b$ (cm)  |         |            |               |            | 1,8           |         |
|                              | $Z_{MI}$ (cm)   | 1,4     |            |               |            |               |         |
|                              | $Z_{p_{ii},\alpha}$ (cm)  | 1,7     |            |               |            |               |         |
|                              | $f_{awf}$ (MHz)   | 1,69    | 1,68       |               | 2,11       |               | 2,55    |
| Other Information            | $p_{rr}$ (Hz)   | 2340    |            |               |            |               |         |
|                              | $s_{rr}$ (Hz)   | 30      |            |               |            |               |         |
|                              | $n_{pps}$   | 1       |            |               |            |               |         |
|                              | $I_{pa,\alpha}$ at $Z_{p_{ii},\alpha}$ ( $W/cm^2$ )                           | 129,7   |            |               |            |               |         |
|                              | $I_{spta,\alpha}$ at $Z_{p_{ii},\alpha}$ or $Z_{s_{ii},\alpha}$ ( $mW/cm^2$ ) | 43,5    |            |               |            |               |         |
|                              | $I_{spta}$ at $Z_{p_{ii}}$ or $Z_{s_{ii},\alpha}$ ( $mW/cm^2$ )               | 53,4    |            |               |            |               |         |
|                              | $p_r$ at $Z_{p_{ii}}$ (MPa)   | 2,14    |            |               |            |               |         |
| Operating Conditions         | Depth (cm)  | 5,4     | 22,4       |               | 5,4        |               | 22,4    |
|                              | Width (°)   | 70      | 70         |               | 90         |               | 70      |
|                              | Application   | Cardiac | Cardiac    |               | Ob         |               | Cranial |

Figure 7-14. Sector array transducer - black and white (including harmonic)

**Transducer Model: Sector array transducer - Vscan Air SL probe  
(continued)**

Operating Mode: black and white (including harmonic) and color

| Index Label                  |   | MI      | TIS        |               | TIB        |               | TIC     |
|------------------------------|---|---------|------------|---------------|------------|---------------|---------|
|                              |   |         | At Surface | Below surface | At Surface | Below surface |         |
| <b>Maximum: Index Value</b>  |   | 1,57    | 1,04       |               | 0,38       |               | 1,17    |
| <b>Index component value</b> |   |         | 1,04       | 1,04          | 0,38       | 0,38          |         |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 2,04    |            |               |            |               |         |
|                              | $P$ (mW)  |         | 226        |               | 82,8       |               | 62,9    |
|                              | $P_{1 \times 1}$ (mW)   |         | 105,4      |               | 35,9       |               |         |
|                              | $Z_s$ (cm)  |         |            | 3,7-4,1       |            |               |         |
|                              | $Z_b$ (cm)  |         |            |               |            | 4,6-6,5       |         |
|                              | $Z_{MI}$ (cm)   | 3,9     |            |               |            |               |         |
|                              | $Z_{pii,\alpha}$ (cm)   | 3,9     |            |               |            |               |         |
|                              | $f_{awf}$ (MHz)   | 1,69    | 1,69-2,23  |               | 2,26-2,27  |               | 2,28    |
| Other Information            | $p_{rr}$ (Hz)   | 1320    |            |               |            |               |         |
|                              | $s_{rr}$ (Hz)   | 18,1    |            |               |            |               |         |
|                              | $n_{pps}$   | 1       |            |               |            |               |         |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ ( $W/cm^2$ )                        | 174,3   |            |               |            |               |         |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ ( $mW/cm^2$ ) | 19,8    |            |               |            |               |         |
|                              | $I_{spta}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ ( $mW/cm^2$ )               | 31,1    |            |               |            |               |         |
|                              | $p_r$ at $Z_{pii}$ (MPa)  | 2,49    |            |               |            |               |         |
| Operating Conditions         | Depth (cm)  | 9,4     | 9,4        |               | 10,4       |               | 8,4     |
|                              | Width(°) black and white  | 70      | 70         |               | 76,5       |               | 70      |
|                              | ROI center(cm)  | 7       | 7          |               | 8          |               | 7       |
|                              | ROI span(cm)  | 6       | 6          |               | 6          |               | 6       |
|                              | Width(°) color  | 20      | 20         |               | 20         |               | 20      |
|                              | Application   | Cardiac | Cardiac    |               | Ob         |               | Cranial |

Figure 7-15. Sector array transducer - black and white (including harmonic) and color



**Transducer Model: Sector array transducer - Vscan Air SL probe**  
**(continued)**

Operating Mode: M

| Index Label                  |   | MI      | TIS        |               | TIB        |               | TIC     |
|------------------------------|---|---------|------------|---------------|------------|---------------|---------|
|                              |   |         | At Surface | Below surface | At Surface | Below surface |         |
| <b>Maximum: Index Value</b>  |   | 1,36    | 0,14       |               | 0,56       |               | 0,35    |
| <b>Index component value</b> |   |         | 0,10       | 0,14          | 0,14       | 0,56          |         |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 2,18    |            |               |            |               |         |
|                              | $P$ (mW)  |         | 23,9       |               | 17,1       |               | 21,8    |
|                              | $P_{1x1}$ (mW)  |         | 12,3       |               | 13,2       |               |         |
|                              | $z_s$ (cm)  |         |            | 2,8           |            |               |         |
|                              | $z_b$ (cm)  |         |            |               |            | 1,9           |         |
|                              | $Z_{MI}$ (cm)   | 5,8     |            |               |            |               |         |
|                              | $Z_{pii,\alpha}$ (cm)   | 5,8     |            |               |            |               |         |
|                              | $f_{awf}$ (MHz)   | 2,58    | 1,68       |               | 2,05-2,19  |               | 2,58    |
| Other Information            | $p_{rr}$ (Hz)   | 500     |            |               |            |               |         |
|                              | $s_{rr}$ (Hz)   | -       |            |               |            |               |         |
|                              | $n_{pps}$   | -       |            |               |            |               |         |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ ( $W/cm^2$ )                            | 133     |            |               |            |               |         |
|                              | $I_{sp\alpha,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ ( $mW/cm^2$ ) | 34,9    |            |               |            |               |         |
|                              | $I_{sp\alpha}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ ( $mW/cm^2$ )               | 102,2   |            |               |            |               |         |
|                              | $p_r$ at $Z_{pii}$ (MPa)  | 3,49    |            |               |            |               |         |
| Operating Conditions         | Depth (cm)  | 22,4    | 22,4       |               | 5,4        |               | 22,4    |
|                              | Application   | Cranial | Cardiac    |               | Ob         |               | Cranial |
|                              |   | -       | -          |               | -          |               | -       |

Figure 7-16. Sector array transducer - M-mode

**Transducer Model: Sector array transducer - Vscan Air SL probe  
(continued)**

Operating Mode: PW

| Index Label                  |   | MI    | TIS        |               | TIB        |               | TIC     |
|------------------------------|---|-------|------------|---------------|------------|---------------|---------|
|                              |   |       | At Surface | Below surface | At Surface | Below surface |         |
| <b>Maximum: Index Value</b>  |   | 0,54  | 0,48       |               | 1,85       |               | 1,27    |
| <b>Index component value</b> |   |       | 0,48       | 0,47          | 0,49       | 1,85          |         |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 0,81  |            |               |            |               |         |
|                              | $P$ (mW)  |       | 57,0       |               | 114,0      |               | 60,5    |
|                              | $P_{1x1}$ (mW)  |       | 43,9       |               | 45,7       |               |         |
|                              | $z_s$ (cm)  |       |            | 1,8           |            |               |         |
|                              | $z_b$ (cm)  |       |            |               |            | 3,9           |         |
|                              | $Z_{MI}$ (cm)   | 4,5   |            |               |            |               |         |
|                              | $Z_{pii,\alpha}$ (cm)   | 4,5   |            |               |            |               |         |
|                              | $f_{awf}$ (MHz)   | 2,28  | 2,27       |               | 2,27       |               | 2,27    |
| Other Information            | $pr$ (Hz)   | 2317  |            |               |            |               |         |
|                              | $srr$ (Hz)  | -     |            |               |            |               |         |
|                              | $n_{pps}$   | -     |            |               |            |               |         |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                            | 30,7  |            |               |            |               |         |
|                              | $I_{sp\alpha,\alpha}$ at $Z_{pii,\alpha}$ OR $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 236,1 |            |               |            |               |         |
|                              | $I_{sp\alpha}$ at $Z_{pii}$ OR $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 494,8 |            |               |            |               |         |
| $p_r$ at $Z_{pii}$ (MPa)     | 1,09  |       |            |               |            |               |         |
| Operating Conditions         | Depth (cm)  | 6,4   | 7,4        |               | 10,4       |               | 6,4     |
|                              | ROIc (cm)   | 3,0   | 2,0        |               | 9,0        |               | 2,0     |
|                              | Application   | Ob    | Vascular   |               | Ob         |               | Cranial |

Figure 7-17. Sector array transducer - PW-mode

## Transducer Model: Linear array transducer - Vscan Air SL probe

Operating Mode: black and white (including harmonic)

| Index Label                  |   | MI       | TIS         |               | TIB        |               | TIC      |
|------------------------------|---|----------|-------------|---------------|------------|---------------|----------|
|                              |   |          | At Surface  | Below surface | At Surface | Below surface |          |
| <b>Maximum: Index Value</b>  |   | 1,25     |             |               | #          |               | 0,27     |
| <b>Index component value</b> |   |          | 0,08        | 0,08          | -          | -             |          |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 3,23     |             |               |            |               |          |
|                              | $P$ (mW)  |          | 7,59        |               | -          |               | 7,83     |
|                              | $P_{1x1}$ (mW)  |          | 3,24        |               | -          |               |          |
|                              | $z_s$ (cm)  |          |             | 0,9           |            |               |          |
|                              | $z_b$ (cm)  |          |             |               |            | -             |          |
|                              | $Z_{MI}$ (cm)   | 1,5      |             |               |            |               |          |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,5      |             |               |            |               |          |
|                              | $f_{awf}$ (MHz)   | 6,64     | 4,81-5,0    |               | -          |               | 6,80     |
| Other Information            | $p_{rr}$ (Hz)   | 2340     |             |               |            |               |          |
|                              | $s_{rr}$ (Hz)   | 20       |             |               |            |               |          |
|                              | $n_{pps}$   | 1        |             |               |            |               |          |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                            | 382,8    |             |               |            |               |          |
|                              | $I_{sp\alpha,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 8,0      |             |               |            |               |          |
|                              | $I_{sp\alpha}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 15,8     |             |               |            |               |          |
|                              | $p_r$ at $Z_{pii}$ (MPa)  | 4,42     |             |               |            |               |          |
| Operating Conditions         | Depth (cm)  | 4,5      | 5,1         |               | -          |               | 8,1      |
|                              | Width (-)   | 2,2      | 2,2         |               | -          |               | 2,2      |
|                              | Application   | Neo Head | Small Parts |               | -          |               | Neo Head |

