ELECTRONIC SPECIALTIES
SPECIALISTS IN INDUSTRIAL CONTROL
53 North 16th St. P.O. Box 1960
Fairfield, Iowa 52556
Phone: 641-472-7084 FAX: 641-472-7630
EMAIL: elespe@lisco.com
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Thank-you for purchasing the ES4AC-3 power supply rebuild kit for the Drake AC-3 power supply

First, a few words about SAFETY:

Electronic equipment like the AC-3 power supply contain voltages which can be considered LETHAL and capable of causing INJURY or DEATH. Please exercise CAUTION at all times when working on any electrical equipment.

Tools you will need:

Phillips screwdriver, Size 1 preferred
Long nose pliers
Side cutters, flush cutters, or lead trimmers
Soldering iron and a bit of 60/40 electronic solder
#33 or 1/8" drill

Tools that may be helpful:

Wire strippers
Forceps or hemostat clamp
Tablet and pencil for taking notes about how it was
Digital camera for documenting how it was
Masking tape to tag wires during dis-assembly

Procedure:

Determine the operating status of the power supply and radio BEFORE taking things apart. Is the radio working now? Is the power supply working now? You need to know where you are starting from or you may have difficulty finding your way home again.

The rebuild kit was specifically designed for an easy fit into the AC-3 supply from Drake. The instructions are step-by-step. It is strongly recommended you read each step completely before starting the step. There may be a bit of information gleaned at the end of the step that you wished you had just a minute earlier.

Tagging wires. The process of tagging wires is strongly recommended on any repair or

rebuild project. True, the phasing on the secondary leads is not critical and they are color coded but it is a good idea to tag them anyway as referenced in the instructions. Masking tape and a ball point works fine.

(1) Un-plug the AC power cord from the mains outlet.
(2) Disconnect the power supply cord from the powered equipment TR4, T4X etc.
(3) Make sure you have done step 1 and un-plugged the AC power cord from the mains outlet.
(4) Do not plug-in the power cords and re-apply power until you have completed your work AND inspected it and removed any accidental short circuits and stray wire clippings.
(5) You may now remove the bottom cover on the AC-3 supply and place cover and hardware aside.

Before beginning the installation please take whatever time is necessary to familiarize yourself with the power supply as built. An enlarged copy of the original Drake schematic and pictures identifying the original components has been provided. The component designations on the new kit have been chosen to agree with the original nomenclature in an attempt to eliminate any confusion in the conversion. Take the schematic copy and take the time to trace out the wiring. Make certain that the unit you are going to work on is in agreement with the documentation provided. Make the information presented there "your own". Do not assume or get in a hurry. There is no prize for being fast, only for being right. If something doesn't look right, contact me before proceeding. It is much easier to provide assistance before it becomes a pile of loose parts. Manufacturers have been known to deviate from what is generally accepted as "gospel" in the midst of a production run and that can make life interesting.

Now that you are intimately familiar with the AC-3 supply you are ready to proceed with the disassembly stage:
You did unplug the supply from the mains outlet? Right? Better check. Thank-you.

With the supply resting on its top and the cables and bias pot toward you

(6) Un-solder and remove the four diodes (D1, D2, D3, D4) from the terminal strip which has the Red transformer wire (X0) connected to it. It is located immediately below the two large capacitors C1 and C2.
(7) Un-solder and disconnect the Red transformer wire (X1) from (-) of C1. Relocate this wire to the now vacant lug on the terminal strip directly below the other Red transformer wire (X0). Do not solder the connection at this time. Another Red wire from the new circuit board will be attached later.
(8) Un-solder and disconnect the Orange wire (HV) from (+) of C1
(9) Remove the capacitors C1 and C2 and the resistors R1, R2 and R3 from the chassis.
(10) Un-solder the Blue transformer lead and Green power output cable lead connected to (-) C5. Blue is referenced as X4 on new drawing and Green is the BIAS lead
(11) Un-solder the remaining Blue transformer lead where it connects to the small terminal strip located between C3 and C5. This lead is referenced as X5 on the new drawing

