

## **AWA and the Teleradio**

by

***Malcolm R Haskard, Tony Bell and Ray Robinson***

*For a period in excess of forty years Amalgamated Wireless (Australasia) Limited designed and produced its Teleradio sets. This is an extraordinary achievement, both the company and products being an important part of the history of wireless in Australia. This article is in several parts, Part 1 providing an overview of the History of AWA and the early Teleradios, Part 2 the Teleradio at War, part 3 the Changing of Technology and Part 4, the Coming of Single Side Band.*

### ***Part 1 – The History of AWA and the early Teleradios***

#### ***Introduction***

Since the earliest days of wireless, Australia had an interest in this new technology for it allowed communication without wires. Distances across the sparsely populated Australian continent were large, it was surrounded by water navigated by ships of all sizes and further being part of the Commonwealth Empire, regular contacts with Britain was essential. In addition to its own experimenters and innovators, European companies were attracted to Australia to set up communication services, a race to see who could win the communication services of this remote country. There were two major contenders, namely The Marconi Company from Britain and the German Telefunken Company, the latter represented in Britain by Siemens and in Australia the Australasian Wireless Company utilised their equipment. There were constant battles between the two major companies over who owned particular inventions and in 1912 an agreement was signed to exchange patents. In Australia, as part of the settlement, there was a merger of the Australasian Wireless Co. and the Australian branch of the Marconi Co. This new company became incorporated in 1913 and called Amalgamated Wireless (Australasia) Limited, with Marconi Co. holding 50% of the shares, Australian shareholders 42% and Telefunken 8%. With the outbreak of WW I in 1914, the German company's participation ceased, its shares passing into Australian hands [1]. In a separate agreement the Commonwealth Government paid Marconi Company five thousand pounds to drop litigation and permit the Government to use certain equipment, particularly that used at the major coastal radio stations, whose design was covered by Marconi patents. These stations remained under the control of the Postmaster General's Department (PMG) until 1915 when the Navy took charge.

#### ***Amalgamated Wireless (Australasia) Ltd***

Earnest Fisk an Englishman and Marconi wireless operator, came to Australia in 1911 as the Marconi resident engineer and he was appointed as the Technical and General Manager for Amalgamated Wireless (Australasia) Ltd. or AWA as it became known. Fisk became General Manager in 1917. He gathered under himself a team of radio engineers and the company quickly expanded. In 1918 AWA daily received signals from Wales and in September of that year the Australian Prime Minister W. M. Hughes spoke from Wales via the radio link to Australia, the first public communication to pass between the two countries by a direct radio link. Fisk gave the first public demonstration of radiotelephony in 1919 and when public radio broadcasting began in 1923 AWA provided the transmitters. In March 1922 AWA

was granted exclusive rights to construct and operate the stations in Australia for direct commercial wireless telegraph services to both Britain and Canada. Part of the agreement was the transfer of control of all Australian government owned wireless stations; principally the coastal radio service stations within Australia and the Territories to the north, to AWA. To enable all this to happen the capital of the company was increased to a million pounds, the Commonwealth acquiring half a million plus one of the one pound shares to give it a controlling interest in AWA.

The small radio telephone transmitter used for the first public demonstration of sound broadcasting in 1919 was also used to conduct ship to shore telephony tests and the results achieved surprised everybody [1]. Further developments took place and by 1925 AWA was ready to introduce Australia's first radiotelephone service for ships. In 1928, under an arrangement with the British Government AWA took over the responsibilities for the operation of all wireless stations on the islands of Fiji. Gradually the influence of AWA spread further beyond Australian shores. With gold prospectors, plantation managers, missionary outposts in remote areas there was a need for a small portable low powered telephony system, one that enabled people in these places to communicate into bases (AWA called them mother stations) where higher powered transmitters would operate. For such a set the name "Teleradio" was coined and registered as a trade name. The first known Teleradio appeared in 1935 and was employed in New Guinea. In a paper written and published in 1938 [2], Lionel Hooke, then the AWA General Manager, describes the Australian Radio Communication Services established by AWA and under the heading of Island Radio Service provides a map (see Figure 1), which shows some 100 Teleradio set locations. Of the sets he says, "the sets have an aerial rating of 10 watts, and are contained in four units, with a total weight of less than 200 lbs, including the accumulators and engine-charging set, each unit being smaller than 3 cubic feet. The transmitters are provided with two crystal controlled spot frequencies, and the receiver is of superheterodyne type capable of reception on 13 to 500 metres."

