AlgoMusic

Presents

The M51 Galaxy VSTi



AlgoMusic M51 Galaxy

Overall: Two Synths, each offering Phase Modulation (PD) Virtual Analog(VA) and FM (Frequency Modulation) with Sub Oscillators, Digital Controlled Filters. Each has two 8 stage graphic envelopes, LFO, and Pulsar with effects section together with a complex mod matrix, recordable x-y warp gestures, split keyboard and trance gate. Inspired by the M51 Whirlpool Galaxy in the constellation Canes Venatici.

Installation

Simply copy the files into the folder you are using for your VST instruments that can then be read by your Audio host that supports the VST standard. However it is best to keep M51 in its own folder for organizational purposes.

==========

Oscillators (PDO and SUB)



Synth1 and Synth 2

PDO (Phase Distortion Oscillator)

1. Eight waveforms x2 (paged W1 and W2) (Saw, Square, Pulse, Double Sine, Saw Pulse, Reso1, Reso2, Reso3)
2. Semitone (Semi)
3. Volume (Level)
4. Phase Distortion (PD)

SUB (Sub Oscillator) This section represents Virtual Analog (VA)

1. Octave (Oct)
2. Semitone (Semi)
3. Fine tune (Fine)
4. Seven waveforms (Sine, Saw, Ramp, Triangle, Pulse, White Noise, Pink Noise.)
5. Volume (Level)
6. FM Depth (FM)

DCF (Digital Controlled Filter -- 12 dB/oct State Variable Filter

7. Cutoff Frequency (Freq)
8. Resonance (Reso)
9. Filter Type (Type) LP (Low-Pass), HP (Hi-Pass), BP (Band-Pass), AP (All-Pass)

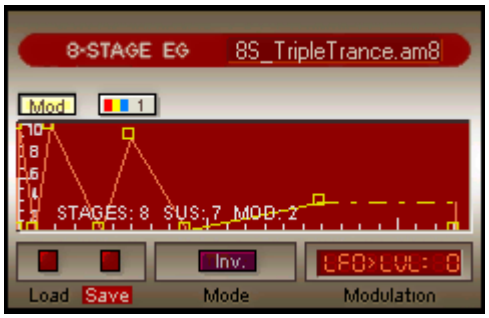
Note: The filter is part of the Sub-Oscillator VA section.

Global controls for oscillators:

1. Mono Mode: Mono: --- = off, ON = mono, LE = mono legato.
   Prior (Mono note priority) --- = off, LO = low, HI = high, LA = last.
2. Ensemble Mode (detune effect) ENS
3. Portamento amount
4. Vibrato Amount (a separate LFO just for vibrato and controlled by Mod Wheel)
5. Mute Button

==========

For each Synth:



Two 8 Stage Envelopes (AMP and MOD)

1. Color selection for inside window graphic. (see preset creation conventions section)
2. 8 Rates, 8 levels
3. Sustain (SUS) point selection
4. Stages: select from 3 to 8 stage envelope structures
5. Modulation (MOD) segment selection
6. Modulation: Selection of LFO or Pulsar modulation to Rate or Level amount.
7. Mode on AMP envelope has switch for PD control.
8. Mode on Mod Envelope: Lin/Exp =switches the AMP (VCA) response curve from linear to exponential.
9. Load and save envelope files. A library of Envelopes is provided.
10. Button to switch between AMP (main Amplifier envelope) and MOD (modulation Envelope)

Using the envelopes
You shape the envelope by dragging the square nodes at the end of each segment. Holding the mouse down on a node displays the segment's current level on a scale of 0 - 10, the segment's current duration in milliseconds, and the current total envelope duration in milliseconds. These values are updated when you drag the node.

Holding the Ctrl key while draging a node gives finer control.
Drag the 3 parameters at the bottom of the window up or down to increase or decrease them.

STAGES: Sets the number of envelope stages, 1 - 8.

SUS: Selects which stage, if any, will be sustained until key release. The selected sustain segment will be displayed with a dashed extension.

MOD: Selects which stage, if any, will be modulated.

To maintain consistency, the number of stages can't be set less than the sustain or mod selections, and the sustain and mod selections can't be set higher than the number of stages.

