Vintage Radio

By Charles Kosina

HMV's 64-52 Little Nipper

Charles Kosina has always enjoyed reading Vintage Radio every month in SILICON CHIP. But rather than being simply nostalgic about his former job after school repairing radios, he decided to restore a valve radio that he purchased online, a 5-valve HMV Little Nipper, model 64-52.

For something of a nostalgia kick, I decided that I would try restoring a valve radio. On eBay there are numerous old radios for sale, some at quite ridiculous prices.

After several unsuccessful attempts, I finally won an auction for an HMV Little Nipper 5-valve set which dates from about 1954.

It is housed in a chocolate brown Bakelite cabinet and has a 5 x 7-inch oval loudspeaker which gives reasonable sound quality. As picked up, the radio was not working. It was reasonably clean but had some damage to the case and front panel. Also part of the trademark Little Nipper logo was missing.

Fortunately, data for this set is easily obtained via the internet and I managed to download everything I needed. Fig.1 shows the complete circuit diagram which is a quite conventional 5-valve design.

An internal ferrite rod antenna is tuned by one section of the tuning gang over the AM broadcast band and the signal is connected to grid 3 of the 6BE6 pentagrid converter, otherwise known as a heptode.

It operates as a self-oscillating mixer, with the local Hartley oscillator function tuned by the second section of the twin-gang capacitor. A fixed padder capacitor of 460pF is used in series with the tuning capacitor. Provision is also made for an external antenna coupled to the ferrite rod by three turns (L2) and via loading coil L1.

The output from the plate, pin 5, is fed to the first double-tuned IF transformer which is peaked to an intermediate frequency of 457.5kHz. It feeds a 6BA6 remote-cutoff pentode. I noted with some interest the 10pF neutralisation capacitor from the plate of the 6BA6 to the bottom end of IFT1.

The second IF transformer is connected to the 6AV6 demodulator and AF amplifier. The demodulator function is provided by one of two diodes. One of these could be used for AGC (automatic gain control) and the other for audio detection.

In this circuit, only one of the diodes is used and its filtered negative voltage appears across the volume control, VR7. Further filtering is provided by R4 and C7 and is used as AGC for both the 6BA6 and the 6BE6.

The signal from the wiper of the volume control is fed to the grid of the triode section in the 6AV6 and its plate signal is fed to the grid of the 6M5 pentode, which operates as a class-A stage driving the speaker via transformer T2.

Negative feedback is applied from the secondary winding of output transformer T2 via the 25µF capacitor C20 to the cathode of the 6M5, to reduce distortion. Potentiometer VR2 and the associated capacitors provide a simple treble-cut tone control.

The power supply uses a centre-tapped transformer feeding a 6X4 rectifier, the output of which is filtered by 16µF capacitor C19 for the 6M5 output stage and by two 10kΩ resistors in parallel (R10/R11) and 16µF capacitor C15 for HT to the preceding stages.

