9407 Tube MicPreAmp trouble-shooting tips/suggestions...

General

For no-go situations power supply and missing input or output signals can be the trouble(s):

Inspect solders to be sure there isn't one that was missed or is 'cold' and hasn't flowed to the component lead/wire and the pad.

Parts out of place or mis-installed can cause troubles.

With two kits, you can use the working one as a point of reference in making checks, comparisons, and voltage tests, etc.

Check to be sure both mic input signals are getting through. If you hold a piece of wire in contact with your thumb and forefinger and touch the two wires going over to the mic polarity switch one at a time, a hum should be introduced in the audio output. If one or the other isn't 'live' it could be a short to ground. The switch is a place this can occur, but it could be the drain melting through and contacting the wire on the red or black of the twin-ax. With the mic removed, touching the xlr receptacles that wire over to the switch should introduce hum too and if not, it could be pointing to the solder not making a good connection on the connector terminals or the polarity switch. Listening for hum, turn the blend from ccw to cw to find out if trouble is particular to the Solid State (ccw), Tube (cw), or both.

Tube path....

Check to be sure the tubes are completely seated in the socket.

A common trouble is the tube not being fully seated in the socket because it takes more force than you might expect to get it in the first time. This coupled with there being a spring in the cover can make it seem like it's held in place with the cover/spring, but this isn't the case. It is possible to peek through an opening near the mounting ears in the base of the socket to confirm that the tube is in all the way, but also, if taking the cover off allows the tube to drop out or if it comes out very easily, then it isn't in good enough and this can result in intermittent/marginal operation.

Check too to see if both Symmetry trims have a 100k marking.

It is easy to get yellow-violet-red and red-violet-yellow (4700ohm and 270kohm) resistors in place of each other and there are 270k ones associated with the tubes.

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Drive LED not lighting...

In some instances an input signal might not be strong enough to cause enough signal to develop on the tube to light the Drive LED. It lights about the time the signal is strong enough through the tube that it will begin to overdrive and clip the signal. Listen to determine if you're able to hear overdrive distortion in the signal when the Blend is set fully cw for 100% tube path. If so, the Drive LED should be lighting. Check the LED flat/cathode to confirm it matches the circuit board marking.

Drive LED always lighted...

Check installation of the LED D11 flat/cathode to confirm it matches the circuit board marking. Check C16 to be sure it's polarity markings agree with the circuit board marking.

Power Checks/Tests--

Power to the unit.

Troubles in this area could be related to the wall mount power supply, the power switch, or a backwards diode at the D1 or D2 position.

The wall mount supply should have markings on the rear to indicate the output voltage. Look here to be sure it is marked 12v ac output (500mA or more), not 12v dc. It would not harm the 9407 to have dc connected, but it would only provide one of the two needed, internally produced dc supplies (+15, 0v, -15 vdc).

Look for possible trouble with the mini-toggle switch used for Power On/Off not making a good contact due to the terminal moving in the plastic body when it was soft from heat during soldering. Look for a misaligned or loose terminal or difficulty in operation as signs of this sort of trouble. A new switch may be needed.

Diodes D1 and D2 convert the ac that comes into the board to dc. The banded end of D1 should have the positive dc voltage and the un-banded end of D2 should have the negative dc. Remember if your tester is analog with a needle that swings to the right from zero, reverse the probes (put red on ground and measure with the black) for negative dc which is less than zero.

Some builders opt to install a power supply connector on the kits instead of wiring direct as instructed and this can cause trouble in a couple of ways: One being worse than the other. If the connector has a terminal that is the same metal as the threaded mounting bushing, this can put one of the two transformer leads in contact with the chassis. This already occurs on the board via the one that is used as the neutral/0v/common/ground circuit and its connection with the 1/4" phone jack sleeve and it's contact with the chassis. If the 'hot' wire going to the power switch is on the added power connector terminal in contact with the case it can short and burn the transformer. If the 'neutral' transformer wire (going to G) contacts the case via an added connector, it makes a ground loop which an introduce a hum in the audio output. A connector with two circuits isolated from the case prevents trouble in either instance.

