

SYNERGENESIS

Installation Guide & User Manual

D.A.Wilson, Hideaway Studio, Sept 2014

HS-K4L-A016

In Memory of Stephen Howell & Max Mathews

Hideaway Studio Presents: Synergenesis

Step into a world of groundbreaking 16-bit digital synthesis.. from the 1970s!?



The 1970s were to be a magical time when a string of groundbreaking technology was conceived and developed at Bell Labs (BTL), Murray Hill, New Jersey. Indeed my late father was a research scientist at BTL during the same era working in Solid State Physics on Charge Density Waves. Many of the developments at Bell Labs have been pivotal and have subsequently played an extremely important part in shaping modern life. This includes the famous UNIX operating system (the grandfather of Linux and all its derivatives), the C Programming Language, fundamental parts of the technology that form the internet, digital telephony, satellite communications and audio/video compression techniques to name but a few.

During this time a very talented research scientist called Hal Alles was working on means to implement echo-cancellation in digital telephone systems. This led to the development of an advanced high speed digital oscillator system. This could so easily have never left the realms of digital communications but on experimenting with the concept it became apparent that it might have some merit as the basis of an advanced music synthesizer using real time digital control techniques. Incredibly, Hal was permitted to setup a side project with funding to explore this notion and after very much toil and expense the Bell Labs Synthesizer or Alles Machine was born. This 300lb behemoth was nicknamed The Blue Monster or Alice for short.

At the heart of the Alles Machine was Hal's high speed digital oscillator technology implementing 32 master oscillators driving a further 32 slave oscillators with 32 computer controlled filters, 32 amplitude multipliers and an incredible 256 envelope generators whereby 192 accumulators would combine the results in any fashion the programmer wished to. All of these sub-systems were purely digital and only the final result was converted back to the analog domain as 4 channels of 16-bit audio.

The instrument was hosted by a DEC PDP-11 minicomputer (the same range of computers UNIX was developed on at Bell) and literally programmed in C to perform whatever task the operator wished to undertake. Needless to say without any form of dedicated controls, synth engine or patch programming interface very few musicians indeed were able to realise the true potential of Alles Machine!

Two musicians that were gifted with the necessary combination of skills to handle The Blue Monster were Laurie Spiegel and Roger Powell. Very sadly almost no recorded material has survived but the few recordings that have

reveal a machine capable of generating huge evolving digital soundscapes – this is particularly apparent in Laurie’s *Improvisation on a Concerto Generator* from 1977.

Towards the late 1970s a number of synthesizer manufacturers became aware of the instrument including the MTI division of Crumar who saw the new technology as a means to leap ahead of the pack. A talented development team was assembled including Mercer “Stoney” Stockwell, Kevin Doren, Wing Moi, and Jerry Kaplan. It was agreed that Bell’s Hal Alles and Max Mathews were to offer technical advice on the best means of essentially commercialising the Alles Machine whilst making it much more accessible to every day musicians. The first instrument to be developed was the GDS (General Development System). Although the instrument was hardly inexpensive (it cost around \$30,000 in 1979) an ambitious cost down exercise was undertaken to reduce the 1400 or so integrated circuits to only a few hundred. Amazingly, the design team was able to meet the stringent material cost target and the GDS was born.



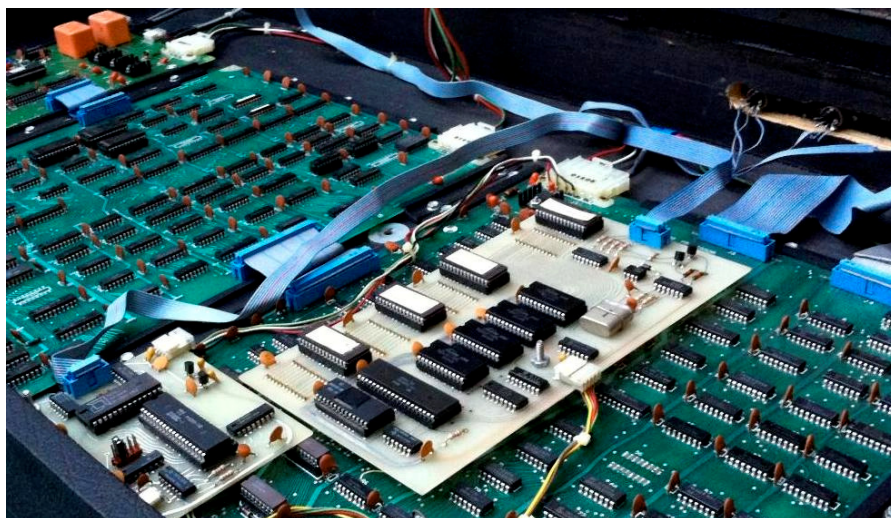
Max Mathews, the father of computer music, working on a Crumar GDS