Dragging horizontally anywhere outside of the nodes scrolls horizontally.

Shift-dragging horizontally anywhere outside of the nodes changes the horizontal zoom.

Double clicking anywhere outside of the nodes sets the view so that the entire envelope is visible.

Ctrl-clicking anywhere outside of the nodes resets the view to the default.

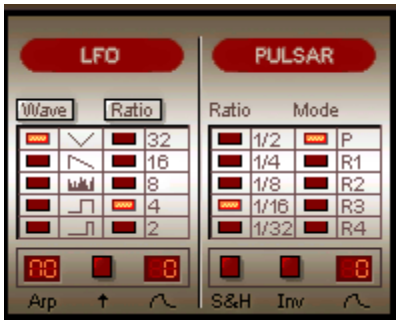
Load and Save: Once you create an envelope, you can save it by clicking on the save button.

Notes on the Envelopes folder

You can then use the load button in the Envelope section to browse to the folder and load the provided envelopes. You can also create envelopes and save them there as well.

Creating Looped Envelopes

In the Mod Matrix select the LFO with a destination to GATE. Choose a pulse or square wave on the LFO, and set it to slower ratios (speeds) Create a multi-segment envelope in the MOD or AMP envelope and the LFO will trigger the start of the envelope, and thus you have a looped envelope effect.



LFO (Low Frequency Oscillator)

You can switch between 10 waveforms. The rate is synced to host BPM (Beats Per Minute). This is used to create different rhythms in conjunction with the pulsar module.

1. Ten waveforms, 5 to each page.
2. Ten Ratios (rates-BPM synced)
3. ARP amount switch which uses the LFO as a unique arppegiator when destination is to PITCH in the mod matrix.
4. Inversion switch
5. Slope control

Pulsar (Rhythm generator)

Another unique module, this provides rhythmic elements to the sound. You can select rates which are synced to the Host BPM as well as different types of rhythmic algorithms. (P, R1, R2, R3, R4).The Pulsar also acts as a sample hold generator which can produce random elements to the sound. To activate it, simply click the S&H button. To get the Pulsar and Sample Hold functions to work, you need to set a destination and depth in the Mod Matrix. (see Mod Matrix) Destinations to Pitch will create random or octave related pitch series. When used in combination with the ARP function, interesting patterns can be created. When used as a destination to the filter cutoff, random patterns in timbre can be produced.

1. Five ratios (rates-BPM synced)
2. Sample Hold Generator switch
3. Inversion switch
4. Slope control
5. Five preset rhythm algorithms

LFO and Pulsar LPF

Basically it rounds the edges of the mod waveform, very much like the Attack/Release of an EG, (but in millisecond range). Works best on square/pulse waveforms. The higher the value the lower the cutoff frequency, and the more the mod wave is rounded. Very noticeable with pitch mod!



Mod Matrix:
a grid for selecting modulators with amount of modulation to each destination.

1. *Modulators:*

Modulation Envelope (MEG)
Low Freq Oscillator (LFO)
Pulsar (PSR)

2. *Destinations:*

Pitch (of PDO)
Cutoff (filter cutoff)
WY (warp Y-Axis)
Gate (envelope trigger start)
WX (warp X-Axis)

Three LED indicators for MEG Trigger, LFO and Pulsar Rates.

Effects section
Each section has a small knob parameter for FX fade in/out.
With this feature you can very smoothly fade in (or out) each effect.
The knobs set the FADE time, and are linked to the on/off switches.
With the knob set to full the fade time is quit long, somewhere between
10-20 seconds. The same switches can also be controlled by sending a CC,
which allows automation from the host sequencer.

List of the CC's:

Warp 1 - 77
Warp 2 - 78
Chorus - 79
X-Delay - 80
AutoPan - 81

Recordable Warp Module. (RWM)
One for each Synth..

The arrow is warp graphic selection. There is also a window displaying the Warp pattern file name selected. There are 3 pages to the RWM. Selecting the page button scrolls through them.



Page 1.

