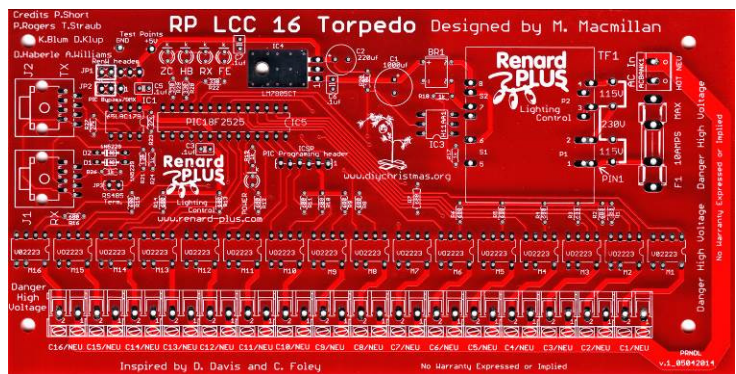
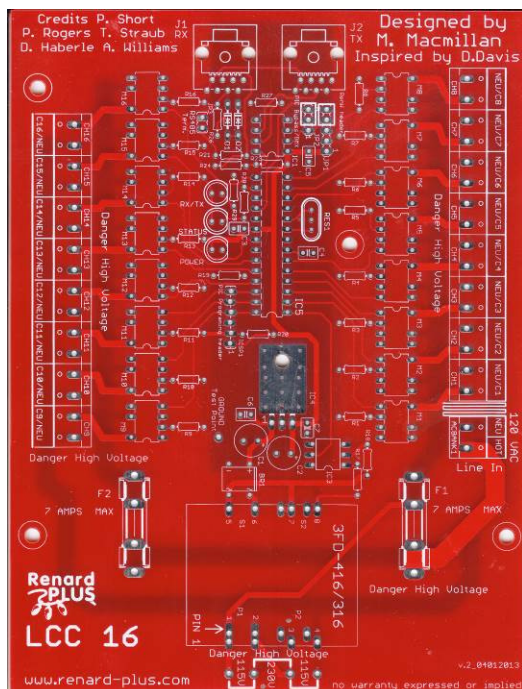




LCC16 Controller

(Low Current 16 channel)



Sep 2014

Board Version 2.00 (v. 2_04012013)
Torpedo Version 1.00 (v. 1_05042014)
 Document revision 2.07



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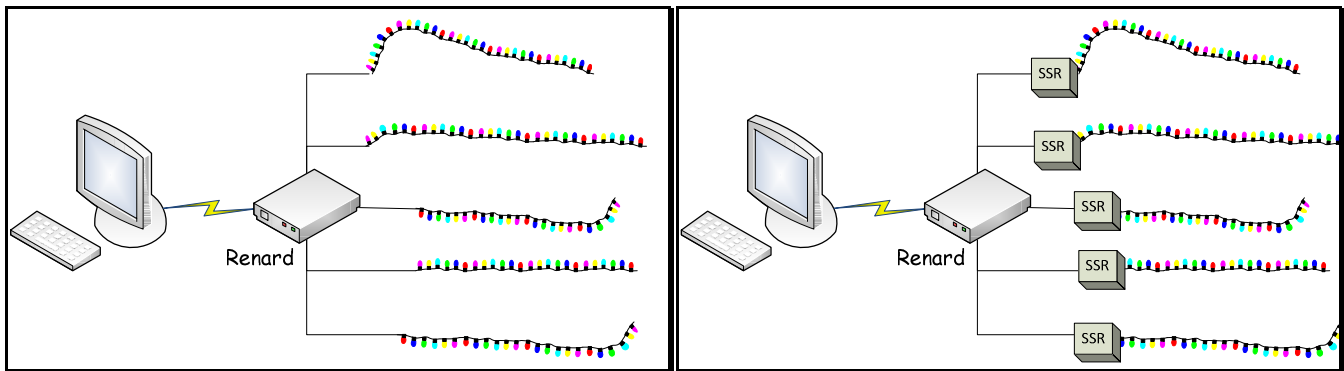
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1. Introduction to Renard

Renard is the name of a “do-it-yourself” (DIY), computer-controlled, PIC-based dimmer light control concept. It also refers to a family of dimming controllers that have been designed and built based on this concept.

The Renard design concept was originally described by Phil Short in the [Simple PIC-Based 8-Port Dimmer](http://computerchristmas.com) 'How-To' on the <http://computerchristmas.com> website. Since then there have been many enhancements and new designs based on this hardware. There have been many contributors to advancing Renard technology including M. Macmillan, D. Davis, P. Rogers, T. Straub, D. Haberle, A. Williams and others.

