PlastiCZ Synthesizer Manual

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About PlastiCZ

PlastiCZ is a synthesizer that uses Digitally Controlled Wave-shaping (DCW) technology to make some really unique "plastic" sounds.

Few Highlights:

- ✓ Uses advanced DCW technology
- ✓ 2 oscillators
- ✓ 2 x 8 selectable duty cycle shapes per oscillator
- ✓ User controlled polyphony from 1 to 16 voices
- ✓ 10 high quality effects

About PlastiCZ Demo Version

If you are using the demo version of PlastiCZ please note the following limitations of the demo version:

- **Demo version is limited up to only 2-voice polyphony.**
- **Demo version mutes its output after 15 minutes. You'll need to restart your VSTi host application in order to active the sound output again.**

The full version of PlastiCZ can be ordered at:

http://www.reFX.net/

Signal Generation

PlastiCZ is a synthesizer based on generating oscillator waveforms from two alternating duty cycle forms and then modulating them with DCW.
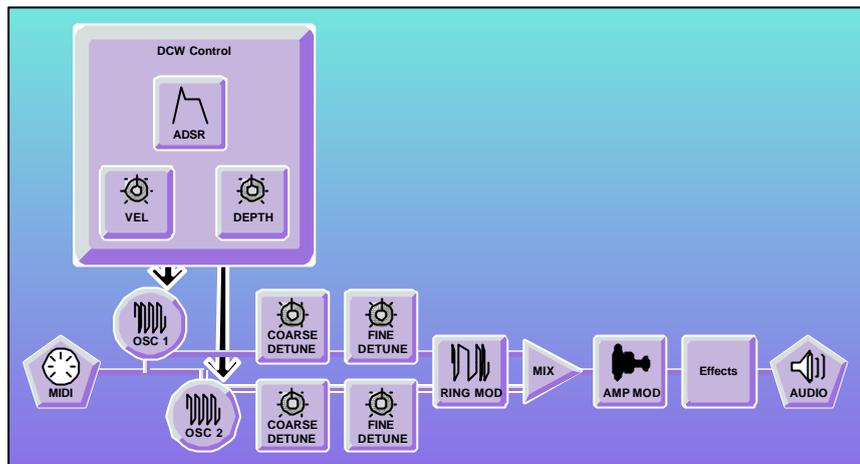
DCW

The DCW controls both oscillators morph-factor between sinus waveform and selected waveforms. The more the DCW is closed, the more the signal resembles a sinus shape. If you open the DCW up, the signal more and more resembles its original shape. A simple ADSR envelope along with a depth control controls the DCW morphing. Also MIDI note on velocity information can be used to control the amount of DCW morphing applied to the oscillator signals.

Oscillators

The two oscillators can be configured independently. Each oscillator waveform is generated by combining two alternating waveform duty cycles. There are eight different duty cycles to select from. This means that each oscillator can generate 64 different waveforms!

Tuning

Both oscillator outputs can be detuned separately. First a coarse detune can be done harmonically (1-5 times the original frequency) and then a fine-tuning of ±50 cents can be applied.

Mixing

Oscillator 1 and 2 outputs can be mixed together with their ring-modulated signal.

Amplifier

In amplifier a simple ADSR envelope along with depth and velocity control allow you to define how the volume of the sound behaves.

Effects

Simple effects section allows you to use one of the 10 effects.

User Interface

As you can see, the user interface layout is quite close to the functional diagram in chapter "Signal Generation". MIDI events arrive to the top left panel, signal path flows row by row and audio is generated at the end of the second row of the GUI.

DCW Controls

The Digitally Controlled Waveshaper envelope is the heart of the synthesizer. It controls the morphing between sinus and selected waveforms in the oscillators.

Attack
Controls the DCW envelope attack time. This is the time it takes for the envelope to reach its peak level after you've pressed a key on your MIDI keyboard. The range is from 1 ms to 4000 ms (non-linear).

Decay
Controls the DCW envelope decay time. This is the time it takes for the envelope to reach its sustain level after it's reached its peak level. The range is from 1 ms to 4000 ms (non-linear).

Sustain
Controls the DCW envelope sustain level. This is the envelope level that is held while you keep a key pressed on your MIDI keyboard. The range is from 0% to 100%.

Release
Controls the DCW envelope release time. This is the time it takes for the envelope to zero after you've released a key on your MIDI keyboard. The range is from 1 ms to 4000 ms (non-linear).

Depth
Controls how much the DCW envelope affects the oscillators. I.e. controls the maximum level at the peak of the envelope.

Velocity Sensitivity
Controls how velocity sensitive the depth control is. The more sensitive you make it the more the DCW envelope will respond to your key press strength on your MIDI keyboard.

Oscillator 1 & 2 Controls

There are two oscillators in PlastiCZ, both independent from each other.

Wave Shape Chooser
The left side collection of waveforms is used to select the waveform of the first duty cycle. The right side collection of waveforms is used to select the second duty cycle.

Symbol	Waveform Name
	Saw
	Square
	SquarePulse
	SawPulse
	DoubleCos
	Reso
	ResoSquare
	DoubleSaw

Tuning 1 & 2 Controls

There are separate tuning controls for both of the oscillators in PlastiCZ. These can be used to detune each oscillator separately to fatten the produced sound.

Harmonical Detune
Controls harmonic detuning that can be set to 1x, 2x (+one octave), 3x, 4x (+2 octaves) or 5x the original frequency.

Fine Detune
Controls fine detuning of ±50 cents.

Mixing Controls

Ring-Modulation Control
Controls the level of the ring-modulation output in the signal. The ring-modulated signal is produced by ring-modulation between OSC1 and OSC2 outputs.
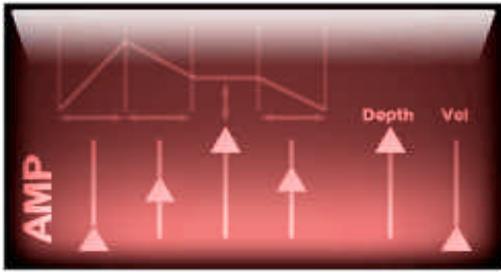
OSC 1
Controls the level of oscillator 1 output in the signal.

OSC 2
Controls the level of oscillator 2 output in the signal.

Amplifier Controls

Attack
Controls the amplifier envelope attack time. This is the time it takes for the sound to reach its peak amplifier level after you've pressed a key on your MIDI keyboard. The range is from 1 ms to 4000 ms (non-linear).

Decay
Controls the amplifier envelope decay time. This is the time it takes for the sound to reach its sustain level after it's reached its peak level. The range is from 1 ms to 4000 ms (non-linear).

Sustain
Controls the amplifier envelope sustain level. This is the amplifier level that is held while you keep a key pressed on your MIDI keyboard. The range is from 0% to 100%.

Release
Controls the amplifier envelope release time. This is the time it takes for the sound to fade away after you've released a key on your MIDI keyboard. The range is from 1 ms to 4000 ms (non-linear).

Depth
Controls the maximum amplification level caused at the amplifier envelope peak values.

Vel
Controls the velocity sensitivity of the amplifier depth control. The more sensitive you make it the more the sound volume will respond to your key press strength on your MIDI keyboard.

Effect Controls

To complete the array of "weapons" in your use the PlastiCZ has a simple effects unit.

Mix
Controls the wetness of the sound or the balance between effect processed sound and the pure sound.

FX Chooser
Chooses the effect from one of the following values:

| Effect	Description	Par1	Par2
None	No effect is in use.	-	-
Reverb	Produces fast echoes of the original signal. Simulates a "room" echo.	Room Size	Damping
Delay	Produces longer echoes of the original signal.	Delay Time	Feedback
TranceGate	Gates (switches on/off) the sound. This effect is synced to the VST host tempo.	Patterns 1 to 4	Speed
Chorus	Smooth stereo chorus that makes the sound appear "wider".	LFO Modulation Speed	Modulation Depth
Phaser	Creates a stereo phasing effect where two sounds seem to flow in and out of phase with each other.	LFO Modulation Speed	Feedback Level
Flanger	A bit like phasing, but phasing effect is deeper as the two sounds are at maximum more out of phase.	LFO Modulation Speed	Modulation Depth
Distortion	Creates a distortion signal that mimics overdriving an amplifier.	Drive	Shape
Bitcrusher	Creates a "low bit count" and "low sample rate" effect that distorts the sound.	Bit Depth	Sample Rate
Leslie	Leslie effect known from the Hammond Organs. Originally it was built with a speaker rotating around a microphone.	Rotation Speed	Modulation Depth
Talkbox	Simulates human-voice formants.	LFO Modulation Speed	Tone or Formant Pitch

VU Meter

VU
VU meter shows the current stereo signal output level.

Misc Controls
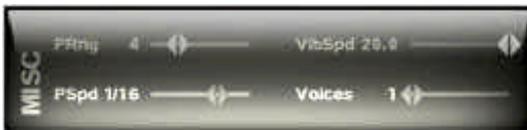
PRng
Controls the pitch bend range.

PSpd
Controls the portamento speed, this control is only effective when Voices is set to 1. The speed is synced to the host tempo and the values are in note lengths.

VibSpd
Controls the speed of the vibration that is created with modulation wheel. Larger values mean faster vibration.

Voices
Controls the maximum polyphone of the synthesizer. This is to enable users with less powerful CPUs to be able to limit the CPU usage. Portamento speed control is only active if Voices is set to 1.

MIDI LED
Lights up whenever PlastiCZ receives MIDI data it recognizes (see MIDI Control). Useful when you need to quickly check if you've wired PlastiCZ up correctly in your VSTi host.

MIDI Control

MIDI Implementation Chart for PlastiCZ

Function		Transm.	Recog.	Remarks
Basic Channel	Default:	x	1–16	Messages are always received
	Change:	x	1–16	on all channels.
Mode	Default:	x	Mode 1	OMNI mode is always on.
	Messages:	x	x	
Note Number	Sound Range:	x	0–127	
Velocity	Note On:	x	o	
	Note Off:	x	x	
After Touch	Keys:	x	x	
	Channels:	x	x	
Pitch Bender		x	o	
Control Change	1 (Mod Wheel)	x	o	One semitone vibrato.
	5 (Portam. Speed)	x	o	
	6 (Data Entry MSB)	x	o	Only Pitch Bender sensitivity.
	7 (Volume)	x	o	
	100 (RPN LSB)	x	o	Only value of 0 is recognized
	101 (RPN MSB)	x	o	Only value of 0 is recognized
Program Change		x	o 0–127	
	Actual No.	x	0–127	
System Exclusive		x	x	
System Common	Song Pos:	x	x	
	Song Sel:	x	x	
	Tune:	x	x	
System Real Time	Clock:	x	x	
	Commands:	x	x	
Aux Message	Local On/Off:	x	x	
	All Notes Off:	x	o	
	Active Sensing:	x	x	
	Reset;	x	x	

Mode 1: OMNI ON, POLY   Mode 2: OMNI ON, MONO   o = Yes
Mode 3: OMNI OFF, POLY   Mode 3: OMNI OFF, MONO   x = No

Special Continuous Controller Messages

In addition to messages specified in "MIDI Implementation Chart for PlastiCZ" the following MIDI Continuous Controller (MIDI CC) messages are recognized and affect the described parameters. By sending MIDI CC messages you can change these PlastiCZ parameters at any time from your VSTi host.

MIDI CC	Parameter	Values	
05	Portamento Speed Control	0–127 - > 1/1 – 1/64	
20	Oscillator 1 Harmonically Detune Control	0–25	x1
		26–49	x2
		50–74	x3
		75–99	x4
		100–127	x5
21	Oscillator 1 Fine Detune Control		
22	Oscillator 2 Harmonically Detune Control	As in CC 20	
23	Oscillator 2 Fine Detune Control		
24	Mixer Ring Modulation Control	0–127 - > 0% - 100%	
25	Mixer Oscillator 1 Control	0–127 - > 0% - 100%	
26	Mixer Oscillator 2 Control	0–127 - > 0% - 100%	
27	Amplifier Envelope Attack Time Control	0–127 - > 1ms – 4000ms	
28	Amplifier Envelope Decay Time Control	0–127 - > 1ms – 4000ms	
29	Amplifier Envelope Sustain Level Control	0–127 - > 0% - 100%	
30	Amplifier Envelope Release Time Control	0–127 - > 1ms – 4000ms	
31	Amplifier Depth Control	0–127 - > 0% - 100%	
32	Amplifier Velocity Sensitivity Control	0–127 - > 0% - 100%	
70	DCW Envelope Attack Time Control	0–127 - > 1ms – 4000ms	
71	DCW Envelope Decay Time Control	0–127 - > 1ms – 4000ms	
72	DCW Envelope Sustain Level Control	0–127 - > 0% - 100%	
73	DCW Envelope Release Time Control	0–127 - > 1ms – 4000ms	
74	DCW Depth Control	0–127 - > 0% - 100%	
75	DCW Velocity Sensitivity Control	0–127 - > 0% - 100%	
76	Oscillator 1 First Duty Cycle Waveform Selection	0–15	Saw
		16–31	Square
		32–47	SquarePulse
		48–63	SawPulse
		64–79	DoubleCos
		80–95	Reso
		96–111	ResoSquare
		112–127	DoubleSaw
77	Oscillator 1 Second Duty Cycle Waveform Selection	As in CC 76.	

Continued on next page...

...special MIDI Continuous Controllers continued.

MIDI CC	Parameter	Values	
78	Oscillator 2 First Duty Cycle Waveform Selection	As in CC 76.	
79	Oscillator 2 Second Duty Cycle Waveform Selection	As in CC 76.	
84	Pitch Bender Range Control	*) 0–127 -> 1–12 semitones	
85	Vibration Speed Control	0–127 -> 1.0–20.0 Hz	
90	Effect Type Selection Control	0–11	None
		12–24	Reverb
		24–35	Delay
		36–47	TranceGate
		48–59	Chorus
		60–71	Phaser
		72–83	Flanger
		84–95	Distortion
		96–107	Bitcrusher
		108–119	Leslie
		120–127	Talkbox
91	Effect Mixing Control	0–127 -> 0%–100%	
92	Effect Parameter 1 Control	0–127 -> 0%–100%	
93	Effect Parameter 2 Control	0–127 -> 0%–100%	

*) = Note that the standard way of setting MIDI pitch bender range is also supported. You'll need to first send the CC 100 with value of 0, then the CC 101 with value of 0 and finally the wanted pitch bending range in semitones with CC 6 (note that the effective range is 1 to 12 semitones and values above 12 are treated as 12).

Contact and Support

We have tried to keep **PlastiCZ** as bug-free as possible, but you never can be 100% certain things work as they should in the world of software. So if you should encounter any problems or if you have suggestions for future revisions, don't hesitate to contact our technical support at:

support@refx.net

Or come and visit us at:

http://www.reFX.net/

Thank you.

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