VINTAGE RADIO

By Associate Professor Graham Parslow

Tecnico 1950 Model 1050

At 9.6kg, this is a heavyweight table radio and it has suitably imposing styling. One could even accuse it of belonging to the early Brutalist period. Fortunately, the splendid walnut-character Bakelite case with decorative slots rescues it from being overly austere.

In the Australian context, the iconic styling of this model is unique. However, Tecnico was in partnership with Bendix USA at the time, and the features of contemporary American Bendix radios influenced this radio.

The perforated metal speaker grille copies Bendix radios and is painted in dappled shades, like military camouflage. Continuing with this theme, the case has the look of a World War Two concrete 'pillbox'. (Military structures of the WW2 were a major inspiration on Brutalism).

Other post-war manufacturers also offered radios with military-themed styling, particularly in portables. The mellow tone of the baffled Rola 6-9H speaker is in harmony with the impressive image of this radio.

In keeping with the new demand for colourful radios at the time, the case was also available in shades of cream, green and blue with various degrees of mottling. The model shown here has four front panel knobs for power on/off (full DPDT switching), volume, tone and tuning.

A smaller case on the styled-alike Model 1140 had only two knobs, offering control of volume and tuning (see the book Radio Days by Peter Sheridan & Ritchie Singer, p243, https://trove.nla.gov.au/version/46138998).

The only resemblance between the models is in the case. The smaller Model 1140 has four valves, all different from the Model 1050, and the chassis is at 90° to the base.

You might like to compare this set to the 1946 Tecnico Aristocrat (Model 651) I described recently, in the February 2020 issue (siliconchip.com.au/Article/12350). You will find that the power supply and output stage are virtually identical, however, the front-end valve lineup is different and some of the circuit details are varied between the two sets.

Circuit details

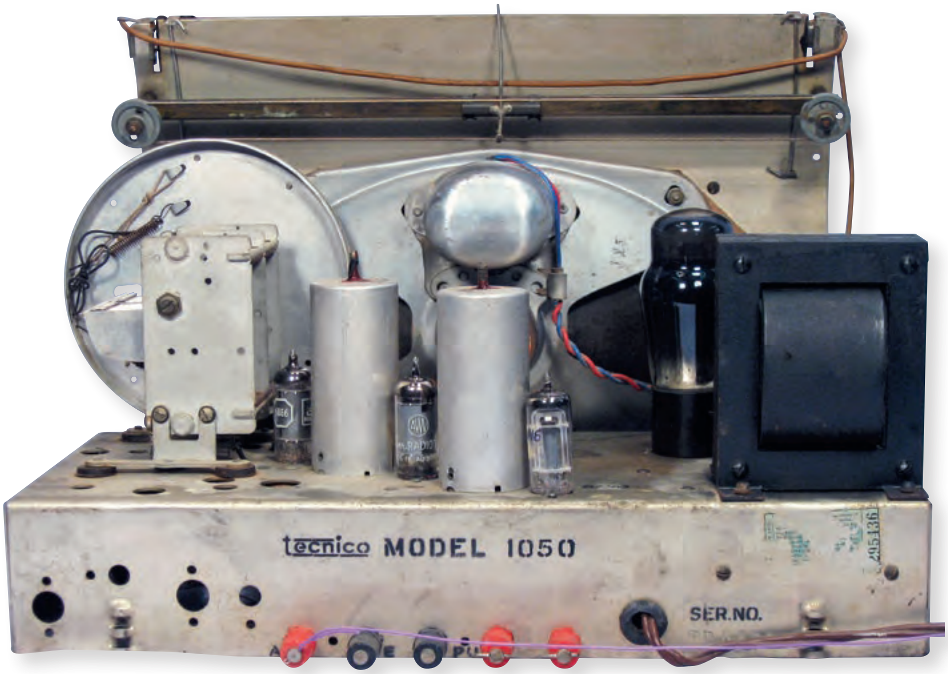
The circuit for this set is shown in Fig.1. The Model 1050 circuit is an evolution of previous Tecnico designs, but modernised with miniature valves for the RF section.

The HT rectifier and pentode output remain as octal-based valves. The circuit diagram also appears in the Australian Official Radio Service Manual (AORSM) volume 9 for 1950.