(12) Un-solder the Yellow transformer lead where it connects to the junction between the (+) terminal of C4A and the (-) terminal of C3. This lead is referenced X3 on the new drawing.
(13) Un-solder the remaining Yellow transformer lead that connects to the terminal strip at the junction of D5 and D6. This lead is referenced X2 on the new drawing.
(14) Un-solder and remove the three diodes D4, D5, D6 connected between terminal strip and capacitors C3 and C5
(15) Un-solder the small gauge Yellow (LV) wire from the power output cable where it connects to capacitor (+) terminal of C4B.
(16) Un-solder the white wire from the power supply output cable from the ground lug of the two terminal strips (now vacant) located between capacitors C3 and C4. You may remove the empty terminal strip. Hint, you may want to save the terminal strip for a later project. The terminal strips are getting hard to find.
(17) Remove the three can capacitors C3, C4, C5 and the bias potentiometer with resistors R6 and R8 from the chassis.

(18) The new board ES4AC-3PS is mounted in the following steps.

The correct orientation is with the bias pot toward the rear of the chassis. There are four circuit board mounting holes provided. Two of the holes line up with two of the original capacitor bracket mounting holes on the Drake chassis (Green dots on photo and located lower left and upper right as looking down on the chassis with the rear apron toward you). Two additional holes must be drilled (Orange dots on photo and located upper right and lower left).
(18) With the board held temporarily in place and lined up over the two existing holes mark the locations for the two hew holes.
(19) The hole located lower left will be directly above the output cable and several transformer leads under the chassis. The cable and wires must be cleared out of the way and protected BEFORE attempting to drill the new hole.
(20) Remove the transformer mounting bolt nearest the location of the new mounting hole at the lower left.
(21) With the cable and transformer leads pushed out of harm's way, carefully drill a #33 or 1/8" hole in the position marked in step (18) lower left
(22) Drill the other #33 or 1/8" hole at the new location upper right.
(23) Use the #33 or 1/8" drill to enlarge the two existing holes that will be utilized to mount the board.
(24) Check to see that the four mounting holes in the circuit board line up with the mounting holes
(25) Place a #4-40 x 2" machine screw in each of the four holes from the bottom side of the chassis
(26) Place a #4 x ¼" spacer over each of the 2" screw installed in the previous step
(27) Carefully install the circuit board over the four mounting screw with spacers installed in the previous step taking care to route the three circuit board wires through the large holes in the chassis
(28) Place a #4-40 nut on each of the four mounting screws and tighten each of the screws making sure the board is properly aligned and not caught on anything to secure

the circuit board to the chassis. The extra length of the mounting screw above the board will be used later to attach the cover.

The circuit board connections are made in the following steps:

(29) Red wire connected to circuit board X0 goes to the Red transformer lead X0 on the terminal strip. Solder 2
(30) Red wire connected to circuit board X1 goes to the Red transformer lead X1 previously re-located to a vacant terminal strip lug. Solder 2
(31) Route the White wire from the circuit board GND to the ground lug at the terminal strip near rear of chassis. Do not solder. Connect the small gauge white wire from the outgoing power cable into this lug and solder the two wires to the grounded lug.
(32) Insert the stripped end of the Blue transformer wire from step (14) into the circuit board pad labeled BU/X4 and solder it from the top of the board
(33) Insert the stripped end of the remaining Blue transformer wire from step (15) to the circuit board pad labeled BU/X5 and solder it from the top of the board
(34) Insert the stripped end of the Yellow transformer wire from step (16) into the circuit board pad labeled YL/X2 and solder it from the top of the board.
(35) Insert the stripped end of the remaining Yellow transformer wire from step (17) into the circuit board pad labeled YL/X3 and solder it from the top of the board.
(36) Insert the stripped end of the small gauge Green wire from the outgoing power cable into the board pad labeled BIAS and solder it from the top of the board
(37) Insert the stripped end of the small gauge Yellow wire from the outgoing power cable into the circuit board pad labeled LV, +250V and solder it from the top of the circuit board.
(38) Insert the stripped end of the small gauge orange wire from the outgoing power cable into the circuit board pad labeled HV +650V and solder it from the top of the board

That completes the connections to the circuit board and you are nearly done. Take a moment to inspect the top of the circuit board looking for inadequate connections or solder bridges between adjacent pads

