

# **STOP IMPORTANT**

***THE HP23 HEATHKIT POWER SUPPLY CONTAINS LEATHAL VOLTAGES! IT  
CAN KILL!***

IF YOU DO NOT HAVE THE TEST EQUIPMENT OR TALENT TO WORK ON THIS PROJECT, SEND THE KIT BACK FOR A COMPLETE REFUND! (less shipping)

**THE BUILDER ASSUMES ALL LIABILITY AND RISK WHEN ASSEMBLING THIS PROJECT.**

CHECK FOR PROPER VOLTAGES COMING OUT OF THE 11 PIN SOCKET BEFORE CONNECTING THE NEW SUPPLY TO YOUR RADIO! IF THE 11 PIN SOCKET IS WIRED INCORRECTLY, DAMAGE TO THE RADIO BEING POWERED WILL RESULT!

**YOU MUST INSTALL A PROTECTIVE COVER ON THE HP23 SUPPLY.** PUSHING IT BACK INTO THE SP600 SPEAKER IS NOT GOOD ENOUGH. A SIMPLE ALUMUNUM SCREEN CAN EASILY BE MADE TO COVER THE PC BOARD. THE ORIGINAL COVER WILL FIT THE HP23 EVEN WITH THE NEW PC BOARD ATTACHED.

REMEMBER. ONCE YOU BEGIN TEARING THE OLD HP-23 SUPPLY APART, YOU'RE ON YOUR OWN. SunLight Energy Systems IS NOT LIABLE FOR THINGS YOU DO TO YOUR SUPPLY OR HOW IT AFFECTS YOUR RADIO EQUIPMENT!

**Under no conditions will Mike Bryce, WB8VGE, The Heathkitshop, SunLight Energy Systems be responsible for your life! Since I have no control on the final assembly and testing, I will not be held responsible for your safety. If this is unacceptable, return the kit for a refund less shipping. The Heathkit HP23RL upgrade kit comes with no warranty other than to replace defective parts for 90 days from invoice date.**

## ***Quick assembly guide for the HP-23RL PS upgrade board***

These instructions are for those that have burnt their share of Heathkit manuals in the past. These are not step-by-step instructions, but rather a guide to help you stuff the pc board.

### **Let's make some assumptions**

1. You know diodes can only be installed one way
2. Electrolytic capacitors can only be installed one way
3. Some of the Heathkit HP23 supplies don't use the same color code
4. You have the test gear and talent to work on high voltage equipment such as this project
5. You have a copy of the schematic of the HP23 your installing the pcb in.
6. "Install" means to insert the correct part in the correct location, solder and clip off excess leads
7. Read though these instructions first before cutting a single wire!

### **Safety first!**

*The voltages inside the Heathkit HP23 series power supplies can kill you. This is not a low voltage power source. If you do not feel you have the talent to assemble and test this project, then please send the kit back. You'll get a full refund of the kit price, minus shipping. Don't feel bad if you elect to send the kit back. You won't be the first ham that has.*

### **The basic idea**

The overall plan is simple. You remove all of the old capacitors and diodes. Then you stuff and mount the new pcb to the HP23 chassis. Then the wires from the transformer connect to the diodes and the output from the pcb goes to the 11-pin socket.

### **Let's begin!**

( ) The best way to start assembly of the pc board is to install diode D5 a 1N5399. It is really hard to install this diode after you have the capacitors in place. Notice the silk screen has a band mark on the board. This band must match the banded end of the diodes

( ) Install diodes (1N5408) D1 through D4. Mount the diodes about 1/8" above the pc board. The banded end of the diodes must match the outline on the pc board.

( ) Next install bleeder resistors R1 through R4 (200K red-blk-yel). These are located in the upper right side of the pc board. Mount the resistors about 1/4" above the pc board.

( ) Install resistor R5, 100K brn-blk-yel, leaving it about 1/4" above the pc board.

( ) Install R6 1K brn-blk-red leaving it about 1/4" above the pc board.

( ) Install resistor R7 100K brn-blk-yel, again about 1/4" above the pc board.