Figure 7-18. Linear array transducer - black and white (including harmonic)

**Transducer Model: Linear array transducer - Vscan Air SL probe  
(continued)**

Operating Mode: black and white (including harmonic) and color

| Index Label                  |   | MI     | TIS         |               | TIB        |               | TIC      |
|------------------------------|---|--------|-------------|---------------|------------|---------------|----------|
|                              |   |        | At Surface  | Below surface | At Surface | Below surface |          |
| <b>Maximum: Index Value</b>  |   | 1,35   | 0,42        |               | #          |               | 0,98     |
| <b>Index component value</b> |   |        | 0,42        | 0,42          | -          | -             |          |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 2,91   |             |               |            |               |          |
|                              | $P$ (mW)  |        | 21,7        |               | -          |               | 19,3     |
|                              | $P_{1x1}$ (mW)  |        | 19,3        |               | -          |               |          |
|                              | $Z_s$ (cm)  |        |             | 0,8           |            |               |          |
|                              | $Z_b$ (cm)  |        |             |               |            | -             |          |
|                              | $Z_{MI}$ (cm)   | 1,1    |             |               |            |               |          |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,1    |             |               |            |               |          |
|                              | $f_{awf}$ (MHz)   | 4,63   | 4,89-5,04   |               | -          |               | 4,6-6,8  |
| Other Information            | $p_{rr}$ (Hz)   | 3317   |             |               |            |               |          |
|                              | $s_{rr}$ (Hz)   | 158    |             |               |            |               |          |
|                              | $n_{pps}$   | 1      |             |               |            |               |          |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                        | 524,6  |             |               |            |               |          |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 56,6   |             |               |            |               |          |
|                              | $I_{spta}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 80,4   |             |               |            |               |          |
|                              | $p_r$ at $Z_{pii}$ (MPa)  | 3,27   |             |               |            |               |          |
| Operating Conditions         | Depth (cm)  | 5,5    | 3,4         |               | -          |               | 4,5      |
|                              | Width(-) black and white  | 2,0    | 2,2         |               | -          |               | 2,3      |
|                              | ROI center(cm)  | 1,3    | 1,6         |               | -          |               | 1,3      |
|                              | ROI span(cm)  | 1,0    | 1,0         |               |            |               | 1,0      |
|                              | Width(-) color  | 0,9    | 0,9         |               | -          |               | 0,9      |
|                              | Application   | Nerves | Small Parts |               | -          |               | Neo Head |

Figure 7-19. Linear array transducer - black and white (including harmonic) and color

**Transducer Model: Linear array transducer - Vscan Air SL probe  
(continued)**

Operating Mode: black and white, Ophthalmic

| Index Label                  |   | MI         | TIS        |               | TIB        |               | TIC |
|------------------------------|---|------------|------------|---------------|------------|---------------|-----|
|                              |   |            | At Surface | Below surface | At Surface | Below surface |     |
| <b>Maximum: Index Value</b>  |   | 0,18       | 0,001      |               | #          |               | #   |
| <b>Index component value</b> |   |            | 0,001      | 0,001         | -          | -             |     |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 0,53       |            |               |            |               |     |
|                              | $P$ (mW)  |            | 0,03       |               | -          |               | -   |
|                              | $P_{1x1}$ (mW)  |            | 0,01       |               | -          |               |     |
|                              | $Z_s$ (cm)  |            |            | 0,8           |            |               |     |
|                              | $Z_b$ (cm)  |            |            |               |            | -             |     |
|                              | $Z_{MI}$ (cm)   | 1,6        |            |               |            |               |     |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,6        |            |               |            |               |     |
|                              | $f_{awf}$ (MHz)   | 9,04       | 9,07       |               | -          |               | -   |
| Other Information            | $p_{rr}$ (Hz)   | 1440       |            |               |            |               |     |
|                              | $s_{rr}$ (Hz)   | 15         |            |               |            |               |     |
|                              | $n_{pps}$   | 1          |            |               |            |               |     |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                        | 10,4       |            |               |            |               |     |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 0,1        |            |               |            |               |     |
|                              | $I_{spta}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 0,1        |            |               |            |               |     |
|                              | $p_r$ at $Z_{pii}$ (MPa)  | 0,87       |            |               |            |               |     |
| Operating Conditions         | Depth (cm)  | 4,1        | 4,1        |               | -          |               | -   |
|                              | Width (-)   | 2,2        | 2,2        |               | -          |               | -   |
|                              | Application   | Ophthalmic | Ophthalmic |               | -          |               | -   |

Figure 7-20. Linear array transducer - black and white, Ophthalmic

**Transducer Model: Linear array transducer - Vscan Air SL probe  
(continued)**

Operating Mode: black and white and color, Ophthalmic

| Index Label                  |   | MI         | TIS        |               | TIB        |               | TIC |
|------------------------------|---|------------|------------|---------------|------------|---------------|-----|
|                              |   |            | At Surface | Below surface | At Surface | Below surface |     |
| <b>Maximum: Index Value</b>  |   | 0,18       | 0,009      |               | #          |               | #   |
| <b>Index component value</b> |   |            | 0,009      | 0,009         | -          | -             |     |
| Acoustic Parameters          | $\rho_{r,\alpha}$ at $Z_{MI}$ (MPa)   | 0,40       |            |               |            |               |     |
|                              | $P$ (mW)  |            | 0,51       |               | -          | -             |     |
|                              | $P_{1x1}$ (mW)  |            | 0,35       |               | -          | -             |     |
|                              | $Z_s$ (cm)  |            |            | 0,8-0,9       |            |               |     |
|                              | $Z_b$ (cm)  |            |            |               |            | -             |     |
|                              | $Z_{MI}$ (cm)   | 1,7        |            |               |            |               |     |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,7        |            |               |            |               |     |
|                              | $f_{awf}$ (MHz)   | 5,15       | 5,15-9,04  |               | -          | -             |     |
| Other Information            | $\rho_{rr}$ (Hz)  | 5096       |            |               |            |               |     |
|                              | $s_{rr}$ (Hz)   | 164,4      |            |               |            |               |     |
|                              | $n_{pps}$   | 1          |            |               |            |               |     |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                        | 5,7        |            |               |            |               |     |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 1,0        |            |               |            |               |     |
|                              | $I_{spta}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 1,9        |            |               |            |               |     |
|                              | $\rho_r$ at $Z_{pii}$ (MPa)   | 0,55       |            |               |            |               |     |
| Operating Conditions         | Depth (cm)  | 4,1        | 4,1        |               | -          | -             |     |
|                              | Width (-) black and white   | 2,2        | 2,2        |               | -          | -             |     |
|                              | ROI center (cm)   | 2,0        | 2,0        |               | -          | -             |     |
|                              | ROI span(cm)  | 1          | 1          |               |            |               |     |
|                              | Width (-) color   | 1,3        | 1,3        |               | -          | -             |     |
|                              | Application   | Ophthalmic | Ophthalmic |               | -          | -             |     |

Figure 7-21. Linear array transducer - black and white and color, Ophthalmic

**Transducer Model: Linear array transducer - Vscan Air SL probe  
(continued)**

Operating Mode: M

| Index Label                  |   | MI     | TIS         |               | TIB        |               | TIC      |
|------------------------------|---|--------|-------------|---------------|------------|---------------|----------|
|                              |   |        | At Surface  | Below surface | At Surface | Below surface |          |
| <b>Maximum: Index Value</b>  |   | 1,03   |             |               | #          |               | 0,04     |
| <b>Index component value</b> |   |        | 0,035       | 0,035         | -          | -             |          |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 2,27   |             |               |            |               |          |
|                              | $P$ (mW)  |        | 1,52        |               | -          |               | 1,08     |
|                              | $P_{1x1}$ (mW)  |        | 1,52        |               | -          |               |          |
|                              | $Z_s$ (cm)  |        |             | 0,9           |            |               |          |
|                              | $Z_b$ (cm)  |        |             |               |            | -             |          |
|                              | $Z_{MI}$ (cm)   | 1,1    |             |               |            |               |          |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,1    |             |               |            |               |          |
|                              | $f_{awt}$ (MHz)   | 4,87   | 4,80-4,94   |               | -          |               | 6,60     |
| Other Information            | $p_{rr}$ (Hz)   | 500    |             |               |            |               |          |
|                              | $s_{rr}$ (Hz)   | -      |             |               |            |               |          |
|                              | $n_{pps}$   | -      |             |               |            |               |          |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                        | 253,9  |             |               |            |               |          |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 34,6   |             |               |            |               |          |
|                              | $I_{spta}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 50,9   |             |               |            |               |          |
|                              | $p_r$ at $Z_{pii}$ (MPa)  | 2,58   |             |               |            |               |          |
| Operating Conditions         | Depth (cm)  | 4,5    | 5,1         |               | -          |               | 8,1      |
|                              |   | -      | -           |               | -          |               | -        |
|                              | Application   | Nerves | Small Parts |               | -          |               | Neo Head |

Figure 7-22. Linear array transducer - M-mode

**Transducer Model: Linear array transducer - Vscan Air SL probe  
(continued)**

Operating Mode: PW

| Index Label                  |   | MI     | TIS        |               | TIB        |               | TIC      |
|------------------------------|---|--------|------------|---------------|------------|---------------|----------|
|                              |   |        | At Surface | Below surface | At Surface | Below surface |          |
| <b>Maximum: Index Value</b>  |   | 0,67   |            |               | #          |               | 0,23     |
| <b>Index component value</b> |   |        | 0,16       | 0,16          | -          | -             |          |
| Acoustic Parameters          | $p_{r,\alpha}$ at $Z_{MI}$ (MPa)  | 1,42   |            |               |            |               |          |
|                              | $P$ (mW)  |        | 7,56       |               | -          |               | 5,44     |
|                              | $P_{1x1}$ (mW)  |        | 7,56       |               | -          |               |          |
|                              | $Z_s$ (cm)  |        |            | 0,9           |            |               |          |
|                              | $Z_b$ (cm)  |        |            |               |            | -             |          |
|                              | $Z_{MI}$ (cm)   | 1,7    |            |               |            |               |          |
|                              | $Z_{pii,\alpha}$ (cm)   | 1,7    |            |               |            |               |          |
|                              | $f_{awf}$ (MHz)   | 4,58   | 4,58       |               | -          |               | 4,58     |
| Other Information            | $prf$ (Hz)  | 1184   |            |               |            |               |          |
|                              | $srf$ (Hz)  | -      |            |               |            |               |          |
|                              | $n_{pps}$   | -      |            |               |            |               |          |
|                              | $I_{pa,\alpha}$ at $Z_{pii,\alpha}$ (W/cm <sup>2</sup> )                        | 94,7   |            |               |            |               |          |
|                              | $I_{spta,\alpha}$ at $Z_{pii,\alpha}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> ) | 137,6  |            |               |            |               |          |
|                              | $I_{spta}$ at $Z_{pii}$ or $Z_{sii,\alpha}$ (mW/cm <sup>2</sup> )               | 236,3  |            |               |            |               |          |
|                              | $p_r$ at $Z_{pii}$ (MPa)  | 1,82   |            |               |            |               |          |
| Operating Conditions         | Depth (cm)  | 4,1    | 2,1        |               | -          |               | 3,1      |
|                              | ROI center  | 2,0    | 2,0        |               | -          |               | 2,0      |
|                              | Application   | Nerves | Vascular   |               | -          |               | Neo Head |

