

# LIGHTBAG II

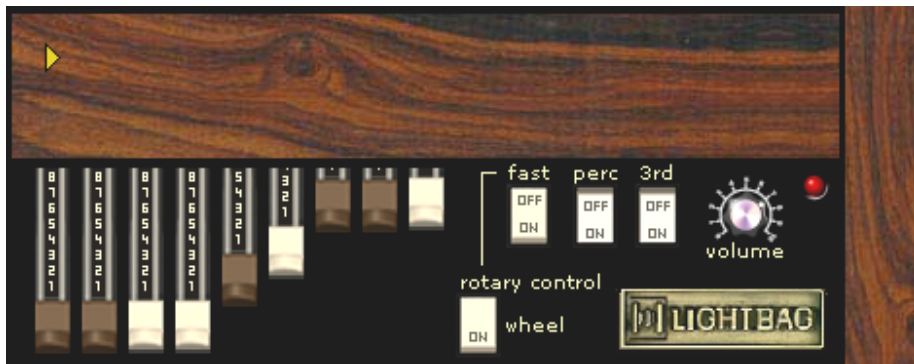
## A VST tonewheel organ

By Istvan Kaldor

This is the latest incarnation of Lightbag, a very convincing emulation of a tonewheel organ and Leslie combination. It has nine drawbars and extensive MIDI implementation for real-time control. Made with Synthedit, it is the baby brother of DirtBag but uses a lot less CPU power – av. 5%.

Lightbag has 32 varied presets that range from traditional Hammond sounds to pipe organs, accordions, and a couple of weird ones thrown in for good measure.

### The drawbars and main panel



Nine drawbars control the levels of the tonewheels. These work in typical organ fashion, by pulling them out (down) to increase level. If all nine drawbars are pulled out, you will hear all tonewheels at full volume.

If you're not familiar with drawbars, you can think of them as a form of additive synthesis. Where the leftmost one is the fundamental pitch and the others are harmonics above the fundamental.

Each drawbar has a dedicated MIDI controller number so you can adjust them from your keyboard or other MIDI hardware controller in real-time. See the MIDI implementation chart at the end of this manual for details.

On the panel to the right of the drawbars are switches for the rotary (Leslie) control, the percussion, and a master volume control. Next to the volume control is a MIDI note indicator LED. Clicking on the Lightbag logo will bring up an information panel.

## Parameter pages

In the top-left corner is a small, yellow arrow which, when clicked, will cycle through six pages of parameters.

## Rotary control



The first page is where you set up the Leslie effect. From left to right, the switch labelled "rotary" turns the effect on/off. Then there is a "level" knob which controls the amount of Leslie effect, this can also overdrive the Leslie at high settings.

"accel" determines the rate of acceleration from slow to fast, and vice-versa, and the "slow" and "fast" knobs set the minimum and maximum speeds of the Leslie's rotation. Two LED's indicate whether the speaker is in fast or slow mode.

The "cutoff and "res" controls work together to alter the Leslie's tone and resonance.

A real Leslie speaker is controlled by the player with two switches; one for fast/slow, the other acts as a brake. Lightbag gives you MIDI control for fast/slow, or you can use the switch on the main panel.

Setting up the Leslie for MIDI control is very simple; just select the MIDI controller using the "rotary control" button (on the main panel to the right of the drawbars).

As you click on this button it will cycle through the controller options;

- "wheel" modulation wheel MIDI CC1
- "sustain" MIDI hold pedal CC64
- "panel" the "fast" switch on the main panel

## Percussion



This adds a short tone with a fast attack and adjustable decay and it can be either monophonic or polyphonic. The volume of the percussion is set with the "level" knob, and "decay" determines how long it will last – pretty easy really.

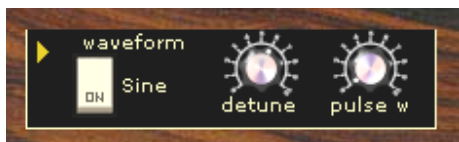
The "keyclick" knob adds a very short click sound to the attack of a note, the sound of which can be adjusted with the "tone" and "color" knobs.

Originally the keyclick sound was an undesirable side effect of the Hammond organ's tone generating system, but players liked it because it made the instrument sound more percussive.

From the main panel you can turn the percussion on/off and select whether it uses the 2<sup>nd</sup> or 3<sup>rd</sup> harmonic.

Monophonic percussion is common to real tonewheel organs, while polyphonic percussion is common to synthesised and electronic organs – with Lightbag you get both.

## Waveform



A waveform selector button cycles through a choice of five different waveforms. They are; sine, saw, ramp, triangle, and pulse. For traditional organ sounds, use the sine or triangle waves. Saw, ramp and pulse will give you brighter sounds.

When pulse is selected, the width of the pulse can be set with the "pulse w" knob. When this knob is turned fully clockwise a square wave is produced – good for a "reedy" type of sound.

