

M164-1 Cardiac sound / Breath sound Simulator

SAKAMOTO Auscultation Simulator 2

User's Manual



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(Refer to the following page for a detailed Table of Contents.)

You can view this product's introductory page on our company's website by using either the following URL or the QR code* at right.

●Sakamoto Model Corporation's Introductory page for the "SAKAMOTO Auscultation Simulator 2"
<http://www.sakamoto-model.co.jp/product/nursing/m164/>

* QR code is a registered trademark of Denso Wave Inc.



SAKAMOTO MODEL
C O R P O R A T I O N

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1 Introduction

Thank you very much for purchasing the "Sakamoto Auscultation Simulator 2".

This user's manual contains cautions and notes on how to use this product safely. Please read this manual carefully in order to ensure that you know how to use the product safely.

In addition, after reading the manual, keep it in a safe place where it can be referred to at any time later on.

After purchasing the product, check the package contents carefully to make sure that nothing is missing or broken. If you notice any problems, contact Sakamoto Model.


■ About this user's manual


● If you have any questions

If you have understood the basic method of use but have any points that you are not sure of during actual use of this product, first refer to "9 Frequently-asked questions" (P.74). If you are still not sure about the correct operation, please contact Sakamoto Model.

● Cautions and other symbols

This manual uses the following symbols to indicate cautions on handling and other information which may be useful to know during use.

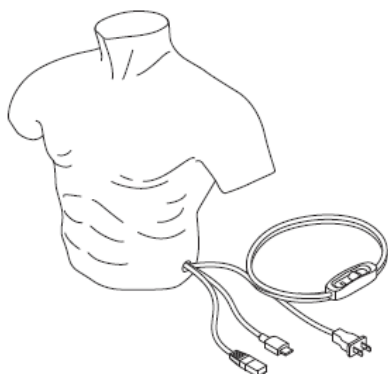
	This indicates a caution that applies when using the product. If the instructions listed are not followed, personal injury or damage to the product or other equipment may result.
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	This indicates information which may be useful to know during use, or which should be taken note of in order to use the product properly.
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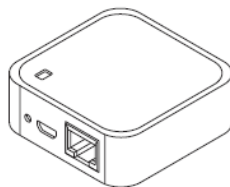
● About illustrations

For reasons such as product improvements, the illustrations which appear in this manual may differ in some parts from the product which you have. The details in the instructions will not have changed, so please follow the instructions.

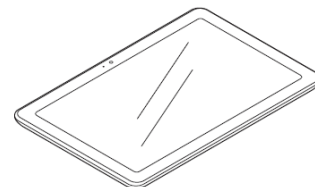
2 Product contents



Body



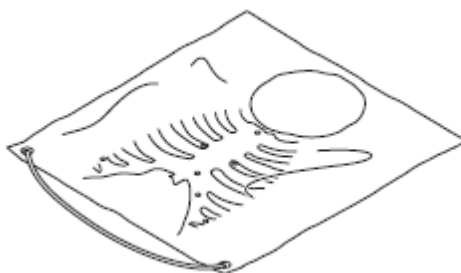
Router



Tablet



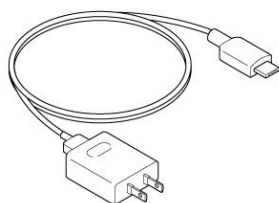
External speaker



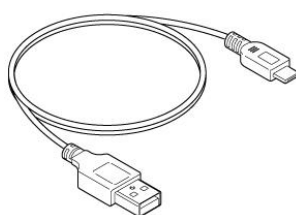
Chest cover



Stethoscope
* Double-head type



Tablet charging cable



External speaker charging cable



Baby powder

3 Cautions on use

In order to use this product safely, be sure to observe the following. (Items which are particularly important are marked with "■".)

■ Body

The body has a skin which is made of silicone, and inside the body are several mechanical parts which include precision devices. Be sure to note the following during handling.

- **Do not subject the body to severe impacts or other forces.**

- Do not drop.
- Do not bump against solid objects.
- Do not apply excessive loads.

If any of the above occur, damage may result.

- **Do not get the product wet or immerse it into water.**

The body is not designed to be waterproof, so do not place it into water or get it wet, otherwise it will become damaged.

- **Do not write on the body with items such as ballpoint pens.**

If you write on the body using a ballpoint pen or similar object, the surface of the body will become smeared with ink which cannot be removed.

- **Do not touch against printed items.**

If the body is placed on top of or wrapped in printed items such as newspapers and books, the body may become imprinted with ink which cannot be removed.

■ Tablet

- **Do not use the tablet for other applications.**

If the tablet is used for other applications, problems may occur when using it to operate this product. In addition, do not install security software to the tablet or use it to connect to any Wi-Fi devices other than to this product's router.

- **Handle the tablet's screen carefully.**

Do not press the tablet's screen (touch panel) too firmly or use sharp objects such as fingernails or ballpoint pens to operate it. It will damage the tablet.

■ General product handling

- **Do not process or modify the product.**

Do not make holes in the product, or process or modify it so that other items can be installed to it, etc. Damage or unexpected problems may occur.

- **Do not use continuously for long periods.**

As a means to protect the product, avoid using it for long periods of time. (No more than 5 hours at a time is recommended.)

- **Do not pull the cables with excessive force.**

When disconnecting the product's various cables, always be sure to hold the cables by the connectors, and pull them out gently. When disconnecting cables, do not hold the cables themselves, and do not apply excessive force to the cables, otherwise damage or problems with operation may occur.

- **Hold the power cable by the plug when disconnecting it.**

When disconnecting the power cable from the wall outlet, hold it by the plug, not by the cable itself. If you hold by the cable when disconnecting it, the cable may become damaged, and it may lead to electric shocks or fire occurring. In addition, do not connect or disconnect the cable with wet hands.

- **If you notice any problems when using the product, stop using it.**

If problems occur with the product during use, stop using it, turn off the power, and disconnect the power cable from the electrical outlet. Then contact Sakamoto Model. If you continue using the product, accidents may result.

- **Do not store in places which are exposed to high temperatures, high levels of humidity or large amounts of dust.**

If the product is stored in a place which is exposed to direct sunlight, near heating appliances or in places with large quantities of oil, moisture or dust, discoloration or deterioration may occur.

- **There are limits to the effectiveness of simulator training.**

This product is a simulator capable of supporting advanced medical training. However, Sakamoto Model does not guarantee that training using this product will provide the same level of expertise as actual treatment.

- **Do not use this product for other applications.**

Do not use this product for applications other than the original application for which it is designed. The product may become damaged or injury may result.

4 Product applications

4-1 Outline of Functions

The Sakamoto Auscultation Simulator 2 lets you reproduce the characteristics of the breathing sounds and heart sounds inside the chest model by operating the model using the tablet. Below are descriptions of each function.

(1) Auscultation of breathing sound

Sounds are generated from the airway and the left and right lungs. Use the accessory stethoscope to carry out auscultation.

The breathing sound can be selected from 12 types, and the volume can also be adjusted. In addition, the breathing rate can be changed within the range of 10 - 40 times per minute or 30 - 60 times per minute in increments of 5.

(2) Auscultation of heart sound

Heart sounds are generated from the left and right cardiac base, the left edge of the sternum and the cardiac apex. Use the accessory stethoscope to carry out auscultation.

The heart sounds can be selected from 20 types, and the volume can also be adjusted. In addition, the heart rate can be changed within the range of 30 - 140 times per minute in increments of 10.

(3) External output of sounds

Breathing sounds and heart sounds can be output from the tablet and the external speaker regardless of whether or not there is a Wi-Fi connection to the body. These can be used as audio samples at times such as during classes.

(4) Saving and loading memory files

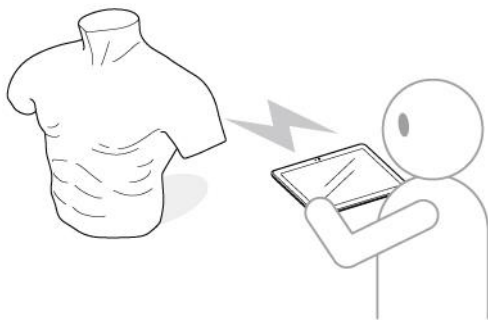
The setting values for all of the above items can be saved together as a single memory file. Up to five memory files can be saved, and the titles of each memory file can also be changed.

4-2 Training Examples

This section gives a brief explanation of the flow of training using the Auscultation Simulator 2.

● Example of training for checking breathing sound

The breathing sound and breathing rate for the Auscultation Simulator 2 are set using the tablet.

