Stradisaurus Rex
The Yamaha CS-80

About myths and legends

Myths and legends are strange things indeed. Some stories grow further away from the truth the older they get. Did Alexander the Great really conquer the world? Or was he just a manic depressive who roamed around middle Asia with a small army until the threat of mutiny made him give up?
But this is no historical website. Here we talk about electronic musical instruments. But with those it is also difficult to keep reputations and the truth apart. Is the Minimoog really the best synthesizer of all times? The thing surely was a trendsetter and it still sounds fantastic but about all modern synthesizers are much more versatile. And what about the Prophet 5? Polyphony and adjustable presets in 1978? Fantastic. One could however also say: "Presets have hardly done originality any good and 5 voices is not very impressive at all".
Off course it is always best to do your own research and come to your own conclusions. But how does one get hold of such a legend? Turning to the CS80: On the internet prices of Eu / US$ 8.000 to 11.000 have already been asked. Excuse me? Who is prepared to pay that for an instrument that has a bit of a dubious reputation when it comes to it´s reliability?
In this article we will meet the CS80 and have a look at this classic instrument. Without giving too much away up front: As always in life, there is no light without shadow.

A bit of history

Where should one start? In 1978 the CS80 appeared? No, things are never that simple. There is a whole family tree involved here. And what a mighty oak that is.
The first Yamaha in which a synthesizer was integrated was the CSY-1 Organ from 1974. Soon a stand alone version was also released, the SY-1. It wasn´t exactly the stuff of dreams. Think of an analog semi-preset monosynth with aftertouch in the ARP Pro Soloist and Roland SH-2000 mold but it sound wasn´t very impressive. The presets where quite conservative. As with about every Yamaha synth instrument since then one had to really dive into it to get the best from it.
Inside the instrument however one could find strange small, black boxes: A VCO (type 3), a LPF, a HPF, a VCF-EG and a VCA-EG. Just like ARP Yamaha embedded its most important circuits in epoxy resin to make it difficult for competitors to copy them.

But these little boxes should not be underestimated at all. After the SY1 the SY2 appeared and then..... then came the GX1. A revolutionary instrument that actually warrants another article all for itself. It looked like a big, white organ standing on 2 mighty chrome legs (funky!) and carrying 3 Manuals augmented with bass pedals. Behind this exterior 4 mighty synthesizers where hidden: 1 mono solo synth, 2 polyphonic´s and a mono bass synth. The keyboards where velocity and aftertouch sensitive. It provided expression heaven on earth. If one added the optional programmer box the instrument even became fully programmable. And this all in a time when true polyphonic synths where just starting to become an accepted proposition.

This monster however had a few ``small`` disadvantages. It was extremely expensive (For the same amount one could buy a rather big Villa) and very, very, very heavy. One ought to buy 6 or more sturdy roadies to go with it right away. Only a handful of acts where able to buy such a behemoth (or maybe some of them got it for free to help Yamaha to establish itself as a synthesizer manufacturer). Well known ``average``users where: Stevie Wonder, Led Zeppelin, E.L.P., Abba (!).

But the GX1 was primarily intended to be a technology demonstrating flagship. More affordable and transportable instruments where about to follow: the CS50, CS60 and …. CS80. The CS80 still was criminally expensive (and heavy) but this time the price was only equivalent to that of a big car!

The small boxes had disappeared though, to be exchanged by openly accessible and more compact circuits. Because the CS uses another oscillator design the sound had also changed somewhat. A pity? One could discuss that point forever and not get to a conclusion. The GX-1 had a well rounded sound. No other analog synth could for instance emulate a string section as well. The CS80 sounds more bombastic. But more about that later.

Very important was the improved user interface. The CS80 is fully programmable and has a lot of Performance controllers.

Hardware

A CS80 is filled to the brim with precious few chips and a lot of transistor age analog hardware: The instrument weighs in excess of 100 kg. That makes it´s so called portability a dubious proposition at best. How that feels? Things could be worse. A big part of the weight was due to an integrated flightcase. Good handles at the front and heavy wheels at the backside where also incorporated. At least you´ve got enough grip on all that bulk.

So a roady could really throw it through the vicinity to his hearts delight? Er, better not! Besides the fact that your roady should then have been King Kong himself there where even more pressing reasons not to allow it. However hard the outer shell might be, the inside of the beast is filled with fragile electronics. If you open the instrument you might think you have been thrown back in time to be turned into a NASA-Technician working on an Appolo capsule.

It is typical CS80 lore never to move the instrument around on its wheels. In such a case the numerous internal tuning pots will drift. Which leads to the most major of all CS80´s faults: It surely sounds impressive but it will never be perfectly in tune. And he who wants to correct the problem should prepare himself for a tuning operation without precedent. All 16 analog oscillators must be tuned over all octaves. And during this exercise one should also be very careful to put his screwdriver exactly at the right places. Otherwise the cure could become worse than the illness.

