



Rhythm[®]:ds32a
High Resolution
Auscultation

**Digital
Electronic
Stethoscope**

User's Manual



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Thinklabs Rhythm Digital Stethoscopes

Congratulations on purchasing your ds32a. You now own an instrument designed for high resolution auscultation - an instrument that produces body sounds with low-noise and high-amplification, providing a new level of clarity. The ds32a provides unprecedented control of the listening process, unmatched by any other stethoscope today:

- **Amplification Modes:** Amplify mode with Adjustable Volume provides low distortion, high power amplification, while standard Acoustic mode provides the familiar sound of a conventional acoustic stethoscope. Both modes utilize signal processing designed to provide very high signal definition.
- **Ease-of-Use:** Three simple controls provide Power on/off, Amplify on/off, and Bell/Diaphragm selection, with mode changes at the push of a button. Additional features are hidden behind these keys to un-clutter simple use, while providing new useful functions when needed. For example, a new Mute function (hold the Amplify key down) provides for muting sound when patients speak, cry, cough, or produce other unwelcome sounds during auscultation.
- **Patented Transducer:** The Electromagnetic Diaphragm™ (EmD) senses and converts body sounds to electronic signals right at the diaphragm, eliminating signal degradation and ambient noise coupling through air-borne transducers or tubing. The EmD is pressure-modulated. By subtle variation of Probe pressure, amplitude and frequency response can be tuned to listen to specific sounds. This provides powerful tactile control over audio characteristics.
- **ANR2 Noise Rejection:** Thinklabs' pioneered ambient noise rejection with patented EmD diaphragm technology and acoustically-vented solid aluminum Probe design. The ds32a builds on this with 2nd-generation Ambient Noise Rejection (ANR2), a 2nd-stage Noise Rejection (NR) function for increased noise immunity in high-noise environments. NR can be turned off in quieter office environments to provide very high-sensitivity, direct-coupled EmD audio when 2-stage noise rejection is redundant. This continues Thinklabs' goal to give the user full control over every aspect of the listening process to fully optimize auscultation.
- **User-programmable Presets:** You can preset the ds32a to power-up in mode settings to match your clinical habits and needs. The ds32a can simply power up in the previous mode settings, or in specific modes suited to your preferences.
- **Audio Port:** An Input/Output port provides an audio line-level output signal or use of the ds32a as headphones suited to listening to recorded auscultation sounds.
- **Design:** All these features are packaged in a stethoscope that has the form factor and weight of an instrument so familiar to the professional community of users.
- **Custom Stethoscope Tuning:** If your ds32a does not perform according to your requirements, please contact us. While we cannot guarantee it, we may be able to fine tune the sound of your ds32a to meet your needs.

Indications

The Thinklabs Rhythm Digital Stethoscope is intended for use as a diagnostic aid in patient diagnosis. It can be used for the amplification of heart, lung, and other body sounds with selective frequency filtering. This product is not designed, sold, or intended for any use except as indicated.



Caution - Follow Directions for Use

Misuse of this product could result in damage to the product, malfunction of the product, or compromise performance.

- Use only AAA Alkaline batteries. The Rhythm will not function if battery voltage is depleted. Use fresh batteries, and replace when indicated.
- Do not sterilize this device, or immerse it in liquids. Clean using alcohol swabs or non-abrasive cloth lightly dampened with alcohol or water.
- Avoid use/storage in very high humidity, high temperature or dusty conditions. Leaving the device in excessively hot or cold vehicles is NOT recommended.
- Do not attempt to modify or repair this device yourself. If you experience problems, send this device to Thinklabs for repair. See the Support page at <http://www.thinklabsmedical.com>
- The Thinklabs Rhythm stethoscope has been tested to be resistant to electromagnetic interference (EMI & ESD). However, it may be susceptible to stray electromagnetic fields. If unexpected sounds are heard, change location, or move away from possible sources of interference, such as cellular telephones or wireless devices.
- At the conclusion of the ds32a useful life, dispose/recycle in accordance with local regulations.

Optimal Use of the ds32a

• **Instructions** - The ds32a is designed to be very easy-to-use. However, taking the time to read the User's Manual will greatly facilitate the effective and optimal use of the ds32a. These instructions provide valuable tips that are well worth knowing, to get the most out of the ds32a.

• **Sound Levels** - Adjust the Volume to a comfortable level. The ds32a has powerful amplification. Maximum volume is not necessary in most situations. Experiment to identify optimal settings and personal preferences.

• **ANR2 Ambient Noise Rejection** - The ds32a has second generation Ambient Noise Rejection (ANR2), enhancing the noise rejection capability of EmD technology. The noise rejection function can be activated or deactivated, providing you with complete control over signal processing functions. Experiment with each setting to select the best for each situation.

• **Diaphragm Pressure and skin contact** - The ds32a Probe uses Electromagnetic Diaphragm (EmD) technology which is pressure-sensitive. Sound characteristics change as the Probe is applied with greater to the patient. Simply apply the Probe to the patient as with a conventional stethoscope, and make subtle changes in pressure, listening for desired sound. Lighter pressure is usually optimal. Increase pressure gradually to increase sensitivity and volume. With significantly increased pressure, low frequencies will suddenly be attenuated and lung sounds will be audible over heart sounds. Apply steady diaphragm pressure for best results. The ds32a's EmD diaphragm operates best when in direct skin contact with the patient. (Page 19)

• **Maintaining Performance** - Your ds32a is a robust instrument designed to provide continued peak performance. If your ds32a is not meeting your highest expectations, please contact us so that we can help you obtain and maintain the performance level for which it is designed.



Quick Reference - Controls and Display

Page 11

Amplify - Amplification On/Off
Click to alternate between volume-adjustable Amplified mode and pre-set Acoustic mode similar to an acoustic stethoscope.

Mute
Push & Hold key down to temporarily Mute sound - useful if patients speak when listening to carotid, pediatric use, etc.

Page 12

Bell or Diaphragm Select
Click to alternate Bell/Diaphragm

Noise Rejection On/Off
Push & Hold for >2 secs, Release to turn Noise Rejection On/Off. Adjusts for high ambient noise or regular office environments.
Page 13

Volume Control
behind Control Panel
(active when Blue LED▲ is On)

Page 10

Power On Click to turn on
Power Off (auto or manual)
Shuts off automatically after 2 minutes*
OR Push & Hold until all LEDs light, Release.
* time is programmable up to 5 min. Clicking any key will extend on-time up to 5 min. max.

Control Panel

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Advanced Use - Preset and Save all your power-on Mode preferences

Program the ds32a to power up in most recent Modes, or in your preset configuration.

Recent Mode wakeup - Push+Hold Power key 5 secs, Red LED flashes slowly, Release.

Preset Modes - (1) Set ds32a in your preferred modes. (ALL Modes are memorized).
(2) Set auto shutoff time - **Click** the Power key the number of minutes ds32a should stay on before auto shutoff (2, 3, 4, or 5 minutes).
(3) Push+Hold Power key > 10 secs, Red LED flashes faster, Release.

