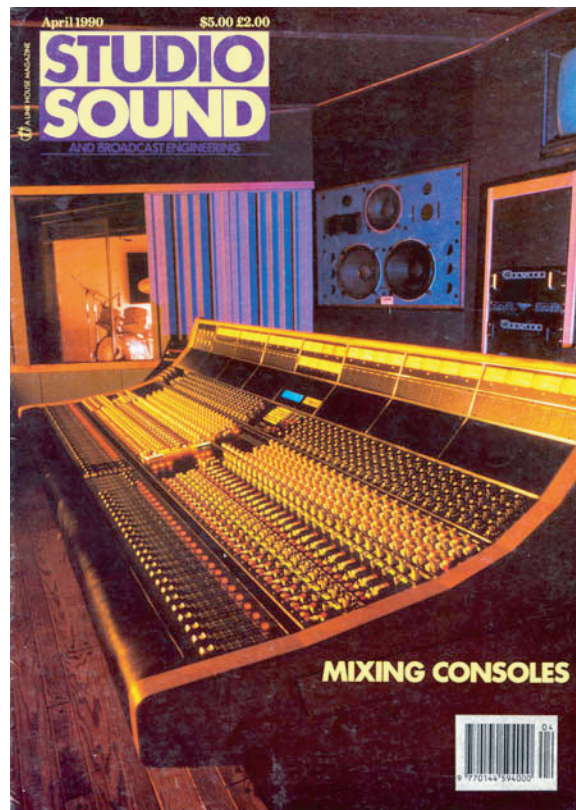# API Past And Present

By

Keith Spencer

Studio Sound

April 1990

API PAST AND PRESENT

From a major name in the '70s to near obscurity in the '80s, API have now returned to console manufacture. Paul Wolff of API talked to Keith Spencer-Allen about past, current and future console developments

Towards the end of 1989 a name that had had little exposure for most of the '80s began to evoke some considerable interest. Many thought all that remained of API was a reputation gained in the '70s when they were one of the world's leading console manufacturers. During their heyday they were known for the 'API sound' and an innovative approach to automation technology. Well over 400 consoles were sold during this period (at a time when there were far fewer studios) but it could be said that they were a perfect illustration for the phrase 'right place, wrong time' as a number of factors including technological directions combined to reduce Automated Processes Inc to a shadow of their former selves. The reputation that they had gained for the 'API sound' among committed users, maintained the name through the '80s despite the company changing hands and almost disappearing at one point.

In the mid '80s the remains of the company were purchased by Paul Wolff to become API Audio Products Inc. Then began a considerable battle to revive the API name and product range, which had suffered from several years of products unsympathetic to the API reputation. This was mainly done by returning to basics and starting production of the component modules for which there was a demand. At the October 1989 AES Convention, API showed a completely new console that drew much from the designs set in the '70s but employing much learnt in the intervening years. This was the first of two consoles now delivered and installed, which puts them firmly back in the console business.

Automated Processes was formed in 1968 and started delivering fully modular consoles the following year. In 1972 they were offering a fully automated console with VCAs and the programmable equaliser appeared a few years

later. In the mid '70s they were developing a complete automation system with Allison Research, known as the Model 256E/D Programmer, which they described as a 256 function device, ie able to control up to 256 different console functions such as individual channel gain, channel echo send, channel stereo panning, channel EQ (four functions each), master levels and echo returns, and quad panning! The accompanying literature describes an automation philosophy that generally would still be accepted as the ideal. The ideas may have been right but the available technology lagged behind.

Paul Wolff: "One of the things that cost the company a lot of time and money was trying to develop a computer to run the console because at that time there weren't even microprocessors that were worth anything. They were using the Allison 65K and stacking them up and streaming the data onto cart tape but it was very slow and sluggish. Too much time was spent on the computers and not enough on the audio—it was a bit noisy because the VCAs just weren't that good then. But it was a phenomenal console in its time and made a lot of things real easy. For example, you could subgroup the equalisers and, for example, if you assigned them to group 1, you could boost the high end on all the equalisers as you were fading them down. This was a real big project and they almost pulled it off—if only they had a PC or a Mac back then to do the filing!"

Wolff had been a user of API gear for many years before joining the company working in all areas of product development. He worked with Saul Walker, one of the originators of API, assimilating the API philosophy.

