MAKIN ORGANS HISTORY 1972 - 1992

Compton Makin Ltd. & J.&J. Makin (Organs) Ltd., Rochdale (1972 - 1985)

Makin Organs Ltd., Oldham (1985 – 1992)

By Hugh Banton, Engineer 1977 – 1988, Technical Director 1988 - 1992

J.R.M.P.

John Robert Makin Pilling was born in Haslingden Lancashire in 1915, the only son of a northern paper-mill owner. In his teens he was sent away to be a boarder at Charterhouse School in Godalming, where he would have found life quite challenging, far from home at a public school in Surrey. But soon began his acquaintance with the newly installed 3-manual Harrison & Harrison pipe organ in the school chapel which started a life-long passion. After leaving school he naturally joined the family business, J&J Makin of Rochdale. His mother was a Makin by birth and had become sole heir.

'Mr John', as JRMP liked to be known (a fashionable manner in which to address The Boss back in those days) became chairman and sole owner of what turned into quite a formidable company during World War II, chiefly because of two of their side-products. Although primarily a paper maker, they had also moved into the related businesses of tinfoil and metal powders.

Tinfoil, it was discovered in 1940, if shredded into thin strips and dropped out of aeroplanes, effectively incapacitated enemy radar. At the time this procedure was known as 'windowing', and a plane would travel ahead of bomber squadrons tipping out the contents of sacks of Makin tinfoil to create a radar fog ahead of the Wellingtons & Lancasters. It has been estimated that this ploy saved two or three British bombers a week from destruction. (Makin's later Telex address was 'tinfoil-rochdale').

Metal Powders was very much JRMP's personal success. Powdered brass, when compressed in a mould, can be formed into engineering components such as sleeve-bearings, and the material has the wonderful property of being porous and hence can permanently accommodate lubricating oil: a long-life maintenance-free mechanical component. You'll find them in washing-machines and vacuum cleaners, and particularly during the war, in tanks and aeroplane engines.

Powdered-metal bearings had been made in America before the war, but of course there were considerable wartime supply difficulties across the Atlantic from 1940 and Mr John personally helped to work out how to replicate the process in Lancashire. Hence his Rochdale factories saw a massive wartime expansion of Makin's premises and manufacturing capabilities. Paper remained a staple but J&J Makin Metals in particular went from strength to strength.

The post-war years in Rochdale saw another manufacturing triumph – metallised cardboard. Bonding copper-impregnated foil to heavyweight paper produced a luxurious-looking product – 'gold cardboard' - eagerly taken up by cigarette manufactures for their packaging, in particular Benson & Hedges and Dunhill. Makin made that product for the whole world, the company thrived and JRMP became a rich man.

J&J Makin acquired several other paper concerns and by the end of the 60's had mills in Rochdale, Dursley & Flint, and also acquired a local printing firm, the Oak Press. The headquarters remained at Wallhead Mill on the corner of Rochdale Rd. to Milnrow. (Wallhead was demolished in 1994 and is now Kingsway Retail Park).

The year after the war John married Margaret Atherton, in Ormskirk. John and Margaret lived in Southport and he became organist & director of music at Holy Trinity Church, which possessed a splendid 1923 4-manual Willis pipe organ, the *other* love of his life. John Pilling had a number of hobbies, in fact during the time I knew him I often doubted if paper manufacturing interested him much at all! He loved mechanical clocks, his house was full of them and he laboriously took mechanisms apart and spent hours with a lathe in his spare time turning original parts. But first and foremost he was a musician, a keen organist and choirmaster.

At his home in Southport, up until the late 60s, Mr John had owned a Hammond C3 organ upon which to practice; certainly a top-of-the-range electric instrument of its time but one which could never be regarded as a church organ as such. So in 1965 he commissioned a 4-manual Electrostatic Organ, to his own specification, from Compton Organs of London. When I was still at school I was fortunate to encounter this very instrument, before it was delivered, during a Compton demonstration tour. I vividly recall being mightily impressed with everything that could be achieved by entirely electronic means, and by a curious coincidence this might well have been a catalyst towards my later career. Electronics & music were already my primary hobbies, and had been for some years.

Compton Organs of London

The John Compton Organ Company was a pipe organ manufacturer founded in 1902 and became, perhaps to their slight regret, particularly famous for their cinema organs, which were hugely successful and commonly referred to as 'the English Wurlitzer'. John Compton was a prodigious inventor and his organs contained dozens of innovations, particularly concerning their elaborate electric action. Between the wars senior engineer Leslie Bourne developed a *pipeless* organ system using a rotary electrostatic generator, which was eagerly adopted by the company. Their electrostatic system undoubtedly produced the most realistic

Compton Organ Co, Chase Road

simulation of a pipe organ to date, for two reasons in particular: unlike the Hammond Organ the notes started smoothly, without an electric 'click', and instead of utilising crude electronic oscillators the electrostatic method employed pipe-like sound waves engraved onto spinning disks. Essentially this anticipated modern digital 'sampling' – the recording and reproduction of the sound of actual organ pipes – by more than half a century.

John Compton himself died in 1957. In 1964 the pipe organ division of the company was sold to Rushworth & Dreaper of Liverpool and for a while the firm successfully focussed on their electrostatic organs. They ultimately had great success with a number of compact church models, the 348, the 357 and 363, and many many large custom instruments, including one temporarily installed at the new Festival Hall on the South Bank, and latterly of course JRMP's home organ in Southport.

By the late 60s John Pilling had inevitably already started 'tinkering'! He was aware of two notable shortcomings of the Compton electrostatic system, and he had ideas to fix them both. But first here's a description of the mechanism: I'm going to have to lapse into technicalities at various times during this saga and here comes the first – feel free to skip!

> The main principle by which Compton Electrostatic organs form their different tones (and exactly the same functionality applies to the Hammond organ) is by a technique known as Additive Synthesis. This relies on the fact that every sustained musical tone can be broken down into a string of 'harmonics', which are sine-waves (pure tones) at multiples of the fundamental pitch, that is to say the pitch of the note we hear. So take middle-C on the piano, a note with a frequency of around 250Hz (250 vibrations per second). This sound also contains harmonic pitches at 500, 750, 1000, 1250, 1500, 1750Hz and so on, and it is the relative proportions of these harmonics that give rise to its particular identifiable tone. Therefore although any instrument playing middle-C will contain all of the above harmonics, it is the differing proportions of each which enables the human ear to identify the distinctive tone of a Piano, an Oboe, a Cello, a Flute, an organ Diapason, a Trumpet and so on.

> Compton's electrostatic system (also known as the Compton 'Melotone' or 'Electrone' in early evolutions) used 12 belt & pulley driven spinning generators, one for each note of the musical scale. The speed of rotation, and hence the pitch of the notes, is set by the diameters of the 12 pulleys.
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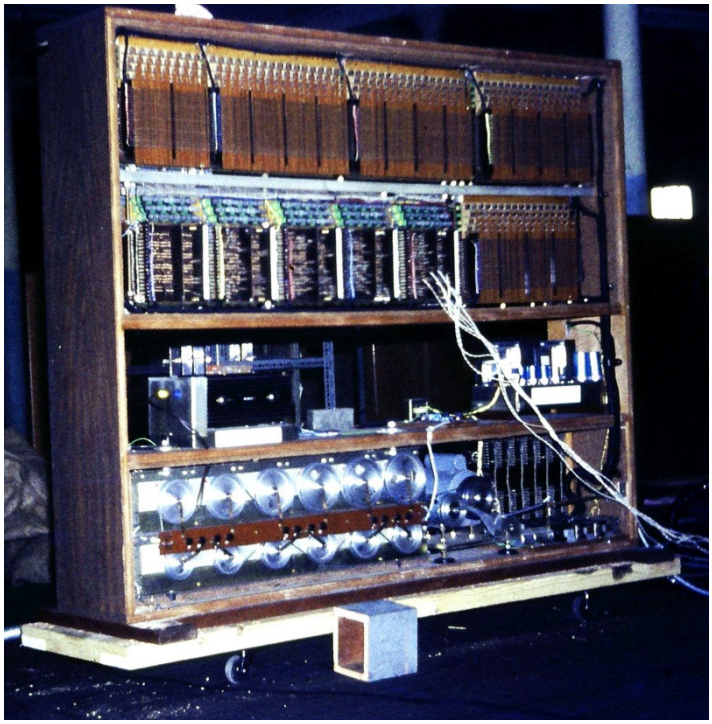
> Each generator contains two main parts – a stator disk with a series of concentric engraved waveform rings, which produce different tones at each octave, and a rotating scanner disk. A high voltage applied to an



A Compton generator cabinet

engraved ring on the stator gave rise to a musical waveform on the scanner disk, and this in turn is passed to the amplifiers and loudspeakers.

By the late 60s the generator disks were engraved mainly with sine-waves, to facilitate the additive synthesis as described above, but it was also found that an engraved string tone proved very useful for a number of stops so this was also included over the middle octaves. In earlier days the disks had featured a whole range of pre-formed pipe waveforms.

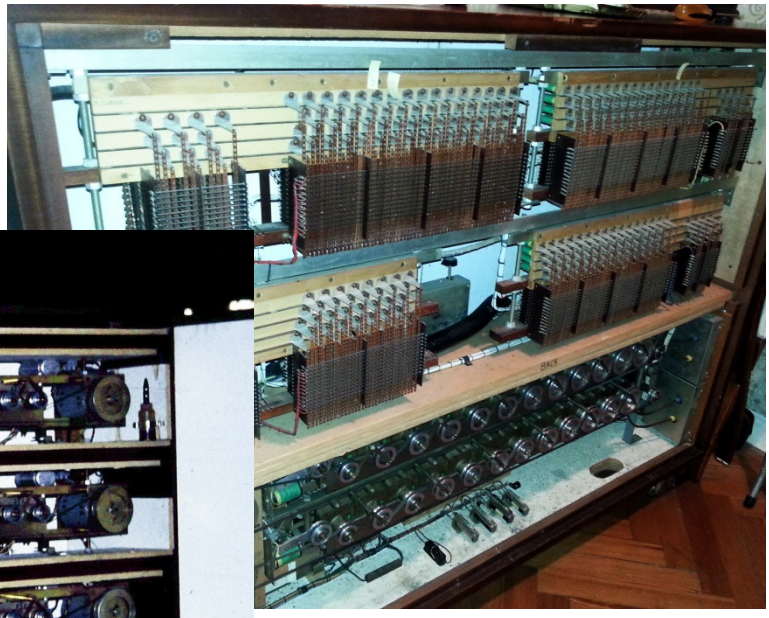
Selecting a stop presents various 'voicing' voltages to large key-relays which are operated by the manuals & pedals; these relay banks add together the voltages and route them to the correct stator rings to play all the harmonics in their correct proportions.

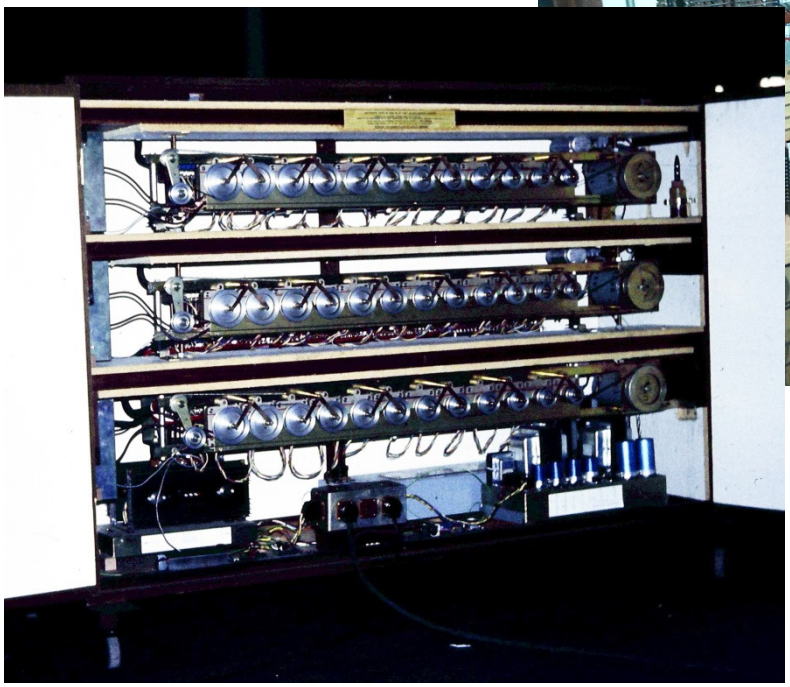
When two stops are drawn together the harmonic levels are simply added and this produces an acceptable composite tone.

Back to the deficiencies that Mr John hoped to solve: the first was the poor quality of organ reed tones – Trumpets, Trombas, Clarinets etc. - particularly down in their low registers - because there were simply insufficient harmonics available. The Compton electrostatic system always struggled to realistically generate organ reeds. Mr John had two insights:

With only twelve disks, tuned to the notes of the scale, the frequencies available for many of the upper harmonics of reed sounds were not sufficiently accurate, so firstly he wanted to add extra sets of 'detuned' rotating generators to take care of this, and secondly he had the idea of a 'diode-resistor matrix' to extend the number of available harmonics and to simplify the voicing. The matrix would pre-mix common groups of harmonics so that a single voicing setting could control entire strings of upper harmonics instead of having to route them separately through individual relays.

No doubt lengthy experiments with his new Compton at home had eventually led him to these conclusions – he had purchased his own voicing terminal when he bought the organ, and evidently also spent many hours with a soldering iron. Ultimately he commissioned Comptons to build him a triple





Custom Compton multi-generator cabinets

2½" generator set in order to produce the reeds separately, now with an extended string of much more accurate harmonics.

> The second issue then became simpler to solve: low Pedal bass notes started too abruptly. Because they had been using a single generator set for everything doubtless Comptons had simply arrived at a compromise. Now that Mr John had separated out the reed generators he could simply add some large capacitors to the bottom octaves of the original 5" generators and so produce the majestic rolling bass of 16' Pedal flues.

The John Pilling modified Compton Electrostatic organ was nearly perfected! John & Margaret Pilling moved to Windermere, and the enhanced 4-manual Compton had pride of place.

