

USING COMPUTER POWER SUPPLIES ON MODEL RAILROADS

by Jerry Hansz

Model railroads need power other than for track/train operation. Buildings need lights, switch machines use voltage, crossing gates and signals don't run on air!

On the Santa Fe Central, we have used several switching power supplies removed from defunct computers. They provide +12VDC for switch machines and accessory printed circuit boards (PCB). The +5VDC is handy for building lights to promote extended life, and for PCBs. Other voltages have not been used, but are available if a need presents itself.

In addition to the 3 units used, there are three units available for backup or expansion. We will examine each of the units in more detail.

SEASONIC SSA-200EE SWITCHING POWER SUPPLY

Modified for model railroad use.

The SSA-200EE power supply is rated at 100-120VAC 50/60 Hz or 200-240VAC 50/60 Hz input. An accessory AC switched receptacle provides 100-120VAC 1A max or 200-240VAC 0.5A max output.

DC outlets at 200 watts are +5V 20A, +12V 8A, -5V 0.5A and -12V 0.5A.

The computer connectors were removed and the wires were connected to a 14 terminal barrier strip as follows:

Terminal 1 +5V 20A Red

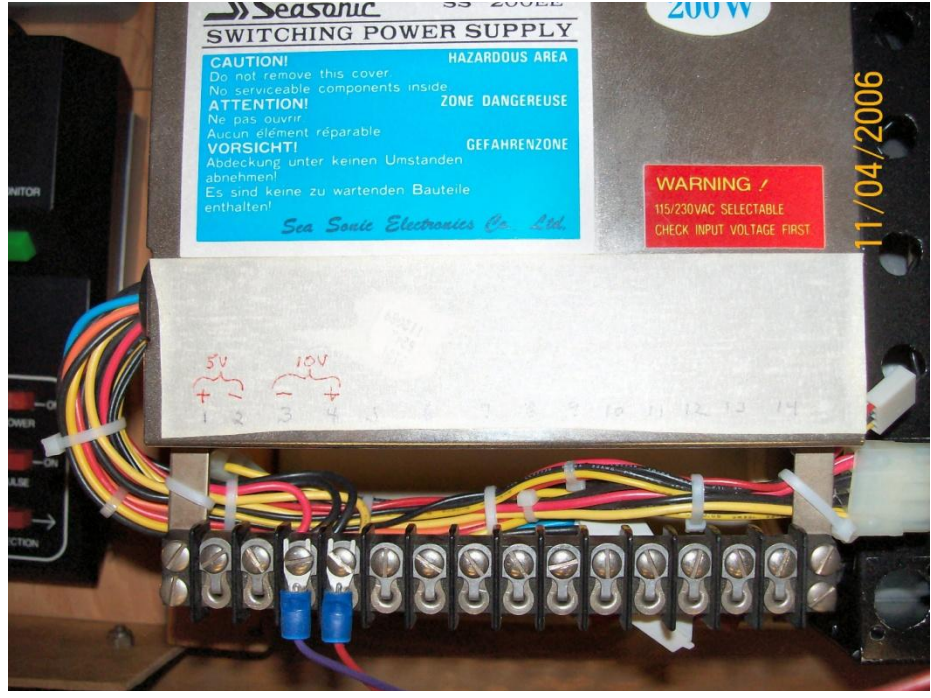
Terminal 2 -5V 20A Black

Terminal 3 -12V 8A Black

Terminal 4 - +12V 8A Yellow

Terminals 5 to 14 are not used.

The modified power supply provides switch machine power for Agua La Sal.



