VINTAGE RADIO

By Associate Professor Graham Parslow

The 1956 Admiral 5ACW valve-based clock radio

The Admiral 5ACW differs in its shape and technology from other radios made by major Australian brands in the 1950s. Plastic-case mantel radios of the time typically had rounded edges. The rectangular simplicity of this radio was to become the norm in the 1960s.

The most radical feature of the 5ACW is the incorporation of a printed circuit board (PCB) that hosts most of the major components.

One of those components is an encapsulated package with seven in-line pins connecting all components between the audio preamplifier and output pentode; it's the orange package next to the 6AQ5 valve.

This radio incorporates a synchronous clock driven by the 50Hz mains that controls timed on-off and snooze. The other front panel knobs are for volume adjustment and tuning.

The addition of a clock made this radio especially welcome in kitchens and bedrooms. In bedrooms of the time there were few power outlets installed; probably only one for a bedside lamp. To avoid using a double adapter, this radio incorporated an unswitched outlet on the rear panel, so a lamp could be daisy-chained.

The gold-accented front panel is a separate moulding, distinct from the main case, and acts as a speaker grille for the 4-inch MSP speaker mounted in its centre.

The same radio was also offered without a clock. The alternative front panel covered the clock area while the speaker remained in the centre. The clockless radio does not include a mains socket at the rear; a blanking plate covers the hole.

This radio was available in various colours: ivory (shown here), primrose, grey, burgundy, beige and tan.

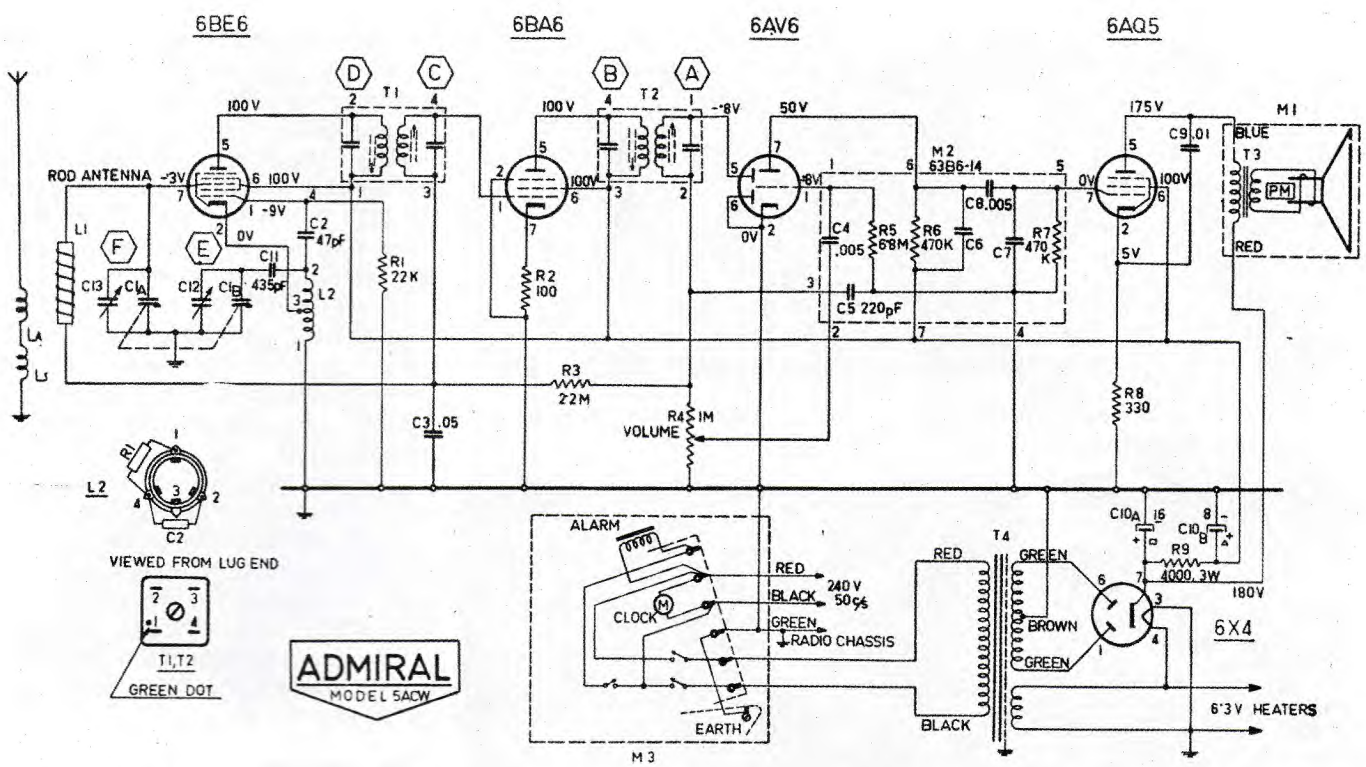
It's highly advanced in some respects, yet conforms to old practices in other areas. The stamped metal chassis is minimalist but still serves as a base for all major components in the way that radios of the 1930s did.