Initial switch-on

With some trepidation, I plugged it in and turned it on. That's not really a

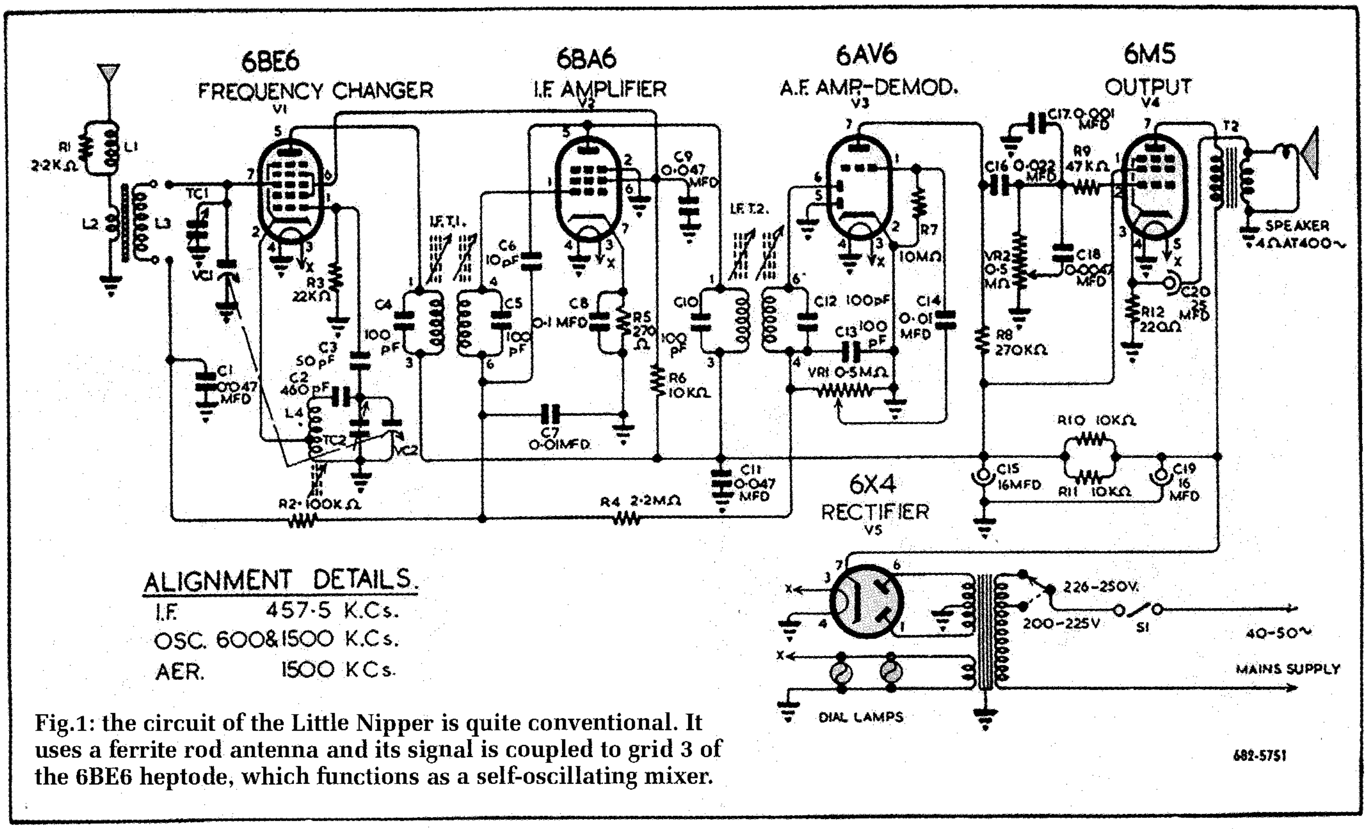


Fig.1: the circuit of the Little Nipper is quite conventional. It uses a ferrite rod antenna and its signal is coupled to grid 3 of the 6BE6 heptode, which functions as a self-oscillating mixer.

good idea without some initial resistance tests. But it was a non-event, with no dial lamps but no smoke, which was a good start! Taking the back cover off I noticed that the cathodes were glowing on all but the 6BA6 valve.

I have a collection of valves from decades back and I rummaged through these looking for a 6BA6. No luck but I came across a 6AH6, which is a sharp-cutoff pentode with an identical pinout.

Well, let's try that I thought and plugged it in. This brought success, of sorts, and the radio sprang to life but every station had a heterodyne whistle. With care, tuning to a zero beat produced a reasonable sound.

The reason for the heterodyne whistles was obvious; too much gain. The 6BA6 has a transconductance of 4400μ℧ (μmhos) and a grid-to-plate capacitance of 0.0035pF. Contrast this with the 6AH6 which has 9000μ℧ and grid-plate capacitance of 0.03pF.

