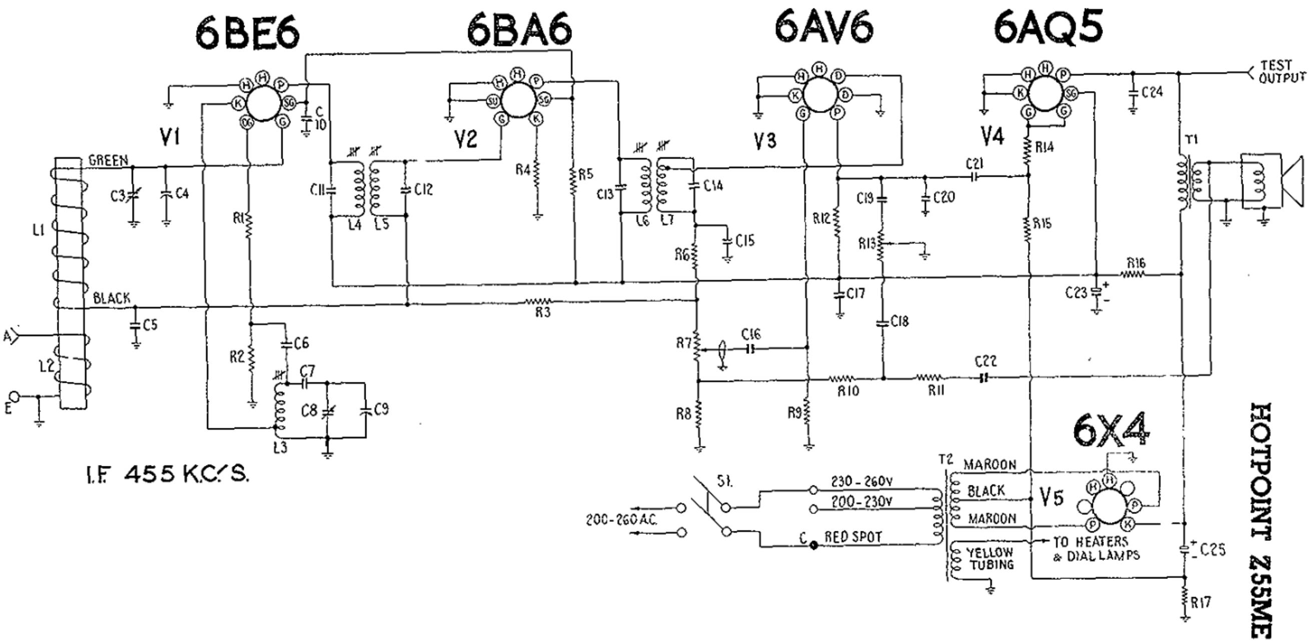
Hotpoint model Z55ME and AWA model 573MA

The only differences evident between the Hotpoint Z55ME and the AWA 573MA are the badge (AWA or AGE) and the lower lettering (Radiola or Hotpoint). The case, dials and knobs are all the same, as is the chassis. These radios were introduced in 1955 and AWA continued into 1958. They have the same circuit diagram printed in separate places in the Australian Official Radio Service Manual. I have one ivory AWA and two Hotpoints in my collection. The Hotpoints are coloured pink-mushroom and non-original orange. The case shared by these models is an evolution of earlier styles like the AWA 467MA. An improvement for this radio is that the two halves of the case no longer seal at the junction by overlapping, but they butt with an air space to improve heat dissipation.

From the 1930s the AWA production facilities were used to produce "badge engineered" Hotpoint radios. For most models the cases featured distinctive differences for the two brands and this was also true in 1955 for the clock radios, AWA 461MA and Hotpoint P55ME. These clock radios differed in the face plate and dial.

AGE is Australian General Electric, a subsidiary of GE in the USA. GE had acquired Hotpoint in the USA to market a range of domestic appliances, as it did in Australia with a broad range of white goods. Radios were made by AWA and the GE subsidiary Australian Electrical Industries made a wide range of



electrical white goods branded Hotpoint. However anti-monopoly action in the USA

HOTPOINT Z55ME

INDUCTORS.