Figure 7-23. Linear array transducer - PW-mode



**Transducer Model: Linear array transducer - Vscan Air SL probe  
(continued)**

Operating Mode: M, Ophthalmic

| Index Label           |   | MI         | TIS        |               | TIB        |               | TIC |
|-----------------------|---|------------|------------|---------------|------------|---------------|-----|
|                       |   |            | At Surface | Below surface | At Surface | Below surface |     |
| Maximum: Index Value  |   | 0,18       |            |               | #          |               | #   |
| Index component value |   |            | 0,001      | 0,001         | -          | -             |     |
| Acoustic Parameters   | $p_{r,\alpha}$ at $z_{MI}$ (MPa)  | 0,54       |            |               |            |               |     |
|                       | $P$ (mW)  |            | 0,012      |               | -          | -             |     |
|                       | $P_{1x1}$ (mW)  |            | 0,012      |               | -          | -             |     |
|                       | $z_s$ (cm)  |            |            | 0,8           |            |               |     |
|                       | $z_b$ (cm)  |            |            |               |            | -             |     |
|                       | $z_{MI}$ (cm)   | 1,6        |            |               |            |               |     |
|                       | $z_{pII,\alpha}$ (cm)   | 1,6        |            |               |            |               |     |
|                       | $f_{axt}$ (MHz)   | 9,04       | 9,04       |               | -          | -             |     |
| Other Information     | $p_{rr}$ (Hz)   | 500        |            |               |            |               |     |
|                       | $s_{rr}$ (Hz)   | -          |            |               |            |               |     |
|                       | $n_{pps}$   | -          |            |               |            |               |     |
|                       | $I_{pa,\alpha}$ at $z_{pII,\alpha}$ (W/cm <sup>2</sup> )                        | 10,5       |            |               |            |               |     |
|                       | $I_{spta,\alpha}$ at $z_{pII,\alpha}$ or $z_{sII,\alpha}$ (mW/cm <sup>2</sup> ) | 0,8        |            |               |            |               |     |
|                       | $I_{spta}$ at $z_{pII}$ or $z_{sII,\alpha}$ (mW/cm <sup>2</sup> )               | 2,21       |            |               |            |               |     |
|                       | $p_r$ at $z_{pII}$ (MPa)  | 0,88       |            |               |            |               |     |
| Operating Conditions  | Depth (cm)  | 4,1        | 4,1        |               | -          | -             |     |
|                       |   | -          | -          |               | -          | -             |     |
|                       | Application   | Ophthalmic | Ophthalmic |               | -          | -             |     |

Figure 7-24. Linear array transducer - M-mode, Ophthalmic

**Transducer Model: Linear array transducer - Vscan Air SL probe  
(continued)**

Operating Mode: PW, Ophthalmic

| Index Label           |   | MI         | TIS        |               | TIB        |               | TIC |
|-----------------------|---|------------|------------|---------------|------------|---------------|-----|
|                       |   |            | At Surface | Below surface | At Surface | Below surface |     |
| Maximum: Index Value  |   | 0,15       |            |               | #          |               | #   |
| Index component value |   |            | 0,005      | 0,005         | -          | -             |     |
| Acoustic Parameters   | $p_{r,\alpha}$ at $z_{MI}$ (MPa)  | 0,32       |            |               |            |               |     |
|                       | $P$ (mW)  |            | 0,238      |               | -          | -             |     |
|                       | $P_{1x1}$ (mW)  |            | 0,238      |               | -          | -             |     |
|                       | $z_s$ (cm)  |            |            | 0,9           |            |               |     |
|                       | $z_b$ (cm)  |            |            |               |            | -             |     |
|                       | $z_{MI}$ (cm)   | 1,7        |            |               |            |               |     |
|                       | $z_{pii,\alpha}$ (cm)   | 1,7        |            |               |            |               |     |
|                       | $f_{awf}$ (MHz)   | 4,58       | 4,58       |               | -          | -             |     |
| Other Information     | $p_{rr}$ (Hz)   | 1184       |            |               |            |               |     |
|                       | $s_{rr}$ (Hz)   | -          |            |               |            |               |     |
|                       | $n_{pps}$   | -          |            |               |            |               |     |
|                       | $I_{pa,\alpha}$ at $z_{pii,\alpha}$ ( $W/cm^2$ )                        | 3,5        |            |               |            |               |     |
|                       | $I_{spta,\alpha}$ at $z_{pii,\alpha}$ or $z_{sii,\alpha}$ ( $mW/cm^2$ ) | 5,5        |            |               |            |               |     |
|                       | $I_{spta}$ at $z_{pii}$ or $z_{sii,\alpha}$ ( $mW/cm^2$ )               | 8,83       |            |               |            |               |     |
|                       | $p_r$ at $z_{pii}$ (MPa)  | 0,41       |            |               |            |               |     |
| Operating Conditions  | Depth (cm)  | 4,1        | 4,1        |               | -          | -             |     |
|                       | ROIcenter   | 2,0        | 2,0        |               | -          | -             |     |
|                       | Application   | Ophthalmic | Ophthalmic |               | -          | -             |     |

Figure 7-25. Linear array transducer - PW-mode, Ophthalmic

# Appendices

## **Statements on the safety of ultrasound**

October 1982, revised March 1983 and October 1983.

Diagnostic ultrasound has been in use for over 35 years. Given its known benefits and recognized efficacy for medical diagnosis, including use during human pregnancy, the American Institute of Ultrasound In medicine herein addresses the clinical safety of such use.

No confirmed biological effects on patients or instrument operators caused by exposure at intensities typical of present diagnostic ultrasound instruments have ever been reported. Although the possibility exists that such biological effects may be identified in the future, current data indicate that the benefits to patients of the prudent use of diagnostic ultrasound outweigh the risks, if any, that may be present.

# Measurement accuracy

## Measurement accuracy

The following information is intended to provide guidance to the user in determining the amount of variation or measurement error that should be considered when performing clinical measurements with this equipment. Error can be contributed by equipment limitations and improper user technique. Be sure to follow all measurement instructions and develop uniform measurement techniques among all users to minimize the potential operator error. Also, in order to detect possible equipment malfunctions that could affect measurement accuracy, a quality assurance (QA) plan should be established for the equipment that includes routine accuracy checks with tissue mimicking phantoms.

### General

When using measurements, it is important to keep in mind the different aspects that affect the accuracy of the measurements. These include acoustical properties, patient echogenicity, measurement tools and algorithms, system setup (especially Field-of-view or Range settings), probe type used, and operator inputs.

### Sources of error

#### Image Quality

The accuracy of each measurement is highly dependent on image quality. Image quality is highly dependent on system design, operator variability, and patient echogenicity. The operator variability and patient echogenicity are independent of the ultrasound system.

## Operator variability

One of the largest potential sources of error is operator variability. A skilled operator can reduce this by optimizing the image quality for each type of measurement. Clear identification of structures, good probe alignment and correct cursor placement is important. Because of pixel resolution, the accuracy of a measurement decreases with decreasing distance on screen. Therefore it is important when scaling the object on the screen to avoid measuring objects that are too small.

**NOTE:** See also 'Optimizing Measurement Accuracy' on page 8-186 for recommended techniques.

## Image measurement

The accuracy in lateral direction is limited by the beam width and the beam positioning. The radial accuracy is mainly limited by the acoustic pulse length.

## Doppler alignment

Errors in velocity measurements increase with the cosine of the angle between the measured flow and the ultrasound beam. For under-estimation of the velocities, while an error of 40 degrees will cause the under-estimation to be 24%. It is highly recommended to optimize transducer position to align the ultrasound beam with the flow direction.

**NOTE:** *If alignment is not possible, you may use the Angle Correction control to compensate if the flow direction is known.*

## Screen pixel resolution

The display screen is composed of an array of square picture elements (pixels). The smallest resolvable unit is +/- 1pixel. This pixel error is only significant when measuring short distances on the screen. By observing good scanning practices, the settings of the field of view should be such that the measured distance is significant with respect to the full size of the screen. When such scaling is impossible, the pixel error may come into play.

## Speed of Sound in Tissue

The average speed of sound value of 1540 meters / second is used for all calculations. Depending on the tissue structures, this generalization may give errors from 2% (typical) to 5% (much fatty tissue layers present).

## Optimizing Measurement Accuracy

### Probe selection

Select a transducer appropriate for the application. Higher imaging frequencies provide better resolution, but less penetration than lower frequencies. Lower Doppler frequencies can measure higher max velocities, and at greater depths, but with less velocity resolution than higher Doppler frequencies.

### Field of View

All display modes should be adjusted so that the area of interest covers as large portion of the display as possible. Use Depth, Zoom, Horizontal Sweep and Velocity controls to optimize the different modes.

### Cursor Placement

All measurements are dependent on the accuracy of their “input” data. Consistency and precision in placing cursors correctly on the images are important.

**NOTE:** *Avoid placement of the cursor near the top of the image, close to the transducer, when using convex or linear probes.*

## Measurement Uncertainties

The accuracy percentages reported below are based on data taken with optimum control settings, using calibrated phantoms and test equipment. The calibration was done for the basic measurable parameters: Distance, Time and Velocity. Independent sources of uncertainty contribute to a total uncertainty by a RMS (Root Mean Square) combination of the sources. Refer to the discussions above regarding measurement accuracy and sources of error when reading the table below.

