

CAPTURE THE SCENE RAW AND NON-DESTRUCTIVE

MULTI-PATTERN FLAGSHIP WITH THE OPTION TO ADJUST
THE POLAR PATTERN AFTER THE RECORDING



// **LCT 640 TS**
USER MANUAL

SOUNDS LIKE  **LEWITT**

// Index

Box Content	3
Intro	3
Features	4
User Interface	6
Operating Modes and Setup	7
Multi-pattern Mode //	7
Dual Output Mode //	8
// Important Facts About Polar Patterns	9
How to read a polar pattern diagram //	9
// Most Common Polar Patterns and Characteristics	10
// Some Technical Background	11
// How To Create Different Polar Patterns Manually	11
// Change Pattern With The POLARIZER	12
Installation MAC //	12
Installation Windows //	13

// What To Do With A Dual Output Mode?	14
Automate/change the polar pattern after the recording //	14
Change the direction of the microphone, not only the polar pattern //	14
MS stereo with only one LCT 640 TS //	14
MS - the fun way //	14
MS - the easy way //	15
// Stereo applications with two LCT 640 TS	15
XY and Blumlein //	15
AB stereo //	16
ORTF //	16
// Perfect Match Technology	17
// Regulatory Information	18
// Safety Guidelines	18

// Intro

Thank you for choosing the LEWITT LCT 640 TS! In return, we will make your life way easier. Recording with the LCT 640 TS will offer you a level of flexibility you wouldn't have guessed being possible.

There are certain developments that fundamentally changed the way how things are being done - like digital photography compared to analog photography and later on the giant leap from jpg compression as standard to the open RAW standard enabling the photographer to change things like exposure and white balance after the picture has been taken already. The LCT 640 TS also provides such a leading development - but now for the music industry.

Using both outputs of the LCT 640 TS while recording is more like capturing the whole session instead of just recording a source. It adds the freedom of changing the polar pattern dynamically from cardioid all the way to Figure-8 during post-production. In fact while mixing your track, you could still turn your microphone by 180° although you've finished your recording days ago. And we haven't even touched all the possibilities of two LCT 640 TS in a stereo-stereo setup ...

You see, recording with the LCT 640 TS is different than using any other large-diaphragm condenser microphone: it's record now, decide later.

// Box Content

LCT 640 TS microphone
LCT 40 SHx shock mount
LCT 40 Wx windshield
LCT 40 PSx Pop Filter
DTP 40 Lb artificial leather bag
Black military-grade flightcase





// Features

Dual-output mode // The LCT 640 TS provides the signal of the front and the back capsule separately. That way any kind of polar pattern from Omnidirectional to Cardioid, to Figure-8 can be realized dynamically. And the most fascinating fact; you can **change the polar pattern after the recording** during post-production.

Customized or one-click // Plug in your 3pin XLR as you would do with any other mic and you'll get a large diaphragm multi-pattern condenser mic. Plug in the included mini 3pin XLR and experience all the possibilities of a true next gen recording microphone.

MS stereo with only one mic // Record "Mid Side" stereo with only one LCT 640 TS. Just point the side of the microphone to the source!

The Polarizer plug-in // The Polarizer is a newly developed DAW plug-in. Change or fine-tune the polar pattern during post-production, both on PC and Mac. The Polarizer supports VST, AU and AAX.

Low-cut filters // They do exactly what they say, they cut low frequencies. Low-cut filters eliminate low-frequency sounds to compensate the proximity effect and reduce structure-borne noise.



Pre-attenuation // Pre-Attenuation reduces the sensitivity of a microphone. Use it to avoid clipping when recording very loud sound sources.

Key Lock // The Lock function makes the 3 pushbuttons inactive, to avoid accidental change of settings.

Clipping Indicator // If the input signal is very loud the electronics inside the microphone will distort - in other words, the signal will clip. The Status Indicator will blink red to alert the user to adjust the pre-attenuation setting.

Clipping History // It is easily possible to miss if clipping occurred during the recording. The clipping history makes it possible to check if the microphone clipped since it was last turned on by the phantom power.

Perfect Match Technology // Every number of LCT 640 TS will always form matched pairs - thus the LCT 640 TS is the ideal tool for professional stereo and surround recordings.