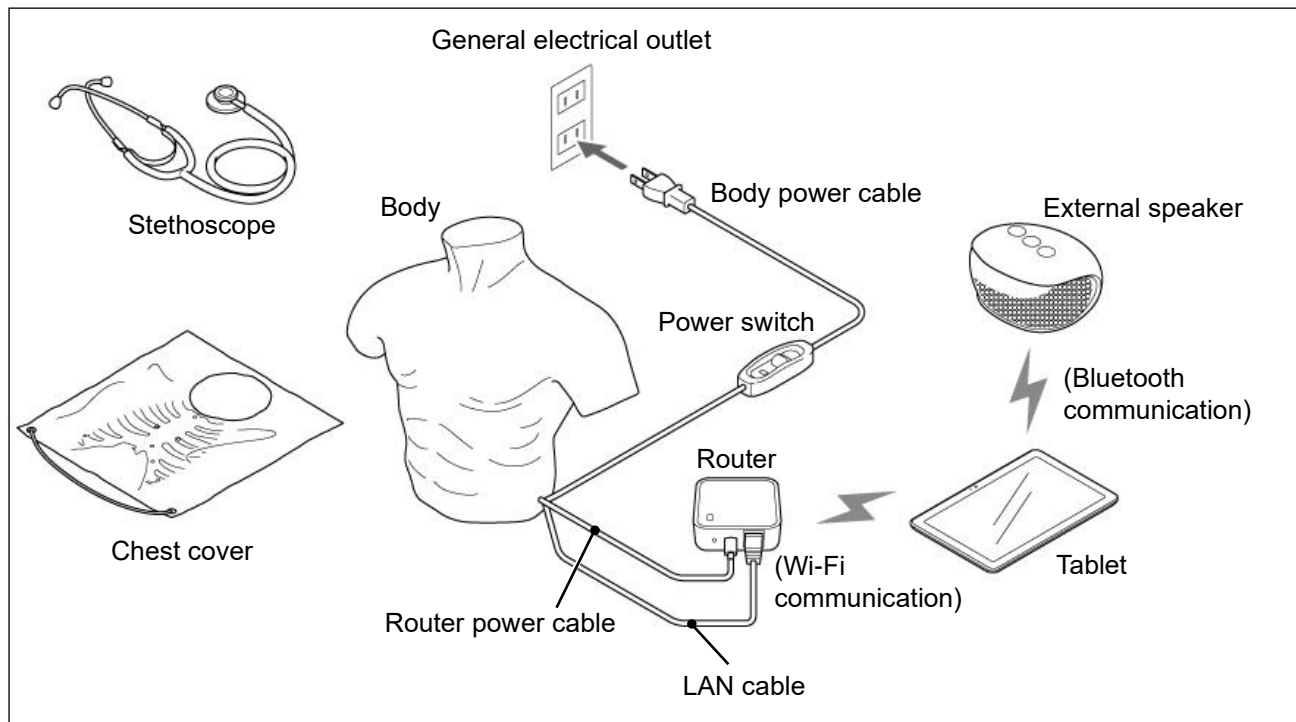


The trainee checks the breathing sound of the Auscultation Simulator 2.



5 Part names / Overall connection diagram

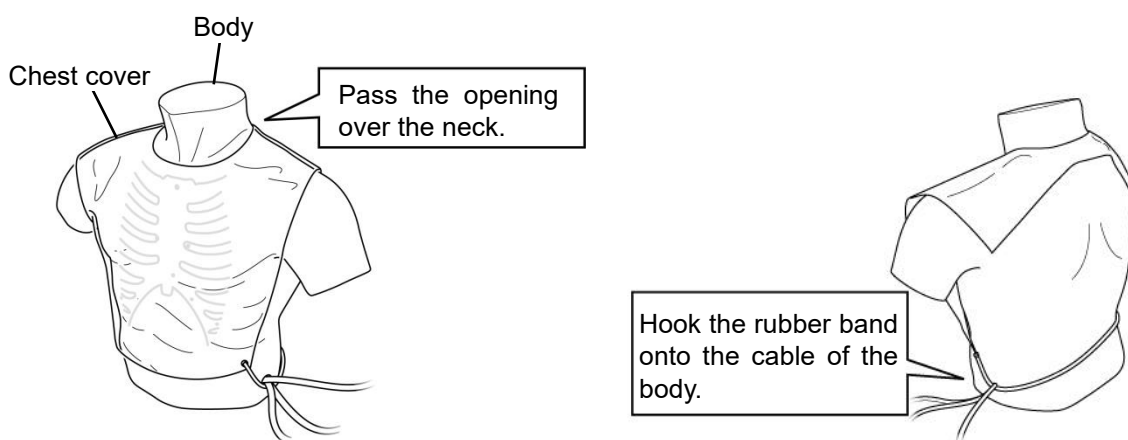
The names of each part and the overall connection diagram are given below. The overall connection diagram shows the product with the various parts connected in preparation for use. Refer to this diagram while carrying out the steps in "6 Preparation" (P.50).



<Installing the chest cover>

The points for carrying out auscultation are marked on the chest cover so that the points can be easily located when the chest cover is placed onto the body. Use the chest cover if necessary when carrying out training.

Place the chest cover onto the body as shown in the diagram below.



6 Preparation

To prepare the product for use, connect the cables from the body to the router, turn on the power, and then enable the connections for the tablet and external speaker.

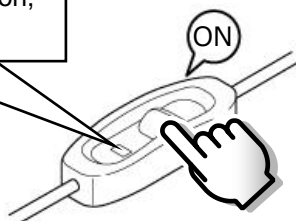
- 1 Refer to "5 Part names / Overall connection diagram" (P.49) while making the connections.

TIP

When disconnecting the router from the body, follow the procedures given in "Disconnecting the router" in "8 Cleaning and storage" (P.72).

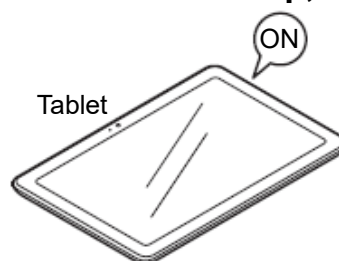
- 2 Turn on the power switch of the body.

When the power has turned on, the indicator will illuminate.



- 3 Turn on the power switch of the tablet.

After the router and the tablet have started up, the Wi-Fi connection will be enabled.



CAUTION

Do not use the tablet for other applications. If the tablet is used for other applications, problems may occur when using it to operate this product. In addition, do not install security software to the tablet or use it to connect to any Wi-Fi devices other than to this product.

TIP

- The Wi-Fi connection between the tablet and the body is enabled at the time of purchase.
- The Wi-Fi connection will not be enabled while the router is still starting up (while the indicator is flashing). Wait until the indicator lights steadily.
- If the Wi-Fi connection is not enabled even after the router has finished starting up, (the indicator is illuminated), connect the Wi-Fi while following the procedure in "Wi-Fi connection is not enabled" (P.51).

- 4 (Using the external speaker)**
Turn on the power switch of the external speaker.

Bluetooth communication with the tablet will be enabled.

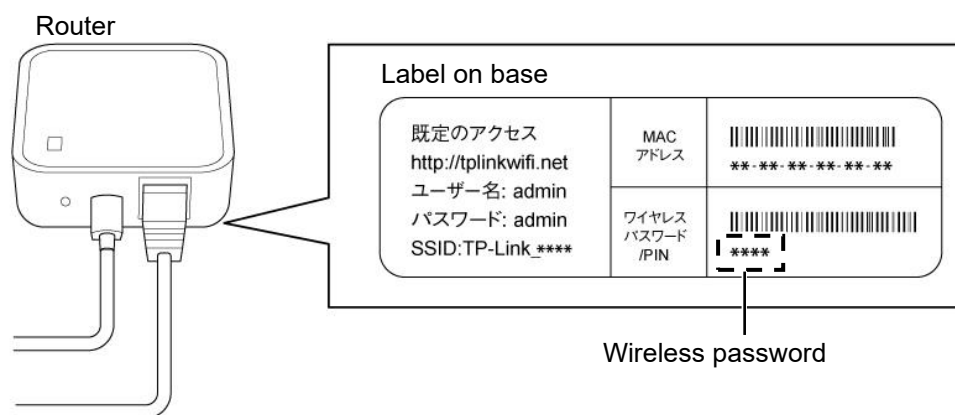


TIP

The Bluetooth connection between the tablet and the external speaker is enabled at the time of purchase.

<Wi-Fi connection is not enabled>

- 1** Check the wireless password which is written on the label on the base of the router.



TIP

The content of the characters on the label may vary from the above diagram depending on the specifications of the router.

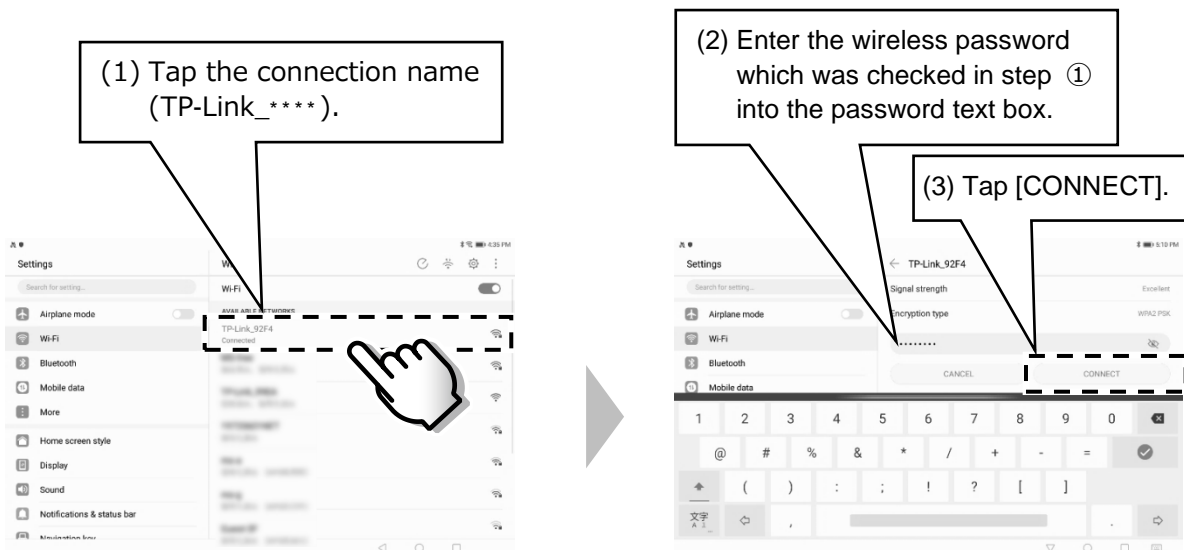
2 Tap [Settings] on the tablet. ▶ Tap [Wi-Fi].