VIEW OF INSTALLED POWER SUPPLY SHOWING TERMINALS



VIEW OF POWER SUPPLY BEHIND AGUA LA SAL PANEL

SANTA FE CENTRAL RAILROAD
 RELAY POWER SUPPLY
 AGUA LA SAL



MULTIPLE WIRES TO VARIOUS CONNECTORS

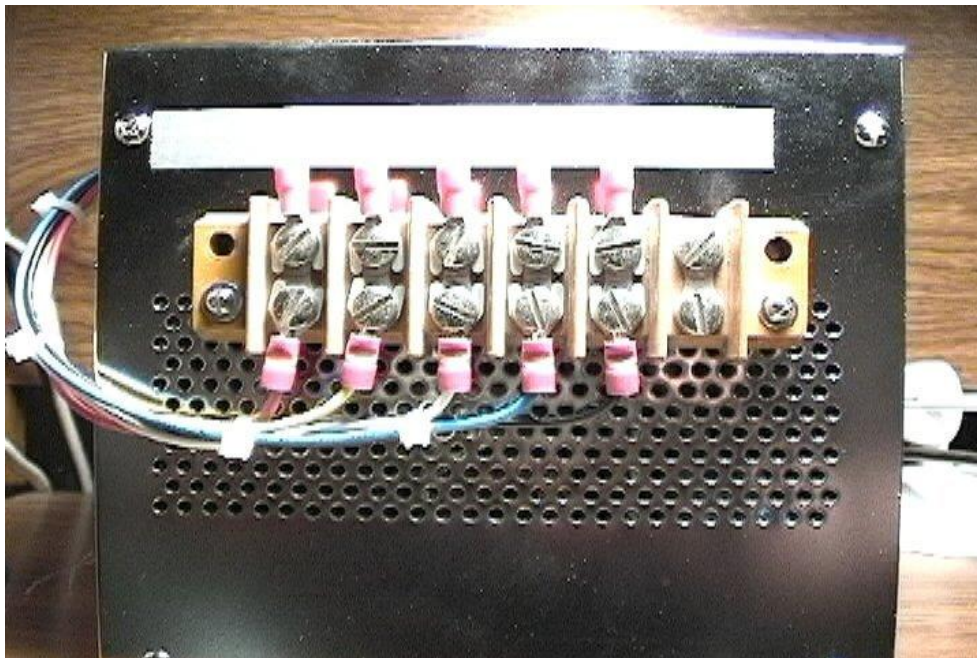
- A - 4 WIRES TO LARGE 4-PIN MOLEX
(wired to 14-terminal barrier strip on s/n 11107729)
- B - 4 WIRES TO 2 LARGE 4-PIN MOLEX
- C - 4 WIRES TO 4-PIN MINIATURE - 2 CONNECTORS
- D - 6 WIRES TO LARGE 6-PIN (P8)
- E - 6 WIRES TO LARGE 6-PIN (P9)

WIRE AND VOLTAGE IDENTIFICATION

- A - RED - +5VDC
 BLK - -5VDC, -12VDC
 BLK - -5VDC, -12VDC
 YEL - +12VDC
- B - RED - +5VDC
 BLK - -5VDC, -12VDC
 BLK - -5VDC, -12VDC
 YEL - +12VDC
- C - RED - +5VDC
 BLK - -5VDC, -12VDC
 BLK - -5VDC, -12VDC
 YEL - +12VDC
- D - OR - +5VDC
 RED - +5VDC
 YEL - +12VDC
 BLU - -12VDC
 BLK - -5VDC, +12VDC
 BLK - -5VDC, +12VDC
- E - RED - +5VDC
 RED - +5VDC
 RED - +5VDC
 WH - -5VDC
 BLK - -5VDC, +5VDC
 BLK - -5VDC, +5VDC

SEASONIC SSA-200EE COMPUTER POWER SUPPLY
 INPUT: 100-120VAC 50/60 HZ 4A or 200-240VAC 50/60HZ 2.2A
 OUTPUTS: -5VDC 20A, +12VDC 8A, -5VDC .5A, -12VDC .5A
 SWITCHED AC OUTLET: 100-120VAC 1A MAX OR 200-240VAC .5A MAX
 50 DEGREES C maximum ambient temperature. Integral cooling fan.