// User Interface

1 Polar pattern indicator // Use center pushbutton to select polar pattern; omni // broad // cardioid // super cardioid // figure-8. Only available in Multi-pattern Mode! Not illuminated in Dual Output Mode!

2 Low-cut indicator // Use left pushbutton to change the low-cut settings. Activate the low-cut to get rid of unwanted low frequencies and structure born noise.

3 Status indicator // Illuminated white: standard operation Illuminated green: Dual Output Mode
Flashing red: clipping occurs Not illuminated: key-lock active

4 Pre-attenuation indicator // Use right button to select the pre-attenuation. Use this setting to avoid clipping when recording very loud sound sources.

5 Pushbuttons

Key-lock // Hold the **left pushbutton** for more than 2 seconds to activate the key-lock mode. Now all pushbuttons are locked until you press the left button for 2 seconds again.

Clipping History // Hold the **right 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.



// Operating Modes and Setup

Unlike other microphones, the LCT 640 TS features a Dual Output mode that enables engineers to **record the front and back diaphragm of the capsule individually**. Ok, that maybe does not sound as spectacular as the bold font indicates, but it definitely is. So let's put it in other words:

The LCT 640 TS makes it possible to change and fine-tune the polar pattern seamlessly all the way from omnidirectional to figure-8 as well as to turn the recording direction of the microphone by 180° - **even after the recording session**.

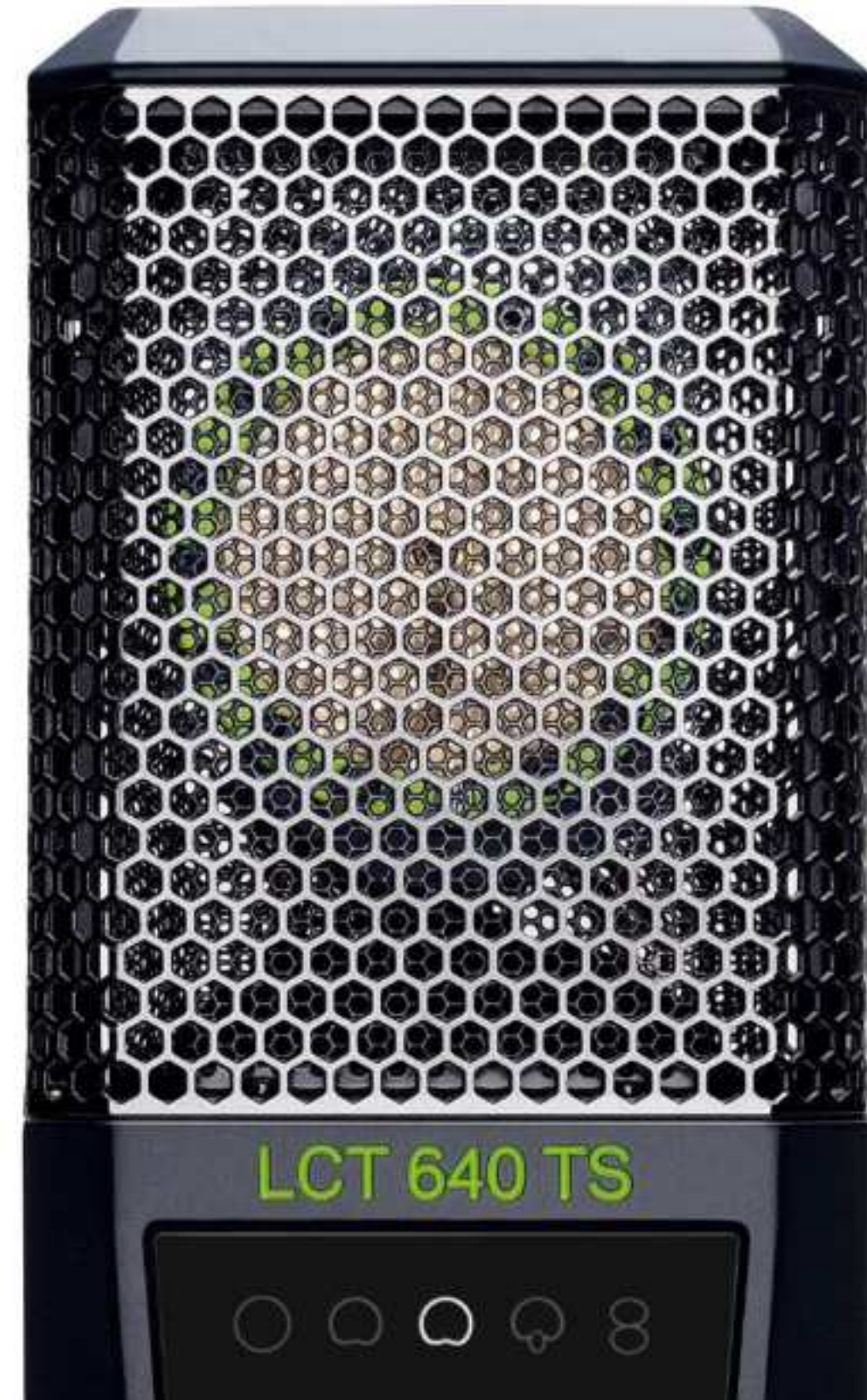
This leads for example to the ability to add as much room sound as desired post-recording and makes a wide range of unique stereo recording techniques possible. But the LCT 640 TS can also be used as a standard multi-pattern microphone. The next section will explain how to set up the microphone for the two modes:

Multi-pattern Mode //

In this mode your LCT 640 TS will behave just like any other multi-pattern condenser microphone. The LCT 640 TS is automatically set to this mode when plugging it up with a standard 3 pin XLR cable.

- // Use a 3 pin XLR cable to connect the LCT 640 TS to your microphone preamp, mixing console or audio interface.
- // Turn on phantom power!
- // Status indicator of the microphone will light up white.
- // Choose one of the five preset polar patterns by pushing the center pushbutton.
- // Adjust the settings on the microphone to your needs.

See section **User Interface** for a walkthrough of the UI elements.





// Operating Modes and Setup

Dual Output Mode //

Now this is where the magic starts. Set to Dual Output Mode the LCT 640 TS enables you to change and fine-tune the polar pattern of your mic at any given time before and after the recording during post-production.

// Use a standard 3 pin XLR cable to connect output A to your microphone preamp, audio interface or mixing console.

// Connect output B with the included adapter cable to your second microphone preamp channel, audio interface or mixing console.

// Turn on 48V phantom power **on both channels!**

// Press and hold center pushbutton for 2 seconds to enter dual output mode.

// Status indicator will light up green.

// Make sure to set the input gain on your preamp to the same amplification for both channels! This is essential to create the polar patterns later on.

// Use your mixing console or DAW to create the polar pattern or use our Polarizer plugin [here](#).

// Attention

It takes up to 20 seconds after phantom power is applied till the microphone reaches it's full sensitivity!

It takes up to 20 seconds till the switch between polar patterns is complete!

Always apply phantom power to output A for normal operation

Always apply phantom power to outputs A and B in Dual Output Mode.

