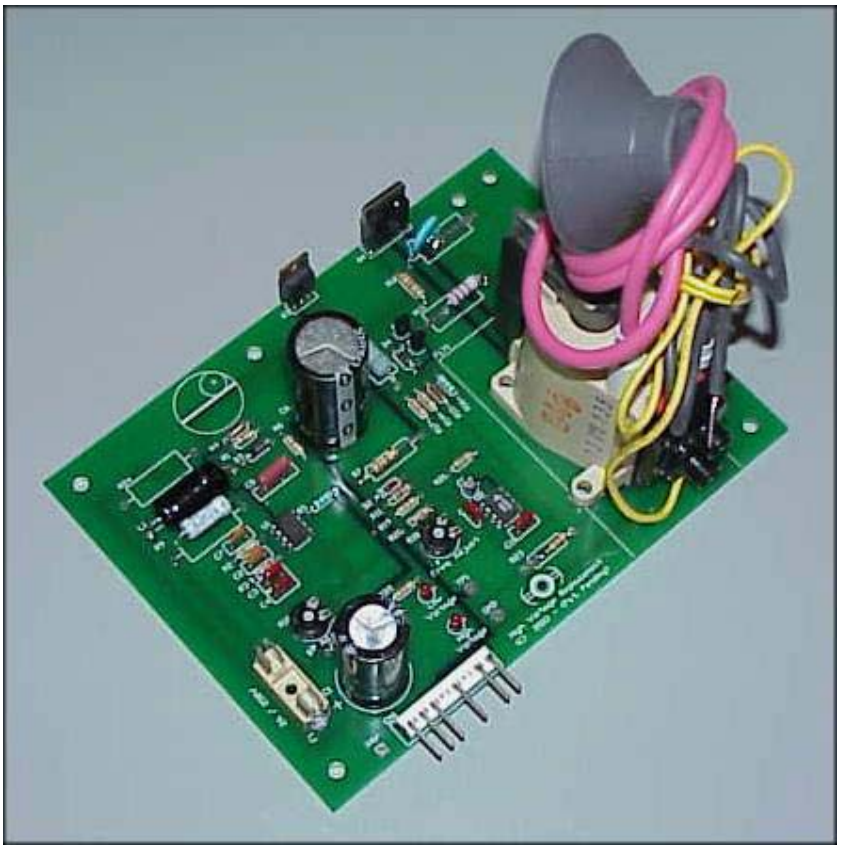
Wells Gardner 6100 High Voltage Replacement



Notice Regarding this Upgrade

WARNING! – Danger Potential

Although this kit has been designed to be easy-to-install, and has been tested in many installations; caution must be exercised when installing this kit. If you are uncertain of how to properly install this kit safely, consult a professional for installation assistance. Neither the manufacturer nor distributor assumes any responsibility for any accidents or damage caused by the installation or usage of this kit. By installing this kit you agree to not hold the manufacturer or distributor responsible for any damage as the result of, or arising out of the use of this kit.

High Voltage
This kit contains and generates high voltages capable of delivering lethal quantities of energy. To avoid serious injury or death, do not attempt to install this kit until you have read and understood all precautions and instructions included but not limited to the instructions with the kit.

X-Ray Radiation
This kit has been designed for minimum x-ray radiation exposure. However, to avoid possible exposure to soft x-ray radiation, it is imperative that you never modify or adjust the high voltage generating circuitry except as described herein.

Implosion Hazard
If the picture tube is damaged while installing this kit, it will implode. Shattered glass and the deflection yoke can fly 6 feet or more from the implosion. Always use care when working around the picture tube.

To perform this upgrade you should:

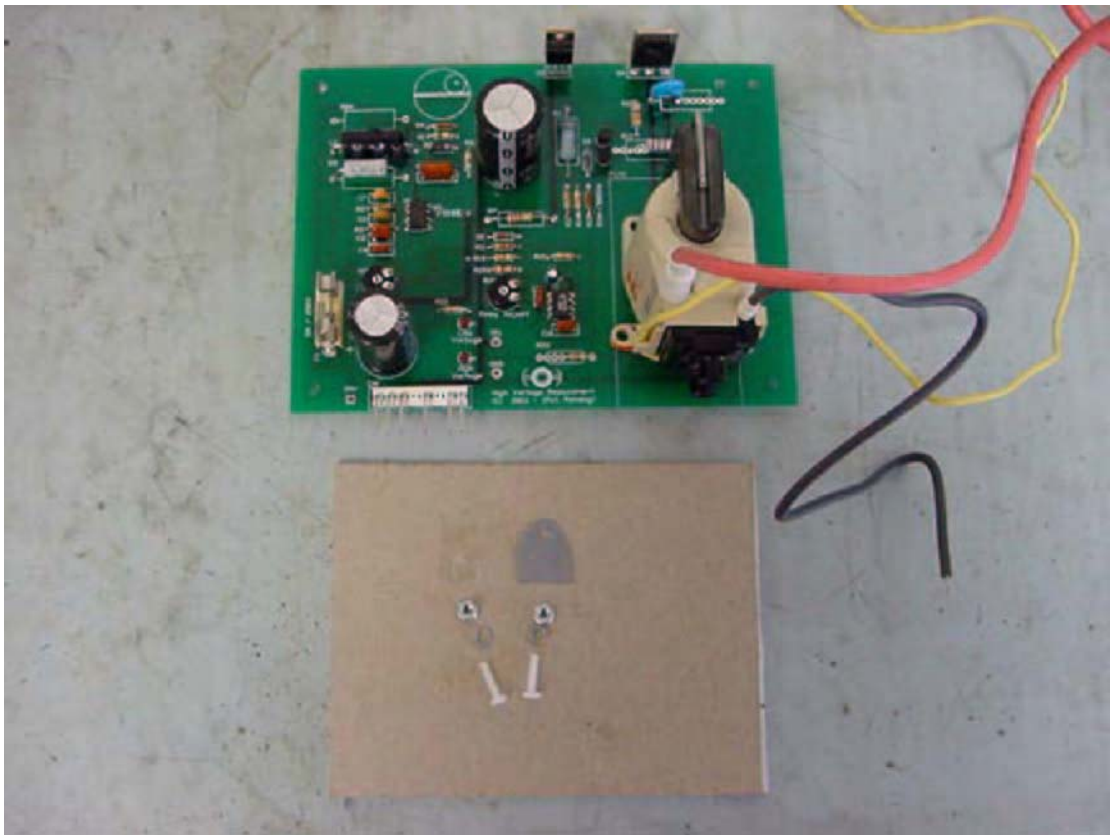
- Be familiar with safe handling procedures for electronic components.
- Be able to use hand tools such as a drill and screwdriver.
- Be able to do basic soldering.
- Be able to follow directions.

PLEASE READ THESE INSTRUCTIONS COMPLETELY THROUGH BEFORE STARTING.

All attempts have been made to make this an easy and clean install but please note that all machines and parts were not made exactly the same way. It is possible that you will need to modify your machine to properly install this upgrade. We will inform you of any inconsistencies that we have found to help the process along.

Special thanks to Caliber Inc. for funding, research, development and coffee; Tom Fischels for multiple machine testing and images.

Documentation revised by Al Warner, October 2003.



Included:

Your kit should include the following parts:

1. 1 High Voltage (HV) Replacement Board
2. 2 Mica Insulators
3. 2 Nylon Screws
4. 2 Lock Washers
5. 2 Nuts

If any parts are missing contact your distributor for assistance.

Required Tools:

- Drill
- Philips Screwdriver
- Soldering Iron
- Solder
- Snips
- Large Flat Head Screwdriver
- 3 ft. of Lamp cord
- Electrical Tape or Heat Shrink Tubing
- Large Alligator Clips (Optional)
- Analog / Digital Ohm Meter or Continuity Tester
- Ammonia or rubbing alcohol
- Heat Sink Compound (available at electronics stores)

Optional:

- Voltage Meter
- High Voltage Probe

Getting Started:

Turn off and unplug the game from the wall outlet.

Discharge the high voltage in the picture tube:

Get a 3 ft. length of lamp cord, strip 1/2" off each end and attach alligator clips to the ends. (kind of looks like midget jumper cables, except that there is only 1 clip on each end!) Clip one end to the metal chassis of the monitor, and the other end to the shaft of a very long, thin, plastic or rubber handled screwdriver. With the power off and EVERYTHING unplugged, AND your free hand in your pocket, slide the screwdriver under the suction cup of the anode until it almost contacts the metal clip (try not to scratch the glass). There will usually be a "snap" sound as the charge leaves the tube. Wait 5 minutes or so and do it again. If you don't hear anything the first time, no need to wait and retry. Many monitors lose their charge on their own. It's a little frightening the first couple of times, but the thrill wears off.