There is no shortwave tuning, so the aerial feeds into a single aerial coil with a tuned secondary. This then feeds into the grid of the 7-pin 6BE6 converter valve. The 6BE6 was released in 1946 by RCA and was subsequently used over many years, manufactured under licence by various companies. The 6BE6 in this radio is a Philips Miniwatt.

The remaining valves were sourced from AWV, a subsidiary of AWA (in turn affiliated with RCA).

A Hartley oscillator is used, shown below the 6BE6, with a single tuned coil feeding the oscillator signal into the 6BE6's oscillator grid. A tap on the oscillator coil connected to the cathode sustains oscillation. The 455kHz heterodyne signal passes to the first IF transformer.



The rear of the Tecnico 1050 chassis showcases the miniature valves, power transformer, tuning gang, 9-inch speaker etc.

The 6BA6 IF amplifier is a 7-pin miniature remote-cutoff pentode, used as an RF amplifier in standard broadcast and FM receivers. It was also released in 1946. The low value of grid-to-plate capacitance minimises regenerative effects, while high transconductance provides good signal-to-noise ratios. Gain for this stage is up to 200 times with optimum grid bias.

The output of the second IF transformer (L7) is detected by one of the diodes housed in the 6AV6 valve. The demodulated signal is then passed by R6 (50kΩ) and the PU shorting link to a 500kΩ volume-control potentiometer (R7). Audio then feeds to the grid of the 6AV6 triode for preamplification.

The PU shorting link can be removed to allow audio from an external source to be fed directly into the set's audio path, allowing it to be used as an amplifier/speaker, without the radio front-end.

The second 6AV6 diode receives signal from the RF section via C21 (25pF). The negative voltage at this diode is proportional to signal strength, and this provides negative feedback to the grids of the first two valves via R8 (2MΩ).

This automatic gain control (AGC) voltage is modified by the small reverse potential (relative to Earth) generated across R9 (15Ω). This provides a default grid bias for the 6BE6 and 6BA6 valves and delays the onset of AGC-reduced amplification until a signal of moderate strength is tuned.

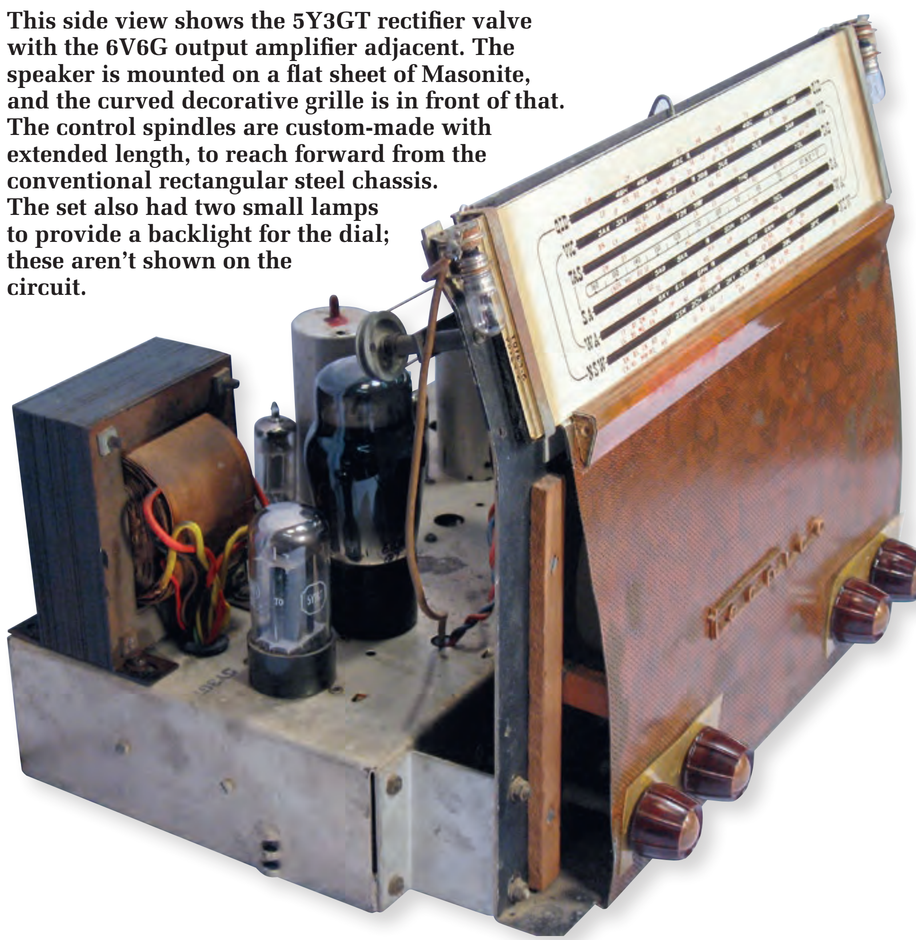
For the output stage, Tecnico used a configuration inherited from other Tecnico designs (eg, the 1946 Model 651 described previously), with a 6V6 operating in Class-A. This design uses negative feedback of the higher audio frequencies (passed by C27, 0.05µF) via 500kΩ potentiometer R17, as a tone control. The more of these high-frequency signals are fed back, the greater the top-cut. This works well, as judged by my ears.