Another pleasant fact about the CS80´s legendary tuning instability: If you fire it up you will have to wait very, very long before it is tune. 30 Minutes are about the minimum. In the mean time one can off course warm up his fingers but even after all this waiting the temperature in the studio or on stage should still stay reasonably stable. Politely said: People whit a neurotic demand for perfect intonation should leave the CS80 well alone.

"My God" the modern lap top musician thinks, "It almost sounds like firing up a steam engine", after which he warms himself on an 8-hour start-up procedure and endless latencies from his latest laptop.

The reasons for the CS80´s tuning particularities are very analog indeed. A true analog synth generates a lot of heat and the CS80 is stuffed full of so much electronics that the thing almost becomes an oven.

Especially early CS80´s basically never where in tune. Thus a tuning modification was introduced quickly. By mounting heat emitting diodes on the the oscillator chips (It actually was not as analog as one would think) these where actually overheated when compared to the surrounding air. A classic electronic trick: If you cannot control the ambient temperature just go higher then what might normally occur.

So they actually heated up things further in there? Yes, but at least the instruments now more or less stayed in tune. But alas the damage had already been done: The CS80 had by now gained an eternal reputation for being a party pooper in the tuning department. It must however be said that this reputation is not entirely deserved. A CS80 with the official service mod it will stay in tune reasonably well. Only the aforementioned roady-rituals should still be avoided. Better still is to keep it in the studio at all times.

But one should be aware of one very curious thing. Especially a not totally perfectly tuned CS80 provides perfect ear candy. The fact that one voice is never perfectly in tune or just as loud or bright as another gives this synth a life off its own. You could say that it is provided with an unique inherent "randomizer" function. Just like a violinist will never be able to perfectly repeat a certain phrase a CS80 player is not able to do that either.

Off course the Yamaha developers never intended it that way but these little deviations actually breath life into the instrument. And software synth developers have also become very aware of this: To emulate an analog synth every note needs to have a small randomized amount added to or subtracted from it as far as tuning, loudness and brightness are concerned.

But we are not concerning ourselves with emulations here. Here it suffices to conclude that the CS80 has a life of its own that makes it sing, cry, breath, scream, etcetera in a way no other synthesizer does in quite the same way.

The concept

Another typical thing about the CS80 is that its differs from the norm in a lot of details. To really understand this one must be aware of these differences.

This is a synthesizer that was specifically designed with the trained musician in mind. Of course every brand claims to be the builder of true musical instruments. But let´s be honest. Most electronic musical instruments are designed for the mass consumer market. In this respect the industry seldom develops things further then the typical demands of a somewhat sophisticated homekeyboard player. So the more mayhem a machine produces after pressing one single key the better.

For the CS80 other goals where set. This was to be an expensive instrument. And who could afford such an instrument? The typical professional who knows how to use more then one finger. Someone who can afford to buy a real performance instrument for his hard earned cash. In this respect Yamaha´s press offensive was not just typically inflated commercial blah blah. The developers really had done their utmost to develop a synthesizer that reacted like a real musical instrument.

And to expand on the ``one-finger`` remark a bi tfurether: We are talking about an instrument that was released in 1978. In those times the music business was not yet dominated by dance-DJ´s who use their second index finger only to poke around in their noses and still get away with it. We are talking about an age when exercising scales was still considered essential for a proper keyboard player. If you wanted to get a synthesizer recognized as a true performance instrument then you really had to do your homework.

The clearest proof of this performance orientation can be found in the fact that the keyboard is velocity sensitive and even provides polyphonic aftertouch. It´s not easy to describe in a few sentences how important and even revolutionary these attributes where at the time. The effect of their presence will again and again surface in the

following paragraphs.

The Architecture

Another very important factor in the sonic architecture of the instrument is its typical 2 channel layout that provides 2 completely independent synthesizer engines. Granted: Each of these channels only has one oscillator per voice so both channels are needed for oscillator detuning.

That might sound like a big disadvantage but it hardly is. If one wants to produce a conventional broad poly sound one can set both channels to identical sounds and detune one of them. But which classic analog synthesizer enables one to program 2 completely different sounds? Only instruments from a later generation are able to do that (Jupiter 8, Syntex, CS70M, etc.). And even when 2 different sounds are produced the detuning trick still works for adding width. In practice the detuning knob is seldom used anyway, courtesy of the instruments already mentioned tuning ``particularities``.

And what about the number of voices? There have been many misconceptions about this in books and on the internet. Per channel there are 8 oscillators and thus 8 voices available. The total number of oscillators is therefor 16 but these cannot be allocated dynamically. When you blend out a channel you are actually only setting it´s output volume to zero. All 16 oscillators are still doing their thing but you can now only hear 8 of them. So a CS80 is always 8 voice polyphonic and never 16 voice. But one should also not talk about the instrument being 2 x 4 voice as has occasionally been reported. And there also is no splitpoint function. Again you have to turn to later instruments for that.

And what about our dearly beloved ergonomic partner, the potmeter? Well actually precious few conventional pots can be found on a CS80. A CS80 player typically tweaks sliders instead. These are very stable and do not move in a linear fashion but like a sort of tiny modulation wheel in which the knob moves through an arc. This is very ergonomic and one gets used to it very quickly. The movement is very natural to a human hand and one gets perfect visual feedback about its position. What you see is what you get. And guess what? These are actually pots after all but they have been mounted at an 90 degree angle to the control surface.

