Technical Information Exchange

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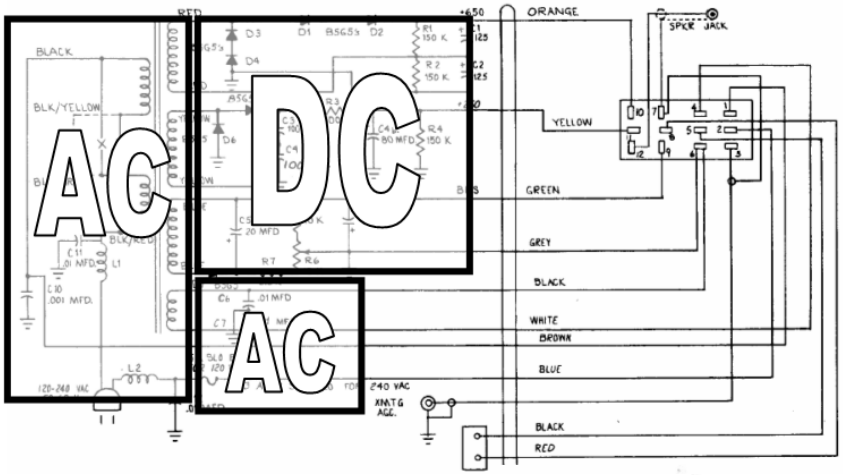
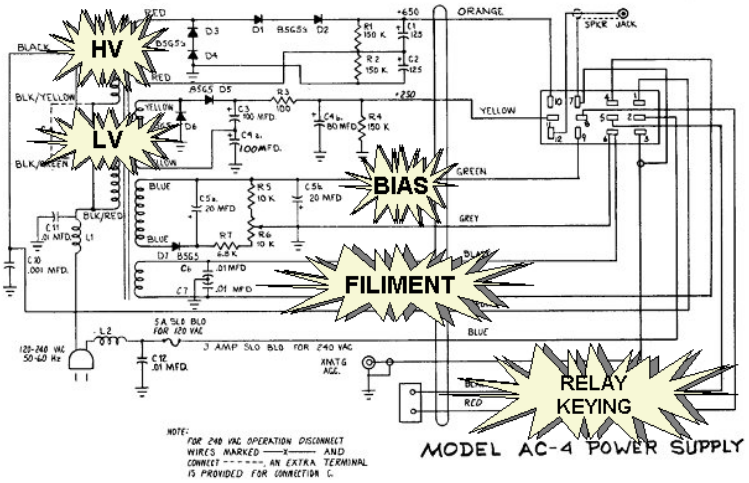
AC4 / AC3 POWER SUPPLY TROUBLE SHOOTING

By: Mark Gilger, WB0IQK

- In the following procedures you will be close to dangerous high voltages. Be careful.
- The first of the procedures has you verify the voltages at the connector. The second requires you to remove the bottom cover for further testing. The second parts is only required if indicated by the results of the first.
- The AC4/AC3 can be divided up into AC and DC sections as pictured below.

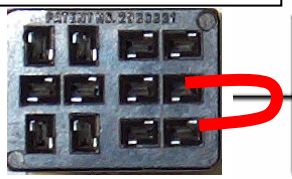


- The supply also has 4 separate sections that supply different voltages.
- The High Voltage (HV) section supplies approximately +650 volts used by the tube final amplifier section.
- The Low Voltage (LV) supplies approximately +250 volts to most other sections of the radio.
- The Bias supply, supplies the needed negative (-) bias voltage to the amplifier sections.

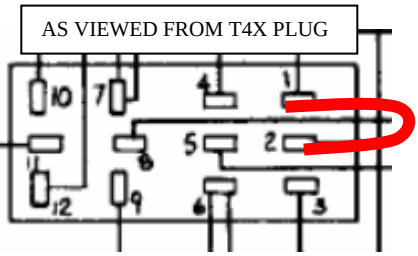


- Last is the filament supply. This supplies the needed AC voltage to all of the tubes in the radio.
- The supply also routes the transmitter ALC and amplifier relay keying voltage to plugs on the rear of the AC4/AC3 for use by a remote amplifiers.
- Unplug the supply from the outlet.
- In order to get the AC4/AC3 powered up, we need to simulate the power on/off switch inside of the radio. This requires us to short pins #1 & 2 together with a jumper. Use the figure below to following the circuit. Pin #1 goes to the black primary winding of the transformer. Pin two goes to the Fuse. By shorting pins #1 & 2 you complete the circuit and enable AC voltage to be routed to the primary of the transformer.

