ES4117C SWAN POWER SUPPLY MODULE v1.0
INSTALLATION INSTUCTIONS

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PARTS SUPPLIED WITH THIS KIT

(2) 0.01 µF 250 VAC Ceramic Disc Capacitor
(1) 3-Wire AC Line Cord
(1) ES4117C Power Supply Module v1.0

WARNING: Voltages inside the power supply CAN & WILL KILL YOU! You MUST also know how to work around HIGH VOLTAGE safely. If you do not, get assistance from someone who does.

PRELIMINARY INFORMATION

Determine the operating status of the power supply before beginning this upgrade. 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.

This module was specifically designed for an easy retrofit into the Swan 117C power supply.

The instructions are step-by-step. It is strongly recommended you read the entire document before you begin and 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. The process of labeling or tagging wires is strongly recommended on any repair or rebuild project. Wires are color coded but it is a good idea to label them anyway as referenced in the instructions. Masking tape and a ball point works fine.

( ) **Read, re-read and fully understand these instructions prior to beginning this upgrade.** Be sure to perform the steps in the order they are listed. Also, be sure to label wires as they are disconnected from various points inside the power supply. This will help when the time comes to re-attach the wires that will be disconnected during installation of the module.

TOOLS THAT YOU WILL NEED TO PERFORM THIS UPGRADE

Long nose pliers
Side cutters, flush cutters, or lead trimmers
Soldering iron and 60/40 electronics solder
Schematic of the Swan 117C power supply (A CORRECTED copy is included at the end of the instructions)

TOOLS THAT WILL BE HELPFUL IN PERFORMING THIS UPGRADE

Desoldering equipment (desoldering braid or vacuum desoldering tool)
Nut drivers
Wire strippers
Forceps or hemostat clamp
Paper and pencil or digital camera for taking notes and documentation

ES4117C POWER SUPPLY MODULE INSTALLATION INSTRUCTIONS

( ) Unplug the AC power cord from the mains outlet and allow time for the high voltage to discharge to 0 VDC.

( ) Disconnect the remote power supply cable from the Swan radio.

( ) Do not plug in the power cord and re-apply power until you have completed the installation, inspected it and removed any short circuits and stray wire clippings.

( ) Remove the cover of the power supply by removing the six (6) screws (three on each side) and lift the cover off. Turn the supply over and remove the four (4) screws securing the bottom cover of the power supply.

Before beginning the installation take whatever time is necessary to familiarize yourself with the 117C power supply as built. The connections and wire colors on the new module have been chosen to agree with the original Swan nomenclature in an attempt to eliminate any confusion during installation of the module. Look at the schematic 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 prior to starting the installation. 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 Electronic Specialties 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 cause problems during installation.

With the 117C power supply resting on its top, the front panel to your right and the power cables to your left, we can identify components according to that orientation. The two large electrolytic capacitors C1 and C2 are to the right of center with the one furthest from you being C1 and the closest is C2. These may be single- or dual-section electrolytic capacitors depending on age of the power supply. If they are dual-section both sections were wired together in parallel. Notice also the two filter chokes. The one closest to you is identified as L1 while the one furthest from you as L2. Swan did not label them on the original schematic, but they are identified on the corrected schematic.

( ) Disconnect the wiring from electrolytic capacitors C1 and C2. You may elect to leave the capacitors in place to preserve the vintage look or just remove them completely. If you do leave C1 and C2 in the supply, make sure that all wiring is removed from them.

( ) Carefully unsolder and mark all wire connections to the original power supply printed circuit board (PCB). The PCB is mounted to the four transformer bolts. DO NOT just cut the wires as often the wire leads are too short to cut them and strip a new end.

1. From the edge of the PCB closest to you is a WHITE transformer lead identified as X3. The WHITE transformer lead X3 is one end of the bias supply winding.
2. Immediately to the left of X3 is a GREEN transformer lead X5 and a large ORANGE power cable wire supplying 12.6 VAC to the remote radio cable.
3. Along the left edge proceeding clockwise is a RED transformer lead X1.
4. Next is a small GREEN small wire supplying 12 VDC to the remote radio cable and the positive (+) lead of a 100 µF electrolytic capacitor and another RED transformer wire identified as X2. The two RED wires are the high voltage supply winding from the transformer.
5. Proceeding clockwise along the edge furthest from you is a large WHITE wire supplying +275 VDC to the remote radio cable.