Renard controllers typically rely on a separate computer running a light sequencing program to send it real-time sequences of controller commands to sequence the lights. The computer communicates with the Renard via RS232, RS485, or wireless (depending on the design) and the Renard controls the lights either through built-in power control (power is output directly to the lights), or via separate “SSRs” (solid state relays supply the power when commanded by the controller).



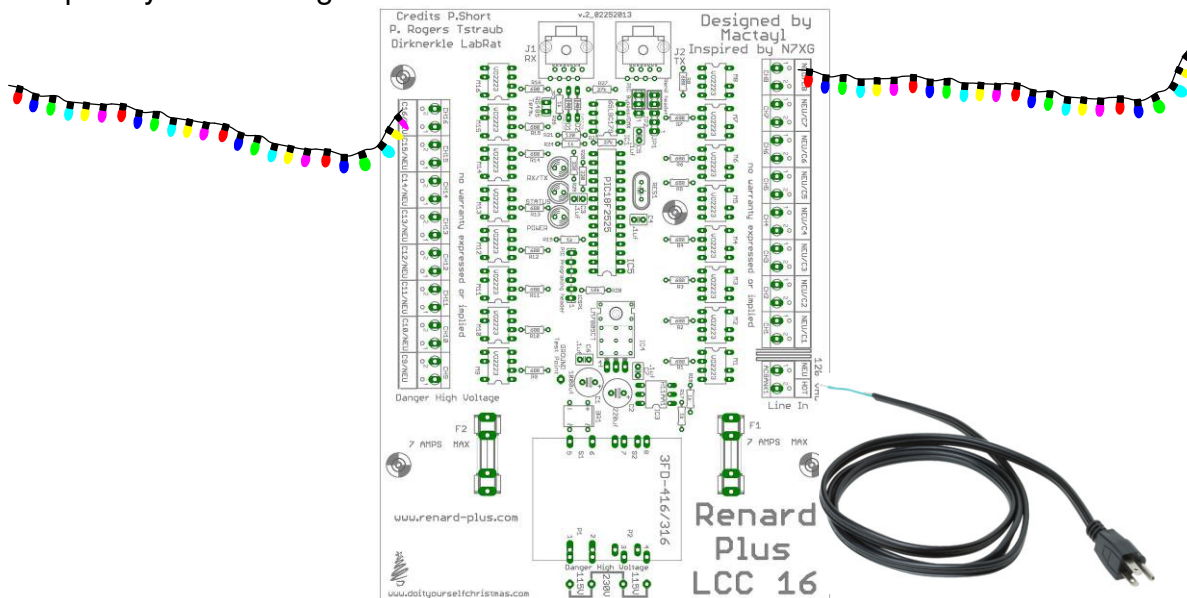
Example Renard configurations

Output of the Renard can be either control signals (to an SSR), direct AC line voltage (110, 100/220, or 220), or DC voltage depending on the design.

Renard is a DIY hobbyist effort and there is a vast amount of products and related peripherals to select from including the Renard Plus LCC16 Controller. To obtain a specific design, there might be “buy a parts kit and/or blank PCB” offering at a site (such as from www.renard-plus.com), “etch it yourself” files for true DIY, or coop/group buys for kits and PCBs also in forums (like at www.DIYChristmas.org).

2. Overview of Renard Plus LCC16

This guide covers the Renard Plus LCC16 including the “Torpedo” variation. This board is designed to take “Renard” serial communications via RS485 from a control computer, and output full dimming light control on its 16 low current AC light connections. It is fully self-contained and does not require any SSRs, or other add-ons to operate besides normal wiring and possible an XBee SnapIn if you want to go wireless.



Feature		Detail
Name	Renard Plus LCC16 (and Torpedo)	
Target use	Channel Count	Low current AC Light control 16
Power input	Power output	110v or 220v AC Yes – 1 Bank @ 7A max, 850ma max per channel
Dimmable?	Status Indicators?	YES – PWM YES
Channel Indicators?	Control Input – Renard	NO – Retrofit is possible YES – RS485 or optional wireless
Control Input – DMX	Daisy-chain output	YES YES – Renard RS485 pinout
Wireless	On board programming	Option – w/add-on wireless Snap-In board Yes through ICSP connector
Enclosure	Heatsink?	LCC16 = CG1000, Torpedo = 4” PVC pipe No

