Vintage Radio

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The Philips BX373A 4-valve receiver

The set with the "Bibber Schaal" (shaky dial scale)

Until now, Vintage Radio has concentrated almost exclusively on Australian-made receivers. This month, however, we're going to take a look at a Dutch receiver, the Philips BX373A 4-valve table/mantel receiver from 1948. It's an excellent performer although the design is different to Australian sets.

THIS PARTICULAR Philips BX373 receiver is owned by John de Haas who has a fine collection of vintage radios, many of them originating from Holland (see SILICON CHIP, June 2012). And although it's a 4-valve set, the BX373A's performance rivals that of many 5-valve receivers. It operates on both the broadcast and shortwave bands, as well as the long-wave band.

As shown in the photos, the receiver is housed in a large, polished Bakelite cabinet with an interesting circular dial to the right. The On-Off/Volume control is towards the centre-bottom at the front of the cabinet, while the Tuning control is to the right. The Wave-Change switch is accessed at the righthand end of the cabinet, while the Tone control is at the opposite end.

The receiver is no lightweight and weighs a substantial 6kg. It's also quite large at 44 x 19 x 25cm (W x D x H), including the knobs. At that size, it could be considered to be either a table set or a mantel set.

The dial scale is unusual but attractive. It's also interesting in that it doesn't indicate the frequency being tuned but instead shows the approximate wavelength. I personally feel uncomfortable with this and prefer some indication of the tuned frequency.

As well as the wavelength indications, the dial-scale also carries corresponding country and city markings around the perimeter. The centre of the dial has three symbols which indicate how the Wave-Change knob should be set to select a particular band.

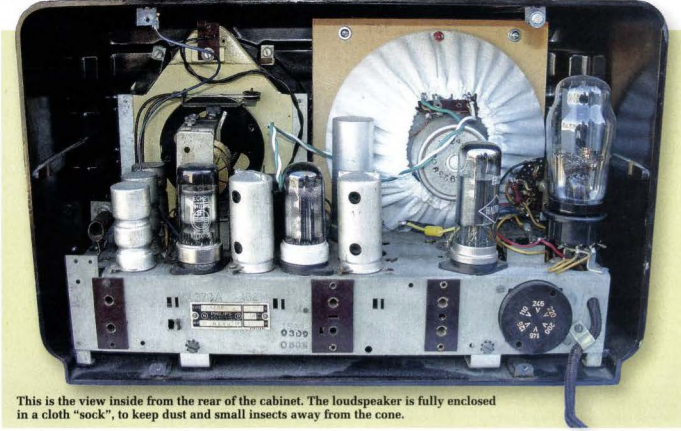
The back of the set is covered by a thin wooden panel with numerous ventilation holes. This panel carries a number of graphics which indicate the functions of the various sockets which are accessible through large clearance holes. These graphics not only helped people who were unfamiliar with radio terminology but also meant that the same panel could be used on sets exported to non-Dutch speaking countries.

Dismantling the receiver

Removing the chassis from the cabinet is straightforward. The first step is to remove the control knobs which are all push-on types. The four screws holding the rear panel in place are then removed, after which the screw holding the tone control's Bakelite shaft in place is loosened. Once that's done, this shaft can then be removed.

However, you have to be careful doing this as this Bakelite shaft is easily broken. And while it's possible to get a replacement from one enterprising enthusiast, it will set you back around $50!

Next, the four screws that go through the rubber buffers on the bottom of the cabinet must be removed, followed by the two screws that secure the front of the chassis to the inside front of the cabinet. These latter two screws are recessed several centimetres into the



This is the view inside from the rear of the cabinet. The loudspeaker is fully enclosed in a cloth "sock", to keep dust and small insects away from the cone.

cabinet, so you will need a special screwdriver for this job, especially when it comes to later reinstalling them.

In my case, I use a small screwdriver with spring-loaded clamps to hold the screw in place on the blade. Alternatively, if you don't have this type of screwdriver, a small amount of Blu-Tack or Kwik Grip on the screw head can be used to hold it in place while it is installed.

Once all the screws have been removed, the chassis can be slid out through the back. The only component left behind is the speaker, which is attached to the inside front of the cabinet.

First impressions

A quick examination of the chassis reveals a few initial surprises. It also has a few things that are different from Australian sets.

First, for some strange reason, the rectifier socket is mounted proud of the chassis instead of flush-mounted. It almost looks as though the designers forgot that they needed space for a rectifier when the chassis layout was being decided on.

In addition, as with many other European sets, the power transformer and the associated wiring to it are not as well-protected against accidental contact compared to Australian designed sets. On the other hand, once in the cabinet and with the rear panel fitted, this European receiver is just as safe as an Australian set.

One unusual feature is that the speaker is fully enclosed in a cloth "sock", to keep dust and small insects away from the cone. This helps ensure that the speaker cone stays in good condition and contributes to the long life of the speaker.

Another unusual feature is the tun-

The parts on the top of the chassis are all easy to access, so servicing is straightforward.