Following some poor management decisions Comptons fell upon hard times, some say because they attempted to enter the budget end of the organ market and compete with the likes of Hammond, Lowry, and a dozen other manufacturers of cheap home organs. In the late '60s, such was the popularity of the electric organ, an organ dealer could be found on almost every town's High Street. Maybe Compton should have stuck to what they knew best - this was certainly Mr. John's opinion. When they became bankrupt in 1970 the company was sold and split up. The pipe organ division had already been acquired by Rushworths back in 1964, and in 1971 the remaining electronic organ business was divided in two – half to Anthony Edwards in Yorkshire, who formed 'Compton-Edwards', and half to John Pilling, who first formed 'Compton-Makin' and later J&J Makin (Organs) Ltd of Rochdale. Makin acquired the sole rights to the electrostatic system whereas Compton-Edwards were able to develop transistorised instruments. One of Compton-Edwards' early successes was an electronic piano, featuring the world's first touch-sensitive keyboard.

Compton-Edwards Pianotron, and a single-manual organ

Mr John adored the sound of the traditional English church pipe organ, and he had by now persuaded himself that an electronic substitute based around Compton's electrostatic technology could be made to a very acceptable standard, would be affordable to churches, and could be the winner that had eluded Comptons down in London.

Compton-Makin & J.&J. Makin (Organs) of Rochdale

Thus the new company Compton Makin started production in 1972, building Pilling's 'upgraded' Compton organ system with multiple electrostatic generators and diode matrices. Three or four of Compton's former London employees had also made their way north to continue with the fledgling

company, including Fred Allen. Fred had joined Comptons after the war and as a talented manufacturing engineer had soon had a hand in the entire production methods of the organs, and he now proved to be an essential element in getting the new company on its feet in Rochdale. There were many unique processes involved – machining the rotary generators from scratch, conductive silver spray plating, waveform engraving, and constructing the big Compton relay banks that would take care of Mr John's elaborations. Fred Allen and his London colleagues Wally Fair and Michael Moore were already expert at them all. Wally had previously worked under Leslie Bourne himself, the inventor of the electrostatic generator.

Along with the acquisition of Comptons had come some specialist equipment, such as a sound level meter, a frequency analyser (for discovering harmonic structures), and a unique machine that could compute the waveform shapes required for generator engraving. Mr John was in his element, and he and his Dynatron tape recorder made a number of field trips to famous organs so that he could study pipe characteristics back at home.

To add to their premises Makin bought a discarded cotton mill alongside the then-derelict Rochdale Canal on Woodbine Street East – State Mill – and 'Organs' were newly installed on the 4th floor. (Makins never did fill more than a couple of the five floors, but rumour had it that the entire acquisition had only cost about the same as a 4-bedroom detached house!) State Mill was about ¼ mile from Makin headquarters at Wallhead Mill and had been built around 1902, relatively late in the Rochdale cotton boom. The floor areas were massive, with the typical rows of steel pillars, vaulted ceilings and heavily oil-soaked wooden floorboards beneath where the looms had once stood. State Mill allegedly featured the tallest continuous spiral staircase in Europe, but mercifully in more recent times electric lifts had been installed at both ends. The old engine house – empty now – was still intact, with the name 'State' emblazoned within the brickwork. The original tall chimney was long gone though. Just one of more than a hundred similar huge mills which had once lined the streets alongside the Rochdale Canal, mostly all demolished now.

The first local recruit was David Brailsford, aged 23. Dave had studied Electronic Engineering at Manchester University but he already had a life-long love of organs and he jumped at the chance.

A early large Makin home installation in Clitheroe

'Organs' took a while to make their mark; in their first year, 1972 they built just two instruments, both for private houses. In 1973 they built four, including a large 4-manual organ for Christchurch Priory in Dorset. The Priory organist Geoffrey Tristram and Mr. John became great friends and the organ itself proved to be a game changer, being heard live on BBC Radio a number of times. The amplification in particular was of a scale not hitherto seen on an electronic organ, and

included at least four 6' diameter 'Rotofon' type rotating speaker arrays, fitted with well over 70 8" loudspeakers manufactured by the Richard Allen company over in Brighouse.

> Comptons had developed the Rotofon Loudspeaker during the 1960s. The principle of moving-loudspeaker units for electronic organs was already well known – Hammond had been sold equipped with 'Leslie' speakers since the 1940s – but Comptons devised a unique arrangement that made their electrostatic system sound much more pipe-like. The idea is generally credited to Arthur Lord, who after his time at Comptons joined forces with Ken Burge in the early rears of the Wyvern Organ Company.
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> Instead of the rotating-horn arrangement found inside the closed-box Leslie, Compton mounted individual 8" speakers on the blades of wooden paddles, with slip-ring connections, and the whole mechanism was made to rotate slowly, akin to a windmill.
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> The effect is regularly misunderstood. It is of course related to the so-called 'Doppler' effect, most readily identified when a police car siren speeds past you: the pitch of the siren appears raised as it approaches you and then abruptly falls as it departs. Continuously moving a loudspeaker creates the same phenomenon, but when it's contained inside a box, or inside a room, all the additional wall reflections come into play as well. Take a speaker travelling away from you; the pitch falls, just like the police siren, but the reflections from the wall behind the speaker will behave the opposite way, because the speaker is approaching the wall, creating a simultaneous raised pitch.
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> In practice each individual speaker is continuously travelling through an arc so relative to the listener the pitch appears to gradually rise and fall. As too do all the reflections, but constantly at different rates and by different amounts, according to the various angles between the moving speakers and the surrounding walls. The variations in pitch are actually tiny, barely enough to be regarded as 'out of tune', but the overall effect is profound. A Rotofon contained 8 (sometimes 16) speakers, enormously multiplying the effect, so in ideal conditions the result is a near-infinite number of small frequency offsets, effectively creating complex three-dimensional 'side-bands' around the steady basic electronic tones that the organ generator itself puts out.
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> Why does this sound 'pipe-like'? Three main reasons: a) even a single individual organ pipe already produces a degree of 'smudging' of its harmonics – side-bands; a much richer and more complex sound than is ever produced by a basic electronic oscillator; b) a collection of dozens of pipes played together can never be perfectly in tune so, as with an orchestra or a choir, you hear a vast turbulent cluster of notes, sometimes known an a 'chorus effect'. Finally c) a pipe chest occupies a relatively large area and a Rotofon successfully changes the 'mono' sound signal into a wide-screen stereo effect.
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> However .. a snag unfortunately is that a Rotofon produces its effect continuously, without ceasing, and unlike a pipe organ the depth of the effect is unrelated to how many stops are drawn or how many pipes are playing. As a result, some critics have questioned whether the effect is beneficial at all, or whether it merely masks other deficiencies. However the static & sterile sound that is emitted by any simple electronic tone-generator with locked frequencies, (which included the vast majority of electronic organ systems so-far devised), is

soon very wearing and un-musical to listen to, no matter how well voiced the instrument. So on balance both Comptons and Makins were much happier to present the organ sound 'in motion' through the Rotofon.

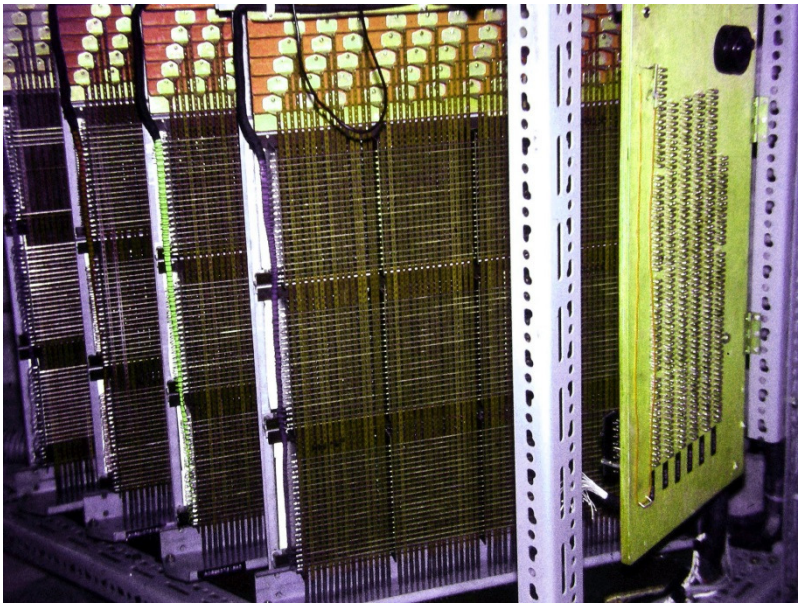
1973 saw several other locals join the company, and once they had been trained the London staff gradually drifted back to the south – with the notable exception of Fred Allen who remained until the end of the decade. Fred assembled the generator cabinets, along with Rochdale-local Jack Chadwick, in their workshop in one corner at State. Fred also supervised all the complex church installation work, accompanied by Keith Sugget, whose everyday function was as the on-the-road service engineer. Keith had succeeded the original engineer Terry Jones. Unsurprisingly the multi-generator system, with its banks of relays, was not the most reliable of electronic assemblies and minor faults needed constant attention. Coupled with the fact that routine maintenance was required every year or so, including the lubrication of a few dozen bearings. So between installations Keith was constantly out on the road.

Rochdale now had people capable of assembling the generators and relays, of adding literally miles of wiring looms to the generator cabinets and consoles, and getting the new instruments fully functioning. Arnold Barlow, a former skilled toolmaker, took charge of assembling the individual electrostatic generators (later to be joined by assistant Steve Lanyon), and Harry Butterworth & John Ashton cabled the cabinets and consoles. J&J Makin HQ over at Wallhead already had office staff, a transport division run by Jack Taylor - with plentiful cars, vans and trucks - and with their massive in-house paper and printing facilities Makin could readily produce advertising brochures!

A lathe-operator was taken on to make all the generator parts and pulleys. David Wastie became the first full-time salesman, and a woodwork shop was newly equipped and headed by Jack Shaw. Several half-built consoles had been acquired as part of the Compton takeover, along with a full complement of woodworking machines, but there were already loudspeakers, Rotofons, and generator cabinets that needed building for new instruments. Soon it became necessary to fully fit and add custom wood-finishes to new consoles & pedalboards, which were mostly obtained in unfinished oak from either P&S in Suffolk or Kimber-Allen in Kent. Occasionally a complete console would be expertly manufactured in Rochdale; this became increasingly common over the years, particularly where the new instrument was to be fitted into an existing pipe organ case.

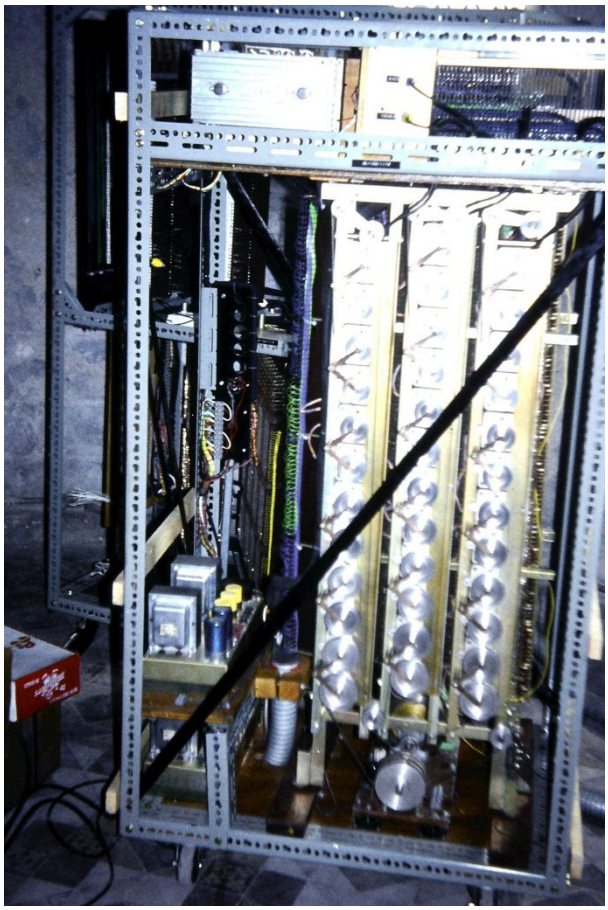
Also in 1973 David Brailsford's 18-year old younger brother Barrie joined the company straight from school. Barrie was something of a prodigy; not only had he taught himself electronics from scratch but also played the organ to a high standard at their local Methodist Church. David and Barrie had both always been passionate about organs and electronics throughout their teens.

During the following couple of years a dozen more instruments were produced and the design evolved further. Mr John added several more innovations: a Diapason matrix (similar to the



Makin 63-bar Key Relays

reed idea) which greatly helped with longer harmonic trains and particularly with the composition of Mixture stops; 'chiff' – an attempt to imitate the sound of a pipe's starting transient; and another idea - albeit short-lived - an attempt to delay the speech of reeds slightly behind the flue stops. The generator cabinets briefly sported an expensive add-on box on the top but it didn't prove to be a reliable system and was abandoned after a few months.



An early Makin generator cabinet; relay cabinet behind

This is a fair illustration of Makin Organ economics. By the 1970s the paper and metal divisions of Makin were virtually running themselves and Mr John was able to devote almost all of his attention to Organs. I believe his fellow directors had very little faith that Organs could ever show a profit and would regularly tell him so: if Compton's instruments had failed, how could this considerably more complicated version succeed? Mr. John would simply remind them of the many years it had taken Metals to make any money and he firmly believed that Organs would follow suit given time, but in the meantime he was financially supporting this new venture, no doubt personally. Nevertheless there were by now 10-15 people now employed full time, a fleet of three permanent cars, and the manufacturing cost of each instrument was by no means clear and was probably never properly analysed at this stage. Four sets of rotary generators, 42-bank key relays, dozens of circuit boards for the matrices and large-scale amplification were not cheap items to put together. Indeed it is hard to believe that the labour costs could be significantly less than those for a small pipe organ rebuild!

Nevertheless Makin instruments were certainly being sold at a fraction of the price. A typical installation consisted of the console itself, plus two wardrobe-sized cabinets - maybe located in the vestry - and two or more large Rotofon cabinets high up on the walls. The instruments were expensive to transport and install, and yet were being competitively priced against others in the market which were being built on a very much more modest scale, mostly in self-contained consoles.

