



Wheatstone D3 Layering Detail



Wheatstone's export sales directors Brad Harrison and Jay Tyler with the Dimesion Three Touch console



Launched in 1984, the A-500 radio console directed Wheatstone towards the broadcast market

Building the bridge

Taking its name from an electronic measurement device, Wheatstone's journey has been dedicated to building the best sounding products it can. **Richard Lawn** reports

ALBERT EINSTEIN'S EVERGREEN COMMENT THAT

'curiosity has its own reason for existing' was tailor-made for the audio pioneers of the 60s and 70s. Today, we live in a more disposable era within the Internet of Things, but the inventors of yesteryear forged their careers and their businesses by dismantling or even destroying equipment in the pursuit of seeing what made them tick. Balancing a passion for music with his technological inquisitiveness allowed Gary Snow in his late teens to earn a crust repairing guitar amplifiers. Having founded what was to become Wheatstone in the early 70s, his dynamism, attention to detail and enthusiasm have formed the solid and successful basis of this privately owned broadcast manufacturer.

Like most hobbyists, Mr Snow would return from work to spend his evenings in Syracuse crafting audio equipment specially requested by his friends. With good supply came increased orders, ensuring this hobby extended into daylight hours and the creation of his mass production company Audioarts. The 5200 Disco Mixer led to the 3100 parametric equaliser followed by the 2K, 4K and 8K consoles and the M10 stage monitor console. Operating from a converted barn, these compressor/limiters, electronic crossovers and consoles found a healthy demand in studios and live sound companies.

Whilst relocating to a 500 sq-m building in Bethany, Connecticut in 1981 in order to maintain production, Mr Snow launched the Wheatstone Project as a very high-end custom sound reinforcement console. This led to the company becoming incorporated as Wheatstone Corporation – a brand name that requires further clarification. 'The company started out as a console project in an old carriage house in rural Connecticut,' attests VP in charge of technology, Andy Calvanese. 'At that time, our president and CEO Gary Snow had been making small mixing boards for bands and production houses under the Audioarts brand name. He developed our first multitrack

console going by the project name Wheatstone, named after the Wheatstone Bridge, which was an electronic measurement device symbolising both precision and balance to an engineer.'

In the four decades that separate the birth of the 5200 and the IP-64 IP Network TV Console, Wheatstone opted for a 'less is more' product catalogue by ceasing to create any audio equipment that was demanded by them. This philosophy was sparked in 1983 when a dealer from Oklahoma asked why they didn't make consoles for broadcast. 'At the time we didn't, because we didn't know much about the market,' furthers Mr Calvanese. 'Our emphasis was always on high performance, best-sound-you-could-make consoles, which was not synonymous with broadcast. The dealer in Oklahoma was selling big sound systems to churches where broadcasting was taking off. They were mystified as the sound consoles sounded good, but the broadcasts were poor. Having thought about it we came up with a design and developed the A-500, which was our launch into broadcast audio.'

Making its debut at NAB in 1984, the A-500 was connected to a 10kHz square wave response on the generator display to demonstrate the cleanest sounding console in broadcast. The talk of the show went into and remained in production for 10 years until it was replaced by the A-6000 with all electronic switching.

With peaking production levels and 22 employees, Wheatstone simply ran out of space and moved to Syracuse, New York in 1986 but its shift into TV and radio console production meant this would only be a temporary home. Coinciding with the launch of the A-6000, Wheatstone's 58 employees were forced to relocate to a purpose built 2,000 sq-m facility.

Having settled into the new building, the Audioarts R-60 console became the first product to integrate surface mount technology (SMT) engineering into its design. 'Our SMT was acquired following a visit to a trade show in Boston,' elucidates



Sales director Jay Tyler inspects a console face plate prior to silk

Mr Calvanese. 'We were looking for equipment that would use the old lead parts to build our consoles, as we could no longer find them. We thought we were at the wrong show as we couldn't find any equipment and it was at that point that we realised times had changed and they weren't being used anymore, so we decided to buy surface mount.'

This same era was pivotal for Wheatstone as it also marked its entry into the digital console arena with the unveiling of the D-500. 'By creating a digital board from scratch based on our own feedback and designs, we devised a way to hot swap modules on operational consoles and retained an analogue friendly interface rather than the in-vogue drop down menus of the time.'