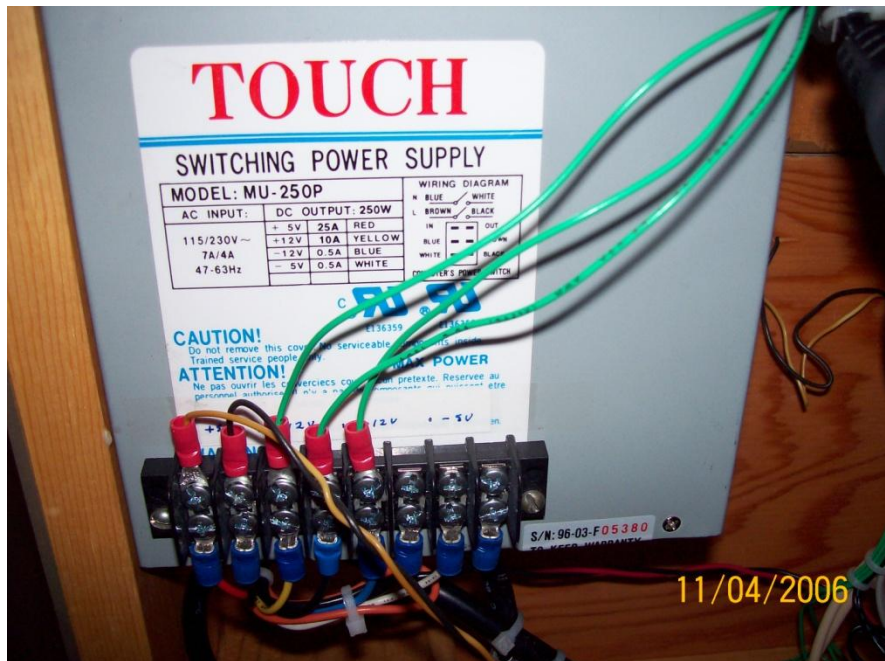
I have another Seasonic SSA-200EE power supply which has been modified.

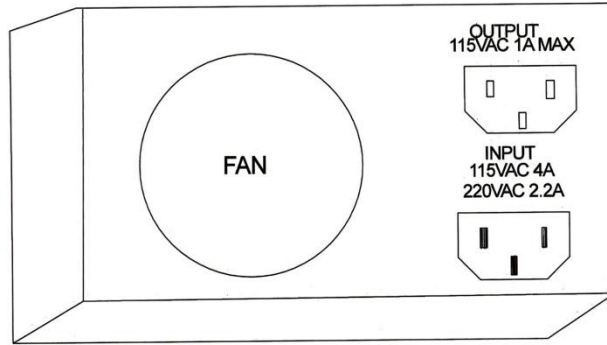


TOUCH MU-250P SWITCHING POWER SUPPLY

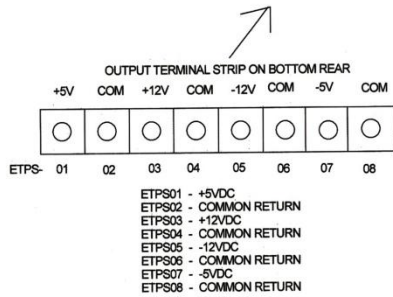
Modified for model railroad use.

The MU-250P provides switch machine and accessory power for the Chestnut Hill Engine Terminal. The power supply is mounted under the Engine Terminal frame, adjacent to the control panel.





SANTA FE CENTRAL
RAILROAD ENGINE
TERMINAL SWITCH
MACHINE AND
ACCESSORY POWER
SUPPLY



TOUCH MODEL MU-250P
SWITCHING POWER SUPPLY
S/N 96-03-F05380

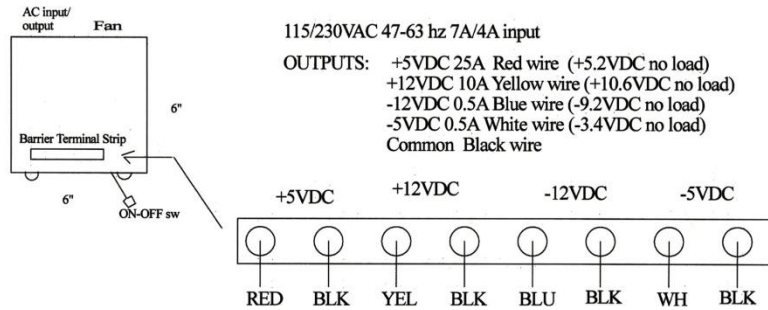
INPUT: 115VAC 50/60HZ 7A OR
230VAC 50/60HZ 4A