Mr John was personally attending each installation all over the country to carry out the on-site voicing procedure, something he'd become rather expert at through his home experiments.

> 'Voicing' on these additive-system instruments could be carried out to a high degree of precision, certainly when compared to any other contemporary electronic system. Firstly it is possible to adjust (in pipe parlance to 'regulate') the level of every note being produced by the generators, which takes care of all building acoustic and loudspeaker irregularities; secondly the harmonic structure of each stop can be precisely adjusted harmonic-by-

> harmonic, and thirdly the scaling of the tone and sound-level can be adjusted up and down the keyboard range. Mr John correctly assessed that this was a fundamental strength of the organs that Makin were producing, and in many ways it is analogous to what can be achieved with pipes:
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> The ability to emulate pipe scaling was a feature that set Compton and Makin organs apart from other electronics. Pipe makers have known for centuries that to achieve an even tone, the pipes' relative length-to-width ratio needs to vary from the lowest note to the highest note of the rank. For example if the pipe for bottom C of a rank is, say, 96" long and 4" wide, the pipe for C5 will be 6" long but maybe around ¾" wide. Thus the ratio up the scale has changed from 24:1 to 8:1, the pipes becoming fatter towards the high notes.
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> What is happening? Well if the ratio doesn't change like this then as we play up the scale the string of higher harmonics become increasingly less audible (beyond the range of hearing), and the net effect is simply that the pipes appear to get progressively quieter and quieter and the tone thinner. Musically, the low notes would drown out the high notes. To compensate, the pipe is made proportionally wider, which increases the sound level of the lower harmonics, and if this is done correctly the audible result is a musically even rank where all the notes balance against each other.
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> Reed pipes are slightly different in that the tubular-pipe's chief function, rather than setting the pitch of the note, is as a resonator affecting the tone of the reed. Going up the scale the group of harmonics that are being emphasised by the resonator becomes tighter and tighter. At the bottom of a 16' Double Trumpet there might be 20-25 strong harmonics (and dozens more weaker ones), but six octaves higher, at the top of a Clarion 4', there will likely be only three remaining strong harmonics, and these need to be boosted hugely to balance with the low notes, so in the same way, the resonator becomes wider.

John Dawson from Lytham - yet another accomplished church organist - became the new Sales Manager during 1975. John was also an accomplished photographer which proved invaluable over the years, but primarily he was a superb organ demonstrator and emissary for the company. He once took an extraordinary step: he possessed a tape recording of an improvisation by Geoffrey Tristram at Christchurch which brilliantly demonstrated the entire gamut of the instrument's range. John Dawson learned how to play this piece note-for-note.

Early Makin consoles featured off- the-shelf Solid State Logic electronic parts, but Barrie and David started to develop some innovative electronics which began to make inroads into the high cost of the rather labour-intensive Compton designs, and began to bring the organs' facilities up to date. The first was a programmable piston-action for the consoles, which memorised stop combinations using solid-state memory chips. The second was a multiplexing system to connect the console to the generator cabinet. Prior to this the organs had used exactly the same arrangement that electric-action pipe organs had been using for decades (and which would have been perfectly familiar to John Compton), large flexible armoured multi-core umbilical cables containing a wire for each key, a wire for each pedal, a wire for each stop and so on, maybe 300-400 individual wires on a large organ, all of which had to be connected at both ends during installation. Multiplex communication replaced all of this with a thin screened cable with just a few cores.

They had also experimented with a fully electronic instrument, replacing Compton's spinning wheels with electronic oscillators and filters to produce sine-waves, with a diode system substituting for the key relays. There were still a number of technical issues to resolve, and anyway Mr John was relatively unmoved and still favoured the unique sonic characteristics of his electrostatic wheels. But the Brailsfords' idea certainly showed some promise.

There were other developments going on. Some of the employees, such as the works manager George Shaw and engineer John Shepherd, were big fans of Cinema Organs. The 'entertainment' organ had been a massive feature of cinemas and ballrooms much earlier in the 20th century and still enjoyed a fair degree of popularity, born out by the fact, as I've already mentioned, that every main High Street still featured the obligatory Organ Dealer. 'The Organist Entertains' on Radio 2 was primetime listening back then! And of course historically Compton of London had been a leader in the field, although in truth cinemas had long since abandoned organs as required entertainment. Mr John however, although allowing a prototype to be constructed using David & Barrie's electronic generator, was never really behind this style of instrument and despite a successful live demonstration concert in Stockport he finally pulled the plug. No doubt the technology itself would have fascinated him but the sound and style evidently did not.

Stockport Town Hall c 1975

George Shaw lasted at Makins only until the latter half of 1976, to be replaced by Arthur Hall. Arthur had a pipe-organ and piano-tuning background.

It should not go un-noted that Mr John had a famous boss's short temper! He tended to be very intolerant of those who did not agree with him, as well as anyone he thought to be not pulling their weight. Legend had it that he had once ordered the backs of a set of chairs to be sawn off after he caught a group of employees over-relaxing. An interesting characteristic, which I experienced on more than one occasion, was that he could exhibit apparent blind fury one minute, and absolute smiling calm the next - most disarming.

But it was said that he had mellowed in recent years. He could certainly be very genial company and was fond of relating his repertoire of amusing stories, invariably prefaced by “Stop me if I’ve told you this before …”. Needless to say, no-one would dream of stopping him.

The two final organs using the old multicore cable interconnection method were a large 3-manual, installed in Sockport Parish Church, and a 4-manual in the smart new Central Church in Torquay, both installed during the hot summer of 1976. By the autumn Makin began constructing a large specification 3-manual electrostatic organ for Sedbergh School in Cumbria using both of Barrie’s innovations, a fully programmable capture piston system in the console with multiplexing to a single external generator cabinet.

Hugh Banton 1977

I started at Makins in Rochdale in February 1977, at the age of 27. My history up to 1976 is already well documented elsewhere, but here is a summary of my career to that date, as relevant to my now becoming an organ engineer. In common with others at Makins I too had had an interest in organs and electronics from an early age. In my teens I avidly read magazines such as ‘Wireless World’ & ‘Practical Electronics’; I built amplifiers & radios, tape recorders, electric guitars and even a simple organ. From the age of 7 I had had piano lessons, and then subsequently on the organ from when I was 12. We had a superb 3-manual Walker pipe organ in my school chapel which I played constantly and in my latter years I briefly bore the illustrious title of ‘School Organist’. As mentioned already I vividly remember a school outing to a Compton Organ demonstration in a church in Sheffield.

My first employment after school was with the BBC at the end of 1967. First I did a course at the BBC Engineering Training Department near Evesham in Worcestershire and then I was moved to London to work in TV News at Alexandra Palace. Mostly I looked after ageing electronic equipment but also had a brief spell operating TV cameras live on the air.

My BBC job lasted only a year, and with my musician’s hat on (and no doubt to my parents’ despair) I next became organist with newly formed rock band Van der Graaf Generator, a venture which first lasted, on and off, from 1968 until 1976. During one of the intermissions I went back to electronics again and worked with a PA manufacturer & instrument hire company in North London, where I learnt a great deal about audio amplifiers & mixers and also taught myself to design printed circuit boards. Back with the band again for a few more years, I became renowned for forever modifying my Hammond and Farfisa organs and building my own effects. Eventually I constructed an entire organ to my own design which briefly made it to the stage. But then I left Van der Graaf in December 1976 – already a well-documented story. Briefly unemployed, then.

During August ‘76 my wife & I had moved up from the south and bought a house in Urmston, Manchester. At this time my parents were living in Torquay, and knowing of my electronic organ fascination had sent me a copy of John Dawson’s Makin leaflet about the new 4-manual ‘pipeless’ organ in the Central Church. Built less than an hour from where I now lived, I discovered. In January I composed a letter to Makins asking about employment opportunities and immediately received a reply from Richard Hilditch, (a cousin of Mr John’s and a co-director of Organs), inviting me up for an interview. “Always on the lookout for new talent”, he had written.

Mr Hilditch took me over to State Mill for a tour of the works. Interestingly eight years before this I had visited Compton's factory at Chase Road in London, (when I myself was in the market for an organ), and no doubt I might still recognise many of the same organ components now relocated to Rochdale. I recall being shown around all the various areas of the factory in Rochdale but I feel sure my attention would have been chiefly with the electronic developments that the Brailsford brothers were working on; the Sedbergh School console would have been well underway.

Presumably the fact that I had built my own organ impressed sufficiently, I was taken on immediately, initially to help with wiring. In reality I never did any wiring at all! I think on day one David Brailsford got me to lay out the circuit assemblies for the next organ console, destined for Louth in Lincolnshire, and on day two we started discussing new circuit ideas. Thus we became an electronic development trio – it was a ground-breaking time in electronics with new integrated circuits (ICs) coming on line constantly. David was a circuit board design expert (still done manually in those days with reels of black crepe tape and a scalpel), and re-designs using the latest ICs became a regular event as digital memories became ever more sophisticated. Barrie and I were testing and setting up the organs when completed, but only four went out in 1977 so the rest of the time we were free to entertain our electronic imaginations.

I was one of the team that went up to Sedbergh School to install the new chapel organ, and Mr John soon latched on to the idea of me taking over the voicing job from him. I imagine Mrs. Pilling must have had negative views about the prospect of Mr John travelling the country to each new organ for years to come, so no doubt he would have already been on the lookout for assistance. I know Barrie had never expressed an interest in voicing; the Brailsfords preferred the regular factory hours in Rochdale and far-flung hotels and late-night motorway adventures did not appeal. Whereas to me such a lifestyle had been familiar territory for much of the past decade. So I was entrusted solely with voicing the next organ at the church in Louth, and as things turned out I went on to voice every single subsequent Makin instrument for the next fifteen years, around 350 in total.

An early bonus of this was a complementary company car – quite a valuable benefit back then under the infinitely more lenient tax regime of the late 70s! Well, a slightly rusty and unloved Morris Marina at the start, but things were soon to improve and Makin provided brand new cars every three years or so. Prior to this – probably for no more than eight weeks or so - I had come up from Urmston on the bus each morning, but Arthur Hall lived nearby in Sale and would give me and others a lift home most evenings. (He wisely had a long-standing rule against picking up employees in the mornings.)

> There were always technical problems to attend to. One concerned the ever present difficulty of combining modern low-voltage digital circuits with the 400-500 volts present around the electrostatic generators. Voltage spikes up and down the control lines gave us a few headaches; transistors would blow, or notes could get transposed.
>
> Another problem concerned the generators themselves. It had been realised around 1976 that an alternative to the laborious process of hand-engraving waveforms would be the use of printed circuit board techniques, thereby making the static part of the generator a mass production item that we could farm out. It worked very well - for a while – but then problems with 'singing' notes started to plague us. (Notes that continue to hang on after they have been played). Much theorising about the cause and never entirely solved.

> Other shortcomings of the organs: in an additive system, which is after all using a limited number of note generators to provide dozens of different harmonics, it is essential that the control voltages are added together with reasonable precision. It's almost impossible to achieve, and a common criticism of the Makin organ was that notes, particularly 'inner parts', seemed to vanish and become inaudible. The effects were known as 'robbing' and 'masking'.
>
> Another concerned the reeds - still – which although now featured excellent harmonic contents in the lower part of the keyboard tended to fade away alarmingly at the top.

During 1977 the Pillings purchased Burrow Hall near Kirkby Lonsdale and moved out of the house in Windermere; rumour had it that they were fed up with the ever increasing tourist aggravation. His Compton organ was diverted en route for a spell at the works at Rochdale, mainly to be fitted with multiplexing, to avoid having to reinstall a main umbilical cable again, but no doubt other modifications were carried out at the same time. It was reinstalled January 1978.

Mr John was by now 63 and approaching retirement age, having long since abandoned working from 8.30 to 4.30 like the rest of us! Each week on Tuesday mornings he would drive down to Rochdale in the Daimler (or very occasionally in the Rolls Royce) and he would return home Friday morning; the Pillings had a private flat at Wallhead Mill. When driving locally around the Rochdale sites he would use a modest fleet car. Tuesday afternoon he would invariably make an immediate beeline for State Mill to see what was happening with Organs, which was certainly getting the lion's share of his attention. Once the multiplexing system was working (and hence the organs could be quickly disconnected and reconnected) he would generally have new instruments moved over to a room adjacent to the flat at Wallhead, so that prior to their installation he could work on voicing in the evenings.

Looking East

from State Mill 4th. floor

1978

I saw at first-hand how seriously Mr John was likely to view proceedings over at State Mill. Early in '78 I made a chance remark about having barely enough time to complete the voicing of a new organ prior to its installation. I am certain his sole comment was little more than "Hmmm ..", but it caused him, on his next visit to the works, to insist that the instrument was immediately extracted from the church again and brought back to his room at Wallhead Mill for a few days! The fact that this involved a 450-mile round trip to Edinburgh was of no concern.

New Makin 'Microchip' system

The manufacture of electronic organs was a booming business during the 70s; churches were strapped for cash and many eagerly replaced their ageing pipe organ with a cheaper electronic substitute. Makin were not alone in having made tonal advances; our chief competitor was undoubtedly the Allen Organ Co of Pennsylvania, who in 1971 had introduced the world's first 'computer organ'. Something of a misnomer – it didn't actually run a computer program - but it was certainly digital, and originally used diode arrays to store waveforms that had been directly derived from recordings of pipes, entirely novel. Effectively this was the world's first primitive 'digital sample player'. Importers Allen UK were located in Kingston-upon-Thames.

A rather more advanced development had recently been taking place over at Bradford University, whose Microcomputer Music Research Unit, under Prof Peter Comerford, had devised a complete organ system based around the newly available Z80 microprocessor. It used a digital additive system to generate waveforms in memory, which were then reproduced by digital sound generator components. This was a true 'computer organ'. The American Rogers Company were early investers into the system, and in England the Wyvern Company in Surrey had collaborated with the University department to work on a prototype. The general view at Makin at this stage was that it needed considerably more work and tonally didn't offer anything over the Makin developments. However the Bradford Computing Organ system comes back into our Makin story a few years later.