Editor's note: μ℧ (micromho) refers to the unit of conductance which is the reciprocal of resistance. That term came from spelling ohm backwards and is written with the upside-down capital Greek letter, omega. Conductance, typically referred to as "mu", is used as a measure of gain in a thermionic valve (specifically triodes), expressed in terms of amps/volt or the amount of plate current which flows for a given grid voltage. One micromho is equivalent to 1μA/V. More typically, gain was expressed in "millimhos", equivalent to 1mA/V.)

With double the gain and ten times the capacitance it was not surprising that the IF stage became an oscillator. As a quick test, I removed the cathode bypass capacitor, C8. That move reduced the gain enough so that the stage no longer oscillated.

But this was just an interim measure as I wanted to keep the set as per original. Looking on eBay, one can obtain 6BA6 valves but at a price rather higher than I was willing to pay, as well as being far away so delivery could take some time. This is where friends come in.

An email to a long-time friend resulted in him sending me a list of valves that he had been hoarding for many years and this included some 6BA6s. He very kindly posted me a couple, and when they arrived two days later I was able to plug one in. Sure enough, the circuit then worked well with no whistles.

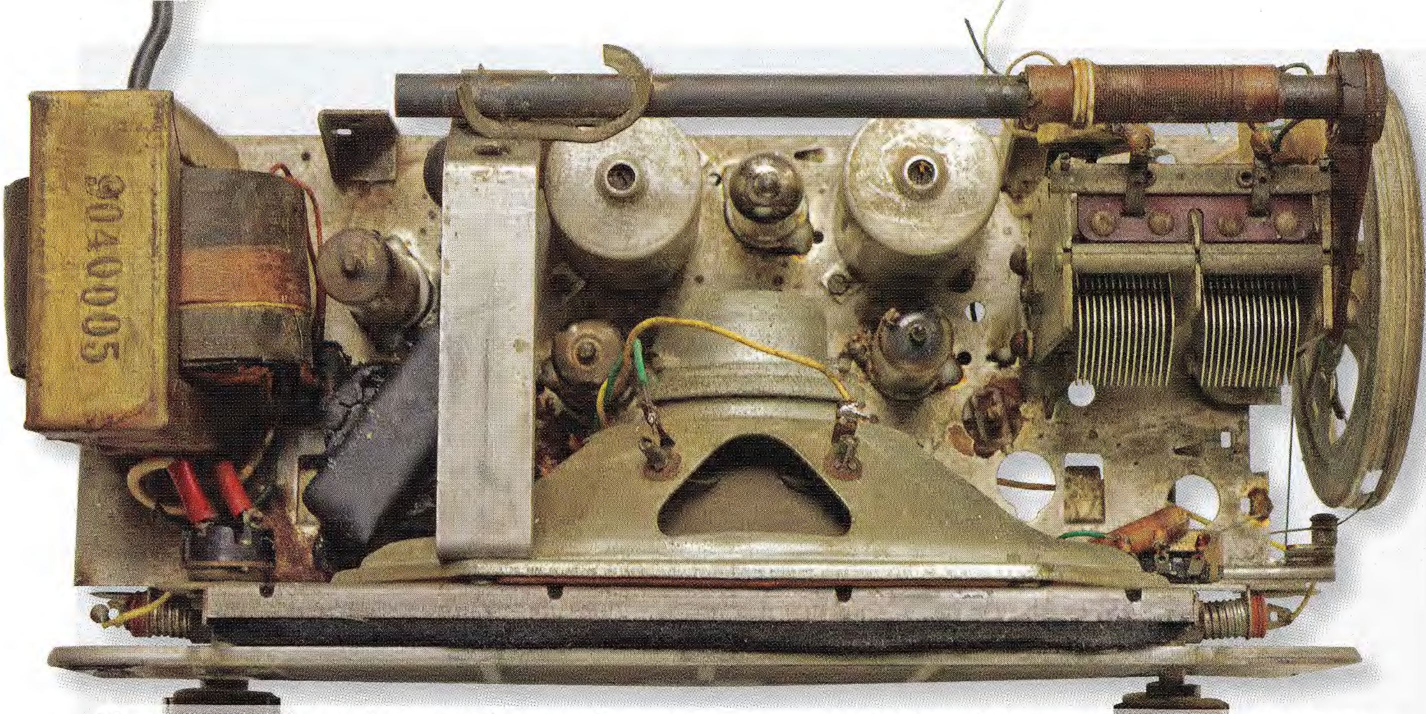
Being in a Melbourne outer suburb, all the metropolitan stations could be received well. The dial markings are obviously out of date as many stations have moved or disappeared but 3LO and 3AR are still approximately on the same dial spots, now renamed 774 and RN (Radio National).