The late '70s saw API in trouble due to a number of business problems, an almost saturated console market, a decline in the growth of the record industry and a general air of stagnation. The company finally went under leaving the

common financial problems for the customers. It was trying to solve one customer's problems for a batch of type 550A equalisers that put API in contact with a Virginia company who completed the order and made an agreement to continue the product line after API went out of business. However, it was not quite so straightforward as they were active in many different areas of technology manufacture but were not so understanding of the finer points of audio that API had originally accommodated. Eventually they decided that audio was not for them and tried to sell the company but there was little interest—although a good reputation still existed for the old products. The current product range had little of this and there still remained much bad feeling from the original collapse.

Wolff had, by this time, left and started Wolff Associates, which was undertaking rebuilds and helping studios with their console problems. He eventually made an offer for API that was accepted and was soon joined by Kevin Raynor who was to become Vice President.

Wolff: "Two days later I turned up in a truck and hauled all the stuff away, moved into a shop in Springfield, Virginia, and started API. What we started off doing was building modules as API had originally built them to get confidence back while slowly introducing new products and this brings us to where we are now."

The equaliser

API are particularly known for their equaliser, the 550A. This was originally designed in 1967 as the 550 and by current products looks rather basic with three bands of switched frequencies and a gain of ±12 dB organised on concentric pots. Its internal design is also rather different from current design practice.

"When you implement a cut you have a capacitor going to ground and when you boost you have a capacitor in the feedback, followed by gain. It is basically a passive equaliser with a couple of 2520 amplifiers in it and a two transistor buffer between each stage to isolate them, which grew to a three transistor buffer in later models (550A).

"Just before API stopped manufacturing in 1979, a version of the equaliser called the 550A-1 was designed using ICs in an effort to reduce the high cost of making the discrete 550A. After putting this equaliser into production the reaction from the users was that it sounded horrid. It took 3 years to live that one down.

"We went back to the original drawings and blueprints. And one of the first things that we did was to return to the original blue knobs on the front of the 550As to make a time mark. Psychologically it gave us a little more credibility

because people saw the blue knobs—they remember the old blue knobs—and were more willing to give us a chance. For a while we just concentrated on building old modules for people who wanted to expand their consoles.

"And then we thought it was time to see if people would accept us for real. So we came out with a new equaliser—the 5502, which was a dual 4-band. To reduce confusion we put it in a rackmount package as we didn't want people to go 'That's not the same. Is it a 550A-1, is it a 550A, or is it an original circuit?' It was accepted very well. One customer asked for this 4-band design in the 550A format module. So we looked at it and the hardest part was finding four switches that would fit in that amount of space. We could not use the original switches and the resistors were actually soldered directly onto them. It took 28 hours to build one of those equalisers and we were not charging very much. It was almost like the API public service equaliser company!

"We eventually found a high quality PC mounting switch that fitted but only left ¼ inch space for the resistors. So we had to come up with another way of doing that so we went to a ceramic vertical pack of silk screened metal film resistors, which are then laser trimmed. This then became the 550B and we stopped the 5502. They are also far more reliable and work when assembled.

"In the 550B we had added 11 new frequencies half of which were in the bottom end that the 550A was known for. We talked to engineers and found what they wanted and now you've got 30, 75, 150, 280 and 350 Hz at the low end and we added a 20 k on the top—when you turn it up it just adds air—you would be surprised at what you can hear. We have only sold one 550A since the 550B was introduced."

For API there were a number of problems in maintaining the sound of such an old design—many of the old components were not available any more. So is there a sonic difference?

"We try to use the same components but they are better these days. The capacitors have less inductance, less leakage—there are better electrolytics and, of course, non-polar caps which we didn't have a lot of back then. Also there is the consistency of the steel in the core of the transformers, which is going to be different. So there is a little change but most of the engineers in the know say that they seem to sound clearer and just a little bit cleaner. We have taken transformers and caps out of the old 550As and put them in the new versions and we have found that they sound absolutely identical."