() Resistors R8 and R9 10K-brn-blk-org are now installed. They can be pushed all the way down onto the pc board.

**() There should now be nine resistors mounted on the board as well as five diodes**

() The electrolytic capacitors will be mounted next. **MAKE SURE YOU INSTALL THEM CORRECTLY!**

() Install capacitors C1 through C4. 150 mfd@450v Watch polarity!

() Install capacitors C6 and C7 47mfd@350v Watch polarity!

() Install capacitor C5 68mfd@450v Watch polarity!

Double check your work. Make sure you have the diodes and capacitors installed correctly! Set the pc board aside until it is ready to go onto the old HP23 supply.

## **Inside the old HP23**

Remove the guts from the old supply leaving as much transformer leads as you can. Keep the old terminal strips, they may come in handy as a junction point to extend those wires that came up short.

Depending on the model of HP23 supply you are working on, you may have to remove the voltage/power switch and or the circuit breaker. Be mindful, that you must bend the tabs on the circuit breaker to remove it from the chassis. Those tabs have not been bent back in some cases in over 40 years! Bend the tabs only enough to allow you to remove the circuit breaker from the chassis. If you break a tab off, you'll be in deep dung!

DO NOT remove any of the wires from either the switch (at this time!) or the breaker (some models have a fuse holder)

Mount the pc board to the chassis using the old capacitors mounting screws and nuts. But DO NOT tighten down the hardware yet, It's easier to get the wires under the pc board this way. The kit has 1/4" spacers to lift the pc board above the chassis.

If the wires from the transformer are not long enough to reach the pcb pads, use one of the original terminal strips as a point to solder extension wires from the transformer to the pcb assembly.

Route the wires coming from the transformer and the 11 pin socket to the pc board by running the wires up through the large holes left by the old capacitors. Run one wire at a time, pushing the wire up from the bottom of the pc board and soldering it from the top side.

## **Wire connections to the pcb pads**

## About this brown-yellow wire and pad BRN/YEL

The brown-yellow wire is the source for the bias voltage. It is also the source for the low voltage used at the 250 vdc position of the voltage select switch IF used. Read though the instructions first before you start moving wires. If you don't have the voltage switch, it's easier. The switch adds confusion!

1. From the transformer
  - a. Red wire to pad marked RED
  - b. Red-Yellow wire to pad marked RED/YEL
2. From transformer
  - a. Blue wire to pad marked BLUE
  - b. Brown-yellow to pad marked BRNYEL (no voltage switch used!)
3. From pcb to 11 pin socket
  - a. From pad BLU (NOT BLUE!) to pin 4 of output socket (+830 volts)
  - b. From pad ORG to pin 3 of output socket (300/250 volts)
  - c. From pad YEL to pin 1 of output socket (fixed bias minus 130V)

## Wiring for the high/low voltage selector switch

Things get interesting here. Some models have a voltage selector switch at will allow the operator to select the higher 300 volts for the HW 100, SB 100 series of radios or the lower 250V for the mono banders like the SB32. Some models of the HP23 DO NOT HAVE this switch.

The HP23RL has provisions for using the original switch or you can hard wire the pcb just like the supplies that lack this voltage selector switch

## Wiring the pcb WITH the voltage selector switch

The switch has six terminals. One side has the black wires connected that turn the supply on and off. Leave these alone.

The other side of the switch has three terminals. On the outer terminals, the wires connect to the transformer.

## Prep the switch

1. Remove the wire from the center terminal. NOT the black wires
2. On the side closest to the transformer, remove all the wires but the one going to the transformer.

You should now have two wires connected to the top three terminals on the switch.

