

Bush VHF90

Several people have asked about the modification to this set that I mentioned on the [Bush](#) page, so I have decided to include it here. Because I am describing circuit modifications, there are several diagrams, some quite large, on this page.

Please note that although I have carried out these modifications several times I can accept no responsibility for any problems or damaged caused by following these instructions.



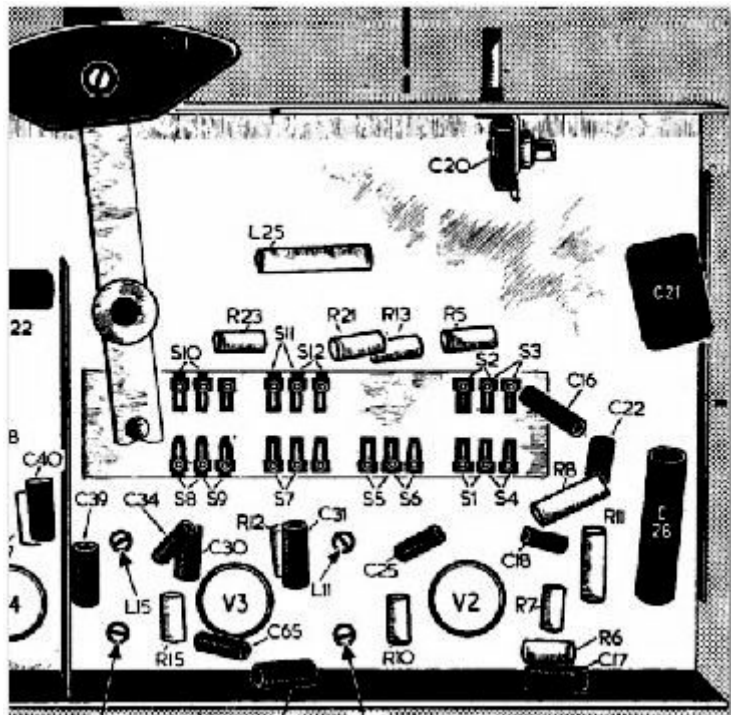
The VHF90 is a small AC/DC set covering MW and VHF bands. When it was released it cost around £17, which was quite expensive compared to similar models from Philips and Pye which also had the LW band and cost around £14. However, the circuit is based on what was then a standard Bush circuit, including the additional IF stage and a decent output stage (using a UL84 when many others were using UCL83 and similar valves). The rectifier is also a valve, in a time when some other manufacturers had moved on to metal rectifiers or similar devices. The advantage of all this, apart from improved performance, is that no large mains dropper is needed. The valve heaters, with the addition of a

thermistor, total to the correct voltage for the 200V setting, and only a couple of small 250 Ohm wirewound resistors are required for the higher settings on the voltage selector (the HT is derived from the incoming mains voltage). This reduces the localised hot spot in many sets where the output valve, rectifier valve and dropper resistor are all mounted close together.

In this particular model however, there are still a number of areas that run very hot. There are also some examples of poorly designed component layout, with power resistors underneath the chassis and close to other components.

If you are offered one of these sets, make sure the wavechange switch is still in place and mechanically operational. The switch often has problems and some repairers tended to leave the set permanently on VHF (possibly hardwiring some connections) and remove the switch lever and linkage. Rebuilding this is probably too much hassle for a set that is still fairly readily available in auctions etc.

There are a number of trouble spots in this set, and in my experience, most examples will have most or all these problems!

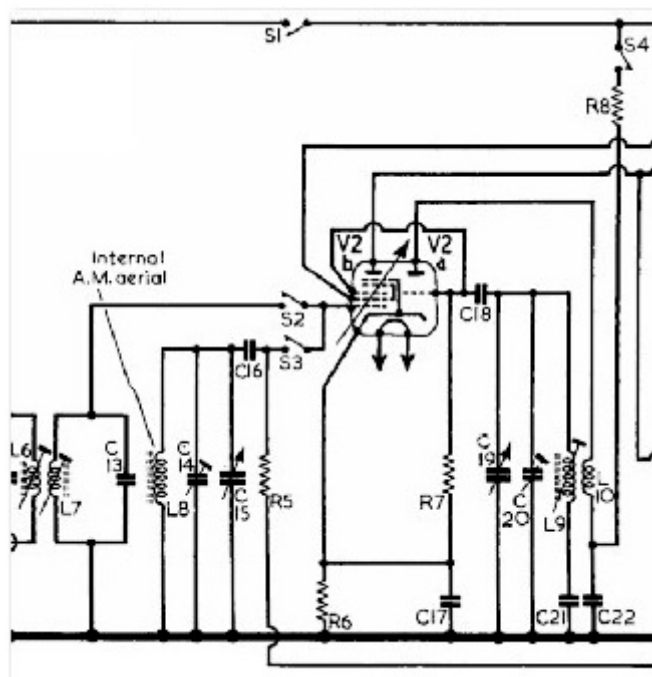


Start by replacing all the Hunts Mouldseal and wax-paper capacitors. There will be about twenty of them, and all will be in a poor state. Do not waste time by testing or checking them - you will find they are all bad, so just replace the lot.

R32 (Trader Sheet 1293) is the cathode resistor for the output valve. It is a 1 Watt 220 Ohm component, and it will probably be low! Even if it is not you should replace it, because it will vary in value as the set warms up. Yes, really, they seem to go low as the set warms up,

causing the output valve to draw too much anode current. It is mounted on a tag strip between the output (UL84) and rectifier (UY85) valves - right next to C56, which is one of the HT smoothing capacitors! I normally fit the replacement at the edge of the chassis, between pin 3 of the UL84 valve holder and a convenient chassis tag on the tag strip.