If these things are all right, then it might be something like the jumper wire installation being omitted, or, solders that haven't flowed between the wires/components and the printed circuit. Let me know if you're not sure about this.

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A multitester set to measure the 12vac voltage of the transformer should read about 13vac and 12vac for the off and on settings. An alligator-clip test lead can be used to connect the ground/common/black wire over to the G/SG/1/4" phone jack sleeve (threaded part) for the ground. It frees-up one hand while the other is used to probe with the red test lead.

Set the tester for DC voltage readings and put the probes to ground/circuit-common (G/SG/jack-sleeve) and pins of the 5532 op-amps, ICs 2 and 3. If the tester is analog, reverse the probes to measure the negative dc. As viewed from the top, the pins count up in a ccw direction around the part from the notch--1-4, across, and up the other side 5-8. Pin 8 should have the positive 15v dc and pin 4 the negative 15 vdc (approximates). Pins 1 and 7 in the audio paths should read about 0v dc.

No phantom/tube-plate voltage.

This could be trouble with the voltage multiplier circuit including the 4049 IC on through to the 51v zener diode. To be sure, measure the voltage on each end of D16, the 51V zener diode for a reading of about 50V DC.

The soldering of pins 1 or 8 of IC1 can be missed since the C5 right next to them is soldered first making it appear there is already solder at these points.

Maybe the 4049 at IC1 isn't switching voltage for the following diode/capacitor multiplier section. Or, the voltage could be shorting to appear near zero volts dc as would be the case with a shorted PP On/off switch. Trouble with the switch is something you could just "eye" before setting things up for further checks/tests. The terminals can tilt or misalign if there is tension on them during soldering and this can result in contact with the metal threaded mounting bushing in contact with the chassis which is in contact with the circuit-ground/common/0vdc circuit originating at circuit-board-wiring-points G / SG. If this looks like a possibility, an ohms measurement will tell (confirm the 9407 power switch is set to Off for this test). There should not be zero ohms between the terminal with wire from E and the outer, metal part of the switch.

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IC1 alternately puts about Vcc voltage or 0v to the diode and capacitor voltage multiplier circuit that follows it. Measurement of the dc of this post-audio-rate pulsing should show a reading between 0 and about 15, but not a steady 0 or 15. It outputs from pins 10 and 12, parallel connected stages on this IC. The pulsing should cause an increasing voltage from capacitor to capacitor on Cs 7, 9, and 11. The reading on the + end of each capacitor should be an increase of an amount about the same as the Vcc voltage to the part or 18v or so, for about 18, 36, and 54 volts.

DC voltage tests.

DC voltage tests can be made at IC1, first, at the power supply pins 1 for voltage and 8 for ground/common, and then at the output pins 10 and 12. The pin 1 dc power supply voltage should be about 16 to 18 vdc. This will surely be there, but if not the most likely cause would be a solder connection that didn't flow at pin 1 or 8. Pins 10 and 12 are outputs of paralleled IC sections and the dc voltage reading here is an average of the 0 to 16-18 volt, 60kHz "on"/'off" switching, and in a 4-12 vdc range--a near zero or Vcc (16 to 18 vdc) reading would point to no switching action that could be due to a failed IC or soldering trouble in the area of sections IC1:A through IC1:D/E looking at the schematic and on the board.

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It is best to measure the dc power supplies right at IC pins. The power supply voltages should be getting into the eight pin dual op-amp ICs on pin 8 (+ 12 to 15 v dc) and pin 4 (- 12 to 15v dc). Viewed from the top of the board, the pins count-up, going ccw from the notch. Select negative DC polarity or swap the probes used to test the pin 4 voltages when using a tester with a meter movement that swings to the right from zero. The sixteen pin hex inverter IC originates at a point earlier in the positive dc power supply circuit and is a couple of volts more. Measure for this voltage shown as Vcc on the schematic at pin 1 of IC1.

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Tube path.