- a. outer terminal connected to the transformer.
  - b. No wires connected to the center terminal
  - c. One wire connected to the transformer.
1. From the center contact of the switch to pad SWITCH on pcb

2. From the terminal closest to the transformer to pad BRN/YEL (this terminal already has the brown-yellow wire from the transformer connected to it)

## **Wiring the pcb WITHOUT the voltage selector switch**

*You may have already connected transformer wire brown-yellow earlier*

If your supply does not have a voltage selector switch proceed with these steps

1. Connect brown-yellow wire from transformer to pad BRN/YEL on pcb

If you want 300 volts output

- a. Connect brown wire from transformer to pad SWITCH on pcb

If you want 250 volts output

- a. Connect pad SWLV to pad SWITCH with a short piece of hookup wire
- b. If you wired for 250V, the brown wire is left UNCONNECTED

## **Wiring the adjustable bias control**

Once again, Heathkit sold several version of this supply. Some had an adjustable bias control mounted on the side.

### **Wiring the bias control**

1. Remove the wires from the two outer terminals on the original control
2. The center terminal connects to pin 11 on the power socket.
3. Connect one outer terminal from the bias control to pad T1 on the pcb
4. Connect the other terminal from the bias control to pad T2 on the pcb.

On models without the panel mounted bias control, there will be no connections made to the T1 and T2 terminals

### **Wire in the choke**

The wires from the choke are brittle be careful you do not break the insulation

1. From the choke, either wire to pad CHOKE on the pcb
2. The remaining wire from the choke to pad CHOKE on the pcb.
3. One pad is between diodes D3 and D1, the other right beside R8

### **Finish up wiring**

1. Wire from pcb GROUND to a suitable ground location on chassis and to pin 7 on socket.

## PCB checkout

There should be three pcb pads not used.

- a. BRN
- b. SW1
- c. SWLV

Check for a wire in the following:

1. Yel pad to socket pin #1
2. ORG pad to socket pin #3
3. GROUND pad to chassis ground and socket pin # 7
4. CHOKE pad to one wire of the choke coil
5. T1 pad to adjustable bias control (if used)
6. T2 pad to adjustable bias control (if used)
7. BRNYEL pad to brown-yellow transformer wire (this wire may be connected to the voltage select switch if used)
8. SWITCH pad to brown transformer wire (for 300V output if used)
9. CHOKE pad by D1 and D3 to other choke coil wire
10. BLU pad to socket pin # 4 (850V output)
11. RED pad to red transformer wire
12. REDYEL pad to red-yellow transformer wire
13. BLUE pad to transformer blue wire

After you have soldered in all the wires from the transformer and the 11 pin socket, secure the pc board down on the chassis with the old nuts and washers.

***Make sure you did not forget the GROUND wire to the pcb to the chassis and socket pin #7***

This completes the quick assembly of the HP23RL PS board upgrade.

Test the supply out completely before connecting it up to a radio. It is especially important that the bias voltage be available to the radio.

## Testing the supply for proper operation

In the next step you will apply power to the supply. To do this you must short out the AC power switch leads on the 11 pin socket.

Using a small length of hook up wire, connect pins 10 and 9 together. This bypasses the external power switch.

In the following steps, lethal voltages are present both on the PC board and inside the chassis.

( ) Plug in the supply to a 110 volt outlet.

( ) If your supply has the voltage selector switch, place it to the on position "LV 300DC."

***IF YOU SEE SMOKE, HEAR SNAPPING SOUNDS OR SMELL SOMETHING GETTING TOO HOT, REMOVE THE POWER PLUG AT ONCE.***

# **Warning! YOU can be killed by the voltage present on the pcb and inside the HP23 chassis!**

## ***HIGH VOLTAGE IS NOW PRESENT ON THE PC BOARD!***

- ( ) Using your meter, probe the +800 volt pad (BUL.) It should be about 830 volts DC
- ( ) On the YEL pad about 140 volts NEGATIVE
- ( ) On the ORG pad +365 volts with the choke (and about +290 with the voltage selector in the low position.)
- ( ) If the voltages checkout, remove power and let the capacitors discharge.
- ( ) Tighten down the hardware, tidy up the wiring
- ( ) REMOVE THE JUMPER YOU INSTALLED BETWEEN PINS 9 AND 10 ON THE 11 PIN SOCKET

## ***( ) INSTALL THE CAGE COVER ON THE SUPPLY AT THIS TIME***

MAKE SURE YOU HAVE THE PROTECTIVE CAGE INSTALLED ON THE SUPPLY AFTER YOU HAVE COMPLETED THE PROJECT. HIGH VOLTAGE APPEARS ON THE PC BOARD!