The HT of 280V from the 5Y3 dual rectifier cathode is filtered by C26 (8µF) and C31 (16µF). The total power consumption of this radio was 54W. With a rated maximum of 120mA, the 5Y3 is well suited to the set's 75mA HT requirement. The 5Y3 is an octal repackaging of the widely-used 4-pin type 80 from the 1930s.

Construction

The rear of the chassis has five spring-clamp terminals: Aerial, Earth, Earth, PU input and Radio output (for linking to PU input). The radio was not originally Earthed via the mains supply.

The output transformer is mounted on the elliptical Rola model 69H speaker. The speaker is secured to the front panel, thereby providing some baffling. Rola also provided the power choke that is mounted below the chassis. The choke is stamped "OCT 1950", so this radio can be firmly dated.



This side view shows the 5Y3GT rectifier valve with the 6V6G output amplifier adjacent. The speaker is mounted on a flat sheet of Masonite, and the curved decorative grille is in front of that. The control spindles are custom-made with extended length, to reach forward from the conventional rectangular steel chassis. The set also had two small lamps to provide a backlight for the dial; these aren't shown on the circuit.

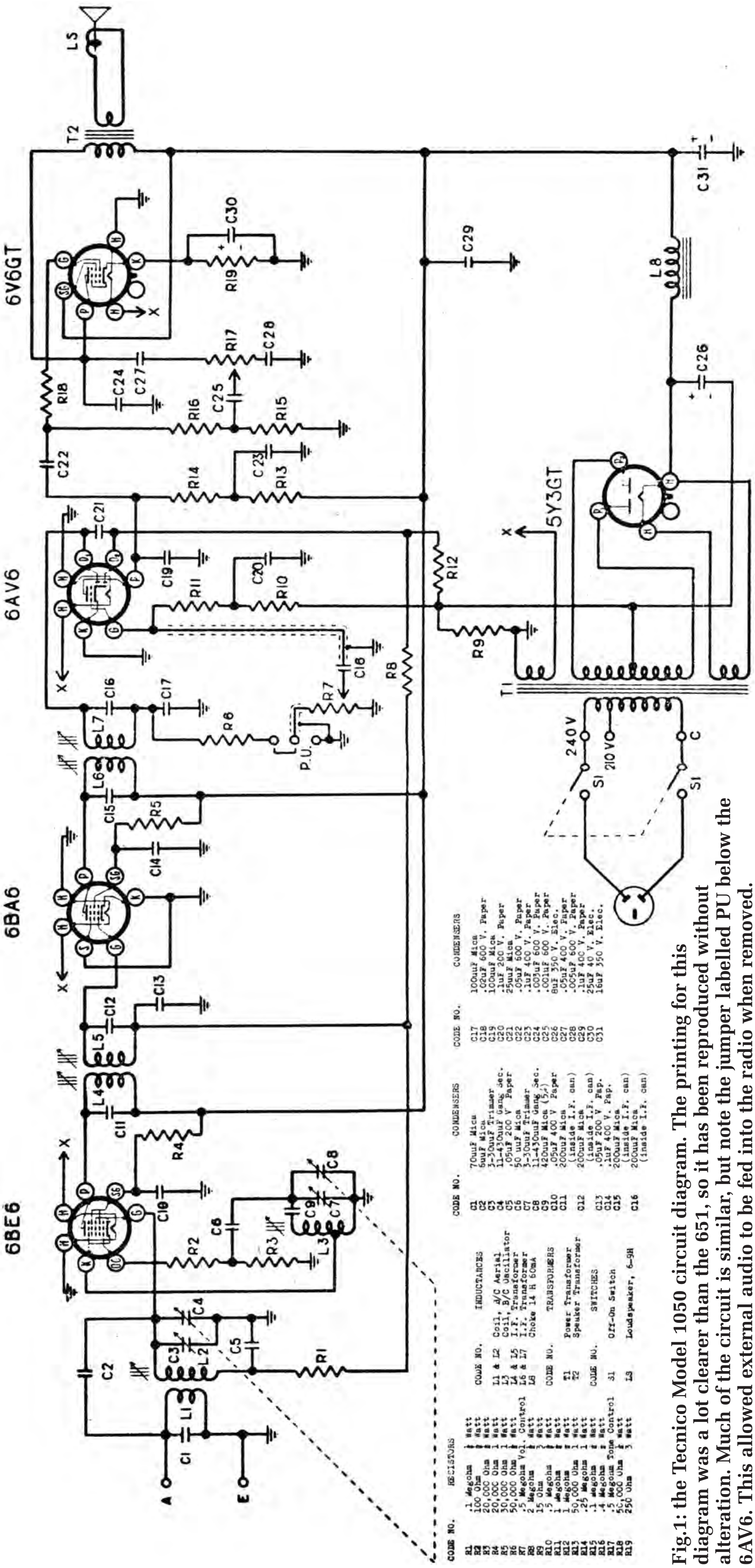


Fig.1: the Tecnico Model 1050 circuit diagram. The printing for this diagram was a lot clearer than the 651, so it has been reproduced without alteration. Much of the circuit is similar, but note the jumper labelled PU below the 6AV6. This allowed external audio to be fed into the radio when removed.

Restoration

The case was in excellent condition and was given a rub-over with Armor All protectant to enhance the gloss. The electrical restoration proved more demanding.

Tecnico manufactured the radio with a figure-8 two core flex held against the inside of the chassis by a simple knot. This was standard practice at the time. A length of new black cotton-covered three-core flex was installed as the mains lead, clamped to the chassis. This cord is a modern reproduction to retain a period look, but has the contemporary colour codes for each wire.

At initial switch-on, the power draw rapidly rose to 110W, so I promptly switched it off. The rapid increase to such a high power is possible because the 5Y3 is directly heated (the heater and the cathode are the same filament). Indirectly heated rectifiers, like a 6V4, take more time to warm up to conduct high currents.