If they have managed to maintain the sound what are the circuit characteristics that determine the sound?
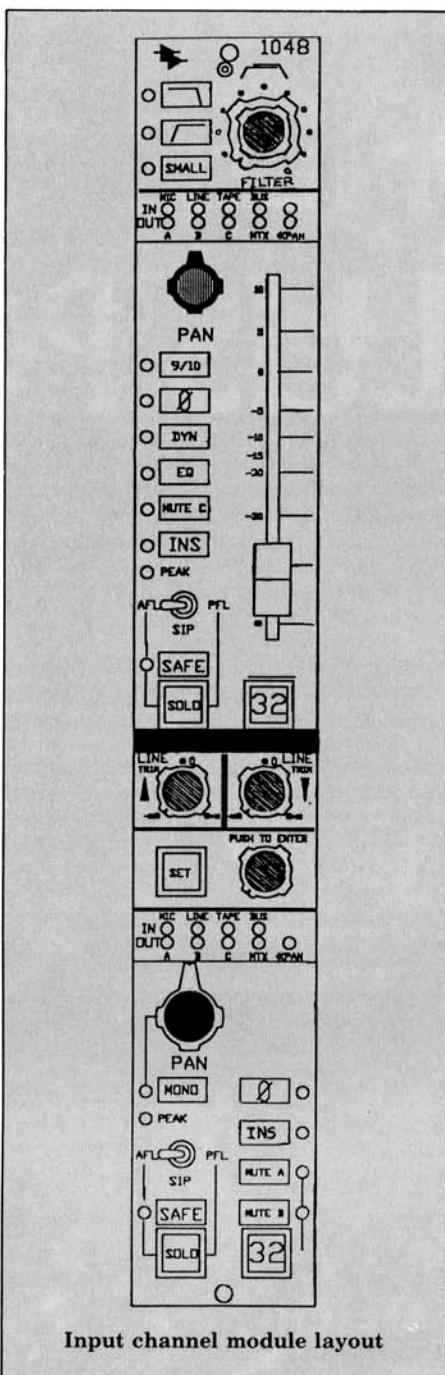
"One of the things is that the Q is not constant, it is proportional. When it was being designed they found that as they clicked through the resistors, the loading of the resistors caused the centre point to shift so they had to adjust the Q resistor to bring the frequency back to the centre. What it turned out to be is that when you boost 2 dB the Q is three octaves wide. On 4 dB it starts to narrow and when you get to +12 dB it is an octave wide. The area under the bell remains the same. This means that for 2 or 4 dB boosts you get a very broad curve—less than 6 dB/octave with 2 dB of gain and so very low phase shift. It is a passive filter too—not a circuit that is being regenerated or with inductors. Also the transformer and op-amp have an effect. The output transformer has a few bumps in the low end and this, with the op-amp which has a certain

tone, combines to give a fat bottom end. It also clips at +30 dB and still sounds clean after boosting the high end.

"One of the reasons the 550A-1 was unpopular was because it was constant Q and you could hear the bell even when only on +2 dB."

New consoles

The new console was shown for the first time at the October 1989 AES Convention. It had been API's intention to get back to console

Input channel module layout

manufacture but spent some time finding out what was expected of them. They had delivered a console 2 years previously but that was based around older modules and this was to be new. Known as the *Discrete* series, the idea is to make just a single model but within that to make it as flexible as possible. There is also a great deal of choice for the customer to configure it to his requirements. API have always used separate modules within the channel strip and the desk on

show had six different module angles. The customer apparently can specify the order of the modules and the angles between them. If he has no preference then standard 15° breaks are taken and entered into the CAD machine, which, according to Paul Wolff, makes it all easy! Several of the modules such as the send module, the EQ and the dynamics use the same 'bucket size' and it is possible for the user to re-order the modules by unscrewing and moving the motherboard to the new position.

Because of the flexibility of the console and the possibilities to vary the components it is hard to look at the console as a specific item—more a console system and philosophy.

There is also an integral automation system developing with the console that looks set to evolve with time. At present it has control of the input and output routing as well as talking to the GML computer that can be used for fader automation. API have in fact been liaising quite closely with GML during the development of the console to ensure much future product compatibility.