The fully post setting on the Blend control adjustment is 100% of the tube signal, so, if nothing gets through on this setting it is trouble in the tube path. Maybe it's just the control twisted so the terminal with the tube signal on it (the solid-state path is on one end and the tube path is on the other with ground in the middle to shunt one side or the other according to the setting) is touching the grounded case. Be sure the tube is seated all the way in it's socket. The bottom of the tube should be against the surface of the socket base. Look through an opening in the side of the base to see this. The Symmetry trim is in-line between the tube stages and maybe it's adjusting disk is loose or the part cracked or broken.

... shorts to ground and the shielded cable. Look for shorts where the shield separates from the internal wire. Heat from soldering can cause the shield to melt the insulation of the internal wire and if there is tension, it can pull on through against the internal wire. Or, a stray strand of the shield might be extending over and contacting an adjacent point. A test can be made to confirm resistance between these points in the circuit with the power to

the unit switched off. Measuring between the two terminals on each connector should yield a reading more than and not equal to zero ohms resistance.

Symmetry Trim adjustment

The Symmetry Trim affects a balance of the signal through the tube stages. Start with the Blend set fully post for a 100% tube signal path. The input signal and/or Drive control setting should be advanced until the sound just begins to overdrive and then adjusting the trim will remove the overdrive, or increase it. Adjust the trim to the point the overdrive clears, but no further. Repeat this process until the trim no longer removes overdrive - advance input drive to onset of distortion, adjust sym. trim to remove. A 'scope would show a sine or triangle wave input clipping on the top or bottom and finally in even amounts.

To visulize what's happening, imagine the Symmetry Trim as being a control for the up/down postioning of a window opening and the Drive control being the control for the amplitude of the wave you're putting through the window. If there is too much input signal or Drive, then no Symmetry setting will be effective. If there is not enough input signal level, then no amount of Drive will cause the wave amplitude to exceed the window. An optimum Symmetry trim setting will allow a maximum amount of Drive signal through the tube and when it does overdrive, the clipping is in even amounts for equal amplitude top and bottom peaks.

The symmetry trim settings should be similar for fully cw Blend signals to sound similar. As it goes one way, the tube gain will be higher and more unsymmetrical. The other direction will provide less tube gain with symmetry--more 'drive' can be applied before the tube clips/overdrives.

The 9407 Tube MicPreAmp sounds good with a guitar connected to the xlr input via a TRS jack to xlr plug adapter and it would accommodate the bass range. So does the 9305 TubeHead. It is two-channel and they can be series connected for a wide-range of tube and solid-state + tube overdrive settings, or clean ones.

The tone is different for the two channels???

The most likely thing to cause a difference in tone between the channels is trouble with a capacitor. It could be one installed in place of another, or, trouble with an associated solder or wire.

Be sure the ones at Cs 19, 23 15, 17, 18, 21, and 22 are marked as specified.

Check the solders for the capacitors looking for a joint insulated by resin flux or a bridge. Look for a frayed or bent-over uninsulated wire touching a nearby component in another circuit.

Try adjusting the Blend fully ccw, then fully cw to see if there is a difference with the sound going through the tube or not.

Exchange the two tubes if the trouble is particular to them. This will tell if it's the tube or the tube circuit.

There does get to be some dc offset that seems to relate to an increase in the ground noise getting in the output when the output control is run up to max.

A way to help prevent this setting being needed is to boost the signal to the tube at the mic input section. Use 100k, 1% resistors in place of the 33k ones at Rs 20 and 39. This will help to ensure there is enough mic input signal to operate just below the overdrive clipping of the tube (where the effect is best).

Also, the Symmetry trim when calibrated for even amounts of clipping on the top and bottom peaks of the tube will be a setting that affords maximum signal throughput. Make this setting using a static waveform input and the Blend fully post or 100% tube. Monitor the output signal and adjust the input to the unit so the Drive adjusts the signal in and out of overdrive. Adjust Drive to the onset of overdrive or clipping of one extreme of the wave and then adjust symmetry to shift this signal up or down out of overdrive. Repeat until no further Drive adjust produces clipping that can be adjusted out with the Symmetry trim. This is the setting that will provide even amounts of clipping on the top and bottom of the wave (and approximately when the Drive LED lights).