Only 10 or so GDS systems were ever built but it became the programming station for its derivatives, the Synergy, Synergy II+ and Mulogix Slave 32. The GDS had a small number of influential owners who were able to work wonders with the new technology. This included Wendy Carlos and Klaus Schulze/Tangerine Dream who released a number of albums and film scores in the very early 1980s heavily drawing on the GDS as a source of digital textures, pseudo realistic timbres and percussion.

Enter The DK Synergy...



The instrument to follow the GDS was the Synergy (DK-1) which relied on the identical 32 high speed oscillator subsystem but coupled to a dedicated Z80 based embedded controller thus enabling the instrument to operate stand alone relying on voice cards plugged into the front panel to permit the user to select between or layer up to 4 combinations of 32 patches. Amongst several unique features was a very clever floating split point function that tracked the players finger positions and determined what sound was played in the left hand and in the right hand regardless of their position on the keyboard.



Returning Programmability: The Synergy II+....



A few years later a clever upgrade was offered to basically return the programming ability of the GDS to the Synergy through the use of an external host computer manipulating a special memory area known as VRAM. This variant was known as the Synergy II+ and was not sold in great numbers.

More Than Additive...

All variants were more than simply large banks of digital sine wave generators as found in more traditional additive synthesizers. They were unusual in that the oscillators could produce both sine and distorted triangular waveforms which could be combined in a very flexible manner ranging from straight additive synthesis, phase modulation or combinations of both. This meant that far more harmonically complex sounds could be generated without having to resort to a massive array of sine oscillators.

Not only was the oscillator topology complex but the modulation abilities were truly groundbreaking. Each oscillator had its own envelope and a whole raft of real time modulation could be applied to each control parameter including the notion of switching between low and high velocity parameter sets.

And then the DX7 came and all was over....

Well not quite... It is true enough to say that the GDS/Synergy is capable of rendering some types of sound very reminiscent of the DX7 such as tuned percussion, mallet type instruments and bells but is equally capable of generating huge evolving digital landscapes, and surprisingly edgy strings complete with bow scrape artifacts. It is also true that the DX7 cost a fraction of what the GDS sold for but by no means all of the GDS/Synergy's potential was carried over and hence for a long time its unique functionality was all but forgotten.

Risen from Near Obscurity...

Time has not been kind to the Synergy with many examples having perished years ago and even stories of some unfortunate examples being left out in the trash (although I've heard similar stories of the VCS3!). Needless to say that very few have experienced a working Synergy first hand in recent times.

Quite by chance earlier in the year I stumbled across a now very rare 1983 Synergy II+ in a rather burnt out state with a very interesting past. After a few days of intense research I was able return this poor beast to working order and I set about the soon to be arduous task of finding a suitable Kaypro II computer to be coupled to it to run the infamous synHCS host control application. The task of tracking down a working Kaypro was tricky enough in the UK but the task of running an OS, finding working application software, making a suitable serial cable to connect the two machines, configuring the link and locating the factory patches in the correct format proved to be a major headache. We are so spoilt these days with our multi-megabyte internet connections and our \$2 memory sticks but very quickly memories of the pain of incompatible 5.25" floppy disk formats, wacky serial connections and command prompt based CP/M operating systems came flooding back. Having completely failed to find any suitable software on disks I resorted to downloading images of disks which were thankfully posted on the net and making my own disks using an obscure old utility.

Into the 21st Century...

As has been such an effective retrofit on other instruments such as my Emulator II, with the invaluable help of its inventor, Jean-François DEL NERO, I successfully managed to install a superb HxC floppy disk emulation system in place of one of the 5.25" disk drives and embarked on the ludicrously tedious task of manually converting the disk images of the entire GDS/Synergy Factory Sound Library to virtual disks. This permitted me to work my way through several hundred patches in awe of this groundbreaking wonder...

Sampling Synergy #01205...

Having worked my way through the entire factory sound patch library I decided to capture a broad selection some of the more impressive sounds. This turned out to be a bigger task that I had envisaged and after many tens of hours of run time the beast died in front of my eyes and after several hours of mild panic I determined that the very elderly and rather grizzly switch mode power supply had failed. To my great relief the beast was returned to operation the following day having retrofitted a modern high efficiency equivalent in its place (which was half the size of the original!).