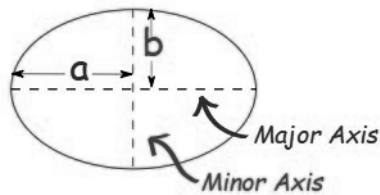
Table 7-2: Measurement accuracy

| Measurement  | Unit        | Useful range | Accuracy                               |
|--|-------------|--------------|--|
| <b>Calipers - Curved array (deep scanning) transducer</b>    |             |              |  |
| Vertical distance (2D, M-mode)                               | cm or mm    | 2mm-200mm    | +/-1mm or +/-3% whichever is greater   |
| Horizontal distance  | cm or mm    | 4mm-100mm    | +/-2mm or +/-5% whichever is greater   |
| Circumference (ellipse)                                      | cm or mm    | 10mm-300mm   | +/-5% or +/-2mm whichever is greater   |
| Time (M-mode, PW)  | Sec         | 50-4000 ms   | 10ms or 5.0% whichever is greater      |
| Velocity (PW)  | m/s or cm/s | 0.1-1.5 m/s  | 10%                                    |
| <b>Calipers - Linear array (shallow scanning) transducer</b> |             |              |  |
| Vertical distance (2D, M-mode)                               | cm or mm    | 1mm-60mm     | +/-0.5mm or +/-3% whichever is greater |
| Lateral  | cm or mm    | 2mm-40mm     | +/-1mm or +/-5% whichever is greater   |
| Circumference (ellipse)                                      | cm or mm    | 5mm-150mm    | +/-5% or +/-1mm whichever is greater   |
| Time (M-mode, PW)  | Sec         | 50-4000 ms   | 10ms or 5.0% whichever is greater      |
| Velocity (PW)  | m/s or cm/s | 0.1-1.5 m/s  | 10%                                    |

| Measurement   | Unit        | Useful range | Accuracy                             |
|---|-------------|--------------|--------------------------------------|
| <b>Calipers - Sector array (deep scanning) transducer</b> |             |              |                                      |
| Vertical distance (2D, M-mode)                            | cm or mm    | 2mm-200mm    | +/-1mm or +/-3% whichever is greater |
| Horizontal distance                                       | cm or mm    | 4mm-100mm    | +/-2mm or +/-5% whichever is greater |
| Circumference (ellipse)                                   | cm or mm    | 10mm-300mm   | +/-5% or +/-2mm whichever is greater |
| Time (M-mode, PW)   | Sec         | 50-4000 ms   | 10ms or 5.0% whichever is greater    |
| Velocity (PW)   | m/s or cm/s | 0.1-1.5 m/s  | 10%                                  |

The ellipse circumference is calculated via the below formula from §16 in Ramanujan, Srinivasa (1914), "Modular Equations and Approximations to  $\pi$ ". Quart. J. Pure App. Math. 45: 350–372. ISBN 9780821820766.

$$\pi \left[ 3(a + b) - \sqrt{(3a + b)(a + 3b)} \right]$$





# OB Tables

## Abdominal Circumference (AC) HADLOCK 84

Reference: Hadlock, F.P., Deter, R.L., Harrist, R.B., Park, S.K., "Estimating fetal age: computer-assisted analysis of multiple fetal growth parameters", Radiology Vol. 152 No. 2, 1984, pages 497-501

$$GA = 8.14 + 0.753 \times AC + 0.0036 \times AC^2$$

Input Unit: cm  
 Output Unit: w (weeks)  
 Min Range: 5.0 cm  
 Max Range: 38.0 cm

Table 7-3: AC: Hadlock, Radiology 1984, Vol. 152:497 (Fetal Age)

| Unit: AC (mm); Age (Week); 2SD (Week) |      |      |     |      |      |     |      |      |      |      |      |
|---------------------------------------|------|------|-----|------|------|-----|------|------|------|------|------|
| AC                                    | Age  | 2SD  | AC  | Age  | 2SD  | AC  | Age  | 2SD  | AC   | Age  | 2SD  |
| <50                                   | n/a  | —    | 135 | 19.0 | 2.06 | 225 | 26.9 | 2.18 | 315  | 35.4 | 2.96 |
| 50                                    | 12.0 | 1.66 | 140 | 19.4 | 2.06 | 230 | 27.4 | 2.18 | 320  | 35.9 | 2.96 |
| 55                                    | 12.4 | 1.66 | 145 | 19.8 | 2.06 | 235 | 27.8 | 2.18 | 321  | 36.0 | 3.04 |
| 60                                    | 12.8 | 1.66 | 150 | 20.2 | 2.06 | 240 | 28.3 | 2.18 | 325  | 36.4 | 3.04 |
| 65                                    | 13.2 | 1.66 | 155 | 20.7 | 2.06 | 245 | 28.7 | 2.18 | 330  | 36.9 | 3.04 |
| 70                                    | 13.6 | 1.66 | 160 | 21.1 | 2.06 | 250 | 29.2 | 2.18 | 335  | 37.4 | 3.04 |
| 75                                    | 14.0 | 1.66 | 165 | 21.5 | 2.06 | 255 | 29.7 | 2.18 | 340  | 37.9 | 3.04 |
| 80                                    | 14.4 | 1.66 | 170 | 22.0 | 2.06 | 258 | 30.0 | 2.96 | 345  | 38.4 | 3.04 |
| 85                                    | 14.8 | 1.66 | 175 | 22.4 | 2.06 | 259 | 30.1 | 2.96 | 350  | 38.9 | 3.04 |
| 90                                    | 15.2 | 1.66 | 180 | 22.9 | 2.06 | 260 | 30.2 | 2.96 | 355  | 39.4 | 3.04 |
| 95                                    | 15.6 | 1.66 | 185 | 23.3 | 2.06 | 265 | 30.6 | 2.96 | 360  | 39.9 | 3.04 |
| 100                                   | 16.0 | 1.66 | 190 | 23.7 | 2.06 | 270 | 31.1 | 2.96 | 365  | 40.4 | 3.04 |
| 105                                   | 16.4 | 1.66 | 192 | 23.9 | 2.06 | 275 | 31.6 | 2.96 | 370  | 40.9 | 3.04 |
| 110                                   | 16.9 | 1.66 | 193 | 24.0 | 2.18 | 280 | 32.0 | 2.96 | 375  | 41.4 | 3.04 |
| 115                                   | 17.3 | 1.66 | 195 | 24.2 | 2.18 | 285 | 32.5 | 2.96 | 380  | 42.0 | 3.04 |
| 120                                   | 17.7 | 1.66 | 200 | 24.6 | 2.18 | 290 | 33.0 | 2.96 | >380 | n/a  | —    |
| 123                                   | 17.9 | 1.66 | 205 | 25.1 | 2.18 | 295 | 33.5 | 2.96 |      |      |      |
| 124                                   | 18.0 | 2.06 | 210 | 25.5 | 2.18 | 300 | 34.0 | 2.96 |      |      |      |
| 125                                   | 18.1 | 2.06 | 215 | 26.0 | 2.18 | 305 | 34.5 | 2.96 |      |      |      |
| 130                                   | 18.5 | 2.06 | 220 | 26.4 | 2.18 | 310 | 34.9 | 2.96 |      |      |      |

## Biparietal Diameter (BPD) HADLOCK 84

Reference: Hadlock, F.P., Deter, R.L., Harrist, R.B., Park, S.K., "Estimating fetal age: computer-assisted analysis of multiple fetal growth parameters", Radiology Vol. 152 No. 2, 1984, pages 497-501.

$$GA = 9.54 + 1.482 \times BPD + 0.1676 \times BPD^2$$

Input Unit: cm  
 Output Unit: w (weeks)  
 Min Range: 1.40 cm  
 Max Range: 10.2 cm

Table 7-4: BPD Hadlock, Radiology 1984, Vol. 152:497 (Fetal Age) [a]

| Unit: BPD (mm); Age (Week); 2SD (Week) |      |      |     |      |      |     |      |      |      |      |      |
|--|------|------|-----|------|------|-----|------|------|------|------|------|
| BPD                                    | Age  | 2SD  | BPD | Age  | 2SD  | BPD | Age  | 2SD  | BPD  | Age  | 2SD  |
| <14                                    | n/a  | —    | 36  | 17.0 | 1.19 | 59  | 24.1 | 2.18 | 82   | 33.0 | 3.08 |
| 14                                     | 11.9 | 1.19 | 37  | 17.3 | 1.19 | 60  | 24.5 | 2.18 | 83   | 33.4 | 3.08 |
| 15                                     | 12.1 | 1.19 | 38  | 17.6 | 1.19 | 61  | 24.8 | 2.18 | 84   | 33.8 | 3.08 |
| 16                                     | 12.3 | 1.19 | 39  | 17.9 | 1.19 | 62  | 25.2 | 2.18 | 85   | 34.2 | 3.08 |
| 17                                     | 12.5 | 1.19 | 40  | 18.1 | 1.73 | 63  | 25.5 | 2.18 | 86   | 34.7 | 3.08 |
| 18                                     | 12.8 | 1.19 | 41  | 18.4 | 1.73 | 64  | 25.9 | 2.18 | 87   | 35.1 | 3.08 |
| 19                                     | 13.0 | 1.19 | 42  | 18.7 | 1.73 | 65  | 26.3 | 2.18 | 88   | 35.6 | 3.08 |
| 20                                     | 13.2 | 1.19 | 43  | 19.0 | 1.73 | 66  | 26.6 | 2.18 | 89   | 36.0 | 3.20 |
| 21                                     | 13.4 | 1.19 | 44  | 19.3 | 1.73 | 67  | 27.0 | 2.18 | 90   | 36.5 | 3.20 |
| 22                                     | 13.6 | 1.19 | 45  | 19.6 | 1.73 | 68  | 27.4 | 2.18 | 91   | 36.9 | 3.20 |
| 23                                     | 13.8 | 1.19 | 46  | 19.9 | 1.73 | 69  | 27.7 | 2.18 | 92   | 37.4 | 3.20 |
| 24                                     | 14.1 | 1.19 | 47  | 20.2 | 1.73 | 70  | 28.1 | 2.18 | 93   | 37.8 | 3.20 |
| 25                                     | 14.3 | 1.19 | 48  | 20.5 | 1.73 | 71  | 28.5 | 2.18 | 94   | 38.3 | 3.20 |
| 26                                     | 14.5 | 1.19 | 49  | 20.8 | 1.73 | 72  | 28.9 | 2.18 | 95   | 38.7 | 3.20 |
| 27                                     | 14.8 | 1.19 | 50  | 21.1 | 1.73 | 73  | 29.3 | 2.18 | 96   | 39.2 | 3.20 |
| 28                                     | 15.0 | 1.19 | 51  | 21.5 | 1.73 | 74  | 29.7 | 2.18 | 97   | 39.7 | 3.20 |
| 29                                     | 15.2 | 1.19 | 52  | 21.8 | 1.73 | 75  | 30.1 | 3.08 | 98   | 40.2 | 3.20 |
| 30                                     | 15.5 | 1.19 | 53  | 22.1 | 1.73 | 76  | 30.5 | 3.08 | 99   | 40.6 | 3.20 |
| 31                                     | 15.7 | 1.19 | 54  | 22.4 | 1.73 | 77  | 30.9 | 3.08 | 100  | 41.1 | 3.20 |
| 32                                     | 16.0 | 1.19 | 55  | 22.8 | 1.73 | 78  | 31.3 | 3.08 | 101  | 41.6 | 3.20 |
| 33                                     | 16.3 | 1.19 | 56  | 23.1 | 1.73 | 79  | 31.7 | 3.08 | 102  | 42.1 | 3.20 |
| 34                                     | 16.5 | 1.19 | 57  | 23.4 | 1.73 | 80  | 32.1 | 3.08 | >102 | n/a  | —    |
| 35                                     | 16.8 | 1.19 | 58  | 23.8 | 1.73 | 81  | 32.5 | 3.08 |      |      |      |