The oscillators can also be de-tuned against each other in order to give a fatter sound.

## Delay



This page gives access to a simple delay effect controlled with “delay” the amount of delayed signal, “time” delay time, and “fdback” delay feedback.

## Other controls



Organists use a pedal to control the volume of the upper manual (swell) while playing; with Lightbag you can use a MIDI controller to do this. The “swell” button cycles through the available options. This does NOT affect the master volume knob; it controls the overall signal level before it goes into the amplifier/speaker. Therefore, if distortion is used, swell can alter the timbre as well.

“velo” controls how much velocity will affect the volume – this is not common to traditional organs, but is often found on synthesised organ sounds.

“attack” is the attack rate of the amplifier envelope – there are no decay, sustain, or release controls.

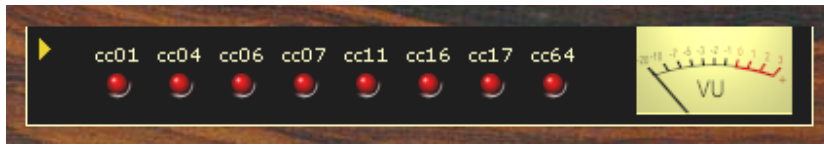
Another feature that real organs don’t have is portamento. Lightbag has it though, controlled via the “porta” knob. Even though a Hammond doesn’t have portamento, or pitchbend, the more experimental players discovered that it was possible to bend notes down by turning off the power to the tonewheels momentarily.

Distortion can be introduced with the “dist” knob.

“gain” is the master level for the drawbars. This is NOT the same as the volume control on the main panel; it is used to balance the drawbar sound against the percussion sound. If you turn it all the way down, you will still hear the percussion, provided of course percussion is enabled and turned up.

The “tone” knob applies a 1 pole low pass filter to Lightbag’s output, useful for taming sounds that use the brighter waveforms.

## MIDI indicator LED's and VU meter



Finally, there's a row of LED's that indicate which MIDI controllers are being received by Lightbag, and a VU level meter for Lightbag's output.

## Things you should know

There are two parameters that are NOT saved as part of a patch. They are;

1. the Leslie control selector button
2. the swell control selector button

This is because we figure you probably don't want these to change whenever you select a different preset.

Every time you open Lightbag they will default to "panel" for Leslie speed control, and "off" for swell volume. Use the control select buttons to set Lightbag up for your keyboard and as you change patches, the assigned controllers will remain constant (until you close Lightbag).

## A brief history of the Hammond organ and Leslie speaker



The original Hammond Organ was Designed and built by the ex-watchmaker Laurens Hammond in April 1935. Hammond set up his "Hammond Organ Company" in Evanston, Illinois to produce electronic organs for the "leisure market" and in doing so created one of the most popular and enduring electronic musical instruments ever built.

Hammond's machine was designed using technology that relates directly to Cahill's "Telharmonium" of 1900, but on a much smaller scale. The Hammond organ generated sounds in the same way as the Telharmonium, a tone generator assembly consisting of an AC synchronous motor connected to a geartrain which drove a series of tone wheels, each of which rotated adjacent to a magnet and coil assembly. The number of bumps on each wheel in combination with the rotational speed determined the pitch.

The Hammond had a unique drawbar system of additive timbre synthesis (again a development of the Telharmonium) and stable intonation - a perennial problem with electronic instruments of the time. A note on the organ consisted of the fundamental and a number of harmonics, or multiples of that frequency. In the Hammond organ, the fundamental and up to eight harmonics were available and were controlled by means of drawbars and preset keys or buttons.

In 1936 Don Leslie applied for a full-time job with Hammond but was rejected and instead, given a part-time job changing 50 cycle Hammond tone generators in customer's homes. Don Leslie explains, "In 1936, various areas outside the City of Los Angeles served by Edison (electric) were going through a 50 to 60 cycle change-over. While the main concern was the necessity of new clocks and some other electrical appliances, people with Hammond Organs had real problems because their (50 cycle) organs would play at a higher pitch (when operated at 60 cycles). Various schemes such as gear boxes were devised but the best remedy was to install a whole new generator..."

In 1940, with the help of his brother Bob, he built the first Leslie speaker (the Vibratone). He offered his invention to Hammond hoping they would hire him, but they rejected him from the start. Leslie never held an engineering or other position with Hammond and neither Laurens Hammond nor his research department played any part in the development of the Leslie Speaker. Had Laurens Hammond offered Don Leslie an acceptable job in 1936, he would have owned the rights to everything Leslie invented and there never would have been a "Leslie" Speaker.