During my time sampling the Synergy a curious feeling crept over me that I have very rarely experienced whilst sat in front of a vintage instrument – that of sheer wonder that a team of engineers had the vision and bravery to develop an instrument so very ahead of its time and so different from those of the day. In fact, despite the number of wonderful vintage synths I get work on these days, the last time I felt this way was when I was returning the infamous 1938 Novachord #346 to life.

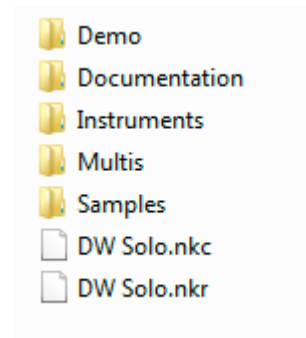
In short, I hope you enjoy playing the sampled instruments as much as I've enjoyed making this library...

Installation

This library requires the full version of Kontakt 4.2.4 or higher.

Approximately 1GB of free hard disk space is required.

Uncompress the zip archive, this should result in a new folder called "Synergenesis" containing the following sub-folders and files:



To run Synergenesis simply load up one of the .nki files in the Instruments folder.

Synergy Percussion

The GDS/Synergy II+ is surprisingly capable of synthesizing all manner of percussive sounds including many of a similar but not identical nature to their analog counterparts from drum machines of yesteryear.

As well as the main body of instruments Synergenesis features over 220 percussive samples capturing a significant proportion of the drum patches featured in the original factory instrument library which dates back to the early 1980s. They have been presented as two main drum kits and as a series of sets primarily intended to permit the user to preview them and experiment with filtering and dynamics on select sounds. Multiple instruments can then be used in this manner over a number of midi channels if required. More technically minded users can remap the drum sets as they wish in Kontakt.

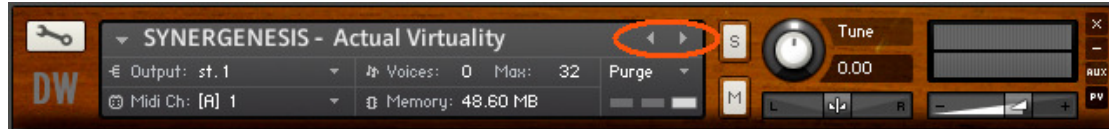
WAV Samples

The drum sounds in this library are also presented in .wav format. These are located in the folder: "/samples/WAVS Synergy Perc"

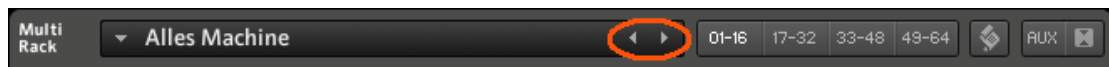
As well as the original 24-bit samples the percussion is also presented in 16 and 8-bit formats (all at 44.1KHz sample rate) in their respective folders for use on a wide range of software based sample players and applications as well as a number of hardware samplers such as the MPC series.

Instant Gratification

You can easily cycle through any of the 60 instrument patches (.nki) in the instruments folder by clicking on the small arrows to the right of the instrument name.



Please note that the 40 example multi instruments (.nkm) in the Multis folder can also be cycled through by clicking on the arrows to the right of the multi rack window:



Hopefully by loading up the patches you will be able to see how they have been constructed in the synth engine and can be used as starting points for new sounds which can be saved under new file names.

NB: Please note that a velocity sensitive keyboard is almost essential as the sounds in this library have been designed to respond to playing style and often benefit from a delicate touch interspersed by more rigorous moments.

Editing Instruments in The Synth Engine



Naturally the example instruments packed with each release in the library can be used as is but the sounds can be tweaked to your needs using the synth engine control interface in a similar manner to the factory patches on a classic subtractive S+S synthesizer.

Using the Envelope Controls

Three independent envelopes are provided. One envelope controls the amplitude dynamics (VCA), one controls the filter dynamics (VCF) and the third controls the pitch (VCO).

Each of the three envelopes is selected by clicking on the small arrow to the right of **ENVELOPE**.



This produces a pull down menu permitted the user to select the envelope that is required.

The relevant independent **Attack**, **Decay**, **Sustain** and **Release** controls are displayed on selecting one of the above.

