

SWRFM—A Technical Journey—Pt 1

From the very start, SWRFM has stood unique in radio broadcasting in Australia. This was principally due to its commitment to technical excellence and innovation. Yes those might be words of spinwriters and people flushed with their own success. But in this case, you can make up your mind for yourself in this chapter of the SWRFM Book of History.

SWRFM never got on very well with the established broadcasting technical crowd. Back in the early days, broadcasting stalwarts used to dismiss SWRFM as a flash in the pan. *Nothing of significance ever happens out there. Even if it does, it never sticks, 'coz they ain't got no money.*

Whilst SWRFM never attempted to do the impossible with nothing, there's always been that underlying Western Sydney "Westie" trait of rubbing it in their faces. SWRFM engineers liked nothing more than to prove the establishment wrong. And this they did. Repeatedly. Often with reckless abandon.

Broadcast limiters for \$50 bucks. Outside broadcast links for 25 cents instead of \$2500. Home made antennas, which when fed with a just 80 watts, blew the competition off the dial. An endless stream of super cheap, domestic solutions to complex broadcast solutions that worked and sounded good. *Technical sales people hated SWRFM!*

In reality though, right from the first test broadcast, SWRFM was only ever competing with itself. That January 1992 test set a series of technical benchmarks well above even established community and commercial stations at the time. The SWRFM reason was always "because we can," when everyone else was pretty sure "we couldn't". It's comforting to know SWRFM is still around while most of those doubters and even other stations, are now either dead or long gone. *SWR is still here, 35 years later.*

The First Test

The first SWRFM test broadcast in January 1992 essentially used the same cobbled equipment used by Paul, Ken and Enayat for WOW FM's initial test in May 1991. Being only a test broadcast, it was very practical to borrow equipment. Indeed the *total first budget for SWR Test No. 1 was a massive \$300*. Even the phone lines were "borrowed" from an adjacent child care centre which was not open at the time.

From 1992 until 1995, SWRFM borrowed its FM transmitting equipment from Rhode & Schwarz at Silverwater, who were eventually rewarded for their patience when a 30w exciter was finally purchased from them in 1997.

The main broadcast mixer for test one wasn't a broadcast mixer at all. It was an old "Cutec" cheapie 12 channel unbalanced mixer owned by Paul which had served as a PA unit since 1981. It had been so heavily modified over this time, as to be virtually unrecognizable.

But at least it worked. And work.. it did!

Music sources were: two turntables, themselves borrowed from home stereos and modified. A selection of old cassette decks and two very cheap 1988 vintage CD players from the local pawn shop, completed the sound sources. One of the CD players was still in use at SWRFM over six years later, long after newer and more expensive units had given up the ghost!



Above : The antenna is raised atop the roof of the Poppondetta Road Emerton site.



Above : A Photo actually taken just before the second test in May 1992—showing Enayat at the newly constructed Mk1 Mixer Panel.
Below : the original Cutec mixer used in the first (1992) test.



Microphones were cheap SM58 copies. A significant addition at this time was a Panasonic NVF65 Hifi VCR: It was used to both log on air content and to play out overnight programs recorded before the test. Hifi VCRs were a marvelous consumer product of the 1980s. They provided a readily available, cheap and easy way to record and play back programs in high quality audio of up to 8 hours in length. This was in a broadcasting sector where the only other recording mediums significantly used by anyone, were still the venerable Revox B77 reel to reel recorders and the equally awful 1/4 inch "cart machines" for spot playback. Both of these never saw service in *any* SWRFM studio whatsoever. *Thank gawd!*

Keeping all this under control on the FM band, was a "unique" compressor limiter which cost the princely sum of \$50. It was based on a Jaycar / Electronics Australia kit available at the time, which was simply called the "CD Compressor." It had originally been designed to allow enthusiasts to squash the dynamic range of a CD into something which could be easily recorded onto a cassette.

The original "SWR Compressor," constructed complete in a 1RU rack case folded up from bare sheet steel in a local fabricating shop, gave the station that lovely pumping sound that everyone salivated over. It more than admirably did the job on the first SWR test!

SWR's first antenna was entirely home built, from aluminium purchased from the local hardware store for \$10. Quickly dubbed the "Pocket Rocket" this 50 ohm, Ken Jones ultra simple vertical dipole design featured a feeder rod consisting of a piece of cable insulation shoved inside the middle of the rod. A piece of Coke can, folded around the reflector, was then screwed together allowing the rod to be moved up or down in order to tune the antenna. This contraption was then mounted onto a set of scrap poles "pinched from work," erected on the flat roof of the old Emerton Baptist Church building (now Church of Tonga) on Popondetta Rd.

"Pinched from work." Hmm. *Now there's a term that's always formed the back bone of SWRFM technical operations even today. Making use of equipment and materials disgarded and recovered from their "professional occupations" has been elevated to an art form by just about anyone who has ever been a member of the SWRFM Technical Committee.*

The "Pocket Rocket" became so successful that it's reputation proceeded it for many years. Similar designs were used for several other stations in the early '90s, most notably 2CCR FM in Baulkham Hills, now known as Alive 90.5. The Pocket Rocket remained SWRFM's principal radiator right up until 1994, when a more conventional, commercially made vertical folded dipole was purchased for the "more permanent" antenna installation erected at the Mt Druitt TAFE college.