By the 1960s, most radios (by then, transistor based) had a circuit board capable of supporting the ferrite rod and tuning capacitor so that no metal chassis was required.

Circuit details

By 1956, the majority of mantel radios included a ferrite rod aerial. This one has a 10-inch long ferrite rod and it provides excellent sensitivity for local stations. An external antenna and Earth connection are provided using coils wound over the ferrite rod.

The circuit diagram shows two aerial



windings, and these are wound on top of each other, separated by tape. The tuning circuit is a standard superhet configuration using a 6BE6 valve as the mixer-oscillator (converter). The oscillator coil (Hartley type) is mounted on the circuit board adjacent to the 6BE6 valve.

Resistor R1 (22kΩ) and capacitor C2 (47pF) are mounted on the oscillator coil pins rather than on the circuit board. Both IF transformers (T1 and T2) are shielded in standard-size cans, rather than a miniaturised type that was available at the time. This also applies to the two-gang tuning capacitor, which is a traditional full-size type.

The set uses an intermediate frequency of 455kHz. The 6BA6 IF amplifier valve is a common type for this application. It was released in 1946 and is described as a remote cut-off pentode for RF amplification. Remote cut-off refers to the smooth change in gain when grid bias is altered by an AGC circuit.

In this radio, pin 5 of the 6AV6 valve provides the AGC feed to both the 6BE6 and 6BA6 grids via R3 (2.2MΩ), then via the antenna coil for the 6BE6 or T1 for the 6BA6.

The 6AV6 dual-diode/triode is another venerable valve, released in 1947 and intended for use as an audio preamplifier. Pin 5 of the 6AV6 (a diode) acts as a detector and audio is passed to the 6AV6 grid via 1MΩ potentiometer R4, the volume control.

Pin 7 of the 6AV6 (the plate) feeds into pin 6 of a 7-pin package encapsulating the passive components between the audio preamplifier and the 6AQ5 output pentode.

The author has not seen such a package in other Australian radios before the 1960s. Admiral Australia was fortunate to be a subsidiary of a US parent company at the forefront of advances in component fabrication (see history box).

Audio is fed to a 4-inch speaker via an output transformer with a primary impedance of 16kΩ to match the 6AQ5 pentode. The 6AQ5 is a repackaging of the common octal-based 6V6 valve, released in 1936.

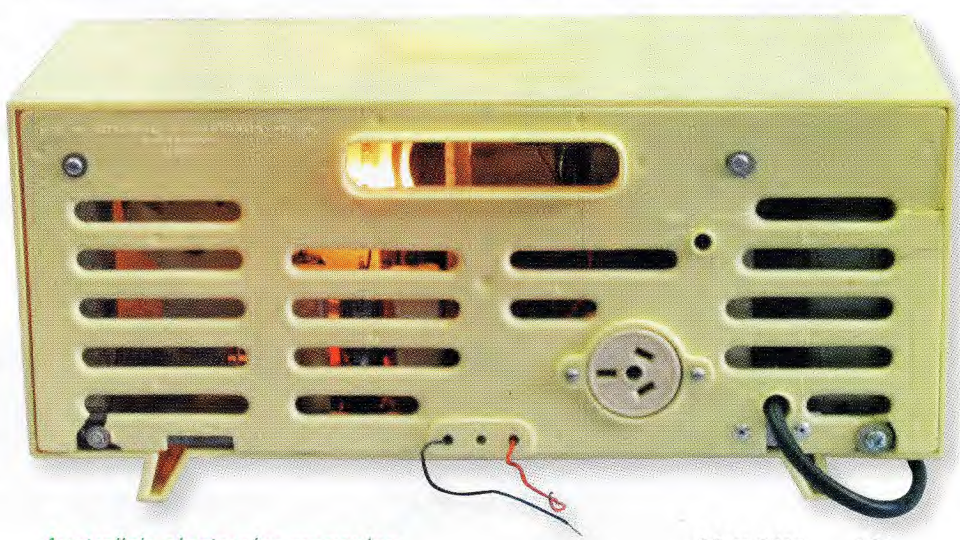
The HT power supply produces 180V DC. This is the value given on the circuit diagram, and I measured my radio as producing very close to this.