It's no secret that Laurens Hammond didn't like Leslie speakers. Once, when asked about Leslie Speakers, Hammond's almost irrational response was, "I never intended for my organs to sound that way". Evidence suggests that Hammond had little concept of what "sounded good or bad." Laurens Hammond was a brilliant inventor who held 110 electrical and mechanical patents by the time he retired. He received his degree in mechanical engineering from Cornell University in 1916 but had no musical ability whatsoever.

Hammond always claimed he couldn't play an instrument nor "even carry a tune." Ego and arrogance certainly were factors, but Hammond's lifelong opposition to Leslie Speakers is also attributed to his alleged inability to hear the improvement Leslie animation made in the sound of his organs.

Leslie Speakers were so popular they literally sold themselves. Hammond's ongoing anti-Leslie propaganda actually increased interest in the speaker which improved sales. Don Leslie comments, "I was amazed at all the publicity Hammond created for me by their continuous bad-mouthing of my product. This word-of-mouth advertising was so good that from the start until the company was sold to CBS in 1965, no advertising was ever needed and my problem was always keeping up production to match the sales". Only later (throughout the late sixties and seventies), did CBS place Leslie Speaker ads in music trade and organ enthusiast publications.

Don Leslie readily admits that, in the early years, he "wanted so much to be part of Hammond!" Only after Hammond rejected him and the Leslie Speaker in 1940, did he organise Electro Music as an independent company. In 1965, Leslie sold his successful, profitable company to CBS Inc. and Electro Music became a division of CBS Musical Instruments. Part of the CBS-Leslie sales agreement was that Don Leslie stay on as a consultant for five years. In 1980, the Hammond Corporation bought Electro Music and the Leslie name from CBS. Currently, Leslie remains part of Hammond under Hammond/Suzuki, USA.

Leslie speaker cabinets consist of an upper rotor for the high frequency driver and a rotating cage on the bottom with a scoop which projects the sound from the down-facing low speaker. This created a sound that locked in perfectly with the sound of the organ and in fact became known as the "Hammond Sound".

There were many varieties of the Hammond organ, some designed for home use, some designed for church use, and some designed for live gigs and studio recording. But the most popular model, and the one still commonly in use today (if you can find one that isn't too beat up), is the Hammond B-3. Hammond also patented an electromechanical reverb device using the helical torsion of a coiled spring, widely copied in later electronic instruments.

People played Hammonds from the time of manufacture throughout the 1940's but Jimmy Smith was the man that popularised the instrument in the 1950's with his trio consisting of organ, guitar and drums. Others were playing the instrument but Jimmy defined the style. Booker T and the MGs put it to work on many of the Stax recordings of the 1960's and had several hit recordings of their own, including "Green Onions" and "Time Is Tight". It then went into the rock arena with the Young Rascals, Procol Harum, Chicago, The Allman Brothers, and Santana, and has since become an integral part of the music scene.

With the synthesiser revolution of the 1970's and 1980's, then samplers (that basically used recordings of the Hammond organ sound), and because of the weight of the 600-pound instrument and difficulty of carrying it around, it became less and less plausible to include the instrument on stage performances. Hammond abandoned tonewheel organ production in the late 70's and, sadly, stopped making the instrument in 1984.





## **HUMOR**

Did you know Bach had some 10-14 children?  
They say there were no stops on his organ.

What is the difference between a Hammond player and a terrorist?  
You can negotiate with a terrorist.

Why are an organist's fingers like lightning?  
Because they rarely strike the same place twice.

Why was the Hammond organ invented?  
So the musician would have a place to put his beer.

What do you get if you drop a Hammond B3 on an army base?  
A flat major.

What do you get if you drop Hammond B3 down a mine shaft?  
A flat miner

How many organists does it take to change a light bulb?  
Three - one to change the bulb and two to decide how Jimmy Smith would have done it.

What do you call a Hammond player who's been playing for thirty years?  
Anything you like, because he probably can't hear you anyway.

## MIDI implementation

Parameter	MIDI CC No.
Main volume control	CC 7
Percussion on/off	CC 16
Percussion 3rd	CC 17

### Drawbars left to right

Drawbar 1 (leftmost)	CC 22
Drawbar 2	CC 23
Drawbar 3	CC 24
Drawbar 4	CC 25
Drawbar 5	CC 26
Drawbar 6	CC 27
Drawbar 7	CC 28
Drawbar 8	CC 29
Drawbar 9 (rightmost)	CC 30

Rotary control	CC 1, or CC 64 - choice
Swell volume	CC 4, CC 6, or CC 11 - choice

## Credits

We hope you have as much pleasure using Lightbag as we've had making it. Please send any feedback/comments to;

[ikaldor@mindspring.com](mailto:ikaldor@mindspring.com)

LightBag was designed by Istvan Kaldor

This Manual was written by Andy McDonough

Synthedit is made by Jeff McClintock

VST was invented by Steinberg

The names Hammond and Leslie belong to Hammond/Suzuki, USA

## Bibliography

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