It is nominally an in-line design in as much as its physical layout although there is the possibility to run the two sides as completely separate channels—even with its own EQ and automation.
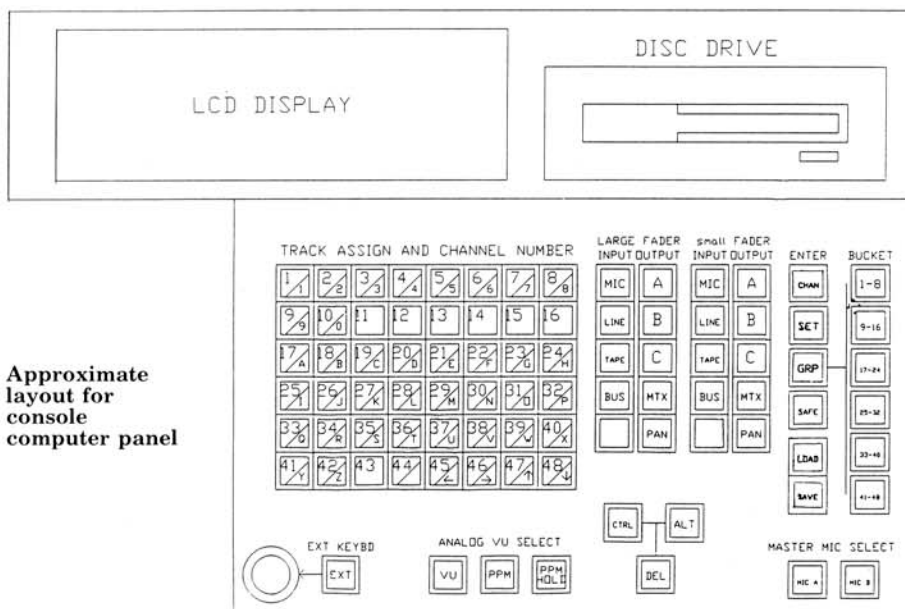
Paul Wolff: "The sketches for this console are an evolution from 1967 to 1989. What we came up with was the idea to make all the inputs and outputs completely flexible. So the large fader can access mic, line, tape or bus, as can the small fader. The large fader can output to any of the three stereo buses (ABC); direct to the matrix or via the pan. The small fader has the same features and the only difference between them sonically or feature wise is that one has the GML fader and the other, the short throw. How you use the faders is controlled through software but the control is accessible from the module, from the computer (or from a stored file or against SMPTE timecode). This was considered a better way rather than generating proprietary functions and terms of differing console statuses.

There are no mic preamps in the console, the idea being that these will be remote. They do have a small one for those that require it designed so it will also retrofit into Sony mic pre modules. Selection of mic pre's would normally be completed at the patchbay.

Once the signal is in the module there are solos with AFL/PFL and solo-in-place functions; a mono button that bypasses the panpot; a phase switch; an automated insert point (under the GML computer which stores the timecode value of selection); two mute groups; ±10 dB of line input trim; and a soft mute. This is a circuit that uses a FET to short the audio out with a 10 ms ramp. There is also the relay mute in the GML fader which is fast and so there is a choice.

The small fader section has the same function and facilities. It is also possible to assign the EQ or the dynamics to the small fader. Should it be desired it is possible to install another equaliser rather than a dynamics module and so both with the right selection, both small and large faders could have a full equaliser. At some point this small fader could be motorised under GML control to give almost equal facilities—96 full 'no kidding' channels. The small fader can also become echo sends 9 and 10.

The send module has eight sends set so they can be manually or computer muted. These sends are arranged on four concentric pots with switches that allow assignment to the small fader. This is a passive module with balanced bussing.

LCD DISPLAY

DISC DRIVE

Approximate layout for console computer panel

TRACK ASSIGN AND CHANNEL NUMBER

LARGE FADER INPUT OUTPUT small FADER INPUT OUTPUT   ENTER   BUCKET

1/1	2/2	3/3	4/4	5/5	6/6	7/7	8/8
9/9	10/0	11	12	13	14	15	16
17/A	18/B	19/C	20/D	21/E	22/F	23/G	24/H
25/I	26/J	27/K	28/L	29/M	30/N	31/O	32/X
33/Q	34/R	35/S	36/T	37/U	38/V	39/W	40/X
41/Y	42/Z	43	44/\	45/%	46/+	47/<	48/>

MIC A MIC A CHAN 1-8
LINE B LINE B SET 9-16
TAPE C TAPE C GRP 17-24
BUS MTX BUS MTX SAFE 25-32
PAN PAN LOAD 33-40
SAVE 41-48

EXT KEYBD EXT
ANALOG VU SELECT VU PPM PPM HOLD
CTRL ALT
DEL
MASTER MIC SELECT MIC A MIC B

After the EQ and dynamics modules there is the track assign display that is just an LED showing what track has been selected.