Amplitude Envelope



The further the attack (**A**) control is moved clockwise the more gradually the sound builds up. The more the release (**R**) control is moved clockwise the longer it takes for the sound to decay after the note is released. The decay (**D**) control determines how quickly a sustained sound diminishes with time. The more clockwise the control, the longer it takes to decay. Very rapid attack and decay settings will produce plucked or staccato effects and slow settings will produce a swelling effect. The sustain (**S**) control determines the volume at which the sound will rest during sustain once the decay portion of the envelope has completed.

Responding to Playing Style...

There two further controls in the **AMP** section which can really bring a sound to life by changing the way it responds to changes in keyboard velocity.

VEL>ATK The further anticlockwise this control is set the more the attack phase is shortened with increased velocity. This is a very powerful means to increase the urgency of a sound when played with rigour. For this to be effective on strings, for example, it needs to be used in conjunction with a slow (more clockwise) attack (**A**) setting.

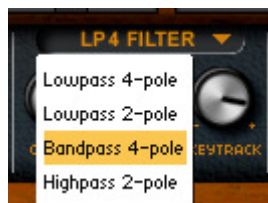
VELOCITY The further this control is moved clockwise the more the amplitude is changed in sympathy with the key velocity. For sounds that are not required to respond in amplitude to key velocity this control (eg. an organ) should be set fully anti-clockwise. Typical settings are around the mid point.

Filter Envelope & Controls



The filter cutoff and resonance levels are set by the **FREQUENCY** (cutoff) and **RESONANCE** controls. These are modulated by the **FILTER ENVELOPE**.

The filter **KEYTRACK** control is used to setup the relationship between the played key position and the cutoff frequency. This can be used to mask the effects of noise (eg. hiss becoming apparent in the lower registers), to mimic natural tonal responses over the playing range (eg. a piano) or, when used in conjunction with very high degrees of filter resonance, to accurately setup sympathetic self resonance with key position for the emulation of bells etc.



The new synth engine features 4 filter modes. By clicking on the arrow to the right of **FILTER** the type of filter can be selected from the pulldown.

The filter envelope is dedicated to controlling the filter cutoff. The further the attack (**A**) control is moved clockwise the more gradually the filter cutoff frequency increases. The more the release (**R**) control is moved clockwise the longer it takes for the cutoff frequency to decay after the note is released. The decay (**D**) control determines how quickly the cutoff frequency falls with time. The more clockwise the control, the longer it takes to decay. Very rapid attack and decay settings will produce plucked or staccato effects and slow settings will produce a brass like swelling effect. The sustain (**S**) control determines the cutoff frequency at which the filter will remain during sustain once the decay portion of the envelope has completed.

The more the **AMOUNT** control is moved away from its centre position, the more the filter cutoff is modulated by the envelope. For *most* filter control applications the control is moved clockwise to increase the amount of *positive* response to the envelope generator. Note that if you want the filter to be swept over its full range then the filter **FREQUENCY** must be set to zero and the **ENV AMT** set to fully clockwise. In cases where little or no modulation is required, the cutoff control may be used as a basic tone control by setting the **ENV AMT** to the centre position and setting the **CUTOFF** control to suit.

Making the Filter Respond to Playing Style...

VELOCITY The further this control is moved towards its extremities the more the filter modulation reacts in sympathy with the key velocity. Normally this control is used in it's positive phase (clockwise) as many acoustic instruments generally become brighter (their harmonic content increases) the louder they are played. For sounds that do not require velocity sensitive filter modulation (eg. organ) the control should be set to the mid point.

Pitch Envelope



Perhaps a little more unusually, the synth engine features a pitch modulation envelope which can be used to impart everything from subtle changes in pitch during moments of rigorous playing (eg. guitar/harp/drums) or during attack transients (eg. brass) to wild sound effects.

When the **AMOUNT** control is positioned within the positive (clockwise) half of its travel, the further the attack (**A**) control is moved clockwise the more gradually the pitch rises. The more the release (**R**) control is moved clockwise the longer it takes for the pitch to fall after the note is released. The decay (**D**) control determines how quickly a sustained note falls in pitch with time. The more clockwise the control, the longer it takes to fall. The sustain (**S**) control determines the pitch at which the sound will rest during sustain once the decay portion of the envelope has completed.

The pitch modulation is reversed when the **AMOUNT** control is positioned within the negative half of its travel. The further the control is moved towards its extremities the more dramatically the pitch modulation responds to the pitch envelope.

Responding to Playing Style...