Display

Amplify Mode (Blue)
LED On - **Amplified** - Volume is Adjustable
LED Off - Acoustic - Volume is Pre-Set

Bell Mode
(Green)

Diaphragm Mode
(Green)

Low Battery (Red)
Change Batteries

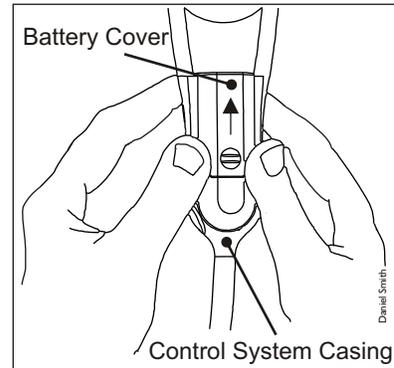


Initial Setup

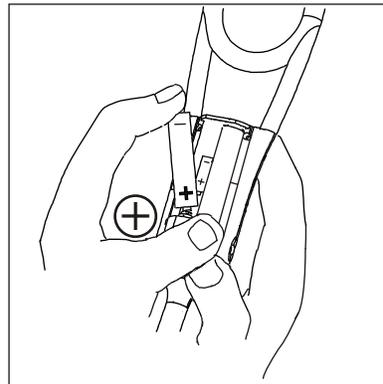
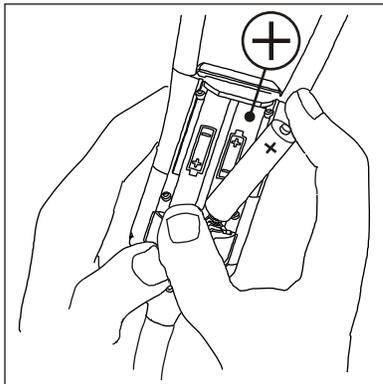
Installing Batteries

Open the Battery Cover.

Hold the Control System Casing with two hands as shown. Slide the Battery Cover in the direction shown by the arrow, by using both thumbs placed on the Battery Cover sides as shown, or by using one thumb applied to the ribbed indentation in the center of the battery cover.



Insert 2 AAA Batteries as shown below. NOTE THE POLARITY - Reversing the polarity can cause damage to the ds32a.



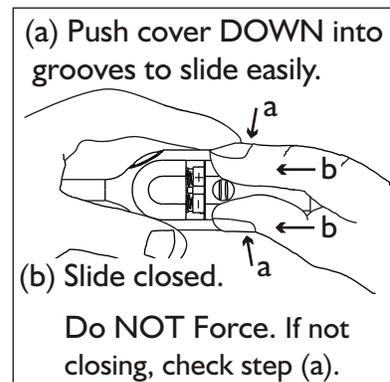
Compress the large battery spring sufficiently to ensure that the batteries are well-seated in the battery compartment, and that all springs connect with the battery contacts.

Use Alkaline Batteries only. Rechargeable batteries tend to have lower voltages even when fully charged, which might trigger a Low Battery indication even when the batteries are charged. While the ds32a will operate, the Low Battery warning will not provide accurate indication.

Close the Battery Cover.

Place the Battery Cover into the slide grooves, and slide the Battery Cover, using thumb and forefinger as shown, until fully closed. If the cover does not close easily, take care to ensure that the Battery Cover is pushed all the way into the grooves, and slides easily. Do not exert excessive force.

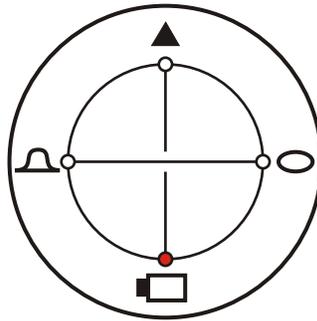
If your Rhythm does not operate after changing batteries, carefully recheck battery polarity, and ensure that fresh batteries are being used.





Battery Life and the Low Battery Indicator

The Low Battery Indicator on the display will show when the batteries require replacement. A red LED in the Low Battery Indicator signifies a low battery condition.



Low Battery (Red)
Change Batteries

After a Low Battery indication initially occurs, the Rhythm will provide a few additional hours of operation, which should be sufficient for a few days of use in a typical work environment. It is recommended, however, that batteries be replaced within a day of the Low Battery Indicator warning, to ensure uninterrupted service.

When the batteries have become depleted beyond their useful life, the unit will fail to power up, or will power up and immediately power down, preventing further use. **The unit cannot be used in any mode without battery power.**

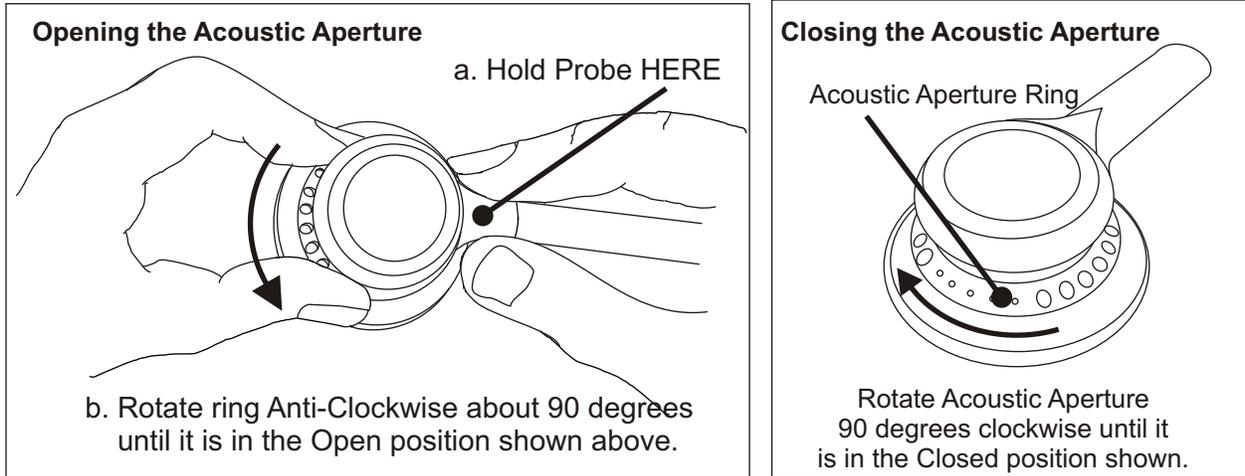
ds32a battery life is highly dependent on device use. Examining a large number of patients each day will naturally require more regular battery replacement than occasional use. Another important factor is the volume level and type of body sound. The ds32a has high current bass drive circuitry to reproduce powerful low frequency signals without distortion. This circuitry consumes more current when reproducing heart sounds in Bell mode compared with, say, listening to lung sounds in Diaphragm mode. It is for this reason that an exact battery life specification is not provided.

Note: The Low Battery Indicator (Red LED) is also used as a Programming indicator, when saving power-up preferences. See page 14 for further details.



Probe Setup

The Probe has a black Acoustic Aperture ring which is shipped in the closed position. The Aperture should be left closed in most cases.



To open the Acoustic Aperture, rotate the ring anti-clockwise. To close, turn clockwise.

The Acoustic Aperture affects the Probe acoustics, subject to the environment in which the ds32a is used. In many situations, the audible differences are very subtle, and the Aperture Ring should then be kept closed to protect the Probe from dust and moisture. The effect of the Acoustic Aperture positions are as follows:

Aperture Closed - The Acoustic Aperture closes the internal Probe cavity, protecting it from dust and moisture, and producing a more “closed” tonality.

Aperture Open - When open, the Acoustic Aperture can improve the acoustics of the ds32a in certain environments. If you are using the ds32a in a high ambient noise environment, try opening the aperture ring. You may find that the more “open” sound is preferable. Then rotate the ring to the closed position when you return to a quiet environment.

Using the ds32a with open or closed aperture is a matter of personal preference.



Using the ds32a

The ds32a is designed to be very intuitive to use. Take a few minutes to understand the various functions, and within a very short time, using the ds32a will become second nature. You will be able to feel and hear, rather than have to look at the keys and display.