The blown dial lamps are rated 6.3V at 0.3A. Jaycar had replacements rated at 0.25A, which is close enough. It's amazing that after so many years, near identical 6.3V lamps with screw bases are still available.

The first modification I made was to replace the 2-core power flex with a 3-core double sheathed cord, to properly earth the chassis. The way to anchor the 2-core flex in those days was a knot inside the grommet; illegal and unsafe by today's standards. I used a much better clamping system, as can be seen in the photos.

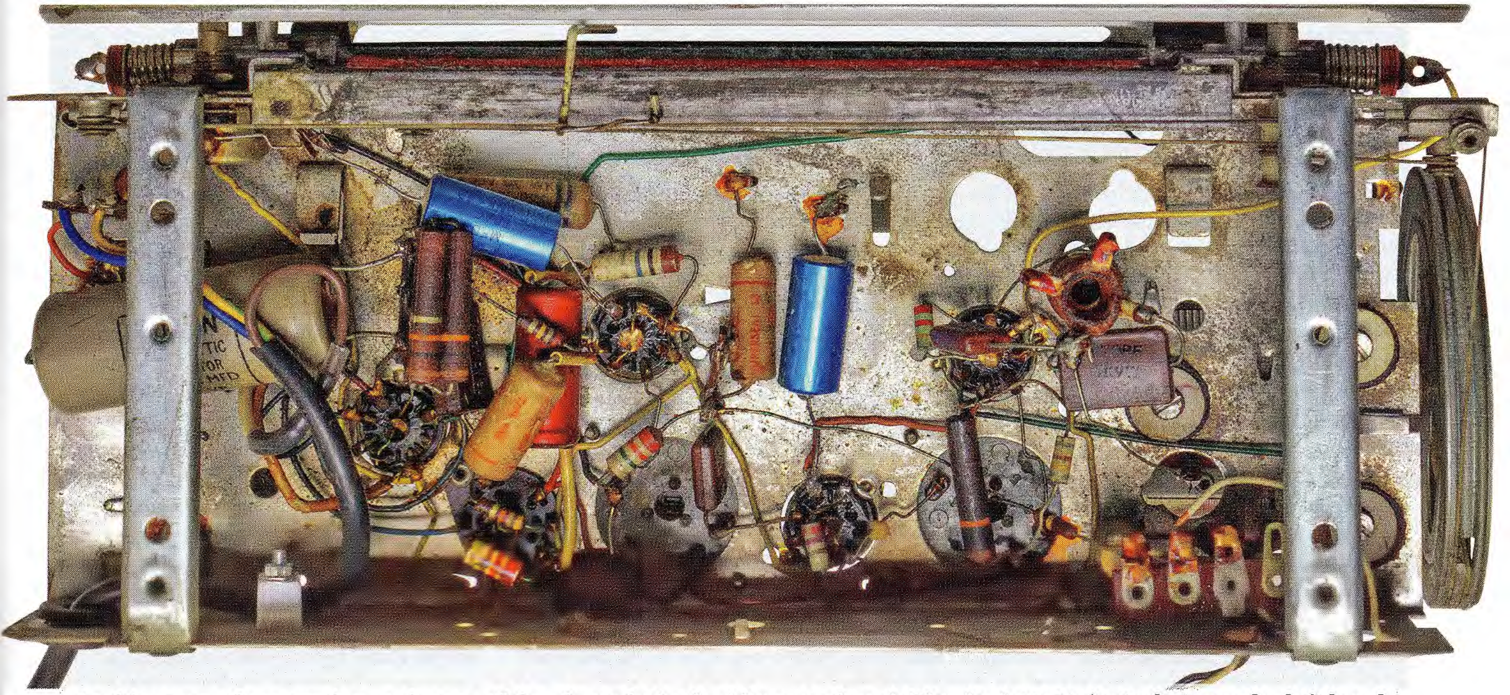
Then I left the set running for some time, watching for any overheated components. None showed any signs of distress but I could not trust any of the high voltage capacitors. The filter capacitors, C15 and C19, are actually a dual electrolytic in one case. They showed no signs of distress but I have doubts about how long they would last. These will be replaced when I can get suitable new ones.