TIP

- For details on basic operation of the tablet, refer to "7-1 Basic Tablet Operations" (P.54).
- The screen displays may differ slightly depending on the specifications of the tablet and the OS.

3 Connect by following the procedure given below.



TIP

The "****" part varies for each product.

- 4** Return to the home screen, and tap ["ちょうしん"くん].



7 How to use

This section explains the operating method for each function, and how to proceed with training. These explanations describe how to use the product once all of the steps listed in "6 Preparation" (PP.50 - 53) have been completed and the product has been turned on.

7-1 Basic Tablet Operations

Operation of this product is carried out using the tablet. When you directly tap the buttons, etc. which are displayed on the tablet screen with your finger, the screen reacts so that you can enter the operation you would like to carry out.

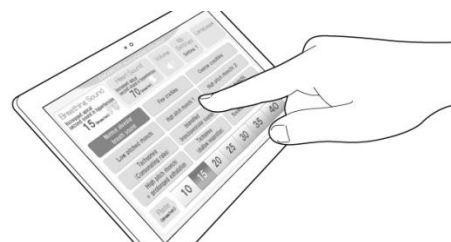
This describes the basic terms and methods for operating the product using the tablet.

TIP

The tablet screen displays are taken from when the product was in development. They may differ slightly from actual displays, but the method of operation is the same.

(1) Tap

This is the most basic operation. Gently tap the tablet screen with your finger at the place where you would like to carry out an operation.



(2) Slide

Touch the tip of your finger against a control on the tablet screen, and then slide your finger while still pressing down. This is used at times such as when adjusting the volume ("7-4 Volume adjustment and external output" (P.61) etc.)



(3) Character input

Use the keyboard which is displayed on the tablet screen to enter characters in the same way as an actual keyboard. This is used at times such as described in "7-6 Saving and Loading Memory Files" (P.65).



7-2 Auscultation of Breathing Sound

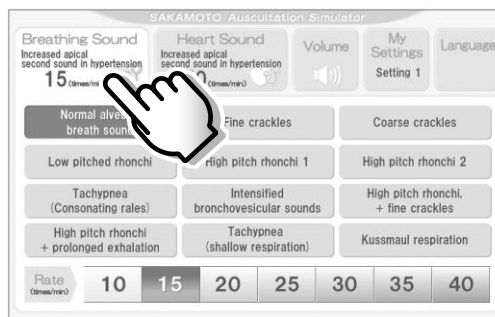


TIP

The tablet screen displays are taken from when the product was in development. They may differ slightly from actual displays, but the method of operation is the same. (All text is the same from this point onward.)

◆Operating method

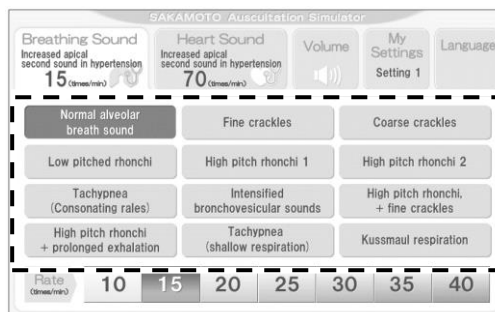
1 Tap [Breathing Sound] on the tablet screen.



TIP

Be sure to carry out the next step (②), even if the breathing sound which you would like to set is already selected (the button is highlighted) at this time. (This is because the setting is linked to the body operation.)

2 Tap the breathing sound which you would like to use. (There are 12 choices available.)

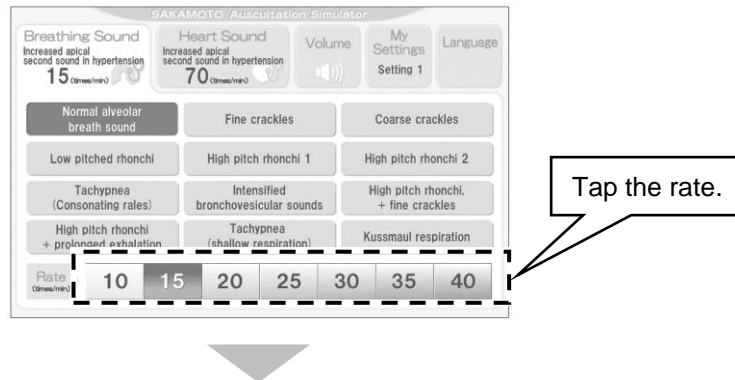


Tap the breathing sound.

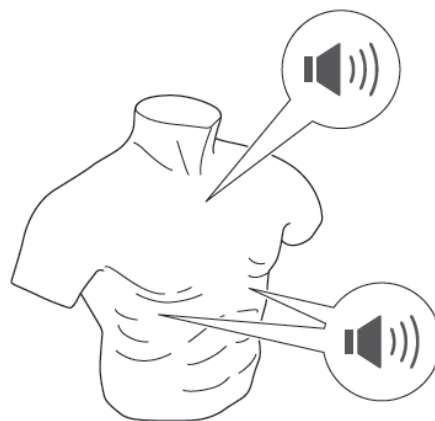
TIP

Be sure to carry out the next step (③), even if the rate which you would like to set is already selected (the button is highlighted) at this time. (This is because the setting is linked to the body operation.)

- 3** Tap the rate which you would like to set. (The rate can be set within the range of 10 - 40 times per minute or 30 - 60 times per minute in increments of 5.)



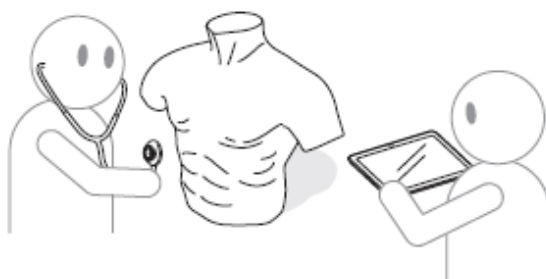
The breathing sound will come from the airway and the left and right lungs of the body.



TIP

- The available rate selections will vary depending on which breathing sound was selected in step ②. The selection will be 30 - 60 times per minute when "Tachypnea (Consonating rales)" or "Tachypnea (shallow respiration)" is set, and it will be 10 - 40 times per minute for all other settings.
- Either step ② or step ③ can be carried out first. However, note that the available selections for the rate will vary depending on which breathing sound has been selected.

- 4** Use the accessory stethoscope for training.



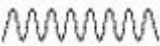
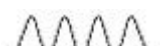
TIP

- The back of the body cannot be used for auscultation.
- A commercially-available stethoscope can also be used.

◆Types of breathing sound that can be set

This product has 12 different types of breathing sound to choose from as shown in the table below.

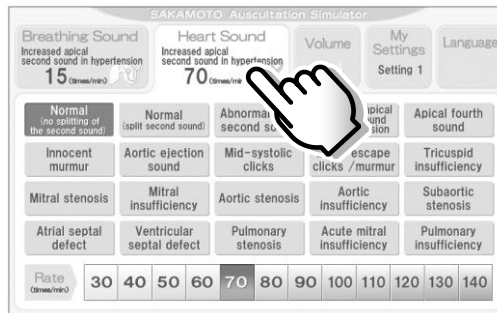
List of "SAKAMOTO Auscultation Simulator 2" breathing sounds and their characteristics

	Tablet display name	Major classification	Minor classification	Ailment
1	Normal alveolar breath sound	Normal alveolar breath sound	-	Normal
2	Fine crackles	Intermittent rales (moist rales)	Fine crackles	Interstitial pneumonia, pulmonary fibrosis / pulmonary edema
3	Coarse crackles	Intermittent rales (moist rales)	Coarse crackles	Pulmonary edema, pneumonia, alveolar effusion
4	Low pitched rhonchi	Continuous rales (dry rales)	Low pitched rhonchi (sonorous rhonchi)	Stenosis of middle-large bronchi, bronchial secretion
5	High pitch rhonchi 1	Continuous rales (dry rales)	High pitch rhonchi 1, wheeze	Bronchiolar stenosis, bronchial asthma
6	High pitch rhonchi 2	Continuous rales (dry rales)	High pitch rhonchi 2, wheeze	Bronchiolar stenosis, bronchial asthma
7	Tachypnea (Consonating rales)	Tachypnea	(Consonating rales)	Nervous dyspnea
8	Intensified bronchovesicular sounds	Intensified bronchovesicular sounds	-	Resting dyspnea
9	high pitch rhonchi + fine crackles	Continuous rales (dry rales) + intermittent rales (moist rales)	High pitch rhonchi, wheeze + fine crackles	Cardiac asthma
10	High pitched rhonchi + prolonged exhalation	Continuous rales (dry rales)	High pitch rhonchi, wheeze + prolonged exhalation	Bronchial asthma
11	Tachypnea (shallow respiration)	Abnormal respiratory pattern	Tachypnea (shallow respiration)  60 times / min	Central hyperpnea (midbrain disorder) hyperventilation syndrome
12	Kussmaul respiration	Abnormal respiratory pattern	Kussmaul respiration  36 times / min	Diabetic ketoacidosis, uremia

7-3 Auscultation of Heart Sound

◆Operating method

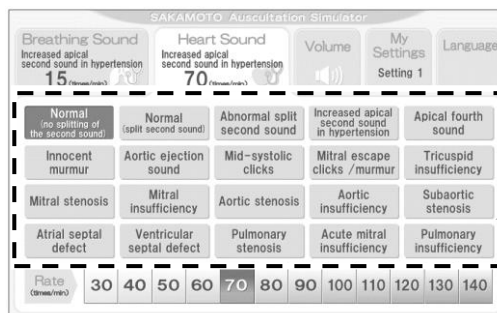
- 1 Tap [Heart Sound] on the tablet screen.