The remaining steps are performed where the incoming power cord connects to the power supply
(39) Install the #8-32 machine screw in the vacant transformer mounting hole. Place a #8 solder lug over the screw and secure with a #8-32 nut with lock washer. Tighten securely
(40) Remove the fuse from the fuse holder
(41) Un-solder and remove the line cord connection at the terminal strip where it connects to the transformer lead
(42) Un-solder and remove the other line cord connection to the rear terminal of the fuse holder
(43) Remove the old line cord and bushing completely from the chassis
(44) Check the fit of the new 3-wire line cord in the bushing. It may be necessary to slightly ream the inside of the bushing to accept the new cord
(45) Install the new line cord in the existing hole making sure that you have allowed

enough length for the white wire to connect to the terminal strip connection at the front of the chassis
(46) Connect the White or ribbed line cord wire to the terminal strip with the transformer lead where the old cord was connected but do not solder yet
(47) Place one lead of a 0.01 µF line capacitor in the lug with the White wire and the transformer lead. Place the other capacitor lead through the hole in the terminal strip with the grounded mounting foot. Solder the capacitor and line cord connections just made and trim any excess leads.
(48) Connect the Black or smooth line cord lead to the open rear terminal of the fuse holder and solder it
(49) Connect one lead of a 0.01 µF line capacitor to the front terminal of the fuse holder with the lead that goes to the output cable and the line switch in the radio. Leave enough length of the capacitor lead to allow the other capacitor lead to connect to the new ground lug under the transformer mounting bolt in step 39
(50) Connect the other lead from the capacitor in the previous step to the ground lug at the transformer but do not solder yet
(51) Connect the line cord Green wire to the same ground lug and solder both connections
(52) Re install the fuse in the fuse holder

At this point you have completed the installation of the conversion kit!
Please make one final inspection for loose wire clippings and quality solder connections. Thank-you.

Test and re-assembly

If you have a multi-meter capable of measuring at least +700vdc it is always prudent to make a few tests to verify the re-built supply is working correctly before closing it up and connecting the radio. It is time to test the completed supply.

EXERCISE EXTREME CAUTION IN THE FOLLOWING STEPS

Connect the power supply output cable to the radio set OR you may elect to test the supply stand-alone by jumpering the ac line switch connections.
Plug in the ac power cord to the mains supply outlet.
Switch on the radio if connected.
With multi-meter set to measure HV and the negative lead connected to chassis there should be approximately +680 to 740vdc on the orange wire in the power cable (pin 10). There should be approximately +240 to 300 VDC on the yellow wire in the power cable (pin 11). The BIAS voltage on the Green wire in the power cable (pin 9) should be variable from -40 VDC to -75 to -100 VDC. The bias will be set after the radio is connected per the radio set instructions. In the original AC-3 there was a 5 ohm resistor between the negative of the HV supply and ground for additional current measuring capability. This resistor has been deleted in the new circuit board and the supply operates the same as the later AC-4 supplies relying only on the meter in the transceiver or transmitter for measuring current. Please remember the readings above are “typical”

values measured with TR4-C connected and in receive mode and they may vary and are dependent on individual AC power line voltages. No load voltages obtained by jumpering the line switch leads without a radio connected will be the higher of values shown above.

Assuming everything has checked out correctly you may proceed.
Un-plug the AC power cord from the mains outlet.
Disconnect the power supply output cable from the radio
Install the bottom cover on the power supply
Place a #4 x 1 ¼" spacer over each of the four circuit board mounting screws and place the perforated cover over the screws. Secure the cover in place with the remaining four #4-40 nuts with captive lock washers.
Connect the output power supply cable to the radio
Plug the line cord into the mains outlet and switch on the radio.

Enjoy your rebuilt power supply which should continue to provide many additional years of service.