One small exception, was a brief flirtation with *Mixed polarization* in October 1992. The results of this test however were found to be abysmal, when compared to the efficiency of the 'rocket. It was found that while mixed polarisation did somewhat slightly improve reception in areas close to the transmitter, fringe reception suffered significantly. SWRFM always considered that it was more important to get better fringe coverage than strive for stronger local quality. So SWR's FM transmissions have remained vertically polarised to this day, in a sector where it is otherwise considered the norm to use expensive, inefficient and difficult to tune "mixed polarization" antennas for FM radio broadcast.



The polarisation argument raged for many years. It still is one of those things that separates opinion between SWRFM and the rest of the broadcast sector. Working mainly in the two way radio world, Ken Jones could see little reason why the FM broadcast "norm" was to use mixed polarization antennas. It became obvious at an early stage to Ken that most receivers being used by the public to listen to SWRFM were predominantly located in moving cars or were portable "ghetto blasters" or 'walkmans." These had antennas very similar to those he used in the taxis and courier vans that Ken's networks worked with every weekday.

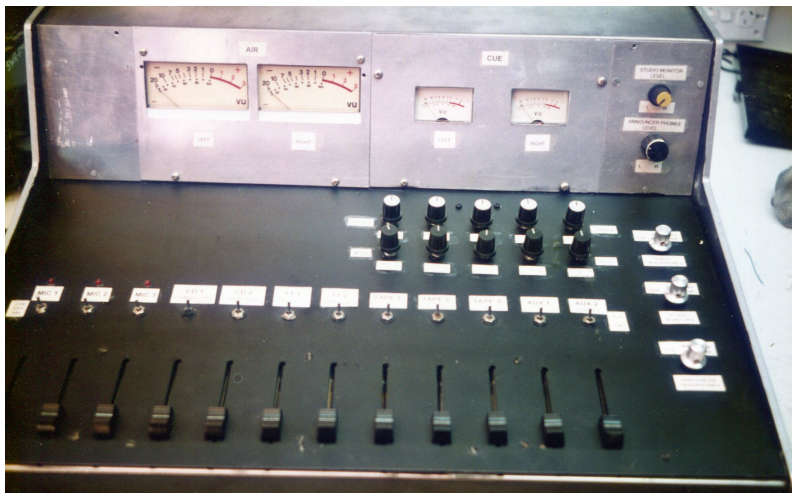
It had long been established by Ken that the most efficient way to serve low power mobile services was by using vertically polarised radiators. His transmitter sites were covered with them. In the commercial low power communications sector "mixed polarisation" was a virtual unknown. Ken saw little reason why this shouldn't work the same way for FM radio broadcast, which is basically the same, but with a wider bandwidth.

In the end, his observations and methodology have proven correct. SWRFM still retains a vertically polarised radiator system today, giving it vastly superior coverage in the Sydney Metropolitan area, when compared with other services using mixed polarization patterns but with similar or equal licensed output power to SWRFM.

The Mk1 Mixer

Soon after the inaugural January 1992 test, it became obvious that SWRFM would need to have its own proper broadcast desk. Examples suitable for use in community radio in the early '90s were far and few between. Very few locally manufactured options were available and they were all generally in the \$10k to \$20k price bracket. These prices were well out of reach of SWRFM.

Added to this, was the desire to produce a design that had an absolute minimum of controls on the front panel, enabling it to be operated by "just about anyone".



Above : The original Mk1 "Black Hole" Broadcast panel, and
Below : Under construction.

The idea of designing studio equipment so that users needed less training, was completely foreign to the broadcast sector. There were also a lot of other things SWRFM didn't need. Things like balanced inputs, since back in those days virtually all of the sound sources that would ever be connected to the studio would likely be of the unbalanced "domestic" variety using just the usual two RCA connectors on the back.

What SWR needed was more akin to a *glorified disco mixer*, rather than a low end broadcast desk. And so it was, that Ken and Paul decided to design and build, *completely from scratch*, a new broadcast desk, specifically for the SWRFM studio.

The Mk1 SWR mixer was designed around a junked frame, believed to be from an old TAFE college test desk. To this was added a new steel panel, folded and welded in a local friendly steel fabricating shop.



Underneath, Paul designed a series of circuits based around the ubiquitous NE5532 dual op. amp, so commonly in use in domestic and semi pro audio PA equipment around that time. The overall bus design also took influence from the old RME 500 series broadcast desks from the '70s. These included *two completely separate stereo busses*, something you certainly wouldn't find in any disco mixer.

A simplified monitoring scheme based on rotary switches was also used. Metering was included for both air and cue busses. Interestingly enough, one feature included on the Mk1 was a set of *bass and treble EQ controls* on some of the stereo channels. These were included, so that an operator could "appropriately compensate" for some of the poor quality playback mediums in regular use at the time. Specifically compact cassettes, which were widely used in those days for playing all station promos, sponsorship announcements and a good deal of the music!

Amazingly, the completed Mk1 desk was designed, built and ready for use by the May 1992 test. Not bad for four months! It was indicative of SWR's dedication to technical progress back in those early days. The Mk1 remained at the centre of SWR's test broadcasts until November 1994, when it was finally replaced by the CP12S or "Mk2" unit.

Unfortunately, due to an extreme lack of money and the need to raise some of it to pay for parts for the Mk2 unit, the Mk1 was eventually sold to Radio "Five O Plus" in Gosford, another aspirant group testing at the time who had previously "borrowed" the unit off SWRFM. They liked it so much, they decided it was perfect for their senior members to become familiar with. Sadly, like with lots of SWR stuff in the very early days, very little photographic record of the desk remains.