TIP

Be sure to carry out the next step (②), even if the heart sound which you would like to set is already selected (the button is highlighted) at this time. (This is because the setting is linked to the body operation.)

- 2 Tap the heart sound which you would like to use.
(There are 20 choices available.)

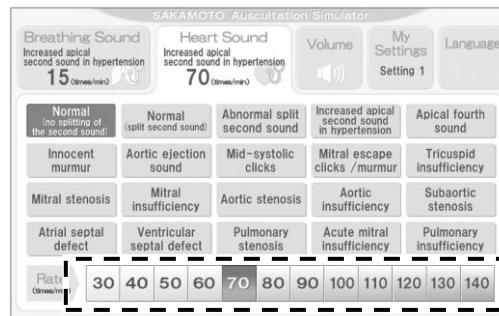


Tap the heart sound.

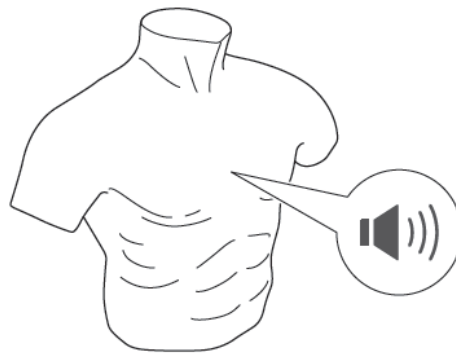
TIP

Be sure to carry out the next step (③), even if the rate which you would like to set is already selected (the button is highlighted) at this time. (This is because the setting is linked to the body operation.)

- 3** Tap the rate which you would like to set. (The rate can be set within the range of 30 - 140 times per minute in increments of 10.)



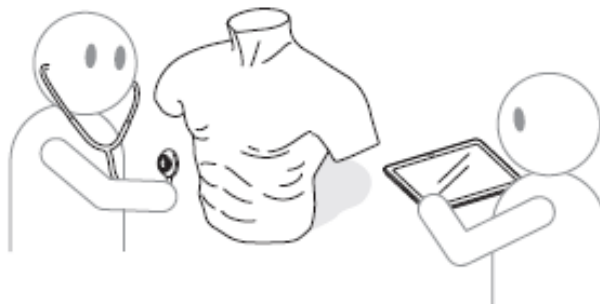
The heart sound will come from the left and right cardiac base, the left edge of the sternum and the cardiac apex.



TIP

Either step ② or step ③ can be carried out first.

- 4** Use the accessory stethoscope for training.



TIP

A commercially-available stethoscope can also be used.

◆Types of heart sound that can be set

This product has 20 different types of heart sound to choose from as shown in the table below.

List of "SAKAMOTO Auscultation Simulator 2" heart sounds and their characteristics

1	Normal (no splitting of the second sound)
2	Normal (split second sound)
3	Abnormal split second sound
4	Increased apical second sound in hypertension
5	Apical fourth sound
6	Innocent murmur
7	Aortic ejection sound
8	Mid-systolic clicks
9	Mitral escape clicks / murmur
10	Tricuspid insufficiency

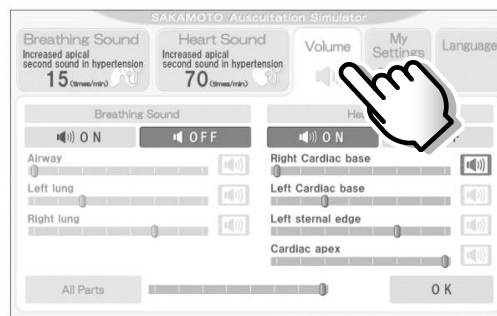
11	Mitral stenosis
12	Mitral insufficiency
13	Aortic stenosis
14	Aortic insufficiency
15	Subaortic stenosis
16	Atrial septal defect
17	Ventricular septal defect
18	Pulmonary stenosis
19	Acute mitral insufficiency
20	Pulmonary insufficiency

7-4 Volume Adjustment and External Output

The following breathing sound and heart sound operations can be carried out at the [Volume] screen.

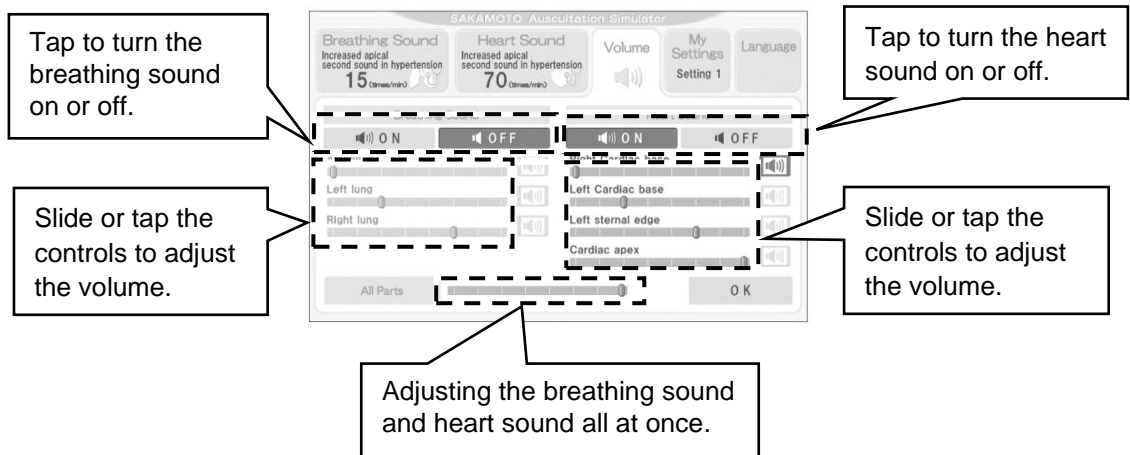
- * Turning sounds on and off (Breathing sound and heart sound can be switched separately.)
- * Adjusting sound volume (Each emitting location can be adjusted separately.)
- * Adjusting all volume settings at once
- * Switching sound output to tablet or external speaker

1 Tap [Volume] on the tablet screen.

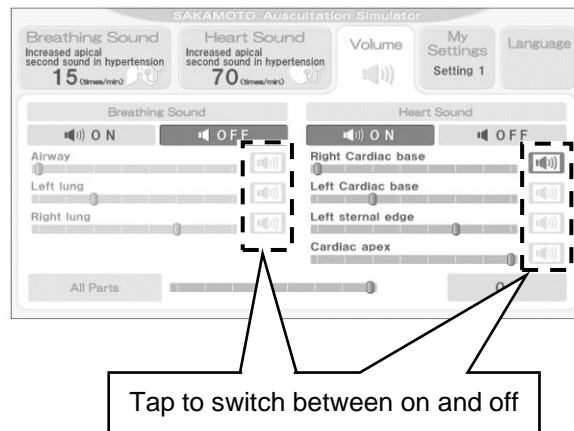


2 Set and adjust using the "Volume" screen.

〈Adjusting the volume〉



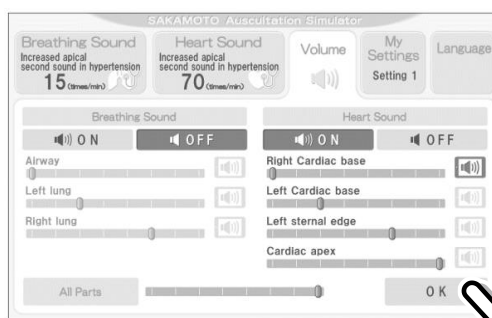
〈Switching sound output for tablet (and external speaker)〉



TIP

- You can use "All Parts" to adjust all of the breathing sounds and heart sounds at the same time.
- If the breathing sounds or heart sounds have been switched off, adjustment using the respective controls, switching the tablet output on and off and adjusting these sounds at the same time as other sounds will no longer be possible.
- If the power for the external speaker is turned on while sound has been set to be output from the tablet, the sound output will switch to the external speaker instead of the tablet.
- Use the volume adjustment function for the tablet or external speaker to adjust the volume of the sound coming out from the tablet or the external speaker.
- The breathing sounds and heart sounds can be played from the tablet and the external speaker, but these sounds cannot be output from both simultaneously. Furthermore, sounds from multiple locations on the body cannot be output simultaneously.

3 Tap [OK]. ▶ The settings and adjustments will be applied to the body.



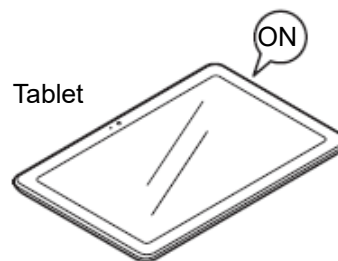
TIP

If you do not tap [OK], the settings and adjustments will not be applied to the body.