VELOCITY The further this control is moved towards its extremities the more the pitch modulation reacts in sympathy with the key velocity. For sounds that are not required to respond in pitch to key velocity this control should be set to the mid point.

The LFO Controls



The synth engine provides three independent LFOs each dedicated to modulating pitch, amplitude and filter cutoff.

To select the LFO that requires adjustment click on the triangle to the right of **LFO** and a pull down menu will appear. Click on the LFO required.

Pitch LFO



Vibrato is a regular modulation of pitch and can produce anything from natural effects such as a gently quivering flute or legato strings to a deep plunging effect. The **RATE** of the Vibrato effect can be altered along with the depth of the pitch modulation using the **DEPTH** control.

No vibrato effect is heard when the depth control is set to its most anti-clockwise position.

A typical vibrato effect is heard with the rate control at roughly the 12 o'clock position and the depth control at the 2 o'clock position. For a more natural vibrato a triangular modulation wave is a common choice of waveform. The shape of the modulating **WAVE** (waveform) may be set by the slider switch to the right of the rate control. The 4th (lowest) position is the sample hold position which imparts a random amplitude modulation effect.

The **VIA** switch to the right of DEPTH control determines whether the degree of depth control is fixed (**D**irect), increased by turning the modulation **W**heel on the controlling keyboard or by the amount of ***A**ftertouch during keypress.

****NB:** Not all keyboards support aftertouch or transmit it over MIDI.*

Amplitude LFO



Tremolo is a regular modulation of amplitude and can produce anything from natural effects such as a gently beating bell or an electric guitar tremolo to a dramatic fading effect. The **RATE** of the tremolo effect can be altered along with the depth of the modulation using the **DEPTH** control.

No tremolo effect is heard when the depth control is set to its most anti-clockwise position.

A typical tremolo effect is heard with the rate control at roughly the 12 o'clock position and the depth control at the 2 o'clock position. For a more natural tremolo a triangular modulation wave is a common choice of waveform. The shape of the modulating **WAVE** (waveform) may be set by the slider switch to the right of the rate control. The 4th (lowest) position is the sample hold position which imparts a random amplitude modulation effect.

The **VIA** switch to the right of DEPTH control determines whether the degree of depth control is fixed (**D**irect), increased by turning the modulation **W**heel on the controlling keyboard or by the amount of ***A**ftertouch during keypress.

***NB:** *Not all keyboards support aftertouch or transmit it over MIDI.*

Filter LFO



An LFO is dedicated to modulating the the Filter cutoff frequency and can produce anything from natural effects such as a sustained brass effect to dramatic filter sweeps. The **RATE** of the modulation can be altered along with the depth of the modulation using the **DEPTH** control.

No effect is heard when the depth control is set to its most anti-clockwise position.

As with all of the LFOs the effect is disabled when the **DEPTH** control is set to the mid position.

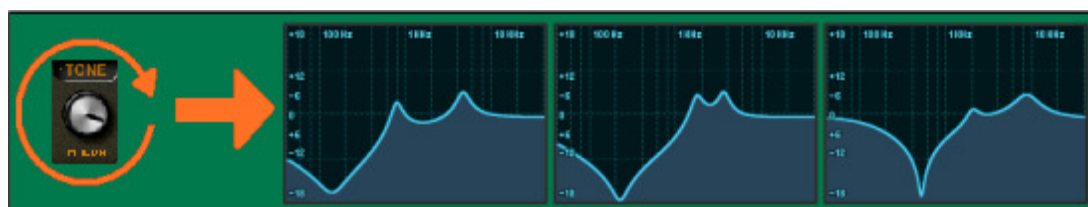
For a more natural effect a triangular modulation wave is a common choice of waveform. The shape of the modulating **WAVE** (waveform) may be set by the slider switch to the right of the rate control. The 4th (lowest) position is the sample hold position which imparts a random filter modulation effect.

The **VIA** switch to the right of DEPTH control determines whether the degree of depth control is fixed (**D**irect), increased by turning the modulation **W**heel on the controlling keyboard or by the amount of **A**ftertouch during keypress.

****NB:** Not all keyboards support aftertouch or transmit it over MIDI.*

The Tone Control

The **TONE** control is a deceptively powerful feature. In the fully counter clockwise the signal is unaffected. As the control is rotated a continuously evolving complex EQ curve is applied. With some experimentation this



feature can be used for embellishing formants within each voice and helping to sit each of the layered voices together in the mix. Note this feature is particularly effective on shaping the percussive instruments in this library.