Wyvern had a sizable factory in Devon and built dozens of low-cost church organs. Another leading British manufacturer was the Norwich Organ company, who had taken over the Miller Organ Company during the 1960s. There were also European manufacturers such as Viscount & Gem who had a big share of the general market. These were our chief competitors at the end of the 70s. At this time only Allen offered a fully digital organ, and in truth the techniques they were using had many shortcomings back at that early stage.

The Compton-Edwards company ceased production around this time so Mr John was finally able to acquire the remainder of the Compton business. In private, Mr John complained that Edwards' bidding for half of Compton back in 1970 had merely served to drive the price up.

I myself had certainly been theorising about new methods of electronic organ tone production for many years - long before my time at Makins - and Barrie & David's 75-76 electronic prototype interested me greatly, since by now I was firmly convinced by the additive system that it shared with the organs that we were currently building. One of its technical problems, concerning a high background noise level, proved fairly easy to overcome. But then I started to think about a 'multiplexed key-relay'.

> Electronic multiplexing, as Makin were already using to connect organ consoles to their generator cabinets, is simple in principle. The state of an entire keyboard (i.e. which notes are being pressed and which are not) is entered into a shift register. A shift register consists of a row of memory elements, one element for each key. The key-states are then shunted along the row in sequence; there are 61 notes on the keyboard so it takes 61 shifts to move the state of the top note all the way to the bottom. What comes out of the end of the shift register down just a single wire, then, is the state of each of the keys one after another, starting with the bottom note and ending with the top note 61 time-slots later.

At the receiving end of this wire is another shift register that works the opposite way round. The signal coming from the console is entered and shunted along 61 elements. At the end of the 61 time-slots the state of every element is latched, and hey presto, the 61 latches at the receiving end exactly match the state of the 61 keys.

This sequence just repeats over and over. Naturally this all has to be done at high speed in order to avoid any perceptual playing delays. A delay of around 1/10th of a second is about the tolerable limit so the entire end-to-end scan must be completed in 1/10th of a second or better, although in truth there are many old pneumatic pipe-organ systems that work a great deal slower than this. (Indeed from the player's point of view, an organ with a detached console positioned 30yds from the pipes exhibits a sound delay of about 1/10th second).

Barrie & David's electronic generator was voltage-controlled, just as is the Compton electrostatic generator - the greater the voltage the louder the note. But the new electronic generator worked at low voltages, of course, instead of the 400v that we normally had to contend with. Their organ used a fairly crude diode gate to switch the keying voltages but 'analogue switches' were just becoming available in IC packages and we'd already started to discuss using them in a redesign. I wondered if we could use this type of component to analogue-multiplex the generator - addressing the notes through one wire rather than dozens - and to have a keying system that would also work sequentially, creating the required voltages one after the next. In principle this would reduce the Compton 42-way mechanical relays to just one small circuit.

I cannot recall exactly how quickly the concept came to me or the time period it took to perfect it, but I vividly remember two particularly productive days:

I had evidently assumed that the generator-scanning idea could be made to work without much effort, so one day in 1978 I gathered together a handful of components to start to look at the basic keying principle. By the afternoon I had a circuit that could process the first four harmonics of bottom C, (being C1, C2, G2 & C3), and shown in principle that playing other notes on the keyboard would sum all the appropriate voltages. Barrie for one was impressed: "That's absolutely ** brilliant!" said he.

96-note multiplexed generator

Unable to get the idea out of my head that evening, by the following morning I had hit on the perfect mechanism and it seemed too simple to be true. If we addressed the generator sequentially from bottom note to top note, synchronised to the keyboard, then to address the correct harmonics all that was required was to delay the keyboard multiplexing by exactly the same intervals as the harmonics are spaced upon the keyboard; you just count up from the bottom. Thus if the fundamental (the 1st harmonic) is made to be *directly* synchronised between the keyboard and the generator, then the 2nd harmonic needs to be delayed 12 notes behind (C2), the 3rd harmonic should be 19 notes behind (G2), the 4th harmonic 24 behind (C3) the 5th 28

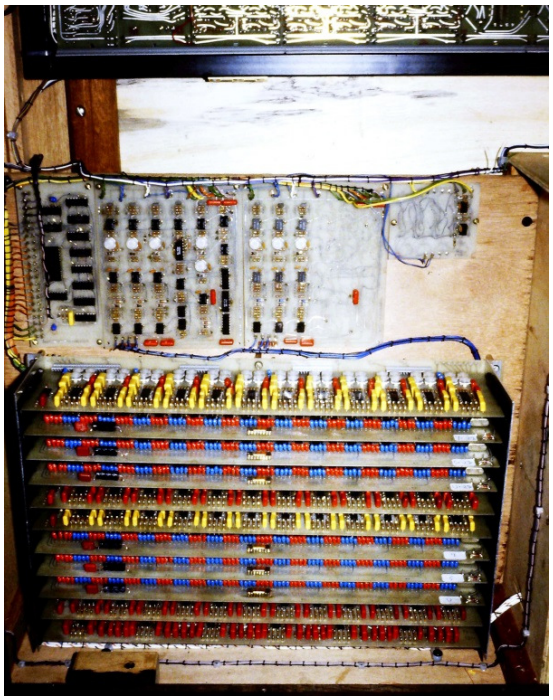
behind, and so on. All that was needed was a tapped shift register delay that followed straight on from the keyboard multiplex data. Eureka.

In effect this forms a sequential analogue computer. Quickly it became obvious that there were a number of significant benefits on offer. For example if, rather than using static voltages for voicing, a waveform shape could be generated - synchronised to the generator scan - then the level of any particular harmonic could be made to vary up the spectrum according to the shape of this waveform. Pipe scaling at a stroke!

By the beginning of the following week we had a plan to put before Mr John. I'm not sure how well he understood it all – we only had it half-figured out ourselves - but he had no doubt about the benefits on offer, both technical and financial, and could see that the three of us were pretty confident that we could make it work. He gave the go ahead without hesitation. Months of work lay ahead, and meanwhile there were still production organs to get out. 1978 proved to be our busiest year yet but curiously 1979 saw a slight lull and provided more time to work on the new system.

It was an exhilarating period for me; certainly I could never describe any of it as a chore! I spent endless spare moments both at work and at home, including most evenings and weekends, happily scribbling circuits and diagrams, and I would habitually turn over ideas and circuit arrangements in my mind as I drove the motorways to visit some Makin installation new or old. I was regularly covering over 20,000 miles a year by car at this time.

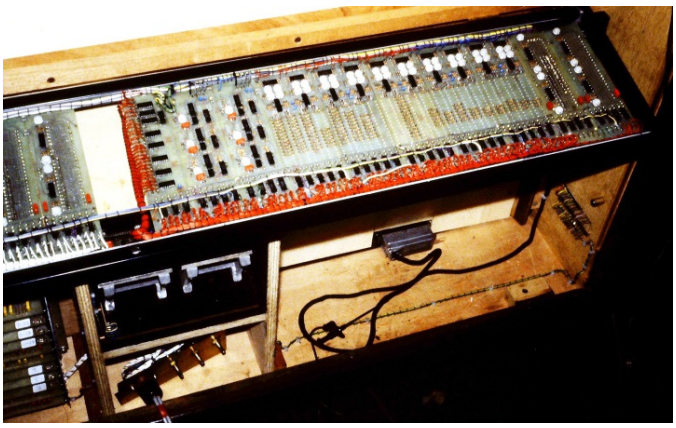
I recall a period where I regularly vacated the factory at State Mill in order to work on the circuit board designs in peace; they had found me an unused room over at Wallhead Mill. I'd just become a new dad that summer as well, so maybe a fortuitous coincidence! Back at State I had assembled a test-bed on a sheet of plywood, with a keyboard and some stop tabs, a power supply, and the various circuit boards as each were being designed and built. Bit by bit it all came together.



A triple-generator assembly, with shared sine-wave filters, formed the heart of the system; this was an exact analogy of the three sets of 2½" generators from Mr John's electrostatic design and gave us 288 frequencies over 8-octaves. A separate bass generator provided 24 sine waves for the bottom 32' & 16' octaves. A single circuit board for each department provided voicing circuits and controls, with small plug-in resistors for setting harmonic levels for each stop. The 'matrix' idea for upper harmonics was also carried over from the old system, but because it now only required a handful of resistors rather than a couple of thousand, a matrix was provided for every stop.

> Barrie came up with the circuit design to provide the harmonic scaling. We nicknamed this the 'bar-bender' (a name which stuck) in reference to the busbars in the Compton relays of old. In a Compton they had hosted a fixed voltage (the sum of the voicing-voltages of whichever stops were drawn), but with the new bar-bender we were able to vary this voltage and modify the level of the relevant harmonic, or group of harmonics, up the scale. Musically speaking this was maybe the most significant innovation of the new system.

In the summer of '79 we put together a complete 2-manual & pedal prototype on the floor at State Mill, using an empty Compton console. It contained two sets of triple-generators, a bass generator for the low 16' & 32' octaves, and three voicing boards.



This number of generators, which would have previously occupied a large external generator cabinet, now fitted easily in the back of the console, along with the power amplifiers. We were still using large external rotating Rotofon loudspeakers at this stage.

Once everyone had confidence a decision was needed about when to try it out in a production instrument - presumably a church needed to be persuaded to act as guinea pig! The first three organs in 1980, and as it turned out the very last of the electrostatics, all went to churches in the south – in Maidstone, Worthing and Reading, but fortuitously the very next in the schedule was for a two-manual for St Martin's in Castleton, barely 2 miles from the Makin works. So the first organ of the new era, Makin no. 37, was installed there during May 1980.

For marketing purposes John Dawson publicised the innovation as the new 'Makin 'Microchip' System', a fashionable term back in the 70s post-valve, post-transistor era.

Fred Allen, now well past retirement age, chose this moment to cease his weekly Rochdale commute; he finished at Makins and permanently moved back home to Ware in Hertfordshire. He continued working, however, and formed the Compton Maintenance Co. which looked after existing electrostatic instruments for several years to come.

His right-hand man Keith Sugget had also recently changed career and left to start his own driving school, and he was replaced by Barry Dawson, who supervised the installation at Castleton. All went reasonably smoothly there apart from the alarming discovery that in the somewhat damper atmospheric conditions of a typical Parish Church the generator circuit boards could leak currents across their surfaces, causing notes to 'sing'. A simple remedy was quickly found of coating the boards in a lacquer. Otherwise the St Martin's organ proved an instant success and the electrostatic system was officially relegated to history.

David Clegg

I chose this moment to request a private discussion with Mr John. It took him by surprise I think, but he seemed delighted that I had done so and first thing the following morning I was granted a meeting in his office at Wallhead Mill. I told him that I felt I had helped create a ground-breaking product that could finally make a profit for the company, and yet I was concerned that in its current form the factory would aimlessly meander along and could never compete with the likes of Allen or Wyvern. A not-very veiled attack on Arthur Hall's old-fashioned style of management I suppose.

My meeting had evidently done the trick and changes started to happen very soon after. (Although typically it never became clear whether Mr John had consulted his fellow directors or simply announced his decisions; very likely the latter). Works manager Arthur Hall was replaced by David Clegg. At the same time I was given the new title of Technical Manager, and David Brailsford was put in charge of production. David Clegg was already well known to the Makin hierarchy and was effectively head-hunted; he had previously managed the Compton-Edwards organ factory over in Mirfield West Yorkshire. Post Compton-Edwards he had started his own small firm, DSM Electronics, making scientific instruments and controls.

David set about completely restructuring the Makin factory. In 1980 it was still just as it had been when I had arrived three years earlier, which perhaps could best be described as a series of independent workshops distributed around the walls on the 4th floor, with a large unused area in the middle. There was no central parts storage or inventory and no attempt at coordination; each section kept their own parts close at hand and ordered what they needed for each task. So a proper store was now constructed in the centre, Frank Clark was taken on as store-manager, and the entire production methods streamlined.

A major project was already underway: a 4-manual organ for the nave of Ripon Cathedral, which was to be a gift from Mr John's friend, and fellow Compton organ owner, Norman Sharp. This was going to be a major challenge for us, and turned out to be only the third organ built using the new system. Installation began in the autumn of 1980 and was completed in time for Christmas. Of course the cathedral already has a famous Harrison pipe organ but the Makin, mounted on a mobile platform, was intended to be used in the nave for larger services. Cathedral Organist Ronald Perrin gave the inaugural recital on the instrument in May the following year. Although well aware that the Makin would never be a serious threat to the magnificent sound of the Harrison, Ronald used the organ enthusiastically and enjoyed hosting many dual-organist recitals in the Cathedral.

Mr John greatly relished this first installation of a Makin organ in an English cathedral, and without doubt it considerably raised the company's profile to the extent that sales tripled in the following couple of years. One notable home installation in 1981 was for Jim Wishart-Hodgson, the organist of Lancaster Priory and close neighbour of Mr John. This was followed within a few months by a huge four-manual organ installation for the Priory itself, our largest instrument to date.

The console for Lancaster Priory needed to fit into the existing – now vacated – Hill pipe organ case, and was constructed entirely in the factory at State Mill. At the Priory a new meeting room and kitchen were being constructed in the space vacated by the pipe organ, and we took the unusual step (at least since the electrostatic era) of building the generator electronics into a separate frame, mounted against a new wall that had been erected behind the console. With Lancaster being on Mr

John's route home he was a frequent visitor during the early life of this instrument, and on this occasion the lengthy voicing of the organ became a joint effort.

> A technical matter that became increasingly pressing was that we were still out-sourcing amplifiers. Numerous Compton-built transistor amplifier chassis had all been used up during the electrostatic era, and Fred Alan had been able to find a suitable off-the-shelf substitute that we used for a while. Now however I set about designing our own; mosfet power transistors had recently appeared on the scene, and I ended up devising a modified commercial circuit that we could build in multiple units that were needed by the Microchip organ system. Mosfet transistors are highly robust by nature, and proved to be ideal for the demands of some of our more remote and damp installations.
>
> A team effort also saw a redesign of the Rotofon. Fred had continued with the traditional Compton design using wooden speaker baffles with a rubber drive belt and motor, and large custom slip rings to connect the amplifiers to the moving speakers. A mould was devised so that we could mass-produce aluminium & resin speaker carriers, with a direct gear-box drive at the hub. Very much cheaper to manufacture but unfortunately in the years to come the design proved to have a rather shorter life-span. But by the mid-80s we had a solid-state alternative so most examples were later upgraded.
>
> The bass-channel on the old electrostatics had invariably been handled by 18" Fane loudspeakers, and on some installations Fred had designed cabinets incorporating four together, a formidably large box that wasn't always very practical. Some new experiments yielded the 'bass-column': an 8' long wooden tube with a compliant 15" driver mounted at one end. Side-by-side tests proved its superiority and it became our standard sub-bass speaker for many years.

Computers

It's hard to imagine now, but although we had already had pocket calculators for about ten years we didn't yet have printers or faxes, and certainly not mobile phones, satnavs, and all the other everyday digital devices and automation that we now take for granted. Communication was only by landline or telegram. Home videotape recording was the latest fascination. The introduction of emails and the Internet were still 15 years in the future. Our office at State Mill possessed a single electric typewriter, and the sole company photocopier was at Makin's Oak Press building down the road. I would regularly walk over there to copy diagrams or circuit-board artwork.

The end of 1981 saw the start of a global revolution: the home computer. Of course major corporations and banks had introduced mainframe computers many years before this, but the new breed of low-cost microprocessors that were starting to appear in the electronics market would bring about an upheaval which has of course never relented.

In America Apple, Commodore and Atari all started out in the mid-70s, and over here we had Acorn, Sinclair and Dragon among many others. Literally dozens of manufacturers were launching portable computer products by 1980 - American, European and Asian. It suddenly became the number-one home craze at the end of 1981 and everybody had to have one. Barrie and David Brailsford bought themselves a Commodore PET, several people at Makins had early Sinclair models, and I bought a

BBC Micro model-A as soon as it came out in February 1982. The BBC Micro, commissioned from Acorn in Cambridge, had started out as an IT education initiative with an associated TV series. Of course we were already aware of the work of Peter Comerford and his department over at Bradford University, who had devised a complete digital organ system based on the Z80 microprocessor. The Z80 also featured in several home computer products at the time.

To Wallhead Mill

Now that the sales rate had picked up Barry Dawson was finding it increasingly hard to cover both of his functions so David Clegg invited Andrew Winterbottom, a former employee from DSM, to join the Rochdale team and take over servicing. From that point on the two areas of installations and servicing remained separately manned.

Early in 1982 we were all greeted one morning with a dramatic decision by the management: J&J Makin were going to sell State Mill, and Organs would be moving onto a vacant floor down the road at Wallhead Mill. Within a couple of weeks Jack Taylor's transport division sprang into action, the entire 4th floor was packed up and the move was completed over the course of a few days.

The exit from State Mill

Starting over in a new environment came with some benefits; among the debris at State there were still several half-built dusty Compton 357 consoles (now minus their valuable wooden keyboards which had already been eagerly recycled) and countless other items that had come up from London back in 1972 but had remained untouched. Just a pile of objects people had become accustomed to navigating around! Finally committed to the tip I imagine.

Jack Taylor and transport

Mr John was particularly happy with the relocation since he now had only a ten second walk between his Rochdale flat and Organs! One has to wonder whether this simple advantage was a major factor in the entire decision, it would not have been atypical. At Wallhead there were three office spaces at one end of the floor and this time a proper enclosed stores area was constructed. At the other end there were a couple of useful sealed-off rooms that we allocated to testing & voicing, and another for a new joinery shop. Jack Shaw, the original cabinet maker, retired at the time of the

Wallhead Mill, day 1

move and his deputy John Connor took charge. Arnold Barlow remained for a few more months, although his primary function had now gone, and his former colleague Steve Lanyon moved over to console cabling & assembly. Of course the cabling requirements of a typical 1982 organ were just a small fraction of those of their earlier electrostatic counterparts so instruments could be put together far more rapidly.

R&D Dept. at Wallhead

The room I chose for my own office-workshop was situated right alongside Mr John's entrance. I was able to upgrade much of my R&D equipment and continued to devise a few new features for the organs, mostly to keep up with our competitors, such as a key-transposer and a reverberation system based on the sustain method that Comptons had used during the 60s. The latter was fairly grim but I recall it was fortunately only ever required for one instrument; digital reverberation units began to appear soon after.

By the middle of 1982 home computers were rapidly gaining in importance. The 5" 'compact' floppy disk and the dot-matrix printer were the must-have accessories; hard disks wouldn't be commonplace for quite a while yet. Barrie in particular was quickly teaching himself programming on his Commodore computer at home and was soon able to demonstrate a rudimentary piston action for the organs. It was already becoming clear where the future lay.

> Thumb & toe pistons on an organ console offer the means to change stops without taking your hands off the keyboards. On an electric pipe organ console, as originally devised in the 1930s, there would be rows of small 'setter' switches (often hidden away somewhere) which enabled the organist to select in advance which stops would be drawn when a particular piston was pressed. By the 70s digital memories had already provided the means to replace

> setter switches with a 'capture system', where by simply pressing a 'set' piston stop combinations could be instantly memorised to any particular piston.
>
> The microprocessor opened up several new possibilities, chief among them the concept of multiple memories, so that different organists could save their own personal settings, and a 'sequencer' whereby pressing a single piston could step through a series of stop combinations, such as would be required by a recitalist.
>
> But the chief advantage was economy of scale. Once you had a computer board with a microprocessor, memory, and a means to connect the inputs and outputs to and from the stop units and the pistons, there was simply no console feature that could not be executed, and invariably without ever having to add any extra hardware as we had in the past.

But in fact the first use of computers at the factory was rather more mundane, for office work – word processing, accounts and store keeping. An organist at a Welsh church where a Makin had recently been commissioned turned out to have considerable experience in the embryonic office-computer field, and a pair of Watford built 'British Micro Mimi 803' machines were purchased following his advice. (They were Z80 based, and incidentally they ran their programs under an operating system called 'CP/M', which was at the time a fierce rival of 'MS-DOS', the very first product of a brand new American company named 'Microsoft').

There were several organs very nearly ready for installation when we moved out of State Mill, which gave us some leeway to spend time organising the new factory. I don't recall there being any obvious pause in production and for the next three years organs were leaving the factory at a rate of one a fortnight so David Clegg & David Brailsford's reorganisation was clearly working.

Barrie and David soon perfected their microprocessor piston action and this replaced all the previous designs. I meanwhile had the lateral idea of building a compact organ with a built-in Rotofon speaker, or maybe better described as building an organ *into* a Rotofon! A chamber-organ design eventually came out of this, both as single-manual and two-manual, and turned out to be quite successful. The first was the so-called 6-6-3, just fifteen stops, but including a full complement of pistons and couplers including Sub-Octave & Super-Octave.

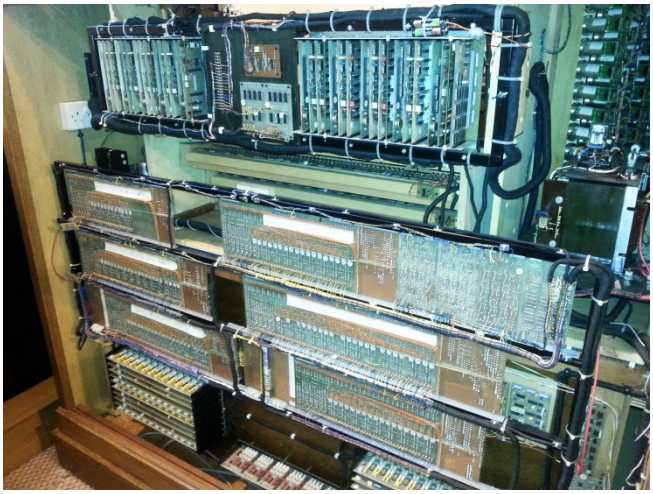
The self-contained 6-6-3

And Mr John's own organ came back to Rochdale again for another rebuild. He had persevered with the electrostatic system at home until now – no doubt partly to maintain a reference point – but was now keen to have it converted and the console upgraded. The same thing happened with the Christchurch Priory instrument. This in fact was initiated by flooding under the floor at the Priory which had caused the

old multicore cable to start to disintegrate and short-circuit. Multiple faults had regularly begun to appear and we certainly no longer had the means to manufacture & replace such a cable, so the console was collected and upgraded to the Microchip system. (I recall that when the cable came back to Rochdale a section was passed over for analysis to Metals' chemical lab, who were able to tell us precisely what had happened to it!)

The console from Ripon Cathedral also made a brief return visit in order to install the new computer piston action and to make a few other modifications, as too did a handful of other early Makin instruments from churches who wanted to upgrade to the new technology. Not to mention gaining freedom from annual lubrication and maintenance bills.

Another flagship installation was a new organ using the pipe-organ console at Holy Trinity Southport, where Mr John's had once been organist – and he would have been in two minds about this one. So we built them a new four-manual organ but left the entire pipe organ mechanism intact and untouched. Although now in poor condition it had been a prime example of Willis' work and hopefully would be restored some day. David Brailsford set about devising an interface so that the console could be readily re-connected to the pipe organ if and when the time came.



One of our largest organs ever was commissioned by Bishop Auckland Wesleyan Methodist Church.

A lead-roof failure at the church had let the rain in and wrecked their pipe organ. Organist John Hart was in a position to order a twin of his favourite instrument, the 4-manual at Durham Cathedral, with a few extra stops thrown in for good measure.

Despite these recent sales successes Mr John wanted to enlarge the sales team (ignoring protests from Richard Hilditch as I recall), and Reg Parrish was taken on to assist John Dawson. Reg had previously been Allen Organs' northern agent so had a lot of insider knowledge, not to mention a long private list of potential future customers.

> My next technical project led to a replacement for the mechanical Rotofon speaker. A new breed of integrated circuits had started to appear called the 'bucket brigade'. This quaint

> term refers to the arrangement of entering an audio signal into the first of a long string of capacitors encapsulated into an integrated circuit. The device then passes the signal down the line at a controlled rate, effectively an audio shift register. The signal emerging at the other end of the line is a delayed version of the input. By varying the speed of the transitions the pitch at the output appears to rise or fall, clearly a good starting point for what we would want to achieve.
>
> 'Chorus effect' units using bucket-brigades were beginning to appear on the market for guitars and in recording studios, but I could see that a simple pitch variation would be woefully inadequate to recreate the complex effect of the Rotofon. With a typical guitar FX device you could readily hear whenever the pitch change arrested and reversed direction. I correctly figured that multiple delay channels would be able mask that, and in the end I came up with a three-phase device, whereby three parallel bucket-brigade channels would be operating at 120º to each other, the analogy of a triple-bladed mechanical Rotofon. Thus at any point in time it would be guaranteed that at least two of the pitch changes would be in motion, and generally all three.
>
> And I knew the reproduction definitely needed to be stereo, preferably three-dimensional. So I next devised a two-channel speaker cluster with 360º omni-directional reflectors, the idea being that from any listening point in a room you would be able to hear the whole spectrum from both channels. The outputs of the three bucket-brigade channels were spread across the stereo field. In an ideal acoustic it did sound very similar to a mechanical Rotofon, to the degree that we were able to substitute the mechanical version for the electronic one on a number of earlier instruments.

The 6-6-3 composite model was one of the first beneficiaries of the electronic Rotofon; the console retained exactly the same dimensions as before but the new 360º speaker arrangement was fitted into the top and a bass speaker unit above the pedals. We had built our first self-contained organ!

The 6-6-3 was a relatively big seller (by Makin standards) and was later joined by a larger 8-8-6 version, as well as a single manual stop-tab organ, the latter with a permanent Auto-Pedal function and split-keyboard feature.

I have always had an interest in new musical technology - which now translated into keeping an eye on our competitors – and during the mid-80s I began a series of annual visits to the Frankfurt Music Fair. It was an easy way to evaluate developments at Allen, Viscount, Rodgers etc., but this was also a time of rapid developments with synthesisers and keyboards. In 1983 a development known as 'MIDI' first appeared (the Musical Instrument Digital Interface) which, although it was only just beginning to feature on a handful of synthesiser keyboards, I could see in time was going to have a big impact on church organs.

Bradford

The Bradford Computing Organ system was always intended to be licenced to multiple manufacturers, who would each be able to protect their data and techniques to guard against competition. The erstwhile National Research & Development Corporation had provided finance for the university's project and we had had several approaches from them over the years to take a

closer look. In recent years a party of us had visited their demonstration organ at Christ Church Ilkley, and I had also been down to the Wyvern showroom to look at an early prototype.

One thing that concerned us considerably around this time were the constant threats from the American Allen Co concerning various patents they were claiming, particularly with regard to multiplexing. Allen had already successfully sued Japanese giant Yamaha (and had come to a mutual agreement) but had so far left UK manufacturers alone. Mr John was naturally reluctant to get involved with any litigation over an organ computing system, of which Allen – rightly or wrongly – claimed to be the pioneers and with the patents to prove it.

So far nothing had come of any of this but in 1985 I had a telephone call from Tony Koorlander, who I had known 15 years earlier back in my BBC days. By coincidence Tony had also later moved into the field of electronic organs, joining the Wyvern works in Devon, but had now left them in order to start his own company Musicom Ltd., specifically to market the Bradford system. Musicom's first customer had been Copeman-Hart, an organ builder with a very similar ethos to Makin. As well as Wyvern and Copeman-Hart two other manufacturers had taken up the Bradford system to some degree: American organ builder Rodgers and the German company Ahlborn. The latter in particular were beginning to make inroads into the UK church organ market by way of the newly formed 'Bradford Computer Organ Company', part of Wood's Music Shop over in the centre of Bradford.

Although we had never heard anything conclusive enough to make us want to abandon our own technology in favour of Bradford we were well aware that our Microchip system still had some shortcomings. The note-masking effect that plagues additive synthesis because of note-sharing was still somewhat evident; we relied heavily on the rotofon speaker (or by now its new electronic derivative) to make the static electronic sound from the generators musically more acceptable, and the background noise level was occasionally not ideal, particularly on large instruments.

