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TECH NOTES

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HELLO THERE!

Hello again. This month we present a variety of troubleshooting tips on Fender tube amps. We truly hope you enjoy reading our newsletter and that you profit from it as well.

ON HUM IN FENDER TUBE AMPS:

As you already know, open or defective filter capacitors in the B+ power supply are the cause of excessive hum in many an amp. This is especially evident to the user as too much hum if the open capacitor happens to be filtering a high gain preamp tube where the ripple gets amplified through a number of stages. So you put the chassis on the bench, fire it up and it hums. Now you try shunting a known good electrolytic capacitor across each filter in turn to no avail. The amp. still hums. Next you think of heater to cathode leakage in a bad tube so you start changing tubes. Good! That's a valid move but now you have changed them all and the amplifier still hums. What now?

Remember that those heaters are referenced close to ground and if they are instead left to float may very well introduce hum into the audio stream. So check with the power off using an ohmmeter to see whether the ground reference is present. In many Fender amps. the heater winding of the power transformer is center tapped. This center tap (coded green with yellow tracers) should go directly to ground. Measuring between each solid green heater winding to ground should give you a low reading. An alternate method uses fixed resistors from each side of the heater winding to ground. These amplifiers have a power transformer with only the two solid green leads and no center tap. On Fender amplifiers the resistors used to keep the filaments close to ground are usually rated at 100 ohms, 2 watts. They are mounted on each terminal of the power on indicator socket to ground. Some Fender amps. have a hum balance control instead of the fixed resistors. These are usually 100 ohms with the two fixed terminals across the heater winding (some have 4.7 ohms or so in series with one side) and the wiper terminal grounded. If the wiper opens you lose the ground reference and get hum.

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WHICH WAY TO GO?

Should you be organized to the extent of having your scope ready at all times it's a simple matter to determine which way to go. Set your horizontal time base to 2 milliseconds per division and measure the period of the ripple. Since most Fender amplifiers use full wave or bridge supplies, power supply ripple equals 120 hertz while heater induced hum equals 60 hertz. So if you read 8.3 milliseconds check the filter capacitors but if you measure 16.6 milliseconds go after the heaters.

UNWANTED OSCILLATIONS?

Audible frequencies other than hum due to unwanted oscillations can sometimes be troublesome especially if the source is in or before a high gain stage. In such a case the oscillation may be small and in the noise where it is virtually impossible to see on some scopes. In these cases try using a coupling capacitor - say a 0.2 microfarad 600 volt mylar with one end strapped to ground. You can systematically ground each tube socket terminal working back to the preamps and when you have gone too far the oscillation will come back. This will localize the stage which you can "shotgun" or further analyze. Sometimes just adding a small capacitor from plate to cathode will neutralize the interelectrode capacitance of the tube enough to stop the oscillation. Try a 220 picofarad 1000 volt disc ceramic.

CHECK THOSE BYPASS CAPS!

Most Fender tube amps use 25 microfarad 25 volt (or 22uf 16v) capacitors bypassing the cathode resistor to provide a good A.C. ground in the preamp stages. These electrolytics may deteriorate with age changing value or even becoming open. This is not an uncommon problem and may cause severe signal degeneration with excessive rolloff or lack of gain. We suggest replacing them in older amps. and at least checking them when any tube type amplifier is on the bench for service.

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VIBRATO "TICKING":

Some years ago Service Bulletin #9 was issued on the cure to ticking in the vibrato of older Fender tube amps. We still get calls on this so let's review the solution here:

The vibrato assembly consists of a photo-cell and a neon lamp held together by a piece of 0.025" thick heat shrinkable black tubing. One side of the photo-cell or LDR goes to a control potentiometer and the other side goes to ground. One side of the NE-2 neon lamp goes to a 100K ohm resistor and the other side goes to a 10M ohm resistor (also tied to the plate of the 12AX7 vibrato tube).

The solution calls for adding one capacitor and dressing the leads:

Connect a 0.01 microfarad 600 volt mylar capacitor from the junction of the 10 megohm resistor (where it connects to the neon lamp on the eyelet board) to ground (where the LDR connects to ground also on the eyelet board).

Dress the leads to the vibrato speed and intensity controls away from the tone controls and filter leads. Bunch together the leads connecting the components on the eyelet board to the tube socket of the 12AX7 vibrato tube.