From 1939 the head quarters of AWA was at 47 York Street, Sydney, with the Engineering Sales Division, the people responsible for the design and manufacture of all communications and broadcasting equipment, located at the rear of the building in Clarence Street. Later this Division moved to Ashfield, a suburb of Sydney, and became known as AWA Radio Electric Works where the research, design and manufacture was undertaken. There were representatives of the Engineering Sales Division in most Australian capital cities as well as some regional areas and countries like New Zealand and Fiji. These people were mainly responsible for the installation, commissioning and handing over of all major communications equipment.

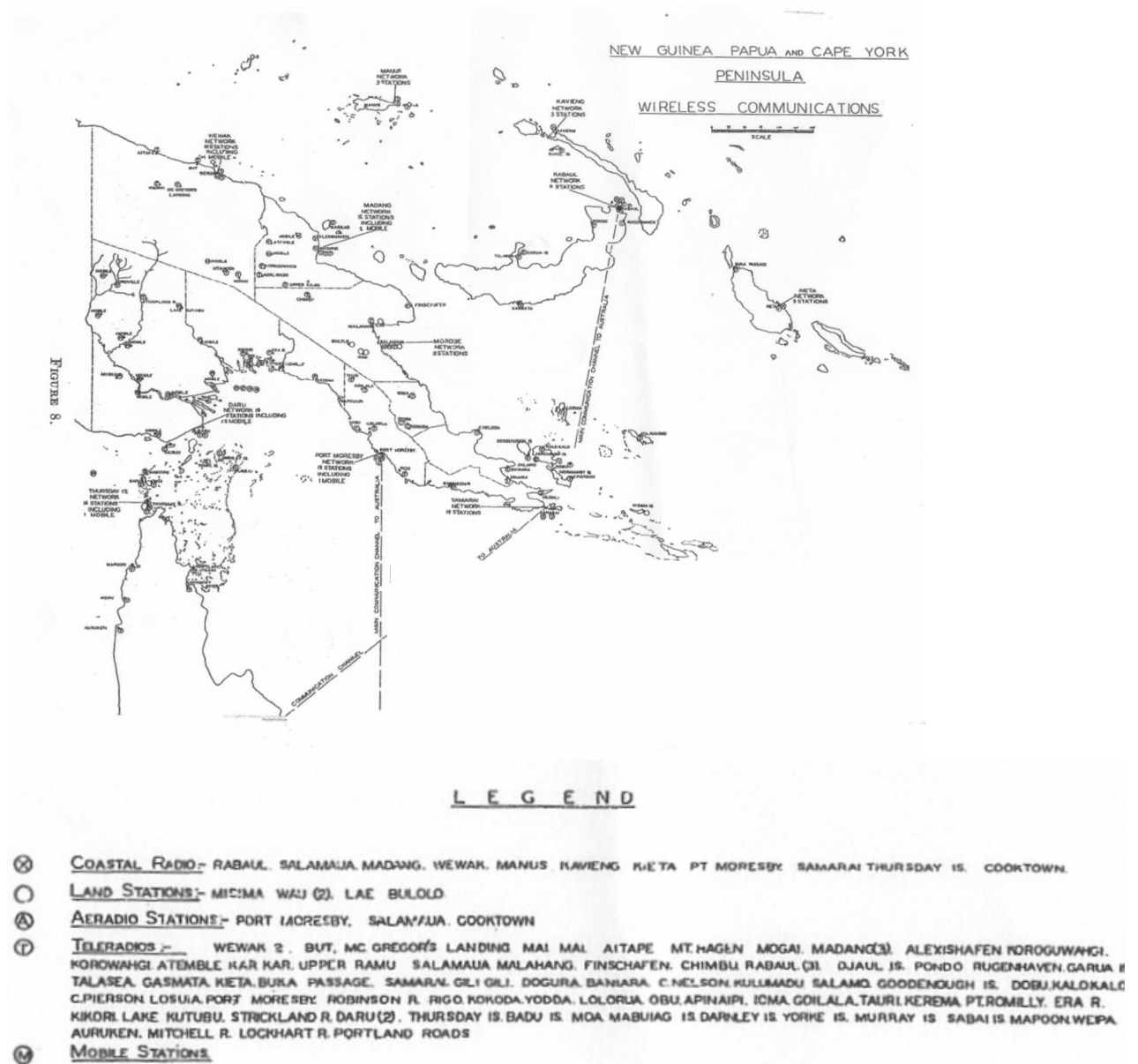


Figure 1. Wireless Communications New Guinea and Cape York in 1938.  
Note the long list of Teleradio locations [2].