Another thing that works very intuitive and again proves that a lot of thought went into the instrument: How many LFO's do typical classic analog synthesizers provide? Often only one per voice, sometimes two. If you scan the CS80´s layout you might think that again only one LFO is available, be it under the slightly different nomenclature of Sub Oscillator. But surprise, surprise: In a CS80 every function that needs a slow speed oscilation has a fully independent LFO for exactly that particular function. These normally only provide a sine wave shape modulation but this is the most musical one anyway.

So nobody can complain that this instrument ever runs out of LFO´s. Te extra Sub Oscillator therefore is exclusively available to provide performance related effects.

All in all we can conclude that Yamaha has done it´s utmost to build a truly effective instrument on which no expense was spared.


Space age hardware memories

At the upper left corner of the program panel we find a big block diagram describing the layout of the synthesis engine. A very friendly gesture indeed. At that time the big universe of synthesizer programming was just opening up to most musicians. So such a visual aid was very welcome. But there is more to this panel then one would expect at first glance. If you pull on the ledge at its lower side it opens up. And presto: 4 Rows of tiny sliders appear (This time they are indeed real sliders and not camouflaged pots). These mirror the layout of a single voice channel and can therefore be used to program the CS80´s 4 (four!) user presets.

Stop laughing please. Before the CS80 came out incomplete programmers like those found on the Oberheim 2, 4 and 8-Voice models where the very last thing. Granted however: On the same NAMM-show in the U.S.A. where the CS80 was first shown the Prophet 5 with it´s digital memory also appeared. Even Yamaha was lagging behind with this GX1 style purely mechanical solution. It still was an original solution though and one should hail the Japanese for making seemingly over-complex and thus fragile solutions work dependable in practice. That´s what turned them into a force to be reckoned with.

Since these tiny sliders mirror the programming panel layout to their right it is quite logical to leave them for what they are for the moment and go there for the next part of our overview.
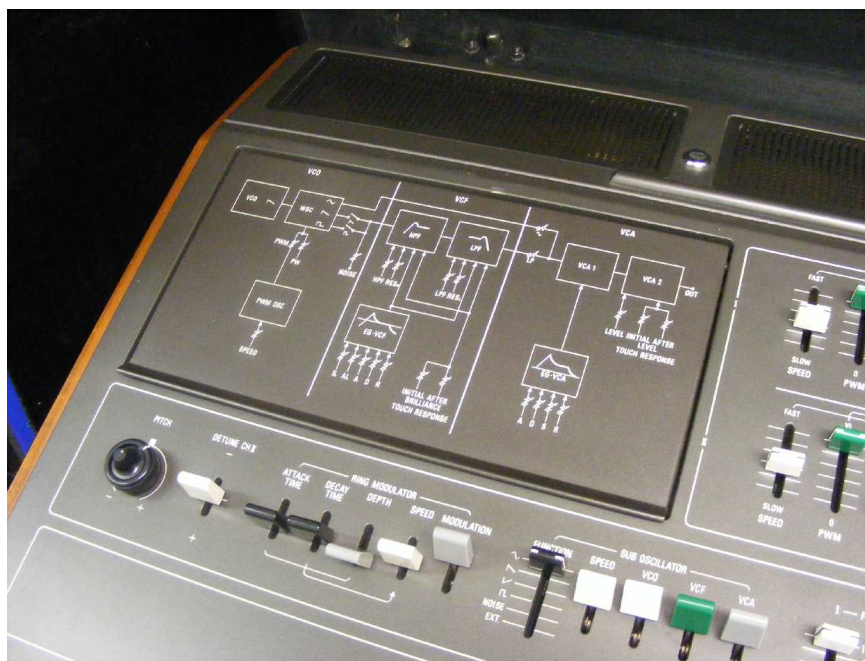
Channel layout

Here we encounter the basic synthesis engine layout mentioned earlier. Two completely similar programming panels are positioned one on top of the other. These represent 2 fully independent 8 voice synth channels. Reading one channel from left to right we first encounter the **VCO** Section. No big surprises here. 2 Waveform switches offer **pulse** and **sawtooth**. These can only be selected and not freely mixed. The width of the pulse wave can however be set manually and modulated per LFO from 50 % to 90 % (**PWM**), which means we have already found the first 2 ``hidden`` LFO´s (1 per channel). **White Noise** is also available, this time through a slider, which is logical because noise needs to be added with a bit of subtlety. Also not without its merits: One noise generator per channel means 2 of them overall. Together with all filter and modulation facilities (see below) this alone already predestines the CS80 as a master of weird sounds. Which analog synth except a real full blown modular provides more?

The **VCF** is next. Often complaints are heard that the CS-series ``only`` has 12 Db filters. So no resonance feedback oscillation is provided here. That´s true. 24 Db would probably have sounded even better but judged on their own merits it must be said that these filters sound very good. Furthermore we are provided with 2 filters per channel: a high pass and a low pass with independent settings for frequency and resonance. So low pass, high and band pass filtering are all possible at once.