All the paper capacitors subjected to high voltage were replaced with modern ones of the same or higher capacitance. I left the low voltage ones



The top view of the set shows a pitch-covered output transformer, to the right of the power transformer. This photo was taken before the top of the chassis was cleaned.

The rear cover of the set had damage around the mains outlet hole and so this was covered by the blue label, since the mains cable exits through the bottom of the set. This case cover was used in a number of Little Nipper models. The short black and white wires emerging from the back are for external antenna and earth.



At this stage of restoration, only two of the electrolytics had been replaced. The dual 16µF electrolytic on the left-hand side will have to be replaced, as well as the wax-covered paper capacitors. Some of the carbon resistors will also have gone high in value and will need to be replaced. Note the 3-core mains cord which has been properly anchored.

in place as I figured any leakage would not matter much.

Cosmetic restoration

Then it was time to fix the mechanical details. Internally, the chassis was reasonably clean. Using circuit board cleaner and a brush, I managed to clean off the accumulated grime on top of the chassis.

The photo of the underneath of the chassis shows the construction techniques of the day which consisted of point-to-point wiring, with components wired to valve sockets and tag strips.

Compared with today's neat circuit boards it looks ugly but that is the way it was done then when we still had factories producing radios in Australia. Despite the untidiness, radios worked quite well.

So far the restoration had been straightforward. However the Bakelite case presented some major challenges. This was something that I had never attempted before so I had to very quickly come up to speed on Bakelite restoration. The case had suffered damage in its past and there was a crack in the bottom right hand corner of the case.

This had been glued together, but there was excessive glue and the broken piece was not quite in correct alignment. I decided that to break the glue line and reglue it was too much of a risk, so decided to leave it as is. But I did remove the excess glue very carefully. The back cover had a piece missing next to the "Mains Outlet" hole. The cover is obviously designed to fit different models as the mains cable did not come through it anyway. What to do about it?

Trying to reconstruct it was too hard and not really worth it. I opted instead to make a label cover with 300gsm photo paper to fit over the hole.

Finally, I spent a fair while polishing the cabinet using car polish and a soft rotary brush on my electric drill. There were numerous tiny scratches and a few slightly deeper ones. Polishing made a huge improvement to the appearance although some of the deeper scratches are still there. With a lot more time, it could be improved further but that is an example of diminishing returns.

The plastic escutcheon was a more difficult problem. It also had a repaired crack and only half the 'Little Nipper' logo was present. The repaired crack also had excess glue and the best option was to carefully remove it. As for the logo, the ideal way to fix this would be to make a replacement using a 3D printer. That's a job for the future.

At least the set had all four of the original knobs. Three of them were OK but the fourth was damaged and would not fit tightly on the shaft. I got around this by cutting a small rectangular piece of thin aluminium sheet and fitting it inside the knob so that it locked on the shaft flat. This was fitted on the least-used shaft, the tone control.

Testing & alignment

I decided to check the voltages to see how they compared to specifications. With a mains voltage of 234VAC the DC output from the 6X4 rectifier was 250V, with a ripple component of 16V peak-to-peak.