By the late 1930s AWA had reached the height of its power, operating both the Beam Transmitting system to England and Canada, the transmitters housed at Ballan (later renamed Fiskville after Sir Earnest Fisk) with receivers located at Rockbank, Victoria; the Australia-Overseas Wireless Telephone Service operating out of Sydney; the Coastal Radio Service which covered Australia (13 stations) and the islands from the north to the east of Australia (8 stations); the Marine Service, some 160 ships of the Australian mercantile marine fitted with wireless equipment; the Island Radio Service; the Aeronautical Service (AERADIO) as well as several local broadcast stations. Other services such as the Sydney Central Ambulance Service were also provided [2]. Within a few years much of this changed. During the Second World

War the vulnerability of cable was evident and several conferences were held to discuss communications across the British Empire. In 1945 a conference recommended public ownership of all such services and so in 1946 the Australian Government passed an Act of Parliament to establish the Overseas Telecommunications Commission (OTC). By agreement AWA continued to manage services until they were purchased by the Commonwealth and taken over by the Commission on the 1<sup>st</sup> February 1947. Included was the Beam Wireless facilities and some 22 coastal radio stations. The Commonwealth surrendered many of its shares, but retained a controlling interest in AWA until 1951 when it sold its remaining shares [1].

AWA still continued to diversify with new groups being formed. These included Manufacturer's Special Products (MSP) producing items such as capacitors, coils and loud speakers, Amalgamated Wireless Valves, KLG (spark plugs), Smiths Instruments (included clocks), AWA Crystal Labs, Audax Acetate Recording blanks and Strong Products (radio cabinet works). In 1971 the Totaliser and Gaming Machines Division was formed, while in 1975 the AWA Computer Services group was established. During the late 1970s the manufacturing facilities at Ashfield closed down and thereafter, for Teleradios, AWA adopted a policy of "rebadgeing" sets made by other companies such as PCM, Racal and Uniden.

On the 13<sup>th</sup> January 1988 Amalgamated Wireless (Australasia) Ltd (AWA) changed its name to simply AWA Limited (AWA) [3]. That same year the Telecommunications Division was sold to Exicom, while AWA Microelectronics was established. In the following year, AWA acquired a controlling interest in Electronic Transactions Pty Ltd, the Australian distributor for Slumberger Industries Smartcard while Thorn EMI, Fairy Australia Ltd and AWA Electronic Services amalgamated to form AWA Defence Industries (AWADI). Consequently by 1993, the 80<sup>th</sup> birthday of the company, there was a radical change in policy with the focus now being on Aerospace, Communications, Defence, Gaming and Traffic Systems.

Commencing about 1996 the company started to disintegrate. The domestic radio Division was sold to Mitsubishi, AWA Microelectronics to Quality Semiconductors Inc., AWADI to British Aerospace, the sale of the traffic, rural and aerospace divisions to Plessey Pacific Division, with the sale of the remaining broadcast interests to Plessey Rand. Having developed the Keno software, gaming machines now became the core business. In 2001 the company was acquired by Jupiters Ltd, which in turn was acquired by Tabcorp. Finally in 2004 AWA Ltd. was purchased by a small group of Australian Investors to become an independent unlisted company.

### ***The Teleradio Concept***

The original Teleradio concept was to provide a separate robust transmitter and general purpose receiver both housed together in a single box for portability. The principle frequencies of operation were to be below 10MHz and transmissions were to be by phone and in case of emergencies by CW. Power to charge the batteries was to come from a generator (pedal or engine driven). Twelve volt operation was usual, although many early receivers could operate from 6 volts.

Numbering of the models commenced at 1 and progressed, however it appears that not all sets developed went into production for there are gaps in the sequence.

Changes in a model (some minor) are reflected by letters A, B, C etc. added after the type number. In some cases the letter simply indicates a modification to reduce the maximum level of transmitted power so that the set met a particular communications standard. SSB sets did not start until the Model SS70, as here the double S letters before the digits or alternatively a single S after the digits indicating single sideband operation. Towards the end of the Teleradio series of transceivers, it appears that AWA decided to group any low power portable/hand held phone transceiver under this designation, including their 27MHz marine sets as well as some VHF/UHF sets. As stated, the receiver and transmitter were normally housed in the same case, the exception being the Model 3 series where separate boxes were used. This provided greater flexibility, allowing other combinations to occur.