L1,L2	Ferrite Aerial Assembly
L3	Oscillator Coil 540-1600 Kc/s.
L4,L5	1st I.F. Transformer
L6,L7	2nd I.F. Transformer

RESISTORS.

R1	100 ohms	½ watt
R2	22,000 ohms	½ "
R3	1.5 megohms	½ "
R4	220 ohms	1 "
R5	10,000 ohms	1 "
R6	47,000 ohms	½ "
R7	0.5 megohm Volume Control	
R8	100 ohms	½ watt
R9	10 megohms	½ "
R10	680 ohms	½ "
R11	680 ohms	½ "
R12	0.22 megohm	1 "
R13	0.1 megohm Tone Control (incl. S1)	
R14	47,000 ohms	½ watt
R15	0.47 megohm	½ "
R16	5,000 ohms	2 watts
R17	150 ohms	1 watt

CAPACITORS

C1	Not used.
C2	Not used.
C3	4-27 uuF trimmer
C4	12-445 uuF tuning
C5	0.05 uF paper 200V working
C6	47 uuF mica
C7	440 uuF padder ± 2½%
C8	8-40 uuF trimmer
C9	12-445 uuF tuning
C10	0.1 uF paper 400V working
C11	100 uuF silvered mica
C12	100 uuF silvered mica
C13	100 uuF silvered mica
C14	100 uuF silvered mica
C15	220 uuF ceramic
C16	.01 uF paper 600V working
C17	0.1 uF paper 400V working
C18	0.25 uF paper 200V working
C19	0.01 uF paper 600V working
C20	100 uuF mica
C21	0.05 uF paper 400V working
C22	0.4 uF paper 200V working
C23	24 uF 350 P.V. Electrolytic
C24	0.0025 uF paper 600V working
C25	24 uF 350 P.V. Electrolytic

TRANSFORMERS.

T1	Loudspeaker Transformer
T2	Power Transformer, 50 C.P.S. 40 C.P.S.

LOUDSPEAKER.

7 x 5 inches Permanent Magnet

SWITCHES

S1	Power Switch (on R13)

HC

L1, L2,L3, L4,L5, L6,L7, L8, L9,L10, L11,L12, R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, LS1, LS2, T1, T2

required GE to divest itself of its Australian companies in 1956. GE did subsequently re-enter the Australian market making radios including the GE model MR1 of 1962 that was made under licence by James Kirby Pty Ltd. The GE MR1 was described in the previous issue of Radio Waves (number 150 p36). The complex company affiliations and technology sharing between Marconi, RCA and GE made the hybrid company AWA the market-leading Australian manufacturer to provide quality radios at an attractive price.

The circuit is a conventional 5 valve superhet.

The front end starts with a ferrite antenna that is set diagonally across the chassis. Two coils are wound onto the ferrite and encased in pitch. The external aerial connection is made by a brass spring-clip on the coil former. The point of connection can be seen at the end of the red aerial wire in the photo of the open back. The tuned ferrite coil winding feeds into the grid a 6BE6 mixer and is heterodyned with the signal from the local oscillator L3. The oscillator is a Hartley type and has a tuning slug that is reached from an adjustment port mounted on top of the chassis to the left of the 6BE6. This port marks the beginning of a linear sequence of components that follow from the front end to the output. All of the valves are 7-pin miniature types.

The 6BA6 IF amplifier is a remote-cutoff pentode used as an RF amplifier in broadcast and FM receivers. Like the preceding 6BE6 mixer, its year of release was 1946 so these valves represent proven performance. The low value of grid-to-plate capacitance of the 6BA6 minimizes regenerative effects, while high transconductance provides high signal-to-noise ratios. Gain for this stage is up to 200x with optimum grid bias. The designation remote-cutoff (as distinct from sharp cutoff) means a smooth change of gain in response to bias applied by AGC.