It is logical that we encounter the **Filter EG** next. Again these differ from the norm. The Envelope Generator is a 5 stage affair with unusual names (Initial Level, Attack Level, Attack Time, Decay Time and Release Time).

The thinking behind this layout is often misunderstood. If we look at this envelope as a traditional ADR affair with two extra parameters stuffed in front of it we however come nearer to understanding it. Initial Level basically means that he envelope does not have to start at the zero level. It can also be started at a higher or lower level. Higher means an instant attack which is immediately followed by the normal attack. When the attack is not instant we get a sudden start followed by a slower attack (Think: PWWWAAAA). One could look upon it like a attack phase that is split into two segments. An attack set lower then zero means that the triggering of the note is actually followed by a short "dip" before the filter is opened at all. Only then the normal attack follows (Think: .… WWWAAA).

The latter option might seem daft but can still have a subtle and very musical effect. Imagine what happens if someone plays a harmonica. He or she blows (innocently and thus without any dubious associations, thank you!) and moves the instrument to open the appropriate air channel for the chosen notes. So the note simply changes doesn´t it? Not really. For a short moment the air stream is broken when one blows against the walls between the openings. Now that is about exactly what a sub zero Initial Level imitates. So no wonder the CS80 of all the analog synthesizers is the one that best imitates Harmonica´s and other wind instruments.

Having discussed the pre attack settings one might also understand that the attack phase of a tone can also be divided into a level component (to which level will the filter eventually open ? = Attack Level) and an attack time

(How fast does the filter open up to this level? = Attack Time) and this erstwhile strange contraption holds few secrets for us anymore.

The only thing we are missing is a sustain component. We will however encounter extra sustain options when we have a look at the performance aids to the left of the keyboard.

In the **VCA** section we find a normal ADSR envelope. But still something special is going on. In the VCO-section we where cheated out of a waveform that appears here at last: A pure **sine** wave can be added as a third waveform (Forewarnings of the almost unfathomable architecture of the CS30 are resounding!).

But even behind this seemingly strange feature a lot of logic hides. One cannot filter a sine wave properly because it does not contain any harmonics! So it does not make too much sense to send a sine wave through a filter at all. To send the sine wave into the audio path in the VCA actually makes a lot of sense!

In practice the most important thing is to know that adding a sine wave to the sound adds a lot of depth to it, especially when the original signal has been thinned out by strong high-pass or bandpass filter settings.

The last channel-parameters determine how the sound reacts to **Touch Response,** again a point in which the CS80 leaves the competition far behind! There are 2 sliders to adjust how the sounds reacts to the velocity, comparable to how a piano reacts to touch. Furthermore there are two sliders for the measure in which the Filter and VCA are influenced by the aftertouch. Surprisingly these functions are available on both sound channels and work polyphonically! So there are not 1 but 8 parameters (4 per channel) available for the keyboard dynamics? No. Eventually we will encounter 16 (!) such parameters. If anything proves how much attention the Yamaha engineers have paid to the instruments performance possibilities, this is it. The competition must only have produced sour smiles in response. Even today there is nothing comparable out there!

Performance parameters

Below the pure sound programming sections we find a next set of controllers over the total width of the instrument. These are typically used to improve the musical expression of the instrument even further.

To the extreme left we encounter one of the few "normal" pots on the instrument: A pot with an inner core and outer ring is used to set the **tuning** of the upper and lower channels. So both channels can be tuned independently. It's however not a good solution for quick detuning during playing. Therefore an extra slider is available to detune channel 2 relative to channel 1.

Next we encounter one of the CS80´s best features: The **Ringmodulator***.* This is typically wired in series with (=downstreams of) the combined output signal of channel 1 and 2. If used sparingly it sounds very smooth and organic and adds an almost breathing quality to the sound. Used in anger it really turns the sounds inside out and upside down.

Within the ring modulator section we again encounter a dedicated LFO. Even more uniquely its modulation speed can also be controlled by a dedicated attack/release EG. Modulation tempo changes can thus be programmed into the sound. That actually means that the ring modulators modulation is being modulated. Seriously!

Klaus Schulze loved this section. He used it to make his famous abstract bursts. It has also often been claimed that the ring mod scream from the original Dr. Who Soundtrack was made on a CS80 but this is doubtful. It does not fit in chronologically and the creator of the Doctor Who, Deliah Darbyshire, was a typical, presynth tape manipulator/tress.

But that´s a deviation. Let´s stay with the business in hand.

Further to the right we encounter the **Sub Oscillator**, a LFO with 4 waveforms: Sine, falling sawtooth, rising sawtooth and pulse wave. Furthermore Noise and EXT have been added as modulation sources. The EXT is another interesting function indeed. At the backside of the instrument an audio signal can be fed in. If EXT is selected this signal triggers an envelope follower which then acts as a the LFO modulator. It can for instance be used to let the instrument ``dance`` along with a drum(computer)rhythm, an often underestimated trick to create polyphonic sequencer-like effects.