The high power use suggested the failure of an electrolytic capacitor connected between the supply rails, ie, a filter capacitor. C26 had been previously replaced with a Ducon type common in the 1960s. This was cold to the touch, but C31 (made by United Capacitors) was slightly warm.

The reason this was warm but not hot is that with a low DC resistance, due to failure of the dielectric layer, most of the power is dissipated in the 5Y3 valve and choke L8. Either the valve or the choke can fail in this circumstance. Happily, they survived.

I replaced both C26 and C31 with new 22µF 400V electrolytics. The power consumption then dropped to a much more normal 59W. The 6V6 grid measured 5mV, indicating no leakage through C22 (0.05µF). The 6V6 plate was at 222V, and the screen measured 240V. The 250Ω cathode resistor (R19) generated a grid bias of -10.6V.

That all seemed right, but the radio sounded sick. There was intermittent distortion and the volume alternated between high and low of its own accord. Sometimes there was crackle. Both the volume and tone controls did little much of the time.

I was immediately suspicious of the volume control potentiometer's wiper contact resistance. So I removed the pot (made by Tecnico) and overhauled it. This resulted in faultless performance of the potentiometer on the bench.

To double-check whether it was the pot that was at fault, I soldered a new 500kΩ unit in, but the symptoms were unaltered. So I reinstalled the original pot, because it has a long shaft tailored to reach the front panel.

The paper capacitors were my next suspects. Progressively replacing them produced no audible change, although the power use did fall from 59W to 54W.

This left the mica capacitors as the next in the line of usual suspects. Eureka! The first mica to be replaced was C19 (100pF), manufactured by Simplex. The result was dramatic, with everything now performing as it should. That faulty mica was stamped 100pF but measured 220pF with a series resistance of 100kΩ. With 100V across it, it showed intermittent failure, passing up to 3mA.

C19 bypasses any unwanted RF in the audio output of the 6AV6 plate to Earth. Because it was so leaky, it had been shorting the audio and the plate HT as well, thereby generating all of the symptoms.