CONTENTS

Each ES4AC-3 kit contains the following:
(1) ES4AC-3 circuit board
(2) 0.01 µF @ 250 VAC ceramic line capacitors
(4) #4 x 1-1/2" spacer
(4) #4 x ¼" spacer
(4) #4-40 x 2" machine screw
(8) #4-40 nut with captive lock washer
(1) #8 solder lug
(1) 3-wire 120 VAC line cord with plug
(1) Perforated metal cover

SOLDERING AND VINTAGE ELECTRONICS:

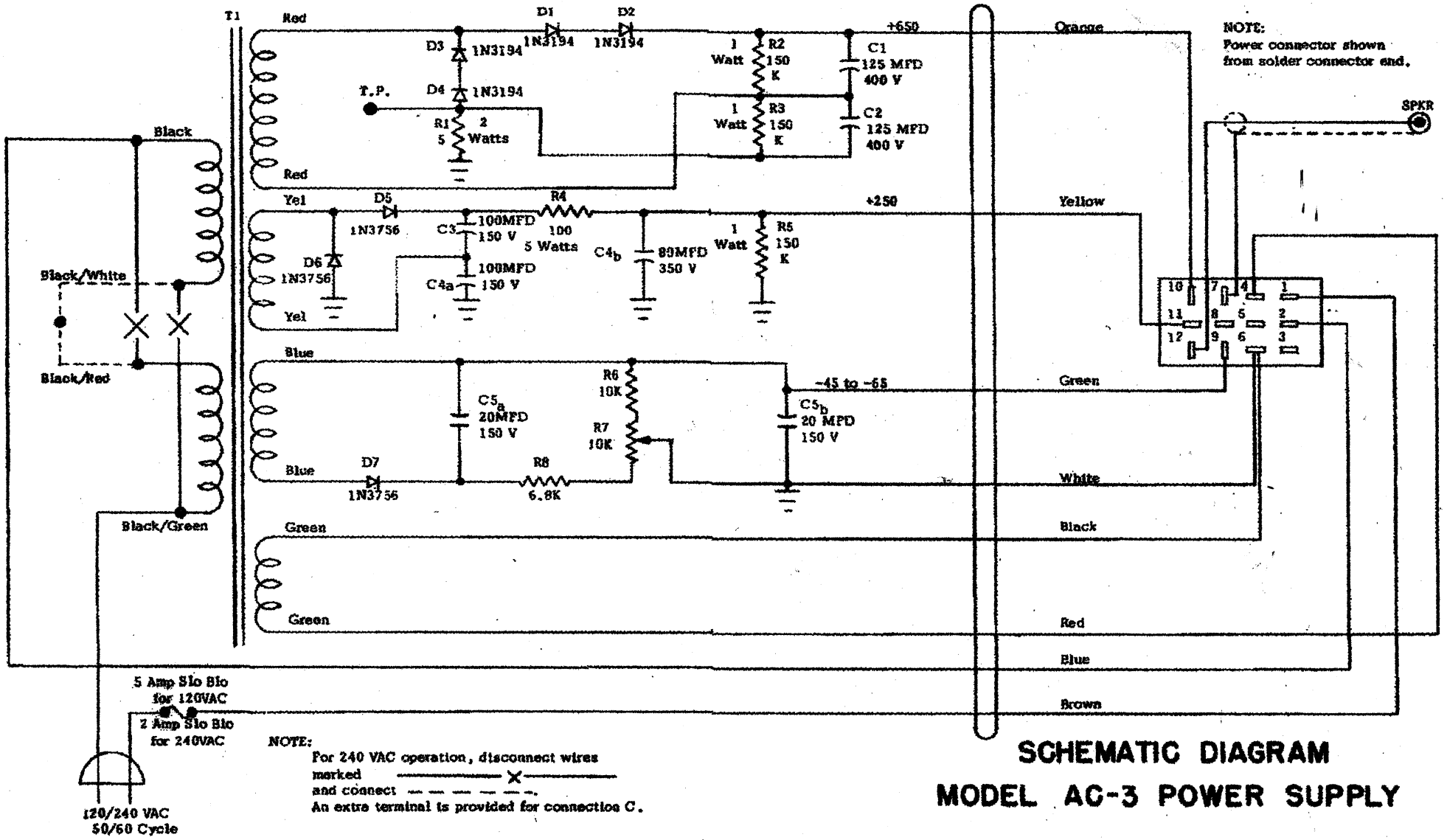
Many times when working on vintage electronics I have found that old connections do not want to re-solder properly. Old wiring, transformer leads, and terminal strip connections seem the worst. The wiring gets contaminated from the insulation jacket material. The lugs have oxidized. These surfaces usually need a bit of cleaning by sparingly applying a bit of flux, heating the part to get the flux to do its job, re-tinning with new solder, and cleaning away any flux residue. Then the connection is ready to be re-soldered with the new or added component.