7-5 Playing Sounds Independently from the Tablet

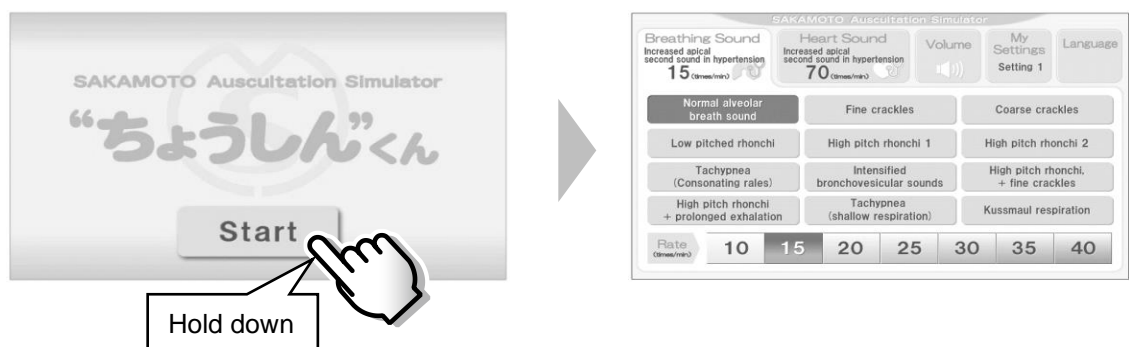
You can output breathing sounds and heart sounds from the tablet independently, without turning on the power for the body. The sounds can also be output from the external speaker.

- 1 Turn on the power switch of the tablet.

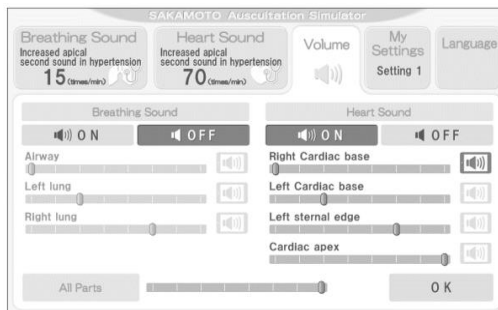


- 2 At the Auscultation Simulator 2 startup screen, hold down the [Start] button.

The operating screen will appear.



- 3** The same operations can be carried out as if the power for the body is turned on. (However no sounds will be output from the body.)



TIP

- If the external speaker is turned on, the sounds will be output from the external speaker.
- The breathing sounds and heart sounds can be played from the tablet and the external speaker, but these sounds cannot be output from both simultaneously. Furthermore, sounds from multiple locations on the body cannot be output simultaneously.

7-6 Saving and Loading Memory Files

The setting values for all items which have been set using the tablet can be saved together as a single memory file.

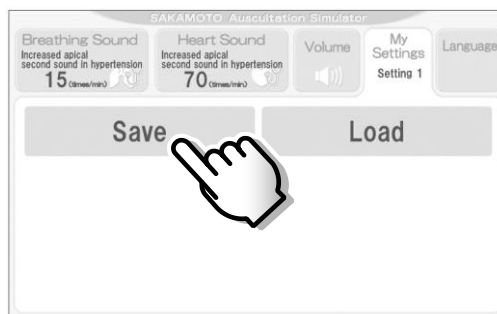
Up to five memory files can be saved, and the titles of each memory file can also be changed.

◆Saving memory files

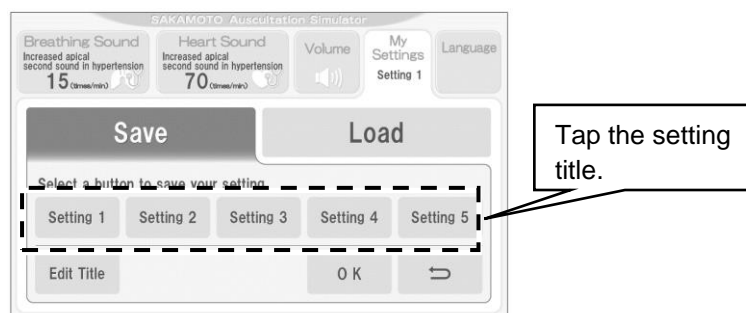
- 1 Tap [My Settings] on the tablet screen.



- 2 Tap [Save].



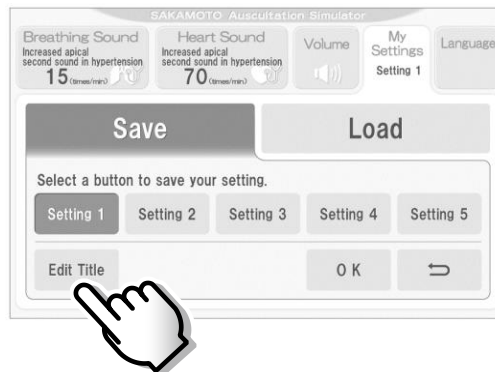
- 3 Tap the setting title for the saving destination.



● TIP

The initial setting titles are "Setting 1" to "Setting 5".

- 4 To change the setting title, tap [Edit Title].**



TIP

The setting title can also be changed afterwards.

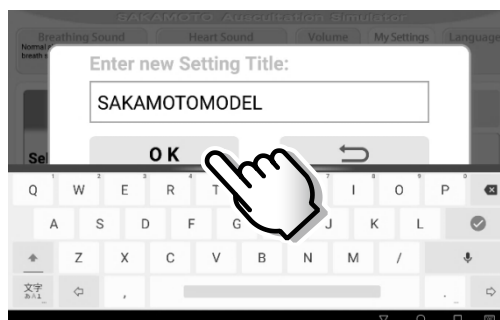
- 5 Tap the text box in the input screen.**

The keyboard will appear.




- 6 Enter the new setting title, and then tap [OK].**

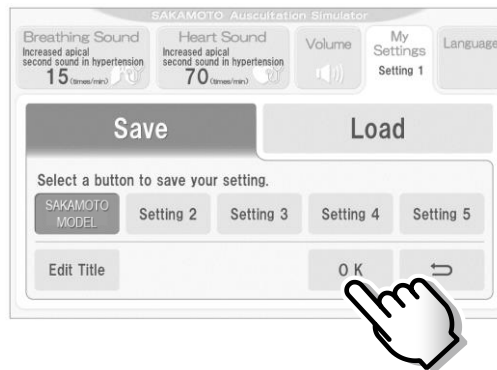
The setting title will be changed.



TIP

Tap [] to return to the previous screen without saving the setting title.

- 7** Tap [OK]. ▶ The settings will then be saved.

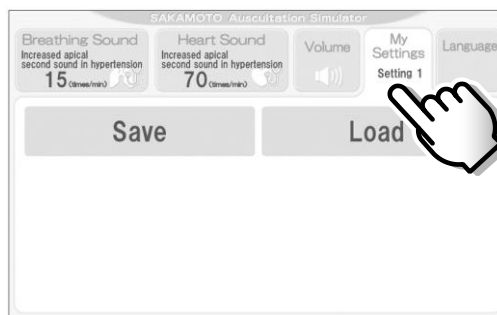


TIP

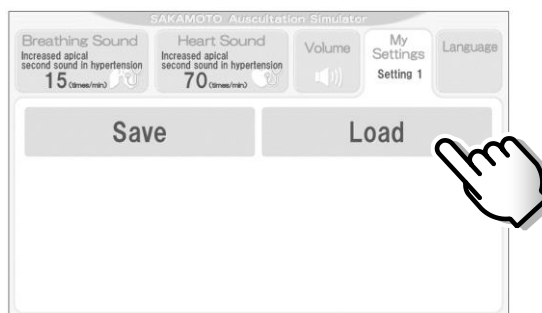
Up to five different groups of settings can be saved. In addition, the settings cannot be saved onto external media such as a USB drive.

◆Loading memory files

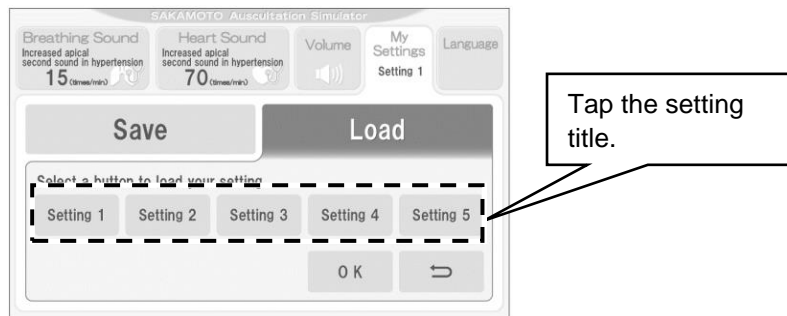
- 1** Tap [My Settings] on the tablet screen.



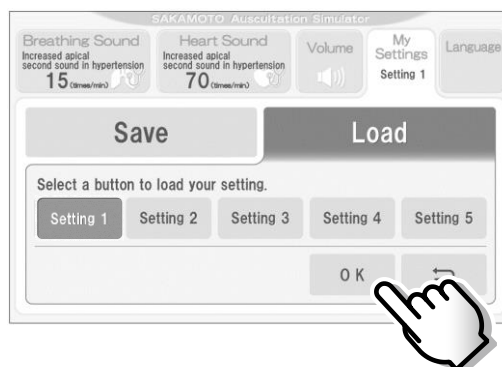
- 2** Tap [Load].