The output of the second IF transformer (L7) is detected by one of the diodes housed in the 6AV6 valve. The second diode in the 6AV6 is earthed. The negative voltage at the junction of R6 and R7 provides negative feedback to the grids of the first two valves via R3 (1.5M).

Demodulated signal from the diode is passed by R6 (47K) to a 500K potentiometer R7 to control volume. Audio then feeds to the grid of the 6AV6 triode for preamplification. No provision is made for a pick-up connection.

The popular 6AQ5 pentode drives the output producing relatively undistorted sound, to a high listening volume in this radio. This is due to the good performance of the elliptical speaker. The 150Ω resistor R17 generates a grid bias for the 6AQ5 of minus 6.8V. Generating grid bias by dividing the HT voltage over R17 eliminates the need for a cathode bypass capacitor. Circuits using a bypass capacitor provide a low impedance path for audio from chassis to cathode, but with the 6AQ5 cathode directly earthed there is no loss of audio signal.

The tone control is variable resistor R13 (100K) and it is the central knob of the two concentric knobs at the left hand side. This knob also switches the mains on and off. The effect of the tone control to my ear creates a muffled sound at maximum bass and a rather strident sound at full treble. My preference with this radio is to back-off slightly from full treble.

The tone control appears at first glance as a simple top-cut shorting higher frequencies to earth from the plate of the 6AV6, via C19 (0.01µF).   However, the tone control has an additional complimentary task of changing the frequencies fed back from the speaker coil to R8 to keep the audio amplifier stable. C18 (0.25µF) diverts higher frequencies in the feed-back line to ground via the wiper of R13. When the tone is set to high C18 is connected to earth via R13 thereby reducing the amplitude of high frequencies fed back out of phase to the volume control. Less treble in the feedback circuit allows higher gain for the treble register.   i.e. there is a synergy between top cut and altered gain at high frequencies. Bass frequencies, in isolation, will be little affected, but higher frequencies are cut and boosted by the tone control.

The conventional π-HT filter incorporates the economy of a 5K dropping resistor R16 rather than a choke. The 5K is achieved by wiring two 10K 1W resistors in parallel. Measured on the orange radio R16 drops the HT from 250V to 167V thereby dissipating 1.5W. Two 24µF HT filter electrolytics C23&25 reduce mains hum to a low, but perceptible level. The radio consumes 39W at mains of 240V.

The inspiration to write about these radios was provided by purchasing a sad-looking Hotpoint with a broken grille in a burgundy case. Cleaning the dust off the case showed the effects of photo-bleaching from sun exposure. The sun has degraded many burgundy cases from that era. The original colours included grey, blue, ivory and brown. The transformation to orange is due to an impulsive acquisition of bright orange paint (White Knight brand) when shopping at Bunnings. The finished radio invoked nostalgia for the 1970s when orange dominated many a kitchen colour scheme.

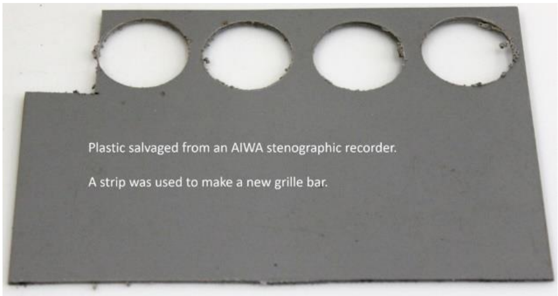
The restoration provided an interesting range of challenges.

The case was free of cracks. This was surprising because something had been forced into the grille creating several cracks and deleting a bar of the grille. The cleaned halves of the case were prepared for a colour change by spraying with Emoleum flat white primer purchased from Bunnings.

Two coats of bright orange brought the case to a lustrous new look.

The grille had a chunk missing that had fortunately fallen inside the case and was able to be glued back in place. There were multiple cracks in the grille and all were repaired using Revell plastic model glue.

