

REDISCOVER SOUND
BRING IT TO PERFECTION
1" TRUE CONDENSER MICROPHONE
FOR ULTRA-DETAILED RECORDINGS

LCT 540 S

// **LCT 540 SUBZERO**
USER MANUAL



LEWITT

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1. Introduction

With the LCT 540 SUBZERO, LEWITT introduces a cutting-edge microphone for ultra-detailed sound images. Get involved with tone and sound in ways unheard and bring your recordings to perfection by capturing all the fine-grained characteristics that constitute each moment of your performance. Rediscover your instrument and voice on a whole new level of musical detail.

2. Box Contents

- // LCT 40 SH- Shock mount with 5/8" thread and 3/8" adapter
- // LCT 50 PSx - Magnetic pop filter
- // LCT 40 Wx - Windscreen
- // DTP 40 Lb - Leatherette transport bag

3. Features / Top applications

The LCT 540 SUBZERO is built to record any sound source at an exceptionally high level of detail. In doing so, it will retain the musical character of the sound source. This 1" true condenser studio microphone was developed in close cooperation with world-renowned producers and audio engineers; first and foremost, to be an outstanding vocal microphone. Naturally, thanks to its specifications, it is suitable for almost any application.



4. Control elements - User interface

// Status indicator ①

Illuminated white: standard operation

Flashing red: clipping occurs

Not illuminated: key-lock active

Illuminated red: Automatic Attenuation active

Flashing red/white or green/white: Clipping History active

// Low-cut indicator ②

Use left pushbutton to change the low-cut settings. Low-cut filters eliminate unwanted low-frequency sounds, compensate the proximity effect and reduce structure-borne noise.

// Pre-attenuation indicator ③

Use right pushbutton to select the pre-attenuation. Use this setting to avoid clipping when recording very loud sound sources.

// Pushbutton functions ④

Key-lock: Hold the center pushbutton for more than 2 seconds to activate the key-lock mode.

Now all pushbuttons are locked until you press any button for 2 seconds again.

Clipping History: Hold the left pushbutton for more than 2 seconds to enter Clipping History. If the status indicator flashes green/white, no clipping occurred. If the status indicator flashes red/white, clipping occurred. The illuminated pre-attenuation symbols show at which pre-attenuation setting the clipping occurred. Press any button for more than 2 seconds to exit Clipping History. Once you exit the Clipping History or remove 48V the history is deleted.

Automatic Attenuation: Hold the right pushbutton for more than 2 seconds to activate Automatic Attenuation and the status indicator turns red. In this mode, the microphone adjusts the attenuation setting automatically when clipping occurs. The adjustment produces an audible sound. Therefore, this feature is intended to be used for recording test runs only and to set all mics to the correct attenuation. It is not recommended to be used during actual recordings. Deactivate by pressing any button again for more than 2 seconds; the status indicator turns white again.