AS VIEWED FROM AC4 PLUG

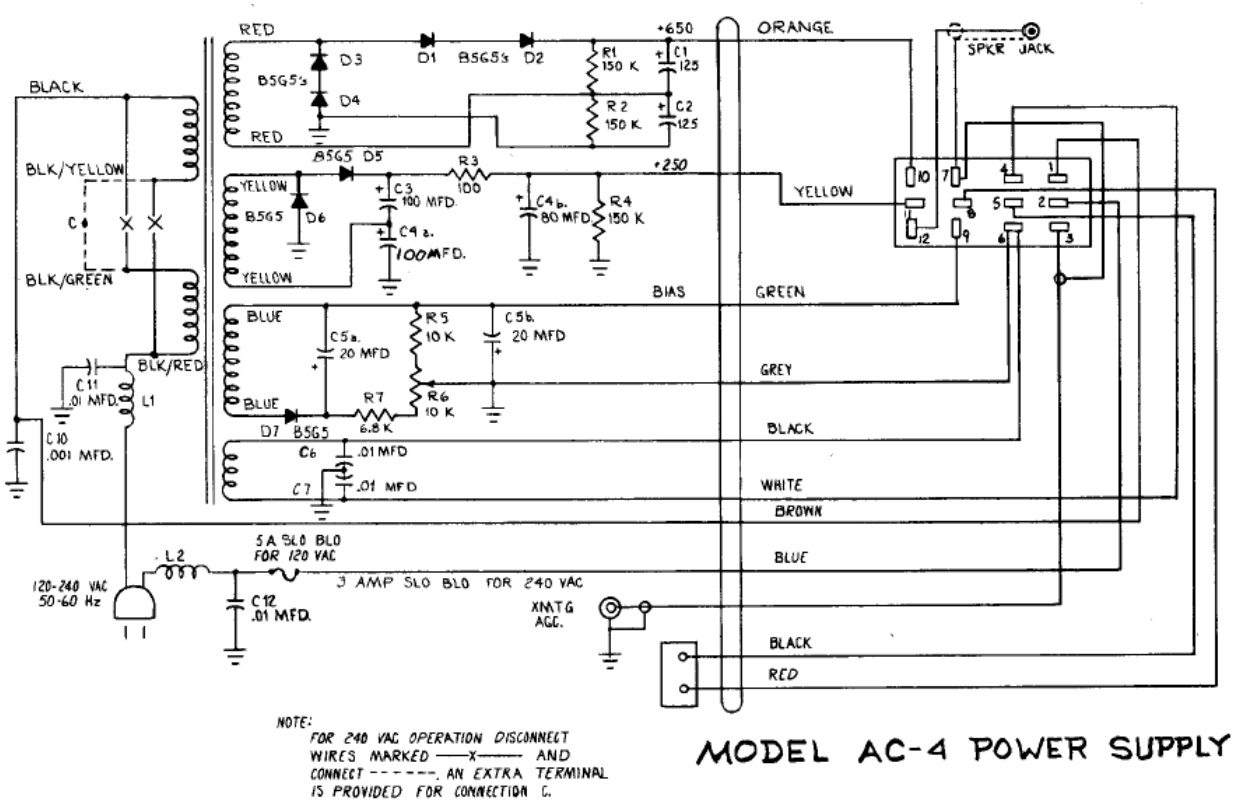


AS VIEWED FROM T4X PLUG



- Plug the positive (+) lead of your DC volt meter into pin #10 on the connector. This is the High Voltage +650 Volts DC. Make sure you set the meter up to read >650 Volts DC.
- Hook the negative (-) test of your DC volt meter to the supply chassis.

- When performing the following step, make sure that if you do not see a voltage within several seconds, you unplug the supply immediately.
- In each of the following steps, you can choose to unplug the supply after each step. This will prevent damage to components while you are checking other sections. If you have 3 volt meters that can be hooked up at the same time, you can make sure all 3 voltages are present to make sure damage does not occur.
- Plug the supply into the AC outlet. Verify there is DC voltage present. It should be in the mid +690 to +740 volt DC range with no load (I.E. power supply is not plugged into the radio). If it looks ok, turn your meter to AC and verify you have very minimal AC voltage present. This AC reading should be less than 2 volts.
- Move your positive lead to pin #11 and verify you have +250 volts, with less than 1 volt AC. With no load, the voltage should be close to +280 to +310 volts DC.
- Reverse your positive and negative leads by moving your (+) lead to the chassis ground.
- Move your negative (-) lead to pin #9 and verify you have negative -20 to -60 volts present with less than a half volt AC present This is your bias voltage and can be adjusted by turning potentiometer R6 located on the front of the AC4. Without a load, this voltage can be -40 to -90 volts, or so.
- Turn your meter to AC and put either lead in pin #6 and pin #4. You should read around 12-14 volts AC. This is the filament supply voltage.

