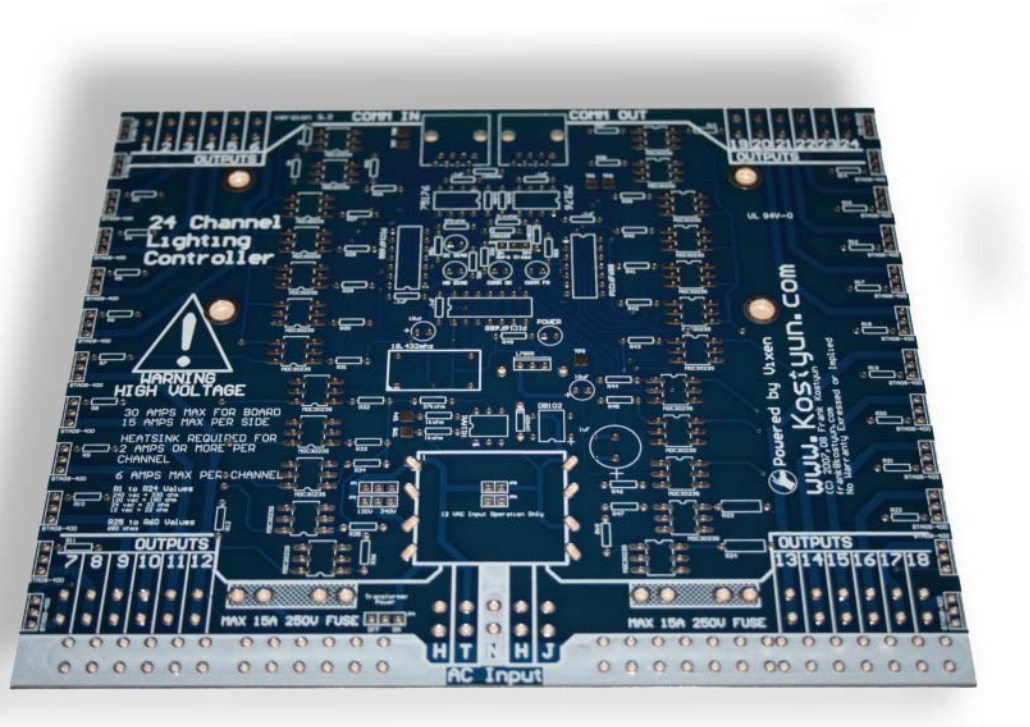
Building the Renard 24 Dimmer



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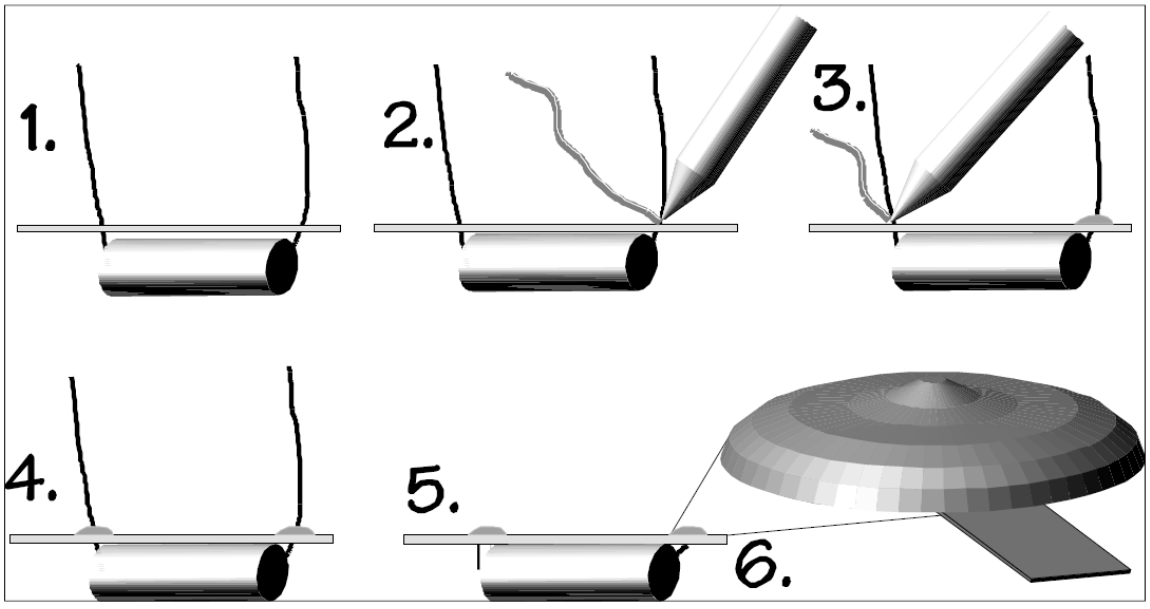
Special Thanks to Phil Short who without the Renard PIC Code this project wouldn't have been possible.