Modes:

1. LP (low pass filter)
2. SC (Soft Clip distortion)
3. HC (Hard Clip distortion)
4. Clip amount

Page 2

Transport controls, load and save



5. Record, playback and Loop buttons, with LED's for record and play mode.
6. Selection for the number of beats after you *stop* moving the ball.
7. Save and Load buttons for custom warp files.



8. Start adjust, Speed, End Adjust (of the preset file).

Recording warp patterns
We tried to make it so that there are no unwanted "silences" at the start and at the end of the recording. So, after pressing the record button, recording doesn't start right away, but waits until you move the ball and create a gesture. If you pause moving the ball the recorder waits for the selected amount of beats to resume record. If no additional movements occur in the specified amount of time (beats) then record stops, and any "silences" afterwards are deleted (this happens anyway). Otherwise record continues. You can then save (by selecting the S button) your gestures as a file that you can load as a preset.



Chorus
This module provides smooth chorusing or heavy flanging effects. On/Off and stereo spread buttons are provided.

1. Rate and Depth controls
2. Right channel Time and feedback controls
3. Channel Time and feedback controls
4. Stereo spread switch.

X-Delay
A stereo delay synced to the Hosts BPM. Parameters include Gain, with Time and Feedback for each channel. LPF control: The LPF (Low Pass Filter) is in the feedback path, so it dampens the high frequencies in the delayed sound. The X-delay is the meat in creating the different rhythms and it also provides the ambient space that is the sound of the M51. On/Off button are provided in case you prefer an external plug-in effect.
Two delays each with:

1. Five rates (time) BPM synced
2. Gain and Feedback
3. Slope: (a filter cutoff)
4. X- switch (Cross Delay)

Mixer
1. Auto-panner with rate and depth
NOTE: this works in conjunction with the mixer. If the Pan settings are set to 50 in the mixer for both channels, an even cross-fade effect with each synth is created. If the pan settings are extreme (0/99) the auto pan will go from hard right/left to the center.

2. Volume and pan
Provides level settings for each synth. Synth 1 is Vol. 1, and synth 2 is Vol. 2. There are also Pan Settings for each channel

GLOBAL
Selecting the Global button gives you 3 pages of options.

1. **Built in piano keyboard** for auditioning.
2. **Global controls for each Synth:**

MIDI Channel
Pitch-bend Range
Split HI and LOW (for creating split keyboard effects)



3. **Trance Gate**

3 modes
1: to gate of Synth 1
2. to gate of Synth 2
3. to gate of Synth 1 and 2

Play/stop switch.



4. **MIDI Learn**

While you can still use the CC list, MIDI controller numbers can now be assigned and changed at will using MIDI Learn.

To initiate MIDI learn on a parameter, select the MIDI learn button. You will see the status LED turn on. Using the mouse, select and move a parameter that you want to control. Then turn a knob on your knob box or controller device. The status LED turns off. The parameter is now learned. The settings will be saved upon closing the VST (...\510700\MidiControllers.txt). To use MIDI learn for the X or Y motion of one of the warps, first select a patch that does not animate the warp, such as [BAS Dow Toa]. Then, move the warp ball horizontally for X or vertically for Y, and move your external controller as mentioned above.

If you would like to un-learn your setting(s) from memory, first select the Lock button, then press the Reset button and all parameters will be un-learned. Then deselect the lock button, so you won't accidentally erase any new settings.

Parameters

Types of control

1. Dialog. You will see small boxes with numeric or alpha characters inside them. Simply clicking into the box and moving the mouse up or down will increase or decrease the values.

2. Paging Buttons. Used in the LFO, Warp and Global display, they page you to different screens with new sets of parameters.

3. On-Off Buttons. You will also find several off/on buttons to activate or inactivate the selected module. This can be quite useful, such as turning off synth 1 while you are working on a sound for synth 2. You can also turn off effects if you want to use external plug-in effects.

4. Graphic Envelopes. Used for precise control of envelopes. See Envelope section.

5. Knobs. Used in the effect section. Clicking on a knob and moving the mouse in an upward or downward motion will turn the knobs.