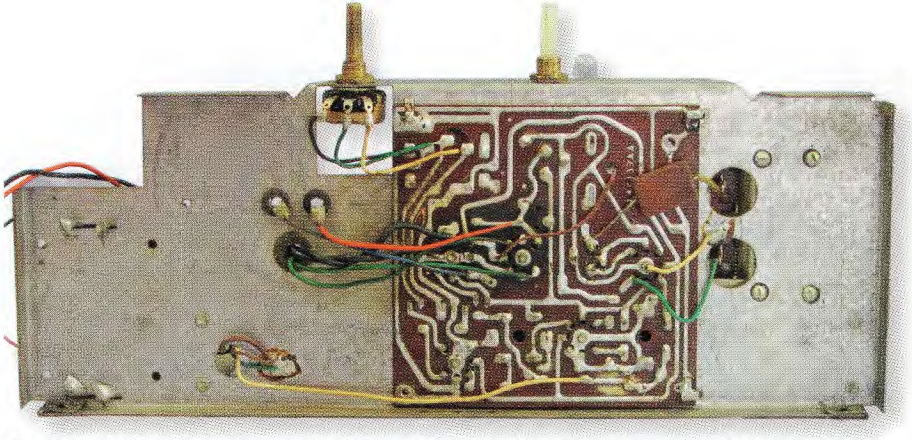
Other measured voltages were slightly above the values indicated on the circuit diagram, probably due to using a DMM rather than an analog meter, which would have a higher burden current.

Physical construction

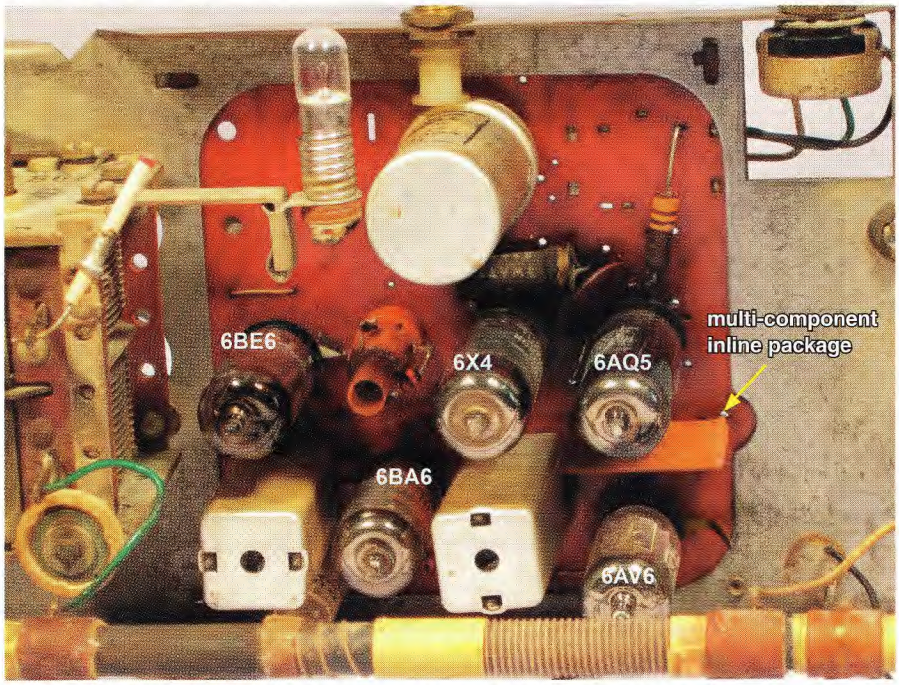
All the miniature valves in this radio are 7-pin types, so all valves use the same base to mount on the circuit board.