3. Assembly Instructions

This section covers the construction of the Renard Plus LCC16 controller board. It approaches these tasks as a learning exercise for new builders, so that they can develop proficiency and self-confidence. The project itself is quite simple and if you follow the steps *carefully*, you should have a working controller when you are done. Additional information and guides on techniques and tools can be found in the “Tools and Parts ID Guide” at:









[www.renard-plus.com/files/Tools and Parts ID Guide.pdf](http://www.renard-plus.com/files/Tools_and_Parts_ID_Guide.pdf)

3.1 Renard Plus LCC16 Parts List / BOM

The following is the Bill Of Materials (BOM) for building the LCC16 or Torpedo. This is the Mouser Project link:

<http://www.mouser.com/ProjectManager/ProjectDetail.aspx?AccessID=7ef8ecbf7f>

Picture	Designators	Description	Qty	Mouser P/N
	R1 – R16	680 ohm resistor 1/4 watt	16	299-680-RC
	R17 R18, R19, R24, R26	1k ohm resistor 1/4 watt	5	299-1k-RC
	R20	10k ohm resistor 1/4 watt	1	299-10k-RC
	R21	120 ohm resistor 1/4 watt	1	299-120-RC
	R23, R27	27k ohm resistor 1/4 watt	2	299-27k-RC
	R28,R29	330 ohm resistor 1/4 watt	2	299-330-RC
	D1	1N5239 (9.1v) zener diode	1	78-1N5239B
	D2	1N5229 (4.3v) zener diode	1	78-1N5229B
	C1	470uf 25V Electrolytic Cap	1	647-UVZ1E471MPD
	C2	220uf 25V Electrolytic Cap	1	647-UVZ1E221MPD
	C3, C4, C5, C6,C7	.1uf cap	5	81-RPEF51104Z2S2A03A
	CH1 – CH16 and ACBANK1 / Line In	Terminal Blocks 5.08MM PCB PC1-C16,AC/NEU	17	571-7969492
	J1-J2	Modular Jacks 8 pin RJ45 PCB TOP ENTRY	2	571-5556416-1
	IC3	6 pin IC Socket (Optional)	1	571-1-390261-1
	M1 – M16, IC1	8 pin IC socket (Optional)	17	517-4808-3004-CP
	IC1	28 pin IC Narrow Socket (Optional)	1	571-1-390261-9
	ICSP, JP1, JP2, JP3	16 pin header cut to fit	1	571-16404526
	JP1, JP2, JP3	Shunts for REN-W header and Bypass	3	737-MSC-G
	IC4	LM7805CT voltage regulator	1	512-LM7805CT
	U1 – U16	Triac Output optocouplers 1 amp VO2223A	16	782-VO2223A
	IC2	65LBC179	1	595-SN65LBC179P
	IC3	H11AA1	1	782-H11AA1
	BR1	4 pin Bridge rectifier 1A dip	1	625-DF02MA-E3


	IC1	PIC Microcontrollers (MCU) 48KB 3968	1	579-PIC18F2525-I/SP
	Status	yellow 5 MM LED	1	78-TLHY5405
	Power	Red 5 MM LED	1	78-TLHR5401
	RX/TX	Green 5 MM LED	1	78-TLHG5401
	F1, F2	Fuse Clips and Holders PC FUSE CLIP 5 MM	4	534-3517
	F1, F2	5mm x 20mm Medium Time Delay Fuse 125VAC 7Amp	2	504-GMC-7
	F1, F2	Fuse Cover (Optional)	2	534-3527C
	3FD-416/316	Transformer pri.115/230volts sec.8volts 800ma.	1	3FD-416

3.1.1 Transformer Options

The Parts list above only calls out one of the many transformers that can be used on this controller board. The following are other transformers that can be used:

	Mouser P/N	Primary Volts (AC)	Sec. Volts (AC)	Current (ma)
Dual Voltage	838-3FD-412	115 / 230	6.3	1000
	838-3FD-416	115 / 230	8.0	800
	838-3FD-420	115 / 230	10.0	600
	838-3FD-424	115 / 230	12.0	500
	838-3FD-312	115 / 230	6.3	400
	838-3FD-316	115 / 230	8.0	300
Single Voltage	838-3FS-412	115	6.3	1000
	838-3FS-416	115	8.0	800
	838-3FS-420	115	10.0	600
	838-3FS-424	115	12.0	500
	838-3FS-312	115	6.3	400
	838-3FS-316	115	8.3	300