Foreword

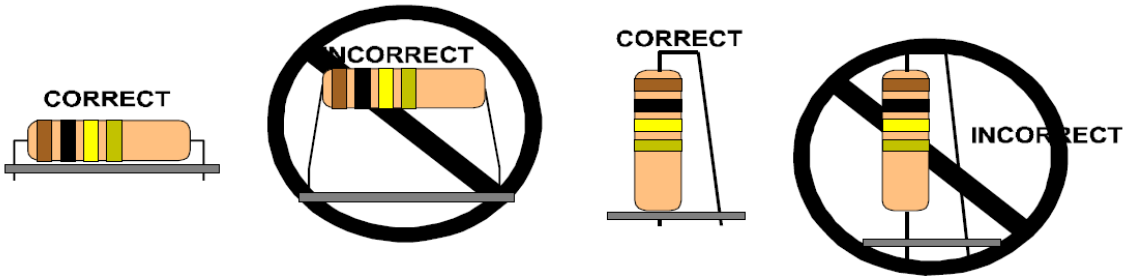
Be sure to read through all of the steps, and check the boxes as you go to be sure you didn't miss any important steps. Although you may be in a hurry to see results, before you switch on the power check all wiring and capacitors for proper orientation. Also check the board for any possible solder shorts, and/or cold solder joints.

Board building tips

Use a good soldering technique - let your soldering iron tip gently heat the traces to which you are soldering, heating both wires and pads simultaneously. Apply the solder on the iron and the pad when the pad is hot enough to melt the solder. The finished joint should look like a drop of water on paper, somewhat soaked in. Mount all electrical parts on the top side of the board provided. The top side is clearly marked with the the component silkscreen, you can't miss it. When parts are installed, the part is placed flat to the board, and the leads are bent on the backside of the board to prevent the part from falling out before soldering (1). The part is then soldered securely to the board (2-4), and the remaining lead length is then clipped off (5). Notice how the solder joint looks on close up, clean and smooth with no holes or sharp points (6).



We want to mount the parts AS LOW AS POSSIBLE to the board. A 1/4" lead length on a resistor not mounted close to the board can act as an inductor or an antenna causing all sorts of problems in your circuit.



Renard 24 Assembly

☐ 1. Pick the correct part value to start with.

☐ 2. Insert it into the correct PC board location. Make sure the part is mounted flush to the PC board unless otherwise noted.

☐ 3. Orient it correctly. Follow the PC board drawing and the written directions for all parts - especially when there's a right way and a wrong way to solder it in. (Diode bands, electrolytic capacitor polarity, transistor shapes, dotted or notched ends of IC's, and so forth.)

☐ 4. Solder all connections unless directed otherwise. Use enough heat and solder flow for clean, shiny, completed connections.

Tools Recommended to Complete Assembly

☐ Pencil type soldering iron (30-40 Watts) or a soldering station.

☐ Roll of fine 60/40 solder (less than .045” diameter)

☐ Sensitive voltmeter or DMM (which is great for diagnostics)

☐ Pair of flush-cut side cutters.

Installing Resistors

☐ Install 24 resistors R1 to R24, the will all are 180 ohm resistors (for 120v operation)

☐ Install 29 resistors R25 to R53, which are 680 ohm resistors. R49 to R53 are located in the center of the board for the power and diagnostic LED’s.

☐ Install four 1k ohm resistors, two will be located above the transformer block, and two are located below the RJ45 jacks.

☐ Install three 27k ohm resistors, two are located below the RJ45 jacks, and one is located just above the transformer.

☐ Install the 120 ohm resistor below the RJ45 jack (This resister is omitted if using the Renard 24 with DMX firmware.)