## Crown Rump Length (CRL) HADLOCK

Reference: Hadlock F., Shah Y.P, Kanon D.J., Math B., Lindsey J.V., "Fetal Crown-Rump Length: Reevaluation of Relation to Menstrual Age (5-18 weeks) with High-Resolution Real-Time Ultrasound." Radiology, 182:501-505, 1992.

$$GA = e^{1.684969 + 0.315646 \times CRL - 0.049306 \times CRL^2 + 0.004057 \times CRL^3 - 0.000120456 \times CRL^4}$$

Table 7-5: CRL Hadlock - Part 1

| CRL<br>(cm) | GA (weeks) |       |       | CRL<br>(cm) | GA (weeks) |       |       |
|-------------|------------|-------|-------|-------------|------------|-------|-------|
|             | 5%         | 50%   | 95%   |             | 5%         | 50%   | 95%   |
| 0.20        | 5,24       | 5,70  | 6,16  | 3.20        | 9,29       | 10,10 | 10,91 |
| 0.30        | 5,43       | 5,90  | 6,37  | 3.30        | 9,38       | 10,20 | 11,02 |
| 0.40        | 5,61       | 6,10  | 6,59  | 3.40        | 9,48       | 10,30 | 11,12 |
| 0.50        | 5,70       | 6,20  | 6,70  | 3.50        | 9,57       | 10,40 | 11,23 |
| 0.60        | 5,89       | 6,40  | 6,91  | 3.60        | 9,66       | 10,50 | 11,34 |
| 0.70        | 6,07       | 6,60  | 7,13  | 3.70        | 9,75       | 10,60 | 11,45 |
| 0.80        | 6,16       | 6,70  | 7,24  | 3.80        | 9,84       | 10,70 | 11,56 |
| 0.90        | 6,35       | 6,90  | 7,45  | 3.90        | 9,94       | 10,80 | 11,66 |
| 1.00        | 6,53       | 7,10  | 7,67  | 4.00        | 10,03      | 10,90 | 11,77 |
| 1.10        | 6,62       | 7,20  | 7,78  | 4.10        | 10,12      | 11,00 | 11,88 |
| 1.20        | 6,81       | 7,40  | 7,99  | 4.20        | 10,21      | 11,10 | 11,99 |
| 1.30        | 6,90       | 7,50  | 8,10  | 4.30        | 10,30      | 11,20 | 12,10 |
| 1.40        | 7,08       | 7,70  | 8,32  | 4.40        | 10,30      | 11,20 | 12,10 |
| 1.50        | 7,27       | 7,90  | 8,53  | 4.50        | 10,40      | 11,30 | 12,20 |
| 1.60        | 7,36       | 8,00  | 8,64  | 4.60        | 10,49      | 11,40 | 12,31 |
| 1.70        | 7,45       | 8,10  | 8,75  | 4.70        | 10,58      | 11,50 | 12,42 |
| 1.80        | 7,64       | 8,30  | 8,96  | 4.80        | 10,67      | 11,60 | 12,53 |
| 1.90        | 7,73       | 8,40  | 9,07  | 4.90        | 10,76      | 11,70 | 12,64 |
| 2.00        | 7,91       | 8,60  | 9,29  | 5.00        | 10,76      | 11,70 | 12,64 |
| 2.10        | 8,00       | 8,70  | 9,40  | 5.10        | 10,86      | 11,80 | 12,74 |
| 2.20        | 8,19       | 8,90  | 9,61  | 5.20        | 10,95      | 11,90 | 12,85 |
| 2.30        | 8,28       | 9,00  | 9,72  | 5.30        | 11,04      | 12,00 | 12,96 |
| 2.40        | 8,37       | 9,10  | 9,83  | 5.40        | 11,04      | 12,00 | 12,96 |
| 2.50        | 8,46       | 9,20  | 9,94  | 5.50        | 11,13      | 12,10 | 13,07 |
| 2.60        | 8,65       | 9,40  | 10,15 | 5.60        | 11,22      | 12,20 | 13,18 |
| 2.70        | 8,74       | 9,50  | 10,26 | 5.70        | 11,32      | 12,30 | 13,28 |
| 2.80        | 8,83       | 9,60  | 10,37 | 5.80        | 11,32      | 12,30 | 13,28 |
| 2.90        | 8,92       | 9,70  | 10,48 | 5.90        | 11,41      | 12,40 | 13,39 |
| 3.00        | 9,11       | 9,90  | 10,69 | 6.00        | 11,50      | 12,50 | 13,50 |
| 3.10        | 9,20       | 10,00 | 10,80 | 6.10        | 11,59      | 12,60 | 13,61 |

## Crown Rump Length (CRL) HADLOCK (continued)

Table 7-6: CRL Hadlock - Part 2

| CRL<br>(cm) | GA (weeks) |       |       | CRL<br>(cm) | GA (weeks) |       |       |
|-------------|------------|-------|-------|-------------|------------|-------|-------|
|             | 5%         | 50%   | 95%   |             | 5%         | 50%   | 95%   |
| 6.20        | 11,59      | 12,60 | 13,61 | 9.20        | 13,89      | 15,10 | 16,31 |
| 6.30        | 11,68      | 12,70 | 13,72 | 9.30        | 13,98      | 15,20 | 16,42 |
| 6.40        | 11,78      | 12,80 | 13,82 | 9.40        | 14,08      | 15,30 | 16,52 |
| 6.50        | 11,78      | 12,80 | 13,82 | 9.50        | 14,08      | 15,30 | 16,52 |
| 6.60        | 11,87      | 12,90 | 13,93 | 9.60        | 14,17      | 15,40 | 16,63 |
| 6.70        | 11,96      | 13,00 | 14,04 | 9.70        | 14,26      | 15,50 | 16,74 |
| 6.80        | 12,05      | 13,10 | 14,15 | 9.80        | 14,35      | 15,60 | 16,85 |
| 6.90        | 12,05      | 13,10 | 14,15 | 9.90        | 14,44      | 15,70 | 16,96 |
| 7.00        | 12,14      | 13,20 | 14,26 | 10.00       | 14,63      | 15,90 | 17,17 |
| 7.10        | 12,24      | 13,30 | 14,36 | 10.10       | 14,72      | 16,00 | 17,28 |
| 7.20        | 12,33      | 13,40 | 14,47 | 10.20       | 14,81      | 16,10 | 17,39 |
| 7.30        | 12,33      | 13,40 | 14,47 | 10.30       | 14,90      | 16,20 | 17,50 |
| 7.40        | 12,42      | 13,50 | 14,58 | 10.40       | 15,00      | 16,30 | 17,60 |
| 7.50        | 12,51      | 13,60 | 14,69 | 10.50       | 15,09      | 16,40 | 17,71 |
| 7.60        | 12,60      | 13,70 | 14,80 | 10.60       | 15,18      | 16,50 | 17,82 |
| 7.70        | 12,70      | 13,80 | 14,90 | 10.70       | 15,27      | 16,60 | 17,93 |
| 7.80        | 12,70      | 13,80 | 14,90 | 10.80       | 15,36      | 16,70 | 18,04 |
| 7.90        | 12,79      | 13,90 | 15,01 | 10.90       | 15,46      | 16,80 | 18,14 |
| 8.00        | 12,88      | 14,00 | 15,12 | 11.00       | 15,55      | 16,90 | 18,25 |
| 8.10        | 12,97      | 14,10 | 15,23 | 11.10       | 15,64      | 17,00 | 18,36 |
| 8.20        | 13,06      | 14,20 | 15,34 | 11.20       | 15,73      | 17,10 | 18,47 |
| 8.30        | 13,06      | 14,20 | 15,34 | 11.30       | 15,82      | 17,20 | 18,58 |
| 8.40        | 13,16      | 14,30 | 15,44 | 11.40       | 15,92      | 17,30 | 18,68 |
| 8.50        | 13,25      | 14,40 | 15,55 | 11.50       | 16,01      | 17,40 | 18,79 |
| 8.60        | 13,34      | 14,50 | 15,66 | 11.60       | 16,10      | 17,50 | 18,90 |
| 8.70        | 13,43      | 14,60 | 15,77 | 11.70       | 16,19      | 17,60 | 19,01 |
| 8.80        | 13,52      | 14,70 | 15,88 | 11.80       | 16,28      | 17,70 | 19,12 |
| 8.90        | 13,62      | 14,80 | 15,98 | 11.90       | 16,38      | 17,80 | 19,22 |
| 9.00        | 13,71      | 14,90 | 16,09 | 12.00       | 16,47      | 17,90 | 19,33 |
| 9.10        | 13,80      | 15,00 | 16,20 | 12.10       | 16,56      | 18,00 | 19,44 |

## Femur Length (FL) HADLOCK 84

Reference: Hadlock, F.P., Deter, R.L., Harrist, R.B., Park, S.K., "Estimating fetal age: computer-assisted analysis of multiple fetal growth parameters", Radiology Vol. 152 No. 2, 1984, pages 497-501.

$$GA = 10.35 + 2.46 \times FL + 0.17 \times FL^2$$

Input Unit: cm  
 Output Unit: w (weeks)  
 Min Range: 0.6 cm  
 Max Range: 8.2 cm