Alternative Method

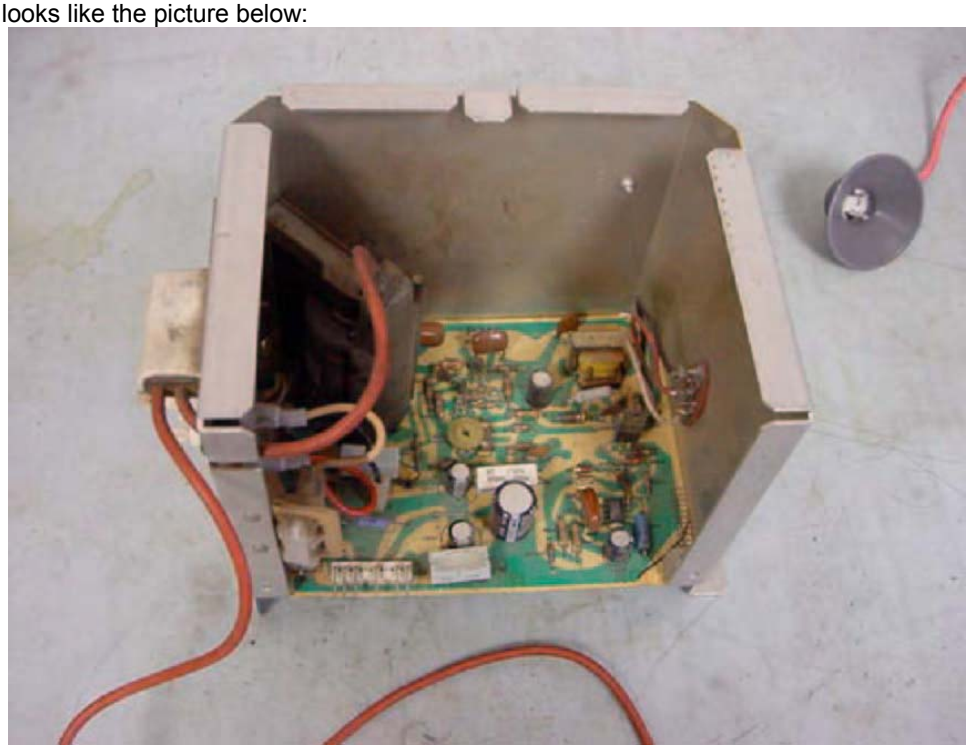
The alligator clips are optional, some recommend that you don't use them in fear that they will fall off during the procedure. You can just wrap the exposed wire around the screwdriver and around the metal chassis.

Undo the Anode!

After the tube is discharged you can SAFELY remove the anode. It is clipped to the monitor, you can squeeze and rock it back and forth to get it off of the tube at the suction cup thing. You can use the screwdriver with the lamp cord still attached (to both places) to squish it together.

Disassembly continues:

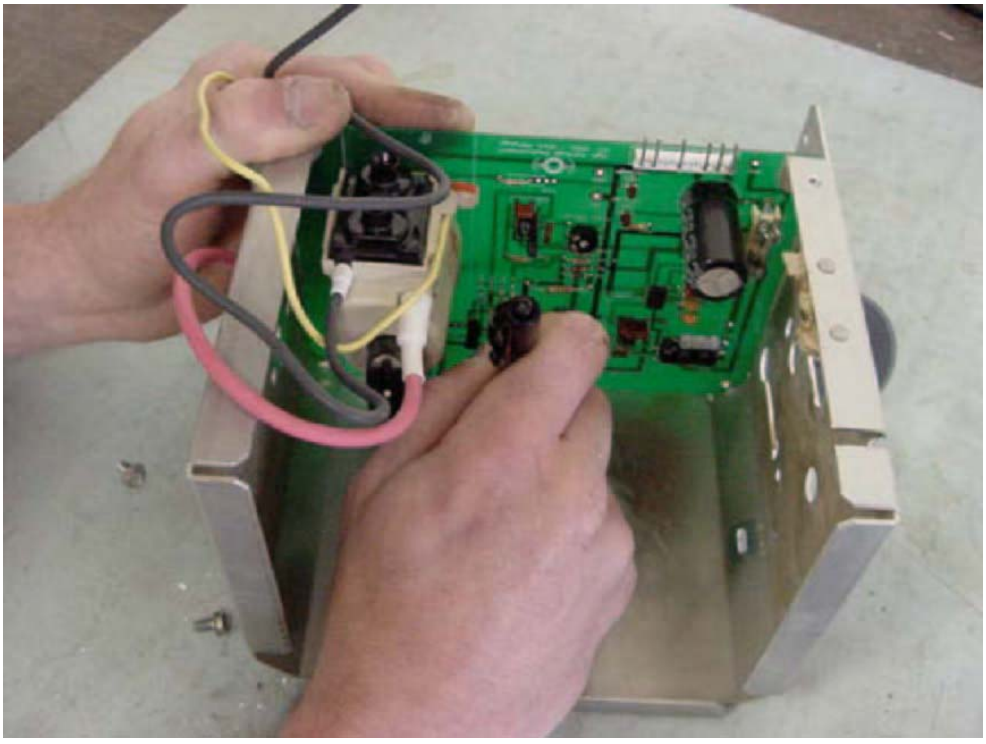
Remove the old HV cage from the monitor chassis. Place your old HV unit on a clean work surface. You should have something that looks like the picture below:



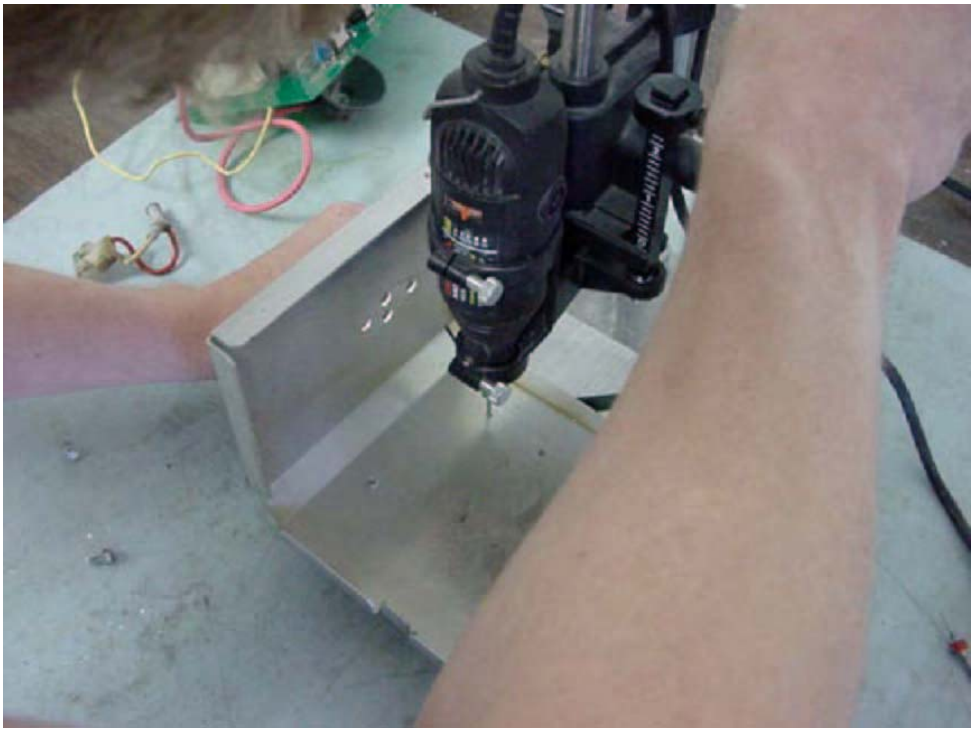
Remove everything from the old HV cage. The parts that you need to keep to complete the conversion are shown below:

Assembly:

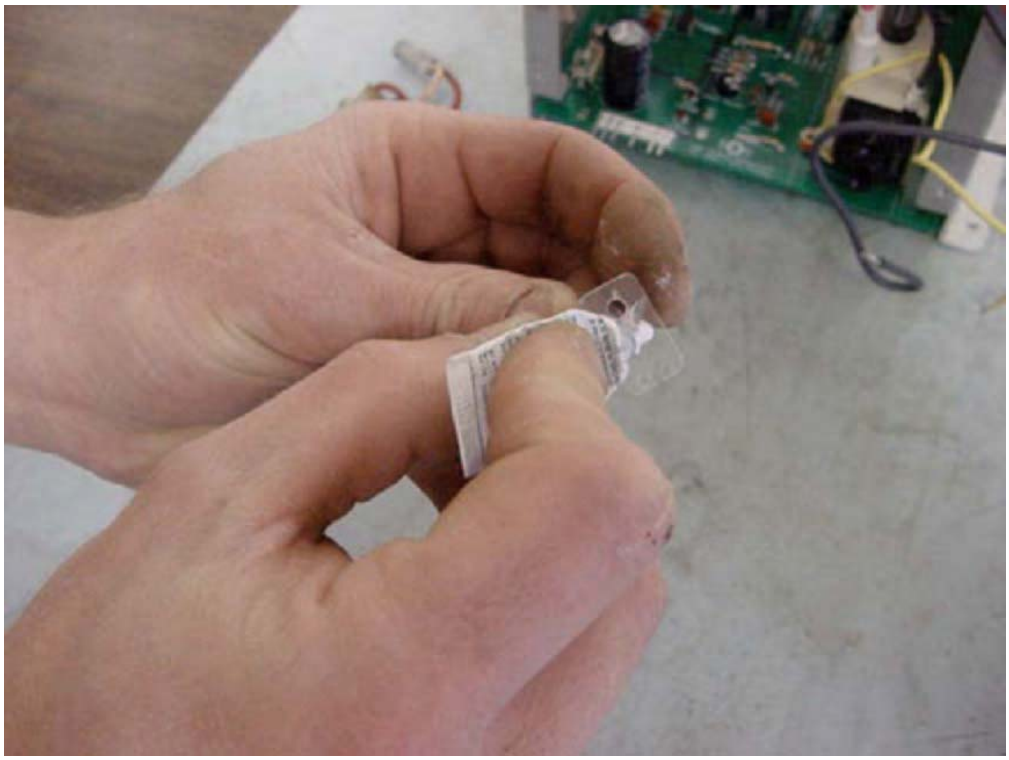
There are two transistors on the side of the High Voltage board that need to be mounted to the side of the metal frame you removed. This will dissipate the heat that they generate. Place the new HV board in the cage. While holding the new HV unit in place, mark the center of the two transistors with a pen so holes can be drilled in the correct locations.



Drill two holes in the cage where your marks were made. The holes should be slightly larger than the diameter of the included nylon screws.



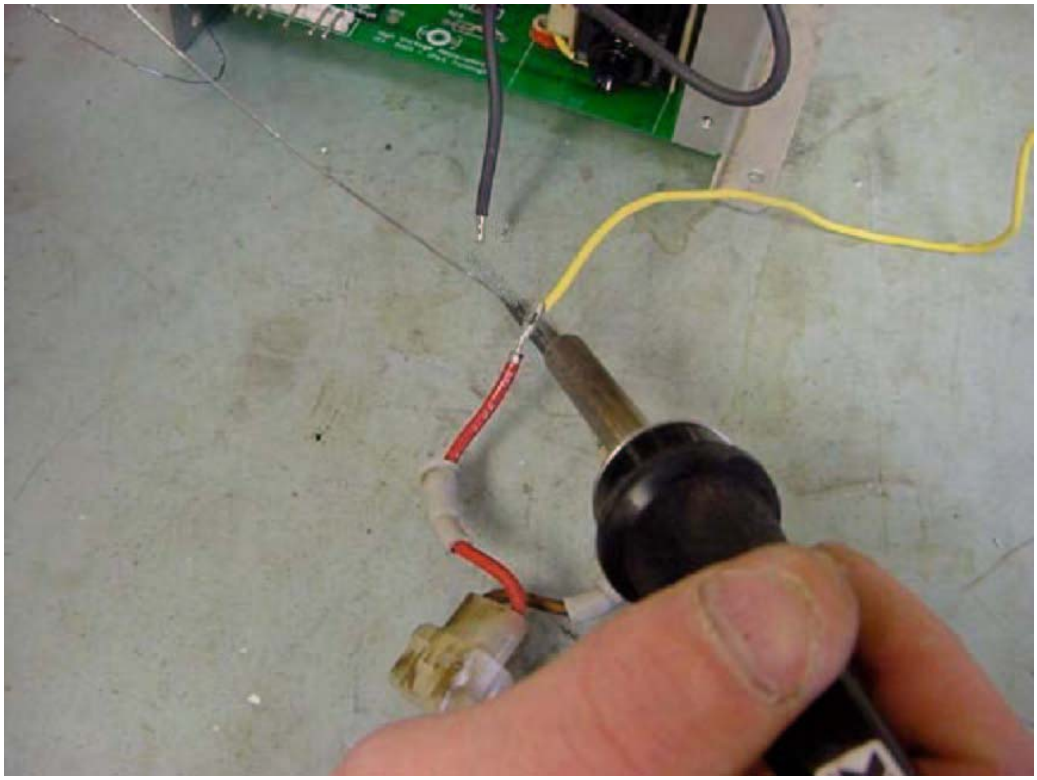
Clean off the metal surface that the transistor will be sitting against using ammonia or rubbing alcohol. Apply a very thin layer of heat sink compound on both sides of the mica insulators. Smooth out the compound with your fingers. The object is to fill the microscopic pits in the metal and insulator to allow maximum heat conductivity. If you put on too much on you will actually reduce the heat conduction.