6. X-Y joystick. Used for the Warp module, moving the ball inside the field will control the warp effect.

Application:

Creating "Totem" sounds

The rhythmic possibilities in M51 were inspired by the classic electronic work of Klaus Shultze called "Totem". In this piece, he used an Arp Odyssey to create the rhythmic structure. In order to achieve the same concept in M51, being able to trigger the envelope start with the LFO clock is the basis of the sound. That is why Gate is a destination target.

There are two ways to create this in M51.

1. Use PSR (Pulsar) as a source to Gate with a depth value of 99. You can use the rhythm algorithms in Pulsar to achieve different rhythms. Creating a tight MOD envelope to modulate the Phase and the sub oscillators Filter section (with a high resonance setting) is also part of the sound. Be sure to have the Mod envelope as a destination to Phase in the mod matrix.

2. Use the LFO as source to Gate with a depth value of 99. Also use the PSR source to Phase with whatever value you want. If you select the S&H (Sample and Hold) random timbres can be achieved, which is part of the "Totem" sound.

Another chief element is using the BPM synced X-Delay at different settings which creates the feel in the rhythm. Presets in the Factory bank which are labeled as RYM and SEQ are examples of this kind of programming.

Creating SEQuences and Arpeggios

The technique in creating arpeggios and algorithmic sequencer effects is in using the unique ARP function located in the LFO section.
Clicking into the the ARP dialog turns the arpeggiator on. (Default is set to NO) From there, moving the mouse up or down, you can increment in semitones. To hear the results, the LFO has to have a destination to Pitch in the Mod Matrix. Setting the Depth in the Mod Matrix will also be setting the range of the arpeggiation effect. Setting different waveforms in the LFO as well as the LFO rate will also create different types of arpeggiations.

The +/- button: when the switch is "off" the LFO waveform swings between -5V and + 5V and as a result the ARP is alternately subtracting or adding to the pitch. When the switch is "on" the LFO waveform is lifted up and then scaled so that it is between 0 and 5V, and the ARP is only adding intervals to the pitch. Using PSR (Pulsar) as a source to Pitch in the mod matrix at the same time will also provide interesting results.

Examples can be heard in the SEQ presets in the factory bank. A unique function not found in other virtual instruments. Using this module you can create bass lines, high-speed arpeggiations and sequences, all from playing one note on the keyboard!

Tips

Playing the RYM and SEQ presets.

To play these types of patches effectively, a technique of playing can be learned. These types of sounds are dependent on the X-delay which can get out of control if not played correctly. Try playing only one note, or a triad chord, or simply 5ths. You can also change the overall tempo of your host to a slower beat (BPM) and the M51 will change its rhythms to match the BPM of the host. A slower tempo can yield some interesting results. Listen for the rhythm to unfold, then change the note/chord on the beat of the rhythm so it sounds smooth. Some practice may be required to get a smooth transition. However, you may find this to be fun and innovative. This is part of the design quality of AlgoMusic which is to provide "expert" systems so that anyone can have fun creating music. However, in the hands of real musicians, astonishing results can be achieved.

Preset creating conventions

In creating the default banks for M51, we have followed these conventions in which you may want to follow in creating and sharing your own presets with others.

1. Color coding using the envelope color selection. We have used the following color codes for the type of preset (for both envelopes).

Blue = PAD Black = BAS Red = KBD Violet = LED Orange = RYM

Grey = ATMO Green = SEQ

2. If you are not using the WARP module, display the warp letter graphic and also blank out any warp file in the warp file field.

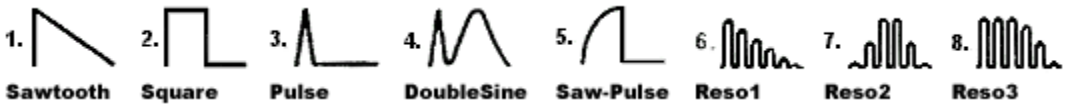
3. On the envelopes, double click on the left side bar so the entire envelope is seen. Also make sure there are no clicks produced from overlapping segments, unless that is the desired effect.

4. Presets named first with the type of patch, then the patch name, then if desired, your initials. For example: [PAD Jupiter TC]

These are not set rules, but only conventions that may be used if desired.