OUTPUTS: +5V 25A +12V 10A
-5V .5A -12V .5A

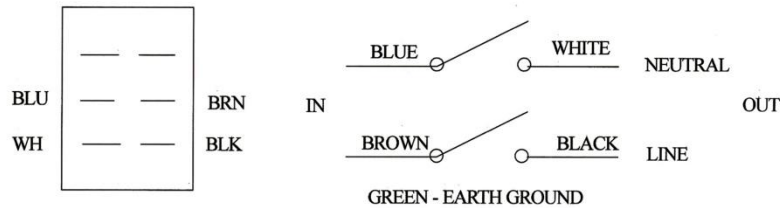
SFCRR05W/SKF

REVISED 8/2/2003 AS BUILT

Touch MU-250P Switching Power Supply



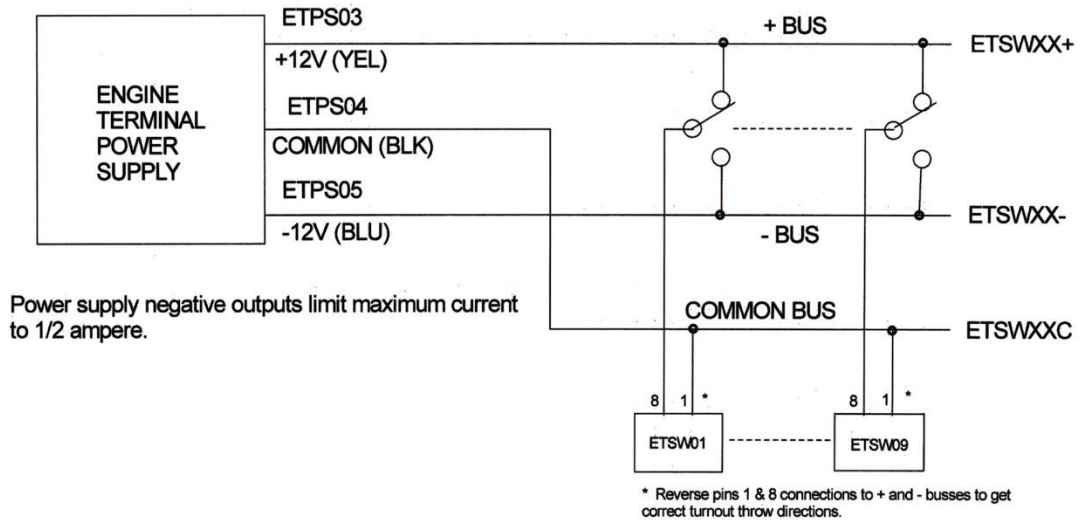
POWER SWITCH



SFCRR05W1.SKF

DRAWN 6/28/2003 AS BUILT

SANTA FE CENTRAL RAILROAD ENGINE TERMINAL SWITCH MACHINE POWER WIRING



HIPRO HP-150CLFA6 Rev:01 COMPUTER POWER SUPPLY

Modified for Model Railroad Use.

The power supply was modified for model railroad use by removing the computer cables and connectors, and installing an 8-terminal strip.

The power supply input power can be either 115VAC at 6A or 230VAC at 3.5A.

Output voltages and currents are shown in this chart:

<u>TERMINAL</u>	<u>COLOR</u>	<u>NOMINAL VOLTAGE</u>	<u>MEASURED VOLTAGE</u>
1	RED	+5VDC at 18A	+5.35VDC
2	YELLOW	+12VDC at 4.2A	+10.4VDC
3	ORANGE	+3.3VDC at 14A	+3.09VDC
4	BLUE	-12VDC at 0.5A	-8.61VDC
5	BLACK	GROUND	0VDC
6	Not used		
7	GREEN	POWER SUPPLY ON	
8	BLACK	POWER SUPPLY ON (GROUND)	

Voltages were measured with power input of 121VAC.



Figure 1. Power Supply Label.



Figure 2. Fan and Terminal Strip.



Figure 3. AC connector side.

To use the power supply, wires are connected to the required terminals, with ground to terminal 5. A single-pole, single-throw (SPST) switch is connected between terminals 7 and 8, to turn the power supply on.

Since connections to the power supply were not intuitive, we contacted the Hipro support people at supportla@hipro-us.com. They kindly provided the output voltages and their associated wire colors. Thanks to Diven Liu (diven_liu@hipro-us.com) for his assistance.

SPARKLE POWER INTERNATIONAL LTD. SPI-300G POWER SUPPLY Modified for model railroad use

The SPI-300G computer power supply was modified for model railroad use by removing redundant wiring, installing an 8-terminal strip, and modifying the switch wiring for a SPST toggle switch.