The remaining functions of the Sub Oscillator speak for themselves: A speed slider and independent amount sliders for VCO-, VCF- and VCA-modulation.

To the right of the Sub Oscillator we find faders for **Octave Selection**, one per channel. Rather unique is that there also is a notch to detune the oscillator to a fifth. Which makes it rather easy to integrate the instrument into typical powerchord rock arrangements.

After this things become even more colorful then the color coding of the slider caps: We encounter the CS80´s typical internally lit preset switches. 24 of these provide all sounds one expects from an instrument of this vintage, from Strings and Brass over Clavichord to something called Funky. One should not take these names too literally. Just expect typical analog preset stuff which begs to be adjusted using the performance functions.

The upper row of switches presents the presets for the 1st, upper channel while the lower row represents those

of the 2nd, lower channel. The last 2 x 3 switches have a somewhat different function: 4 of these represent the user presets set under the upper left panel (2 presets x 2 channels), the last 2 (1 per channel) switch the instrument to the programming panels we already discussed. During life performances these could be seen as a 3rd user preset per channel.

Getting confused? Just remember the 2-channel layout of the instrument: Per channel 11 factory presets, 2 user presets and 1 programmer panel selection switch are available. For the total number of available sounds we have to double these (22 factory presets, 4 user presets and 2 program panel switches). It´s nothing compared to modern standards but for the time it was quite a flexible proposition.

Up to the next slider. This one determines the mix between the upper channel (channel 1) and the lower channel (channel 2). If the fared is set fully to the upper channel only that is heard. If the slider is pulled fully down only channel 2 sounds. Any setting in between leads to a mix of both sounds. The middle setting means both sounds are amplified equally strong.

Further to the right we encounter another typical Yamaha feature: An extra low pass filter that influences the aforementioned summed signal. The mixed sound can thus again be finetuned with cutoff and resonance controllers.

The range of this filter is quite broad. At this point we might express some doubt about an old myth: The CS80 ``only`` has 12 Db filters, now doesn´t it? But what happens if a set of 12 db low pass filters are put in series (on per channel and 1 over the sum)? This might still not be a totally equivalent to 24 Db filters (one is for instance still missing out on resonance feedback) but it surely goes a long way.

We mentioned a total number of 16 **Keyboard Response** controllers. Now we encounter slider 9 to 12. The first one introduces an Initial pitch bend effect. This provides a short swoop that mimics the way many instruments rise from an ever so slightly lower tuning to the intended pitch. Another small but not insignificant parameter to enable this synth to emulate the character of a natural instrument.

The next 3 faders control how the Sub Oscillator reacts to the touch response. There are separate sliders for Speed, VCO amount and VCF amount. The AR envelope in the ring mod therefore is not the only means to control the LFO frequency. Here the keyboard dynamics can be used for this. Very expressive!

Next are keyboard response controllers 13 to 16. Here it is determined how strongly the upper and lower keyboard half dynamics influence the sound. They provide variable keyscaling for both velocity and aftertouch.

Last we find another conventional pot. It determines the overall output volume.

Pause

Phoo! Breaking out in a sweat yet? He who has not dozed away yet is really a keyboard geek. And we are still not there yet. Maybe this is the right spot to take a break, get something to drink, eat or ….
Too late! Here we go again.

The ribbon controller

One floor lower, just above the keyboard, another great feature is to be found: The best ribbon-controller ever. Are you in to wheels? Do you think they are the ultimate in control? You must be joking! How difficult life must have been for you. And you didn´t even know what you where missing!
This ribbon controller takes the point you first touch it as its centerpoint. So when you actually first put your finger on it the pitch does not change at all. In stead the length of your finger movement from this initial point determines the depth of the bend. This makes it eminently usable for all sorts of bends, vibrato´s and thrills. If you first put your finger at the utmost left and move it to the right you can bend the note up 1 octave. If you start from the right you can even bend down until only some subsonic crackling is left. Fantastic!
Really skilled people can turn the CS80 into a true Stradivarius by using this ribbon in conjunction with the keyboard. The keys then determine the initial pitch and control the aftertouch after which full legato phrases can be played on the ribbon only. But this needs a lot of practice and you must have an almost perfect sense of pitch. In the list with audio examples at the end of this article a perfect example from a lady named Kate Bush is mentioned.

Still want more?

To the left of the keyboard we find a few extra delicacies.
There are switches to select **Volume** or **Volume/Wah** for the footpedal. The wah does however rather thin out the sound so this option is more for the Funky Faction then for the Wagnerians.
Furthermore there are a switches and a slider that determine the **Sustain** behavior if the sustain pedal is used. One tip from somebody who has learned the hard way: Never mix up the sustain and footcontroller pedals. If you use the wrong inputs your instrument will begin to smoke and turn silent. Luckily it´s actually not that hard to fix afterwards but you have to know where to search for the fault so better to avoid it anyway. I spent a year hunting for somebody who was willing to take a look at the inside of my CS80 at all. I never found that elusive person so I still had to figure everything out myself.
Back to the business in hand. **Portamento or Glissando** can also be chosen and their speed set on this panel.
Last of all we find the controls for the **Stereo Chorus/Tremolo**. This processes the sum signal of channel 1 and 2 after the ring mod. The effect is a bit noisy but sounds rather good.
By the way: The channels cannot be output individually. That's about the first mod I would contemplate. But who wants / dares to mod a CS80?

The Keyboard

The sound of the CS-80 is legendary. Nobody will however be prepared for the quality of the interface until he or she plays one.
No synthesizer I have ever encountered has a better keyboard then this one.
It's touch is rather close to that of a piano. To achieve this the keys have been made very long. They stretch almost to the very back of the quite deep instrument. So there is no real hammer mechanism involved. In this case the length behind the hinges is used to supply the balanced feeling. Not that it is as heavy as a real piano but it is clearly heavier then that of a typical synth keyboard. And the keyboard is fully velocity sensitive. No wonder that typical keyboard players like Stevie Wonder and Michael Mc Donald chose it.
But that's not all: The real surprise comes when one tries the POLYPHONIC aftertouch. A modulation and expression paradise opens itself up to the player. It is vastly superior to the almost digitally on/off monophonic aftertouches most recent keyboards produce. Worse still: Aftertouch often is totally absent on many MIDI/USB keyboards, That's the future for you!
The CS80's keyboard must also be pressed quite firmly but the amount of aftertouch can be controlled very well. A typical trick is to set up a sound in such a way that the sound from one channel is immediately audible at every keystroke while the other channel only sounds when aftertouch is applied. If the filter, VCA and aftertouch controls are set accordingly the latent second channel voices can then be blended in and out individually within a

chord. That's real polyphonic aftertouch for you. No modwheel or footcontroller can beat that because these apply the same effect to all voices at once in stead of individually per note!

All in all, whatever you do with it, the CS80 is always a little bit better then you are. And that is very rare in a synthesizer.

Polyphonic aftertouch: A sad story

There where few other instruments who offered this. The Sequential Circuits T-8, Yamaha DX-1 and Ensoniq´s middle generation of instruments did. That hardly any newer gear with polyphonic aftertouch exists is partly to blame on Ensoniq. They had an exclusive contract for such keyboards with manufacturer Fatar.

Still though a few masterkeyboards provided the capability, for instance the Roland A50 and A80, but I tis said these often where badly implemented (just digital: no modulation or maximum modulation but precious little inbetween).

Furthermore only few instruments and expanders actually react to polyphonic aftertouch. The Waldorf Microwave XT and Wave are said to process it. The Wave had it´s own keyboard but strangely enough this can only generate monophonic aftertouch. A crying shame!

Strangely enough the often underestimated Italian keyboard industry has been a small Island of hope in this sad tale. Elka produced the MK/line of masterkeyboards and GEM (nos also defunct) even released a synth with polyphonic aftertouch in the nineties. So if you hunt down a GEM S2, preferably in its Turbo version, you can still go poly pressure for a few hundred bucks. And in this case it really works quite well!

At the moment no conventional keyboard with polyphonic aftertouch is produced as far as the author knows.

The Haken Fingerboard provides a polyphonic, X,Y,Z sensitive tablet style of "keyboard". On it every single note can even be bent up and down the full keyboard length (as long as no other fingers come in the way) so it should actually even be superior to the CS80´s keyboard and ribbon combiantion. I´d love to get my hands on one but they are hideously expensive.

Then the Endevaour Evo, a standard keyboard with touch sensitive key surfaces, has been announced but they are only 4 octave as yet and also quite expensive.

The only inexpensive alternative is to use an Akai style percussion controller with pressure sensitive pads.

All in all there is hope. Maybe music technology is finally getting there by incorporating portable touch sensitive surface technology. Maybe the future is to have a touch surface keyboard and combine that with touch sensitive tablet style programming surfaces.

But at the moment hardly any sound generator system reacts to the polyphonic modulation information. Isn´t that a sad state of affairs after so many years of so called revolutionary developments in music electronics? No wonder the CS80 is still held in such high regard.

Interfacing

After all these glowing accolades this is the first aspect in which the CS80 is not very impressive. Little is to be explained. There are inputs for the footcontroller, the sustainpedal and the EXT audiosignal for triggering the Sub Oscillator. Only 2 outputs are provided and these both produce a normal mixed mono signal until the stereo chorus is selected. As mentioned earlier there are no separate outputs per synth channel but since the outputs are called 1 and 2 instead of L and R it is very understandable that some confusion exists about this.

All that is left is a headphone output. This is positioned in the underside of the instrument near the front right corner.

No analog or digital in and outputs are to be found, so it for instance is not possible to trigger a monophonic synthesizer from the CS80 keyboard.

That no MIDI is implemented is hardly a surprise. It would still take a few years before the first digital interfaces appeared. Nowadays a Kenton MIDI-interface can be installed but this only supplies MIDI-in. If one however considers that the sound is only one half of the CS-80's power such a solution can only be called a crutch. To stay with an earlier comparison, playing a CS80 through MIDI is a bit like playing a Stradivarius with a hack saw: It's might be nice for basic midi-sequencing but it's of little use for real keyboard playing.

Now imagine the opposite. Wouldn't it be great to be able to use all the CS80's performance options to control MIDI equipment? But converting all control signals into digital data effectively would probably be impossible. What a pity.

The sound

Things are prone to become mighty subjective now. I personally think the CS80 is the best sounding analog synth ever. Period.

Whole armies of Moog lovers will now enter the fray to bring this heresy to a very sticky end. "24 Db", they chant, accompanied by ancient brass instruments made out of Roman bronze (off course best emulated on … a CS80!).

Off course that's all a matter of taste. To the author the sound of the CS80 has an almost archetypical quality. That's how a synthesizer should sound. Many times he has been enchanted by an album to find out, sometimes years later, that it was dominated by the CS80.

In somewhat more objective terms: If analog sounds should really be bombastic few instruments are better suited to perform the task then the CS80. But it can also be beautifully subtle. The only thing is that one must accept (or better still love) that a CS80 always sounds like a CS80 (or at least like an analog Yamaha).

We did already have a look at the filter. With it's two 12 dB filters in series it might not produce the same depths as a synthesizer with real 24 Db filters. However: The sine wave (which almost all competitors have to do without) and eventually a few extra bass-Db from an external equalizer make the windows rattle just as hard. And as we have seen those "strange" filter envelopes are also often misunderstood.

As far as to the often criticized preset sounds are concerned: Of course they have precious little to do with the instruments they are named after. However: If one is able to step only an ears length away from these names things suddenly sound a lot different. As far as warmth and liveliness are concerned they are really the bomb.

CS80 magician Vangelis often was too lazy to build a totally new sound on his CS80(s). The very famous „Blade Runner Blues" solo sound is said to be nothing else then the Flute-preset with a fully opened filter and a lot of resonance on the performance controllers, while putting the sustain switch to the left of the keyboard on position II.

More of such examples can be found in Vangelis's work. No wonder he hardly ever wants to speak about the instruments he uses. He probably did not want to admit how important the CS80 was for his Nemo years sound.

It's also typical how everybody sounds different on a CS80. Of course there still is the already described typical CS-sound but still everybody who understands the instrument still also sounds like him-/herself. It's not like on the Minimoog where a solo is almost bound to be a flowing portamento affair (Ouch. Swords and axes are being sharpened again!).

The only sonic disadvantage the CS80 has is that is is not a chameleon It's not possible to hop from Moog to ARP to Sequential on it. But those who need a chameleon are better helped with a ROMplayer or virtual instrument anyway.

So it's characterful sound actually makes it difficult to say if the CS80 is the Alfa and Omega of analog synthesis. Isn´t that always a matter of taste anyhow? That's why some audio examples have been included in this essay (see bellow). Please make up your own mind.

Conclusion

One should normally keep the conclusion to the end but an awake reader will have understood it a while ago: Although a lot of nonsense has been written about the CS80 truth and reputation do not lie as far apart as one would expect. The thing simply sounds fantastic and the user interface is one of the best a synthesizer has ever offered. In it's heyday its technology was cutting edge, although this also explains why it is rather moody in the electronic stability department.

Looking at it from a user standpoint even today it only has two real shortcomings. Firstly only four of it's sounds can be stored, furthermore it has no digital interfaces. But someone who is really into synthesizer programming might understand that these are actually the two main factors we might better live without. Presets often means "makes you sound like everybody else". MIDI often is synonymous to: "I'll fix it in the sequencer so why bother to play it well the first time?" The CS80 has pulled the author out of both traps. This alone is enough to make this instrument deserve one's ever lasting devotion.

So should everybody go for a CS80 then? Yeah right! First you will have to find one. Those who own a CS80 guard it with their life (Just like me. Kreegah! Tarzan Bundulo!). And if you find one in an add it's price is ridiculously high. Let´s be honest. The prices that are nowadays asked and paid for analog classics are no longer realistic. If things go on like this the CS80's similarity to a Stradivarius will also become fitting in this sense.

And if one owns a CS80 at last one is forever dreading the day that it might develop an incurable fault, wondering how the spares situation is and if one can actually find a person who is willing and even able to repair it. Thus the owner is almost required to become a technical specialist himself. Or you should be rich enough to also fly in a specialist from the other side of the world if required (Which might actually explain a lot. Maybe Jay

Leno is buying them all. Or is it Hans Zimmer?).
So it's an expensive drug for sure. But a the same time there are worse things to invest your money in.
Nowadays it's way better then carrying your money to the bank anyway.
But seriously. There is no reason to get desperate. One can buy an Arturia emulation to at least come near to the CS80 sound and bask a little bit in the warm feeling of its cult.
Another way to feel connected to the real thing is to buy a cheaper monophonic CS. These can still be found for more or less realistic prices. But try to find a CS 15 or something upwards from that. The CS5 and CS10 only have 1 VCO and the CS5 only one ADSR.
But even then: While still craving for the real thing himself the author once sampled a CS5 into a Roland W30 sampling workstation and programmed sounds with its internal digital architecture. The result still sounded a lot like a true polyphonic analog Yamaha. Which goes a long way to prove that the oscillators are just as important for that typical sound as the filters.
Another trick is to loading true Yamaha CS80 samples into a GEM S2 or 3 turbo. That surely adds polyphonic aftertouch to the equasion.
Whatever: Armed with one of these alternatives one can at least dream about the times when polyphonic synthesizers where still hernia-inducing, electronically unstable monsters with near ultimate keyboards and user interfaces.