Metering is to choice. The console I saw had a meter for each group bus and stereo bus together with a switchable monitor meter. The main meters are switchable vu, ppm and peak ppm. The echo master section will have its own small meters.

The finish on the modules is interesting in that the module closest is light grey and the modules darken as they move away from the operator. David Hewitt, one of the first customers will be using the console in a remote truck and the colour scheme darkens towards the speakers and video monitors—the 'fade-to-black' look. It was decided to adopt the same idea for the console. The silk screened legends are very fine. Apparently they are also quite accurate having been measured out and then laid out on a desktop publishing program.

The console is available in sizes from 32-channel upwards. The maximum size in software is 256 but the realistic largest is probably one that is under discussion currently that would be 112 inputs, 96 buses and 24 echo sends per channel. The modular construction means that it is possible to increase the number of sends just by adding more send modules. The console is also designed so that it is not too difficult to increase the number of buses without losing the automation.

That sound again

How does this console sound? Unfortunately I have had no opportunity to find out as yet. I asked Paul Wolff about what they had achieved in this respect.

"One thing that we have done is to de-epitomise the sound in a way. The signal enters the mic pre with Jensen transformer that is very transparent and then passes to the op amp and transformer output stage so that sounds like the original API mic pre. Then there is the equaliser which still has its transformer but then after that you don't have the same chain anymore. In certain places we have a newer op amp that is very fast and very clear and still all discrete. This is used everywhere we would previously have used another of the old API designs. This has stopped reproducing the sounds over and over and prevents it building up to the point where it might just be a little too much. So if you want the sound it is there—and if you don't you can route around it".

Routing and patching

Part of the design philosophy was to rationalise the bus selection. Paul Wolff said he still felt it important to be able to select a bus on the module

rather than through a central assignment panel or to have to address the computer. Routing on the module is by hitting the SET button and turning the rotary encoder causing LEDs to illuminate on the track assignment LEDs and on the channel input and output indication LEDs. When you get to the one you want, the SET button is pushed and this selects or deselects that connection. It is also possible to use the keyboard of the computer to route signals and this has been modified to be more responsive to the module layout. All settings can be saved on a disk file and recalled with a quote setup within one frame.

Computer control brings with it the problems of what happens following power failure. With API—should the power fail for less than two frames the console remains configured as it was. Should the computer go down then the setup will remain exactly as it was because the system is 'dead clocked'—data is only going through when something changes otherwise there is no clock.

Paul Wolff: "GML has released a preliminary set up of their computer that has 128 bits of useable data per channel for doing switch assignments and eventually this will take over our computer function although both computers will back each other up."

All the stereo buses and the track buses have been taken to a separate cross point switch frame which is external to the console. Paul Wolff says that this offers a number of advantages—the ability to use a higher level to drive it, it can be fully RFI shielded; kept away from other high level signals and it can be computer controlled. All the buses are balanced and relays are used for the switching. The relays are a high spec reed type designed for military use and rated at 10 billion tested cycles. After selection it turned out to be the same one GML had been using for some years with good results—sonically and reliably.

The patch bay is very comprehensive with almost every point available rather than an insert point that you can move around.

The future

The console will continue developing—something that is much easier with the modular approach. A new dynamics module with a gating function and a stereo broadcast module are shortly to be added. Also planned are motorised rotary pan pots and later motorised echo sends.
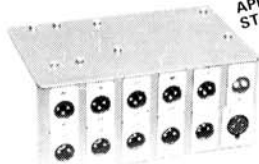
In a wider context there is the relationship with GML—API has adapted a bus they had been using and this will ease interchange and interfacing of new products. There also have been moves to standardise on a GML data protocol for assigning certain functions—ie bit 1 is mute, bit 2 is EQ in/out etc. There have been discussions with other manufacturers so that hopefully certain aspects of automation data will be transferable between different manufacturers' consoles.

There appears to be an air of cooperation between the small but high cost console manufacturers. There appears to be a degree of resignation to the fact that when you are paying the sort of prices some of these consoles demand, the customer will buy precisely what he wants and there is little that can be done to change that. He either likes the sound, the looks and the facilities or he doesn't. The API is perhaps not quite so expensive as some consoles in this category but Paul Wolff is not looking to make more than five a year. It is undeniably an interesting console with some innovative design approaches. It looks as if the API name (and sound) is back.