Phase Distortion Synthesis

AlgoMusic's M51galaxy VSTi, like the original Casio CZ synths, offers 8 basic waveforms:



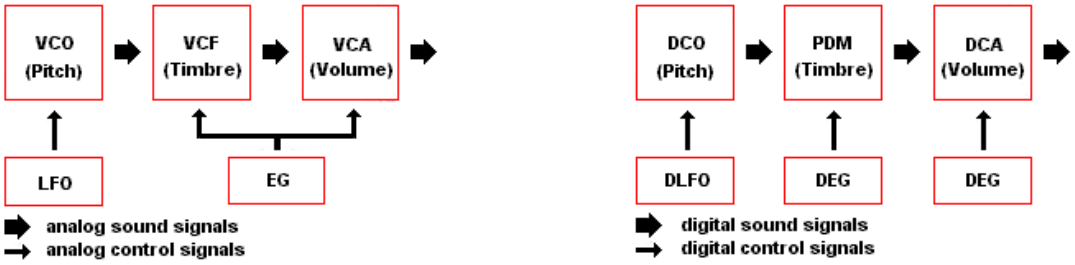
1. Waveforms.
The choice is not arbitrary. While the first two waveforms are very identical to those offered by almost any analog synth, the others are not.
For example, waveform 3 (Pulse) and 4 (Double Sine) were designed with E-piano and Organ type of sounds in mind. Waveform 5 (Saw-Pulse) offers a more vintage type of saw tooth sound, and the 3 resonant waveforms were to emulate a resonant low pass filter.

But, there is more.
PD also offers a *second* set of (identical) waveforms that can be added to the first, but the way of adding is quite unusual. For example, what happens when you add a Square (2) to a Saw tooth (1) waveform, or a Reso1 (6) to a Saw-Pulse (5) waveform?



Hmmm, not at all what you expected, right?
Instead of simply adding the two waveforms, the second wave is pasted at the end of the first. This gives a typical 'octave' type of sound**.**

2. Block Structure of a typical Analog Synthesizer and that of a Phase Distortion Synthesizer.



As you can see there's not that much difference.

OK, a PD synth is a digital synth, so you have digital sound, and digital control signals, but apart from that it's all pretty much the same. The only *real* difference is the label in the timbre block called 'PDM', which is short for 'Phase Distortion Modulation'. The next chapter tries to explain what Phase Distortion Modulation (and Synthesis) really is.

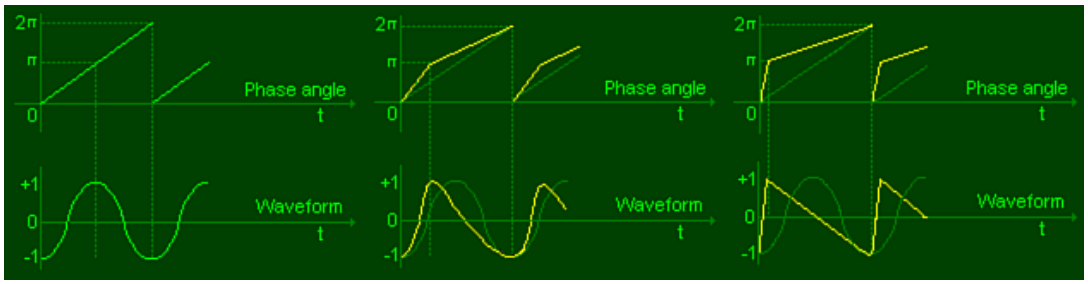
3. Phase Distortion Synthesis.

PD, like FM, employs only sine (or cosine) waves stored in ROM (or in a lookup table in RAM) to create new harmonically more interesting waves. So, how for example do we get the waves shown in chapter 1?

Let's for now concentrate on waveform 1, a saw tooth, and have a look at the 3 pictures below.