Installing Diodes and Capacitors

☐ Install the 1N5239 diode and the 1N5229 diode. These are located just below the 75176 chips.

☐ Install the 1N4001 diode. This diode is located above the transformer.

☐ Install 5 .1uf capacitors. These are located at the end of the PIC16F688 chips, and two are located above the 75176 chips.

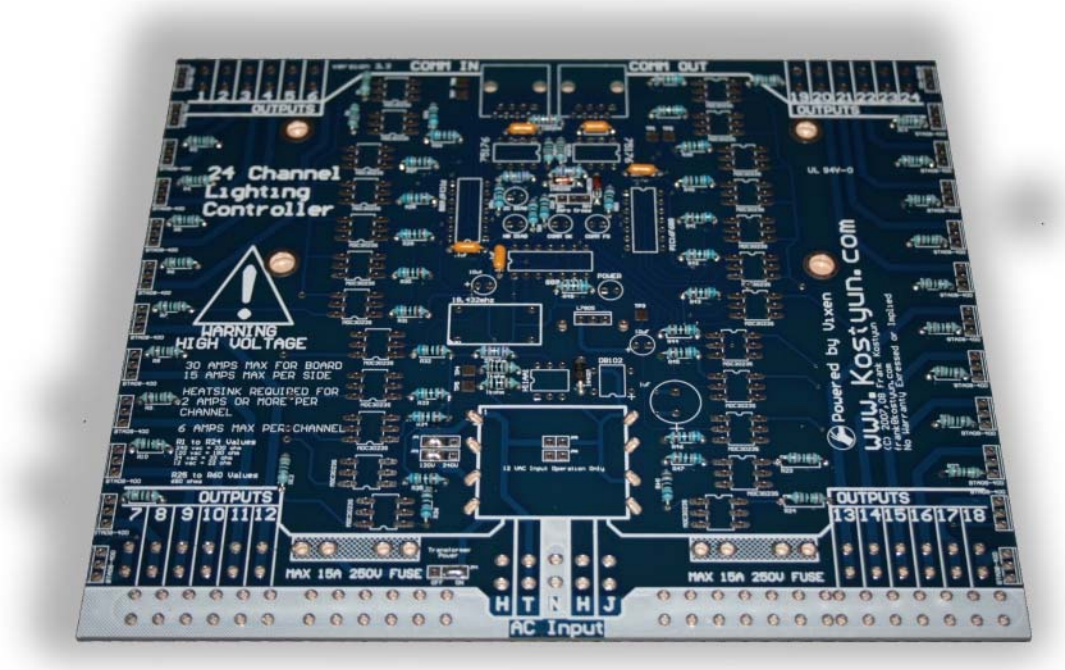


Image of the Renard 24 with all resistors, diodes, and .1uf capacitors installed.

It's time to take an eyeball break before we move on to the next section of our project! This would be a good time to go through and check your work for good assembly practice. Check for solder bridges, cold solder joints, and improperly oriented devices. A common practice among engineers is when you can't find a mistake is to get up, take a short break and come back with a new perspective. You would be surprised how many problems you can find when you do this.

Installing Sockets

☐ Install 24 six pin sockets. These are for the MOC3023 chips. If you are planning on directly soldering the MOC3023 chips without sockets, this would be the time to do so. Don't forget to pay attention to the orientation of the socket.

☐ Install one six pin socket for the H11AA1 chip. If you are planning on directly soldering the H11AA1 chip to the board, this would be the time to do so. Don't forget to pay attention to the orientation of the socket.

☐ Install one six pin socket for the DB102 chip. If you are planning on directly soldering the DB102 chip to the board, this would be the time to do so. To allow the socket to properly fit, you will need to remove two of the pins from the socket, which is easily accomplished by gently pushing up on the two center pins. Don't forget to pay attention to the orientation of the socket.

☐ Install two eight pin sockets, these are for the 75176 RS485 communication chips. Don't forget to pay attention to the orientation of the socket.

☐ Install three 14 pin sockets for the PIC16F688 chips. Don't forget to pay attention to the orientation of the socket.

Installing Diagnostic LED's and Power Connectors

☐ Install the crystal oscillator, pin one will go into the hole with the square pad on the PCB.