Table 7-7: FL: Hadlock, Radiology 1984, Vol. 152:497 (Fetal Age)

| Unit: FL (mm); Age (Week); 2SD (Week) |      |      |    |      |      |    |      |      |     |      |      |
|---------------------------------------|------|------|----|------|------|----|------|------|-----|------|------|
| FL                                    | Age  | 2SD  | FL | Age  | 2SD  | FL | Age  | 2SD  | FL  | Age  | 2SD  |
| <6                                    | n/a  | —    | 25 | 17.6 | 1.38 | 45 | 24.9 | 2.08 | 65  | 33.5 | 2.96 |
| 6                                     | 11.9 | 1.38 | 26 | 17.9 | 1.38 | 46 | 25.3 | 2.08 | 66  | 34.0 | 2.96 |
| 7                                     | 12.2 | 1.38 | 27 | 18.2 | 1.80 | 47 | 25.7 | 2.08 | 67  | 34.5 | 2.96 |
| 8                                     | 12.4 | 1.38 | 28 | 18.6 | 1.80 | 48 | 26.1 | 2.08 | 68  | 34.9 | 2.96 |
| 9                                     | 12.7 | 1.38 | 29 | 18.9 | 1.80 | 49 | 26.5 | 2.08 | 69  | 35.4 | 2.96 |
| 10                                    | 13.0 | 1.38 | 30 | 19.3 | 1.80 | 50 | 26.9 | 2.08 | 70  | 35.9 | 2.96 |
| 11                                    | 13.3 | 1.38 | 31 | 19.6 | 1.80 | 51 | 27.3 | 2.08 | 71  | 36.4 | 3.12 |
| 12                                    | 13.5 | 1.38 | 32 | 20.0 | 1.80 | 52 | 27.7 | 2.08 | 72  | 36.9 | 3.12 |
| 13                                    | 13.8 | 1.38 | 33 | 20.3 | 1.80 | 53 | 28.2 | 2.08 | 73  | 37.4 | 3.12 |
| 14                                    | 14.1 | 1.38 | 34 | 20.7 | 1.80 | 54 | 28.6 | 2.08 | 74  | 37.9 | 3.12 |
| 15                                    | 14.4 | 1.38 | 35 | 21.0 | 1.80 | 55 | 29.0 | 2.08 | 75  | 38.4 | 3.12 |
| 16                                    | 14.7 | 1.38 | 36 | 21.4 | 1.80 | 56 | 29.5 | 2.08 | 76  | 38.9 | 3.12 |
| 17                                    | 15.0 | 1.38 | 37 | 21.8 | 1.80 | 57 | 29.9 | 2.08 | 77  | 39.4 | 3.12 |
| 18                                    | 15.3 | 1.38 | 38 | 22.2 | 1.80 | 58 | 30.3 | 2.96 | 78  | 39.9 | 3.12 |
| 19                                    | 15.6 | 1.38 | 39 | 22.5 | 1.80 | 59 | 30.8 | 2.96 | 79  | 40.4 | 3.12 |
| 20                                    | 16.0 | 1.38 | 40 | 22.9 | 1.80 | 60 | 31.2 | 2.96 | 80  | 40.9 | 3.12 |
| 21                                    | 16.3 | 1.38 | 41 | 23.3 | 1.80 | 61 | 31.7 | 2.96 | 81  | 41.4 | 3.12 |
| 22                                    | 16.6 | 1.38 | 42 | 23.7 | 1.80 | 62 | 32.1 | 2.96 | 82  | 42.0 | 3.12 |
| 23                                    | 16.9 | 1.38 | 43 | 24.1 | 2.08 | 63 | 32.6 | 2.96 | >82 | n/a  | —    |
| 24                                    | 17.2 | 1.38 | 44 | 24.5 | 2.08 | 64 | 33.1 | 2.96 |     |      |      |

## Head Circumference (HC) HADLOCK 84

Reference: Hadlock, F.P., Deter, R.L., Harrist, R.B., Park, S.K., "Estimating fetal age: computer-assisted analysis of multiple fetal growth parameters", Radiology Vol. 152 No. 2, 1984, pages 497-501.

$$GA = 8.96 + 0.54 \times HC + 0.0003 \times HC^3$$

Input Unit: cm  
 Output Unit: w (weeks)  
 Min Range: 5.5 cm  
 Max Range: 35.8 cm

Table 7-8: Head Circumference Hadlock 84 (Part 1)

| HC (mm) | Age (weeks) |       | HC (mm) | Age (weeks) |       | HC (mm) | Age (weeks) |       | HC (mm) | Age (weeks) |       |
|---------|-------------|-------|---------|-------------|-------|---------|-------------|-------|---------|-------------|-------|
|         | mean        | ± 2SD |         | mean        | ± 2SD |         | mean        | ± 2SD |         | mean        | ± 2SD |
| <55     | n/a         | —     | 135     | 17.0        | ± 1.2 | 215     | 23.6        | ± 1.5 | 290     | 31.9        | ± 3.0 |
| 55      | 12.0        | ± 1.2 | 140     | 17.3        | ± 1.2 | 219     | 23.9        | ± 1.5 | 295     | 32.6        | ± 3.0 |
| 60      | 12.3        | ± 1.2 | 145     | 17.7        | ± 1.2 | 220     | 24.0        | ± 2.1 | 300     | 33.3        | ± 3.0 |
| 65      | 12.6        | ± 1.2 | 149     | 18.0        | ± 1.2 | 225     | 24.5        | ± 2.1 | 305     | 33.9        | ± 3.0 |
| 70      | 12.8        | ± 1.2 | 150     | 18.1        | ± 1.5 | 230     | 25.0        | ± 2.1 | 310     | 34.6        | ± 3.0 |
| 75      | 13.1        | ± 1.2 | 155     | 18.4        | ± 1.5 | 235     | 25.5        | ± 2.1 | 315     | 35.3        | ± 3.0 |
| 80      | 13.4        | ± 1.2 | 160     | 18.8        | ± 1.5 | 240     | 26.1        | ± 2.1 | 319     | 35.9        | ± 3.0 |
| 85      | 13.7        | ± 1.2 | 165     | 19.2        | ± 1.5 | 245     | 26.6        | ± 2.1 | 320     | 36.1        | ± 2.7 |
| 90      | 14.0        | ± 1.2 | 170     | 19.6        | ± 1.5 | 250     | 27.1        | ± 2.1 | 325     | 36.8        | ± 2.7 |
| 95      | 14.3        | ± 1.2 | 175     | 20.0        | ± 1.5 | 255     | 27.7        | ± 2.1 | 330     | 37.6        | ± 2.7 |
| 100     | 14.7        | ± 1.2 | 180     | 20.4        | ± 1.5 | 260     | 28.3        | ± 2.1 | 335     | 38.3        | ± 2.7 |
| 105     | 15.0        | ± 1.2 | 185     | 20.8        | ± 1.5 | 265     | 28.9        | ± 2.1 | 340     | 39.1        | ± 2.7 |
| 110     | 15.3        | ± 1.2 | 190     | 21.3        | ± 1.5 | 270     | 29.4        | ± 2.1 | 345     | 39.9        | ± 2.7 |
| 115     | 15.6        | ± 1.2 | 195     | 21.7        | ± 1.5 | 274     | 29.9        | ± 2.1 | 350     | 40.7        | ± 2.7 |
| 120     | 16.0        | ± 1.2 | 200     | 22.2        | ± 1.5 | 275     | 30.0        | ± 3.0 | 355     | 41.6        | ± 2.7 |
| 125     | 16.3        | ± 1.2 | 205     | 22.6        | ± 1.5 | 280     | 30.7        | ± 3.0 | >358    | n/a         | —     |
| 130     | 16.6        | ± 1.2 | >210    | 23.1        | ± 1.5 | 285     | 31.3        | ± 3.0 |         |             |       |

**EFW Hadlock 1 (AC, FL)**

$$FW = 10^{1.304 + 0.05281 \times AC + 0.1938 \times FL - 0.004 \times AC \times FL}$$

Inputs: AC, FL in (cm)

Output: FW in (g)

Reference: Hadlock FP, et al, "Estimation of fetal weight with the use of head, body and femur measurements: A prospective study" Am. J. Obstet. Gynecol. 1985; 151: 333-337

**EFW Hadlock 2 (BPD, AC, FL)**

$$FW = 10^{1.335 - 0.0034 \times AC \times FL + 0.0316 \times BPD + 0.0457 \times AC + 0.1623 \times FL}$$

Inputs: BPD, AC, FL in (cm)

Output: FW in (g)

Reference: Hadlock FP, et al, "Estimation of fetal weight with the use of head, body and femur measurements: A prospective study" Am. J. Obstet. Gynecol. 1985; 151: 333-337

### EFW Hadlock 3 (HC, AC, FL)

$$FW = 10^{1.326 - 0.00326 \times AC \times FL + 0.0107 \times HC + 0.0438 \times AC + 0.158 \times FL}$$

Inputs: HC, AC, FL in (cm)

Output: FW in (g)

Reference: Hadlock FP, et al, "Estimation of fetal weight with the use of head, body and femur measurements: A prospective study" Am. J. Obstet. Gynecol. 1985; 151: 333-337

### EFW Hadlock 4 (BPD, HC, AC, FL)

$$FW = 10^{1.3596 - 0.00386 \times AC \times FL + 0.0064 \times HC + 0.00061 \times BPD \times AC + 0.0424 \times AC + 0.174 \times FL}$$

Inputs: BPD, HC, AC, FL in (cm)

Output: FW in (g)

Reference: Hadlock FP, et al, "Estimation of fetal weight with the use of head, body and femur measurements: A prospective study" Am. J. Obstet. Gynecol. 1985; 151: 333-337



# Indications Reference Guide

## Disclaimer

The information in this section is meant to be reference for examples of anatomies and examinations that can be evaluated by this product. The list may not be all inclusive.