The HT filter capacitor mounting arrangement is simplified by having both electrolytics (16µF & 8µF) in a single





The Admiral 5ACW was one of the earliest radios to use a printed circuit board. Note the scorching around the base of the 6X4 rectifier valve.



The multi-component inline package ("couplate"; M2), visible above, contains a few resistors and capacitors in a 7-pin package. It is shown in the dashed box on the circuit diagram between the 6AV6 and 6AQ5 valves.

can with connecting pins at the base.

The phenolic circuit board is of minimal size, so the five valves form a tight cluster; hence, they represent a focal source of heat as they dissipate most of the 27W that this radio consumes at 230V AC. A heat-stress crack had formed in the case of this radio above the circuit board as a result.

Valve-based circuit boards often show scorching of the phenolic material around valve bases. This one was slightly stressed around the 6X4 rectifier base and the adjacent 6AQ5 output valve.

The circuit board soldering was obviously done by hand, but neatly.

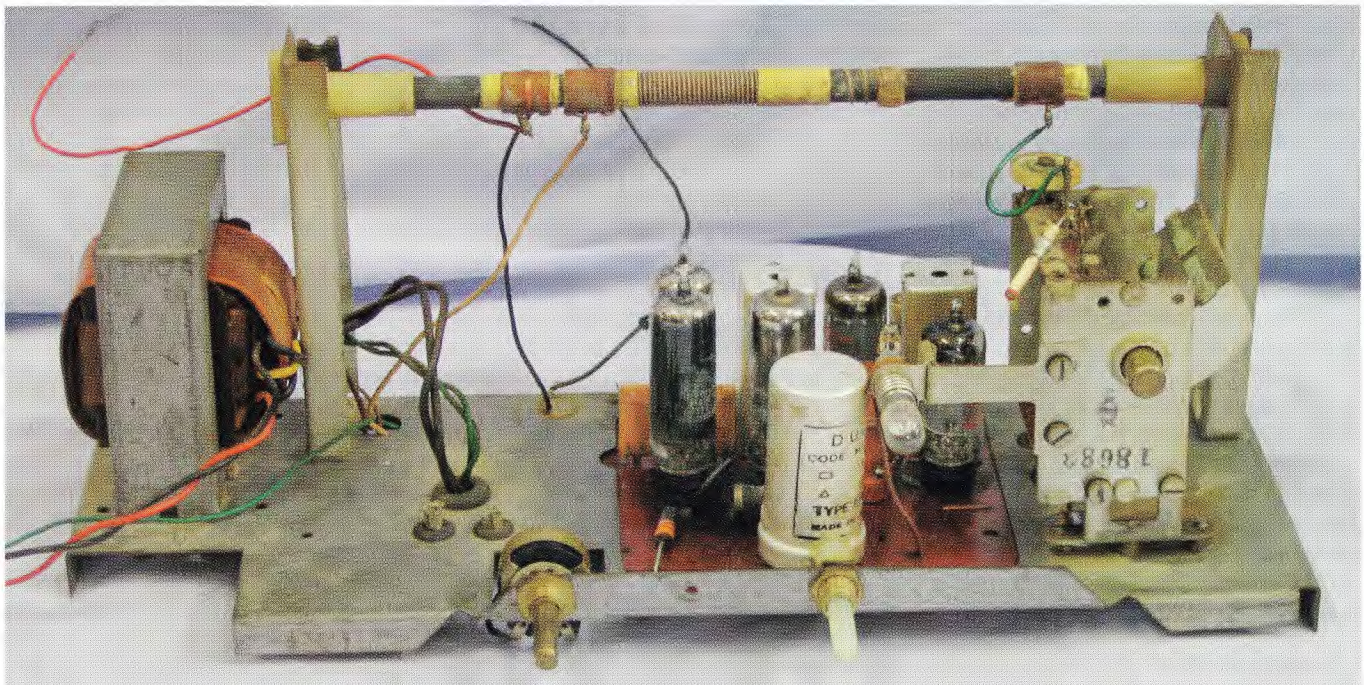
In the context of the pioneering use of circuit boards, the contemporary Admiral transistor radio model 8K2 is also worthy of mentioning. All other Australian transistor radio manufacturers through the 1950s still used point-to-point wiring.