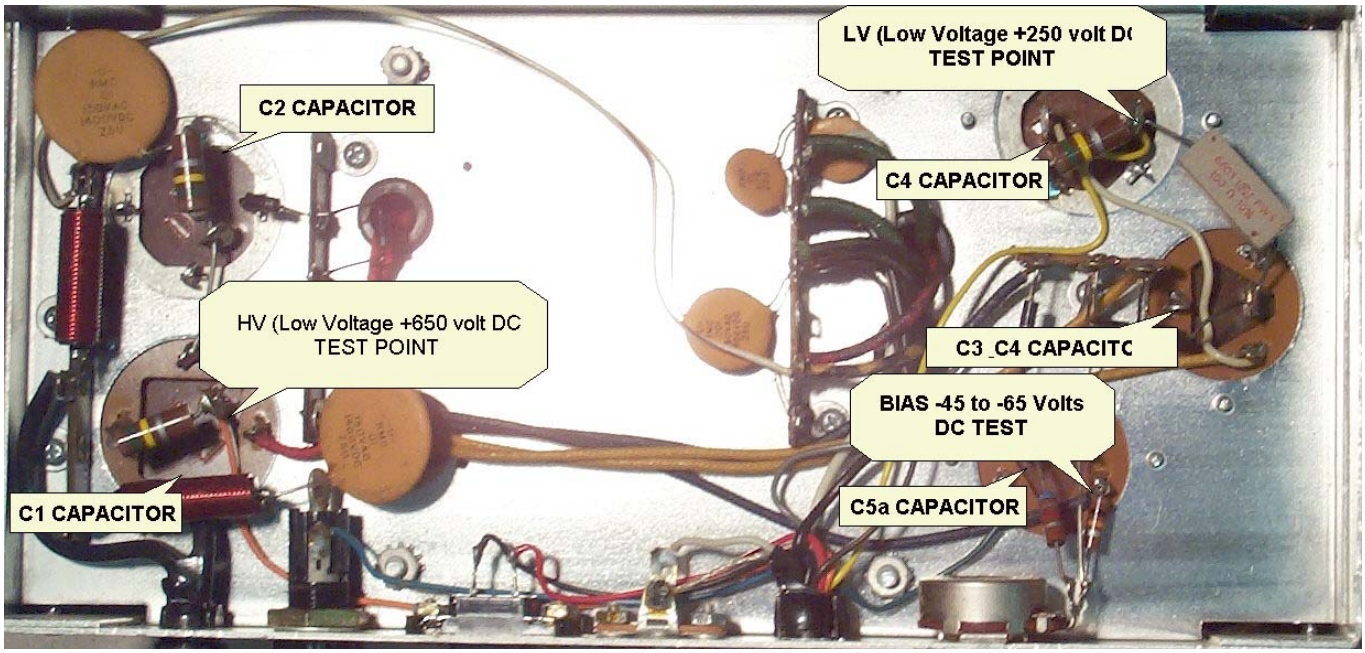


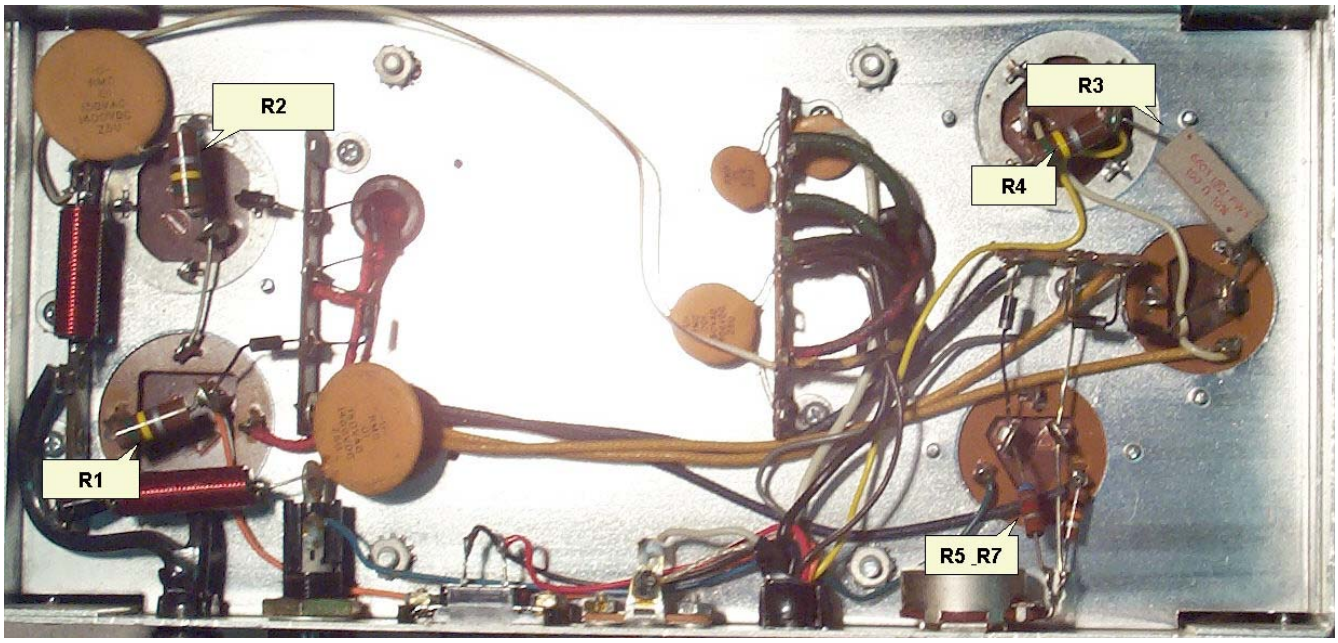
- The reason for checking the AC component of the DC supplies is to verify the filter capacitors are doing their job. If the filter cap is open, a high AC ripple will be noted and will cause a hum to be noted on the transmit signal. Especially so in the 250 volt supply.
- If a problem is noted in any of the above steps. Unplug the unit from the AC outlet.
- Remove the 10 screws securing the bottom cover.
- Use the following pictures to help locate components.
- Note any burnt components and replace.
- If one of your supplies had a low voltage, the problem could be a bad diode. It's easier to just replace them all than trying to isolate which one is bad. Radio shack sells a good replacement, it's their catalog number 276-1114. It's a 2.5 amp 1000 volt rectifier diode. A 1N4007 in addition to many more work just fine.

- Resistor R3 is often the culprit in the 250 volt section. It is susceptible to over heating, which causes it to open up resulting in no, or very little voltage output.
- The most troublesome problem is the filter capacitors failing. They dry out or start leaking and can cause damage when they fail. Inspect around the base of each of the 5 filter capacitors for leakage. If any is noted, replace.
- Unplug the AC4 and let it sit for several minutes before proceeding. Put your meter in the resistance mode.