We knew that Bradford was an open system with apparently endless voicing parameters, so it was decided to investigate further to see how far it had evolved. I paid a visit to Musicom in Bideford, but we also summoned a patents expert from Surrey to advise us about the legal position. Many doubted Allen's claim, but if digital competition in the church organ market was starting to bother us it would certainly have been getting Allen's attention as well.

To Oldham

However before much else could develop on the Bradford front, we had another bombshell dropped upon us: over one weekend Mr John had casually sold J&J Makin Ltd. – the whole group in its entirety - to J. Bibby & Sons. He was now aged 70 and had no direct family heirs, so presumably felt this to be his wisest course of action. Apparently negotiations had been kept secret even from his co-directors and the decision came completely out of the blue. Bibby's interests were chiefly in farm foods, but they already owned a paper manufacturing division as well and no doubt were also keen to get their hands on Metals.

But not Organs, of course. It quickly became clear that although Mr John was now officially retiring from the paper industry he intended to continue with his favourite hobby and that although we would be forced to move again his organ venture would carry on. Thus on the 26th April 1985 J&J

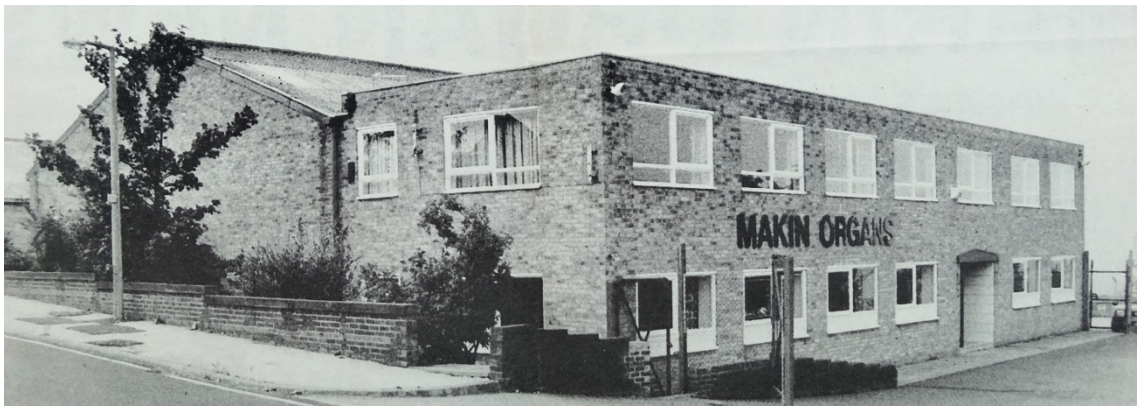
Makin (Organs) Ltd was wound up and we were all, in effect, made redundant. Full redundancy payments were honoured by Bibby.

The new company Makin Organs Ltd. started immediately after the weekend, on Monday 29th. The first directors were John Pilling and John Cranmer, who had been Financial Director for the Makin group for many years and retained this function for the new venture. Like Mr John, Mr Cranmer was also at retirement age and once the new company was established came into the office on just three or four days each week. Director Richard Hilditch parted company with the Makin group but took over Oak Press in Rochdale, evidently another Bibby disposable asset.

Some personnel streamlining was in order, so unfortunately there had been a process of deciding who should stay and who should go. We were summoned into David Clegg's office in turn to be informed, but apart from a couple of exceptions it had always been fairly obvious, and one or two had made their own choice anyway.

Organs remained at Wallhead for several more weeks while new premises were investigated. David Clegg and David Braisford were regularly out on the factory equivalent of a house-hunt! Eventually a suitable building was found on Franklin Street in Oldham which had previously housed a builder/kitchen installer. It comprised a main factory area just a shade smaller than at Wallhead, front & rear car parks, a full showroom area, several small offices or workshops, and upstairs rooms that could be transformed into Mr & Mrs Pilling's new Lancashire flat, altogether ideal.

During the summer of 1985 our factory was packed up once again, and everything transported to Oldham. Several other Makin departments' personnel were involved in the move which at the time seemed perfectly normal, but I guess by now they were technically employed by Bibbys. The new works were decorated (while this remained relatively easy), in particular the offices, the showroom, and the upstairs flat. I had been able to select a prime corner office-cum-workshop adjoining the showroom, with the Brailsford brothers immediately next door; our own R&D empire! Security was a concern now that we were no longer cocooned within a larger mill, so steel fences and shutters had to be added and part-time security man John Salmon was appointed. A new red 'Makin Organs' sign was attached to the front of the building, which now bore the address 'Compton House'.



Compton House

Oldham

1985

This time production slowed down for a couple of months while the new factory floor was organised, but by November we were back in full swing and the following year saw our biggest output to date. We were by now obtaining all of our consoles from Kimber-Allen, already stained and polished, so it was decided to scale back our own woodwork division and sell off some of the

heavier machinery. Such items as speaker boxes and screens would in future be sub-contracted to local Oldham joinery firms.

Within a few weeks of starting up in Oldham we were recruiting again; a new service engineer was needed but in fact we selected two new recruits on the same day in September – Brian Hartley & David Fetterman. David took on outside servicing and Brian was mostly involved with installations.

Sadly, it became known that autumn that Mr John's wife Margaret had become seriously ill; she died soon after in the spring of 1986. This was completely unexpected, especially having just so recently made major life changes and plans for their retirement. It was naturally a massive blow to Mr John, and unsurprisingly he was absent from the factory at Oldham for several weeks.

Musicom Bradford

I had started talking regularly with Tony Koorlander in Bideford about the Bradford system, and had also visited his booth at the exhibition in Frankfurt, where Musicom were demonstrating a complete organ system in a briefcase-sized box. The sound was remarkable. Back in Oldham it was decided to purchase an evaluation package from Musicom, consisting of a boxed set of circuits that we could hook up to a spare console and amplification, and a 'voicing terminal' – a Bradford University design comprising a BBC computer with two 5" floppy disc drives. Data for an organ was written on the terminal and then uploaded to the system. Voicing could be carried out in real time, more-or-less, by typing in short commands or strings of numbers - no graphical interfaces yet in 1986! Program-assembling was a very long-winded process wherein the data would be shifted back & forth between the two disks for 15 minutes or so before you could find out whether you had made an error or not. Plenty of tea-break opportunities.

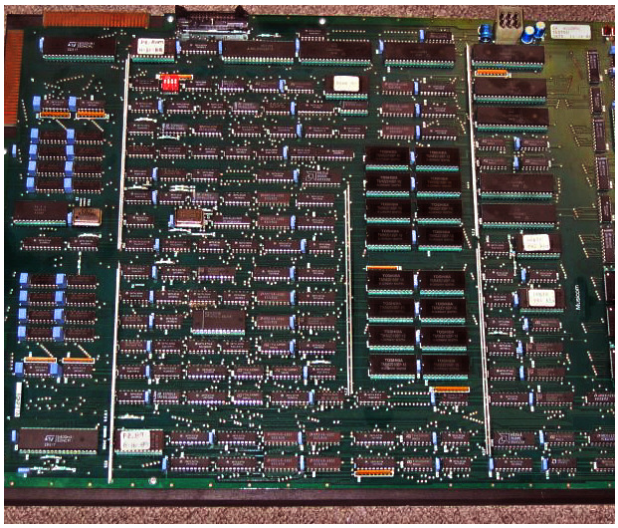
> The Bradford Computing Organ system was pioneered by Prof Peter Comerford during the 1970s. It was originally devised as a multi-purpose musical instrument simulator, but it soon became clear that the church organ was a particular strength, and moreover where a market might lie for it, so development had recently been concentrated in this area. Indeed, simulating other instruments had by now become the domain of the fast-growing keyboard synthesiser business, dominated by low cost products from America and Japan.
>
> The Bradford organ system operates basically as follows, but it should be emphasised at the start that the software design had always been intended to be 100% flexible, so that individual manufacturers would be able to decide themselves exactly how to implement it.
>
> A Bradford waveform is defined by a set of numbers, each number representing the level of a particular harmonic; so to create a sound with 10 harmonics there will be 10 numbers. To allow for rank scaling several sets of numbers are stored, defining different versions of the sound at various 'voicing points' spaced up the keyboard. A basic organ stop might consist of, say, six such sounds. When this stop is drawn the system very rapidly assembles six waveforms, as defined for each voicing point.
>
> The part of the hardware that produces the sound is a waveform scanner, effectively a single-cycle sample player. If the key you are playing matches the position of a voicing point

it plays the exact stored waveform. For notes that lie in-between two voicing points the sound is derived by proportionally averaging the pair of waveforms on each side of it. Thus when you play up a scale from bottom to top you would pass through the six voicing points, and as long as the voicing has been carried out skilfully the sound appears to progress smoothly.

Moreover a stop can be defined to consist of any number of simultaneous sounds, a simple example being the chiff at the beginning plus the continuous sustain that succeeds it.

The system is modular and can define a complete organ of almost unlimited size and complexity, and naturally there are parameters available for tuning, amplitude and pitch envelopes, randomisation effects and so on. It incorporates a complete console system for keyboards pedals and couplers, including a comprehensive piston action.

1986 Bradford 5b Music Module



Our experiments seemed very promising, however one feature that was notably absent was the ability to individually regulate each note of the scale, something we considered essential for church installations and which even Comptons had featured as far back as the 1930s. My solution was to devise a board containing a bank of parametric equalisers that could be tuned to boost or attenuate specific frequencies. Not ideal - but it sufficed, and we decided to proceed. Anyway this importantly gave us a feature unavailable to any other organ manufacturer who used the Bradford system, who by now were beginning to proliferate: Wyvern Bradfords were now in full production and were being joined by the newly formed Bradford Computer Organ company, and later too by Copeman-Hart.

As we had done back in 1980 the new technology was offered to upcoming customers, and our first Musicom Bradford installation was at Victoria Hall Methodist Church in Sheffield, followed soon after by St. Mary's Wirksworth, both sizable three-manual instruments. But we continued to build instruments using both systems; Bradford was less cost-effective for small organs and was also proving to be very time consuming to set up, particularly on the early examples where we were having to overcome both hardware and software problems.

For a couple of technical reasons we still had a lingering reluctance to using the Bradford system exclusively. The first was a notable 'sluggishness' in its playing response. From a 21stC perspective it's now easy to recognise how slow processors were back in the early 80s and unfortunately it showed.

The second concerned 'polyphony', the number of notes a digital system can play simultaneously. At first it looks reasonable - the basic Bradford Music Module is capable of

playing 64 notes at once, whereas the original Allen computer organs had got away with a polyphony of just 12! But to make a large organ feasible the university had devised some complicated algorithms to optimise the limited polyphony, and occasionally its shortcomings could be evident, even on an organ equipped with multiple modules.

Our Microchip generator had no polyphony limit at all, however like the majority of earlier analogue organ designs its generators were 'phase-locked', that is to say the various waveforms progress exactly in step with each other with no movement or chorusing. (Hence the preference for rotating speaker designs – even Allen had recently used this technique with their mechanical 'Gyrotone' cabinet). Bradford however offered complete frequency independence, and the pitches of individual notes could be made to develop very much as their pipe counterpart. But there really weren't enough of them.

The basic computer files from which a Bradford organs' program is originally assembled are written in plain text, back at this time using a very primitive word processor on the voicing-terminal computer. Unfortunately what was notably absent was any simple means to cut & paste, so each new organ proved immensely time consuming. We had equipped Barrie with a new BBC Micro computer model and he was able to rise to the occasion as always and devise a system to semi-automate this process within a rather more advanced BBC Micro word-processor.

By this stage Barrie was fully occupied with software, either assembling data for Bradford production or working on console developments, with little time for anything else. So new employee Peter Cross arrived in order to take on all of Barrie's former tasks as test engineer.

Mr John was keen to have a Bradford unit at home to experiment with, but rather than rebuilding his organ again we built him a box that could directly plug into his four-manual console in place of the existing Microchip electronics, and he was able to swap from one to the other with comparative ease. A second voicing terminal was ordered from Musicom so that he could do voicing experiments at home at his leisure.

Export

Mr John was a staunch Anglican and would probably ideally have preferred to build organs exclusively for churches on the UK mainland, however export opportunities started to appear and as an enthusiastic tourist I myself was particularly keen to pursue this avenue if possible. We had recently installed an organ in a church in Selby, upon which the brilliant Abbey organist Mervyn Byers had given the inaugural recital. Mervyn was an Australian and about to retire back to his native homeland; he wanted us to build him an organ for his new house in Blackheath NSW. Immediately prior to his appointment at Selby Abbey in 1966 he had been organist at St Andrew's Cathedral in Sydney and still had close contacts with local churches down there, among whom, he informed us, St Martin's in Killara wanted a new organ as well. The church's organist visited the Oldham works during 1987 and evidently reported back favourably. So the opportunity arose to send two organs to Australia simultaneously which appeared to make the venture economical.

We used the Bradford system for both, and they were shipped in February 1988. I myself travelled out there during June to attend to the voicing. We had shipped out the bulky Bradford voicing terminal separately. Mervyn's retirement home was in the Blue Mountains inland from Sydney, but

while I was there he took the train down to the city to perform the inaugural recital at Killara. I also called in on another of our customers who had recently retired from Surrey to Brisbane, taking his Makin 8-8-6. My 1988 trip evolved into a sales tour, and a number of other future Makin exports were initiated en route.

Makin had had a long association with an electronic organ builder named Neil Shaw. Neil originally hailed from Burnley but had emigrated to Ontario during the 1950s. He had devised his own organ system and started Shaw Organs Inc, building instruments that featured an ingenious and truly unique 13-channel loudspeaker arrangement. On his regular UK family visits he would invariably call in to the Makin factory to compare notes, and I had reciprocated back in 1981 during a family holiday to Toronto.

In 1987 he contacted us about building an electronic unit that could become part of a large pipe organ in the USA. Actually he had two in mind - for the same pipe-organ builder - to be added to a four-manual organ and a five-manual organ, both due for installation in Mobile Alabama. (Only in America!) As well as about a dozen conventional organ stops two unfamiliar effects were required - Glockenspiel and Celesta - percussion sounds more likely to be found in the UK on a Cinema organ. Under Neil's guidance I was able to devise a circuit that approximated. (It was actually a derivation of the so-called reverberation unit that I had designed back in 1981).