This was close enough to the design figure of 280V±15%. Despite the amount of ripple on the DC voltage, there was no noticeable hum coming from the speaker. Likewise, the filtered voltage at C15 was 170V, compared with 185V in the specification.

Finally, I decided to do a complete realignment. Fortunately, the downloaded data included a complete realignment procedure. Feeding in a signal generator, I discovered the IF was detuned to about 440kHz, not 457.5kHz as per the specification. Why was it 457.5kHz instead of the normal 455? Who knows?

After tweaking this up, I then set the oscillator coil slug (L4) and trimmer (TC2) to have correct calibration at 600kHz and 1500kHz, and peaked the antenna trimmer (TC1) at 1500kHz.

I don't have the equipment to measure the sensitivity in terms of field strength as μV/m. My Meguro signal generator is calibrated in dB starting at 1μV, into 50Ω. Connecting to the antenna terminals does not give a good result as L1 is in series with the signal and heavily attenuates it.

I wound two turns around the ferrite rod (L3), and by measuring the open-circuit and connected voltage, I calculated that the impedance seen by the signal generator was about 272Ω at 1000kHz. Measuring the voltage at the top of L3 indicated a voltage step-up ratio from the signal generator of 22 times.

Tuning the receiver to a quiet spot near 1000kHz, and setting the generator to the lowest setting of 1μV (0dB) with 50% modulation at 400Hz, the tone was clearly audible.

Because of the step-up ratio, this would represent about 18μV RMS at the control grid of V1. I decided to measure the maximum RF gain of the set, so first I disabled the AGC by shorting it out at C7, and measuring the rectified DC voltage at the top end of VR1.

With the signal generator setting of +40dB relative to 1μV (this would be approximately 169μV RMS) the DC voltage is -12.56V. This represents a gain of 74,300 or 97dB. Re-enabling the AGC, the output was -4.0V with the same input.

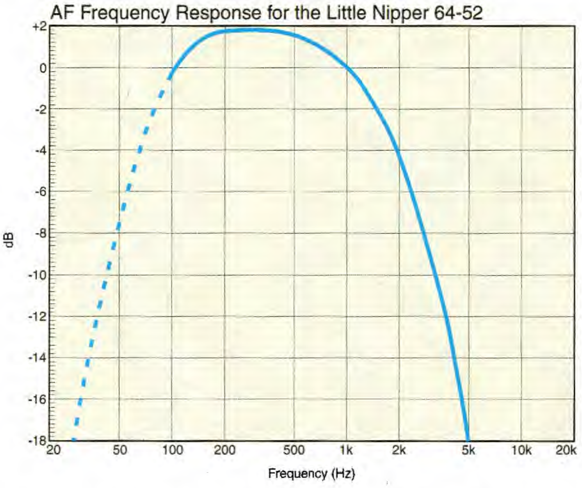


Fig.2: the Little Nipper's audio response was pretty typical for the day. It's quite far down at 5kHz and this is largely a result of the narrow IF response, which was desirable to get high sensitivity and good selectivity.

I don't have a direct way of measuring signal-to-noise so an estimate was made by measuring the peak-to-peak output voltage across the speaker terminals with an unmodulated carrier, followed by 400Hz modulation set to 50%. This gave me an S/N ratio of -32dB at 1μV + 30dB input, and -42dB at 1μV + 50dB.

The audio output appeared adequate and the measured power into the speaker was 1.1W before there was any noticeable distortion of an input sinewave. I also did a frequency run on the set from the antenna to the speaker and this is shown in Fig.2. Using 1000Hz as the 0dB reference level, the -3dB point is about 1700Hz and at 3000Hz the audio response is 9dB down.

Getting such an old radio working and looking reasonable was quite a rewarding task. Of course, the investment in time was way out of proportion to the final outcome but it provided an enjoyable trip down nostalgia lane. **SC**