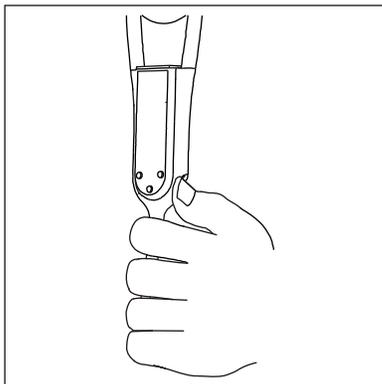
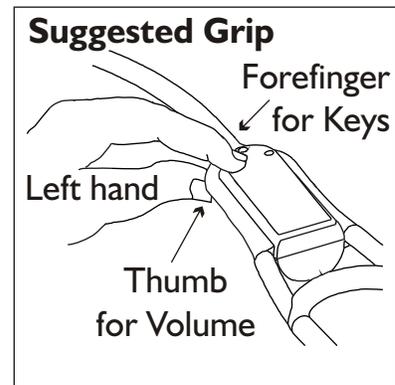
The Quick Reference guide on Page 5 provides a summary of the Control keys and Display Indicators on the ds32a. Details of each Control and Display function are provided in the following pages.

It is suggested that you first familiarize yourself with operating the ds32a without wearing the headphones. Get comfortable with the layout and operation of the Controls. Then do some listening with the ds32a, operate the Controls, and listen to the effects of the various operating modes and functions.

Control Ergonomics

The Control keys are designed to be operated by the thumb and forefinger of the left hand, as shown.

Operate the controls with firm pushes on the keys. The keys are designed to require a modest amount of pressure, in order to avoid accidental switching.



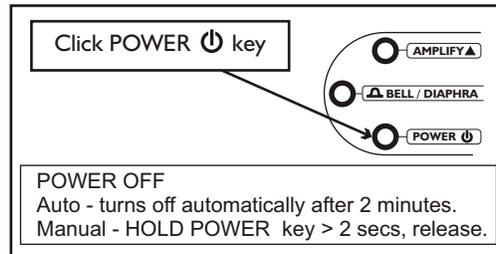
The Volume Control is located behind the Power Key. It is designed to be operated by the left thumb as shown in the illustrations, leaving fingers to control the keys.

The exact grip and position is a matter of personal preference, and should be adjusted for comfort and ease of operation.



Power On/Off

Power On



Click the Power  key firmly to activate the unit. All the LEDs will light up momentarily to confirm LED operation, the unit will initialize operating modes (see below), and be ready for use.

(Note that at high volumes, a transient “pop” sound occurs during power-up sequencing. This is normal. It is recommended that the power be turned on before inserting the eartips, to avoid hearing the turn-on transients.)

Power Off

Push and hold the Power  key for a few seconds until all LEDs light up, then release.

Auto Shut-Off

The ds32a will power down automatically after 120 seconds. It is therefore not necessary to manually turn off Power. This timeout period can be programmed to 2, 3, 4, or 5 minutes. The shutoff time will automatically extend beyond the set time if you click any key, but will shut off after a maximum on-time of 5 minutes. (See Programming Preset Modes, page 14.)

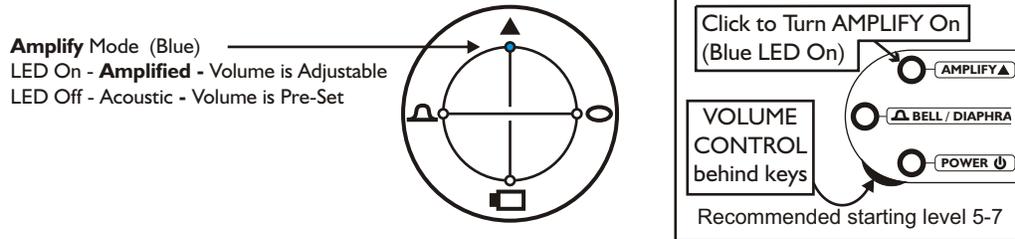
Mode Settings on Power Up

The Power key is also used for saving power-up preferences. The ds32a can be programmed to power up in specific modes that are preset and saved by the user, or simply power up in the same modes that were active when the ds32a was last used. See Programming Preset Modes, page 14 for further details.



Amplify ▲ , Volume Control and Mute

To alternate between Amplify and Acoustic modes, click the ▲ key.
To Mute sound, hold the ▲ key:



Amplify mode - Augmented sound, Volume is ADJUSTABLE - BLUE LED On. Volume Control located behind the Control Panel near the Power key.

Acoustic mode - Volume is PRE-SET - BLUE LED Off. Provides pre-set Volume similar to a conventional acoustic stethoscope. The ds32a still performs electronic signal processing in Acoustic mode, and you will notice the resulting clarity of signals in Acoustic mode. However, the sound characteristics in this mode are set to be similar to an acoustic stethoscope, so that users can compare standard and boosted sounds, such as during the grading of murmurs. This provides the “best of both worlds”, with access to both acoustic and boosted sound characteristics in one device.

Mute function - Push and Hold the Amplify key to Mute sound. When potentially loud sounds could occur, keep a finger on the Amplify key, ready to Mute when necessary. Example situations might be when listening to a carotid bruit and the patient might begin to speak, or when listening to pediatric patients.

Volume Settings and Psychoacoustics

It is suggested that volume levels be varied when listening to each patient. Body sound characteristics and detail change as the signal is amplified to different volume levels. Sounds also vary with Probe position, diaphragm pressure, age and obesity of patients.

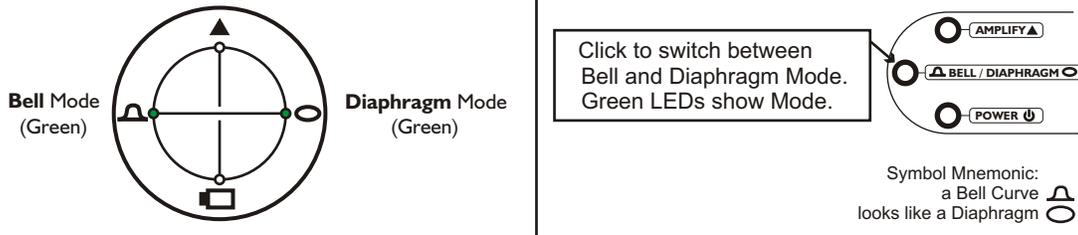
The human auditory system “masks” quieter sounds with louder sounds. This is often a problem when using a conventional stethoscope, where louder heart sounds mask quieter sounds such as murmurs, and there is no way to control volume. By listening to the same sounds at different volume levels, auditory masking can be exploited, rather than being a limitation. At low volumes, masking will help to hear only certain louder sounds and quieter sounds will be masked. At higher volume settings, the ds32a will allow the auditory response to overcome masking effects to hear low-amplitude murmurs “through” the louder sounds. Volume levels from 5-8 are usually optimal. Some users might prefer to use the pre-set Acoustic mode for most listening, using the Amplify mode when further signal detail is required. It should also be noted that diaphragm pressure changes the sensitivity of the EmD sensor. Increasing pressure will increase sensitivity, and therefore volume. [See page xx for further details.](#)

Warning - Protect your Hearing: Permanent hearing loss or Tinnitus can result from exposure to high sound pressure levels. Threshold shift (adaptation to high volume) makes loud sounds seem normal. Use caution when listening at high Volume, and limit exposure to loud sounds.



Bell-Diaphragm Mode

To Alternate between Bell and Diaphragm Modes, click the  key:



Diaphragm Mode - provides frequency response suited to valve and breath sounds. Diaphragm Mode will remove low frequencies, making it easier to discern higher frequencies that may be masked by the louder low frequencies.

Bell Mode - provides boosting of very low frequencies to facilitate listening to heart murmurs. Due to the substantial low frequency energy in some heart sounds, Bell Mode has significantly higher signal power than Diaphragm Mode.

The choice of Mode for any given diagnostic situation is a matter of listener preference, and alternating between modes helps to discern the nuances of body sounds.