R35 is a 160-Ohm wirewound resistor feeding the cathode of the UY85 rectifier valve. This resistor is often open-circuit, and sometimes causes discolouration in the cabinet below. It is positioned under the chassis, close to the UY85. If it is OK, you will probably find that the soldered connections and tag strip have suffered from the effects of the localised heat. I normally replace it with a 150 Ohm 5 Watt wirewound component. You might like to consider arranging to mount it above the chassis on suitable through-chassis type tags or similar.



The dial lamps are in series with the mains neutral connection, and are shunted by a 30-Ohm wirewound resistor. Because the dial lamps are so dim in normal operation you will sometimes find that this resistor has been replaced with a higher value component. If one of the dial lamps then fails, this resistor has to handle the total mains current drawn by the set. The original 30-Ohm resistor had no problems with this, but a higher value resistor would run hotter and could give the same problems as R35 (above).

I have had to replace the rectifier valve holder in one set, because it was badly carbonated due to the heat from the resistors and valve. Normally they are OK though, as are the valves (with the possible exception of the UCC85 and UABC80, but these always seem to age quicker than the rest of this series).

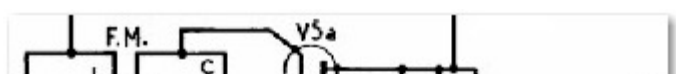
Before testing the set remember to check the mains switch (they are usually OK) and replace the mains flex (neutral to chassis please!).

If you are lucky the set will work nicely - but you will almost certainly not be that lucky. The usual problem is crackling on VHF and no reception on MW - caused by the problem with the waveband switch that I mentioned earlier. To prove this, connect a digital meter between pin 2 (control grid) of the UCH81 mixer-oscillator valve and chassis, and switch the set to MW. If there is a positive voltage, the switch is indeed exhibiting the usual problem.

Refer to the first circuit diagram section and switch layout diagram shown here. Both are taken from the Trader Sheet for the set. Switches S1/S4 and S2/S3 are positioned opposite each other, and the wipers are only about 2mm (3/32") apart. S1/S4 switches the HT either to the VHF tuner (S1) or to the anode circuit of the MW local oscillator (S4). S2/S3 switches either the IF from the VHF tuner (S2) or the MW aerial and AGC signal (S3) to the control grid of the UCH81 valve. That is a lot of voltage difference for closely spaced contacts, and after a few years the insulation starts to break down, causing leakage. Since the control grid is at high impedance on MW (due to the AGC circuit), it does not take much leakage to bias the valve fully on and incapable of acting as an amplifier. On VHF the impedance is lower, but the leakage still sufficient to cause a rustling sound.

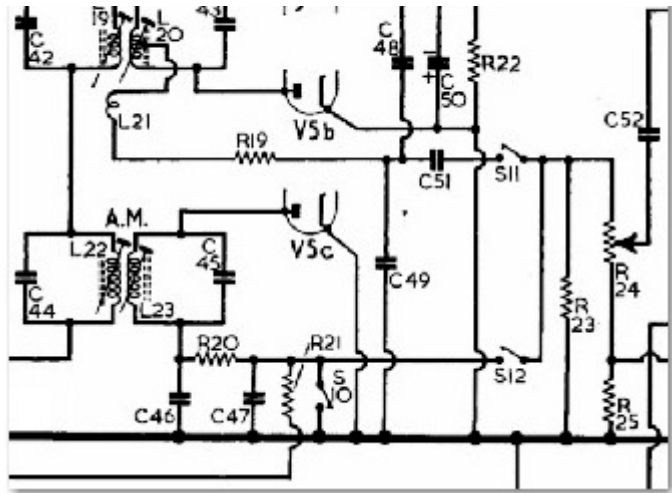
I have attempted to remove the switch (not an easy job) and clean everything, but this does not solve the problem. Therefore, the only solution is to separate the switch sections, and the only way to do that is to rewire one section of the circuit onto an unused switch section. The problem here is that there are no unused switch sections but it is not too difficult to modify the circuit to obtain one. Refer to the second circuit diagram section here.

Switch S11/S12 selects the audio output from either the VHF (S11) or MW (S12)



detector circuit for connection to the top of the volume pot. S10 short-circuits the MW AGC line to ground when the set is switched to VHF. S10 is the switch section we are going to make available, since the other half of this switch is already unused. The AGC feed (R21) is then connected to the other side of S12. On MW, the circuit is electrically exactly the same, and on VHF the MW AGC line is somewhat less directly grounded via the volume control and R23. In practice, this works fine.

Physically R23 (180K) is connected between the junction of S11/S12 and one terminal of S10. This terminal is also connected to chassis via a short piece of wire. Cut both these leads from S10. The chassis connection wire can be removed, and the resistor should be able to reach the same chassis tag easily. The other tag of S10 is connected via a single wire, which can simply be removed. R21 (2.2M) can be disconnected from S12 and reconnected to the junction of S11/S12.



The free switch section will be used to replace S1/S4. Since the opposite sections (S8/S9) are also switching HT, this makes sense if we are trying to avoid a repeat performance! Rather than disconnecting the wires from S1/S4, I normally separate it from S2/S3 by bending up and cutting off the fixed contacts, then bending up and cutting off the wiper. Some care is needed to avoid further damage to the switch.

Now all that remains is to connect the tags of the original switch to the tags of the free section. Do not attempt to thread the wires between the switch and the chassis because the capacitive coupling will prevent the circuit from working correctly. I use three lengths of rigid insulated wire, formed about 3mm (1/8") away from the switch. These are a bit prone to being disturbed when the chassis is being worked on but will be fine when the set is reassembled.

The set should now work properly! Please let me know how you get on with these modifications. If you find a simpler solution, I would be pleased to include it here.

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