// Important Facts About Polar Patterns

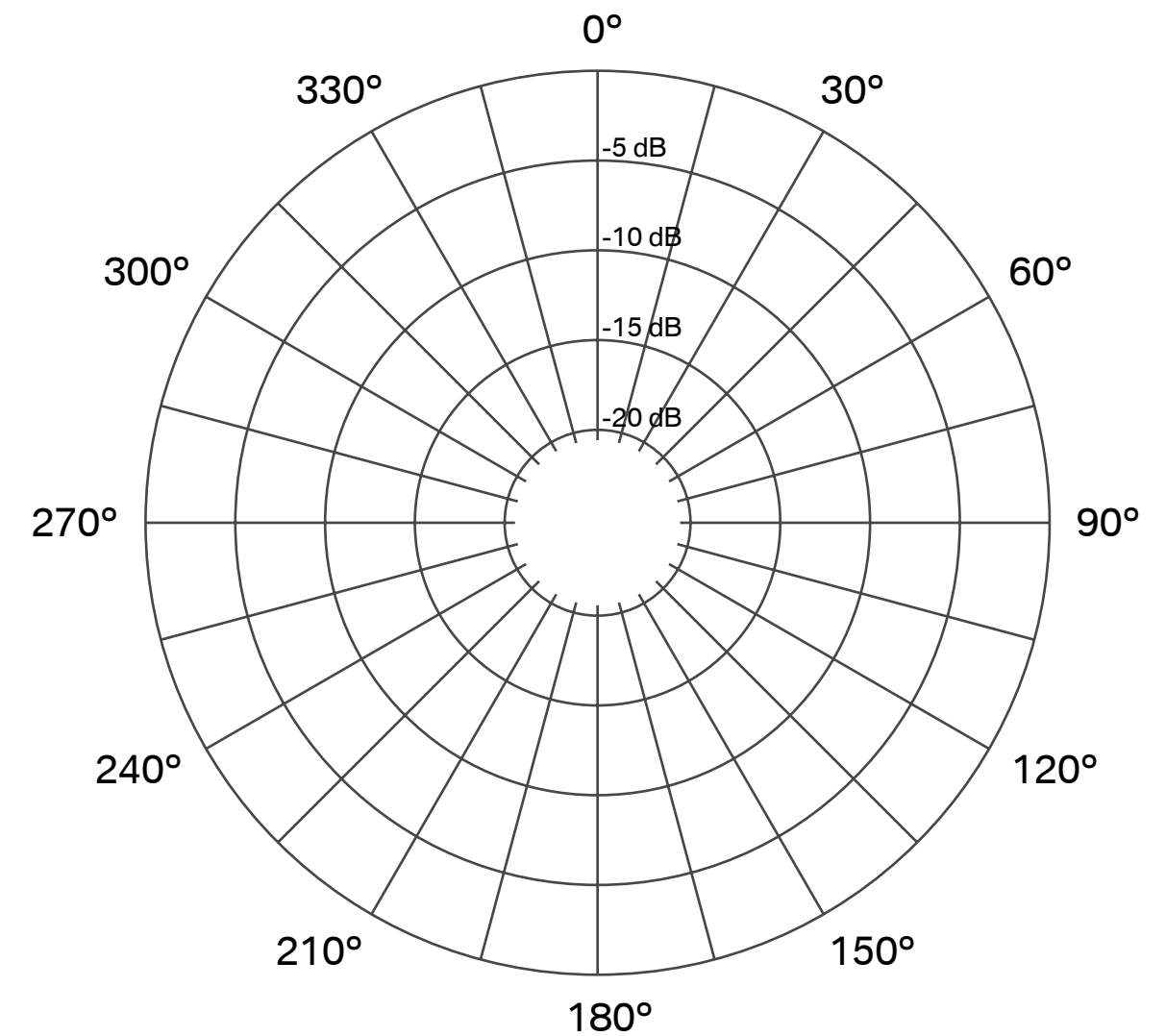
It is very important to understand the basic principles about polar patterns in order to get the best out of every recording. The polar pattern of a microphone determines the sensitivity on different angles. In other words, it defines how much of the signal will be picked up by the microphone from different 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.

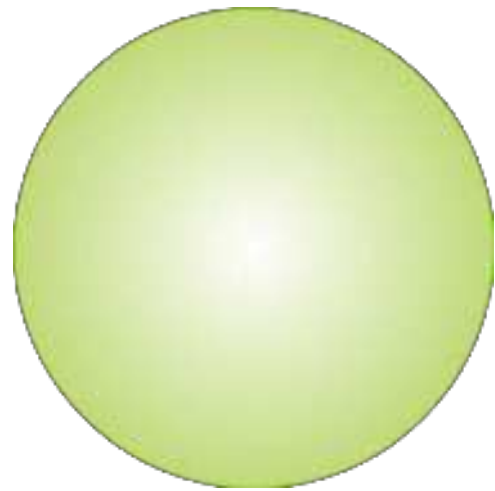
How to read a polar pattern diagram // First of all you have to be able to read a polar pattern diagram properly. In fact it alone tells everything you need to know in order to foresee the result during recording.

The polar pattern consists of a circle, representing 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 5dB decrease in sensitivity. Typically it goes till -25dB.

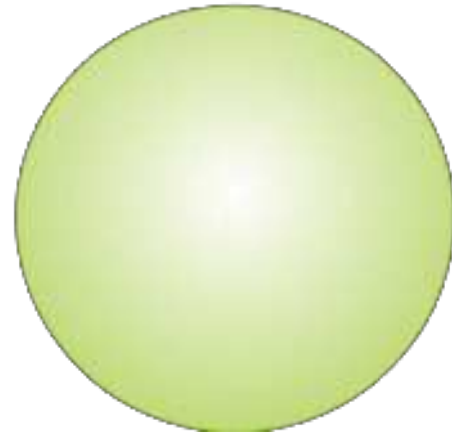
When looking at polar pattern diagrams it is important to know what the dB values actually mean. The decibel (dB) is a logarithmic unit to compare two values. If the specification of a cardioid pattern microphone states it has a rear rejection of 25 dB, it means that the most sensitive part (0°) and the least sensitive part (180°) is compared.