With the SMT now available to measure the electrical properties of all the components prior to insertion on the board, the TV-1000 soon followed. 'With a million op-amps on it and a countless number of resistors and capacitors, the TV-1000 was most complicated analogue piece of equipment we ever made.'

It went on to become one of Wheatstone's greatest sellers and owing to its success, the company relocated to its current home of New Bern, North Carolina in 1998. Not only was this move significant in that it was geographically almost 1,000 miles due south of the company's roots close to the Canadian border, but its 5,000 sq-m footprint would no longer inhibit growth. 'Gary also had the foresight to purchase a large woodland adjacent to this plot should we ever need to build a larger premises,' highlights sales director Jay Tyler to underline Mr Snow's fatigue of constant packing and unpacking at that time.

Today, manufacturing is divided into multitrack recording and on-air control surfaces for radio and television, together with Audioarts mixing consoles in addition to IP networking and routing systems and a 31-band spectral audio processor for radio. 'Our ethos encompasses great design, manufacturing and a bit of heavy metal, by custom building and machining every single one of our consoles,' explains sales engineer Brad Harrison whilst highlighting the fact that no production is outsourced. 'Here at Wheatstone, we actually make stuff to make stuff. It's vital that you create your own parts to exact tolerances and use the very latest surface mount technology in order to ensure consistently zero defects. By controlling processes such as silk screening, graphics and powder coating, laminates and furniture building together with computer controlled quality control testing in-house, the finished products



Inside the testing and measurement room



screening

never return. In essence, we're making sticks as opposed to boomerangs!

The huge production loop in the New Bern facility starts with a warehouse where all the incoming raw materials such as sheet metals and PCBs are thoroughly inspected. Once cut to size and folded mechanically, the console faceplates are powder coated and baked in an oven. 'For the electronic insertions, it generally takes three days to produce a console's mainframe according to a client's requirement, such as the hand-mounted faders and ports,' furthers Mr Harrison. Barcoded PCBs precisely allow the SMT robotics to create the broadcaster's bespoke product, before being manually inserted with larger parts. With everything under one roof - including front-end computer design, software coding, R&D and prototyping - the highly efficient and diverse production capabilities ensure that any design direction can be taken.

The workflow journey of a product from parts to insertion undergoes constant appraisals made by Audio Precision testing



The real-time digital audio recorder editor VoxPro

and measurement equipment and listened to carefully by human ears on headphones. 'We started using AP gear in 1987 as it was getting very time consuming doing everything by hand on the first PC based testers,' explains systems engineer Scott Johnson. 'Back then we were using basic programs on Apple 2+ computers. Now we conduct full sweeps from rack mounted equipment on HP computers.'

Wheatstone's emergence as a DSP provider was something of an accident following the development of the Audio Ecosystem in 2001, which required the company to create its own Bridge router. By integrating the DSP into the resultant D-8000 digital console, processing and limiting was available on all the individual channels. Consequently, radio control surfaces were then created to work with the Bridge router as was the D-9



Rack mountable Blades prior to silk screening

console for mid-market TV stations. Following many years of software development, the WheatNet-IP system was launched to critical acclaim in 2009 and was utilised in large projects such as Melbourne's Crown Casino. More significantly perhaps, the WheatNet-IP business spur ultimately provided Wheatstone with a proprietary DSP platform that could be integrated into its console surfaces and network solutions. TV audio networking to IP has recently been enabled with the Gibraltar IP Mix Engine.

Having consulted heavily with large TV stations, the development of the Gibraltar mix engine card was a huge step, allowing Wheatstone to create systems that are capable of processing over 1,000 signals simultaneously. 'It may have only been a PC card, but it was a significant step for us,' adds Mr Calvanese. 'Furthermore, by integrating the VE blade (Aura8-IP) and adding the SideBoard, a console was no longer required to operate the system.'

The 2008-9 recession may have stunted development at Wheatstone, but unlike most other US and western manufacturers, no employees were lost. 'With the recession that hit the broadcast industry, price dominated designs were critical,' furthers Mr Calvanese. 'This was frustrating as this was not what we wanted to do as a company. Our development of the LX-24 basically proved that we could still do that and that there is a market for it.'