When I get around to it, this power supply will be installed behind the Main Line Control Panel at Talheim, to replace several power supplies cobbled together when the panel was installed.

The power supply is rated at 300 watts.

The input is 100-120/200-240 VAC 6/3 A 60/50 Hz.

The outputs are:

+5VDC 30A, measured 5.4V no load

+12VDC 12A, measured 11.1V no load

-5VDC 0.5A, measured -4.3V no load

-12VDC 0.5A, measured -9.6V no load

No load voltages were measured with a VTVM

A connection is provided for a PC signal. Connecting this to ground had no effect on the outputs.

The on-circuit board fuse is 6.3A 250V.

The modified circuit is shown on drawing SPI300G.SKF, attached.



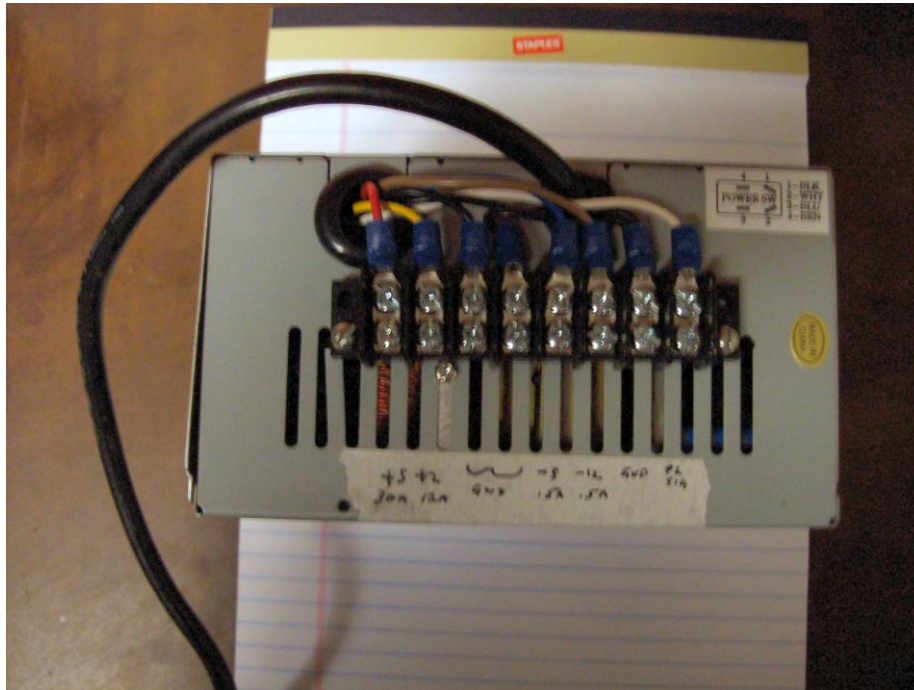
TOP VIEW OF THE SPI-300G POWER SUPPLY AND ON-OFF SWITCH.



TOP VIEW OF THE SPI-300G, SHOWING THE NOMENCLATURE LABEL.



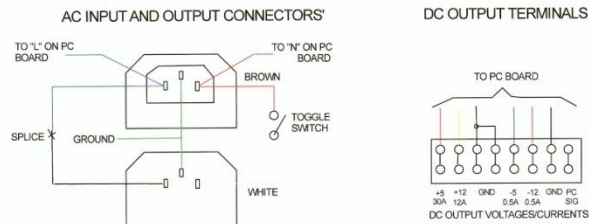
VIEW OF THE SPI-300 FRONT PANEL. The AC input connector is on the bottom right. The AC output connector is on the top right. The 12 volt cooling fan is on the left.



THE SPI-300G REAR PANEL SHOWING THE MODIFIED OUTPUT TERMINALS.

The 8-terminal strip is secured to the rear panel with 8-32 machine screws through the top of the cooling vents. The wires from the PC board are terminated with spade lugs secured to the top row of terminal screws. The outputs from left to right are: +5V, +12V, two grounds, -5V, -12V, another ground, and the PC signal input.

**SPARKLE POWER INT'L LTD. SPI-300G POWER SUPPLY
MODIFIED FOR MODEL RAILROAD USE**



SPI300G.SKF

DRAWN 12/8/2009

ENLIGHT CORP. MODEL HPC-300-101 POWER SUPPLY

Modified for model railroad use

Input: 115VAC 6A or 230VAC 3A, 50/60 Hz, peak load 300W.