The 2nd and 3rd tests from Emerton

The second test in May 1992 was scheduled for nine days, so as to take in two weekends. This would increase the opportunity for special events. Test 3 took place in October and as documented in previous chapters, involved a change of frequency to 100.3 which in turn caused much grief to Ch. 9 Television viewers in the area. After this test, it was decided to only seek transmission sites outside residential areas. With all future at the Emerton site now extinguished, it was time to move on.

The March 1993 “Doonside High” Test

This short but challenging four day test was the most technically demanding event ever conducted by SWRFM in its entire history. It included :

- 1.) An FM transmitter site, established on the *roof of the Blacktown Council building in Flushcombe Rd.* The transmitter was housed in the lift motor room.
- 2.) An outside broadcast van studio, stationed at Blacktown Showgrounds, for the duration of the Blacktown Show that weekend. This was established in an O/B van borrowed from 2RRR. It came otherwise empty with no internal equipment, so everything had to be supplied.
- 3.) A second and completely functional studio, which was located in the Music department building of Doonside High School. At that time, Doonside High already had a functional recording studio. The radio broadcast studio was established within this facility.
- 4.) A very successful “SWR Dance Party,” held in Doonside High School hall on the Sunday night, broadcast live of course.

To facilitate this mammoth effort, a network of audio links between all of the sites was established. This included;

- *Separate UHF STL links* between both the Blacktown Showground and Doonside sites, back to the Council Chambers building using multiple equipments borrowed from Rhode & Schwartz. A remote control RF relay, controlled via a phone line at the Council building, was used to switch between the two incoming UHF feeders, which were otherwise pointing in different directions.
- A bi-directional *Crossbar audio* (mono 10k broadcast line) link between Doonside and the Showgrounds. This allowed audio from one site to be fed through to the other and thence to the relevant STL link in the event that either failed. It was also used to facilitate change over. *Note: for a definition of “Crossbar link” see the history chapter on SWRFM O/B’s).*
- Two temporary phone lines into the showground site. Three existing services at the school were also borrowed for the duration.

The Doonside High OB tested the technical team to its absolute limit. There was very little sleep over the four day duration! Never the less, the show went on. *All the scheduled programmes went to air.* While its long been recognized that the only thing driving this test was the need for certain people to prove to themselves that it could be done, it also stood as a very active step into the heart of Blacktown. It was the test that important people noticed.

Many new members also joined, after seeing and hearing of SWRFM for the first time during this landmark test. Quite a lot of egg ended up in the face of a number of well known Sydney commercial radio sector identities, who had spent considerable effort declaring to all of their peers that it could never be pulled off.

Other notable things from this period that have lived on at SWRFM include some of the “heritage” station promo recordings occasionally still heard today, such as the infamous Colleen Jones “Crash Promo.” This was pieced together at Doonside using their Alesis 8 track digital recorder. Others were created using a Tascam 4 track cassette unit over the same period.

The Whalan Tests

The first of the two Whalan Community Centre tests saw the transmitter located at the Prospect Electricity’s (now Endeavour Energy) depot site tower at Huntingwood.



One of only a very few photos in existence from the Whalan days, showing the make shift studio built in the chair store, with Paul and his elderly Nan producing a Christian music show.

The second transmitter location was originally going to be the roof of the Rooty Hill RSL resort, later moved to Mt Druitt TAFE (as better documented in the "History" chapter.)

The studio at Whalan was built in the hall's "chair store." This was the only appropriately sized room that could be found. Nobody seemed to be able to find the key to the supposed "manager's office" which would probably have been a better choice. Both tests suffered from *poor UHF STL paths and noisy signals*. Whalan was a low site.

In early days, the idea was thrown about by Council that they may turn over the entire Whalan site to SWRFM. Land lines would then be use to link to the TAFE site. However the October '93 test put an end to that, when security became a major issue and SWR chose to abandon the Whalan site.

The Greenhouse and The Mk2 Mixer Panel

The main entrance road to the Blacktown Olympic Precinct on Eastern Rd today, runs over a patch of land once occupied by SWRFM's third studio site: *the "Greenhouse"*.

SWRFM occupied part of, and later all of, this building from March 1994 to October 1999. Audio was linked back to the TAFE transmitter site via land lines and then later to the "Space Probe" transmitter site via STL.

Whilst initially there was a lot of progress and activity constructing "the Greenhouse" studio, by 1997 it had become clearly known that the building had a limited future and would almost certainly be demolished to make way for the Olympic precinct. Once that salvo was delivered by Council in March 1997, all development stopped. *Cold. DEAD!*

Imagine a century old weatherboard and asbestos sheet wood frame house. Inside, is a partially completed studio and foyer. Sections of wall and a temporary bit of wood which basically became the "tech area" complete the space. Now, imagine that suddenly nobody ever cleaned this house anymore. Anything that ever broke or needed fixing was either left broken if it's function was not absolutely critical to broadcasting, or fixed using the quickest, cheapest, roughest and most bodgy sticky tape and glue means possible. Now imagine that this house, and the studio that was inside it, remained this way in use, for *two and a half more years* before another site was finally found for SWRFM to move into.