6. Next is a small BLACK wire that is one end of choke L2, and a small RED lead to one half of the dual-section 40 µF electrolytic capacitor. The three leads described in 5 and 6 are connected to the top end of two 68KΩ 2W resistors in parallel.
7. To the far right of this edge there is a small RED wire connected to the positive (+) terminal of C1.
8. Continuing down the right edge of the PCB is a small GRAY wire that connected to the positive (+) terminal of C2 which is also the negative (-) terminal of C1.

( ) Once all the wires have been unsoldered, use a 3/8" nut driver remove the four (4) nuts securing the original PCB and remove it.

( ) Examine the terminal strip located just above the transformer. The terminal strip is arbitrarily numbered 1-12, from left to right, beginning at the end to your left near the power cord. As-built, the terminal connections are listed below.

1. AC line cord BLACK, AC line bypass capacitor, BLACK transformer lead L2 and a small VIOLET wire to terminal strip position #10
2. No connection
3. A small BLACK wire to remote radio cable, AC line bypass capacitor and WHITE wire to fuse holder
4. No connection
5. A small RED wire to remote radio cable. This is the audio output to speaker.
6. A small GRAY wire to remote radio cable (BIAS), WHITE transformer lead X4 and the negative (-) lead of a 100 µF electrolytic capacitor
7. A RED lead to the second half of the 40 µF dual-section electrolytic capacitor, a BLACK lead to choke L1 and a BLACK lead to choke L2
8. A YELLOW/RED transformer lead and a BLACK lead to choke L1
9. No connection
10. A small VIOLET wire from terminal strip position #1 and a BLACK pilot lamp lead
11. No connection
12. A small YELLOW wire to the remote radio cable, a BLACK transformer lead L1 and a BLACK pilot lamp lead

( ) Note that there are three (3) ground lugs in the vicinity of the terminal strip. Two (2) lugs to the left near the power cables and one (1) to the right. The lugs on the left are ground for the two AC line bypass capacitors, the original 100 µF electrolytic filter capacitor for the 12 VDC supply and the large BROWN wire from the remote radio cable. The lug on the right is the ground for the 12.6 VAC GREEN transformer lead and the positive (+) lead of the original 100 µF bias electrolytic capacitor.

( ) **Before proceeding please take time to verify that the wiring as described above is correct and that you understand the functions of each wire. Make notes on any differences in wire color or connections.**

( ) Remove the old two-wire AC power cord. An easy way to remove these old cords and the bushing is to cut the line cord inside the chassis close to the bushing and outside the chassis about an inch away from the bushing. Grasp one of the wires and just pull it out of the bushing. Grasp the other wire and cord jacket and pull them out as well. The bushing can now be easily removed.

Before installing the new AC power cord we will clean up some of the original wiring and begin installing the new module and parts.

( ) Remove the fuse from the fuse holder. Unsolder and remove the original AC line cord wire (probably WHITE) from the rear lug of the fuse holder and clean any excess solder from the lug.

( ) Unsolder and remove the original AC line cord wire (probably BLACK) from terminal strip lug #1 and clean any excess solder from the lug.

( ) Unsolder and remove the original ceramic disc capacitor lead from terminal strip lug #1. Unsolder and remove the other lead of the original ceramic disc capacitor from the ground lug and clean any old solder from the lugs.

( ) Unsolder and remove the original ceramic disc capacitor lead from terminal strip lug #3 but leave the other two wires in place. Unsolder and remove the other lead of the original ceramic disc capacitor from the ground lug and clean any excess solder from the lugs.

( ) Unsolder and remove the original 100 µF electrolytic capacitor lead from its ground lug and clean any excess solder from the lug.