## **Part list for the HP23RL**

D1 1N5408  
D2 1N5408  
D3 1N5408  
D4 1N5408

D5 1N5399

C1 150mfd@450v  
C2 150mfd@450v  
C3 150mfd@450v  
C4 150mfd@450v  
C5 68mfd@450v

C6 47mfd@350v  
C7 47mfd@350v

All resistors 3W  
R1 200K (red-blk-yel)  
R2 200K (red-blk-yel)

R3 200K (red-blk-yel)

R4 200K (red-blk-yel)

R5 100K (brn-blk-yel)

R6 1K (brn-blk-yel)

R7 100K (brn-blk-yel)

R8 10K (brn-blk-org)

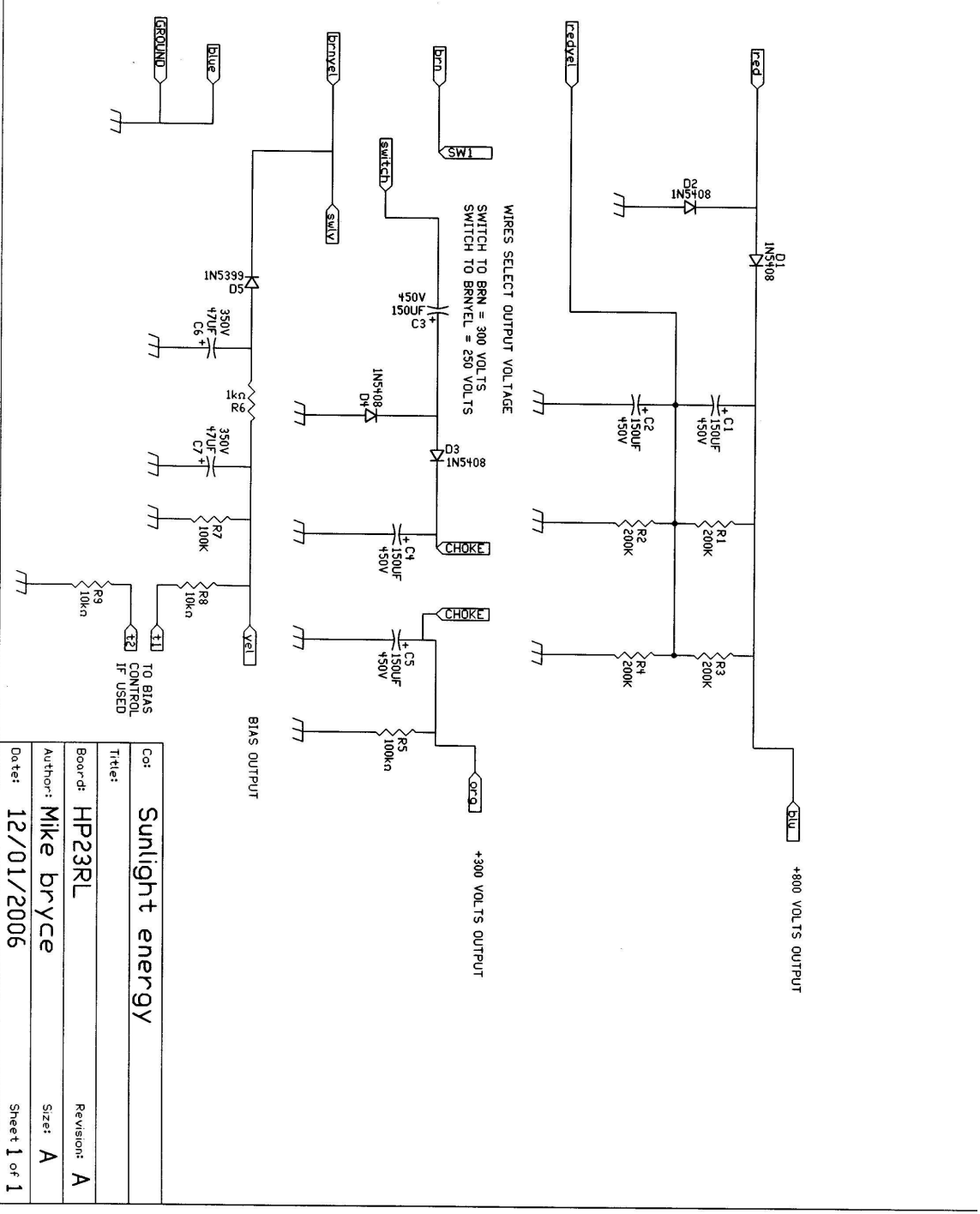
R9 10K (brn-blk-org)