3 Tap the setting title for the loading source.



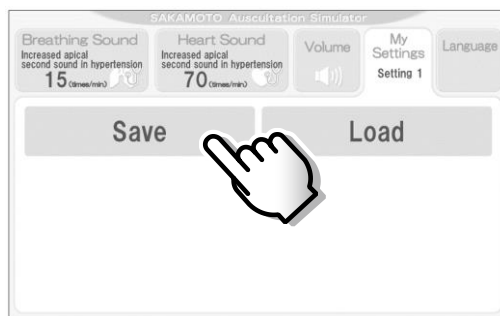
4 Tap [OK]. ▶ The settings will then be loaded.



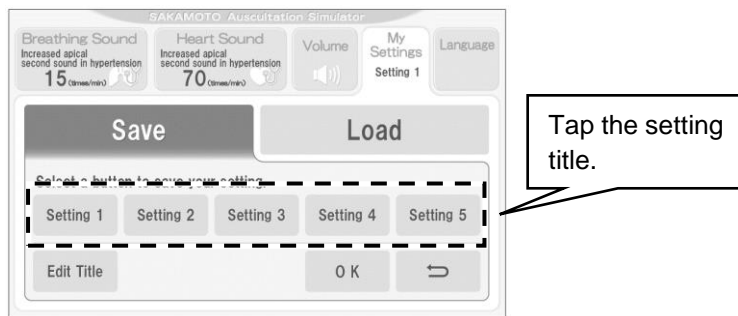
◆Changing the setting titles

To change a setting title after settings have been saved, carry out the following steps.

1 Tap [My Settings] ▶ [Save].



- 2 Tap the setting title which you would like to change.



- 3 Tap [Edit Title].



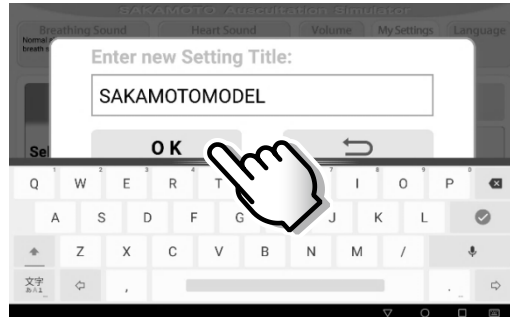
- 4 Tap the text box in the input screen.

The keyboard will appear.



5 Enter the new setting title, and then tap [OK].

The setting title will be changed.



TIP

Tap [↩] to return to the previous screen without saving the setting title.

6 Tap [↩].



TIP

If you tap [OK], the setting will be overwritten, so tap [↩] here instead.

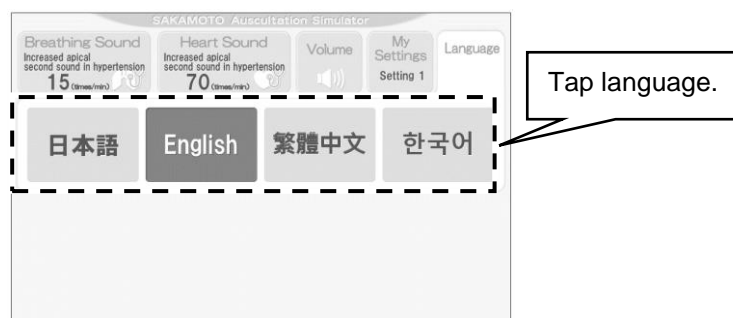
7-7 Setting the Language

The language for tablet screen operations can be switched between Japanese, English, Chinese (Traditional) and Korean.

1 Tap [Language].



2 Tap the language which you would like to set.



8 Cleaning and storage

■ Once training is finished

Be sure to observe the following points when leaving the product after training is finished.

(Be sure to read the instructions in "When storing for long periods" also.)

- **Disconnect the power cables.**

When not using the product or when cleaning or storing it away, be sure to turn off the power switch for the body and disconnect the power cable.

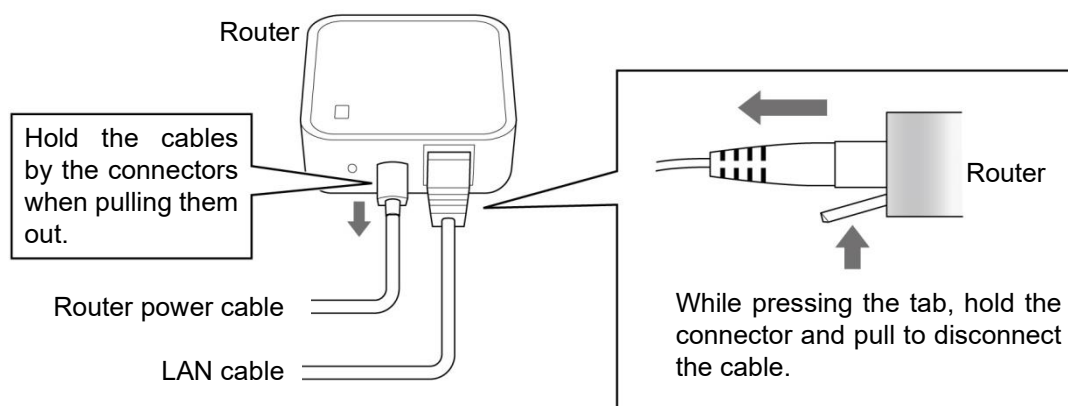
- **Turn off the power supply for the tablet and the external speaker.**

When not using the product or when cleaning or storing it away, turn off the power switches of the tablet and the external speaker.

- **Disconnecting the router**

It is not necessary to disconnect the router from the body after using the product, but take care not to subject the router to shocks or bend the cable with excessive force when transporting the body.

If disconnecting the router, pull out the cables according to the diagram below.



■ When storing for long periods

When not using the product for long periods, clean it carefully and store it away while being sure to observe the following. (Be sure to read the instructions in "Once training is finished" also.)

- **To clean the body, use a soft cloth to gently wipe the surface.**

- If it is extremely dirty, wipe it with a cloth which has been moistened with diluted alcohol, and then wipe it again with a dry cloth.
- Do not use benzine, thinner or other solvents. In addition, do not apply alcohol directly to the surface. It may damage the product or cause the surface to deteriorate.
- If you write on the body using a ballpoint pen or similar object, the surface of the body will become smeared with ink which cannot be removed.

- **Do not get the product wet or immerse it into water.**

The body is not designed to be waterproof, so do not place it into water or get it wet, otherwise it will become damaged.

- **Coat the body with baby powder to protect it and to stop it from becoming sticky.**

If not using the product for a long period of time or if the body is sticky, coat it with the accessory baby powder.

- **Do not store in places which are exposed to high temperatures, high levels of humidity or large amounts of dust.**

If the product is stored in a place which is exposed to direct sunlight, near heating appliances or in places with large quantities of oil, moisture or dust, discoloration or deterioration may occur.

9 Frequently-asked questions

The following table contains a list of frequently-asked questions and their answers.

Question			Answer	Reference page
Function	No.	Content		
Auscultation of Breathing Sound	1	What numbers can be set for the breathing rate?	<p>Breathing rate value:</p> <ul style="list-style-type: none"> • When the "Breathing Sound" selection is "Tachypnea (Consonating rales)" or "Tachypnea (shallow respiration)", the setting can be between 30 - 60 times per minute in increments of 5. • For all settings other than the above, the setting can be between 10 - 40 times per minute in increments of 5. 	"7-2 Auscultation of Breathing Sound" (P.55)
	2	Where on the body can the breathing sound be listened to?	<p>Over the whole of the chest.</p> <p>Furthermore, there are three speakers : one is built into each of the airway, left lung and right lung.</p>	"7-2 Auscultation of Breathing Sound" (P. 55)
	3	Can the back of the body be used for auscultation?	No, it cannot. Auscultation can only be carried out at the chest area	"7-2 Auscultation of Breathing Sound" (P. 55)
Auscultation of Heart Sound	4	Does the heart sounds change depending on the location used for auscultation?	<p>It does change.</p> <p>The four built-in speakers all emit different sounds, so the sounds do change depending on the auscultation position.</p>	"7-3 Auscultation of Heart Sound" (P.58)

10 Troubleshooting

No.	Symptom or problem	Remedy	Reference page
1	The body does not operate correctly.	Check that the body power cable is securely inserted into an electrical outlet.	"5 Part names / Overall connection diagram" (P.49)
		Check that the power switch of the body is turned on.	"6 Preparation" (P.50)
2	The screen does not move on from the "Start" screen.	Check that the router power cable is securely inserted into the router.	"5 Part names / Overall connection diagram" (P.49)
		Check that the Wi-Fi connection for the tablet is enabled.	"6 Preparation" (P.50)
3	The characteristics set using the tablet are different from the actual characteristics and rate determined from auscultation.	<p>The setting values on the tablet screen may not have been applied to the body (such as immediately after the body is turned on).</p> <p>Enter the setting value once more at the tablet screen. If the values are still different, there may be a problem with operation.</p>	<p>"7-2 Auscultation of Breathing Sound" (P.55)</p> <p>"7-3 Auscultation of Heart Sound" (P.58)</p>

If any problems are not fixed when the remedies given above are carried out, contact Sakamoto Model.