As others have noticed, mica capacitors are now increasingly failing, after up to 90 years of fault-free service. If a vintage radio has crackle then, as I need to remind myself, 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.

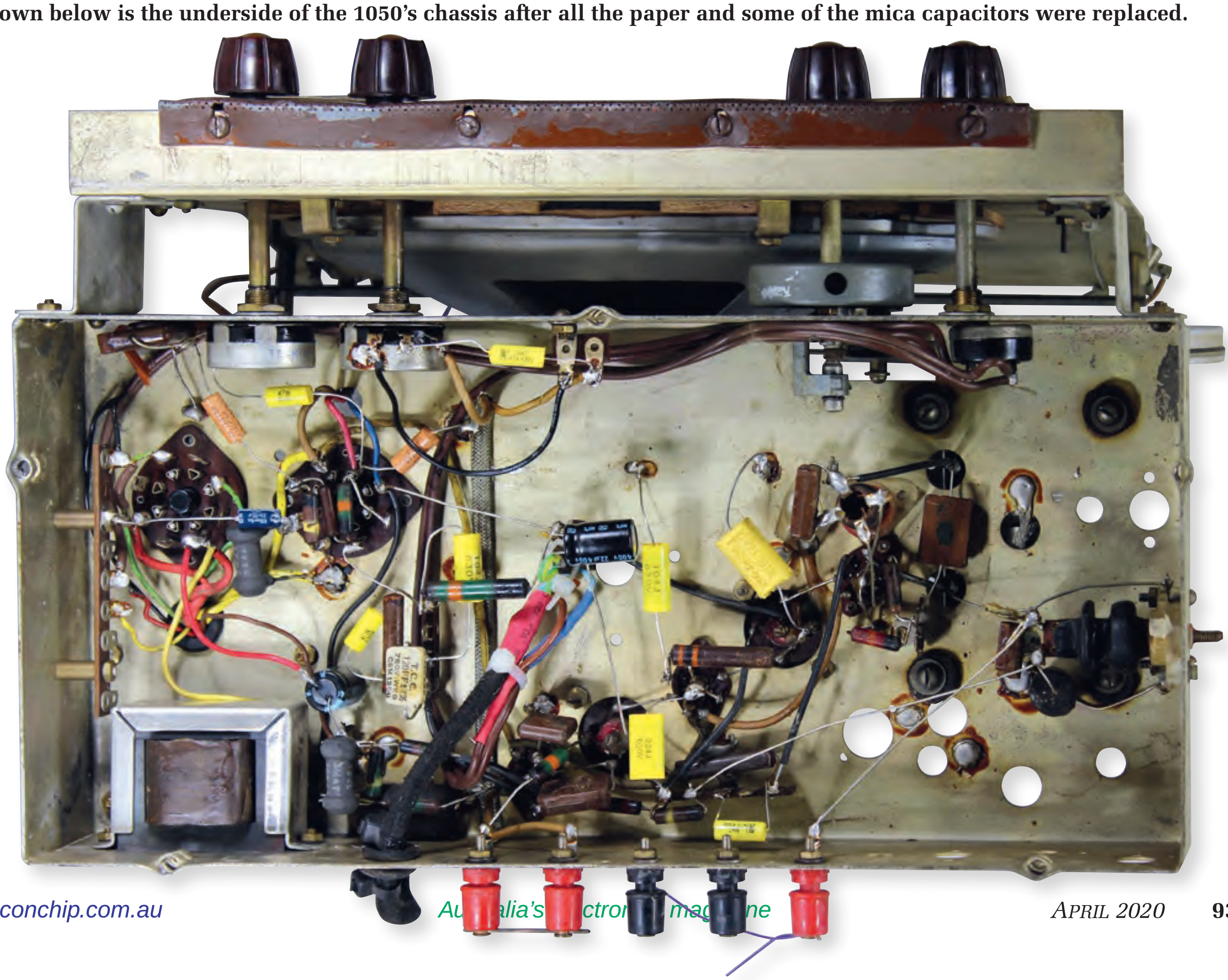
The mesh behind the rear grille bars restricts heat transfer, so the gap below the handle at the top is the major ventilation port.