To get a feeling for dB values let us give you an example, even if it includes a bit of maths: For (sound) pressure, current and voltage +6 dB is double signal, +20 dB leads to 10 times the signal. As a typical rear rejection for a cardioid pattern is about -20 dB, it means that sound sources in the back are picked up only at 1/10th sensitivity in comparison to the front signals.





Omnidirectional



Wide Cardioid



Cardioid



Supercardioid



Figure-8

// Most Common Polar Patterns and Characteristics

Omnidirectional // the omni pattern has the same sensitivity to sound coming from any direction. This can be problematic in a bad sounding room or in a live situation where you have Monitors and a PA system as it can lead to feedback. It can also shine in good sounding rooms and time based stereo recording techniques. The omni pattern gets more directivity the smaller the wavelength gets in comparison to the capsule size.

It has the best bass response, flattest frequency response overall and is the least sensitive to handling or wind noise.

Figure-8 // The Figure-8 pattern has the same sensitivity at 0° and 180°, it is the least sensitive at 90° and 270°. This makes it very interesting for various stereo recording techniques (Mid Side, Blumlein). It can also be very helpful in situations where you do not want a signal coming from a 90° angle to bleed into the microphone.

Bass response is the weakest of all polar patterns and it is the most sensitive to wind and handling noise.

Cardioid // That's the most commonly used polar pattern, it is most sensitive at 0° and the least sensitive at 180°. This makes it a great choice for most applications. It is easy to blend out a bad sounding room, a noisy fan in the background and other things alike and get a dry signal.

Wide Cardioid // A mix between omni and cardioid with all their characteristics.

Supercardioid // Supercardioid leads to even more directivity as a cardioid pattern. It is very useful in live situations as it allows for very high gain before feedback. It also keeps the signal very dry because you get a lot of direct signal from your sound source.

// Some Technical Background

Every multi-pattern microphone follows the same technical principle: two membranes back to back with the electrode between them. Both sides have a cardioid pickup pattern. Mixing these signals together with different levels and phase creates different polar patterns.

Distance factor // The distance factor describes how far away a directional microphone can be placed in comparison to an omnidirectional microphone while preserving the same ratio of direct and reflected sound.

Acceptance angle (-3 dB reduction) // The acceptance angle is the angle in which the sensitivity of the microphone is not reduced by more than 3 dB. It is not recommended to place a sound source outside the acceptance angle.

Maximum reduction // The maximum reduction describes the angle with the least sensitivity of the microphone.

Rear rejection // Amount of dB the signal is reduced at the angle of maximum reduction.

// How To Create Different Polar Patterns Manually With Your LCT 640 TS

First of all, you can of course select a preset polar pattern if your microphone is set to Multi-pattern Mode. See **Operating Modes and Setup** for details.

But wouldn't it be awesome to create the different polar patterns with the LCT 640 TS using your mixing console or DAW? It definitely would ...

All you need to do is to record the front and back signal on two different tracks. Make sure to set the gain on both input channels on your preamp to the exact same value. Then it's just a matter how you set the levels and if you invert the phase on one channel. See the table below for the correct values.

	Omni	Wide cardioid	Cardioid	Super cardioid	Figure-8
Front Diaphragm Level	0 dB	0 dB	0 dB	0 dB	0 dB
Back Diaphragm Level	0 dB	-10 dB	-∞ dB	-10 dB	0 dB
Front Diaphragm Phase	0°	0°	0°	0°	0°
Back Diaphragm Phase	0°	0°	0°	180°	180°
Acceptance angle (-3 dB reduction)	-	90°	65°	57°	45°
Maximum reduction	-	180°	180°	126°	90°
Distance Factor	1	1,38	1,73	1,93	1,73

// Change Pattern With The **POLARIZER**

It wouldn't be us if wouldn't have a clever and more convenient way of changing the polar pattern. To make it easier and more fun to play around with different polar patterns we created a plugin, the "Polarizer". It is compatible with PC and MAC and available as VST, AU and AAX plugin.