11 Specifications

■ Overall product

Recommended ambient temperature	5 – 40 °C
Power supply	AC 100 – 240 V 50/60 Hz
Power consumption	15 W
Wi-Fi connection distance	Distance between tablet and router should be 5 m or less (this may vary due to obstacles or signal status).
Continuous operating time	5 hours or less recommended

■ Body

Dimensions	(W) 54 cm × (D) 28 cm × (H) 48 cm (Dimensions are approximate.)
Weight	5.5 kg

12 [[Appendix]] Auscultation Points and Changes in Cardiac Sound

In this chapter we will explain in detail the changes in cardiac sound and the conditions of each disorder that can be learned by using "SAS2."

12-1 Auscultation Points

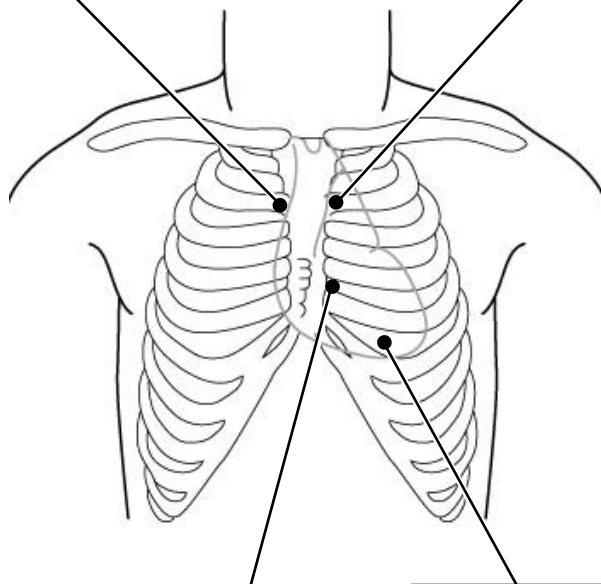
The following 4 points are used to auscultate the heart using "SAS2."

Right cardiac base

The right cardiac base is located on the right side of the sternum in the second intercostal space. The sound of the aortic valve and aorta can be clearly heard from this area.

Left cardiac base

The left cardiac base is located on the left edge of the sternum in the second intercostal space. The sound coming from the pulmonary artery can be clearly heard, but the sound of the mitral valve and aortic insufficiency can also be heard from this area.



Left sternal edge

(LLSB)

(Right heart or tricuspid area)

The LLSB is located on the left side of the sternum in the fourth intercostal space. The sound coming from the right heart, the tricuspid area in particular, can be clearly heard, but the sound originating from the left heart can also be heard from this area.

Cardiac apex

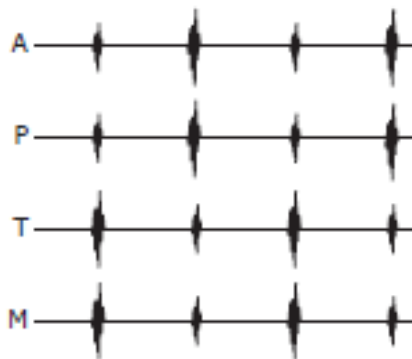
The cardiac apex is located in the fifth intercostal space of the middle collarbone. The sound coming from the mitral valve and the left ventricle can be clearly heard from this area.

12-2 Changes in Cardiac Sound

We will auscultate the heart using the Auscultation Simulator. Only a single cardiac sound or cardiac murmur will be produced from the 4 auscultation points. However, as is the case when auscultating on an actual patient, the I sound and II sound spread mutually, and at the cardiac apex a $I > II$, at the cardiac base a $I < II$ relationship is reproduced.

We have attached a simple electrocardiogram and explanation for each of the following 20 cases. Please listen to them every day repeatedly even if it is only for a short time. We hope it is useful in improving your auscultation skills.

(1) Normal (II sound no break-ups)



Each of the auscultation points of the heart is shown as

A Right cardiac base (around aorta)

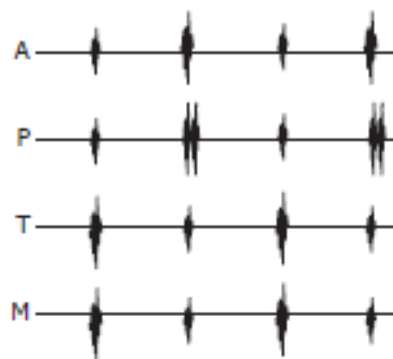
P Left cardiac base (around pulmonary artery)

T Left sternal edge/third intercostal space (around tricuspid valve)

M Cardiac apex

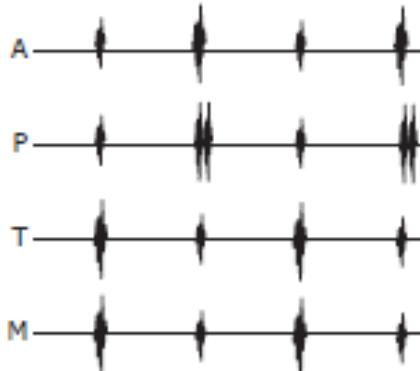
First, compare the volume of the I sound and the II sound at each point.

(2) Normal (II sound break-ups)



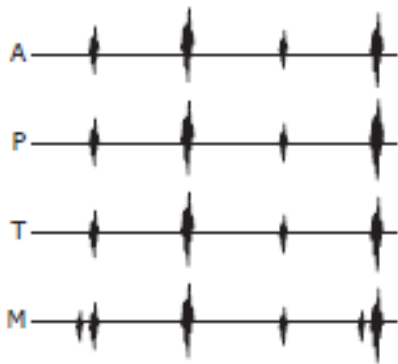
Next, apply a stethoscope to P. The II sound will break up three times and twice it will be a single sound. The interval of the break-up is 0.03 seconds, which shows normal respiratory disruption.

(3) Abnormal (II sound break-ups)



Again at P, this time the II sound break-up can be heard at a much longer interval (0.08 seconds). This is a typical characteristic of complete right heart block, etc.

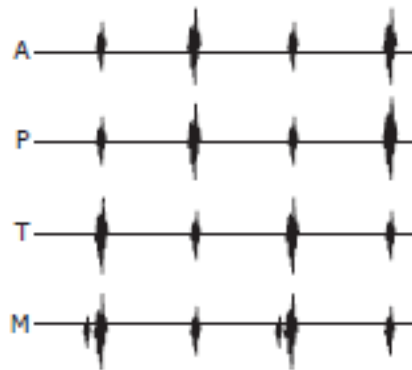
(4) Acceleration of II sound in cardiac apex when blood pressure is high



When a stethoscope is applied to M, the relationship between the I sound and II sound becomes $I < II$ which is similar to auscultation results of the cardiac base.

This may occur when a patient is suffering from a high blood pressure disorder and the pressure exceeds 100mmHg. It can occasionally be heard normally, but can be distinguished because the IV sound is not heard.

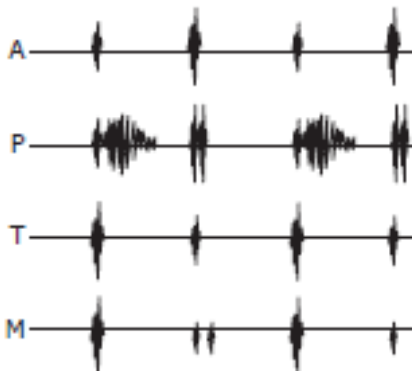
(5) Cardiac apex IV sound



At M, the relationship between the I sound and II sound is normal, but the IV sound can be heard.

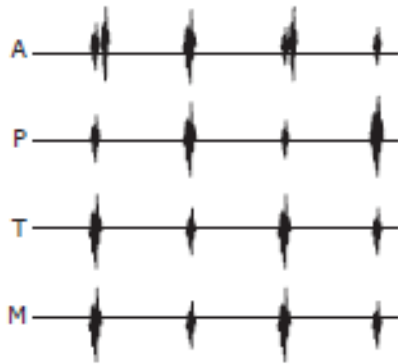
This is because the extension of the ventricular muscles has dropped due to anemic disorder, etc. It can be heard in 50% of people over 60 years old.

(6) Harmless murmur



At P, during early~mid systole, a soft ejection murmur can be heard. A respiratory disruption of the II sound can simultaneously be heard. It can be heard in 90% of children younger than ten and about 30% of people in their twenties, and is normal.

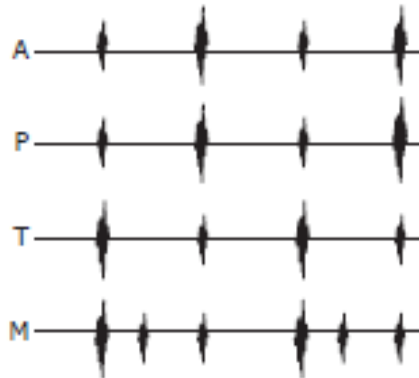
(7) Aortic valve ejection murmur



At A, the break-up sound heard immediately after the 1 sound is an ejection murmur.

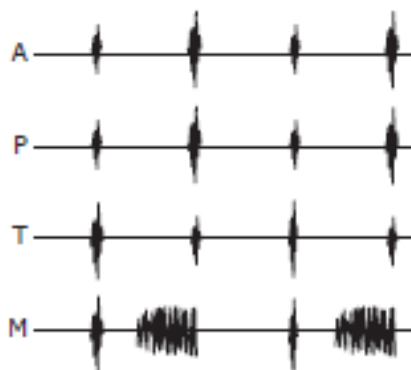
It can be heard due to the blood volume passing through the aortic valve and when the blood flow is fast.