Outputs: +5VDC 25A, +3.3VDC 20A (165 watts max)

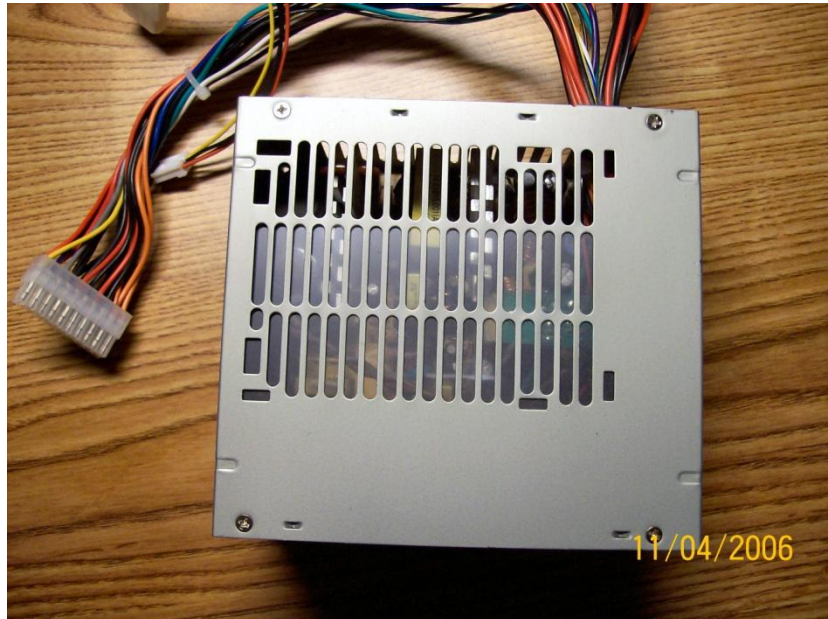
+12VDC 13A (165 watts max)

-5VDC 0.3A (1.5 watts)

-12VDC 0.8A (9.6 watts)

+5VSB 1.5A (7.5 watts)





This switching power supply shows how a typical computer power supply appears before modification. A frightening amount of wires and connectors!



I determined which wires provide which voltage output.

The power supply is set up for 115VAC operation. With a dedicated input cable connected to the wall outlet, I explored one of the 4-pin sockets, which would be used for a disk drive. It is logical that the red wire would be +5 volts DC, black wire-common (-), and the yellow wire should be +12 volts. A voltmeter will tell the tale.

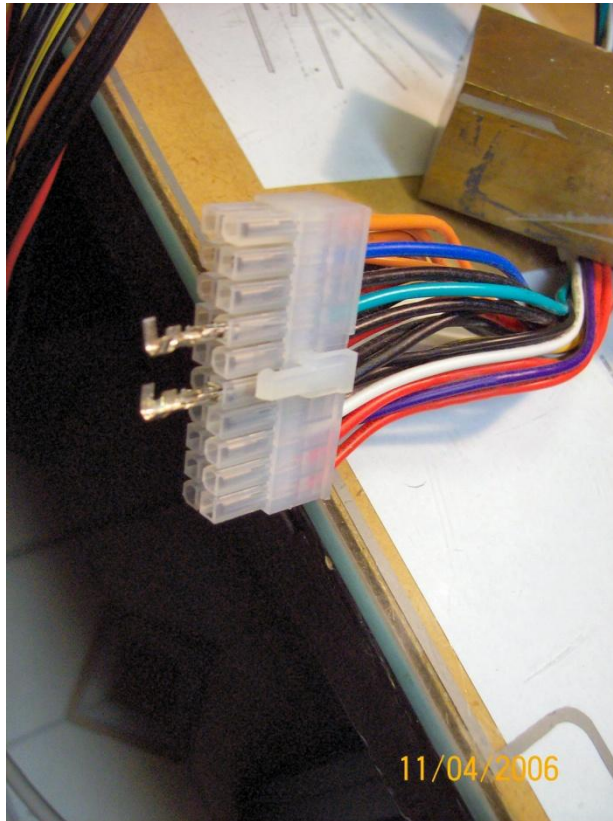
To determine the other voltages, I examined the 20-pin socket. In addition to red, black, and yellow, there are blue, green, orange, and white wires. These PROBABLY carry the other voltages. We'll see. Won't hurt to recheck the red, yellow and black wires!