The first picture shows what happens if the phase angle of a cosine wave is read from 0 to 2π in a linear way and at a fixed speed: the output is still a cosine wave. Nice, but not what we're looking for. But, what would happen if we were to *speed up* the read back angle from 0 to π, and then *slow it down* from pi to 2π? Then the phase angle would be no longer linear, but *distorted*, and the output waveform no longer a cosine. In fact, it already begins to look a bit like a saw tooth wave (pic. 2). Now, the more the phase angle is distorted, the more the resultant wave resembles a saw tooth wave (pic. 3). Finally, all we have to do is make the distortion of the phase angle a digital control signal, and *voilà*, we have what we were after: Phase Distortion Synthesis!

1 2 3

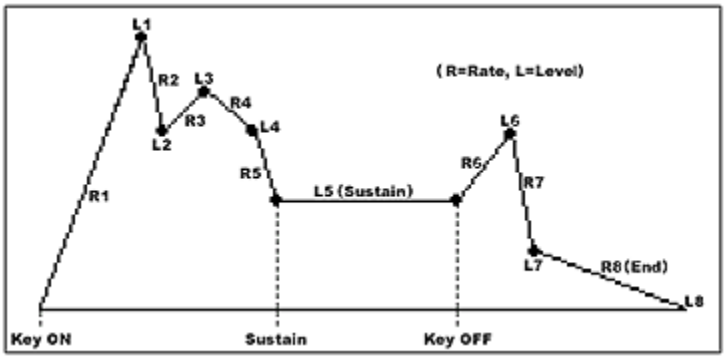


Ok - fine, but how does it *sound*? Well, pretty much like opening the filter of a analog synthesizer, a bit more clean perhaps, but still *very* warm, and certainly more versatile, because of the many waveforms at hand.

And, there's more to PD, of course: very typical are the 8-stage Envelope Generators, as opposed to the fixed ADSR envelopes of more traditional synthesizers. 8-stage EG's can shape the sound in much more detail.

But that's for the next chapter.

4. The 8-stage Envelope Generators.
Back to the eighties?



While doubtless one of the greatest features of the CZ synths, the 8-stage envelopes were also a real nightmare to program. Can you imagine setting up to 18 parameters for each of the 6 available EG's with only a set of up/down buttons, peering at a dim lit 32 character LCD? That's where the first MIDI equiped computers like the Atari ST came in rather handy.

While the picture certainly looks impressive, if not intimidating, the way it works is actually pretty simple. Each stage is called a *segment* and has two parameters: *rate*, and *level*, which are self explanatory.

Furthermore, there are 2 segments that are a little different from the others: one is the *end* segment, the other is the *sustain* segment. Any segment can be the sustain segment, the choice which one (if any) is up to you. The same goes for the end segment, but there are some differences. The first is that the end segment is used to set the number of stages, and the second is that the end segment cannot be omitted.

There are, of course, a few more exceptions to these rules, but that's really beyond the scope of this tutorial.

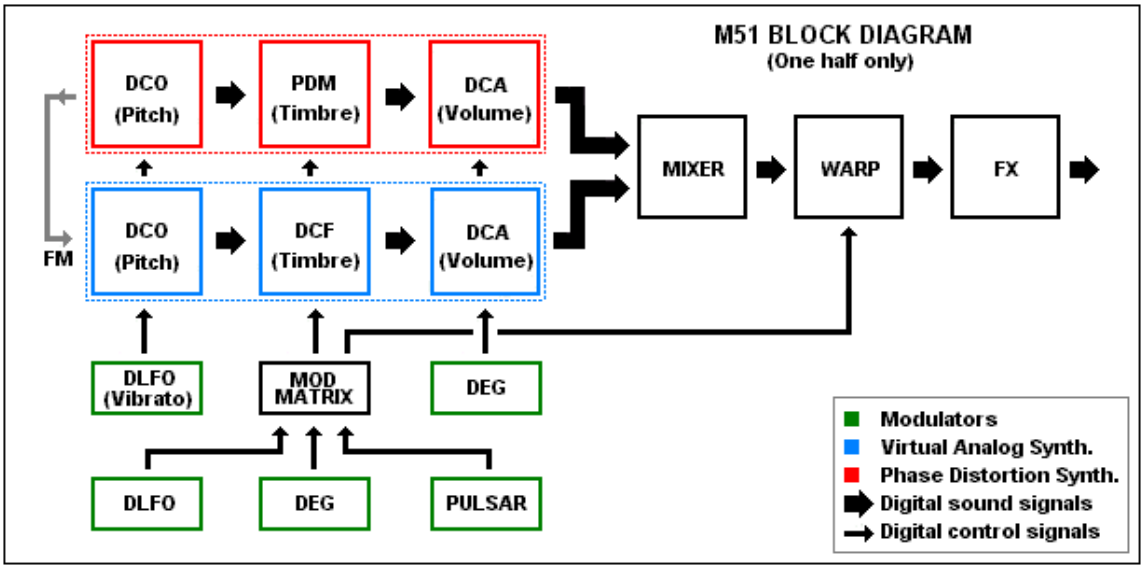
The 'timbre' envelope (see chapter 2) is of special importance since with PD there's no 'frequency cutoff' knob like on a analog synth. This may be, at first glance, look like a serious oversight, but really, it is not.

Once you've learned to focus on the *envelope* instead, you'll soon forget about the knob! Another (and practical) reason for the omission is that the digital domain is not as tolerant for overflows as its analog counterpart. It's quite hard to 'window' the modulation range, without all kinds of nasty and unwanted side-effects.

The M51galaxy VSTi of course, with its many modulators modeled after the much acclaimed M42 Nebula VSTi, really takes Phase Distortion to a another level.

M51 Galaxy Vsti

Block Diagram

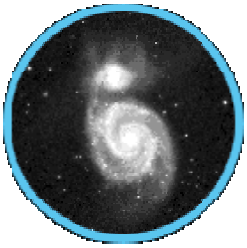


M51 Galaxy CC chart

Synth	1	2
OSC PD		
Waveform 1/2	73,74	83,84
Level	75	85
Semi	25	26
PD	3	9
OSC VA		
Waveform	77	87
Oct	76	86
Semi	106	107
Filter Freq/Res	78,79	88,89
Filter Type	27	28
FM Level	23	24
Level	108	109
MOD		
LFO wave,ratio	90,91	94,95
PSR ratio, mode	92,93	96,97

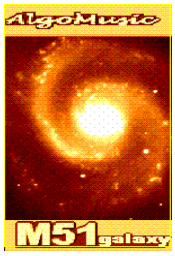
M51 Galaxy VSTi
CC Chart

Synth	1	2
MATRIX		
Depth	70,71,72	80,81,82
MEG	17	20
LFO	18	21
PSR	19	22
FX on/off switches		
Warp1,2	116,117	
Chorus	118	
Delay	119	
Panner	16	
FX controls		
Chorus rate,depth	102	103
Delay time 1/2	104	110
Delay gain 1/2	105	111
Delay feedback 1/2	29	30
Delay damp	64	65
Mixer volume 1/2	112	113
Mixer pan 1/2	8	10
Warp XY	12,13	14,15
Warp XY (LSB)	44,45	46,47
Warp mode	66	68
Warp clip	64	65



Astronomy: The M51 Whirlpool Galaxy

Located in the constellation of Canes Venatici is an exquisite object known as M51, the Whirlpool Galaxy. This was one of Messier's original discoveries. He found it in 1773 while observing a comet. M51 is a beautiful example of a face-on spiral galaxy. The obvious spiral shape of this object is what gave it the name, Whirlpool. It was the first spiral galaxy to be discovered. Careful observation reveals that this object is actually two galaxies. The second, known as NGC 5195, is interacting with M51. The outer regions of the two galaxies actually touch each other. M51 is located about 37 million light years from Earth. Under dark skies, it is an easy target for small telescopes. It is one of the brightest and easiest galaxies to locate for the experienced amateur.



Synth design by Guido Goeburtus, Dave Haupt and Tim Conrardy
Default bank (Sound Design) by Tim Conrardy and UGO
Custom Modules by Dave Haupt.
NoteQuantise module (used for the ARP) by Dan Worrall.



Created using SynthEdit and the Synthedit SDK by Jeff McClintock.

Manual by Tim Conrardy and Guido Goeburtus.
Copyright AlgoMusic 2006 http://www.algomusic.nl

VST *is a trademark of Steinberg Media Technologies AG*