All of these become more likely with increasing age. For a rigorous treatment of the causes of failure, see the paper titled "Some mechanisms of failure of capacitors with mica dielectrics" at: **siliconchip.com.au/link/aav9**

I feel that the 12 capacitors replaced in this restoration represented good value, restoring full function and guaranteeing future reliability. The result was an iconic radio that delivers a pleasant listening experience.

But wait, there's more!

Shown below is the underside of the 1050's chassis after all the paper and some of the mica capacitors were replaced.



Tecnico 1951 “Baby Fortress” Model 1140

By Associate Professor Graham Parslow

Here is a short bonus article on a Tecnico Model 1140. The only similarity between this radio and the Model 1050 is in the case design. The restored radio does not have a truly “authentic” look as the case should be white, and the knobs and grille are not originals.

Although this radio used a similar overall case design as the model 1050, it was significantly scaled down. It is a modest 270mm wide and weighs 4.9kg. By comparison, its 'big brother' model 1050 is 400mm wide and weighs 9.6kg.

Electrically and mechanically, it is an entirely different radio. This one was created as a budget radio for the kitchen, rather than an imposing table radio for the lounge.

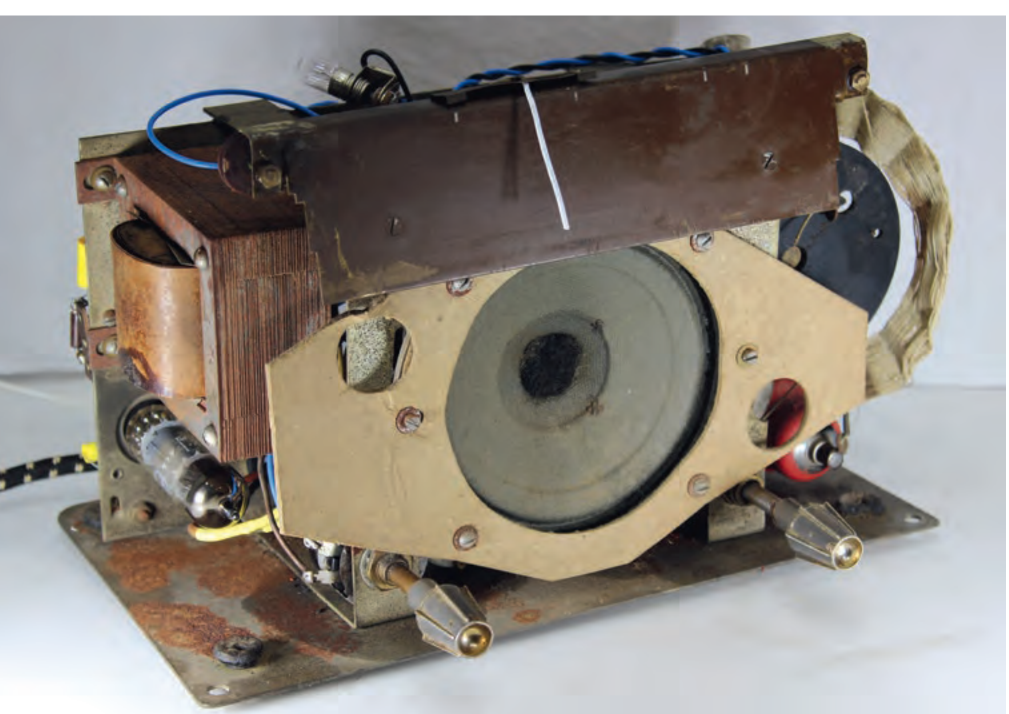
The model numbers used by Tecnico combined the year of release (1 = 1941) with the number of valves, plus a gratuitous zero at the end. Hence the model 1050 is a five-valve radio released in 1950, and the model 1140 is a four-valve radio released in 1951.

The example shown here was acquired lacking the front grille and knobs, so it needed some restoration work. In this case the replacement knobs were taken from an HMV stereogram. The genuine grille and knobs are the same as for the model 1050.

The radio has an unconventional vertical chassis, more commonly seen in TV sets. In good reception areas, an external aerial was not needed because the primary tuning coil is also an antenna, as is common in portable models from this era.