Besides the broad AWA categorising of the Teleradio, AWA also used a type numbering system, which extended from complete systems to component level. A code letter was used to describe the type of equipment or component, followed by a 3, 4 or 5 digit serial number, issued sequentially. Typical examples are C for receivers, J for transmitters or a complete transmitter- receiver set combination, N for transceivers, D for speakers and H for power supplies. A digit before the code letter represents a variant or modification. Further variants or modification of the first variant is represented by a digit and a – (dash) before the variant digit, eg 1-1C6770. In later times a variation of this system appears to have been employed. From examination of manuals for New Zealand designed sets, it appears that AWA NZ did not use this type numbering system and in several instances this caused some conflict.

It should also be mentioned that while producing the Teleradio product range AWA also made other series of transceivers, examples being the Seafarer (HF marine sets), Forestphone (HF) and Carphone (VHF mobile).

While every attempt has been made to compile a complete list of Teleradios there may be omissions. Each of the known set models will be discussed.

### ***The early Teleradio sets***

#### ***a) Teleradio Model 1 (1935)***

During the 1930s Papua and New Guinea were opening up and there was need for a small portable set that could be readily transported to the goldfields, plantations and mission stations so that messages could be sent and received. Such stations, when operated by AWA staff were referred to as sub-stations. The initial set, the Model 1, consisted of a simple receiver and transmitter, both tuneable and housed in a single metal box. Figure 2 shows the unit.

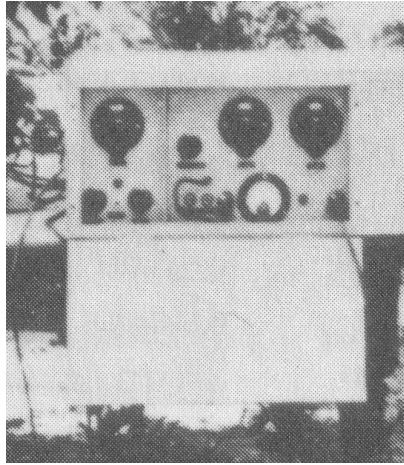


Figure 2. A Teleradio Model 1. The receiver is on the left and transmitter on the right in the cabinet. The front cover provides protection and storage during transport and hinges downwards when the set is in use. Thus it could be used as a writing table when taking messages. [1]

While little specific detail is known about the set, some information can be derived from publicity given on later models and the improvements made [4]. The receiver was a simple TRF set with either a regenerative or an anode bend detector, followed by an audio amplifier. This may seem surprising, but a major partner in AWA was the Marconi Company, which favoured such practises [5]. Further, a number of AWA engineers, including Fisk, had served as marine wireless operators with Marconi and would have been familiar with this technology. The photo of the set shows no speaker box so it is presumed that the receiver fed headphones. The transmitter was not crystal controlled, the frequency determined by a simple LC oscillator, this oscillator driving a power amplifier. The meter was used to tune the transmitter and adjust aerial loading. Modulation of the final amplifier would have either been by the grid or choke method. The carbon microphone was a standard telephone handset having the earpiece section cut off. The same microphone was used in later Teleradios and given the designation type R1484. Because the set had to operate in remote areas, either from batteries or a generator set it was important that the power consumed was kept to a minimum. A set of such simplicity would meet this requirement.

The Model 1 set came with a pedal generator, which is shown in Figure 3. It is believed that the generator could drive the set directly, that is, there were no batteries or no batteries of significant capacity so a local native was employed to constantly power the set when it was used. Like the wireless operator the native was an employee of AWA and as seen in the figure wore an AWA uniform consisting of a lap-lap and belt.



Figure 3. Pedal generator set used to power the Teleradio Model 1. Note the AWA logo on the lap-lap. [1]

It is believed that this set did not perform adequately and following a major rethink a considerably improved design resulted, the Model 3 series.

***b) Teleradio Model 3A (1937)***

The improvements implemented in the new set were significant. The receiver was a single conversion superheterodyne type with improved selectivity, the transmitter crystal controlled with the final stage plate modulated, each unit housed in independent metal boxes to give greater flexibility. Operation was from two 6 volt accumulators each 100 to 120Ah capacity, the accumulators charged by a 12 volt Delco generating set. In January 1938 a Teleradio type 3A set was shipped to Glasgow for the Scottish Empire Exhibition. The packing slip gives the following information [4]

Teleradio Model 3A consisting of

- 10 watt telegraph transmitter type J4195 (No. 32) comprising
  - Transmitter type J3908
  - Power Unit H3909 (12V RCA vibrator type 16582)
  - Crystals mounted in type R583B holders
  - Hand microphone type R1484
  - Telegraph key and cord R688A

Superheterodyne communications receiver type 4C3487 (No.8) including the following items

- 4.5V bias battery type 126
- Pair Ericsson headphones
- Set interconnecting cables
- 200' 7/20 aerial wire
- 6, Bullnose insulators
- Lead in insulator with rod
- Instruction book

Figure 4 shows a Model 3A set in operation. The photo taken in 1938 in New Guinea and the whole is called a substation. Notice the two batteries under the table as well as the charging generator.