The missing grille bar was fabricated from a strip of plastic that was originally a part of an AIWA dictation recorder. This followed a rummage through my plastic bits bin. The photo shows that the plastic had been previously used for other replacements. A strip for the grille was hack-sawed off then smoothed and profiled with a file and abrasive paper. The bars have a V-profile cross section with the narrow face to the front. The replacement bar was undercoated then finished with yellow oxide paint branded *Australian Export*. The result was almost indistinguishable from other grille bars.



The single original two-part knob on this radio was transferred from the tuning spindle to control the volume and tone, driving concentric spindles independently. No genuine knobs were in my collection, but with patience a set may turn up. For this restoration a replacement tuning knob was cobbled together by gluing an STC knob to the top of a Pye knob to create the best approximation I could from the knobs in my bins.

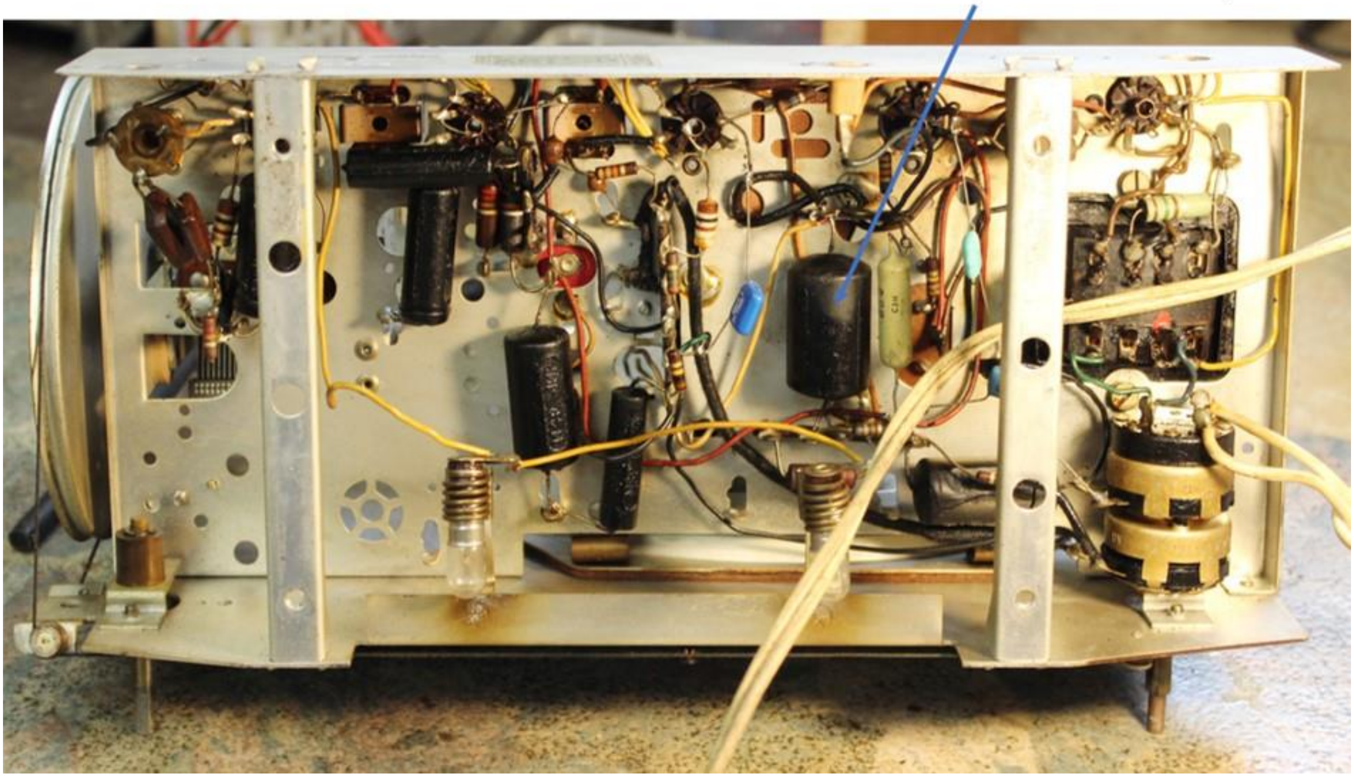
The speaker grille fabric behind the face was tattered and dirty so new cloth was installed with hobby glue.