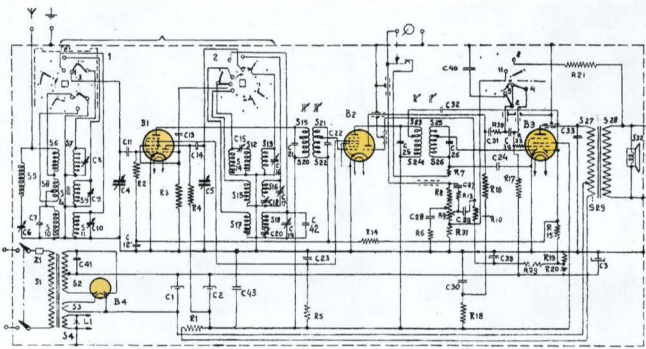


Fig.1: the circuit is a fairly conventional 4-valve superhet design. Note that the detected audio from valve B3 is fed back to the grid of the triode section in valve B2. This signal is then amplified by B2 and fed to the grid of B3 which further amplifies the signal and drives the loudspeaker via an output transformer.

Did the designers forget to leave space for the rectifier when they designed the chassis? For some strange reason, it's mounted proud of the chassis instead of sitting down flush.

ing capacitor mounting arrangement. If you touch the tuning capacitor, you immediately discover that it is on a very flexible mounting. As a result, it wobbles around quite a bit more than usual, hence the set's Dutch nickname of "Bibber Schaal", which roughly translates to "Shaky Scale".

It make me wonder just how stable the tuning is on shortwave if the set is given a bump!

Under the chassis, the multi-band tuning and switching arrangement is very compact and servicing this part of the circuit would be awkward. It would also make alignment adjustments a little more difficult than usual.

Circuit details

Take a look now at Fig.1 for the circuit details. It's a fairly conventional superhet design with four valves, including the rectifier.

The first thing to note is that although there is provision for an external antenna, a "plate" antenna is also provided for those who consider an antenna a nuisance. This plate antenna consists of foil plate glued to the inside of the back panel and this is attached to the antenna input in parallel with a lead from the external antenna terminal. In strong signal areas, a plate-type antenna will work quite well but an outside antenna will provide the best performance.

The front-end is typical of that used in many European sets. It's a triple-band design with long-wave (150-420kHz), medium-wave (517-1620kHz) and shortwave (5.9-18.75MHz) tuning capabilities. In Australia, the long-wave band was used for only a very short time when public radio broadcasts first started in the 1920s. These days, the band is used for navigational beacons which send out tone-modulated Morse code identification or computer spoken weather reports for aircraft.

The 3-band antenna and oscillator tuned circuits are selected as required by the band-switch. As shown, the antenna terminal is connected to a series-tuned circuit consisting of coil S5 and C6. These are tuned to the 452kHz IF (intermediate frequency) and this minimises signal breakthrough from stations at the high-frequency end of the long-wave band. This is necessary because these stations operate at frequencies close to the IF (down to a minimum of just 32kHz away).

The tuned input signal is applied to the signal grid (grid one) of the heptode section of valve B1, an ECH21 triode-heptode converter. The oscillator signal is applied to grid three, so that the incoming signal is converted to the 452kHz IF.

The selected output signal on 452kHz is taken from the anode and applied to the heptode section of valve B2, another ECH21, via a double-tuned IF transformer (in this case, the triode section is not connected to the heptode). The amplified signal is then fed via a second double-tuned IF transformer to valve B3, an EBL21 duo-diode power output pentode.

As an aside, AWV in Australia later developed the 6BV7, a 9-pin miniature valve with similar characteristics to the EBL21. It wasn't as reliable as the EBL21, however.

Getting back to Fig.1, the detector diode in B3 is fed from a tap on the secondary of the IF transformer. The detected audio signal is then fed back to the grid of the triode section of valve B2 where it is amplified and applied to the grid of B3. B3 in turn drives the speaker transformer and the set's internal speaker.

There is also provision for an extension speaker and this can be plugged in via a socket on the back panel. Note that negative feedback from the speaker's voice coil is routed back via R21 and the tone control switch (shown just above valve B3 on the circuit).

The ventilated panel at the rear of the set carries graphics which indicate the functions of the various sockets. As well as antenna and earth terminals, the set has pick-up input terminals and an external loudspeaker output socket.

Pick-up inputs

The rear panel also provides access to a pair of pick-up inputs, so that records can be played back via the audio amplifier stages of the receiver. To prevent interference from the front-end stages, the output from the detector is open-circuited when the pick-up lead is plugged into the rear-panel socket (see top of circuit). The RF and IF stages of the receiver remain fully operational, however.