Place the mica insulators on your aluminum HV cage. Be sure to line up the holes in the insulators with the holes you made in the HV cage.

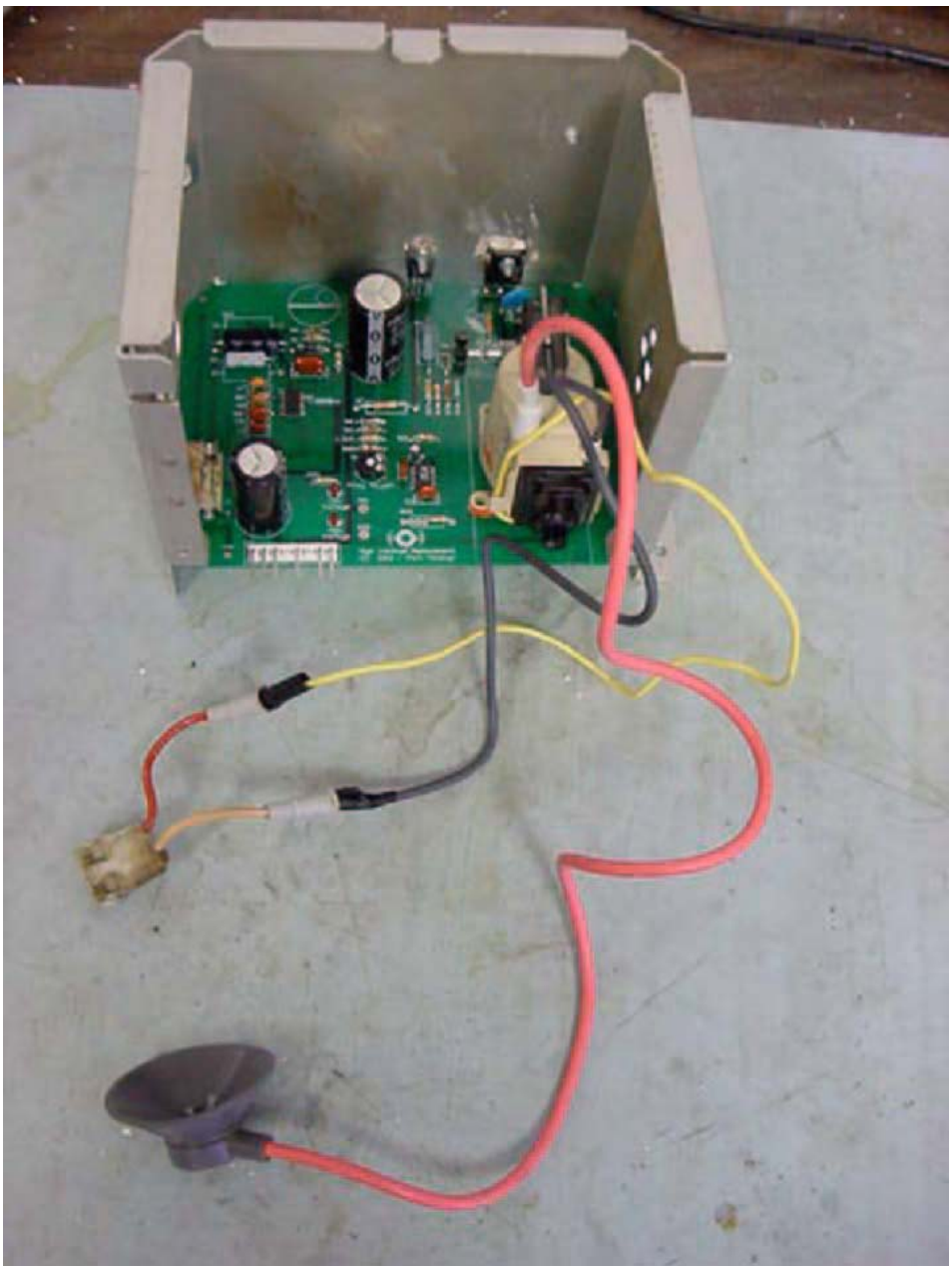
Install the new HV board in the cage (be sure to tighten the 2 screws that hold the PC board in place from below) and mount the transistors with the included hardware. It is very important that the transistors be insulated from the aluminum cage by the mica insulators. Use an ohm meter to test that the transistor cases are not making contact with the aluminum cage. This is the job of the mica insulators and nylon screws. Also be sure to put the nuts and washers on the inside of the cage as shown.