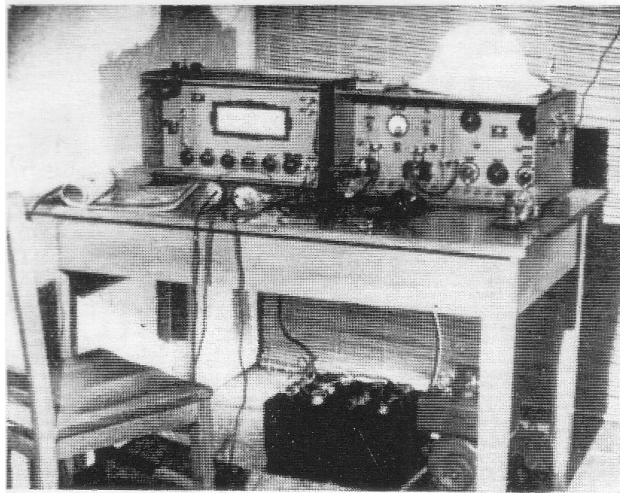


Figure 4. An AWA Teleradio Type 3A set up as an operating substation [2].

The receiver, situated on the left, employs 2V filament valves, 1C4 RF amplifier, 1C6 converter, 1C4 IF amplifier, 1K6 detector, AGC and audio amplifier, 1C4 BFO oscillator and 1D4 power output stage [4]. Controls included tuning, range switch (three ranges - long wave, broadcast band and short wave), volume, BFO oscillator on/off and vibrator on/off. The rectangular dial is calibrated in wavelength rather than frequency and the operating manual gives instructions how to convert wavelength to frequency and vice versa [6]. The receiver vibrator power supply uses a 4V vibrator, which allowed the receiver to operate from a single 6V battery rather than the full 12V [6].

The transmitter employed two type 42 valves, one as the crystal oscillator and the other as the microphone preamplifier. The RF final valve was an 807, plate modulated by a 6A6 valve, the two halves connected in push pull configuration. Specified RF output power is 10 watts. It is interesting to note that in the shipping note the 807 and 6A6 valves are specified as being RCA brand. All other valves, including those used in the receiver are Australian made. (In a hire agreement with P D McDonald dated 1<sup>st</sup> June 1939 all valves are now listed as AWA Radiotron types. Thus within a matter of 18 months the 807 and 6V6 were being manufactured by AWA in Australia [7]) The transmitter vibrator is also specified as being an RCA type (16582) so already at this stage there is a strong link between AWA and RCA (Radio Corporation of America) for both companies can trace their parentage to the Marconi Company. Controls include key/speech switch, oscillator on switch, meter switch, aerial switch (SW – Receive – LW), LT switch with red pilot light, HT switch with red pilot light, oscillator tuning dial and PA tuning dial. The meter is 100mA FSD [4,6].

The new Teleradio Model 3A proved to be a success and AWA not only used them in quantity for their own services (See map given in Figure 1), but hired them to plantation owners and other organisations. In Part 2 of this series we will examine the later developments of the Model 3, sets that played a significant role during the Second World War.



***To be continued – Part 2***

***References***

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- [3] <http://www.delisted.com.au/>
- [4] AWA records held NSW Mitchell Library, Box Reference 1393. Shipping packing note for a Teleradio type 3A shipped to the Scottish Exhibition in Glasgow, January 1938.
- [5] Dowsett H M & Walker L E Q (1942) *Handbook of Technical Instruction for Wireless Telegraphists*, 7<sup>th</sup> Edition, "The Wireless World", Illiffe & Sons Ltd, London.
- [6] Signals, New Guinea Force (Issued - circ. 1940) *Operation and Maintenance of AWA Teleradios, Types 3A and 3B*.
- [7] AWA records held NSW Mitchell Library, Box Reference 1393. Agreement between AWA and Percy Donald MacKenzie, dated 1<sup>st</sup> June 1939, to rent a Teleradio Type 3A.

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