Auscultation - a Pathology-Physiology Dichotomy

There is a dichotomy between the frequency characteristics of cardiac pathology and the physiology of human hearing. Many pathological heart sounds have significant low-frequency content. Unfortunately, human hearing is most inefficient when detecting such low frequencies. This dichotomy helps to explain why pathological sounds can be so difficult to discern, especially with a conventional acoustic stethoscope.

Much of the energy in a heart sound is in the frequency range below 100Hz. At the low sound pressure levels of a conventional acoustic stethoscope, a sound at 30Hz, for example, would be perceived as 40 decibels softer than a sound at 200Hz, even if both signals had the same power. In other words, the ear is 40dB (100 times) less sensitive at 30Hz than at 200Hz. The combination of low-amplitude and low-frequency can thus result in heart sounds that fall below the threshold of human hearing, making some pathological sounds essentially inaudible.

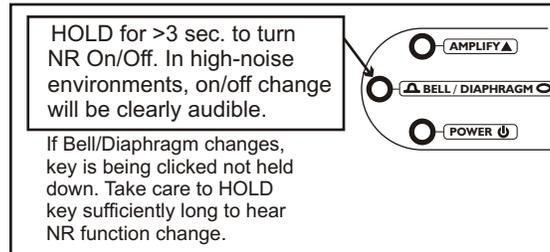
The ds32a reproduces very high audio power levels in the low-frequency range when compared to an acoustic stethoscope, raising the power at these frequencies above the human hearing threshold. In particular, Bell Mode is designed to provide significant power boost in the low-frequency range.

The Rhythm stethoscope's ability to reproduce low bass heart sounds explains one of the reasons the Bass Clef appears in the Rhythm logo.



Noise Rejection (NR)

To turn Noise Rejection (NR) On/Off, Hold  key for 3 seconds:



The NR function is turned On or Off by Holding the Bell/Diaphragm key for at least 3 seconds. There is no visual indicator, however if there is ambient noise, the On or Off state should be clearly audible. When ambient noise is decreased, NR is active. Since both Bell/Diaphragm and NR functions are assigned to the same key, the ds32a interprets which function is being addressed by the length of time the key is down. A click will change Bell/Diaphragm which will be visible. Hold >3sec, and NR change is audible.

About Noise Rejection

The ds32a improves on the ds32 ambient noise rejection by adding a 2nd-stage of signal processing to further enhance the noise rejection characteristics of the original EmD technology. This second-generation, 2-stage system is referred to as ANR2. For convenience, this is abbreviated to NR in this Manual.

The ds32a provides for NR to be On or Off. The reason is that in many diagnostic situations, noise is not a problem for the EmD sensor, and it is desirable to have access to the most direct, purest signal detected by the EmD diaphragm. In such cases, NR Off provides the direct signal. In other situations, there is significant ambient noise, and the optimal sound is obtained by rejecting noise components. When active, NR subtracts ambient noise from the overall incoming sound. This choice gives you complete control over ds32a signal processing functions. Along with Amplify/Acoustic, Volume, Bell/Diaphragm, and EmD pressure control, you have extraordinary control over your listening experience.

We recommend trying both NR On and NR Off and selecting the mode that is most preferred for a given auscultation. It is easy to switch NR On and Off, so the choice can be made for each patient examination simply by listening to both modes and selecting the better one. In quiet conditions, the difference might be almost inaudible, while in high-noise environments, the difference will be more dramatic. You may also prefer NR On for listening to some body sounds, and Off for others, similar to selecting Bell and Diaphragm modes for heart or lungs. (Placing NR on the Bell/Diaphragm key is intended to provide single-key control over listening preferences). NR further expands your control over obtaining the best possible sound. The following guide might provide some assistance in determining the best mode:

Turn NR On if:

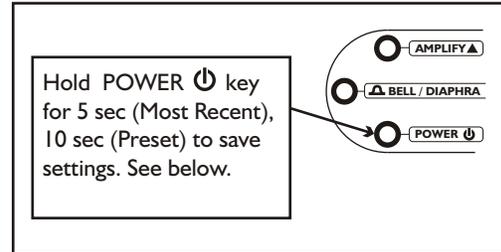
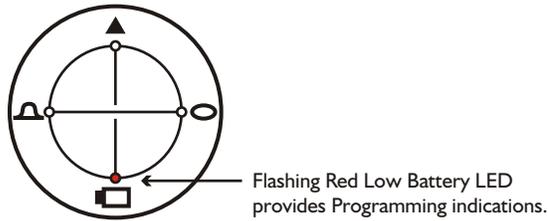
- There is significant ambient noise
- It is not possible to get good skin contact while listening, thereby increasing susceptibility to ambient noise and decreasing sensitivity to patient body sounds. This could be due to clothing, or significant body hair.

Turn NR Off if:

- Examination conditions are conducive to detailed listening, ambient noise is low, and good skin contact can be obtained.



Programming Preset Modes



The ds32a memorizes all Mode settings and can be programmed to power-up according to your personal preferences and work style. There are two power-up options:

- Most Recent Modes power-up: The ds32a simply powers up in the modes last used.
- Preset Modes power-up: The ds32a always powers up in your preferred mode settings.

Once the ds32a powers up you can, of course, change mode settings. Programming simply establishes the initial power-un modes for your convenience.

Most Recent Modes power-up

To set the ds32a to power up in the most recent mode settings, perform the following steps:

1. Turn on the ds32a by clicking the Power key.
2. Hold the Power key about 5 seconds until the Red LED (Low battery indicator) flashes, then Release.

All modes are memorized from last use (Amplify, Bell/Diaphragm, Noise Rejection). Note that Most Recent Modes power-up defaults to a 2-minute auto shutoff. However, auto shutoff time is extended another minute when any key is clicked, up to a maximum of 5 minutes.

Preset Modes power-up

To set the ds32a to power up in specific modes, regardless of the mode settings when it was last used, perform the following steps:

1. Turn on the ds32a by clicking the Power key.
2. Set all ds32a Modes to your preferences. These include:
 - Amplify/Acoustic mode
 - Bell/Diaphragm mode
 - Noise Rejection On/Off
3. Set the auto shutoff time - Click the Power key once for each minute you'd like the ds32a to stay on before auto shutoff. Click twice for 2 minutes, 3 times for 3 minutes, etc. up to 5 clicks for 5 minutes. The minimum setting is 2 minutes, the maximum is 5 minutes.
4. Hold the Power key for at least 10 seconds. After 5 seconds, the Red LED (Low Battery indicator) will begin to flash slowly. Continue to Hold. After 10 seconds, the Red LED will flash more quickly, indicating that Preset Mode is programmed. Release the Power key. Settings are now memorized. When performing the final step, ensure that you hold, and do not click the key inadvertently, since this will increase your programmed auto shutoff time.

To cancel Preset Modes power-up, simply follow the instructions for Most Recent Modes power-up.



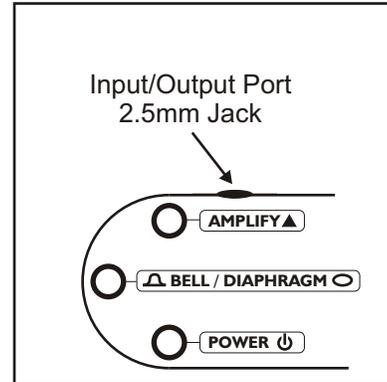
Input/Output Port

An Input/Output Port is provided on the ds32a.

The I/O port can be used to record sounds on an iPod, iRiver or other MP3 recorder/player, or other digital device; and to listen to sound, using the ds32a as headphones specially designed for listening to auscultation sounds.

Two ds32a stethoscopes can also be connected together for simultaneous listening. External headphones can also be connected to the ds32a.

Use only Thinklabs-supplied cables. Contact Thinklabs for assistance or check our website.