Listening tips:

- *Everything VANGELIS made in his Nemo Studio / London period. So from SPIRAL (1977) up to SOIL FESTIVITIES (1984), including the BLADE RUNNER Soundtrack of which a beautiful 25th Anniversary Edition has been released (Hmmmmm).*

- *THERE GOES A TENNER from KATE BUSH´s Album THE DREAMING (1982).*
  The synthesizer melody in the chorus is the best example of ribbon control virtuosity I have ever heard. Lyrical!

- *U.K. by U.K. (1978).*
  Bombastic, symphonic jazzrock. That might sound dreadful but not when you actually hear it. Keyboard player Eddie Jobson chose the CS80 as his prime instrument. The text on the record sleeve actually says: "THE CS80 POLYPHONIC SYNTHESIZER IS BY YAMAHA." You can say that again!

- *THE GREEN ALBUM by EDDIE JOBSON solo (1983).*
  Same man again. This time it´s even easier to find the CS80: Besides some minor Minimoog stuff all electronic parts where played on the CS80. This is less jazzy then the U.K. stuff. In stead the CS80 is really turned into a true rocker, especially because it has regularly been sent through a Leslie! Who still needs an old Hammond then!

- *TRANCEFER by KLAUS SCHULZE (1981).*
  Listen to the broad and breathing vocoder enhanced chord improvisations in A FEW MINUTES TO TRANCEFER. Most Schulze-Fans do not consider this album to be among his best work but I still get goosebumps from it!

- *JAH MO B THERE by MICHAEL Mc DONALD / JAMES INGRAM (1983).*
  The only example in this list I am not totally sure of. For years I thought that the weird solo had been played on a sampler or digital synthesizer. It does however sound too organic to be produced by a sampler. So the CS80 with creative use of glide and ringmod is a better bet, especially since Mc Donald was a CS80 user and the rest of the synth arrangements in this song reek of CS80 anyway.

A lot more examples can be found but you get the drift. Even this short list proves that neither the Prophet 5 (1978), the DX7 nor sampling (both circa 1982) could drag owners away from their CS80. Most of them played the instrument until it just broke down (too often).

A bit of loosely CS80 connected trivia

Some years ago I visited the Musikmesse in Köln, Germany. It must have been 2003 because at this same show Roland introduced the V-synth and Dave Smith Instruments the Evolver.
From afar I saw the venerable Mr Bob Moog, to which I kept a devote distance, although acording to his reputation it might not have been necessary to do that. But at least I "met" him in time before he sadly died.
I did have a quick chat with 2 other legends though.
Firstly with Dave Smith, who seemed pleasantly surprised that I was able to compare his voice connectivity system with that of the old Oberheim SEM poly's.
Where does the CS-80 come in then? Well, I also had a talk with John Bowen of Sequential Circuit fame. Triggered by Bowens revised Pro One emulation for Native Instruments we talked about the virtues of good soft synth emulations. During that conversation I asked if John knew of anybody who was planning to emulate the CS-80.
Not very much later the Arturia CS-80V came out. And since then I have always been wondering if my question was not passed on by John which could mean that I might have had a very small influence on the decisions of Arturia to release that product. It's probably only wishful thinking but it is a nice idea anyway.
At least this proved to me that the old Gods of synthesis are very approachable people in real life, who after a lot of hardship in their pasts seem pleasantly surprised their reputation lives on.
I wish I had more time to visit music fairs.
Later I was able to buy my very own real CS80 so I never bought emulation I craved for. And the software does not really do full credit to the real thing anyway, especially if you appreciate that half of the CS80's power lies in it expressive interface. But had luck not been on my side I would have bought the softsynth willingly, even if that would have meant putting a PC or laptop into my studio. I must be honest here. Until I could lay my hands on the real thing the CS80 sound was the only thing I wished for and although the CS-80V sounds more clinical then the real thing, it goes a long way in supplying THAT sound.
I think one should never be snobbish about such things. There is a price to pay if you want the real thing, Not only literally because it cost so much to obtain one but also because you have to live with it quirks and the constant fear that it might break down for good one dark and hopefully very distant day. So let say hurray for the democracy a good emulation provides to us all.
But don't be mean. Buy that soft synth if you want it! Do not use an illegal copy. Programming and selling soft synth is not a guaranteed road to riches. So be respectful of those who do it. We are not talking about multinationals like Microsoft here.