## Curved Array (Deep scanning) Transducer

*The curved array transducer on Vscan Air CL supports Black/white (B-mode), Color (Color doppler), Harmonic, M-mode and PW doppler modes. Vscan Air is indicated for ultrasound imaging, measurement, and analysis of the human body in clinical applications that include:*

Table 7-9: Curved Array Transducer

| Clinical Application          | Anatomy  | Evaluation   |
|-------------------------------|--|--|
| Abdominal (Adult/ Pediatrics) | <ul style="list-style-type: none"> <li>• Gall bladder, biliary tree, common bile duct</li> <li>• Liver</li> <li>• Pancreas</li> <li>• Spleen</li> <li>• Bowel including Appendix, small bowel loops</li> <li>• Abdominal aorta</li> <li>• Kidneys</li> </ul> | <ul style="list-style-type: none"> <li>• Gall stones</li> <li>• Gall bladder inflammation ((wall thickening, surrounding fluid)</li> <li>• Biliary obstruction (duct dilatation)</li> <li>• Hepatomegaly</li> <li>• Fatty liver</li> <li>• Splenomegaly</li> <li>• Intestinal obstruction</li> <li>• Appendicitis</li> <li>• Peritoneal fluid</li> <li>• Mass/cyst/ Abscess</li> <li>• Abdominal aortic aneurysm</li> <li>• Kidney stones</li> </ul> |
| Urology (Adult/ Pediatrics)   | <ul style="list-style-type: none"> <li>• Kidneys</li> <li>• Ureter</li> <li>• Urinary Bladder</li> <li>• Uretero-vesicular junction</li> <li>• Prostate</li> </ul>   | <ul style="list-style-type: none"> <li>• Kidney, ureteral, bladder stones</li> <li>• Kidney length</li> <li>• Hydronephrosis</li> <li>• Bladder dysfunction</li> <li>• Pre-post Bladder volume</li> <li>• Bladder inflammation (wall and mucosal changes, calcifications)</li> <li>• Prostate size and volume</li> <li>• Mass/ cyst</li> <li>• Ureteral jets with color</li> </ul>   |

Table 7-9: Curved Array Transducer

| Clinical Application  | Anatomy   | Evaluation  |
|---|---|---|
| OB-GYN  | <ul style="list-style-type: none"> <li>• Uterus and endometrium</li> <li>• Ovaries</li> <li>• Cervix</li> <li>• Pouch of Douglas (POD)</li> <li>• Gestational Sac (GS)</li> <li>• Placenta</li> <li>• Amniotic fluid</li> <li>• Fetus(es)</li> </ul>                                    | <ul style="list-style-type: none"> <li>• GS location (Intra-uterine/ extra-uterine)</li> <li>• Fetal viability/ heart motion</li> <li>• Placenta position- (including low-lying and previa)</li> <li>• Fetal position and presentation</li> <li>• Amniotic fluid assessment</li> <li>• Cervical length measurement/ cervical insufficiency</li> <li>• Fetal well-being assessment: Biophysical profile (breathing, movements, tone, amniotic fluid)</li> <li>• Confirmation of fetal death</li> <li>• Intrauterine device position</li> <li>• Endometrial thickness measurement</li> <li>• Uterine/ adnexal mass/ cyst (fibroids, cysts)</li> <li>• Free fluid in Pouch of Douglas</li> </ul> |
| Lung/Thoracic (Adult/ Pediatrics)   | <ul style="list-style-type: none"> <li>• A-lines, B-lines, E-lines</li> <li>• Pleura</li> <li>• Lung tissue</li> <li>• Lung sliding</li> <li>• Lung point</li> </ul>  | <ul style="list-style-type: none"> <li>• Pneumothorax and hemothorax</li> <li>• Pleural Effusion</li> <li>• Lung consolidation <ul style="list-style-type: none"> <li>• Pneumonia/ pneumonitis</li> <li>• Pulmonary fibrosis</li> </ul> </li> <li>• Pulmonary interstitial and inflammatory disorders (Ex. ILD, COPD)</li> <li>• Acute respiratory distress syndrome</li> </ul>   |
| Cardiac and hemodynamic assessment (Adult/ Pediatrics*)<br><br><i>*Pediatric population for Cardiac application defined as minimum body weight 40 Kg and above.</i> | <ul style="list-style-type: none"> <li>• Heart (atria, ventricles, valves) including pericardium <ul style="list-style-type: none"> <li>• Subcostal view</li> </ul> </li> <li>• Inter-atrial and interventricular septum</li> <li>• Pulmonary arteries/ veins</li> <li>• IVC</li> </ul> | <ul style="list-style-type: none"> <li>• Pericardial fluid</li> <li>• LV and RV size and function</li> <li>• Valvular regurgitations/ stenosis</li> <li>• Volume status and responsiveness <ul style="list-style-type: none"> <li>• IVC size</li> <li>• Respiratory variation</li> </ul> </li> </ul>  |
| Musculoskeletal (Conventional) (Adult/ Pediatrics)  | <ul style="list-style-type: none"> <li>• Hip/knee/ Shoulder joints</li> <li>• Femur</li> <li>• Humerus/elbow</li> <li>• Tibia/fibula</li> <li>• Radius/ulna</li> <li>• Muscles</li> <li>• Ligaments</li> <li>• Tendons</li> <li>• Nerves</li> </ul>                                     | <ul style="list-style-type: none"> <li>• Fluid</li> <li>• Cyst/ Mass</li> <li>• Long bone fractures</li> <li>• Ligament and joint integrity</li> <li>• Tendon injuries (tendonitis, rupture/ tear)</li> <li>• Muscle tears</li> <li>• Peripheral nerve blocks</li> </ul>  |

Table 7-9: Curved Array Transducer

| Clinical Application                   | Anatomy  | Evaluation  |
|--|--|---|
| Procedure guidance (Adult/ Pediatrics) | <ul style="list-style-type: none"> <li>• Heart</li> <li>• Lung</li> <li>• Uterus</li> <li>• Abdomen</li> <li>• Thorax</li> <li>• Bladder</li> <li>• Nerve plexus</li> <li>• Hip/Knee/ Shoulder joints</li> </ul> | <ul style="list-style-type: none"> <li>• Fluid detection: Pericardial, Pleural, Peritoneal, Amniotic, Joints</li> <li>• Procedures: Thoracentesis, Paracentesis, Pericardiocentesis, Amniocentesis, Arthrocentesis</li> <li>• Foreign body visualization/ localization</li> <li>• Bladder catheterization</li> <li>• Nerve blocks</li> <li>• Biopsy</li> <li>• Placement and monitor position of tubes and catheters</li> </ul> |
| Protocols                              | <ul style="list-style-type: none"> <li>• Heart</li> <li>• IVC</li> <li>• Lungs</li> <li>• Abdomen</li> </ul>   | <ul style="list-style-type: none"> <li>• FAST</li> <li>• eFAST</li> <li>• BLUE</li> <li>• FASH</li> <li>• FASE</li> </ul>   |

### Linear Array (Shallow scanning) Transducer

*The linear array transducer on Vscan Air CL and the Vscan Air SL supports Black/white (B-mode), Color (Color doppler), Harmonic, M-mode and PW doppler modes. Vscan Air is indicated for ultrasound imaging, measurement, and analysis of the human body in clinical applications that include:*

Table 7-10: Linear Array Transducer

| Clinical Application                       | Anatomy  | Evaluation  |
|--|--|---|
| Peripheral Vascular (Adult and Pediatrics) | <ul style="list-style-type: none"> <li>• Arteries including Carotid, vertebral, subclavian, axillary, brachial, iliac, saphenous, popliteal, femoral</li> <li>• Veins including Jugular, subclavian, cephalic, basilic, saphenous, femoral, popliteal, tibial</li> </ul> | <ul style="list-style-type: none"> <li>• Deep vein thrombosis</li> <li>• Atherosclerosis- Intima media thickness, plaques, vessel occlusion/ stenosis</li> <li>• Subclavian Steel syndrome</li> </ul>   |
| Lung/ Thoracic (Adult / Pediatric)         | <ul style="list-style-type: none"> <li>• A-lines, B-lines, E-lines</li> <li>• Pleura</li> <li>• Lung tissue</li> <li>• Lung sliding</li> <li>• Lung point</li> </ul>   | <ul style="list-style-type: none"> <li>• Pneumothorax and hemothorax</li> <li>• Pleural Effusion</li> <li>• Lung consolidation                             <ul style="list-style-type: none"> <li>• Pneumonia/ pneumonitis</li> <li>• Pulmonary fibrosis</li> </ul> </li> <li>• Pulmonary interstitial and inflammatory disorders (Ex. ILD, COPD)</li> <li>• Acute respiratory distress syndrome</li> </ul> |

Table 7-10: Linear Array Transducer

| Clinical Application   | Anatomy   | Evaluation  |
|--|---|---|
| Small organs<br>(Adult/ Pediatric)   | <ul style="list-style-type: none"> <li>• Testes</li> <li>• Scrotum</li> <li>• Thyroid</li> <li>• Breast</li> <li>• Bowel</li> <li>• Abdominal wall</li> <li>• Skin</li> <li>• Subcutaneous tissue</li> <li>• Fascia</li> <li>• Lymph nodes</li> </ul>                               | <ul style="list-style-type: none"> <li>• Testicular torsion (size, echo-texture and vascularity)</li> <li>• Epididymo-orchitis</li> <li>• Fluid collection in scrotal sac</li> <li>• Hematomas, hernias</li> <li>• Breast nodules, mass, cyst</li> <li>• Abdominal wall masses, hernias</li> <li>• Thyroid nodules/cyst/mass/ diffuse enlargement</li> <li>• Bowel pathology (ex. appendicitis, diverticulitis, intestinal obstruction)</li> <li>• Pyloric stenosis/ Intussusception for pediatric patients</li> <li>• Soft tissue infection (cellulitis, abscess, bed sore)</li> <li>• Foreign body visualization/ localization</li> <li>• Cutaneous mass</li> </ul> |
| Musculoskeletal –<br>(Superficial and conventional)<br>(Adult/ Pediatrics) | <ul style="list-style-type: none"> <li>• Tendons</li> <li>• Muscles</li> <li>• Ligaments</li> <li>• Nerves</li> <li>• Long bones (ex. Humerus, Radius, Ulna, Femur, Tibia, Fibula)</li> <li>• Joints (Ankle, Shoulder, Knee, Elbow, Wrist)</li> <li>• Joint space/ bursa</li> </ul> | <ul style="list-style-type: none"> <li>• Tendon injuries (tendonitis, rupture/ tear)</li> <li>• Muscle tears</li> <li>• Long bone fractures</li> <li>• Carpal Tunnel syndrome</li> <li>• Fluid collection in joint space, muscles, bursae</li> <li>• Joint and ligaments integrity</li> <li>• Cyst/ Mass</li> <li>• Hip joint evaluation for neonates and infants</li> </ul>  |
| Nerves (Adult/<br>Pediatrics)  | <ul style="list-style-type: none"> <li>• Peripheral nerves including examples as Interscalene, supraclavicular, infraclavicular, axillary plexus, Median N, Radial N, Ulnar, Femoral, Popliteal, Tibial, Peroneal, Saphenous N</li> </ul>   | <ul style="list-style-type: none"> <li>• Peripheral nerve blocks</li> </ul>   |
| Neck and airway<br>(Adult / Pediatric)                                     | <ul style="list-style-type: none"> <li>• Cervical Lymph nodes</li> <li>• Trachea</li> <li>• Epiglottis, cricoid cartilage, cricothyroid membrane</li> <li>• Esophagus</li> <li>• Vocal folds</li> </ul>   | <ul style="list-style-type: none"> <li>• Neck masses</li> <li>• Airway assessment</li> <li>• Vocal cord dysfunction</li> </ul>  |