## Troubleshooting the HP23RL

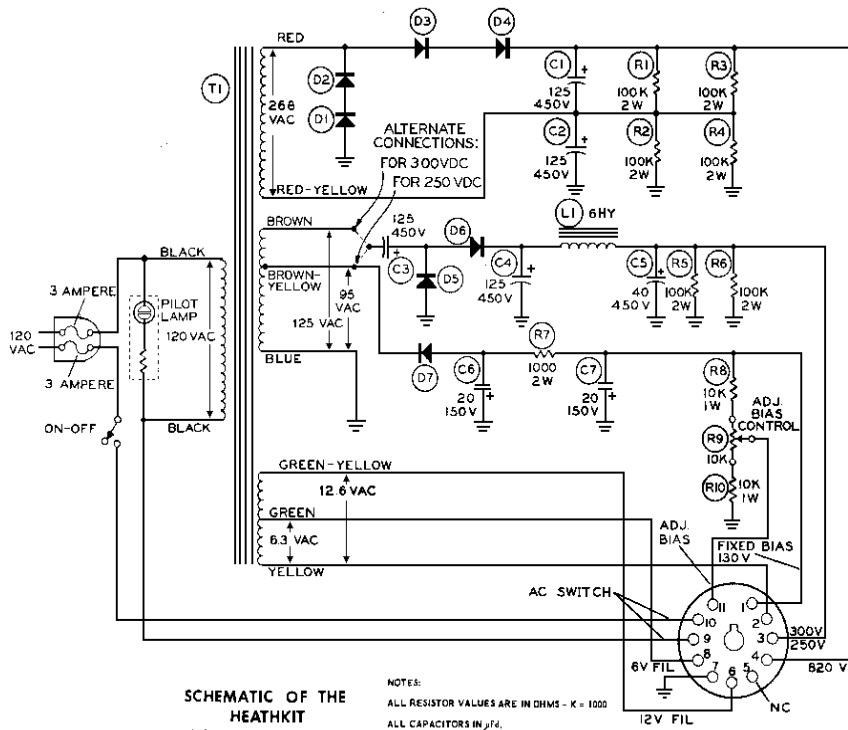
Most of the trouble getting the HP-23R supply running will be from a misplaced wire or component.

Problem	Fix
No +800 volts	Diodes D1-D2
+800 volts is only 400 volts	Diodes D1 or D2. C1 or C2 in backwards. Also check red and red/yellow wires to the diodes
No bias voltage	Diode D5 in backwards. Missing R6. Capacitors C6 and or C7 in backwards
No +300 volts with choke	Wiring error from transformer/switch to pads. C3 in backwards. Choke not installed or wired to the correct pads. Diodes D4 or D3 backwards. C4 in backwards
Voltage selector switch operates backwards ie. Low voltage is 300V Instead of 250V	A wiring error on the switch to the pcb or error on switch