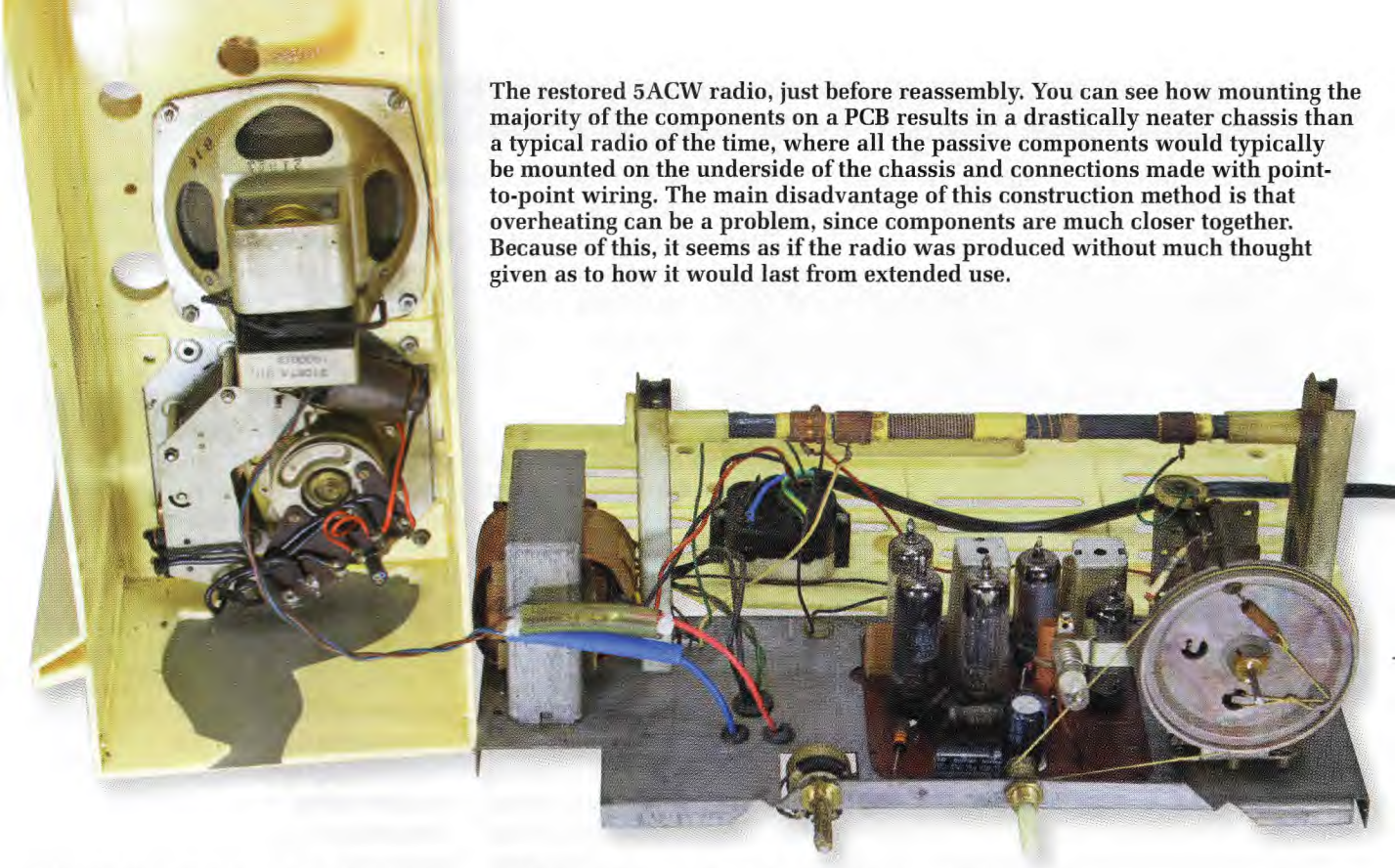
The speaker

Admiral sourced their speakers from AWA who branded their products as Manufacturers Specialty Products (MSP), ostensibly to obscure the source as a competing radio company.

The speaker has a round cone, but the frame is pressed with wide flanges for the mounting screws. The type of permanent magnet used here would soon disappear as the advantages of ferrite magnets became evident.