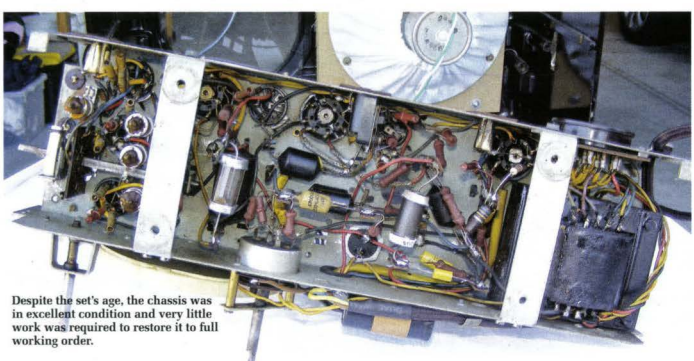
In practice, this means that if the set just happens to be tuned to a very strong station, some leakage of the detected audio signal would almost certainly occur across the pick-up socket. That, in turn, would result in a weak radio signal audibly interfering with the signal from the record player.

Rendering the front-end of the receiver inoperative by removing the HT to some or all of that section would have completely eliminated this problem. However, simply tuning off the station may also have been enough to prevent interference.

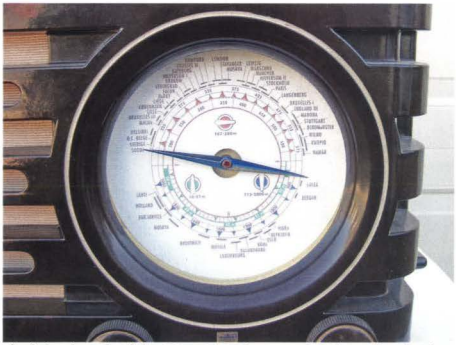
Power supply

The power supply is conventional and includes a power transformer with six primary tappings to cater for mains voltages ranging from 110VAC to 245VAC. The secondary has three windings: a 4V winding for the rectifier heater, a 6.3V winding for the other valve heaters and a centre-tapped HT (high-tension) winding. The two outer leads of this HT winding go to the anodes of rectifier valve B4.

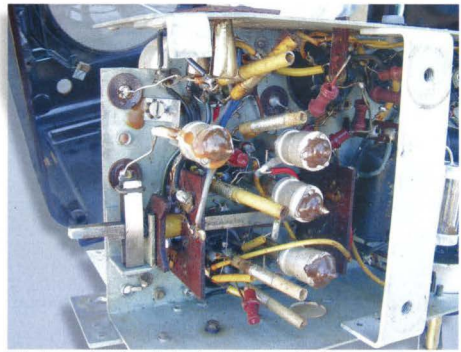
B4 is an AZ1, which is a duo-diode rectifier. Its HT output is fed though a winding on the audio output transformer and this not only provides ripple filtering but also bucks any hum which may be present on the grids of the audio amplifier stages.



Despite the set's age, the chassis was in excellent condition and very little work was required to restore it to full working order.



The dial-scale on the Philips BX373A is rather unusual, with wavelength rather than frequency indications. In addition, the perimeter carries various European country and city markings.



This close-up view shows the band-switching assembly. The compact layout makes it awkward to service and align correctly.

The set's power consumption is around 45W, which is about average for this type of set.

Delayed AGC

As shown on Fig.1, a back-bias network is connected across the centre-tap of the secondary winding on the power transformer. This network provides bias for valve B3 (EBL21) and for the triode section in B2 (ECH21), as well as providing a delayed automatic gain control (AGC) voltage source for both B1 and B2.

Valve B3 has two detector diodes inside its envelope. One is used as the detector, while the other is used to provide delayed AGC. In this case, a standing bias of about -2V is obtained from the junction of R19 and R20. This is fed via R15 to B1 and B2 to ensure correct operation before AGC voltage is applied.

This bias voltage is also fed to the AGC diode in B3, while a sample of the detected audio signal is derived from the primary of the second IF transformer and also fed to the AGC diode. As a result, a strong signal will quickly equal or exceed the negative bias (applied via R15) on the AGC diode, to control the gain of the front-end stages.

Summary

Despite being only a 4-valve set, the Philips BX373A is effectively equivalent to a 5-valve set and performs accordingly. The valves used are ones not commonly used in Australia and they also have base layouts which were not much used here either. In fact, the valves can be considered to be high-performance units and this set was designed to a high standard for the time (around 1948).

One area of criticism is that this set has controls which emerge through the sides of the cabinet – in this case, the wave-change switch at one end and the tone control at the other. The tone control in particular is very poorly thought out and it shouldn't have been all that difficult for it to have been fitted to the front skirt of the chassis.

Of course, the BX373A is not alone in placing some controls like this and some designs even have controls at the back of the set as well.

John has the original service manual for the set and although it's printed in Dutch, it's still quite easy to understand most of the information in it. This includes the dial-stringing arrangement, which is rather unique (to put it mildly) due to the very flexible dial drive and tuning capacitor mounting. It certainly deserves the "Shaky Scale" nickname.

Other useful diagrams show the wiring layout for both the top and underside of the chassis.

In summary, the Philips BX373A is a well-designed set that performs extremely well and looks very appealing. It didn't require a large number of parts for John to restore it good working condition, which indicates that Philips used good quality parts during manufacture.

This is one of John's favourite receivers and it makes a fine addition to a collection. SC