(8) Mid-systolic click



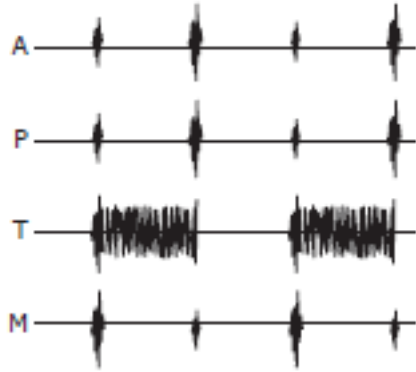
At M, it is sometimes heard during mid-systole. This is due to a minor gap that develops mid-systole in the cusps anterior and posterior to the mitral valve. Occasionally, two or more clicking sounds can be heard.

(9) Mitral valve deviation click • murmur



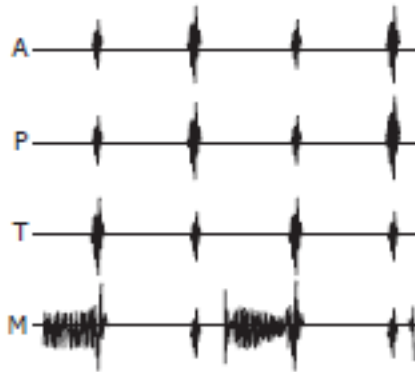
At M, during mid~late systole, a regurgitant murmur can be heard. This murmur occurs because the closure of the mitral valve deviates, as in case 8.

(10) Tricuspid insufficiency



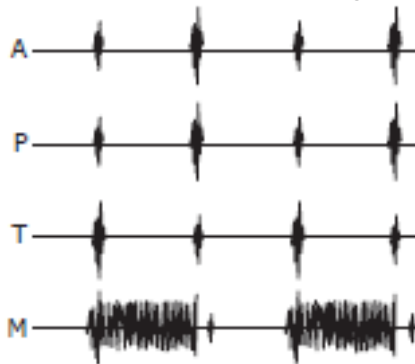
At T, a regurgitant murmur can be heard throughout early systole. This is due to tricuspid insufficiency. As a physical observation, the V wave increases during systole of neck veins, and murmur increases during expiration (Rivero Carvallo Sign). It is important to distinguish this from ventricular septal defect.

(11) Mitral stenosis



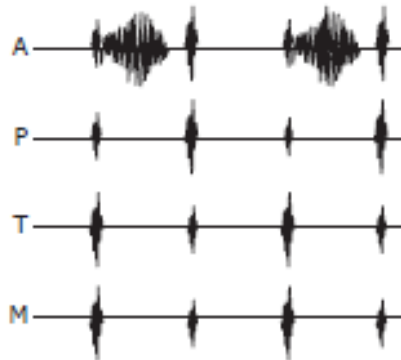
At M, a distinct acceleration of the I sound, followed by the II sound, and then, an opening snap (OS), rumbling noise during middiastole, and a murmur during early systole can be heard. The patient's auscultation position should be lying on the left, and a bell-type stethoscope should be used.

(12) Mitral insufficiency



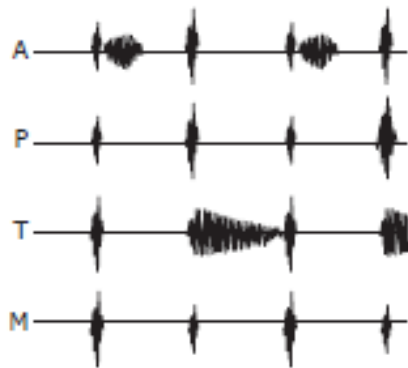
At M, a regurgitant murmur can be heard during all systolic periods. This is due to mitral insufficiency. When mitral insufficiency is mid-degree the III sound can be heard, and when it is serious, rumbling noise can be heard during middiastole.

(13) Aortic stenosis



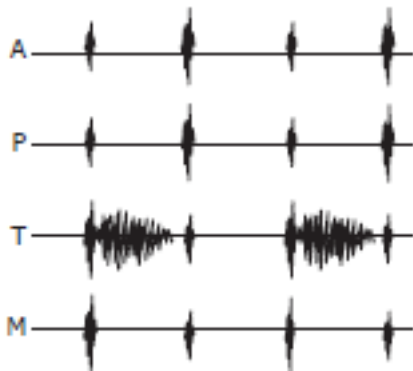
At A, during mid-systole, a rough ejection murmur can be heard. When the aorta is stiff from calculus due to old age arterial stiffness, the murmur can be quite large, but if the blood pressure is normal, the extent of stenosis can be considered light.

(14) Aortic insufficiency



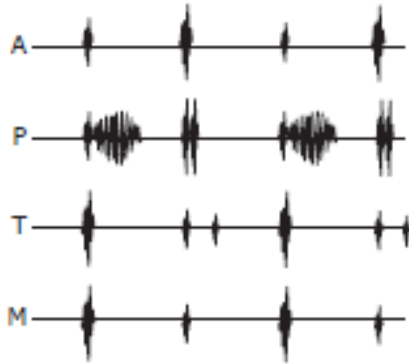
At A, an ejection murmur can be heard. This is a relative murmur due to increased blood volume. This murmur occurs because at T, blood that was initially sent to the aorta regurgitates to the left ventricle during diastole. This murmur during systole and diastole is generally called "to and fro murmur."

(15) Subvalvular aortic stenosis



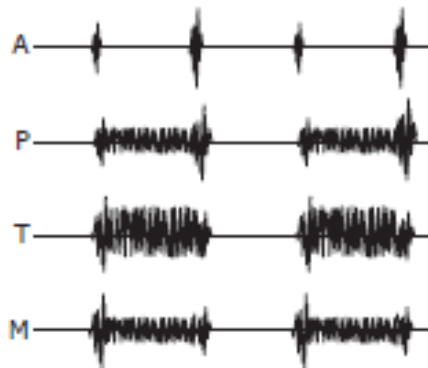
At T, an ejection murmur can be heard during early~mid systole. This is because the muscular enlargement at the lower aortic valve narrows the left ventricular pathway to the aorta, presenting a type of "hypertrophic cardiomyopathy."

(16) Atrial septal defect



At P, an ejection murmur can be heard during early systole. Also, a fixed break-up II sound that does not change from breathing can be heard. This is relatively often seen in inherent heart disorders. In children, it is necessary to distinguish this from harmless murmur.

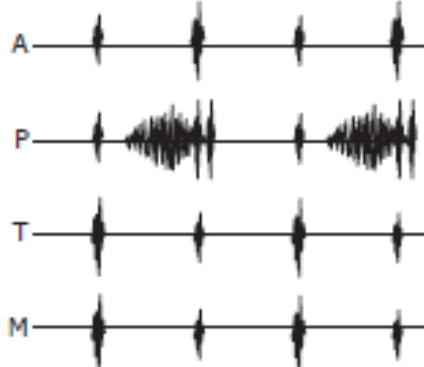
(17) Ventricular septal defect



At T, mainly at this point, a large rough murmur accompanied by trilling can be heard during all systolic periods.

This is commonly seen among congenital heart disorders, but the smaller the pathway from the left ventricle to the right ventricle is, the larger the murmur heard. (Levine 3/6, 4/6)

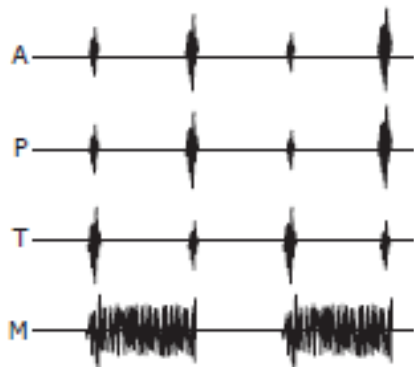
(18) Pulmonary stenosis



At P, an ejection murmur can be heard during late systole. It is sometimes combined with congenital heart disorders such as Tetralogy of Fallot. It accompanies cyanose, and the child's growth is defective.

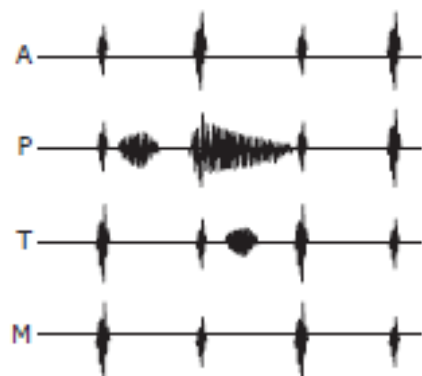
Occasionally, only valvular stenosis is observed, the growth is normal, and it may be mistaken as harmless murmur.

(19) Acute mitral insufficiency



At M, a murmur is acutely heard during early systole. In most cases, it occurs due to ruptured chordae tendineae accompanying a myocardial infarction. The patient suffers from acute congestive heart failure. The III sound is not so obvious.

(20) Pulmonary insufficiency



At P, an ejection murmur during systole and a regurgitant murmur during diastole can be heard. As in the case of aortic insufficiency, the murmur occurs because blood regurgitates from the pulmonary valve into the right ventricle. At T, a rumbling murmur can be heard during mid-diastole.

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