Despite the speaker's limitations, the radio has excellent sound for a compact mantel type. The speaker has flying leads terminating in plugs that





The restored 5ACW radio, just before reassembly. You can see how mounting the majority of the components on a PCB results in a drastically neater chassis than a typical radio of the time, where all the passive components would typically be mounted on the underside of the chassis and connections made with point-to-point wiring. The main disadvantage of this construction method is that overheating can be a problem, since components are much closer together. Because of this, it seems as if the radio was produced without much thought given as to how it would last from extended use.

fit sockets mounted in rubber grommets through the chassis.

This arrangement caused me some grief, as related later. A smarter location for the speaker sockets would have been directly on the circuit board.

Restoration

The radio was manufactured with a three-core mains cable, but the rubber insulation had severely perished and so I had to replace the cable with a new one.

Otherwise, it passed visual inspection, so I powered it up and it worked the first time. At least, it did in 2002 when I acquired it.

The inspiration for writing about this Admiral radio was the chance reading of a history of Admiral in Australia, written by Neville Williams in Electronics Australia. After reading that, I took the radio from its shelf and plugged it in, whereupon a mild amount of 50Hz hum was produced, accompanied by an acrid aroma of catastrophic failure.

It transpired that the 180V HT lead to the speaker transformer had shorted to Earth due to a perished rubber grommet in the metal chassis. This overload destroyed the 6X4 rectifier. The canned electrolytics had also failed, with an ooze of electrolyte-goo protruding from the base.

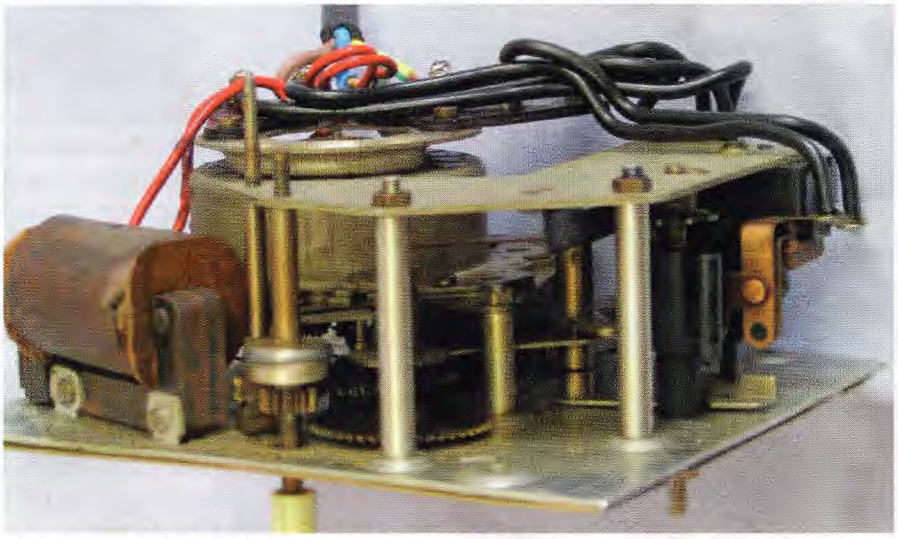
Fixing it was simple enough. I plugged in a new 6X4, replaced the electrolytics in the can with new ones and rewired the flying leads to the transformer to eliminate the sockets.

The post-restoration view of the chassis shown here illustrates other interesting aspects of the assembly.

Admiral Australia was a subsidiary of a US company and they tried to compete fairly with other Australian companies.

However, their innovations and attempts to share their expertise did not endear them to locals and, paradoxically, their success as an Australian manufacturer led to their demise. The history box offers a summary of the rise and fall of Admiral.

Admiral radios and TVs have not become sought after items by collectors, but they deserve to be.



Close-up of the clock portion of the radio, which has an alarm and sleep function. The clock hands were most likely painted with a mixture of radium, zinc sulphide and copper which glows green in the dark. While Radium has a half-life of 1600 years, this dial had no glow because the zinc sulphide crystal structure that supports phosphorescence had broken down.

History: Stromberg Carlson, Admiral and the battle they both lost

This summary is condensed from a two-part history written by Neville Williams and published in *Electronics Australia* (September & October 1994 issues). Scans of the two original articles will be available as a free download from the SILICON CHIP website. Look for items listed in the SILICON CHIP Online Shop under Electronics Australia.