The Effects Section

Below the main synth user interface is the effects section:



To enter the effects page the right hand slide switch is set to the **FX** position.

The effects section comprises of four basic types of effects: auto-panning, modulation, echo and reverb.

Each of the effects are chained in series and can be disabled by turning their respective **AMOUNT** control fully anti-clockwise. In the case of **AUTOPAN** the effect is disabled by setting the **DEPTH** control fully anti-clockwise.

Autopan Effect

The **AUTOPAN** section features three controls. The **RATE** control determines how rapidly the position of the instrument is moved within the stereo field. The **DEPTH** control determines how far it pans from the centre position and the **WAVE** slide switch sets whether the pan is gradually modulated by a triangular wave or jumps between two set positions by a square wave.

Modulation Effects

The synth engine offers three basic forms of modulation FX:

To select each of three options, click on the triangle to the right of the **FLANGER/CHORUS/PHASER** indicator and select from the pulldown menu:



The **CHORUS** is a digital simulation of a classic stereo analog chorus (minus the noise!). The **RATE** control determines how rapidly the chorus is modulated, the **DEPTH** control determines how much the effect is modulated, the **FEEDBACK** control determines how much of the effects output is fed

back to its input and the **AMOUNT** control sets the amount of the effect to be mixed with the dry signal.

The **FLANGER** is a digital simulation of a classic stereo analog flanger. The **RATE** control determines how rapidly the flanger is modulated, the **DEPTH** control determines how much the effect is modulated, the **FEEDBACK** control determines how much of the effects output is fed back to its input and the **AMOUNT** control sets the amount of the effect to be mixed with the dry signal. The effect is particularly dramatic when the **FEEDBACK** control is set high (clockwise).

The **PHASER** is a digital simulation of a classic stereo analog phaser. The **RATE** control determines how rapidly the phaser is modulated, the **DEPTH** control determines how much the effect is modulated, the **FEEDBACK** control determines how much of the effects output is fed back to its input and the **AMOUNT** control sets the amount of the effect to be mixed with the dry signal. The effect is particularly dramatic when the **FEEDBACK** control is set high (clockwise).

Echo (Delay)

The echo section comprises of delay with feedback and damping and may run in either a mono or stereo mode.



By clicking on the triangle to the right of **ECHO** a pulldown menu will appear permitting **Mono** or **Stereo** modes of operation to be set.

The **TIME** control sets the delay whereby turning the control clockwise increases the delay time. The **DAMPING** control determines how much the effect is diminished on each echo. The **FEEDBACK** control sets the amount of the signal from the delay that is fed back to the input. The further this control is turned clockwise the more the input signal is recycled thus creating dramatic repeating and sustain effects. The **AMOUNT** control determines how much of the effect is mixed in with the dry signal.

Reverb

The reverb utilises the latest convolution technology to digitally simulate the reverberation of a physical or simulated acoustic space.



Three types of reverb simulation are provided. Select each reverb by clicking on the slide switch marked **TYPE**.

H is a large HALL simulation.

P is a classic PLATE reverb simulation.

S is a vintage SPRING line tank simulation.

Use the **SIZE** control to set the size of the selected reverberation space and the **AMOUNT** control to set the amount of the effect to be mixed with the dry signal.

Saving Your Own Patches

All of your creations can be saved as .nki instruments simply by using the **save as** function by clicking on the **files** icon in the main Kontakt control pane.

Remember that if you edit an existing sound you must save it under a new name otherwise you will overwrite the original!

In Loving Memory of Stephen Howell RIP

Synergenesis is dedicated in memory of my friend and mentor Stephen Howell AKA Hollow Sun whose untimely passing has been a huge shock to all who knew him. Stephen was one of a few very talented individuals who motivated and encouraged me to break free of the normal every day humdrum and setup as a freelance vintage synthesizer specialist and sound designer. Displaying a wonderful combination of eccentric eloquence, brilliantly witty banter, an encyclopedic memory and old school values he can never be replaced and I desperately miss him.

Credits

Dani Wilson (Hideaway Studio)

Synergy Restoration/Patch Selection, Sample Capture, Example Patches & Demos

Stephen Howell RIP (Hollow Sun)

UI Concept, GUI Design & Graphics

Mario Krušelj

Synth Engine Script

Very many thanks to Mercer "Stoney" Stockwell, Hal Alles and Jean François DEL NERO for their invaluable technical assistance whilst returning Synergy 01205 to working order.

For more information and many more releases for Kontakt by Hideaway Studio please visit:
www.hideawaystudio.net

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