Then, with this optimum setting of signal throughput, the Output (gain) control won't have to approach the amount that ground noise becomes trouble.

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DC V (volt) and mV (milliVolt) readings at circuit points (referenced to ground/circuit-common):

K/C15- = 0 to 0.4 mV

C15+/R10 = 18 to 20 V

R10/tube1 = 19 to 22 V

tube6/R16 = 22 to 24 V

R16/C17+ = 21 to 22 V

C17/R22 = -60 to -90 mV

tube2/R22 = -60 to -90mV

R22/R29 = -12 to -16 mV

tube3/ R33 = 115 to 145 mV

tube 8/ R32 = 90 to 110 mV

tube 7/C20/R24 = -110 to -160 mV

C20/R28 = 0.3 to 0.8 mV

R28/H = 0.3 to 0.8 mV

R11/R12 = 35 to 40 V

Scott's Tube MicPreAmp mods.

1) modify the wire length for wire A so instead of running from the switch to the board along between the circuit board and the front edge of the case, it runs back from the switch to the case rear and along the back edge and up through the middle area of the case to wiring point A (twisted with the transformer wire to the switch to the mid area, then with the other transformer wire as they both go from this rear mid area up to wiring points A and G). Also, modify the routing of the three wires to the second channel from the 'front' area of the board to be; from A/G/SG at a diagonal towards the tube of the second channel, under it, then up towards the top, and then along with and arcing up and over to the second channels A/G/SG points.

The wire A has the transformer ac voltage on it and it being near the mic input wires and the area for the circuits attached with IC3A can introduce hum into the output signal.

2) Substitute a greater value capacitor with a 50V or more rating for capacitor C14.

This capacitor filters/smooths the voltage to the tube plates from the voltage multiplier output and at 47uF or more, hum particular to the tube path (blend cw) and due to ripple originating at Vcc to IC1 is minimized.

Then, if not enough 'Drive' is obtainable to get the tube drive LED lighting,

3) Substitute 100k,1% resistors for the 33k, 1% ones at resistors Rs 20 and 39.

This increases the gain of the MIC input stage, presenting more signal to the tube.

Then, if hum is apparent in the audio output when a condensor mic is connected with blend ccw for solid state,

4) Substitute a greater value capacitor with a 50V or more rating for capacitor C12.

This improves the filtering/smoothing of the voltage used as the phantom supply to the mic (again, from the voltage multiplier/Vcc ripple) and I've heard reports of users going as great as 1000uF here.

I'd say try just 1 and 2 first, then do 3 and/or four if needed. With the Sovteks, the dc-filament mod isn't needed and can make hum apparent where it wasn't before due to the increased ripple currents associated with the added resistor/capacitor filter. This mod came to be back when we stocked tubes labeled, Made In China.

The setting of the Symmetry trim can be 'calibrated' as follows to optimize the s/n / headroom through the tube.

A signal generator is connected to the input and the output is viewed on a scope (or in a pinch, monitored by ear) with the blend set to 100% tube signal (blend fully post/cw) and the Drive control and the Symmetry trim alternately adjusted.

Start by setting the Bend fully post and the Drive and Output at about 12:00 to 1:00. Connect the input signal source and vary it's level externally from minimum up until the tube begins to clip due to overdrive and stop at the onset. Most likely, it will be either on the top or the bottom of the waveform extreme (oh yeah, use a sine or triangle here so you can detect the flattening due to clipping). Adjusting the Symmetry trim one way will increase this effect and the other will remove it. Adjust to remove it and go back and increase the input to the tube by either increasing the external signal input level or the Drive control to the onset of overdrive again, and, readjust the SymTrim to remove it. Go through this process again and again and eventually, you'll notice that no more input signal or drive can be applied to cause overdrive that is removeable with adjustment of the SymTrim. This is the 'calibrated' setting for the trim.

related,

http://www.prosoundweb.com/recording/tapeop/paia.php