☐ Install the indicator LED's. The color of the LED's are up to your personal preference, . The **shorter leg** of the LED will install into the hole with the square pad. (This is the cathode) **** *DESIGN NOTE* **** *the LED for the COMM FR MUST be installed with the LONGER LEG in the hole with the square pad.*

☐ Install the fuse clips. To properly insert the clips, you will need to bend the back pin of each clip slightly inward. One trick to help in putting the fuse clips in and soldering them in is to stick a fuse into the clips before soldering.

☐ Now it is time to install the jumper headers. You will need four sets of three pin headers. Alternatively, you can use a small piece of wire to jumper the transformer on/off and the 120/240v selection jumper.

☐ Install the six 5.08mm six pin screw down terminals. Four of the terminals are installed along the bottom, and two are installed along the top of the PCB. If you have chosen to use the spade terminals, this would also be the time to install the 53 spade terminals on the board.

☐ Install the 10uF capacitors. Both capacitors are installed above the power transformer. Pay very close attention to the orientation of the capacitor.

☐ Install the four 35 degree 5.08mm three pin screw down terminals. These get installed into the output sets along the bottom. Don't forget to slide the terminals together before soldering them onto the PCB.

☐ Install the two RJ45 jacks along the top of the PCB.

☐ Install the LM7805 voltage regulator. The flat part of the board will face the RJ45 jacks at the top of the PCB.

Installing Triacs

☐ Install 24 of the BTA08-600 or the BTA04-700T triacs. These are the chips that actually do the switching of the AC current. One trick to installing these is to install them one side at a time. If you solder one pin on each triac, you can then adjust each triac, and then solder the remaining pins.

☐ Install the 1000uF capacitor. This is a important capacitor, as it is required for proper operation voltage regulator. Pay very close attention to the orientation of the capacitor.

☐ Install the two pin and 3 pin 5.08mm screw down terminals. These get installed into the input along the bottom. Don't forget to slide the terminals together before soldering them onto the PCB.

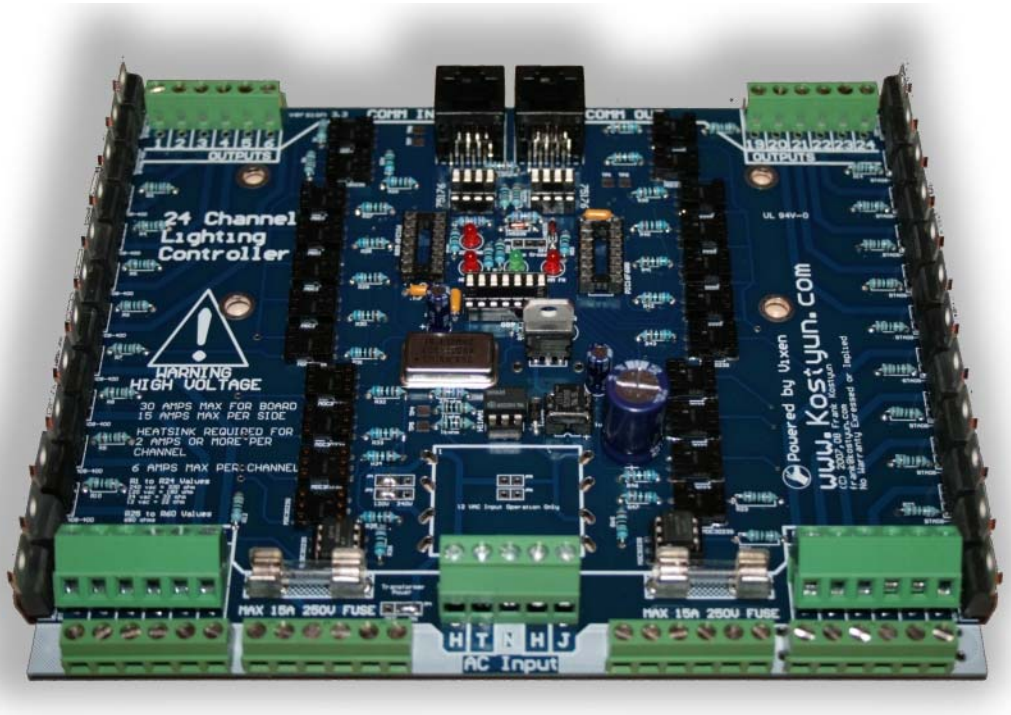


Image of Renard 24 with all sockets, triacs and capacitors installed.