The electronics for each, including their power amplifiers, were contained in portable boxes and sent over to be installed in the pipe organ chambers. I later went out to Alabama to assist and to voice. An American five-manual Baptist Church pipe organ is quite an eye-opener, and I'm quite sure Mr John would have been suitably horrified.

DMS

By now of course computers were everywhere in the factory. The IBM PC revolution had begun and in addition to our Bradford terminals PCs were to be seen in the sales office, as well as for store-keeping and production, for accounts and for circuit board design.

With all our larger instruments now being built using the Bradford system there was some sales-office concern that we should come up with a name for the technology, and which would also serve to differentiate our own Bradfords from those of any other manufacturer. 'Digital Music System' was the result, shortened to 'Makin DMS'. Colour brochures and advertising were duly commissioned.

Unfortunately we had started to have problems with Bradford. The reliability of the large central 'Music Module' circuit board was proving to be very poor, and the Bradford system has, to this day, the unfortunate characteristic of stopping completely unless every component is functioning correctly. Organs mostly contained two, three or more Music Modules. Hence whereas we were fairly accustomed to hearing of specific faults on an organ - maybe a note off or a piston sticking, or maybe a couple of stops not working – now we were regularly hearing of organs simply refusing to start, or stopping abruptly mid-way through the second hymn. A degree of panic set in and soon Mr John decided to pull the plug, and production of Bradford organs abruptly stopped again.

We had produced organs using the Bradford system from summer 1987 until early 1990.

But curiously the DMS name was retained; Mr John and David Clegg reasoned that since it had never been revealed what technology lay behind DMS we could simply revert back to using my Microchip system throughout the range again, call it DMS, and make no public comment. Although the sound generators used analogue audio circuits it was certainly true that the keying system was digital and the consoles were by now being run by a microprocessor. In the event I had to regularly try and field puzzled queries regarding the nature of DMS technology for quite a while afterwards.

Marketing

Mr John resumed his Tuesday to Friday routine, staying in the upstairs flat during the week. David Clegg and John Cranmer had offices on the same floor, with the sales office located downstairs by the front door. The sales staff grew to four at one point, with John Ram joining John Dawson and Reg Parrish, and with Nicky Howarth answering the phone, dealing with the post and ensuring the smooth running of the department. It's an inescapable fact that since David & Barrie Brailsford and myself spent the majority of our time in R&D there were actually 10 members of staff not directly involved in day-to-day production.

David Clegg and I were both elevated to become directors in 1988, but Mr John continued to make all major company decisions. After all, he was still the sole owner of the company, had financed everything and there was as yet no sign of a profit.

Mr John remained convinced that lack of sales lay at the heart of our financial problem. He didn't relish the news of Copeman-Hart and the Bradford Organ Company gaining inroads into our market, particularly when the latter installed a generally-admired four-manual instrument in Worcester Cathedral. Another persistent irritation to him concerned the Council for the Care of Churches, whose Organ Advisory Committee regularly ruled against electronic organs in Anglican churches. When this happened a church could, if they wished, appeal for a Consistory Court hearing - this had occurred recently over the organ at St. Mary's Wirksworth.

Mr John's complaint was that one member of the advisory board was himself a pipe organ builder, and that this constituted a conflict of interest. At one point during the long dispute the Council offered a place to Mr John himself; he declined, concluding that it might well just have been a ploy to discredit his argument.

Looking for an outside opinion about marketing we took up an offer of free advice from a Business Consultant, who recommended that we investigate appointing a public relations firm to help with our advertising and promotion. This job ultimately went to Jack Gilling's Manchester company JGPR, and they worked alongside us for a couple of years, helping to produce publicity material, organise demonstrations and get us some exposure on TV and radio.

Out of my redundancy payment in '85 I had equipped myself at home with semi-professional recording equipment. I regularly made the gear available and volunteered to make demonstration recordings of new organs; John Dawson organised the professional packaging. Over the months various recordings took place at Watford, Christchurch, Southport and in Exeter and Liverpool Cathedrals, resulting in a number of Makin compilation cassettes.

Makins started to make regular appearances at the annual Christian Resources Exhibition (CRE), which was at Epsom Racecourse in its early years. JGPR helped us design the stands, which along

with our sales team David Clegg and I both manned on a few occasions. Our CRE presence also provided us with a useful opportunity to study our rivals' products.

George Sixsmith & Son, and Digital Action Ltd.

By 1987 Brian Hartley was promoted to Production Manager and co-ordinated the Oldham factory. Installation was taken over by Ian Harpham (who had been a former colleague of Brian's), assisted by John Salmon who was now employed full-time. (In his spare time 'big John' was a champion arm-wrestler, an asset that proved tailor-made for shifting heavy organ components). Console cabling and assembly was headed by Steve Lanyon & Colin Aspinall.

Our nearest pipe organ building neighbour was George Sixsmith, who with his son Andrew ran a thriving company over in Mossley. They too became interested in producing pipe-electronic hybrid organs which would clearly seem ideal for us, and the association that followed also provided us with a source of high quality consoles. We had been keen to find a local alternative because the Kimber-Allen company had recently started to cut back their woodwork division, which soon after closed down altogether.

For a prototype hybrid instrument Barrie & David adapted the microprocessor console system to be able to control ranks of pipes, and the first Makin-Sixsmith organ was installed in a church in Hyde.

It was soon realised that the resulting electronic hardware could be a saleable product in its own right, to be marketed to pipe organ builders, but rather than putting it under the Makin banner (we were regarded as rivals by many pipe organ companies), a new associate company was launched, which we named Digital Action.

A set of colour brochures for the Digital Action company were commissioned and distributed. A leaflet also featured our hybrid electronic-stop boxed systems, which became another DA product targeted at pipe organ builders.

MIDI and the Micro120

For Digital Action products the communication link that we had chosen to connect the organ console with its pipes used the new universal standard 'MIDI' protocol. Now that we had a microprocessor inside every organ we began to fit a MIDI interface to every instrument so it was the obvious route. The Bradford system too had recently had MIDI facilities added; MIDI had started to prove as universal as everyone had predicted.

> MIDI was originally developed by two synthesiser manufacturers during the 1980s to allow communication between digital instruments so that, for example, playing on one causes the other to play along in unison, adding to the available sound palette.
>
> But one of its greatest benefits to organs is that the MIDI data stream itself can be recorded and played back, which has the capacity to make an organ 'play itself'.
>
> Commercial MIDI Recorders were starting to come on the market and we were now able to either fit such units into the console or offer them as an accessory. Thus an organist could record hymns or music in advance, which could then be used by anyone to literally play the organ in the organist's absence.

A simple comment from an amateur organist in 1988 led to a rather unusual Makin project: an organ without any stops! The comment in question concerned the rows of very expensive drawstops fitted to the new Makin 8-8-6 that he played each week. I was visiting the church to make some adjustments and in response to one of my questions about a specific stop he said “Oh, I never touch any of those, I don’t understand them so I just press pistons”.

During the drive back to the factory the thought came to me that if we could store in memory the voicing information for every likely stop combination on such an organ, then these pre-set registrations could be called up using pistons alone - the stop units could be left off altogether. Mr John and David Clegg liked this idea; they figured it could reduce our costs by at least £1000 from even the smallest instrument, and yet such an organ should be able to reproduce the tonal range of a much larger one.

The development of the Micro120 (a name that the Gillings company came up with) certainly provided cerebral entertainment for Barrie, David and myself for many months. I worked on the hardware while Barrie developed a character-display and control system. I was keen to implement the kind of arrangement that I had seen regularly featured on commercial synthesisers, which themselves by now revolved entirely around pre-set sounds.

Although the Micro120 used the same multiplexed generator as all our regular production Microchip organs, I devised a digital front-end that could rapidly assemble the generator input data streams under command of the stop-less console. At the time a typical microprocessor chip would not have been fast enough for the task so what was needed was a real-time hardware number-cruncher.

It took the form of a group of memory chips containing data for the voicing, for the bar-bend shapes and all the swell pedal attenuations, as well as a processor to generate the correct attacks and decays, all coupled together into a digital arithmetic circuit. We were able to copy all the relative levels from any regular DMS organs which more-or-less guaranteed that the voicing would be up to scratch.

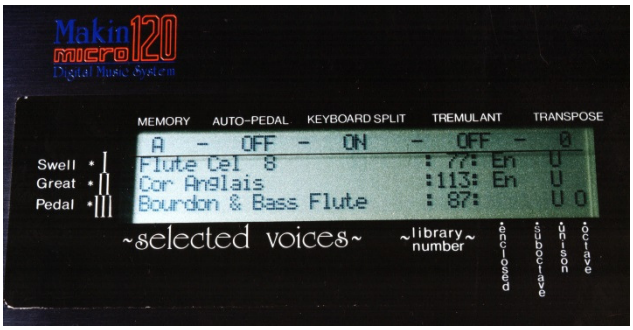
In the end we produced the Micro120 as a two-manual & pedal organ, as a single manual (with the consoles built by Sixsmiths), and also as a sound-module in a box that could be used with any MIDI keyboard. They all had 120 stop combinations that could be applied to either manual or pedals, via their pistons, and they incorporated all the traditional couplers and tremulants. Internally the three versions had identical electronics. The ‘virtual stop list’ was equivalent to a large cathedral organ.

The Micro120

A promotional tour was organised for the Micro120, split between recitalists Ronald Perrin, the Ripon Cathedral organist, and Ian Tracey from Liverpool Cathedral, both of whom had become good friends of the company and had regularly given inaugural recitals on new Makin instruments over

the years. Ian also recorded an excellent Micro120 demonstration tape for us in the Lady Chapel at Liverpool.

In reality, a professional organist is bound to be the least appreciative of a stop-less console. Ian once commented that it was a bit like climbing into a car and finding that there's no steering wheel! In retrospect, maybe the Achilles heel of the Micro120 was that to get the best out of it an organist would be best served if they already had an encyclopaedic knowledge of organ controls and of stop registration; so something of a contradiction.



Micro120 Panel

The Micro120 sold reasonably well by Makin standards, but it became superseded after a couple of years and can't have done the company finances any favours in the end. Mr John was certainly not keen on my MIDI sound-module version, and production was cancelled after a couple of prototypes. He often spoke of his fears of our electronic methods being reverse-engineered by a competitor, so possibly disliked the idea of separately marketing the complete internal workings of an organ. However without any doubt the Micro120 would have proved particularly unfathomable.

But Barrie and I were by now at the top of our game, and keen to move the organ technology forward.

1989-90. The M114 and the uP100 system

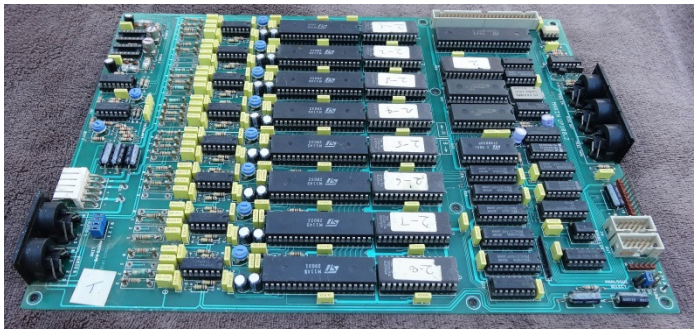
During my annual visit to the Frankfurt Music Fair in 1989 I was alerted by a new development; our Italian competitors Viscount and Gem had both adopted a new digital component which was practically 'an Allen organ on a chip'. The SGS-Thomson M114 was a digital sample player IC, and the sound quality now coming from the Italian instruments had suddenly become far more realistic than anything they had produced to date. I reported back to Oldham, and upon investigation we discovered that the M114 even allowed for note-by-note regulation, the omission of which had been one of the greatest drawbacks for us with Bradford. Equally importantly, a modest bank of low-cost M114s would instantly exceed the polyphony limits of a Bradford module.

Coincidentally I received a phone call from Welsh company Technomusik, who had just produced a prototype MIDI add-on sound module for Allen UK using the M114. They had recently been impressed with our own Micro120 module when they saw it at the CRE in Esher so were aware that we were looking into MIDI developments. They wanted to know if we were interested in an M114 organ system. I was despatched down to Tredegar during the summer to have a look at what was on offer, which on the face of it seemed an attractive proposition. After all, we now had a complete microprocessor controlled console which incorporated MIDI, so 'flying-in' a MIDI-driven generator should be relatively straight forward.

Clearly Barrie could have tackled such a project himself but at the time he was seriously tied up with the Digital Action & Sixsmith projects, and Technomusik already had experience with M114 programming. Also we had recently decided to switch to a more up-to-date and powerful

microprocessor and Barrie was busy familiarising himself with the code as well as moving over to a new Atari ST computer.

Technomusik eventually delivered a prototype to us. It had taken them much longer than anticipated and there were still numerous technical and sound problems to overcome. All somewhat disappointing, but it would be fair to add that Technomusik's preliminary work had at least highlighted many of the pitfalls that we needed to avoid. In the meantime Barrie had been studying the M114 protocol himself and in effect we three decided to short-circuit the whole process and design our own version instead, which I recall was achieved at considerable speed. Mr John got what he'd paid for but by a rather circuitous route. The resulting main circuit board was actually David Brailsford's 100th design, so the resulting system became known as 'uP100'.



uP100 board

The uP100 board was quite a masterpiece; eight M114 chips split into two groups of four, each group with its own pitch generator, tremulant and multi-outputs. The board was entirely MIDI controlled, so we could literally hang it on to our console MIDI hardware via a pair of wires and an organ would be complete. The board could thus take care of two departments of an organ, maybe 15 - 20 stops. An instrument might need 2, 3, 4 or more up100s depending on its size. The beauty of this arrangement was that the Digital Action pipe system also ran under MIDI, so implementing a hybrid organ was going to be very streamlined.

Barrie and I devised a rather convincing 'wind-demand' effect for the uP100. In a pipe organ, situated between the blower and the pipes is a reservoir, intended to maintain a steady air pressure irrespective of the demands of the pipes when they are being played. In practice there is always some disturbance however, and the reservoirs can be observed 'bouncing' to some degree with a corresponding variation in the organ's pitch. It's a familiar characteristic of a wind-blown organ and we devised an algorithm to emulate the effect.