( ) Unsolder and remove the original 100 µF electrolytic bias capacitor from terminal strip lug #6 and the ground lug to which it was connected. Unsolder and remove the small GRAY wire from the remote radio cable and the WHITE transformer lead X4 from terminal strip lug #6. These two wires will connect to the new PCB later. Clean any excess solder from terminal strip lug #6 and the ground lug. Leave the large GREEN transformer lead in the ground lug where the 100 µF electrolytic bias capacitor was connected.

( ) Unsolder the RED lead from the original 40 µF dual-section electrolytic capacitor and two BLACK choke leads at terminal strip lug #7. Clean any excess solder from terminal strip lug #7. Note that one of the BLACK leads goes to choke L1 and the other BLACK lead goes to choke L2. Label the BLACK leads accordingly as L1 and L2.

At this point all original parts (the power supply PCB, the dual-section 40 µF electrolytic capacitor, two (2) 100 µF electrolytic capacitors and two (2) ceramic disc capacitors) should be disconnected and out of the power supply chassis.

( ) Using a ¼" nut driver, tighten the nut on each of the three (3) ground lugs making sure they are secure to the chassis.

( ) Install a new 0.01 µF 250 VAC ceramic disc capacitor with one lead connected to terminal strip lug #1. Wrap the lead around the terminal strip lug and cut any excess lead off. Insert the other lead of the 0.01 µF 250 VAC ceramic disc capacitor into the ground lug furthest from you. There should also be a heavy BROWN wire from the remote radio cable connected to this ground lug. Solder the ground lug connection.

( ) Install a new 0.01 µF 250 VAC ceramic disc capacitor with one lead connected to terminal strip lug #3. Wrap the lead around the terminal strip lug and cut any excess lead off. Insert the other lead of the 0.01 µF 250 VAC ceramic disc capacitor into the ground lug on the left side of the chassis. Solder the ground lug connection.

( ) Remove an additional 5" of outer jacket from the new AC line cord and trim away the fabric binders leaving three wires approximately 6" in length.

Note: One of two different power cords may be supplied. One version of the AC line cord has the traditional North American color code of BLACK, WHITE and GREEN. The other AC line cord version has the IEC color code of BROWN, BLUE and GREEN/YELLOW for the three wires. The correlation for the two different color codes is BLACK=BROWN=HOT, WHITE=BLUE=NEUTRAL, and GREEN=GREEN/YELLOW=GROUND.

( ) Insert the new AC power cord into the bushing leaving about 1/2” of jacket protruding through the bushing, compress the bushing with pliers and snap the bushing into the chassis.

( ) Solder the BLACK or BROWN wire from the AC power cord to the rear lug of the fuse holder and replace the fuse.

( ) Trim 3” from the WHITE or BLUE wire in the AC power cord, strip and tin the end of the WHITE or BLUE wire and insert into terminal strip lug #1 along with the BLACK transformer lead, a small VIOLET wire and the lead of the 0.01 µF 250 VAC ceramic disc capacitor. Solder the connection.

( ) Trim 3” from the GREEN or GREEN/YELLOW wire in the AC power cord, strip and tin the end of the GREEN or GREEN/YELLOW wire and insert the lead into the ground lug along with the lead of the 0.01 µF 250 VAC ceramic disc capacitor. Solder the connection.

( ) Strip and tin the end of the 3” GREEN or GREEN/YELLOW wire removed in the previous step and install one end into the ground lug with the large GREEN transformer lead and solder. The other of this short jumper wire will connect to the new power supply PCB when it is installed.

( ) Place the new power supply PCB over the transformer oriented so that the number ES4117C is toward you but DO NOT attach to the mounting studs until the wiring is completed.

( ) In the following steps individual wires will be connected to the PCB by inserting the wire end up through the hole in the PCB from the bottom and soldering to the top of the PCB. Trim each lead of excess wire after it is soldered in place.

( ) Connect the WHITE transformer lead to the pad labeled WH X3.

( ) Connect the GREEN transformer lead to the pad labeled GN X5.

( ) Connect the large ORANGE wire to the pad labeled OR 12.6VAC.

( ) Connect the RED transformer lead to the pad labeled RD X1.