It's time to take another break before we move on to the next section of our project! This is a good time to go through and check your work for good assembly practice.

☐ Install the heat sink for the LM7805 regulator. This may take a bit to get it soldered, as it will take a fair amount of heat to solder the heat sink down.

☐ If you haven't already done so, you will now want to install the H11AA1 and the DB102 into the sockets on the PCB. Pay close attention to the orientation of the parts. With the DB102, the + pin is indicated on the PCB on the bottom right of the socket.

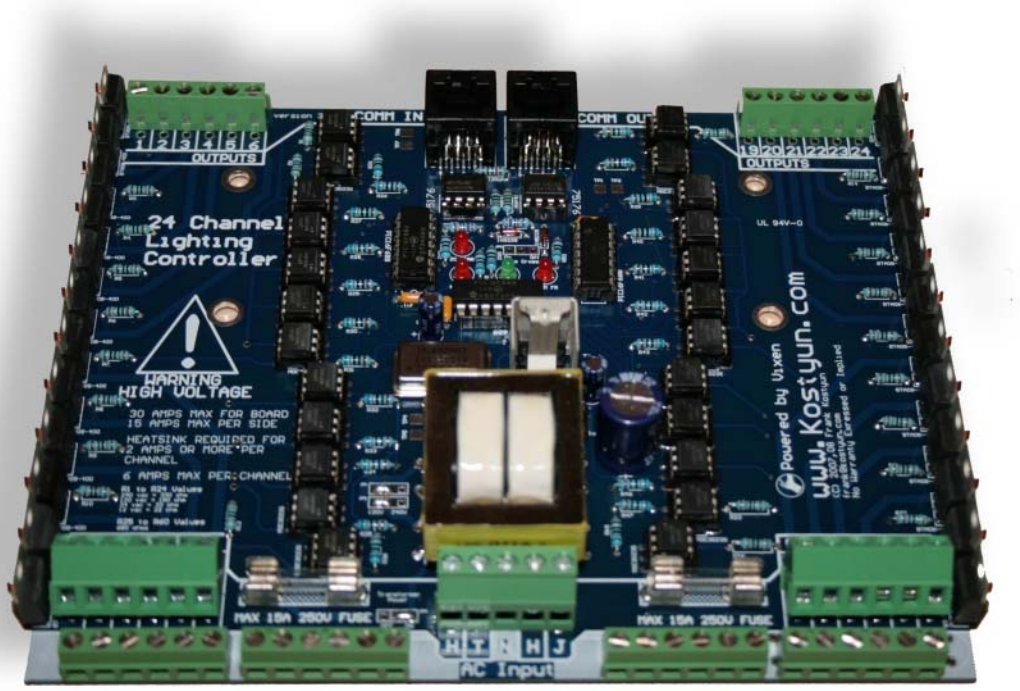
☐ Install the power transformer. Pay close attention to pin one of the transformer (It will be indicated on the side of the transformer. Pin one is indicated on the PCB with a 1 beside the hole.

☐ Now it is time to put in the MOC3023's into sockets if you did not solder the chips directly to the PCB. Pay close attention to the orientation of the parts

☐ Install the 75176B RS485 communication chips into the two sockets location on the top of the PCB below the RJ45 jacks. Pay close attention to the orientation of the parts

☐ Last – it is now time to install the PIC16F688 microcontrollers. These will be already programmed for you if you have purchased a Co-Op parts kit, or the programmed PIC chips from the PCB purchase. If you need assistance in programming them, you can refer to [Wayne J's PIC Chip Programming How-To]

Current assembled firmware is available from [http://www.kostyun.com/current-projects/renard24/]



Completed Renard 24 Lighting Dimmer

Congratulations! You have now completed building the Renard 24 lighting controller, and now it is time to test the operation.

Power Input connectors (From left to right)

H = Channels 1 to 12 power input (black wire)
T = Transformer power inut
N = Neutral (white wire)
H = Channels 13 to 24 power input (black wire)
J = Jumper, install a wire to jumper the left and right power inputs together.

Assembly time

Beginner: 5 to 10 hours.
Intermediate: 3 to 5 hours.
Advanced: 2 to 3 hours