First, I had to get the power supply turned on! Let's see, the Hipro 150 used the green wire to ground to turn on. Maybe that'll work here? We did a little research-removed the cover and used magnifiers to check the circuit board. Found the following labels:

**Red wires (lots of them) marked "+5v",
Yellow wires marked "+12V",
Violet wire marked "+5US",
White wire marked "-5V", and
GREEN WIRE MARKED "ON-OFF". Whee!**



I replaced the cover and put small pins in the green and a black socket on the 20-pin connector.

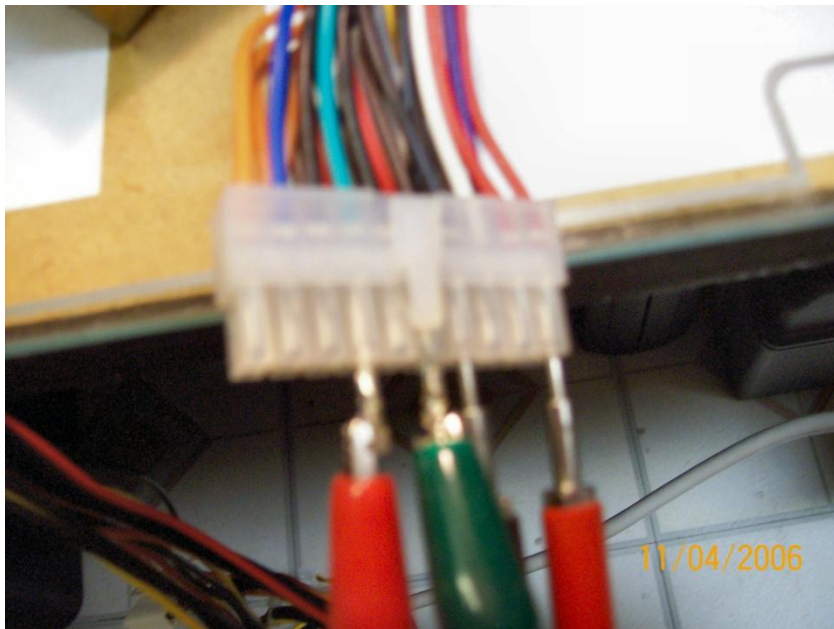


Then I connected a computer power cable to the power supply and plugged it into the power strip.





With the meter connected to red and black sockets, no voltage. The power supply fan didn't turn. I then jumpered the green socket to a black socket.



The fan started. The meter showed +5.17 volts. So-the green wire WAS the on-off switch.



With the power supply operating with no load, I checked all the different colored wires on the 20-pin connector:

Black	- ground	Gray	? (5.16)
Red	+5 V (5.17)	Violet	+5 VSB (5.16)
Yellow	+12 V (12.03)	Blue	-12 V (-11.1)
Orange	+3.3 V (3.35)	White	-5 V (-5.01)

Now that I knew how to turn the supply on, and which wires carry which voltage, I converted the unit for model railroad use. I eliminated all the unnecessary wires, keeping one each red, yellow, and orange for +5V, +12V, and +3.3V. I kept three black wires to provide return for those three voltages. Don't think I'll need the negative voltages. I coiled those wires up inside, in case I change my mind.

The green wire and another black wire will go to a toggle switch, so I can turn the power supply on. All cutting took place inside the power supply so no bare wires will protrude.

All 8 wires were connected to an eight-terminal barrier strip as follows:

<u>Terminal</u>	<u>Color</u>	<u>Function</u>
1	RED	+5V
2	BLK	-5V
3	YEL	+12V
4	BLK	-12V
5	OR	+3.3V
6	BLK	-3.3V
7	GRN	ON-OFF
8	BLK	ON-OFF

This will make an excellent auxiliary power supply for a model railroad.

As you can see, converted computer power supplies can be an economical way to obtain various voltages for model railroad accessories. Certain colors are standard, such as black for common, red for +5 volts, etc. Careful observation can make the conversion an easy project. Sometimes using a magnifier on the circuit board will give you the exact identification.