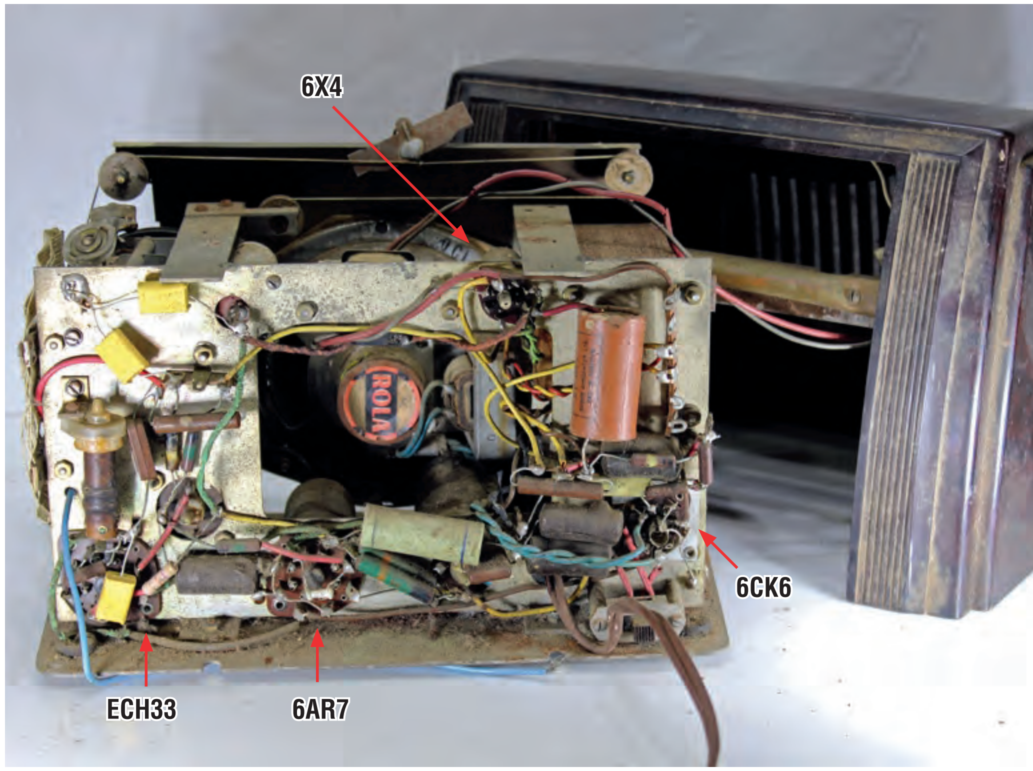
The chassis rear view shows the valves in this particular radio. In production, there were opportunistic valve substitutions, and some are shown on the official circuit diagram.

At variance with the official circuit shown in Fig.1, the output pentode in this radio is a 6CK6 (designated as EL83 in Europe) that is rarely seen in Australian radios. The 6CK6 can be pushed to 9W audio output, so it is



The 6CK6 output pentode is located below the power transformer. The loop coil antenna can be seen to the right of the 5-inch Rola model 5C speaker. From the mid-1950s, ferrite rods replaced woven coil antennas.

Point-to-point wiring was used, with the smaller components mounted on tagstrips, as was common in 1950s radios. The switch at the back is a top-cut tone control (S1) which switches capacitors connected to the primary of the output transformer. (This photo was taken before all paper capacitors were replaced.)