Mixture stops were the best we had yet conceived; Barrie was able to organise a derivative of his pipe-control setup to organise the ranks exactly as they would be on a pipe organ, with authentic break-backs and every note generated individually. Gone were the days of note-sharing and borrowing.

I meanwhile had been working on a set of sounds. Each M114 uses an associated memory chip as its sound store. I too had purchased an Atari ST computer for use at home and I spent many an evening during 1990 generating a complete library of organ ranks using an additive-synthesiser program named Softsynth, an early product from American company Digidesign. Most manufacturers who had already adopted the M114 recorded actual organ pipes for their sound sources - they would have had little alternative. But there are invariably audible side-effects and pitfalls associated with this process, particularly with the

relatively crude resolution of an early device such as the M114. We all felt that using our comprehensive knowledge of harmonic structures could yield a much more controlled result, and so it proved. Each morning for several weeks I would arrive at work armed with floppy disks of home-grown 'samples' that we could load in, so a complete series of Diapasons, Flutes, Reeds and Mixtures were gradually accumulated.

John Cranmer retired in 1989, and David's wife Mavis joined the company in his place to oversee the company accounting. I made a second excursion to Australia in 1990, this time to attend to five recent exports, including two Micro120s and a prestige 3-manual drawstop organ for St Andrew's Cathedral Choir School. Production organs had now all reverted back to my solid-state generator. Once again I briefly put on my salesman's hat in Australia which led to some future Makin orders. In Sydney we had now acquired both an official importer and a local agent.

A custom Micro120

in NSW Australia

Also in 1990 Mr John decided to revive his 'reed-delay' idea from 1986, whereby he saw advantage in retarding the speech of reed stops, although in truth absolutely no-one else could see very much musical merit in the scheme!

I maybe foolishly revealed that it's fairly straight forward to accomplish a time delay (it just needs a long shift register to delay the keyboard signal), but it turned out to be quite an

> expensive exercise because in effect the reeds would have to operate as a floating department with their own voicing sections as well.
>
> For a period in 1990 reed-delay became Mr John's obsession and all large organs had to have it incorporated, or even retro-fitted if they were already half-built. Rather awkwardly, when it came to voicing these organs in churches the delay effect was regularly questioned by more astute organists, and on many occasions I had little alternative but to rewire and return things to normal. But keeping this to myself, not a very happy situation.

The up100 hardware was finally ready in early 1991 and although Mr John initially declared his delight with it he no longer showed the degree of patience that he had in earlier times. Back in 1973 & 1979 he had always been content to gradually perfect the performance of instruments, positively enjoying the process. Now however, entering his late 70s, he seemed to want immediate results. Nevertheless uP100 installations began in May, gradually becoming our primary organ system.

For regulating uP100 organs I had obtained a Yamaha C1 computer, a primitive example of a flat-screen laptop computer, which also featured built-in MIDI ports for music applications. During the summer Barrie and I began to work on a program whereby I would in future be able to generate samples out in the field, effectively voicing organs in the same way that I had with Bradford.

Viscount

We had become aware that several of our competitors were starting to offer a range of lower-priced budget organs alongside their more expensive custom models. In general they were simply acting as importers for one of the European manufacturers, whose M114-equipped systems could now produce a very acceptable instrument. So for example the Bradford Organ Company had become sole importers of Gem from Italy, and Wyvern represented Dutch manufacturer Content.

Mr John and David Clegg realised that our own showroom in Oldham would be ideal for such a side-line, so towards the end of 1989 an approach was made to the Watford-based importers of Italian Viscount Organs to represent them in the north of England. Viscount UK already supplied a number of regular musical instrument shops throughout the UK, but they favoured the idea of a dedicated organ showroom to complement their own in the south.

So a representative range of Viscount models were ordered, about ten in total, and for the first time our showroom featured wall-to-wall instruments.

Viscount had recently started to manufacture dedicated models for the UK market and moves were initiated for Makin to begin collaborating over their design and voicing, something that Watford freely admitted was not their forte. I had previously met some of the Italian team over in Frankfurt, and now I had a couple of meetings in London with Mauro Galanti – joint heir to his family's Viscount company - with a view to developing this further.

Johannus

However in the latter part of 1990 we had had an approach from Dutch organ manufacturer Johannus. They had been marketing their instruments in the UK for a number of years using an importer in the south of England. The sound of Johannus organs had been generally considered

rather thin and ‘continental’ by English standards, and as such had never been a major threat to UK manufacturers. However they too had just developed an M114 system that had convincingly transformed their instruments, and as a result had seen a massive increase of sales in Holland. They were now keen to find a bigger partner in the UK.

David Clegg and I arranged to fly out to their factory for a day at the end of November, where we had a meeting with Johannus’ new owner Gert Van der Weerd. He had a sample of their new compact M114 generator assembly on his desk. Gert’s proposition was twofold: that Johannus would manufacture a range of Makin-badged organs, using specifications and sound samples of our choosing, and that Makin would also become the new UK agent for Johannus’ own instruments. David & I both realised this was a very attractive business idea; I had very recently produced a ready-made set of M114 sound samples for the uP100 board so in principle a Johannus with a Makin sound looked entirely practical.

Mr John jumped at the idea and agreement with Johannus was swiftly reached. It was also clear to all three of us that Johannus had effectively given Makins first-refusal, and were we not to proceed we might well find that one of our UK competitors had instead acquired a powerful Dutch ally.

Despite having liberated Makins from an unviable electrostatic system with my solid-state version back in 1979, we had still not succeeded in giving Mr John a profitable organ business. But perhaps my personal three-year pursuit of the M114 device, since first encountering the component in Frankfurt, might now yield the business solution that he had so long strived for.

Naturally our new association with Johannus rapidly caused our embryonic Viscount collaboration to fall by the wayside. Overnight Mr John & David Clegg suddenly began dismissing them as ‘the opposition’ - most notably when in Gert’s company. Most of the Oldham Viscount stock was quickly sold off, bar a couple of the most basic models which were deliberately retained in order to extol the musical virtues of everything else in the showroom.

A stop list for a Makin-Johannus prototype was agreed on and I sent out a set of my home-grown Atari ‘samples’ to Holland to be incorporated. Johannus soon shipped the first organ, along with a handful of their own models that would start to refill the showroom at Oldham, and the very first Dutch Makin was duly voiced and regulated.

The only minor technical surprise with their design was the lack of a MIDI-In socket, something that Viscounts incorporated as standard. Strangely Johannus had anticipated the possibility of customers adding a MIDI sound-expander box, but not of MIDI recording & playback. Barrie rose to the occasion and astonished everyone by disassembling the entire Johannus program code over the course of a day or two, adding a comprehensive MIDI facility, and then re-assembling the program. On his next UK visit Gert’s eyes lit up when he saw one of his organs ‘playing itself’ for the first time. Barrie went on to write our own exclusive code for all the Makin-Johannus instruments.

Johannus’ original UK outlet down south had been run by Martin Colam, an accomplished and versatile organist who had played professionally in London’s west end and could readily turn his hand to any musical genre. But like many musicians he had found it preferable to earn a regular income within a more commercial field and church organ sales evidently suited him. Nevertheless

Gert Van de Weerd was now proposing to dispense with his services. Makin solved Johannus' potentially problematic change of heart by taking Martin on in the Oldham sales department.

Martin's first project was to transform the showroom, but in fact Mr John decided we should now go further by extending the showroom area out into the factory. New partition walls were erected, displacing the console cabling area, and a bank of external speakers were installed overhead in the centre of the component stores area, so a proportion of the factory and stores needed to be rearranged accordingly.

Anthony Bogdan joined in Feb '91 to become Martin's sales assistant. It became clear to Mr John & David Clegg that the sales department had now become somewhat top-heavy, but they evidently favoured the new team and so John Dawson, Reg Parrish and John Ram were retired in fairly quick succession.

A range of three or four Johannus-built Makins entered production in Holland and were shipped over, furnished with a set of my samples from our uP100 development. A couple of Saturday 'open days' were organised during the summer of '91 with organ demonstrations all day, featuring the new instruments. Another promotional event was an all-day 'organ festival' over in Leeds Town Hall; Martin Colam and his new assistant Anthony Bogdan manned a Johannus showroom adjoining the foyer during the daytime, and in the evening a concert in the main hall featured recitals on instruments that had been provided by Copeman-Hart, the Bradford Computer Organ Company, the newly-restored Town Hall pipe organ and our own very first uP100 demonstration model. Ian Tracey and Simon Lindley of Leeds Parish Church were among the recitalists.

Mr John was by now regularly turning to Martin Colam for new ideas. At his former southern Johannus dealership Martin had had limited electronic facilities or knowledge, so he regularly simply bought in commercial audio mixers, graphic equalisers and rack amplifiers for organ installations. Despite the additional costs these items all started to appear in Makin showroom setups. Mr John and Martin experimented with enhancing the Johannus sound using open-back speaker boxes whose colouration exhibited similar characteristics to, say, a typical Diapason organ stop.

January 1992

Only a handful of uP100 organs were built in the end, including a couple of large three-manuals for Warwick School and for St Thomas' Parish Church in Up Holland, Lancashire.

By the time we dispersed for the 1991 Christmas break Mr John had privately started to formulate a new business plan that would see the end of Makin production in Oldham. It seems he had reached the point whereby over the years around £1m of his own money had been poured into the business, and had concluded that it was finally time to call a halt. He called a directors meeting on his very first day back on January 6th : he had decided that all areas of production in Oldham would cease, R&D would cease, Digital Action would cease, and Makin instruments would from now on be built solely by Johannus in Holland, using their technology.

Barrie would be required to hand over all of his software developments to Johannus, including all his work on piston actions, pipe control and MIDI, along with all the uP100 M114 expertise. I would be among the redundancies that day.

February 1992

I myself went on to form my own organ building company, but in the early years I continued to help Makins look after many of the custom instruments that we had produced since 1977, some continuing even to this day.

Epilogue : some Banton-Brailsford projects that ended up on the cutting-room floor!

Over the years Barrie and I came up with numerous other ideas which never saw their way into the organs for one reason or another. Here's a handful:

1) By nature, Compton's rotary electrostatic generator is a very low-capacitance device. One upshot of this is that despite the application of several hundred volts to the stator rings only a tiny audio output, just a few millivolts, is produced from the other side, and this level falls off alarmingly at low frequencies. In an idle moment one of us wondered what would happen if, instead of DC, a low-voltage radio-frequency sine-wave at, say, 150kHz were to be applied and then rectified on the output side – effectively replicating an AM radio circuit.

It's a most impractical idea for organ building purposes, but it happens to work rather brilliantly: you get near 100% efficiency all the way down to very low frequencies! This experiment actually happened in the same month that I originally came up with the Microchip system. Mr John was most impressed and declared that if our electronic developments failed we should investigate this idea further. Which gave us all the more incentive …

2) In 1984 a customer in Ambleside wanted reverberation on his organ. This was some years before digital FX units appeared on the scene and we never used echo springs or plates, so Mr John suggested I emulate Compton's idea of adding sustain to every generator note, making low notes hang-on much longer than high notes in the manner of cathedral reverberation. It's patently flawed as a reverberation technique, because it doesn't add any new phase delays or any spatial effect.

Nevertheless I rose to the challenge and perfected a multiplexed sustainer unit; sounded awful. Mercifully we used it just the once, but the circuit was resurrected a few years later for generating percussive sounds for the USA hybrids.

3) In our quest to generate free-phase waveforms we investigated a digital 'quadrature' idea. For quadrature modulation, as well as a basic sine-wave you also need its cosine-wave counterpart (90º behind), its compliment (180º behind) and its cosine compliment (270º behind). Let's take middle A, 440Hz. Continuously sequencing through the four 440Hz waveforms at a rate of 1Hz produces a sine-wave of 441Hz. Sequencing in the other direction produces 439Hz. Sequencing using a narrow-band noise signal produces a cluster of frequencies centred around 440Hz – side-bands!

The technique is loosely related to Yamaha's FM synthesis, widely used in their 80s DX synthesisers. There's a famous photo of Yamaha's wardrobe-sized development rack for FM synthesis. Yamaha, however, had their own microchip manufacturing plant so were able to shrink this all down to a few components and build their familiar slimline keyboards. Not really possible in Oldham …

4) We briefly toyed with manufacturing a PA system. Providing PA had been a regular request whenever we were involved with a new church building, and looked like it could tie in with our installation work, where we were already dealing with loudspeakers, amplifiers, cabling round a church and of course scaffolding. I designed prototype circuits but in the end it proved too time consuming to fully develop and was abandoned. As a bi-product we installed successful induction-loops (for hearing aids) on a couple of occasions.

5) When we were first investigating the Bradford system I wondered if we could replace the 'bucket-brigade' delay lines in our electronic rotofon with digital memories, it seemed an obvious substitution. Barrie built a working prototype circuit but had already realised what I had not – the modulation of the bucket-brigade sweep oscillators is by way of a smooth analogue modulation, whereas with this one you could clearly hear it step from one delay length to the next. No go.

6) As mentioned I had created all of our M114 samples at home on my Atari computer using 'Softsynth', an American additive synthesis program. Considering Softsynth could not possibly have been conceived for generating organ voices it worked pretty well for this, as is still evident in countless early Makin-Johannus instruments to this day. When it came to voicing uP100 organs in churches it soon became obvious it would sometimes be highly advantageous to be able to generate new samples on the spot, exactly as I had been able to do with Bradford. Barrie had started to look at writing our own real-time synthesis program to run on my voicing PC but the project remained on the drawing board come January '92.

Hugh Banton - January 2015

My thanks for their help in recalling a thousand details from the old days, to Barrie Brailsford, Brian Hartley, David Fetterman, Anthony Bogdan.

Photography by David Brailsford, Hugh Banton, John Dawson & Chris Thors-Smith

If readers have any first-hand knowledge or other relevant information that could be added, please email me at hb@organworkshop.co.uk

LINKS :

Compton organs - http://www.electrokinetica.org/d8/1/index.php

Makin today - http://www.makinorgans.co.uk/