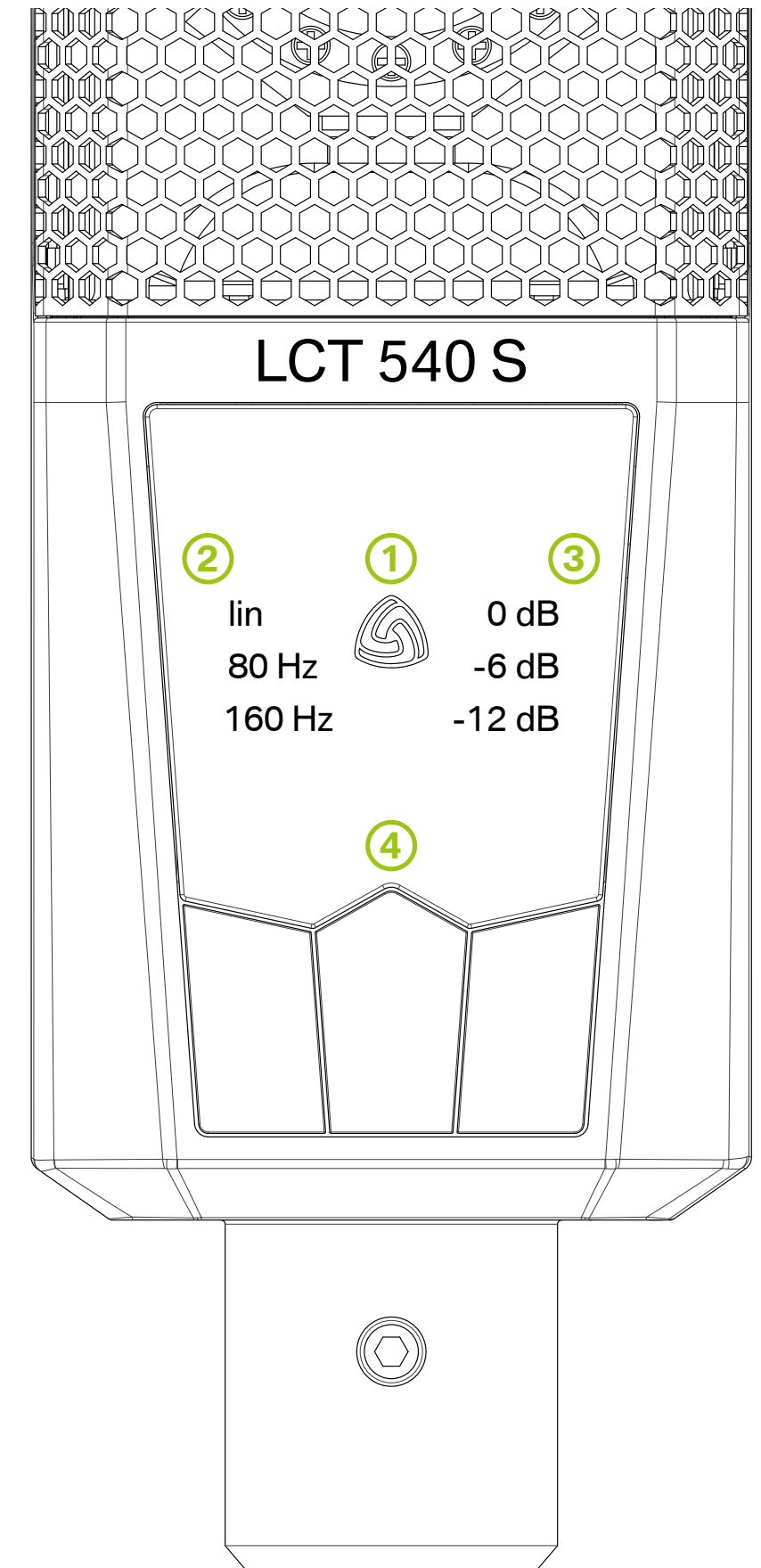


Figure 4.1

5. Setting up your LCT 540 SUBZERO

// Attach the included shock mount to a stable and sturdy microphone stand. A shock mount isolates the microphone from structure-borne noise. Place the LCT 540 SUBZERO in the shock mount and secure it by fastening the threaded nut turning it counter-clockwise.

// Make sure the display faces the open side of the shock mount! It indicates the front of the microphone.

// If you are planning to record vocals or spoken word, make sure to use the supplied LCT 50 PSx magnetic pop filter. The pop filter prevents plosive sounds that are overloading the signal. Plosive sounds are occurring when pronouncing aspirated plosives, which are sounds that are accompanied by a strong burst of breath, e.g. P(opping) in spoken language.

// The pop filter also prevents the capsule being exposed to moisture, and in addition to that, it looks great.

// Loosen the adjustment screw on the back of the shock mount. Adjust the angle and then fastened it securely

// Connect the microphone via standard 3-pin XLR cable to your recording device or preamp. Make sure it is capable of providing 48V phantom power (P48).

// Mute your microphone channel before you turn the phantom power on - it produces a switch-on sound.

// Adjust the input gain and make sure you leave enough headroom (peaks around -12 dBFS). This way you are safe from digital distortions and have a good signal-to-noise ratio.

6. About condenser microphones

6.1. The basic principle of a condenser capsule

// A condenser capsule consists of a diaphragm, that is positioned in close proximity to a solid metal plate hence forming a capacitor. This diaphragm is electrically conductive.