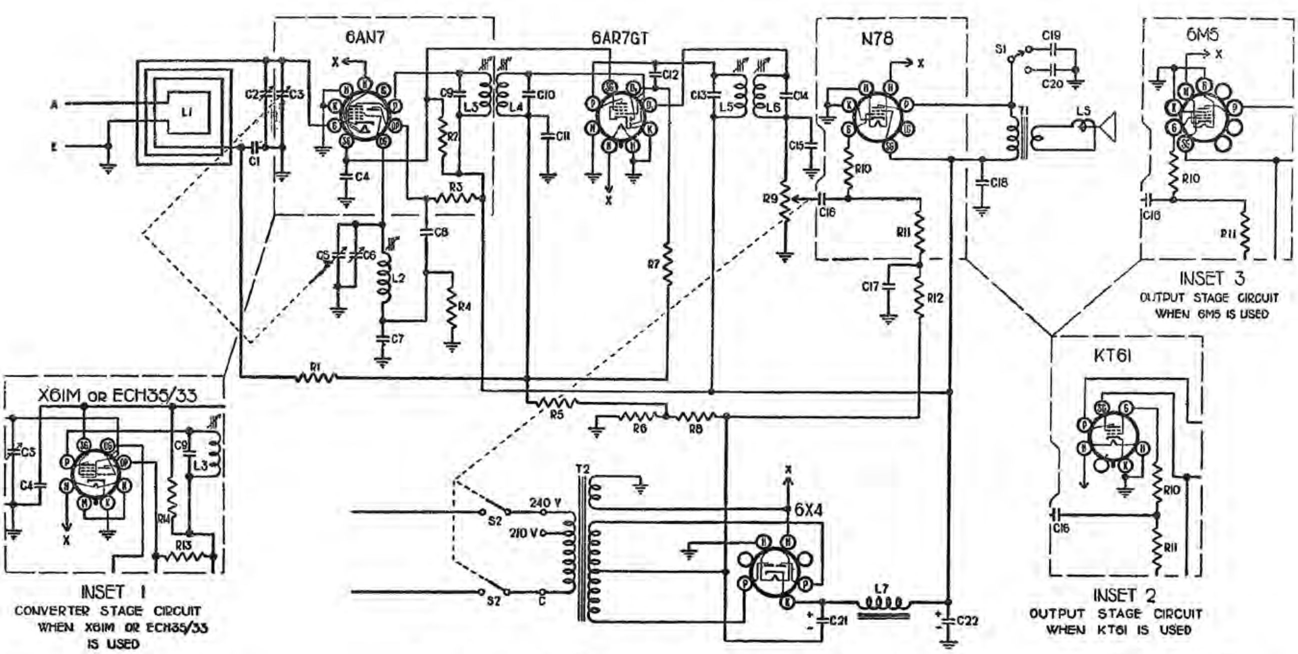


mismatched with this application.

It is a nine-pin valve, described as a video power pentode capable of plate voltages up to 300V (the plate was measured at 220V in this radio). Eight of the nine pins are functional, allowing individual connection to all grids as well as an internal shield.

The radio shown here needed a replacement 6AR7 due to an open filament in the original valve. All paper capacitors were replaced. For its compact size and given the limitations of the Rola 5-inch speaker, it performs well. SC

Fig.1 (below): details on the 1140 can be found at https://vintage-radio.com.au/home.asp?f=3&th=587 including how to do the alignment. We've reproduced the circuit shown in that link as it's the best quality scan available. It's important to note that the valve line-up differs a bit from the actual radio shown, with a 6CK6 used instead of the N78 (and other substitutes).



R1	.1 Megohm ½ Watt
R2	12,500 ohm 2 Watt
R3	50,000 ohm 1 Watt
R4	50,000 ohm ¾ Watt
R5	1 Megohm ½ Watt
R6	30 ohm ½ Watt
R7	1 Megohm ½ Watt
R8	50 ohm ½ Watt
R9	.5 Megohm vol. cont. TA-134
R10	50,000 ohm ½ Watt
R11	.4 Megohm ½ Watt
R12	.1 Megohm ½ Watt
R13	50,000 ohm 1 Watt
R14	25,000 ohm 2 Watt

C1	.05 uF 200V Paper
C2	3-30 uuF Trimmer
C3	11-450 uuF Gang Section
C4	.1 uF 200V Paper
C5	11-450 uuF Gang Section
C6	3-30 uuF Trimmer
C7	420 uuF Mica (5%)
C8	.05 uF 200V Paper
C9	70 uuF Mica (inside I.F. can)
C10	70 uuF Mica (inside I.F. can)
C11	.05 uF 200V Paper
C12	25 uuF Mica
C13	100 uuF Mica (inside I.F. can)
C14	100 uuF Mica (inside I.F. can)
C15	500 uuF Mica
C16	.005 uF 600V Paper
C17	.1 uF 200V Paper
C18	.1 uF 400V Paper
C19	.02 uF 600V Paper
C20	.005 uF 600V Paper
C21	8 uF 350V Electrolytic
C22	16 uF 350V Electrolytic

L1	Loop Aerial 209-176
L2	Coil, B/C Oscillator 209-178
L3 & L4	I.F. Transformer 208-104
L5 & L6	I.F. Transformer 208-105
L7	Choke 12H 50mA 207-139
T1	Speaker Transformer .. ECG70
T2	Power Transformer TA-142
S1	Tone Switch TA-129
S2	Off-On Switch .... TA-134 (coupled to vol. cont.)
L5	Loudspeaker 5C 204-107