Using the Audio Input/Output Port

Analog Input - The Analog port can be used as an Input when the ds32a is powered OFF. This provides the following functionality:

- **Dual Listening** - Connect two Rhythm stethoscopes together. Turn one ds32a ON to be used as a stethoscope, and turn the second ds32a OFF to be used as a second listening device. This is useful for teaching purposes. A Thinklabs dual 2.5mm-plug cable is required. Contact Thinklabs for information.
- **Headphones** - Turn OFF the ds32a, and use it as a set of high quality sealed headphones for listening to recorded auscultation sounds. Connect the ds32a to the headphone output of any audio device such as a PC, MP3 player, or CD player. The ds32a headphones are very sensitive, and will often reproduce noise from the connected device that may not be audible with conventional headphones. Neither the ds32a nor the equipment is faulty - simply use very low noise audio equipment or sound cards with the ds32a. The ds32a headphones are mono, and are optimized for low/mid-frequency (body sound) reproduction.

Warning: Sounds levels can be extremely high due to the sealed eartip design of the ds32a.

Analog Output - The Analog output provides a line-level signal for recording body sounds on external portable devices, such as notebook computers, PDA's or Digital/MP3 recorders. Connect the ds32a to the Mic or Line Input of the recording device. When recording, make sure that the recording levels are set appropriately, so that signals from the ds32a are not "clipped" or otherwise distorted. Recorded sounds can then be played back through the ds32a headphones, as described above. Note that Volume and Bell/Diaphragm settings affect the Output signal.

The same cable can be used for recording and playback. When recording, the cable is connected to the recording equipment Mic/Line Input, and during playback to the Line or Headphone Output.

Notes:

1. **Warning: When used as a stethoscope contacting a patient, do not connect the ds32a to mains grounded equipment. Use only with portable devices operating on batteries.**

2. Contact Thinklabs for accessories and connection cables. **Do not use cables or connections provided by third parties.**

4. The Port also comprises digital serial connections. Contact Thinklabs for information regarding software and equipment interfaces to the ds32a serial Port.



Optimizing the ds32a

The ds32a can be fine-tuned to each user's preferences. Take the time to read this section, and learn how to maintain and optimize your ds32a to get the most out of using your stethoscope. Please contact us for any assistance. We are always willing to help you with any questions you might have.

General Maintenance and Cleaning

- Do not immerse the ds32a in any liquid. If the ds32a is inadvertently immersed in liquid, do NOT Power ON the unit. Completely dry out the inner spaces before trying to use the ds32a again. Contact Thinklabs for assistance.
- Do not sterilize the ds32a using any sterilization process.
- Wipe the ds32a with alcohol swabs or a soft cloth moistened with alcohol or water. Do not use abrasive cleaning agents, and do not allow fluids to enter the device.
- Avoid extreme heat, cold or humidity for either storage or use of this device. -4F to 110F (-20C to 43C) storage. Room temperature is recommended for use. Note that closed vehicles reach well above 120F in summer.
- Wearing the ds32a on the shoulders is preferable to tightly folding the device and placing it in a jacket pocket.
- Avoid excessive force applied to any part of the device. Damage could result.
- Avoid dropping the ds32a on hard floors, especially concrete. Damage could result.
- Remove batteries if device is not to be used for a period of months.
- See Tips and Troubleshooting, Page 25, for more information.

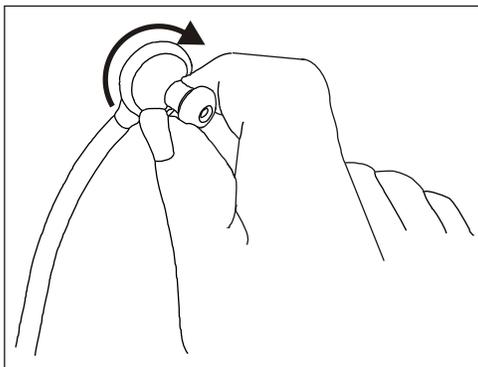
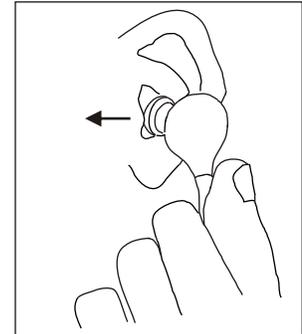
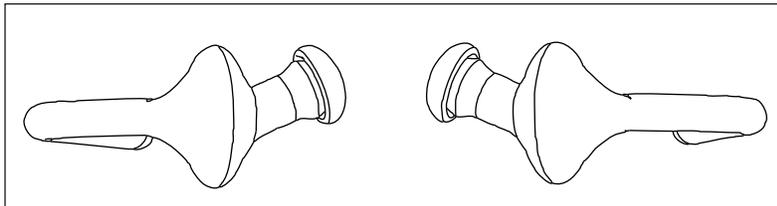
Damage resulting from inappropriate care of the device may compromise product performance or void the Warranty.



Eartip Adjustment

The headphones are designed with soft silicone eartips. Adjustment of the eartips and the headphones will ensure that optimal comfort and fit is obtained. See also Eartip Cleaning and Replacement, Page 23.

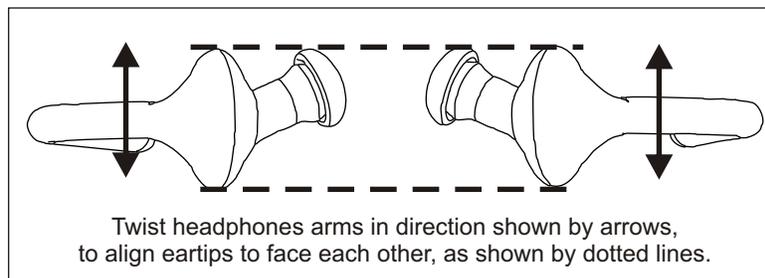
When using the ds32a, the **eartips should be pointed forward**.



To adjust the eartip angles, grip the solid eartip shafts, as shown, and **rotate clockwise** to the correct angle. Do **NOT** rotate anti-clockwise. This may loosen the headphone assembly. Do not force.

This adjustment has been done at the factory and should not be necessary when the ds32a is new.

Both eartips should be at the same angle, and the headphones should be aligned symmetrically as shown, such that the eartips and headphones are mirror images. This may require than the headphone arms be pushed **forward and back** (one forward, the other back) as shown by the arrows, to **align** the spring. This adjustment may be required from time to time to maintain alignment and comfort.

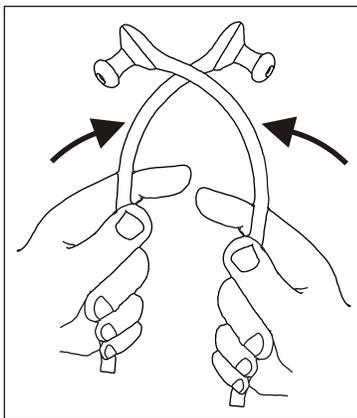
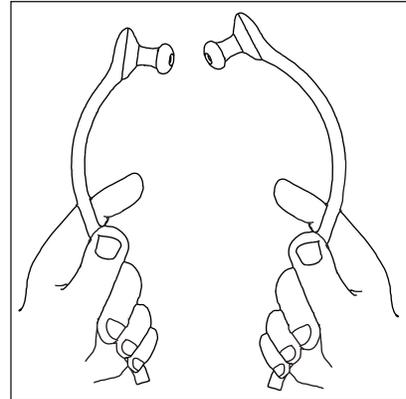




Headphone Adjustment

Use two hands!

To maintain headphone comfort, fit, and alignment, use both hands to insert and remove headphones. Do not “rip” headphones from the ears using one hand. If you must, learn how to open the spring with one hand, and remove the eartips from your ears before pulling the headphones away from your ears.