( ) Connect the other RED transformer lead to the pad labeled RD X2.

( ) Connect the small GREEN wire from the remote radio cable to the pad labeled GN +12V.

( ) Connect the small gauge GRAY wire from the remote radio cable to the pad labeled GY BIAS.

( ) Connect the other WHITE transformer lead to the pad labeled WH X4. **Make sure you are soldering the transformer lead and not the white wire from the remote radio cable!**

( ) Connect the large WHITE wire from the remote radio cable to the pad labeled WH LV. **Make sure you are soldering the white remote radio cable lead and not the white transformer wire!**

( ) Connect the BLACK wire from choke L2 to one pad labeled L2.

( ) Connect the other BLACK wire from choke L2 to the other pad labeled L2.

( ) Connect the BLACK wire from choke L1 to the pad labeled L1.

( ) Connect the large BLUE wire from the remote radio cable to the pad labeled BU HV.

( ) Connect the GREEN or GREEN/YELLOW wire from the ground lug to the pad labeled GND.

( ) Place the PCB over the transformer studs and secure with four (4) #10-32 nuts, one nut on each of the four (4) transformer studs. Adjust the lower nuts (below the PCB) to position the PCB a far as possible from the chassis while leaving enough threads for the upper nuts to secure the PCB.

That completes the installation of the new power supply kit. Be sure to check your work for proper connections and make sure that all wire clippings and any solder splashes are removed from the chassis before proceeding.

TESTING THE ES4117C

EXERCISE EXTREME CAUTION IN THE FOLLOWING STEPS

To test the supply you will need a voltmeter capable of safely measuring 1000 VDC and 500 VAC.

The power supply can be energized without connecting it to a radio by placing a jumper across pins 1 and 2 of the 12 pin connector on the end of the remote radio cable. **If you elect to do this, DO NOT plug in the power supply to AC mains until you have installed the jumper!** Install the jumper and place the connector where it cannot short to anything or temporarily cover it with electrical tape. Connect the common lead of the voltmeter to the power supply chassis. Carefully energize the supply by plugging it into 120 VAC mains power. If there is any sign of a problem, such as a hissing noise or smoke, IMMEDIATELY unplug the supply and determine what the problem is before trying again. Measurements made with the power supply energized and with the AC line voltage set to 117 VAC are listed below. Please note these are no-load voltages and they will be higher than when the power supply is connected to a radio. Measurement are made to chassis ground unless otherwise noted.

GREEN transformer 13.25 VAC
RED transformer 313 VAC
RED transformer 313 VAC
WHITE to WHITE transformer 84 VAC
BLUE HV cable 866 VDC
WHITE LV cable 370 VDC
GRAY BIAS cable -118 VDC
GREEN cable 18.38 VDC

After verifying the proper operation of the power supply, unplug it from the AC mains power and remove the jumper between pins 1 and 2 of the remote radio cable.

Place the bottom cover in place and secure using the four (4) original screws. Place the unit upright and replace the top cover using the six (6) original screws.

The SWAN 117C power supply is now ready for many more years of service.