Admiral had established an excellent range of TVs in the USA and decided to make a range of TVs available for the launch of Australian TV in 1956, coinciding with the Melbourne Olympics.

Competing Australian manufacturers started a smear campaign against Admiral even before they arrived, alleging that they would use lethal transformer-less sets and that their 21-inch sets would be too large for normal comfortable viewing. Admiral was already making 29-inch sets in the USA at the time!

This adverse environment did not stop Admiral from appointing Eric Fanker, previously chief engineer with Tasma, as founding Australian General manager. Fanker was an excellent choice and immediately started building a skilled workforce by attracting top staff from other Sydney manufacturers.

In May 1955, Admiral was set up on the mezzanine floor of the old General Industries Refrigerator Factory at Waterloo, Sydney. A large new factory was subsequently purpose-built at Bankstown.

Fred Hawkins moved from Stromberg-Carlson and was given the initial assignment of developing a range of radio receivers, primarily to give the Admiral tradename exposure on the local market before TV arrived.

The range of radios was to include a five-valve mantel set, also to be offered as a clock radio (ie, the radios featured in this article).

These mantel radios would be in the popular Swedish style, new to Australia. Fred Hawkins was directed to use printed circuit boards with the first batch imported from the USA. A local supplier, thought to be RCS, was to produce the circuit boards.

As far as most people were aware, Admiral used the very first circuit boards in Australian consumer electronics. RCS had been making circuit boards for smart munitions during WWII, but that was top secret at the time. There was no logical reason for Australian manufacturers to ignore the advantages of circuit boards; they were just reluctant to change established practices.

At the time, Ducon in Australia could not supply Admiral with capacitors that were designed for mounting on circuit boards. Admiral provided examples from the USA and Ducon expanded its range of packages to facilitate circuit board mounting.

Admiral's primary objective was to produce state-of-the-art TVs. Eric Fanker tried to warn other manufacturers against launching with obsolescent technology, but this advice was ignored with considerable hostility.

The first Admiral TV sets, as illustrated by the Ansett TV, had front-mounted dual-concentric knobs for channel selection/fine tune and volume/contrast. The knobs gave Admiral TV sets a distinctive 'two-eyed' appearance.

It was mandated that the front glass had to be safety glass in case of a CRT implosion. Because the Admiral design was unique, Pilkingtons required a large order to produce them and thousands of glass screens were ordered.

Admiral set out to have a higher throughput of TV sets than any other Australian manufacturer, and they succeeded.

Others watched on incredulously. These were highly reliable sets built on circuit boards with excellent picture quality. However, they had a low audio output of around 1W that others seized on to denigrate the brand.

Admiral had set up a network of retail distributors and in the first two years, Admiral made healthy profits from their TV sales. However, in late 1957, a credit squeeze severely reduced the number of buyers for TVs.

Coinciding with this, a glass manufacturer strike meant that Admiral's competitors could not source the safety glass they needed for their cabinets. This was a seeming windfall for Admiral who had large stocks of their cabinet glass and they ramped up production to compensate for the stoppage forced on other manufacturers.

Eventually, they had a stock backlog of 5000 units which were proving difficult to move. It was not the bonanza it should have been.

Admiral made a bulk purchase arrangement with retailer H. G. Palmer so that they could retail Admiral TVs at a bargain price.

This did solve the short term problem, but the bargain price was close to the wholesale cost to the Admiral network of dealers, and so these resellers dumped the Admiral brand. Admiral could see no light at the end of the tunnel. The factory site had appreciated considerably, so they sold it and thus ended Admiral in Australia.

There is one more sting in the tail of Admiral's closure: not having learned from Admiral's mistake, Stromberg-Carlson stepped in as a discount supplier to H. G. Palmer.

Dealer networks then dumped Stromberg-Carlson, just as they had dumped Admiral. Stromberg-Carlson could not service its debt and was also wound up as a result. SC

This Admiral TV had pride of place in the Mount Eliza lounge room of aviation and television pioneer Sir Reginald (Reg) Ansett. Sir Reginald launched Melbourne's Channel 0 (later Channel 10). The Ansett TV is now held in the collection of the Australian Centre for the Moving Image (www.acmi.net.au).