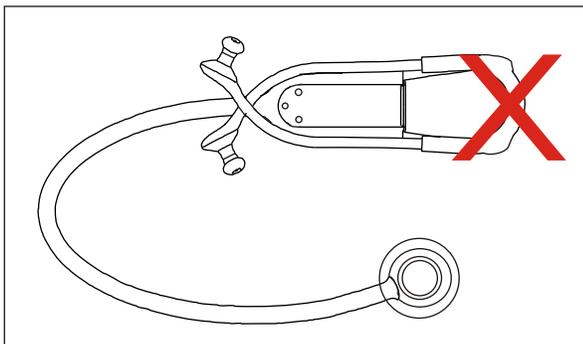
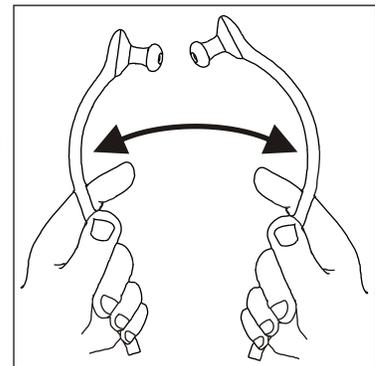
Increasing Headphone Tension

If increased headphone spring tension is desired, close the headphone arms beyond their normally opened position a few times, crossing the metal tubes, and test for comfort and fit.

Although it has been customary in the past to adjust stethoscopes with very tight fit, the amplification of the ds32a and the design of the eartips allows for very light pressure to produce an excellent sound seal.

Decreasing Spring Tension

To decrease spring tension, open the headphones beyond their normal position and test for comfort and fit.



Folding and carrying the ds32a

Tightly folding the stethoscope at the headphones to place in a jacket pocket is discouraged. While the ds32a is designed to fold as shown, wearing the ds32a on the shoulders is a more benign practice, inflicting less wear on the stethoscope.



Listening with the ds32a

The ds32a Probe uses Electromagnetic Diaphragm (EmD) technology which has some important characteristics that should be understood to achieve optimal performance.

Diaphragm Pressure and Frequency Response

This background information is provided simply to enrich your understanding of the ds32a, so that you can obtain maximum benefit from its features. Read this section while experimenting with your ds32a, and this background information will become obvious and self-evident. If the explanation below seems complicated, using the ds32a is very simple.

The EmD Diaphragm is pressure-modulated i.e. pressure controls the mechanical and electrical parameters of the EmD sensing system thereby changing the frequency response and sensitivity. The user can significantly alter the sound by adjusting diaphragm pressure. Learn how to use this to advantage during patient examination - it is a powerful, tactile way to control the sound you hear, and adjust the sensitivity for each patient examination. With a little practice, you will soon be able to control the way you listen, to elicit maximum benefit.

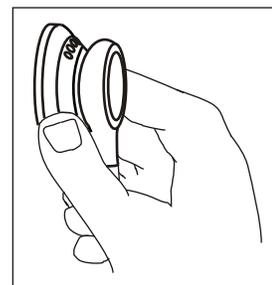
Apply the Probe to the chest, make subtle changes in diaphragm pressure, and listen to the effects. The following control is possible:

- Light Pressure - This is usually optimal for most listening. Apply sufficient pressure to get good skin contact and a clear signal, but do not push too hard.
- Increasing Pressure - Gently increasing pressure will increase the sensitivity of the EmD sensor, making sounds louder. This is useful for listening to obese patients, listening for faint bruits, etc. However, the combination of loud body sounds (such as listening to the heart at the apex on a thin patient) and increased pressure (high sensitivity) can produce distortion due to excessive signal levels in the sensor. It is therefore not necessary to increase sensitivity when sounds are already loud and clear. Apply diaphragm pressure according to the patient and the probe position. The purpose is to provide a tool so powerful and flexible that its characteristics are suitable for a wide range of patients and body sounds.
- Significant Pressure - With sufficiently high pressure, the diaphragm makes contact with the sensing plate behind it, and diaphragm vibration is restricted. At that point, low frequencies are attenuated, and you will hear breath sounds over heart sounds. This can be a useful mode for reducing heart sounds to listen to other sounds, however care should be taken not to work in this mode when heart sounds are the sounds of interest. If low frequencies suddenly become attenuated due to excess pressure, simply back off diaphragm pressure slightly.

Within a short time, it will become intuitive to adjust the Probe/diaphragm pressure for a particular examination and you will enjoy the control that you have over sound characteristics.

Holding the Probe - steady pressure

It is helpful to hold the Probe with a consistent pressure, so that sound can be controlled as described above. One method is to hold the Probe so that the fingers also touch the patient chest wall (such as the left edge of the thumb and the fingertips in the figure.) The Probe and chest wall then move in unison, with a consistent, light diaphragm pressure. This is merely one grip - you will find your own personal preferences for optimally using your ds32a.





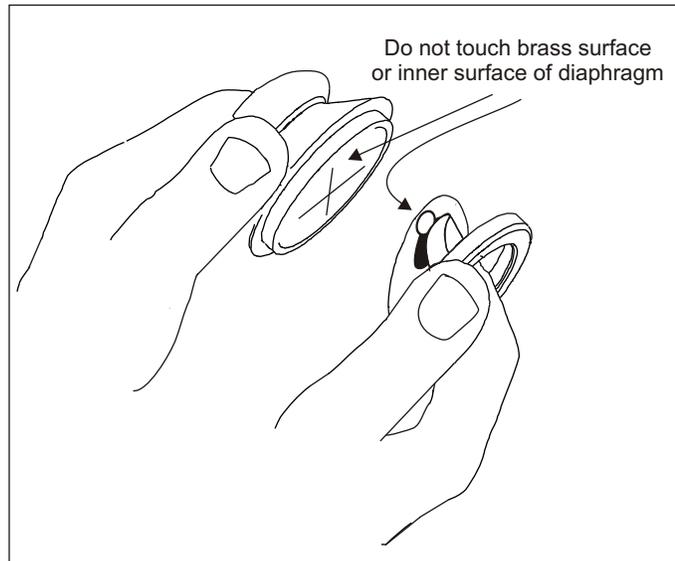
Diaphragm Changing and Replacement

To replace the Diaphragm

Always use a Thinklabs Electromagnetic Diaphragm (EmD). Conventional stethoscope diaphragms will not work on the ds32a.

Never open the ds32a in a dusty environment. Do not allow dust, lint or excess moisture to enter the Probe. For best results, change the diaphragm in a clean, dust-free environment, such as a medical examination room, or other clean environment.

- Unscrew the diaphragm ring and remove as shown. (Direction - unscrew anti-clockwise when looking directly at the diaphragm).



Avoid touching the brass plate or the inside surface of the diaphragm. These surfaces are sensitive, and surface contamination can compromise performance, or cause permanent damage.

- Place the new diaphragm in the diaphragm ring, with graphics facing out, and re-attach the diaphragm ring. Do not over-tighten the diaphragm ring.

If problems occur after replacing the diaphragm, see
Probe Maintenance, Page 21,
Tips and Troubleshooting, Page 25.



Probe Maintenance - ensuring low-noise performance

The EmD sensor sets up has a high-voltage electric field in the space behind the diaphragm. Diaphragm movement modulates this field, such that extremely small vibrations of the diaphragm are directly detected as field changes. For proper operation, the space in which the field exists must be clean and dust- and lint-free, and not contain excess moisture.

Under normal circumstances, the field will remain clean, and require no maintenance. However, if dust, lint or moisture do enter the Probe, unexpected background or louder noises can occur. The simple cleaning procedures below can then be used to rapidly re-establish noise-free operation, using a standard alcohol swab. These procedures are described in great detail for clarity. However, they are simple, and take less than 2 minutes to complete.