I mention this because I just encountered it on one of the power supplies I rebuilt. The connection at the terminal strip with the Red transformer leads soldered, looked satisfactory at a glance, but the supply did not operate! Closer inspection revealed that the solder had all but avoided the old transformer wire leaving it disconnected. The Blue and Yellow transformer leads were also in need of cleaning before attaching them to the new circuit board. Capacitor leads inserted into the bottom of the terminal strip lugs were being stubborn about soldering to the lug. The solder just does not want to flow properly.

Just a tiny bit of flux applied to these areas completely resolves the problem. Usually I just assume I will have a problem and remove all the leads from a lug, apply a speck of flux, heat the lug and work the flux around with the soldering iron tip until the lug is clean. I wash off any flux residue with a cotton swab soaked in rubbing alcohol before proceeding to assembly.

I sincerely hope that your power supply rebuilding experience with the ES4AC-3 is trouble free and rewarding. Please do not hesitate to contact me with any questions or comments.

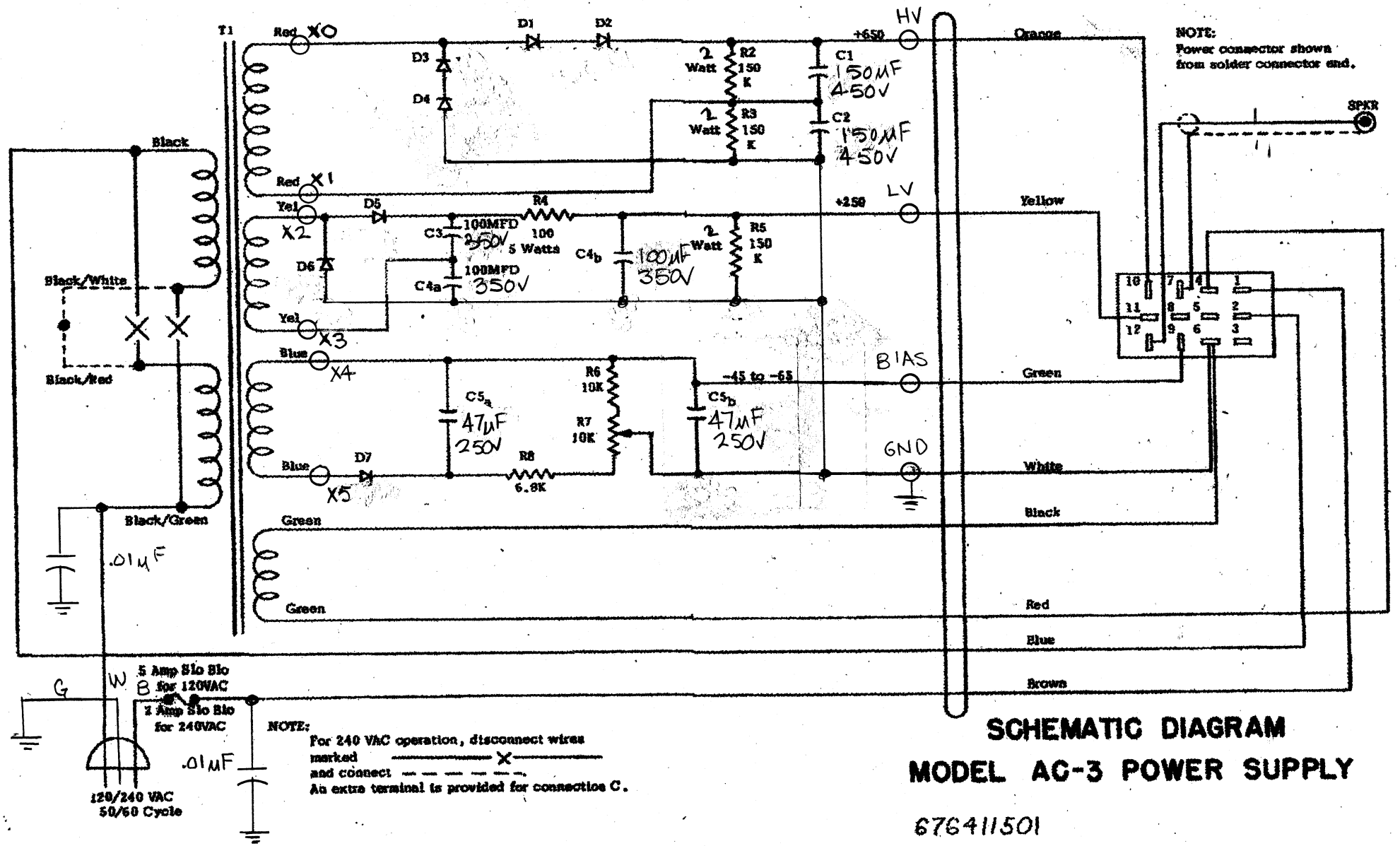
Paul K0UYA



SCHEMATIC DIAGRAM
MODEL AC-3 POWER SUPPLY

676411501

ALL DIODES IN4007



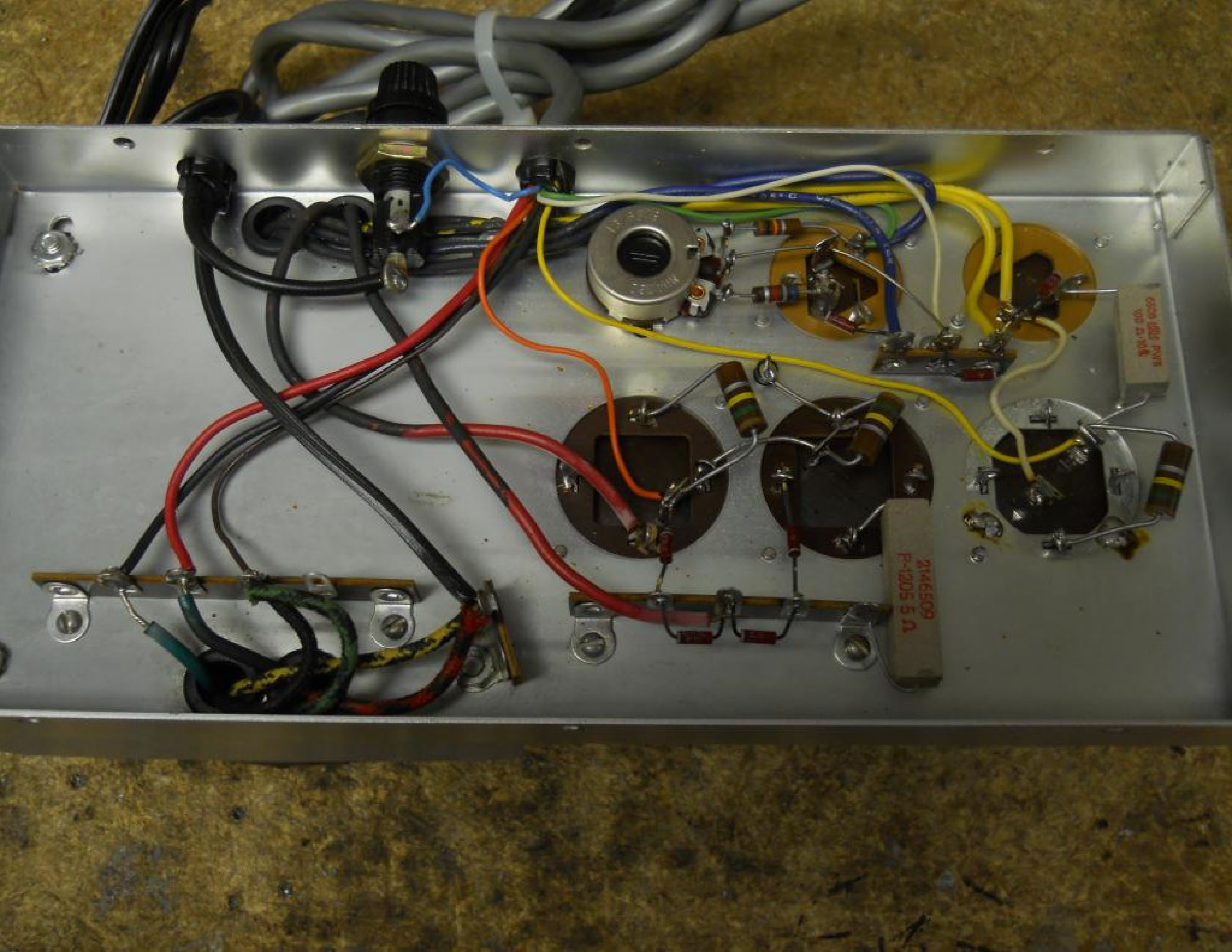
SCHEMATIC DIAGRAM

MODEL AC-3 POWER SUPPLY

676411501

ES4AC-3 INSTALLED

5-15-2013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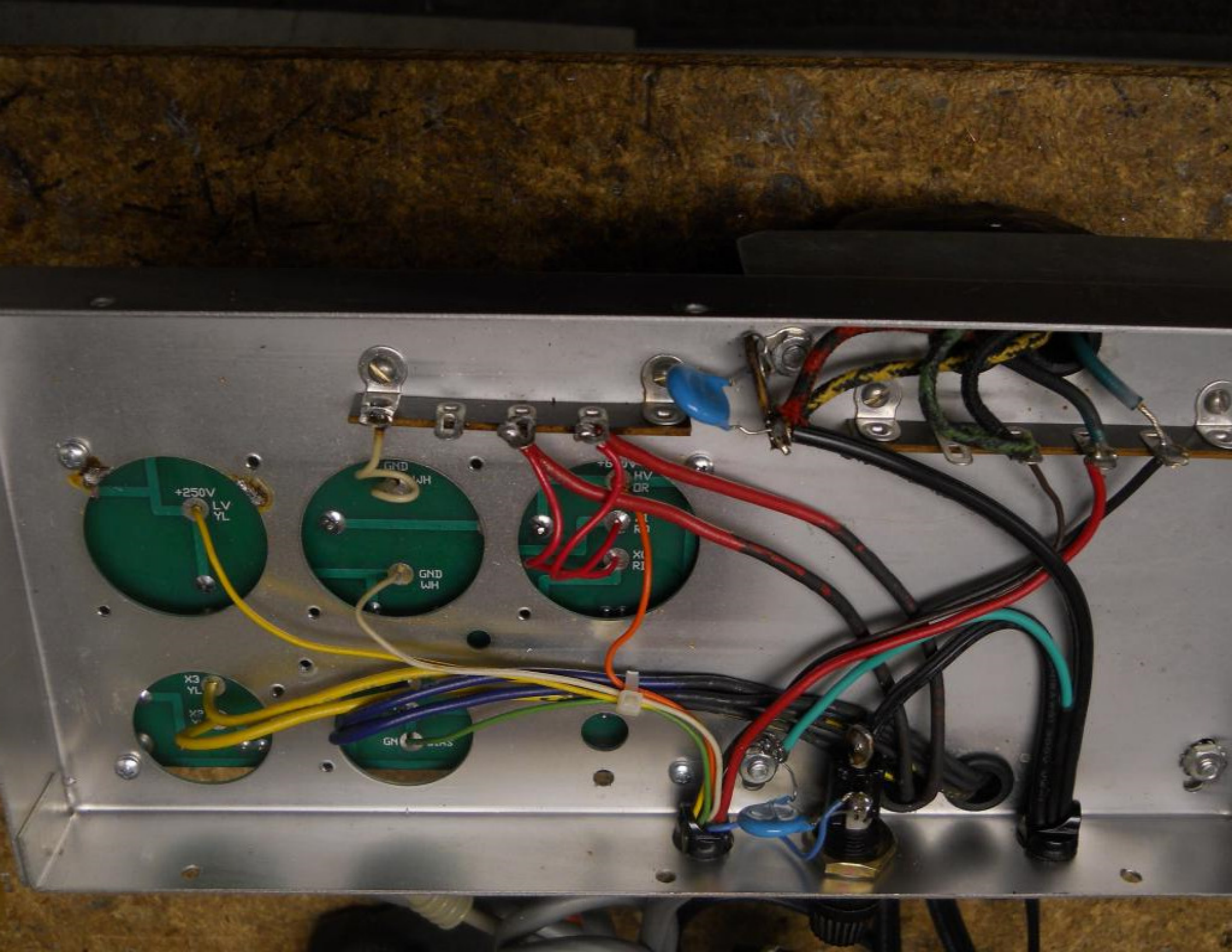
P-1205 5 Ω