ADDENDUM FOR THE SWAN 117B POWER SUPPLY VARIANT

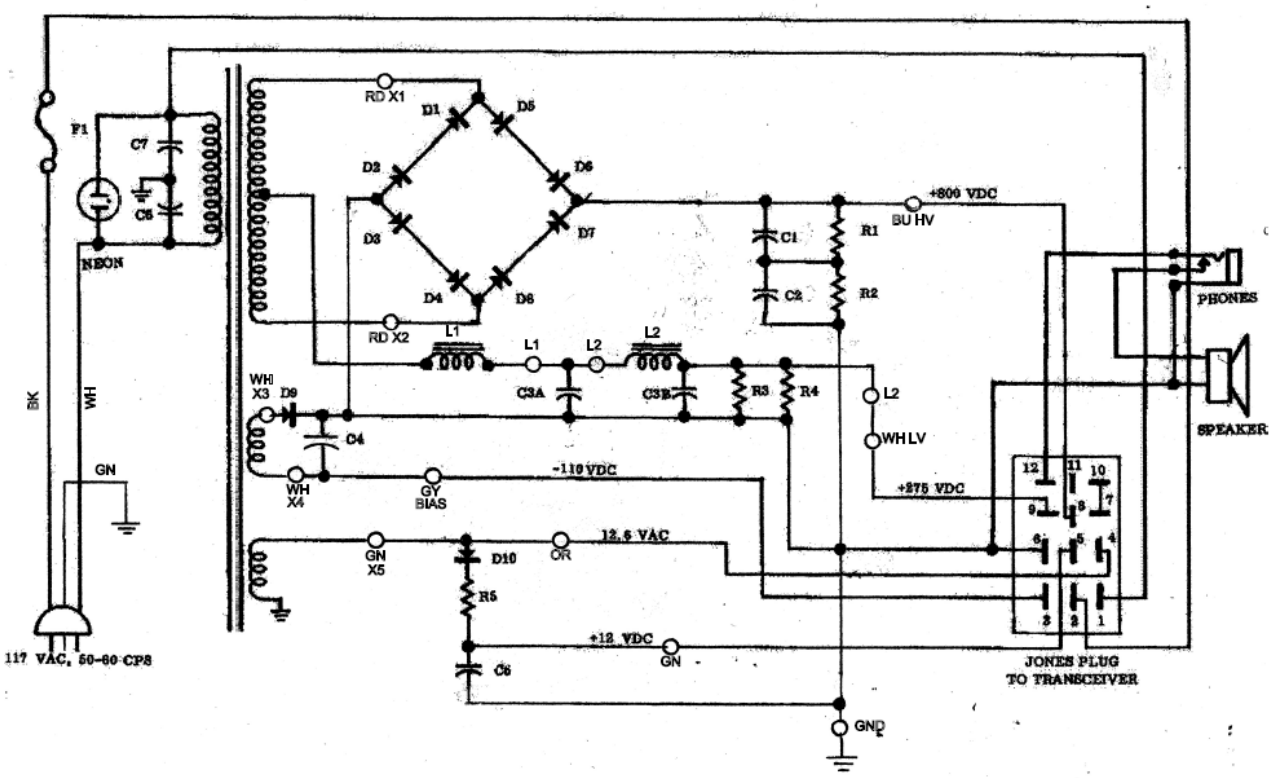
I have found documentation of an earlier variation of the 117C supply which was known as 117B supply. The two supplies appear nearly identical with the exception that the B variant used a 0.5 µF resonating capacitor across the input filter choke L1. I have no way of knowing if the filter chokes used in both B and C models were the same, but I have tried the addition of a 0.5 µF 1 KVDC film capacitor on my 117C supply and it appears to have merit in that the LV was decreased to 290 VDC under no-load conditions, which is what is supposed to happen on lightly loaded choke input supplies.

If you have the B version of the supply you will need to add a 0.5 µF (actually 0.47 µF today) good quality film capacitor rated at least 1 KVDC in parallel with choke L1. A good place to do this is on the terminal strip. The YELLOW/RED transformer center tap and the input wire to L1 are accessible on lug #8 of the terminal strip. There are several empty lugs available to connect the other lead of the capacitor. For example terminal strip lug# 4 would allow adequate room to install the capacitor above the terminal strip. Remove the lead from L1 to the PCB and connect it to the open end of the new 0.5 µF capacitor on terminal strip lug #4 and connect that point to the L1 location on the PCB.

Please don't hesitate to call or write if you have questions or comments.

Thank you
Paul Kraemer, K0UYA

UPDATED SCHEMATIC FOR THE ES4117C SWAN POWER SUPPLY



C1 C2 150mfd 500vdc
C3A C3B 56mfd 450vdc
C4 100mfd 160vdc
C5 220mfd 25vdc
C6 C7 0.01mfd 250vac

R1 R2 150k 2w
R3 R4 68k 2w
R5 4.7 1/2w
D1 - D10 1N4007
F1 3AB 10A 125vac

L1 L2 274-001 3946445

SWAN 117 C POWER SUPPLY
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