Installation MAC // (MAC OS 10.5 and higher)

// Download the MAC plugins [here](#)

// Unzip the file

// Double click the Polarizer.dmg

// You will see 3 files (.vst, .au and .aax) on the left side with the corresponding folders on the right side. Drag and drop the desired plugins into the folders. The operating system will ask you to authorise the copy process, enter your system password to proceed.

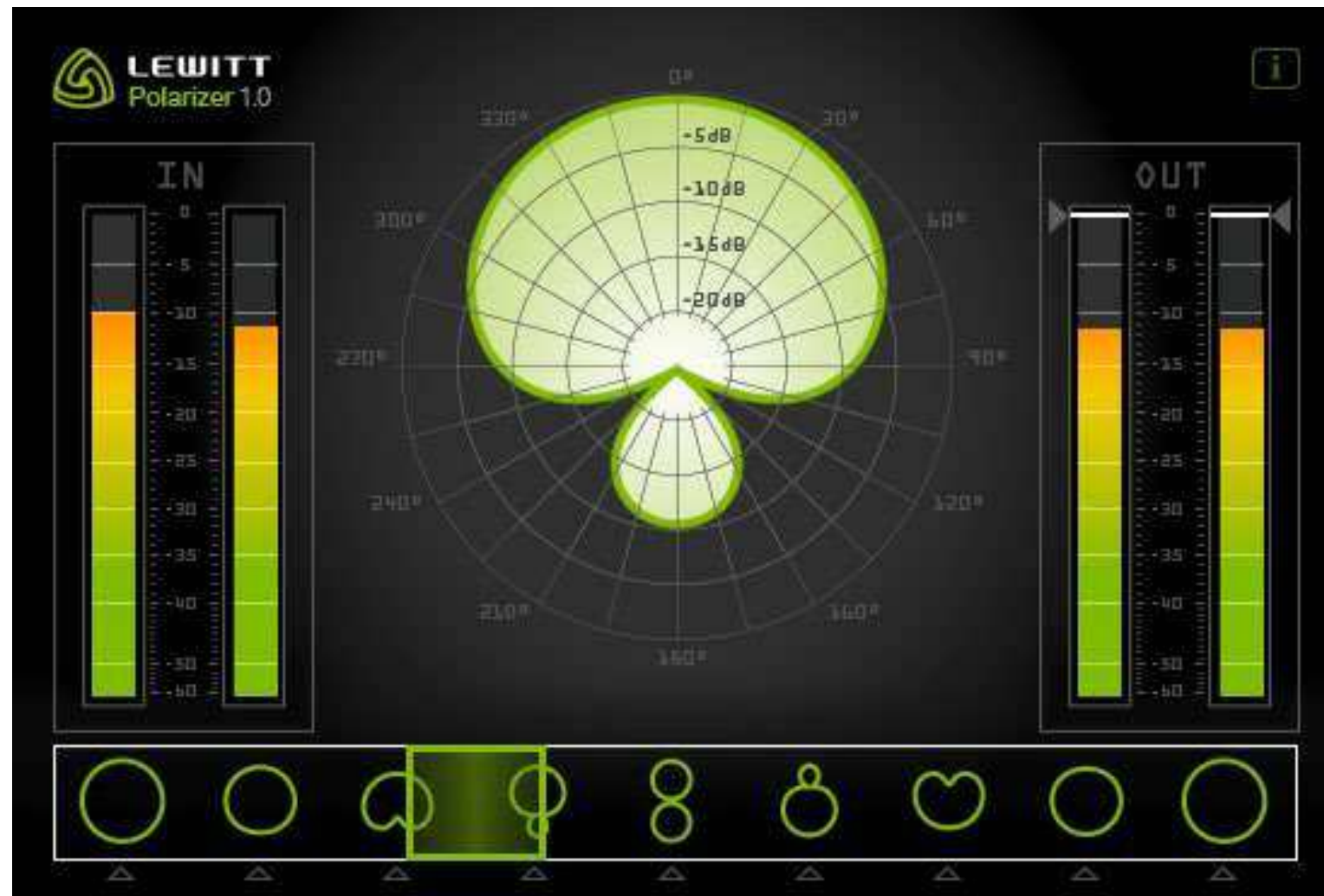
// Done!