You don't have to imagine. Because it DID happen. The SWRFM Greenhouse quickly became the *filthiest and most dangerous and unhealthy broadcast environment known in radio history*. It finally met it's end, one fateful Friday night late October '99, when Paul called a "demolition show." The studio and insides of the house were literally smashed to pieces and destroyed on air during the dying hours of the last broadcast. Smashed walls, collapsed ceilings, glass and dust everywhere, not a single piece of plaster or glass left untouched. Within a few more hours, the remaining functional equipment was stripped out and transported to the new Showgrounds site. Two days afterwards, the bulldozers rolled and by the next day there was just a patch of dead grass where the Greenhouse once stood. *Audio and video evidence of this event.. Remains!*

One important technical development which did take place at the start of the Greenhouse era however, was the *development and construction of SWRFM's "Mk2" broadcast desk*. This unit was a far more serious attempt at professional design than the Mk1 had been. It still essentially subscribed to the original brief of developing a full function broadcast style panel, but using standard unbalanced consumer style electronics.

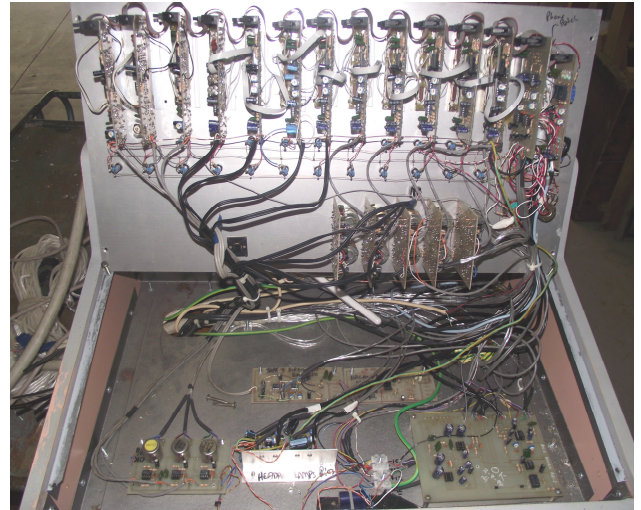
It too was designed and built entirely from scratch. But this time, with a view to possibly entering production if demand warranted it. In 1995, the commercially costed version came in at around \$7.5k. Still around \$4k less than the nearest competition. Still very much a practical option for deployment in the wider community radio sector.



Above : The Greenhouse. Ironically, this photo was taken literally one day before bulldozers arrived to flatten the site in 1999.

Below : Just two days beforehand and with the studio still live to air, a "Demolition party" is held where in classic Westie style, frustrated youngsters take out their revenge destroying mostly their own work only three years after it was done.





Above : The CP12S, photographed in around 1996 at the Greenhouse, and (right) Inside.

Designated the CP12S, this 12 channel unit served SWRFM as it's main broadcast panel between December 1994 and June 2006. A *whopping 12 years!* Albeit with several rebuilds over that time. The unit remains permanently preserved today in the Tennyson Technology Muuseum.

By 1996 however, the market for broadcast mixing panels in Australia had rapidly changed. Several new aggressive manufacturers such as Poul Kirk's *Elan Audio* and importer Jands with their *Soundcraft* product, finally bought "entry level" products onto the market.

These chimed in at around the same price as the SWRFM Mk2 units cost to build, but with vastly superior specification. Indeed SWRFM's next desk, in 2006, was a Soundcraft. It cost about the same as the old SWR Mk2 unit cost to build but used far better components. The end of the CP12S finally came when the manufacturer of the original slider pots ceased production and replacement parts became impossible to find.

Before this tide changed however, in 1995 SWRFM engineers did manufacture and sell two other Mk2 units, to a slightly different design specification, to another Sydney sub metro broadcaster: *2MWM on Sydney's Northern Beaches*. Again these two units saw *well over 10 years' service* at MWM before they were finally upgraded in the late 'noughties.

STL's and Transmitters in the late '90s

From early 1995 to around 1999, SWR's transmitter setup consisted of an ex. Demo, 25w CTE Rhode & Schwartz exciter, coupled to an old 75w, 1970's era American manufacture "QEI" FM power amplifier. This had been a "freebie" obtained broken from somewhere, then subsequently repaired by Ken.

The Telstra land lines that linked the Greenhouse to the TAFE college were originally just a raw 7km pair of phone lines, which had been jumpered across the MDF at Rooty Hill Exchange. An old hifi amp and a one octave EQ was coupled to a pair of 600 ohm transformers at the Greenhouse (transmit) end, giving a high shelf 12dB boost at around 6kHz. There was no EQ inserted at the TAFE (receive) end.

As was customary for analog lines at the time, all stereo coding and pilot tone injection was done at the transmitter end. Despite the fact that the system remained this way for 12 months, it was grossly inadequate. Eventually a friendly Telstra tech "covertly" re jumpered the lines at Rooty Hill, through a pair of standard line amplifier EQ's at the exchange. No records were recorded. And so no charges were levied...haha.



Above : The collection of equipment atop the Space Probe in 1997. The 1RU unit is a gain block to match the MPX output of the RL900 to the input of the CTE. The squelch circuit on the RL900 was modified, so as to switch the equipment on and off whenever a carrier was detected from the Greenhouse, usually about 10:30pm every Friday night.



It was necessary to set the EQ amps at Rooty Hill to an almighty 46dB gain at 8kHz before any kind of frequency response even hoping to approximate “flat,” could be measured at the TAFE end! Most of this was blamed on a very old, paper insulated phone cable that ran under Rooty Hill Road South for about 1km. On several occasions this cable was also damaged, putting the station off the air for several weekends at a time.

The antenna used at TAFE was initially a single folded dipole. This was later upgraded in 1996 to a pair of dipoles on the roof of Block C, which had originally been designed as an antenna test facility. With the move to the Wonderland Space Probe site, a change of antenna was required. This was because management did not want a “big antenna hanging off the probe,” making it look like a tower rather than of it’s intended “spacey” look. A ground plane co linear was thus used.

With the move to Space Probe, a wireless studio to transmitter solution would definitely be required. An old ex Telstra modified AWA RL900, 850MHz, wide band transmitter and receiver pair was obtained. The crystals were changed and the units tuned up and rigged as an STL to get the signal from the Greenhouse to the Probe.

While this worked quite well, aligning the whole set up was a complete pain. The AWA unit was originally intended to couple with telephone equipment. It was not level referenced in a way that allowed it to easily be used with broadcast stereo coders using an MPX signal. It was constantly necessary to change the settings. These 1970’s vintage AWA units had previously been used for linking country phone exchanges with very wide (2MHz) links, onto which around 30 analog telephone voice channels would then be multiplexed.

The Space Probe transmitter equipment was basically dumped on the floor at the end of one of the three narrow steel service walkways in the hat at the top of the probe. It was powered from a work platform power point on an extension lead. The entire hat was open to the air underneath. Wind, cold, damp and moist air and dust was commonplace. This inevitably led to the circuit boards and terminals in the equipment corroding. This set off a series of failures which more often than not, meant that either the PA or Exciter would fail, either leaving SWRFM with a tiny signal, or *none at all*.

Of course this would never be found out.. until around 10pm, the Friday night before a normal weekend test. It would immediately write off any broadcasting on the following Saturday, because access to the probe could never be made until after 10pm after the theme park closed. Even then, this would only happen if someone from SWRFM was available to actually drive there, haggle with the guards at the gate house to let them in and find the keys to the probe and get access to it, climb up and take a look. In many cases they weren’t, meaning the station would be off air for multiple weekends at a time.



Above : The harsh reality of gaining access to the Space Probe—the hard way—an activity which became far too common.

Midnight Saturday 75m high climbs, *straight up a grease covered ladder inside a freezing cold steel tube* with a 12kg, 3RU piece of rack equipment and tools strapped around your neck, smashing into you as you climbed, probably had something to do with the lack of volunteers. In 1997, SWRFM was off air more than it was on, due mainly to the constant technical failures at the top of Space Probe.

An attempt was eventually made to “fix up” the temporary way in which the equipment had been initially installed at the top of the probe. This “attempt” involved hauling a 12RU steel rack up the *outside* of the probe, in the *middle of the night*, on a *120m rope* with the *wind howling at a rate of knots* and with constant threats of the equipment being smashed against the outside of the probe. The rope thashed around, pulling the payload between 20m away and then suddenly back onto the structure. It was an all night affair with a 4am finish. Not a good night for an OH&S inspection.. which fortunately did not take place!

And it was all in vain. As covered elsewhere, SWRFM abandoned the Space Probe in 1998.

At this time, Enayat also purchased an Aphex “FM Pro 2020.” This was a professional grade combined broadcast audio processor and stereo coder unit which finally gave SWRFM “that sound.” Unlike “Optimod” processors available in the 1990s, which employed low sample rates and tended to sound harsh, the FM Pro still employed a 100% analog signal path but was fully digitally controlled. It solved the headaches that had plagued SWR for many years beforehand, trying to align the many separate components previously needed to carry out these important tasks. The FMPro was eventually paid for many years later. It was replaced by Optimod digital equipment in 2010, after 12 years’ service.



First transmitters at the Horsley Park site

The Comsite / Vertel site at Horsley Park was tested in late 1998 with excellent success. In 1999, Enayat purchased a new 250w Transmitter. The old, life expired gear from Space probe could finally be put to rest. The two element vertical folded dipole array from the TAFE college was modified and mounted on the side of the Horsley Park tower. With far better access and a controlled atmosphere inside the transmitter hut, the reliability problems that had plagued SWRFM were now finally gone. A long term contract was signed shortly afterwards to occupy the site permanently. This is where SWR's transmitting facility remains today.

However those southerly buster winds for which Western Sydney is famous, would keep blowing and slowly rotating the un stayed and temporary array around to the east. This didn't really affect the FM broadcast much, but would regularly put the STL receive antenna out of alignment with the Showground site. A temporary receive was thus mounted on the transmitter hut roof itself from about 2001, which at least got things going again when the other receive antenna was out of alignment.

A number of frequency tests were going on in Sydney around 2000, as a result of the ACMA LAP process. One of these involved 2VTR (Hawkesbury) testing 99.5MHz for a few months. To cut a long story short, a complaint was received that SWRFM was interfering with the Hawkesbury test. This set us off on a wild goose chase as to how this could be happening. No doubt about it—the interference was definitely there—and as a matter of fact was also interfering with a number of other Sydney stations, which nobody had either noticed or complained about yet!

After several weekends of pulling hair out, pouring over IFR testers and trying just about every combination of equipment conceivable, it was determined that the FM transmitter was definitely not at fault. This left the old AWA STL as a prime target. It was discovered that using a different STL receiver removed the interference.

However it was eventually determined that it was actually the *AWA STL transmitter at Blacktown* that had gone spurious. It *had always been so. And nobody had noticed!* It was splattering all sorts of unwanted junk all across the UHF band, several hundred kHz above and below it's fundamental frequency of 849.4MHz. The STL receiver bandwidth of course was so wide, that all this crap was just being received and down converted back into base band MPX. This would then be shoved into whatever box came next—in this case the new FM transmitter!

This had never been discovered previously because the old 25w transmitter had an internal 56kHz filter at it's input which filtered out all this junk. However the new 250w unit had a far more open front end, intended to allow for things like sub carriers to be added. All this MPX junk was sending it bonkers, splattering no less than six places on the FM band.. including a nice cracking fat carrier.. *right on top of commercial broadcaster 2MMM! Hmm. Not good!*

An immediate fix was to go "mono" and insert an EQ after the STL receiver to filter out everything above 12kHz. Within a month, Ken had built a separate "bolt on" 56kHz filter for this task, allowing SWR to go back to Stereo but this time without the splatter. In 2001, SWRFM purchased a new Fordray 800MHz STL to replace the old AWA units. This rendered the filter redundant and solved the problem permanently. The Fordray unit remained in service until 2012. SWR's STL equipment has been upgraded at least twice more since then.

The Move to Blacktown Showgrounds

The vacant Simpson Pavilion site had been suggested as a possible site at the "friends" meetings as far back as 1994. There was never the political will to make it happen though, until it became clear that SWRFM was smack bang in the middle of something Blacktown wanted badly—the Olympic site. Construction could not start until SWRFM moved out. It was always going to be a last minute thing for when finally shoved.

The Simpson Pavilion had no infrastructure whatsoever. Power and phone needed to be run considerable distance. However the biggest problem was getting height for the STL antenna, to link the broadcast back to Horsley Park.



Early days of construction of SWR's studio at the Blacktown Showgrounds, which would variously remain in service through a few upgrades right up to 2022.

On the site, there were two tall 18m lighting towers, but these were both more than 70m from the Simpson Pavilion. Directly above the pavilion, is a 33kV railway power line This kind of immediately wrote off any ideas of placing a tall telescopic mast on the building itself!

Trenches were dug and conduits run to the nearest light pole. A large and secure steel box, *pinched from work Of Course*, was then installed to house the UHF transmitter. There were problems with this though. One was the hum problem caused by the unbalanced MPX transmission line over the 70 metres. This was temporarily solved by floating chassis earths and providing a wide band isolation transformer at one end. The other problem was a return to the same problems that plagued space probe... Cold, hot and damp conditions in the box. This later led to equipment failures.

The construction of the studio proceed at a blistering pace, mostly thanks to Ken Jones. The remainder of the technical equipment was installed very quickly over a single weekend following the “destruction” of the Greenhouse. It all worked. But again, much of it was very short term. It would need a complete rethink once the station was finally licensed.

Licensed Broadcasting Begins

After the final management upheaval of SWRFM in late 2001, Enayat took his transmitter (which had not been fully paid for) and left. The new SWR management decided that rather than pay him out for the remaining \$5k needed to keep that one, it would be cheaper to buy a new 100w Fordray FM transmitter, a home grown unit made in Orange, NSW.

At around \$2.5k it made better sense than keeping Enayat’s unit. This gave the station the means to conduct it’s final series of test transmissions in 2002 and through the first half of 2003. *This particular unit still works, more than 25 years later, and is still used as a backup transmitter!*



Mayor Leo Kelly opens SWRFM on 27th September 2003. This was a brief moment when the 70kPh winds abated on this day.

During 2002, the main SWRFM studio at Blacktown underwent the first of several rebuilds it would receive since it’s initial construction. This first rebuild was an attempt to make permanent much of the temporary work that had been hurriedly done during the move in 1999. It was also an opportunity for the new management to slap a coat of paint over everything and make it clear to all that the guard had changed at SWR. The old CP12S (Mk2) panel was given a complete rebuild, it’s first since 1995. This studio rebuild would extend the life of the studio for another four years, which it amply did.

By the time the license was finally granted in 2003, the new station management had not only paid off Enayat for the FM Processor, but had also amassed considerable funds to assist the process of kicking the station into it’s licensed status. A complete renovation of the RF facilities at both Blacktown and Horsley Park was carried out at a cost of around \$20k, prior to the commencement of licensed broadcasting on 23rd September of that year. *The four element folded dipole array now at Horsley Park hails from this era. It has now been in continuous service for nearly 25 years. A recent photographic survey of the array and cabling in 2021 has revealed it is still in good condition. Do it once, Do It Right!*

Below : Tech Racks Circa 2004.

In 2004, the station received a CBF grant for \$7k. Coupled with another \$5k of SWR’s own funds they purchased a new Soundcraft 12 channel RM100 broadcast desk. It sat in it’s box for *another two years*, before being finally installed in the newly rebuilt for a second time, 2006 Studio One. This rebuild would take SWR into the next 16 years.

The STL transmitter was moved from the pole box into the controlled atmosphere of the SWR studio building where it belonged. The installation of a new 80m heliax cable was run through the existing 50mm conduit to the light pole. New heliax cables were also run to both of the antennas on the Horsley Park tower. The transmitter rack was also rearranged and a standby power supply added.