Noise Symptoms

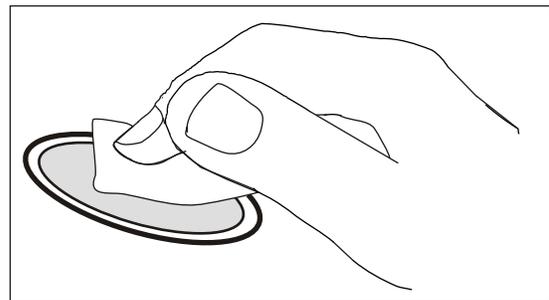
Dust, lint or moisture in the field produces the following possible symptoms:

- intermittent faint white-noise.
- squealing sounds, either faint or more prominent.
- ticking sounds (static discharges).
- above artifact sounds change when the diaphragm is pressed or unscrewed slightly.

If you notice any of these symptoms, follow the cleaning procedures below. If your ds32a is operating well, these procedures are not required for regular maintenance.

Alcohol Cleaning

- Make sure the unit is turned off.
- Unscrew the diaphragm as described on the previous page. **Open the probe in a clean, dust-free environment, and place the open part of the probe face-up. DO not touch the brass plate. Do not place the open probe on a dusty surface or a cloth surface.** Lint could be attracted into the Probe.
- Using a lint-free alcohol swab, carefully wipe the inner surface of the diaphragm as shown. Do not touch the inner plastic surface of the diaphragm with anything other than the alcohol swab.



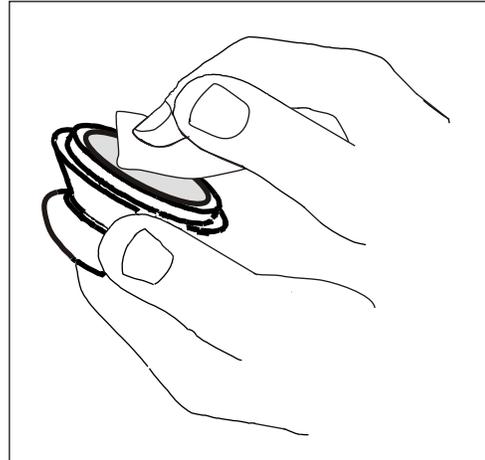
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Probe Maintenance (continued)

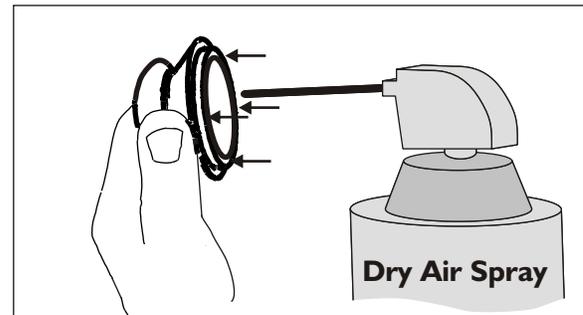
- Using the alcohol swab, carefully wipe the brass plate inside the Probe. **Do not touch the brass plate. This could permanently damage the sensor.**

- Allow the diaphragm and probe surfaces to dry by evaporation. Do not close the unit and power it up with alcohol moisture on the diaphragm. Only after evaporation will the surfaces be clean and ready for use.



Air Drying and Cleaning

The probe can further be cleaned using a dry air aerosol spray. These are available at hardware or office supply store, and are usually used for cleaning computers. This cleaning method is useful when the unit has been exposed to extreme dust, lint, humidity or moisture, or in addition to the alcohol-swab cleaning described above, the rare instance that contaminants exist inside the probe.



- Make sure the unit is turned off.

- Rotate the Aperture Ring to the open position (see page 8) to allow air flow in the Probe.

- Unscrew the Diaphragm Ring and remove the diaphragm. Place the diaphragm with Thinklabs logo face DOWN, so the inside surface does not become dusty.

- Using the dry air spray with the spray's plastic straw, spray the inside of the probe via the vent holes in the Aperture Ring, and around the circumference of the brass plate. Do not touch the brass plate with anything, including the plastic straw. Do not overspray. White condensation sometimes forms, which is counterproductive when trying to dry out the Probe.

- Replace the Diaphragm, and close the Aperture Ring. Wait a few minutes for the Probe to stabilize, and then power up the unit to test.

If these cleaning procedures do not correct the problem, see Tips and Troubleshooting, Page 25, and contact Thinklabs. We can assist you and ensure that your ds32a is operating optimally.

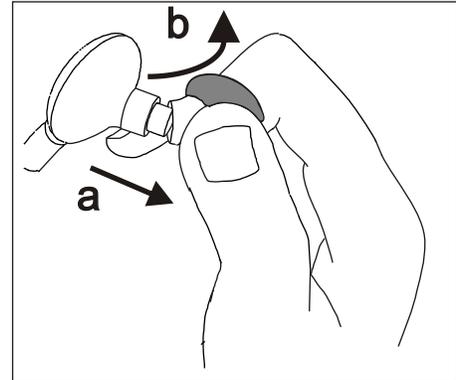


Eartip Cleaning and Replacement

The eartips can be removed for cleaning or replacement.

To remove eartips, grip the eartip between thumb and forefinger as shown, and (a) pull the eartips off in a straight line or (b) gently twist the eartip off the eartip shaft. Do not use excessive force.

To replace eartips, gently push the eartip over the eartip shaft into position. Do not use excessive force.



Quick Clean

Without removing the eartips, use a **slightly damp** soft cloth or alcohol swab to wipe the eartips. Never allow fluids to enter the speaker housings.

Thorough Clean

- Remove eartips for cleaning.
- Clean the eartips with non-abrasive cleaning materials. Alcohol or gentle soap and running water are recommended. (Don't lose the eartips down the drain.)
- Rinse off cleaning agent thoroughly and dry.
- Re-attach the eartips.

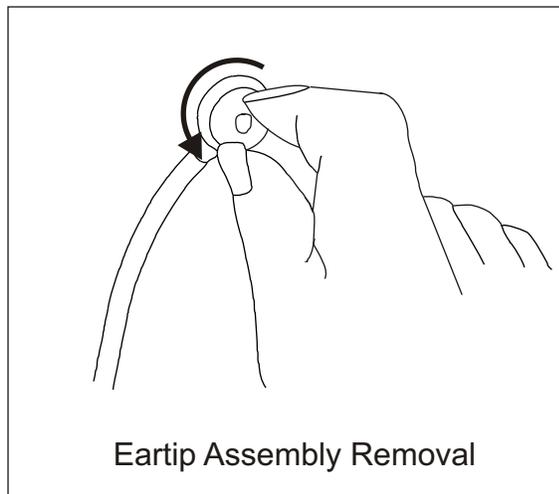
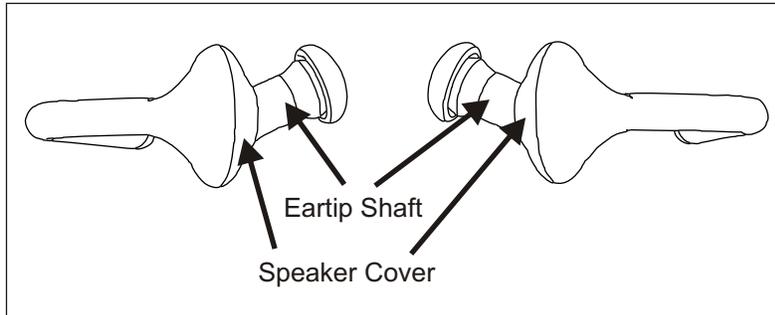
When the eartips become worn, contact Thinklabs or go to the website for replacement eartips.

To Adjust Eartips for comfort and fit, see Eartip Adjustment, Page 17.



Eartip Assembly Replacement

The Eartip Assembly comprises the black Speaker Cover and black Eartip Shaft, as shown below. Under some circumstances, the eartip shaft or speaker cover can become damaged and require replacement. This assembly is available from Thinklabs.



Eartip Assembly Removal

1. Remove the damaged Eartip Assembly by unscrewing the Speaker Cover **anti-clockwise** as shown. **Do not place undue force** on the rear silver speaker housing. Simply apply the rotational force needed to unscrew the cover.

2. Attach the new Eartip Assembly by screwing the new speaker cover **clockwise** onto the rear silver speaker housing. Make sure that the **threads are aligned to screw on easily**. **Grip the Speaker Cover, NOT the Eartip Shaft**, when screwing on the assembly to tighten the Cover. Do not over-tighten.

3. Follow the instructions on Page 18 of the User's Manual for aligning the eartips. Rotate the Eartip Shafts clockwise to align the eartips to face each other.

When using the ds32:

- Avoid wearing the ds32 in a pocket where unusual forces are brought to bear on components. Wearing the ds32 on the shoulders is recommended.

- When attaching and removing the headphones, use 2 hands, rather than "ripping" the headphones from the ears with one hand. This will maintain better headphone alignment and comfort, and cause less wear and tear on eartips and headphone assemblies.



Tips and Troubleshooting

Your ds32a is designed, built and tested to provide you with excellent sound quality and performance. If you have any questions, comments, suggestions or experiences you would like to share, please let us know at service@thinklabsmedical.com We will respond to all emails. If you have a problem requiring more immediate attention, please call us.

Before contacting us, we suggest that you read relevant sections of the User's Manual, read this section of tips and troubleshooting suggestions, and look at www.thinklabsmedical.com, where we will place FAQ's, updates and useful information for Rhythm owners.

Get the most out of your ds32a - Most users do not read User's Manuals. We have tried to provide additional information and tips in the Manual to help you get the most out of using the ds32a. In particular, read the following sections:

Optimal Use of the ds32a	Page 4
Control Ergonomics	Page 9
Volume Settings and Psychoacoustics	Page 11
Auscultation - a Pathology-Physiology Dichotomy	Page 12
Noise Rejection (NR)	Page 13
Listening with the ds32a	Page 19

The ds32a does not Turn On

- Check the Battery polarity (page 6). The wrong polarity can cause damage to the ds32a.
- Batteries may need replacement. Follow instructions on page 6.

The ds32a is not producing any sound

- No sound in Zoom mode (when Blue LED On). Increase the Volume setting. It may be set at a very low level. Set Volume to say, '7', and try again.
- Check the headphone fit. Do you have the ds32a on backwards and the eartips are facing the wrong way? The eartips should face forward, and the control panel should face forward. Check the adjustment of the eartips. See pages 17-18.

The ds32a is producing unexpected interference or noise

The ds32a should provide a low-noise, high-quality signal. If used on clothing or not applied correctly to the patient, artifact can be produced. Simply apply the Probe as recommended, making good contact with the patient. There are some interfering noises that can occur even when not examining a patient. Some potential culprits are listed below, with remedies:

- Radio stations or electromagnetic pickup: Move the ds32a to a location that does not have strong electromagnetic fields from such sources.
- Continuous loud buzzing: The diaphragm is loose. Tighten the diaphragm retainer ring.
- Continuous loud buzzing: The ds32a is connected to mains-powered or grounded equipment. If you have the ds32a connected to an external device, is the device powered by mains electricity or on a wired network? If so, disconnect the other cables from the equipment, so that the ds32a is connected only to "floating" (ungrounded) device.
- Other noise: Dust or moisture may exist inside the Probe. See Pages 21, 22.

Problem unsolved? Contact Thinklabs for assistance. (See page 27 for contact information).



Tips and Troubleshooting (continued)

Headphones do not fit correctly or are uncomfortable

- Are you wearing the headphones the right way? The eartips should face forward, and the Control Panel should face forward.
- Eartips or headphones are out of alignment (page 17).
- Headphone spring tension isn't correct (page 18).

Sound is sometimes distorted or cuts out temporarily when listening

- Volume is too high. Reduce Volume level or try Acoustic mode (page 11).
- Excessive pressure is being applied when listening. Decrease pressure for loud sounds (page 19).
- Probe is not being held in a firm and steady position, or is not being held with a steady pressure against the patient. The ds32a EmD diaphragm can sense frequencies down to the sub-sonic range, in order to cover the whole audio spectrum for murmur detection. Vibrations caused by patient or user hand movement are also sometimes sensed as loud signals that distort body sounds. Hold the Probe steady with a light but consistent pressure against the patient. It sometimes helps to hold the Probe so that the fingers holding the Probe also touch the patient chest wall, so that the Probe and chest wall move in unison.

Heart sounds on some patients are difficult to hear

Heart sounds are attenuated in obese patients. When patients have substantial body hair, this reduces the contact of the diaphragm against the body. Similarly, clothing can sometimes reduce sound transmission. This is a matter of physics, and in such circumstances, conventional stethoscopes are usually not effective. To overcome such limitations, try and ensure that the EmD diaphragm is making good, direct skin contact, preferably in a location that has less body fat or hair to cause attenuation. Do not apply excessive pressure on the Probe. Preferably, apply a light but firm pressure, so that the low-frequency sensitivity of the ds32a is optimized, and the diaphragm is making full contact with the patient. Then gradually increase pressure to increase EmD sensitivity to quiet sounds.

Working in high ambient noise environments

Rhythm stethoscopes are designed to attenuate ambient noise. Use the Noise Rejection (NR) function (page 13) to reduce ambient noise. Other steps to further optimize listening:

- Do not listen through clothing.
- Ensure that the diaphragm is making good contact with the patient.
- Apply light but firm pressure on the Probe. Do not press too hard.
- Adjust the Volume such that body sounds are audible, but avoid using such a high volume that ambient sounds become audible. There is usually an optimal volume setting for a given environment.
- Experiment with the Acoustic Aperture (page 8). In high noise environments, it is suggested that the Aperture be kept open!

Wearing the ds32a - why shoulders and not pocket?

We do not recommend folding the ds32a into a small bundle and stuffing it into your jacket pocket. We know this is done with acoustic stethoscopes, and we've also designed and tested the ds32a to be folded that way. However, wearing the ds32a on the shoulders is a more benign practice, since it places less stress on the mechanical parts. It is therefore a highly preferred way to treat your stethoscope.



Service and Warranty

This product is warranted against manufacturing or materials defects for a period of one year from the invoice date. If a material or manufacturing defect occurs within the warranty period, repairs will be performed free of charge upon returning the device to Thinklabs. The warranty will be voided in cases of abuse, excessive or inappropriate use conditions, or accidental damage to the product. Thinklabs may, at its sole discretion, replace the product with a suitable equivalent model. The warranty is transferable at Thinklabs' discretion only.

For maintenance, repair, service and contact information, visit the Thinklabs website at www.thinklabsmedical.com, and check the Support page. Before shipping the product for repair, please contact Thinklabs first, at

service@thinklabsmedical.com,
or (303)521-5023.

Please quote the serial number, located inside the battery compartment when contacting us.

To have the product repaired, ship the product in suitably protective packaging, with name, return address, daytime telephone number and/or email address, a description of the problem, and a copy of the purchase invoice, to:

Thinklabs inc.
Attn: Service
6571 South Pontiac Court
Centennial, CO 80111

Package Contents

- 1x Rhythm ds32a High Resolution Stethoscope with EmD100 Diaphragm
- 2x AAA Batteries
- 2x Spare eartips
- 1x Quick Reference Guide



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US Patents 6,498,854 6,661,897
Other US and Foreign Patents Pending.

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