Plugin Locations //

aax: Macintosh HD/Library/Application Support/Avid/Audio/Plug-Ins
(only Pro Tools 10.3.5 and higher is supported)

au: Macintosh HD/Library/Audio/Plug-ins/Components

vst: Macintosh HD/Library/Audio/Plug-ins/VST



Installation Windows // (works on Windows 7 and higher)

// Download the Windows plugins [here](#).

// Unzip the file

// You will find an folder with three further folders. AAX, VST32, VST64

// Now you need to manually drag the plugins into the corresponding plugin folder

Plugin folder locations //

aax: C:\Program Files\Common Files\Avid\Audio\Plug-Ins

only Pro Tools 10.3.5 and higher is supported

vst 32 bit: This location depends on the DAW of your choice. It can be a custom folder anywhere on your harddrive for some DAWs, others have specific folders. Please check out the user manual of your DAW for information where to put the plugin files.

For Cubase it's: C:\Program Files (x86)\Steinberg\VSTPlugins

vst 64 bit: This location depends on the DAW of your choice. It can be a custom folder anywhere on your harddrive for some DAWs, others have specific folders. Please check out the user manual of your DAW for information where to put the plugin files.

For Cubase it's: C:\Program Files\Steinberg\Vstplugins\

// What To Do With A Dual Output Mode?

There is a million of really awesome things you can do with Dual Output Mode. Lets cover at least some of them:

Automate/change the polar pattern after the recording // There are many reasons why you want to change the polar pattern after the recording session, just to name a few:

- // To add or remove room sound from the recording. You can also dynamically change the polar pattern and therefore the room sound during a song. Leave for example the vocals quite dry and then during the chorus open up to more room sound.
- // Minimize bleed in a recording, by adjusting polar pattern in a multi instrument session.
- // Change the sound of the recording. Different polar patterns have different characteristics.
- // Compensate the movement of musicians dynamically compensated - mind the acceptance angle!

Change the direction of the microphone, not only the polar pattern //

- // Change the polar pattern and direction (0° or 180°)
- // Crossfade between different polar patterns.
- // Position the microphone between two vocalists for a duet - balance them later on in the post.
- // Same goes for interview or podcasting situations - balance the signal later on in the post.
- // Try to use one or two LCT 640 TS as drum room mics. It can be interesting to use the sound from the capsule facing away from the drumkit pointing at the reflective wall. If it's too diffuse, blend in a bit of the side facing the drumkit.

MS stereo with only one LCT 640 TS //

Mid side stereophony is usually only possible with two microphones. The side microphone is a figure-8, where the side points to the source, the mid microphone is any other polar pattern like cardioid, omni, ..., where the front is pointed to the source. You need to decode the signals to get the stereo signal. It goes like this:
Left channel = Mid + Side, Right channel = Mid - Side

The stereo image can be adjusted from mono to extra wide stereo by changing the ratio of the mid and side signals.

With the LCT 640 TS it is very easy to make a MS recording with only one microphone and without the need to decode the signal. Just point the side of the microphone to the source and record both outputs on a stereo track in your DAW. Now you have 2 options to achieve exactly the same result, a complicated one and a really simple one. For the fun of it let's start with the complicated one, that also explains best what is actually happening.

MS - the fun way //

- // Turn the side of the microphone to the sound source while recording.
- // Create the mid signal by combining both output signals of the LCT 640 TS or use the Polarizer plugin to create an omni pattern.
- // Create the side signal by subtracting the back signal from the front signal or use the Polarizer plugin to create the figure-8 pattern.
- // MS Decode the signals to create a stereo image:

Mid = omni (front membrane + back membrane)

Side left = figure-8 (front membrane - back membrane)
+ omni (front membrane + back membrane)

Side right = figure-8 (front membrane - back membrane)
- omni (front membrane + back membrane)

MS - the easy way //

// Turn the side of the microphone to the sound source.

// Put the front signal on the left channel of a stereo track and the back signal on the right channel of the stereo track.

// Change the panorama for both signals to adjust the stereo width. If the panorama is in the center, the signal is mono (front + back = omni). If the panorama sliders are hard left and hard right it has the maximum stereo effect.