CIN-TRAN
C1
C2
C4
C5
C3


+250V
LV
YL
GND
WH
GND
WH
HV
OR
X3
YL


HV
OR
X1
RD
X0
RD
GND
WH
GND
WH
D1
D3
D4
D7
C5A
C4A
C3
X5
BU
X4
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R6
R7
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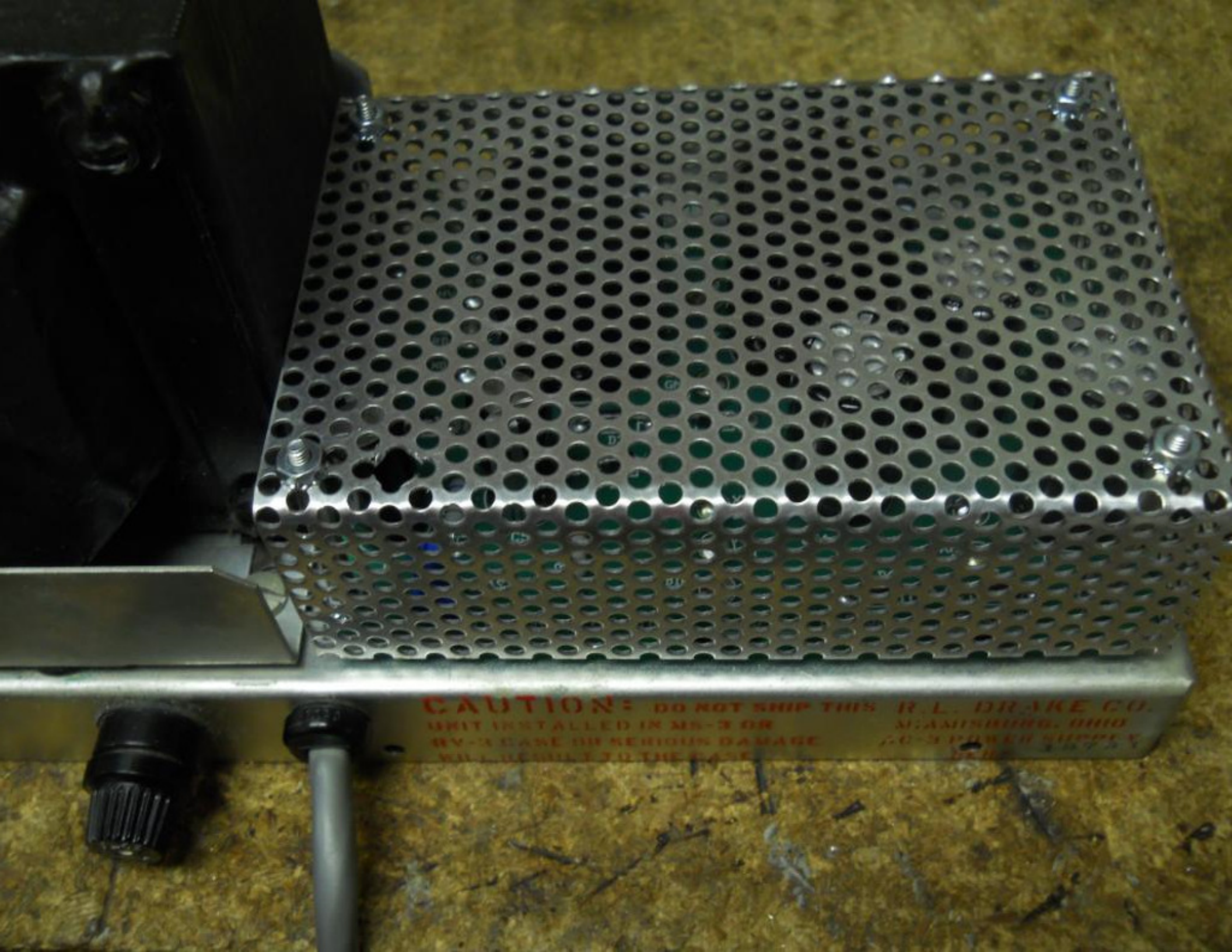
CAUTION: