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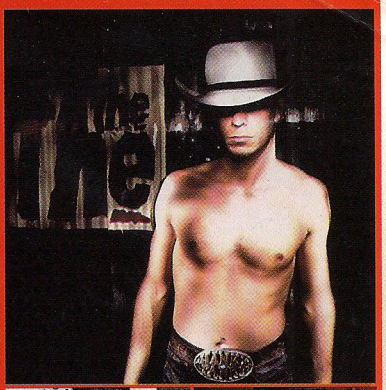

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Cosmology

Though diminuitive in size, the Casio CZ-101 has always inspired fanaticism among its many owners. *Joe Brusi* takes us into the world of Phase Distortion...

Casio, the Japanese brand famous for VL-tone type home keyboards, ventured into the synthesizer market with the CZ (which stands for 'Cosmo') series keyboards, and they did rather well. The CZ-101, the smallest in the series, is a cute example of what good design should be. With its very personal sound, immense synthesis power, simplicity, compact size and fairly stylish looks, it remains a very popular synth, and my personal all-time favourite.

The CZ-101 features a four octave mini keyboard, 32 on-board sounds (16 presets) plus another 16 on an optional RAM cartridge, and 8 voice polyphony, which halves to 4 voices when using two oscillators. The 101 can run on mains or six D-size batteries, which are also used to back up the internal RAM sound. Sound editing parameters are relatively few (specifically, 128 bytes worth of settings), but those present can really be put to very good use. The reduced number of parameters also means that all functions can be accessed from a single button, which makes the CZs a delight to use. Editing pages are only used for scrolling through the envelope steps, otherwise pressing a function button results in the 16x2 character LCD showing all the relevant parameters.

The preset sounds are mostly dull and uninteresting, but this is a machine that urges you to make your own sounds, and makes it difficult to resist the temptation of getting down to some serious fiddling. You soon find yourself strained by the mere 16 RAM memory locations, and transcribing your sound to voice sheets. Indeed, exchanging of CZ sound charts was very popular at the time. In those days, it was still possible to put synthesizer patches in writing! My personal archive has more than 1,500 sound charts, which I have collected over the years.

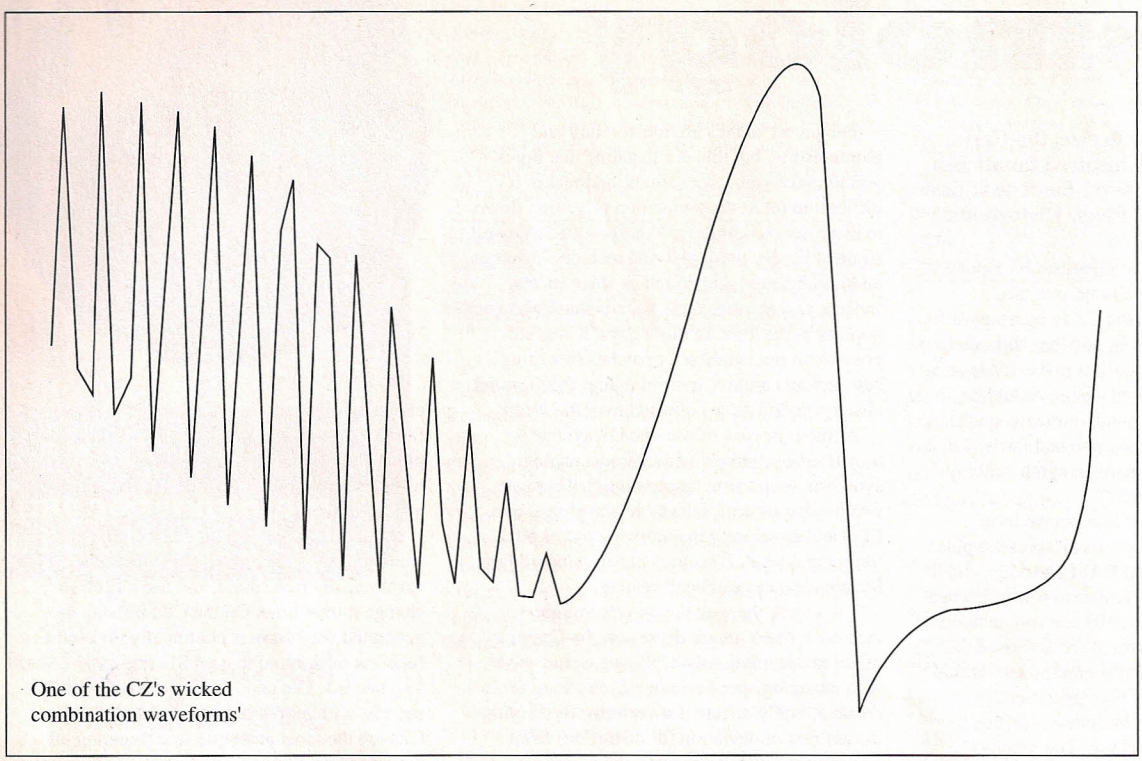
Aiming for ease of use, the CZ synths translated a relatively conventional analog synthesis sound structure to digital. There are two oscillators with selectable waveform, one LFO and envelope generators to control pitch, timbre and level. It seemed pretty standard fare, but appearances can be deceptive.

For a start, the way the waveforms are created, termed 'phase distortion' by Casio, is rather bizarre. It involves playing a sine wave with changing speed within a cycle, so as to create a totally different waveform. By varying the amount of deviation (or distortion) from a linear rate (a pure sinewave), the harmonic content of sounds is changed. It all boils down to creating complex sounds out of simple sine waves, as in FM synthesis.

Up to 33 combination waveforms are available, which are made up of combinations of two single waveforms played in succession. Some crude wave sequencing here! There is a choice of eight single waveforms. Be it the familiar square and sawtooth, the exclusive pulse, double sine and saw-pulse, or the three resonant waveforms, they all have a certain 'CZ' quality to them.

Synthesizers in general, both digital and analogue, are subtractive. They generate a harmonically rich sound, and use a filter to change it over time. On the CZs instead, the generated waveform is continually updated as a function of time, so that no filtering is performed – or needed. The end result is extremely full sounds, with lots of 'microvariation'. In fact, CZs are the most analogue-like sounding all-digital synths I know. The sounds are sometimes so dense that they tend to demand all the space within a mix, particularly when playing chords.

A hidden surprise lies beneath the envelopes. Each oscillator has an independent one for pitch, wave (equivalent to filter) and level. The boys from Casio then scored ten by giving us eight steps for each envelope, with sustain and end ➤



One of the CZ's wicked combination waveforms'

➤ points being assignable to any of them. In terms of synthesis, this is real power stuff. The multi segment envelopes allow for such possibilities as a seven step attack, with single step decay, or a simple attack with a seven step decay, which can be used for wah-wah or delay effects. Since the end point is 'floating', you do not need to face the daunting task of eight steps every time. You can have as few steps as required. I, for one, would like to see this envelope structure on all synths, but no other manufacturer seemed to jump on the idea (any of you synth manufacturers that might be reading).

The DCO and DCA work similarly to their analogue counterparts VCO and VCA, although when playing high values of pitch envelope you get all sorts of wacky unexpected effects. There are two voices in each sound. You may select each of the voices in isolation, or, alternatively, select '1+1', in which case voice 1 gets doubled by a detuned copy of itself, as a kind of sub-oscillator. '1+2' activates the two voices, the second being detuned. Detuning may be up or down, with octave, semitone and fine adjustments.

The LFO is common to the two oscillators and is hard-wired to pitch, offering waveform (square, up or down sawtooth and triangle), speed, level and delay settings. Also, there are modulations, ring and noise, which are particularly useful for special effects and industrial sounds. The ring modulation is that available in many analogue synths, and sadly absent from most of today's sample based ones: The first oscillator can be modulated by itself or the second oscillator. Noise modulation is a bit of an innovation. Turn it on, and oscillator 2 becomes a noise source, the character of the noise being dependent upon the waveform selected. Yes, 33 shades of noise!

A sound may be layered ('tone mixed') with another, or itself, for a really fat sound. Also, a mono mode is available that makes the CZ a four part multitimbral unit. Do not throw too many notes at it though, or the slow internal microprocessor may not be able to follow (giving the synth its own MIDI port helps here, so that it only receives the channels it is meant to play). You can edit a sound while your sequencer is running, without exiting the 4-track mode. An invaluable feature, but unfortunately not very common.

Target price for second-hand CZ-101s should lie in the £80-128 range. Buttons are durable, but in case the unit has been laying unused for years, you should check that the batteries have not leaked and damaged the device. This is also true for the memory cartridge. Also the synth is fairly fussy about its power supply, so make sure you get the Casio adapter. ●

MIDI on the CZ-101/1000

The MIDI implementation of the CZ-101 (same as model 1000) is fairly comprehensive, and certainly very advanced for the time.

Program change and pitch bender are, of course, supported. Controller messages are used to send portamento time and on/off state, as well as switch the LFO in and out.

Although there are no multitimbral memories, setting one up is as simple as sending a MONO ON message (controller 126, value 0), and then program changes to each of the four relevant channels.

Configuring the tone-mix mode is slightly more involved, and is accomplished by means of a short SysEx command.

Transferring individual patches to and from a sequencer via SysEx is also possible, but cannot be initiated from the front panel, and needs a short SysEx request to be sent. This is presumably a hand-shake operation, but not necessarily so. You can load and save patches quite happily, with any sequencer that allows SysEx editing. Alternatively, you should have no trouble finding one of the large number of editor/librarians that were written at the time.

On the RE:MIX CD Track 48

For those of you who don't have a CZ101, don't despair! Joe has kindly donated some of his favourite CZ sounds, which can be found on the CD this month.

A short guide to the cosmos

CZ-101	4-octave mini keyboard. 8/4 voice polyphony.
CZ-1000	Ac 101, but with standard sized keyboard.
CZ-230S	CZ based home keyboard. Preset sounds only, but editable via MIDI.
CZ-3000	As 1000, but with 5-octave keyboard. Also doubles polyphony to 16/8 voices and adds a chorus effect.
CZ5000	As 3000, but with a crude 8-track sequencer.
CZ1	As 3000, but keyboard is velocity and aftertouch sensitive.

The synthesis engine is the same for all CZ synths. In fact the SysEx sound data format is the same for all of them. Only the CZ-1 adds some sensitivity parameters, while remaining fully compatible