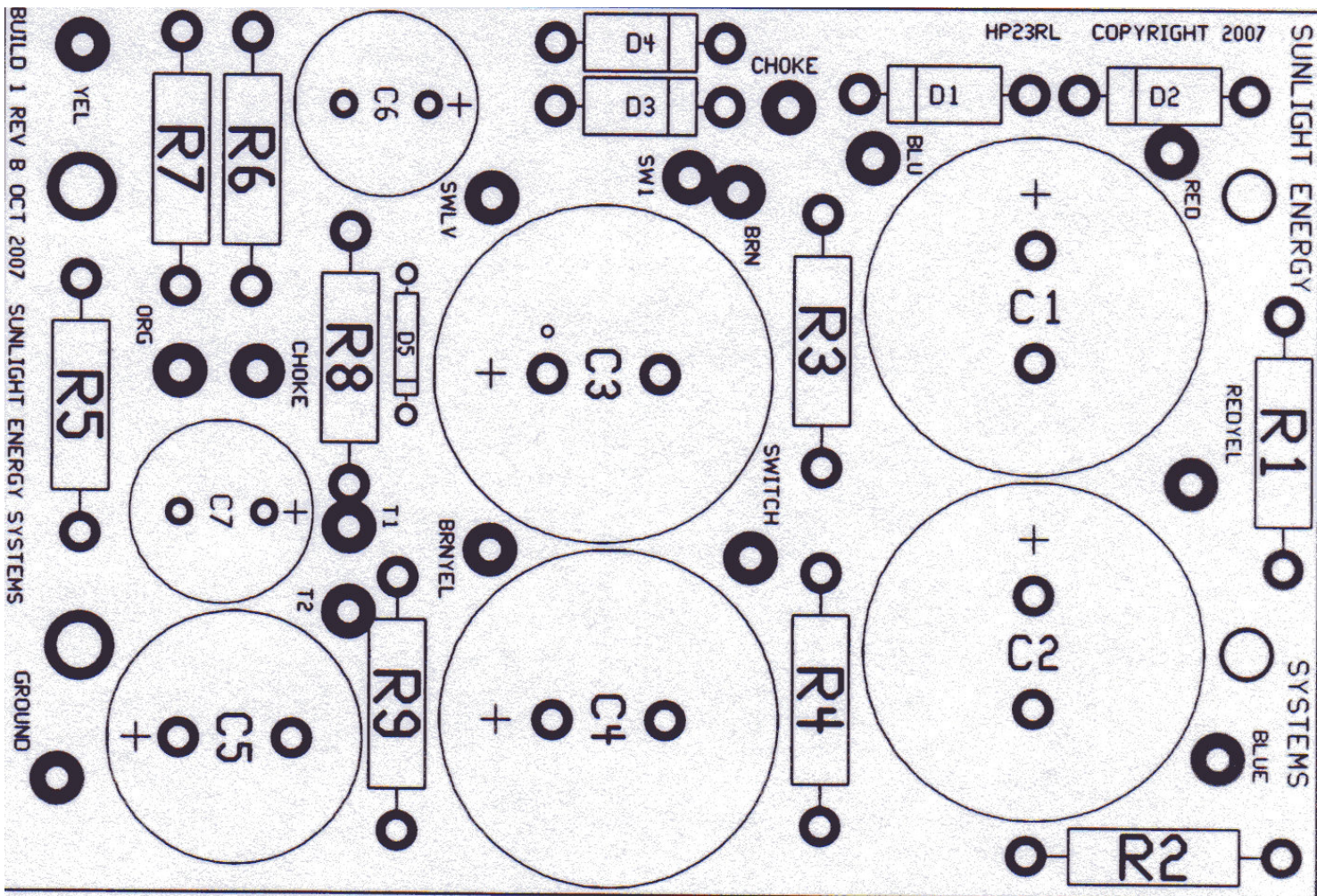


Co:	Sunlight energy
Title:	
Board:	HP23RL
Author:	Mike bryce
Date:	12/01/2006
Revision:	A
Size:	A
Sheet	1 of 1



SCHEMATIC OF THE  
HEATHKIT  
AC POWER SUPPLY  
MODEL HP - 23

NOTES:  
ALL RESISTOR VALUES ARE IN OHMS - K = 1000  
ALL CAPACITORS IN  $\mu$ F4  
ALL DC VOLTAGES MEASURED FROM POINT  
INDICATED TO GROUND.  
VOLTAGES MADE WITH 11 MEGOHM INPUT  
VTVM.



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