// The lower the mass of the diaphragm, the more sensitive it is to changes in sound pressure. In an audible frequency range, we can perceive these changes of sound pressure, and commonly refer to them as sound. For our large diaphragm microphones of the LCT series, we use 3 µm-thin gold-sputtered Mylar.

// Sound waves hit the diaphragm, making it moving back and forth. As the capacitance changes according to the rhythm of incidental sound waves, the electronics transform the change in capacitance into alternating voltage - mechanical waves are converted into an electrical signal.

// Although the induced voltage is relatively high and could, in theory, be audible on your headphones, the signal breaks down in an instant due to the internal impedance of the capsule. An impedance converter and other electronics like an internal amplifier are used to process the induced voltage so that it can be safely transmitted to following equipment.

// The condenser microphone has to be supplied with external power to generate polarization voltage for the capsule and to power the internal electronics. This external power source is commonly known as “phantom power”. (Microphones with permanently polarized condenser capsules still need phantom power to make the internal electronics work.)

6.2. Phantom power explained

// All condenser microphones require an external power source called “Phantom Power” to generate polarization voltage for the capsule and to power the circuitry. Without phantom power, a condenser microphone will not work.

// Phantom power is a DC voltage, that can be supplied by an audio interface, mixing console, pre-amplifier or a designated phantom power supply unit.

// Phantom power needs to be switched on using a designated button located on the audio interface, preamp, or other recording devices. In most cases, the designated button reads “P48” or “Phantom Power”.

// Phantom power is always supplied via the connected standard 3-pin XLR cable and does not require any other connector or cable in addition to that.

// When activating phantom power, a sound can be audible - this is perfectly normal. You can mute the microphone channel while turning on phantom power to avoid this sound.

6.3. Polar patterns

It is important to understand the basic principles of polar patterns to get the best out of every recording. The polar pattern of a microphone determines the sensitivity on different angles. In other words, it defines how much of the signal will be picked up by the microphone from different directions. By selecting the right pattern, you can avoid unwanted sound sources to bleed into your signal, adjust the mix between dry and room sound or change the frequency response and handling noise sensitivity.

// How to read a polar pattern diagram

First of all, you have to be able to read a polar pattern diagram properly. It contains all necessary information you need to foresee the result during recording.

Think of a 360° field surrounding the microphone. 0° is the “front” of the microphone and the angle where the microphone has its maximum sensitivity. The scale of the circle consists of smaller circles, each representing a 5 dB decrease in sensitivity.

The decibel (dB) is a logarithmic unit to compare two values. If the specification of a cardioid pattern microphone states it has a rear rejection of 25 dB, it means that the most sensitive part (0°) is compared with the least sensitive part (180°).

For (sound) pressure, current and voltage +6 dB is double the signal strength, +20 dB leads to 10 times the signal. A typical rear rejection for a cardioid pattern is about -20 dB. Sound coming from the back of the microphone is picked up at 1/10th sensitivity relative to the front signal.

// Cardioid

The most commonly used polar pattern is most sensitive at 0° and least sensitive at 180°. You cannot go wrong using this for most recording applications. It is easy to get a dry signal as the cardioid pattern blends out a bad sounding room, a noisy fan in the background, etc.

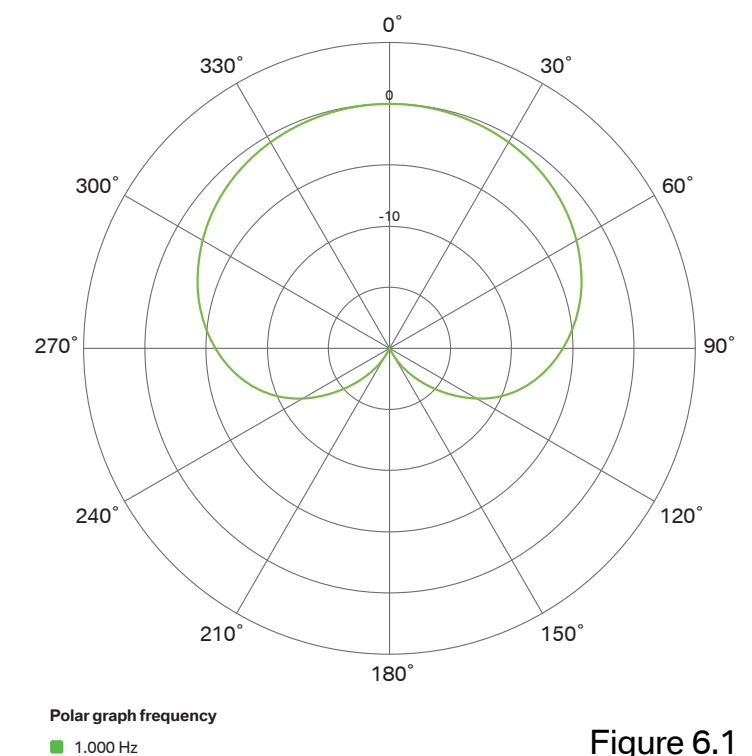


Figure 6.1

6.4. Important specs of a condenser microphone

// Sensitivity

LCT 540 SUBZERO - Sensitivity: 41 mV/Pa, -28 dBV/Pa

You can often read that a condenser microphone has a “high” sensitivity. What does that mean in practical terms? In short, it means that a more sensitive microphone is “hotter” – i.e. it requires less gain (amplification) to achieve a certain output level. You can specify a microphone’s sensitivity in two ways: in mV/Pa or dBV/Pa.

“41 mV/Pa” means, the microphone produces an output signal of 41 mV when it is being exposed to 1 Pascal (1Pa = 94 dB SPL). “-28 dBV/Pa“ means, the microphone produces an output signal of -28 dBV when it is being exposed to 1 Pascal (1Pa = 94 dB SPL). This value is more practical, as dB values are easily comparable.

LCT 540 SUBZERO: -28 dBV/Pa.

Microphone X: -48 dBV/Pa. Microphone X would need an extra gain of 20 dB to produce the same output level as the 540 SUBZERO.

// Equivalent noise level or self-noise

LCT 540 SUBZERO - Equivalent noise level: 4 dB (A)

Self-noise or, more accurately, equivalent noise level is the sound pressure level that is equal to the RMS voltage that can be measured at the output connector of a microphone without an external sound source being recorded. In other words, there is a sound pressure level that matches the inherent self-noise of the microphone. This sound pressure level is the equivalent noise level (self-noise) of the microphone.

Example: if a microphone has an equivalent noise level (self-noise) of 10 dB (A) SPL and picks up a sound source with 10 dB (A) SPL the signal to noise ratio is 1:1 or 50/50.

The range between the equivalent noise level and the maximum sound pressure level is referred to as the dynamic range of a microphone.

Spoken in practical terms, low self-noise does not limit your freedom of microphone positioning. With noisy microphones, you need to get very close to the recorded sound source to get a good signal-to-noise ratio. A low self-noise microphone, on the other hand, can record not only distant but also very quiet sound sources. With its 4 dB (A) of equivalent noise level it is guaranteed that your studio microphone is never the cause of noise problems.

// Frequency response

The frequency response shows the sensitivity over the microphone’s frequency spectrum and has a huge influence on the “sound” of a microphone. See section 9 Tech graph for the frequency response chart.

// MAX SPL

LCT 540 SUBZERO - Max. SPL for 0.5 % THD: 136 dB SPL

Manufacturers state the maximum sound pressure level a microphone can handle before the signal starts to distort. In sound reproduction, we often aim for a “pure”, undistorted signal. When distortion becomes audible, depends on the source material and the listener’s perception. Most manufacturers state the MAX SPL at 0.5% THD (Total Harmonic Distortion), measured at 1kHz.

7. Recording tips

In the following chapters we will provide you with some basic tips about recording. Take this as a rough guide, not as hard rules. Take your time to experiment and don't be afraid to try different things. Always listen to your ears! In a very simplified analogy, you can think of the mic as a flashlight. Whatever your "beam of light" illuminates, will be in the focus of your recording.

// Room sound

Try different rooms if you have the possibility, every location sounds different. A living room with shelves, couches, and carpet will sound balanced, quite dry and will be suitable for most situations. A bathroom will sound more lively due to its reflective tiles. For some scenarios, it can be an interesting place to record vocals or acoustic instruments. Long story short: Finding the right location can make a big difference. Just be creative.

// Microphone positioning

Always spend enough time on positioning your microphone. Even the smallest changes can make a huge difference to the final results. Remember that mic positioning is one of the things that heavily define the quality and sound of your recording, but cannot be changed after the recording process is completed. If you are trying out different microphone positions, make sure that your EQ settings are flat on your DAW, channel strip, audio interface, mixing console, etc. This way you can clearly hear the differences in frequency response that occur from different microphone positions relative to your sound source.

// Sensitive microphones

Sensitive microphones pick up all sounds in a room. You may not notice unwanted sounds right away, take a minute to check for noises from outside, fans, air conditioners, creaking floors and so on.

Most of the time it is unlikely to get a completely quiet room, but that is not a big problem. Try to position the microphone and sound sources you like to record away from unwanted noise sources. The LCT 540 SUBZERO features a cardioid pattern with an excellent rear rejection, meaning that your microphone is a lot less sensitive to sound coming from the back

// The proximity effect

The closer you position your microphone to your sound source, the more pronounced is the lower frequency range. This effect is called the proximity effect, and names the phenomenon of the increase of low frequency response. It helps your vocals or instruments to sound fuller and warmer, but it is essential to find the right balance, as too much low end in your vocals might get in the way of the frequency range of other instruments. And guitar recordings, for example, tend to sound muddy with too much low-end being recorded.

8. Applications

A condenser microphone is a classic go-to microphone for studio work, as it can capture every subtle nuance of the sound source, therefore delivering natural and detailed sound. Of course, it can also be used for many stage applications, for example cymbals, amplifiers, overheads, background vocals, acoustic instruments, and more.

8.1. Vocals

// Start by attaching the LCT 50 PSx magnetic pop filter to the LCT 40 SH shock mount. It not only helps to avoid plosives and hisses on your recording but also protects the condenser capsule from being exposed to moisture.

// Define a distance that the vocalist is supposed to keep relative to the microphone. Depending on the voice and the style of the vocalist this distance may vary (even during the recording). Try starting with a short distance of approximately 15 cm. Use tape to mark a spot on the floor.

// The further away you are from the microphone, the more room sound you end up recording besides your voice.

// The closer you are relative to your microphone, the more pronounced is your lower frequency range. This effect is called the proximity effect, and basically names the phenomenon of the increase of low frequency response, the closer you get to the microphone. It helps your vocals to sound fuller and warmer, but it is very important to find the right balance, as too much low end in your vocals might get in the way of the frequency range of other instruments.

// A cardioid pattern is perfect to get a very defined, articulated, and dry recording. A dry recording gives you the freedom to add reverb (or other effects) to your vocal track later on according to your needs. You can always add reverb, but it is very difficult to almost impossible to reduce your room sound in post-production without loss of signal quality.

// If your vocals sound too bright, try to sing into the microphone slightly from the side. The sound changes depending on the angle and you might find a more suitable one for your recording.

8.2. Guitar amps

// To record a guitar or bass cabinet, start with pointing your microphone towards the speaker's center. From there, start moving your mic outwards until you find a suitable sound. In the center, the speaker's cone, the sound is the brightest. Especially when miking speakers, slight changes in position can produce a completely different sound. Experiment with the position (angle and distance) of the mic, or use more than one mic to get a fuller and more unique sound. We suggest using an additional MTP 440 DM.

8.3. Acoustic guitar

// An easy and very common way to record acoustic guitar using only one microphone is to place it 20-30 cm away from the instrument, pointing towards the area where the neck and body meet. If you are using two microphones, point one towards the 12th fret, the other one points towards the soundhole.

8.4. Drums

// Although you often see drums being miked with lots of microphones, you can achieve good results using a single large-diaphragm condenser microphone. Especially for pre-production, or demo-recordings, it is an uncomplicated way to record your ideas or song-structures. The front-of-kit position is recommended for those scenarios; it records all parts of the kit, but it also delivers a punchy sound coming from the kick. If you want to upgrade your sound using another mic:

1) Take a dynamic microphone like the DTP 340 REX and complement your setup by miking the kick as well. Move the condenser microphone to an overhead position. With hole in kick drum skin: A good starting position is half-way in, pointing towards the beater, try different angles until you are satisfied.

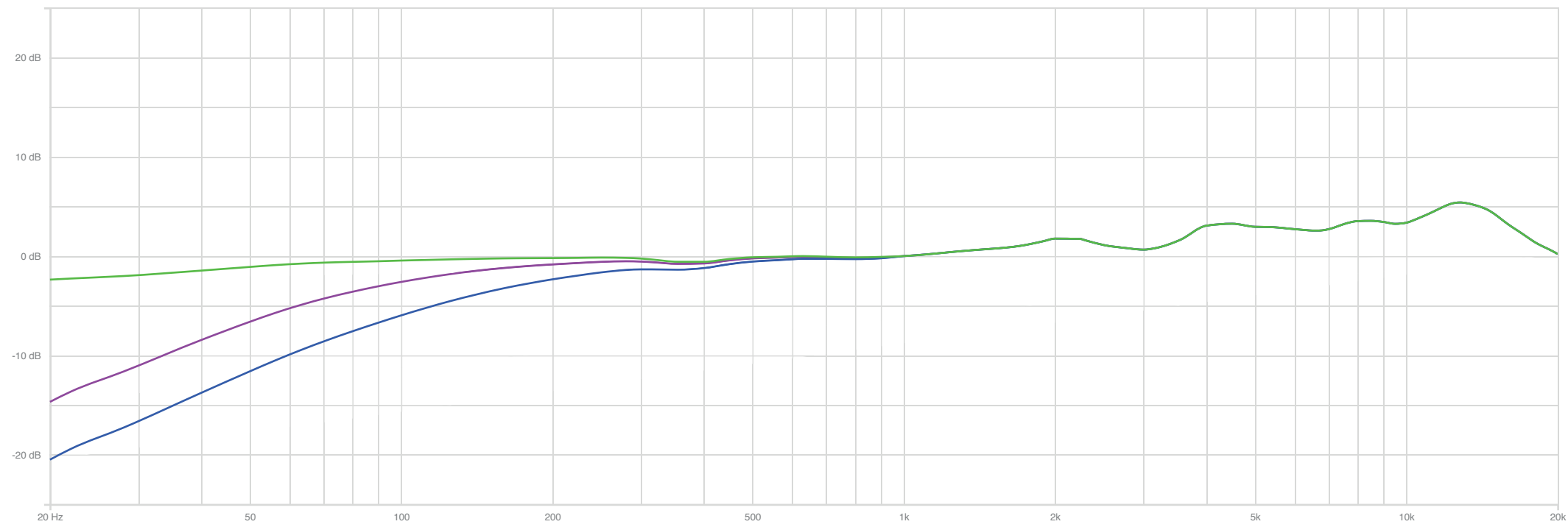
Without hole: position it close to the skin, starting from the center, moving outwards until you find a pleasant sound. Also vary the distance, but be aware, the further away, the more bleed you get from other parts of the drum kit.

2) Adding a snare mic – Try to position the snare mic in a way that it does not pick up too much sound coming from the hi-hat. Use the rear rejection of the cardioid pattern to achieve a clean snare recording. Start by positioning the mic above the rim, pointing to the center of the snare drum. Try varying the angle and also the distance. A good starting distance is around 5 cm between capsule and rim.

8.5. Stage use

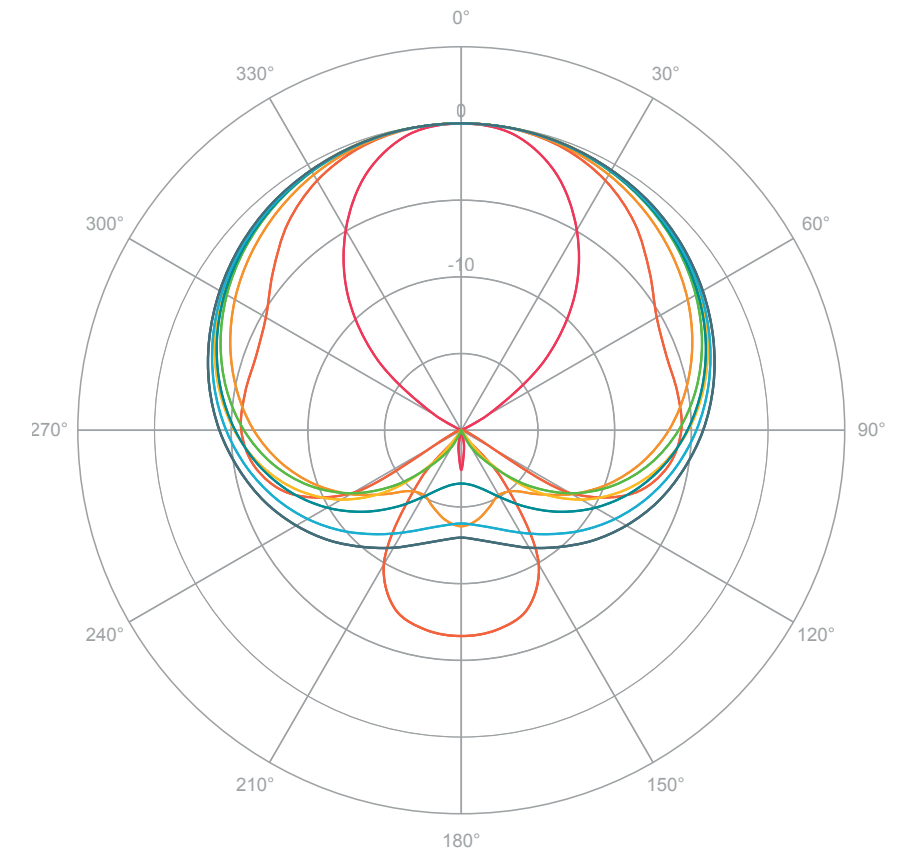
Of course, a condenser microphone can also be used for many stage applications, for example, cymbals, amplifiers, overheads, vocals, acoustic instruments, and more. Although condenser microphones are highprecision tools, they are not as fragile as their reputation may suggest. Today's manufacturing standards allow us to build condenser microphones that can be used in the studio as well as on stage, so there is no need to worry – just please do not throw it around. It is always recommended to handle tools with appropriate care. It helps to sustain their longevity.

9. Tech graphs



- Low cut**
- linear
 - 80 Hz
 - 160 Hz

Figure 9.1 - Frequency response of the LCT 540 SUBZERO



- Polar graph frequency**
- 125 Hz
 - 250 Hz
 - 500 Hz
 - 1.000 Hz
 - 2.000 Hz
 - 4.000 Hz
 - 8.000 Hz
 - 16.000 Hz

Figure 9.2 - Polar patterns of the LCT 540 SUBZERO

10. Specifications

Type	Condenser, externally polarized
Acoustical operating principle	Pressure gradient transducer
Diaphragm	3 micron gold sputtered Mylar
Transducer Ø	25.4 mm, 1 in
Polar pattern	Cardioid
Sensitivity	41 mV/Pa, -28 dBV/Pa
Signal / noise ratio	90 dB (A)
Dynamic range	132 dB (A)
Equivalent noise level	4 dB (A)
Max. SPL for 0.5 % THD	136 dBSPL, 0 dB pre-attenuation
Supply voltage	48 V +/- 4 V
Current consumption	3.6 mA
Internal impedance	68 Ω
Connector	Gold plated 3-pin XLR
Mic enclosure	Zinc die cast
Microphone dimensions	158 x 52 x 36 mm, 6.22 x 2.04 x 1.42 in
Microphone net weight	371 g, 13.1 oz

Table 10.1

11. Accessories

// LCT 40 SH - shock mount

A shock mount is recommended for most recording applications as it reduces unwanted structure-borne noise. The front of the microphone is indicated by the Lewitt logo. The open front of the shock mount allows you to position the microphone as close as you like to the source.

// LCT 50 PSx - magnetic pop filter

The magnetic pop filter was designed to perfectly integrate with the design of the microphone and its shock mount. A pop filter not only helps to avoid plosives and hisses on your recording, but also protects the condenser capsule from being exposed to moisture.

// LCT 40 Wx – windscreen

This one is especially useful when using the microphone outdoors, to shield the capsule from wind. Can also be used for vocal recordings, to protect the capsule from moisture.

// DTP 40 Lb - transport bag

Microphones which are not in use should not remain on the stand gathering dust or be unnecessarily exposed to humidity. Unmount it from the shock mount and put it into the supplied DTP 40 Lb transport bag.

// Protective case

The military-grade protective case made of nearly indestructible material offer you comprehensive protection for your microphone.

12. Troubleshooting

I cannot hear anything!

// Check if phantom power (P48) is switched on. A condenser microphone always needs to be supplied with 48V phantom power to work.

// Check your whole signal chain one by one and check if all connected equipment is supplied with sufficient electrical power.

// Check if your audio interface, mic-preamp, or other subsequent equipment receives an input signal.

// Check if all cables are well connected and functional.

My signal sounds distorted, what can I do?

// Check and adjust input gain on your audio interface, mic-preamp, or other subsequent equipment – always make sure you leave sufficient headroom.

// Plosives sounds during vocal recordings can overload the capsule – use the supplied pop filter and/or keep a greater distance between source and microphone.

// Wind effects – use a fitting windscreen (preferably the supplied accessory).

// Structure-borne noise – use a fitting shock mount (preferably the supplied accessory).

My recording sounds muffled!

// Make sure the user interface is facing the sound source during recording.

// To record with full sensitivity do not cover any part of the wire mesh.

13. Safety guidelines

Lewitt GmbH shall not be liable for consequences of an inappropriate use of the product not complying with the technical allowance in the user manual such as handling errors, mechanical spoiling, false voltage and using other than the recommended correspondence devices. Any liability of Lewitt GmbH for any damages including indirect, consequential, special, incidental and punitive damages based on the user's non-compliance with the user manual or unreasonable utilization of the product is hereby excluded as to the extent permitted by law. This limitation of liability for damages is not applicable for the liability under European product liability codes or for users in a state or country where such damages cannot be limited.

Please note:

// The capsule is a sensitive, high precision component. Make sure you do not drop it from high heights and avoid strong mechanical stress and force.

// To make sure that the microphone's high sensitivity and sound reproduction quality is sustained, avoid exposing it to moisture, dust or extreme temperatures.

// Do not apply extensive force when disconnecting a cable, always pull on the connector and not on the cable itself.

// Microphones which are not in use should not remain on the stand gathering dust or be unnecessarily exposed to humidity. Store it in a dry and safe space.

// Do not attempt to modify or fix the microphone as it would void your product warranty.

// The casing of the microphone can be cleaned easily using a wet cloth, never use alcohol or another solvent for cleaning.

// Keep this product out of the reach of children.

// Please also refer to the owner's manual of the component to be connected to the microphone.

14. Regulatory information

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Declaration of conformity can be requested at info@lewitt-audio.com

Manufacturer Details

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CEO LEWITT GmbH



15. Warranty

All products manufactured by LEWITT GmbH feature a limited two-year warranty. This two-year warranty is specific to the date of purchase as shown on your purchase receipt.

LEWITT GmbH shall satisfy the warranty obligations by remedying any material or manufacturing faults free of charge at LEWITT's discretion either by repair or by exchanging individual parts or the entire appliance. Any defective parts removed from a product during the course of a warranty claim shall become the property of LEWITT GmbH. While under warranty period, defective products may be returned to the authorized LEWITT dealer together with original proof of purchase. To avoid any damages in transit, please use the original packaging if available. Please do not send your product to LEWITT GmbH directly as it will not be serviced. Freight charges have to be covered by the owner of the product.

For further information, please visit www.lewitt-audio.com.