// Stereo applications with two LCT 640 TS

The LCT 640 TS is a unique microphone through and through. It's **Perfect Match Technology** combined with the **Dual Output Mode** and the **Polarizer Plugin** opens a whole new world of possibilities for stereo recordings.

There are two basic principles that allow us to record and more importantly hear stereophonic; we can determine the location of a sound source by differences in loudness and time differences. Let's briefly go over some popular stereo recording techniques.

XY and Blumlein //

The XY stereo technique is based on level differences between 2 directional microphones. Their capsules are placed together as close as possible and one microphone points right the other one left. The opening angle is variable but usually at least 90°. XY stereo recording techniques are excellent for locating individual sources in a recording and are mono compatible. A special XY recording technique is "Blumlein", named after Alan Blumlein, a pioneer in stereo recording. It consists of 2 figure-8 microphones with an opening angle of 90°. It is known for its very balanced and natural sound.

The polar pattern used has a big influence on the stereo image. To locate a signal 100% left or 100% right the level difference between the two signals must be 15 dB. A look at the pictures on the left illustrates what opening angles are necessary to get the widest stereo image for different polar patterns.

With the LCT 640 TS it is possible to change the polar pattern during the mixing process. This way you can adjust the stereo width by changing the polar pattern. The polar pattern also defines how much sound you capture from behind the microphone.

AB stereo //

AB stereo uses time differences to capture a stereo recording. Two microphones, usually omni - sometimes wide cardioid or cardioid are placed in parallel to the sound source with a distance to each other of at least 34 cm. A distance of 34 cm results in a time difference of 1 ms.

If the signal on the right channel arrives at your ears 1 ms earlier than the same signal on the left channel it will feel like it is only coming from the right channel. AB stereophony gives the listener a great feel of the room sound while localisation of individual signals is not as precise as XY stereophony.

With the LCT 640 TS you have a great tool for AB stereophony as you can adjust how much room sound you want to have in your recording, even after the recording.

ORTF //

ORTF (Office de Radiodiffusion Télévision Française) was introduced by French radio broadcasting engineers. It is a combination of level based and time based stereophony. The capsules are placed 17 cm apart with an opening angle of 110°. The result has all the qualities of both methods combined.

By changing the polar pattern you can change the stereo width and also the amount of room sound.

// Perfect Match Technology

Our Perfect Match Technology is a unique approach to matching microphones for stereo and surround use. Usually a matched pair will be selected after production to have a similar sensitivity at 1kHz - this usually involves a lot of testing of each microphone after production and making pairs or groups of units with similar specs. To us this seems like an outdated approach so we made matching the microphones an integral part **within** the production process.

First it is important to understand what sensitivity in a microphone means. Sensitivity determines how much voltage is output at a given sound pressure level. How sensitive a microphone is depends mostly on the size and construction of the capsule and the polarisation voltage. Externally polarized condenser capsules need to be polarized. A higher polarisation voltage will increase sensitivity. Of course there is also a limit of how much voltage you can put on the capsule before a reliable operation is not possible anymore.

We put a microcontroller into the LCT 640 TS that can control the polarisation voltage. During production we increase or decrease the polarisation voltage to achieve exactly the same sensitivity in every single LCT 640 TS ever produced.

// Safety Guidelines

- // The capsule is a sensitive, high precision component. Make sure you do not drop it from great heights and avoid strong mechanical stress and force.
- // To ensure high sensitivity and best sound reproduction of the microphone, avoid exposing it to moisture, dust or extreme temperatures.
- // Keep this product out of the reach of children.
- // Do not use force on the switch or cable of the microphone.
- // When disconnecting the microphone cable, grasp the connector and do not pull the cable.
- // Do not attempt to modify or fix it. Contact qualified service personnel in case any service is needed. Please do not disassemble or modify the microphone for any reasons as this will void users warranty.
- // The casing of the microphone can be cleaned easily using a wet cloth, never use alcohol or another solvent for cleaning. If necessary the foam wind stopper can be washed with soap water. Please wait till it is dry before using it again.
- // Please also refer to the owner's manual of the component to be connected to the microphone.

// Regulatory Information

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

LEWITT GmbH
Burggasse 79
1070 Vienna, Austria



DI Roman Perschon
CEO LEWITT GmbH