Table 7-10: Linear Array Transducer

| Clinical Application                    | Anatomy   | Evaluation  |
|---|---|---|
| Procedural guidance (Adult/ Pediatrics) | <ul style="list-style-type: none"> <li>• Thorax</li> <li>• Veins (including Jugular/ Subclavian/ Axillary/ Femoral / Brachial/ Basilic/ Cephalic)</li> <li>• Arteries (including femoral, radial, brachial, axillary, dorsalis pedis)</li> <li>• Peripheral nerves</li> <li>• Joints</li> <li>• Vertebral spaces</li> <li>• Skin and subcutaneous tissue</li> <li>• Trachea and surrounding structures</li> </ul> | <ul style="list-style-type: none"> <li>• Fluid detection and removal support: thoracentesis</li> <li>• Peripheral venous access</li> <li>• Central venous catheterization</li> <li>• Arterial access</li> <li>• Assessment and support of dialysis access</li> <li>• Nerve blocks</li> <li>• Joint aspiration and injections</li> <li>• Cyst aspiration</li> <li>• Biopsy</li> <li>• Abscess drainage</li> <li>• Foreign body visualization/ localization</li> <li>• Lumbar Puncture</li> <li>• Endotracheal tubes placement and confirmation</li> <li>• Support placement and monitor position of tubes and catheters</li> </ul> |
| Ophthalmic                              | <ul style="list-style-type: none"> <li>• Optic nerve sheath</li> <li>• Retina</li> <li>• Globe</li> <li>• Lens</li> </ul>   | <ul style="list-style-type: none"> <li>• Retinal detachment</li> <li>• Vitreous hemorrhage</li> <li>• Intra-ocular foreign body visualization</li> <li>• Globe rupture</li> <li>• Optic Nerve sheath diameter</li> <li>• Lens dislocation</li> </ul>  |
| Cephalic (Neonatal)                     | <ul style="list-style-type: none"> <li>• Fontanelle</li> <li>• Superficial and mid-superficial cranial structures</li> </ul>  | <ul style="list-style-type: none"> <li>• Gyral-sulcal anatomy</li> <li>• Superior sagittal sinus thrombosis</li> <li>• Cerebral edema</li> <li>• Extra-axial fluid collections</li> </ul>   |
| Protocols                               | <ul style="list-style-type: none"> <li>• Lungs</li> </ul>   | <ul style="list-style-type: none"> <li>• eFAST</li> <li>• BLUE</li> </ul>   |

## Sector Array (Deep scanning) Transducer

*The sector array transducer on Vscan Air SL supports Black/white (B-mode), Color (Color doppler), Harmonic, M-mode and PW doppler modes. Vscan Air is indicated for ultrasound imaging, measurement, and analysis of the human body in clinical applications that include:*

Table 7-11: Sector Array Transducer

| Clinical Application          | Anatomy  | Evaluation  |
|-------------------------------|--|---|
| Abdominal (Adult/ Pediatrics) | <ul style="list-style-type: none"> <li>• Gall bladder, biliary tree, common bile duct</li> <li>• Liver</li> <li>• Pancreas</li> <li>• Spleen</li> <li>• Bowel including Appendix, small bowel loops</li> <li>• Abdominal aorta</li> <li>• Kidneys</li> </ul> | <ul style="list-style-type: none"> <li>• Gall stones</li> <li>• Gall bladder inflammation ((wall thickening, surrounding fluid)</li> <li>• Biliary obstruction (duct dilatation)</li> <li>• Hepatomegaly</li> <li>• Fatty liver</li> <li>• Splenomegaly</li> <li>• Intestinal obstruction</li> <li>• Appendicitis</li> <li>• Peritoneal fluid</li> <li>• Mass/cyst/ Abscess</li> <li>• Abdominal aortic aneurysm</li> <li>• Kidney stones</li> </ul>  |
| Urology (Adult/ Pediatrics)   | <ul style="list-style-type: none"> <li>• Kidneys</li> <li>• Ureter</li> <li>• Urinary Bladder</li> <li>• Uretero-vesicular junction</li> <li>• Prostate</li> </ul>   | <ul style="list-style-type: none"> <li>• Kidney, ureteral, bladder stones</li> <li>• Kidney length</li> <li>• Hydronephrosis</li> <li>• Bladder dysfunction</li> <li>• Pre-post Bladder volume</li> <li>• Bladder inflammation (wall and mucosal changes, calcifications)</li> <li>• Prostate size and volume</li> <li>• Mass/ cyst</li> <li>• Ureteral jets with color</li> </ul>  |
| OB-GYN                        | <ul style="list-style-type: none"> <li>• Uterus and endometrium</li> <li>• Ovaries</li> <li>• Cervix</li> <li>• Pouch of Douglas (POD)</li> <li>• Gestational Sac (GS)</li> <li>• Placenta</li> <li>• Amniotic fluid</li> <li>• Fetus(es)</li> </ul>         | <ul style="list-style-type: none"> <li>• GS location (Intra-uterine/ extra-uterine)</li> <li>• Fetal viability/ heart motion</li> <li>• Placenta position- (including low-lying and previa)</li> <li>• Fetal position and presentation</li> <li>• Amniotic fluid assessment</li> <li>• Cervical length measurement/ cervical insufficiency</li> <li>• Fetal well-being assessment: Biophysical profile (breathing, movements, tone, amniotic fluid)</li> <li>• Confirmation of fetal death</li> <li>• Intrauterine device position</li> <li>• Endometrial thickness measurement</li> <li>• Uterine/ adnexal mass/ cyst (fibroids, cysts)</li> <li>• Free fluid in Pouch of Douglas</li> </ul> |

Table 7-11: Sector Array Transducer

| Clinical Application  | Anatomy  | Evaluation   |
|---|--|--|
| Lung/Thoracic (Adult/ Pediatrics)   | <ul style="list-style-type: none"> <li>• A-lines, B-lines, E-lines</li> <li>• Pleura</li> <li>• Lung tissue</li> <li>• Lung sliding</li> <li>• Lung point</li> </ul>   | <ul style="list-style-type: none"> <li>• Pneumothorax and hemothorax</li> <li>• Pleural Effusion</li> <li>• Lung consolidation                             <ul style="list-style-type: none"> <li>• Pneumonia/ pneumonitis</li> <li>• Pulmonary fibrosis</li> </ul> </li> <li>• Pulmonary interstitial and inflammatory disorders (Ex. ILD, COPD)</li> <li>• Acute respiratory distress syndrome</li> </ul>                    |
| Cardiac and hemodynamic assessment (Adult/ Pediatrics*)<br><br><i>*Pediatric population for Cardiac application defined as minimum body weight 40 Kg and above.</i> | <ul style="list-style-type: none"> <li>• Heart (atria, ventricles, valves) including pericardium                             <ul style="list-style-type: none"> <li>• Subcostal view</li> <li>• Apical 2-Chamber, Apical 3-Chamber, Apical 4-chamber, Apical 5-Chamber, parasternal view (long axis and short axis)</li> <li>• LVOT</li> </ul> </li> <li>• Inter-atrial and interventricular septum</li> <li>• Pulmonary arteries/ veins</li> <li>• IVC</li> </ul> | <ul style="list-style-type: none"> <li>• Pericardial fluid</li> <li>• LV and RV size and function</li> <li>• Systolic and Diastolic function</li> <li>• Valvular regurgitations/ stenosis</li> <li>• Volume status and responsiveness                             <ul style="list-style-type: none"> <li>• IVC size</li> <li>• Respiratory variation</li> </ul> </li> </ul>  |
| Musculoskeletal (Conventional) (Adult/ Pediatrics)  | <ul style="list-style-type: none"> <li>• Hip/knee/ Shoulder joints</li> <li>• Femur</li> <li>• Humerus/elbow</li> <li>• Tibia/fibula</li> <li>• Radius/ulna</li> <li>• Muscles</li> <li>• Ligaments</li> <li>• Tendons</li> <li>• Nerves</li> </ul>  | <ul style="list-style-type: none"> <li>• Fluid</li> <li>• Cyst/ Mass</li> <li>• Long bone fractures</li> <li>• Ligament and joint integrity</li> <li>• Tendon injuries (tendonitis, rupture/ tear)</li> <li>• Muscle tears</li> <li>• Peripheral nerve blocks</li> </ul>   |
| Adult cephalic/ Transcranial doppler  | <ul style="list-style-type: none"> <li>• Circle of Willis</li> <li>• Vertebrobasilar system/artery</li> <li>• Middle cerebral artery (MCA)</li> </ul>  | <ul style="list-style-type: none"> <li>• Stenosis</li> <li>• Cerebral vasculopathy</li> <li>• Vasospasms</li> <li>• Collateral pathways</li> <li>• Right to left shunts</li> <li>• Aneurysms</li> <li>• Positional vertigo</li> <li>• Cerebral microemboli</li> <li>• Ischemic stroke</li> </ul>   |
| Procedure guidance (Adult/ Pediatrics)  | <ul style="list-style-type: none"> <li>• Heart</li> <li>• Lung</li> <li>• Uterus</li> <li>• Abdomen</li> <li>• Thorax</li> <li>• Bladder</li> <li>• Nerve plexus</li> <li>• Hip/Knee/ Shoulder joints</li> </ul>   | <ul style="list-style-type: none"> <li>• Fluid detection: Pericardial, Pleural, Peritoneal, Amniotic, Joints</li> <li>• Procedures: Thoracentesis, Paracentesis, Pericardiocentesis, Amniocentesis, Arthrocentesis</li> <li>• Foreign body visualization/localization</li> <li>• Bladder catheterization</li> <li>• Nerve blocks</li> <li>• Biopsy</li> <li>• Placement and monitor position of tubes and catheters</li> </ul> |

Table 7-11: Sector Array Transducer

| Clinical Application | Anatomy   | Evaluation  |
|----------------------|---|---|
| Protocols            | <ul style="list-style-type: none"><li>• Heart</li><li>• IVC</li><li>• Lungs</li><li>• Abdomen</li></ul> | <ul style="list-style-type: none"><li>• FAST</li><li>• eFAST</li><li>• BLUE</li><li>• FASH</li><li>• FASE</li></ul> |

**Disclaimer:** *Ophthalmic is not available in Japan and China.*







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