- Put the negative lead on the chassis ground and the positive lead on each post of each capacitor. The meter should show a high resistance. The meter movement should start showing the resistance moving down scale (getting smaller) as the capacitor uses the internal meter's battery to charge it up. This indicates the filter capacitor is not shorted, or opened, and might be ok.
- If when checking, the meter does not indicate the discharging of the capacitor in the above step, replace it.
- If the meter shows a very low resistance, the capacitor is shorted and needs to be replaced.
- If the meter shows a high resistance, and does not discharge, it indicates the capacitor is open.
- Any of these indicate the capacitor needs to be replaced.
- Replacement capacitors for theAC4/AC3 are available from N)JMY through his web site4 Hayseed Hamfest Co. http://www.hayseedhamfest.com/
- A complete AC4/AC3 retrofit kit is also available from TheHeathkitShop, www.theheathkitshop.com . This is the preferred method as it replaces 99% of all components in the AC4/AC3.
- If you prefer to refurbish the existing filter, you can refer to the procedures written up by W6SPC http://www.ea1ddo.es/r4b.html . It covers replacing defective R4 filter caps, but it can be easily applied to the AC4/AC3 unit. The general idea is shown here.
- Another procedure to rebuilding capacitor cans is written up by W8UT and is located on his web site at http://www.boatanchors.org/filtercap.htm

Several things to note:

1. The AC4 and AC3 are almost identical and can be interchanged for use on any Drake radio requiring one or the other.
2. The most notable difference is the AC3 is open frame, where the AC4 has an RFI protective cover.




R2
R3
R4
R1
R5 _R7