The existing two loop vertical dipole array was removed, the two existing antennas renovated and then coupled with two new ones to create a large, four element radiator. This was then securely fixed to the tower using a crane,



Above : The studio gets it's second rebuild in 2006.
 Left : The final FM radiating antenna at Horsley Park, still in service today.

so there would be no more of that “wandering” in the wind. The STL receive antenna was also restored and locked off. This antenna system remains in place serving SWRFM today.

In 2007, a new SRK 100w exciter and 300w PA (Power Amplifier) was purchased to replace the Fordray 100w unit which remained as a standby transmitter. A 1.5kW sine wave inverter was installed along with gel cell battery packs to give the station about 2 hours of backup time in the event of a power failure. A failover signal source was also installed.

This SRK FM transmitters would variously remain in service at SWR for the following 18 years! The FMA100 was replaced by a new 500w digital Nortel unit in late 2025. The UHF STL equipment was upgraded in 2014 and remains in service. The UPS (Uninterruptible power supply) at Horsley Park was replaced in 2014 and again in late 2025.

In true SWR “Murphy’s Law” style, the new Nortel unit had been purchased in 2024. It sat unused in its box for more than 18 months while the technical team tried to clear time to perform the upgrade. When a date was finally set, the FMA100 began to intermittently *fail*. *Just five days before* the proposed cutover date! A “pre cutover install” was hurriedly performed, with the new unit sitting on the floor for a week before the work could properly be finished.

The SWRFM technical area underwent it's first slow and painful reconstruction programme in 2008 / 09. It's all about doing surgery on a living station and carefully trying not to lose the patient!

Computing Technology at SWRFM

Computer technology entered SWRFM’s doors considerably earlier than at any other community radio station. In 1997 the shenanigans began. A 386 IBM machine, running Novell and equipped with a “gigantic” 2GB SCSI hard drive, formed SWRFM’s first “Server” at the Greenhouse. A sister 486 machine running Windows 95 and a very early version of Winamp, linked to the server via 10Base2 coaxial Ethernet. The components for the complete set up of course had all been “*pinched from work*.” The only person who knew how it *did* work, was Enayat’s brother. It led to it being out of action many times.

It stored all of the SWRFM sponsorship announcements and promos in WAV format, long before mp3 hit the scene. It lasted about 2 years. It showed the way for the future though, finally banishing those cassettes to the bin where they belonged. The ‘90s computing experiment ended though, briefly overtaken by the use of consumer grade “mini disk” technology.

Computers didn’t enter SWRFM’s doors again until 2000, when a member provided an early Pentium machine in the studio running Windows 98 with Winamp. It was loaded with a motley collection of recent and past hits in a very early form of the SWRFM “music collection”. Again, this unit showed the way.



However it also showed how NOT to run computers in a community radio station!

What was needed, was an idiot proof solution which displayed a single screen and looked as much like a CD player as possible. Today, the term we use for this is "Live Assist." It needed to be so simple, that it would be impossible for any wayward broadcaster to close or minimise the window and start fiddling with the operating system behind it. It also needed good search capabilities.

After a short while, Paul found what SWRFM had been looking for. A quaint little Windows 98 program which sat on the machine as a front door to Winamp. The program actually ran four instances of Winamp behind itself. Its name? : **BAPro**.

This piece of el cheapo software, produced by a tiny company in Europe, had *everything SWR needed*. In particular, it had a very powerful search function, which could search across multiple folders and drives. To the user, this still appeared as if the collection was just one single list.

That's because that is how BAPro worked. It created a complete "look up" database list of all the files available to it by file name (not meta tag) when it first opened. It then searches this look up table every time it needs to search for a song or file.

So powerful was this search function and setup, that over the following *ten years and* long after the original company that made it had gone bust, SWR was still using BAPro as their main "Live Assist" software.

Initially getting it to run 2000 wasn't without headaches. For security, SWRFM needed to do it in such a way that the files were stored somewhere else, i.e. over a network to a server. This way permissions could be set to prevent broadcasters from tampering with them. Another Windows 98 machine was installed in the tech area. This then became SWR's real first "server," with two 40Gb drives holding the now much augmented SWRFM song collection. Back then, the two machines were linked with just a single crossover 10BaseT network connection.

BAPro however, didn't like doing this. It would freak out and crash whenever it was closed and then reopened, losing track of all the files. Paul chewed over this for months. He even went so far as to contact the makers, who in reply declared that they couldn't believe that it even worked at all on a network. As such.. SWR was on its own!

Paul eventually discovered that each time BAPro closed, it wrote its *entire database* to it's own local configuration file before it closed. By accident, he then found that if BAPro were to be prevented from doing this, then the program was subsequently forced to completely rebuild it's look up table every time it restarted. The trick? He deliberately set an invalid path in BAPro for the configuration file. Ironically.. this *worked perfectly!* It meant that any changes to the server were automatically updated, every time the program was restarted each morning.

With a complete system that now worked and was virtually bullet proof, it was installed and began service giving SWRFM a powerful live assist system years ahead of others available at the time. For virtually nicks! It remained the mainstay of SWRFM's Live Assist for the following *nine years*. Getting BAPro to continue to work in later environments under Windows XP, wasn't easy either. A special "guttled" version of Win XP, created by John and David Gardner in 2007, was used during BAPro's final years of service.