Incidentally, the vibrato oscillator is a phase shift type oscillator that uses three capacitors between the plate and control grid of the first triode to shift the phase approximately 60 degrees each or 180 degrees in all to provide regenerative feedback for sustaining oscillation. These capacitors (usually one 0.02uF and two 0.01uF) have a higher incidence of failure than most of the other components in the vibrato circuit (outside of the tube). They should be checked or replaced right away if the circuit is not oscillating.

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A COMMON REVERB QUESTION:

Many of you are aware that the input transducer (part # 071423) of most reverb pans used in Fender amplifiers has an input impedance of 8 ohms and the output transducer (part # 071415) an output impedance of 2250 ohms at 1000 Hz. These correspond to a D.C. resistance of 0.87 ohms (input) and 180 ohms (output).

That's fine, but we get calls frequently from tech's who state that the pan checks good, they have replaced the tubes and checked all circuit components including the 500 picofarad coupling capacitor into the 12AT7 reverb driver (an open 500 pF is a common fault) but the reverb is still dead. This leads to their common reverb question:

"What readings should I get when checking the reverb driver transformer?"

This driver transformer (part # 022921) is an output transformer matching 25K ohms in the primary to 8 ohms in the secondary at 1000 Hz. The primary D.C. resistance should measure 2100 ohms, the secondary 1 ohm. For those of you wishing to subject it to dynamic testing the turns ratio is 53 to 1.

WHOOPS!

We just discovered that incorrect mounting screws were used in a limited run of part number 22-1602 BXR Spectrum Speakers. This system uses two 10" speakers and one 18" speaker. The 10" speakers are correctly mounted with eight (four each) part number 026577, 10-32 X 1" pan head, Phillips, black screws driven into T-nuts. The same part was incorrectly utilized for the eight screws required to mount the 18" speaker. The correct part is a truss head screw instead of a pan head. A 10-32 X 1" truss head, Phillips, black screw has a larger diameter head sufficient to secure the 18" speaker basket. The diameter of the pan head screw is slightly smaller than the diameter of the mounting hole in the speaker basket so in certain instances it may be possible for the 18" speaker to dismount itself.

Examine the BXR Spectrum speaker carefully. If pan head screws were used, replace them with new truss head screws. Order eight part number 029683, 10-32 X 1 truss head, Phillips, black screws under warranty. Thanks for helping "shake out" this new product.

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EARLY PRODUCTION "TWINS":

During the early phases of production on the new tube type "Twin" our wave flow soldering operation was not fine tuned well enough to avoid a couple of potential problems. This was especially true of the flux used at that time. Most of the Twin amplifiers were caught before shipment and reworked but some did get out into the field.

The first possible problem is too little solder adhesion in the various solder joints throughout the P.C. board. To correct this in the field we ask that you carefully examine under a magnifying glass each of the four P.C. boards in the Twin and solder any places that need touching up. Two of the four boards need to be turned over to accomplish this.

The second condition is caused by contamination residue from the flux itself. The resulting leakage between traces causes a ticking sound not always evident because it depends on the configuration of the channel switching circuits. The fix for this is to install a 100K ohm resistor from the cathode side of LDR1 to ground. This cleans up a little noise from the LDR1 supply which tends to bleed through on some of these P.C. boards. The tolerance is not critical, we recommend a 10% 1/4W carbon film resistor.

A third condition may exist (although rarely) where the leads between the tube sockets and the P.C. board need to be dressed properly. Improperly dressed leads cause excessive noise. These leads should be pulled away from the chassis and spread apart from each other.

When servicing one of these Fender Twin guitar amplifiers for any problem we ask that you also check on the three conditions outlined above to be sure the amplifier is up to the latest version. Your efforts on our behalf are genuinely appreciated.

YOUR ATTENTION PLEASE!

Lastly we'd like to call your attention to the Sunn programmable lighting controllers. Internal changes have caused recent versions of the PLC 816 to draw less power. This led to the belief that only one dimmer pack would be needed to provide this power. It turns out that this is not true. Using only one dimmer pack puts the system into a marginal condition where most PLC 816 controllers will malfunction. So always use two or more dimmer packs or the optional A.C. power adapter (part #027158). A PLC 3200 does <u>not</u> derive power from dimmer packs. Always use the included A.C. power adapter (part #029316) and follow the power supply instructions to ensure correct positive tip polarity.