Solder the red wire from your old connector to the yellow wire on the new hIV board. Solder the white wire on your old connector to the black wire on the new HV board. Cover with some electrical tape or heat shrink tubing.



New HV		**Old Connector**
Yellow	->	Red
Black	->	White

Your completed unit should look like the picture below.



Finishing Up:

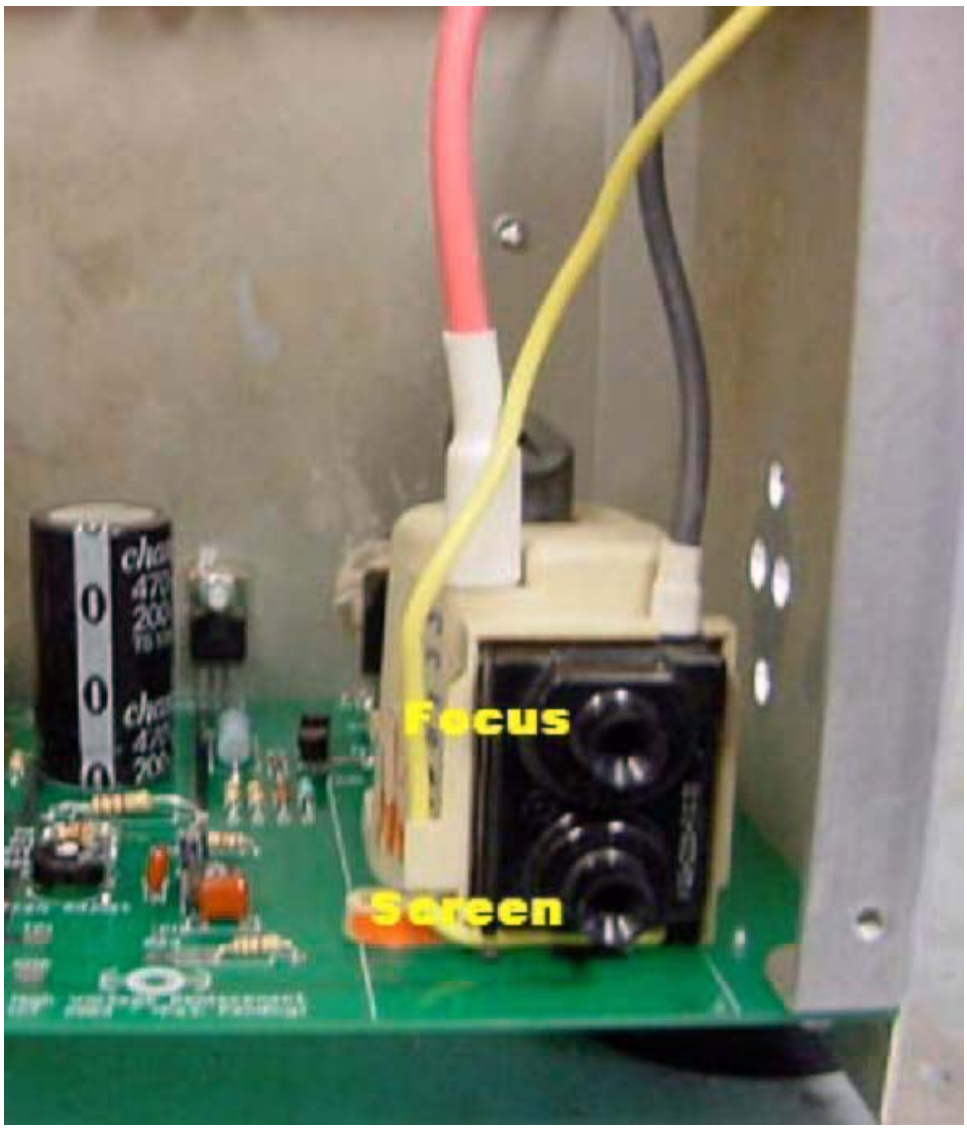
Mount your new unit onto your monitor chassis and reconnect all connectors to their correct positions.

Double check all your work, make sure the anode ("big suction cup") is firmly in place and everything else looks good.