The first step in electrical restoration was to replace the figure-8 mains cord with three core cable to earth the chassis. The radio worked at turn-on, but with a fierce crackle. Three capacitors were obviously replacements before I started. The remaining chocolate-dip paper capacitors were all replaced except for C22 (0.4uF) in the audio feedback link that is a non-critical component with no DC volts applied. The crackle remained fierce.

Crackle was not affected by any setting of the volume control that precedes the grid of the 6AV6. The signal tracer found no crackle at the grid of the 6AV6, but crackle appeared at the plate of the 6AV6. This strongly implicated C20, a Simplex mica capacitor of 100pF that functions to bypass any RF that might be fed to the 6AQ5. When this mica becomes intermittent, for any of the reasons given later, it generates crackle in the audio feed. The confirmation was straight forward. A snip of one pigtail of the mica capacitor

Original view of the components under the orange Hotpoint. Three new caps already in place. All other paper capacitors were replaced.

An exception was the 0.4µF feedback capacitor from the speaker.



completely eliminated the crackle. A new polystyrene 100pF capacitor produced an harmonious radio.

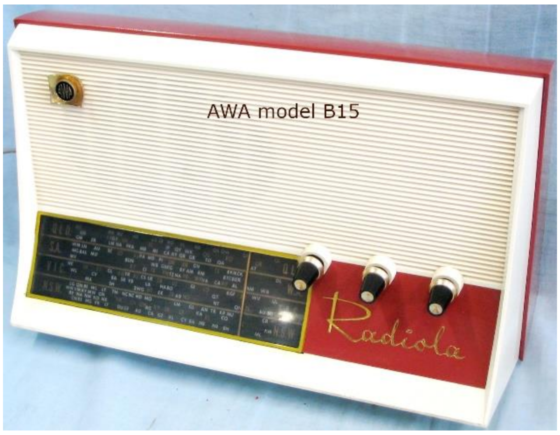
This 100pF Simplex mica C 20 was the cause of severe crackle. Seen here disconnected from the 6AV6 plate.

As others have noticed mica capacitors are now failing with increasing frequency after up to 90 years of fault-free service. If a vintage radio has crackle then a mica capacitor should be the first suspect.

Mica is a silicate mineral that can accommodate small numbers of various metal atoms in a matrix of silicon and oxygen atoms. 37 chemically distinct forms are recognised. The crystalline structure of mica takes the form of layers that can be split with nearly perfect cleavage into thin sheets.

Silver can be plated onto opposite faces of a thin wafer of mica and joined to pig-tail leads either by soldering or simple physical contact to make a mica capacitor. Mica is possibly most familiar as the support sheet used to retain the heating wire in old electric toasters. Mica has generally high resistance to electrical breakdown under high voltage, dependant on thickness

Failure of mica capacitors over time can be due to (1) defects in the mica (mica has many grades from poor to high quality), (2) growth of silver whiskers from the electrodes, (3) failure of the pig-tail to silver joint and (4) ingress of moisture or reactive gasses into the encapsulated capacitor. All of these become more likely to cause failure with increasing age. For a rigorous treatment of the causes of failure look at the paper titled “Some mechanisms of failure of capacitors with mica dielectrics” (https://escies.org/download/webDocumentFile?id=62188).



To my eye these radios made by AWA present with an elegance superior to their predecessors. The successor valve models for the 1960s like the AWA model B15 are more funky than elegant. It is remarkable how radios reflect so sensitively the fashion of the age while simultaneously showcasing the technology and materials of that age.