Some "digital irony" from this era are the server's name and folder arrangements. Even TODAY, in SWR's ultra modern digital studios, *SWR's main file server is STILL called "The Server."* It's the same name given to that original machine in 2000! *Everything is still stored under folders: "SWR Music C, SWR Music D and SWR Music E".* These were the names.. originally given to those three 20GB drives back in 2000 on that first machine. Of course the drives are just a little bit bigger than that nowadays.

In 2010, it simply became impossible to keep BAPro operating. In any case, it was time for the station to move to a more conventional digital playback solution which could generate logs, run the station and schedule sponsorship announcement when nobody was home. Fortunately by this time, the industry had caught up and was able to offer SWR some solutions. The chosen weapon was a New Zealand sourced package known as "*Station Playlist*" which some community stations still use today. "Station Playlist" would go on to form the backbone of SWR's digital operation *for the next 12 years*, finally being replaced with UK sourced "*Payout One*" in 2023 when the current fully digital studios were commissioned.



Above : Matt Reid & Carlo Fornasari, early days, shortly after reconstruction of studio in 2002.

Since licensing in 2003, SWRFM's computing capability steadily became an increasingly important part of technical operations. The system has always been maintained by volunteers with occasional contract work from local providers. By 2010, capability had been extended to:

- A 2TB Linux based "Central Server." The master music files were stored locally on individual machines and routinely updated with the reference data on this server, which also handled all network logons and permissions. This server also handled all broadcaster files.
- A Windows based "Active Server." This would carry out routine regular network operations, such as FTP download of news files via the internet and preparation of log files for Studio Playlist.
- A dedicated Windows based audio logging machine which logged off air broadcasts in one hour increments and saved them as 128k MP3 files.
- A 4TB Linux based "NAS" server, which handled all backup functions and archiving.
- A Windows based machine serving the station's Shoutcast (broadcast audio) stream to the internet;
- Two Windows based machines (mirror copies of each other) running "Station Playlist"
- Two Windows machines, at that time still running the aforementioned incumbent "BAPro" live assist system;
- A Windows machine dedicated to the station's PreSonus 16 track recording system;
- A collection of 6 to 8 of the usual Windows machines used for internet access, general administration and production work plus two additional machines within the outside broadcast van, one of which normally also hosted a 3G wireless internet service for use when the van is off site;
- Two ADSL2+ internet services derived from different ISP's. These operated via a dual port router, which shared traffic between the services, acting accordingly in the event that one service failed. One of these services was configured as an Annex M uplink, which provided sufficient bandwidth for the station's audio internet stream;
- 2 x 3kVa uninterruptible power supplies with additional battery packs.

By 2010, computing formed a major component of SWRFM's technical capability. This was at a time when most commercial broadcasters were still dumber along with 15 year old technology in their racks, running MP2 compression and still using expensive, outdated and slow 64kb/s ISDN links. Most of SWRFM's innovation both then and now, happens in the digital work space.

Throughout the 'twothousandteens, SWRFM's technical committee came under a lot of pressure to upgrade SWR's analog signal chain to digital and introduce digital mixers into the studios. However none of the members of the committee could see the point in doing this, in an environment where the analog wires would just be replaced with AES digital ones. With AES digital, the spaghetti network would just remain as it was before, but with another added level of frustration of not being able to easily trace faults when things didn't work.



Above : The first "Studio 2" (which took three years of slow construction to complete) was a neat but temporary affair using a rebuilt Soundcraft desk recovered from another station.

"What we need is to have all this stuff in a box, not spread out all over the station".

"Ideally, a mixer panel should just be a control surface. It should have just a network jack on the back for telling the computers what to do. It shouldn't have all these stupid rows and rows of AES digital connectors where the analog ones used to be". However unfortunately this time it would be a bit beyond the capability of SWR to "roll it's own" solution from scratch.

"We knew exactly what we wanted. However there were no vendors out there offering solutions that didn't involve still using 1990's AES technology which by the mid teens, was already approaching 20 years old."

SWR would have to wait. Until new technology existed, and vendors were ready to sell. This was kind of OK because the SWR 2006 studio rebuild really was an excellent analogue implementation. The equipment used in there was robust. The design was sound. There wouldn't be a need to update in there for quite a few years yet.

SWR were about to do something they had done before: *leap frog a technology.* *SWR has never used AES in its digital implementations.*

It never will.

Meanwhile, bubbling slowly away in the live performance space, a new way of getting digital audio around live performance venues was emerging: **DANTE**.

It wouldn't be long until *recording studios* stood up and took notice. By the close of the second decade in 2019, a flood of new products were entering the professional audio market. They all had this new "DANTE" sticker on the back, along with an RJ45 network plug. And.. *It was affordable!*

"This is perfect." We can *design a complete radio studio from microphone to transmitter* and have all of the audio exist entirely in ethernet. It can be instantly patched at will. It can be totally remote controlled from anywhere. No more AES. No more analogue. No more splitters. No more patch bays. No more multi cores. All of the inputs and outputs to the studio desks can be instantly patched through Dante, to anywhere they need to go.

The seeds had finally been sewn for the *new, fully digital SWR*.

And just as SWR had done multiple times over many decades so far.. they did it again. *Created something the rest of the broadcast industry had never seen before. A digital broadcast studio held together entirely with DANTE.*

Story Continues in "SWR—The New Era"



Above : Studio 1 in its final days before demolition in 2022.

Below : The wear and tear on the Soundcraft desk after 16 years of continuous service, is clearly evident. Time had finally caught up with SWR.

The time had come for a new beginning.