Designing for the more budget-conscious studio has led in more recent years to the creation of an IP Meters app, new software for AirAura, the L-8 control surface, the Logic Blade, the FM-531HD processor and the M4-IP 4-channel mic processor Blade. The AES67 compatible Blade-3s take the product into applications where other manufacturers can network with it. The birth of the Dimension Three and Series Four TV consoles, L-12 radio console, FM-55 processor, SG192 Stereo Generator and the D-76 followed.

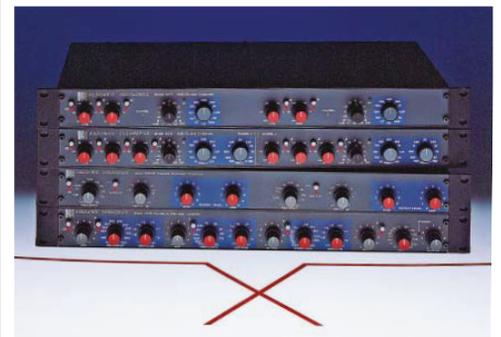
TV stations now benefit from the availability of the Series Two

TV console together with touch screen capabilities added to the Dimension Three, whilst Edge enables the use of IP networks with wireless IP radios. The recent acquisition of Audion Labs has now enveloped the real-time digital audio recorder/editor VoxPro into Wheatstone's already impressive portfolio. As part of the sale, it also acquired the skills of Seattle-based software engineer Rick Bidlack.

The US brand may be a giant domestically, but the global pursuits and visibility of Mr Harrison and Mr Tyler has grown its export sales significantly over the past two decades. Entertainment Network India in Mumbai purchased WheatNet-IP upgrades for its existing D-75 audio consoles through Horizon Broadcast LLP, whilst MCOT in Bangkok installed a D-76 console into its studio.

Following the annual NAB show in Las Vegas, customer feedback generates the R&D cycle. These sparks of inspiration are further stimulated by Mr Snow's blue sky thinking overlooking the St Lawrence waterway near Syracuse during the summer months. Once basic product blueprints have been laid down, he flies south to brief and challenge the R&D team to physically mould these ideas into shape. 'Once we get to the hardware, mechanical and packaging challenges, Gary has lost interest and is busy on the next generation of product development,' comments systems engineer Paul Picard with a grin. 'It's a challenge obviously to design the many facets of hardware, software and firmware, embedded systems, control surfaces and GUIs, but we're a close team and we have a unique culture here that leads to quick decisions and fast actions.'

Rising to the theme, senior sales engineer Phil Owens continues. 'There are no layers of bureaucracy or corporate politics at Wheatstone. We have meetings in the hall when passing one another and we know exactly where to go in order to get a decision. I don't know any other companies like that today in terms of top to bottom communications and agility.' But then again, Wheatstone isn't any other company. The relocation to North Carolina would have been the death sentence for most other manufacturers. However, some two thirds of the employees uprooted their lives crossing the Mason-Dixie line into the great unknown, ensuring that the company legacy, expertise and knowledge rolled south along with the removal trucks. Of the 37 who relocated almost 20 years ago, 25 are still working for the company. 'You either fit in or you don't here at Wheatstone. We're something of a cult and those who stay, generally stay for life. If you do your best during the day, you generally sleep well at night.'



Crossovers together with parametric equalisers and disc mixers were once Wheatstone's staple products

With hindsight, the decision to manufacture audio broadcasting technology was something of a masterstroke rather than a leap of faith for Mr Snow. The subsequent analogue-digital switch seemed equally painless. 'The folks in broadcasting are straight and formal - we actually prefer that,' confesses Mr Owens. 'We'd been pampering to the fashions and fads of the studio recording industry before that, whereby all the studios wanted their own customised mixer based on a Grammy winning design, which is both tricky and expensive to produce. When we created the D-500 20 years ago, we didn't envisage that the first one sold to a radio station in Chapel Hill would still be operational today.'

The tranquil backwater of New Bern has provided Wheatstone with stable roots for its 85 employees who regard their colleagues as family. In such a unique environment, passionate creativity it would appear is continually stirred.

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