When the HV unit was assembled, it was factory set to its default operating voltages. But since every tube and game is different, the Focus and Screen adjustments were not set.

Power-up your game and make sure that both the Low power LED and High Voltage LED are lit. If not then go to the troubleshooting Section.

If both LED's light then adjust the Screen and Focus adjustments on the flyback for the best picture (shown below).



Congratulations - You're all done.

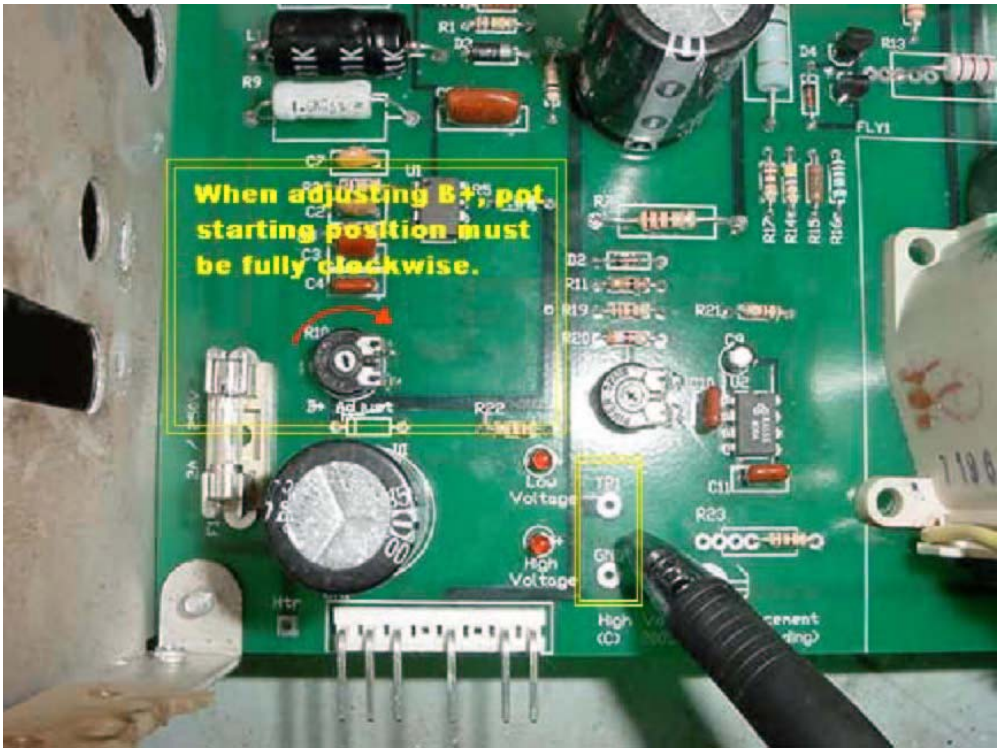
FINE TUNING THE VOLTAGES (optional)

If you have access to a voltmeter AND high voltage probe then proceed with this step. If you do not have a voltmeter and HV probe then DO NOT MAKE ANY ADJUSTMENTS to the potentiometers on the new HV PCB. Improper adjustments can cause damage to the unit and your game. If you do not have the correct test equipment leave the B+ setting how it was set at the factory. It will be close enough for a good picture.

Turn the B+ adjustment pot fully clockwise. Power up the monitor and check the voltages at TP1 and GND. Very slowly turn the B+ pot counter clockwise until you read between +170 and +175 Volts DC. At this point you have correctly adjusted B+.

WARNING -DO NOT ADJUST HIGHER THAN +175 VOLTS DC.

Turn off your monitor and hook up your HV probe to the anode of the monitor and ground. Turn on monitor and use the FREQ ADJUST pot to get no more than 19.5 kV DC at the anode.



Troubleshooting:

Fuse blows:

1. Although the board is marked for a 2 amp fuse the unit needs a 3 to 4 amp fuse. Be sure this is correct.
2. Your transistors are not insulated correctly and are shorted to the aluminum chassis. Double-check the mica insulators for proper installation

Low voltage LED and High voltage LED are not lit:

1. Blown fuse
2. You may have a problem with your monitor's Deflection PCB.

High Voltage LED not lit:

1. Slightly turn the Freq Adjust pot clockwise until the LED lights.

Screen blurry with retrace lines or Dim screen:

1. Adjust the focus and screen adjustments on the flyback transformer.
2. Make sure you have the yellow and black wires connected to the correct red and white wires.