3.1.2 Enclosure

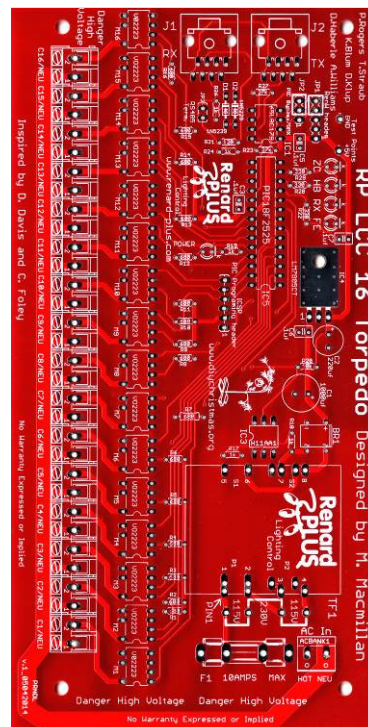
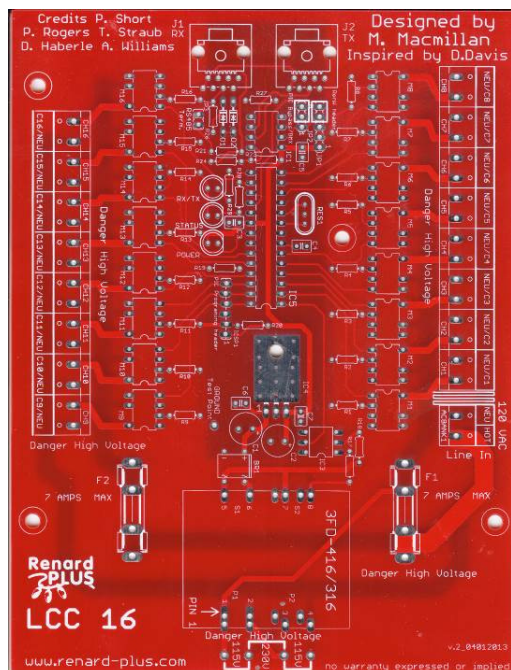
	LCC16	Torpedo
	CG1000 Demarcation Box	4"PVC Pipe

3.2 Parts Assembly

The Renard Plus LCC16 is a fairly simple device to assemble and test. It is easiest if you follow these instructions, checking off steps as they are performed. This will lead you through the assembly installing components from shortest/smallest to tallest.

3.2.1 First Things First

1. Begin by inspecting the PCB(s) to look for any defects such as cracks or breaks. The holes on the board should be open on both sides.

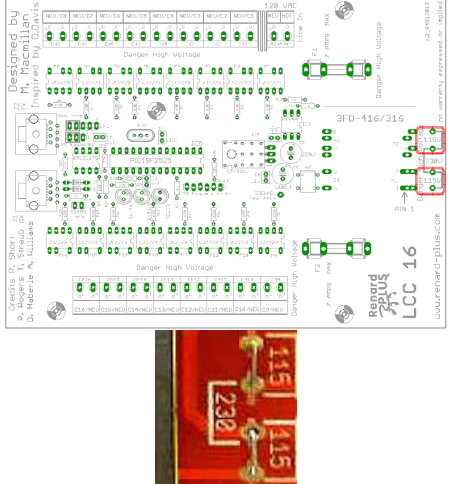
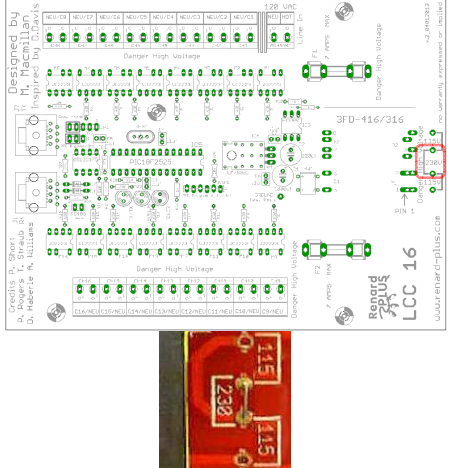


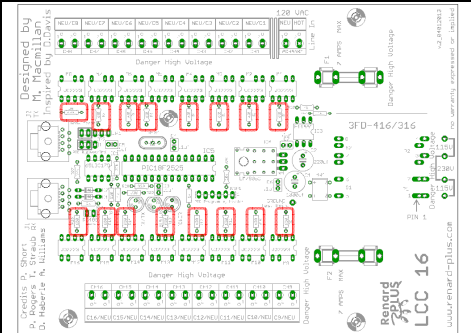
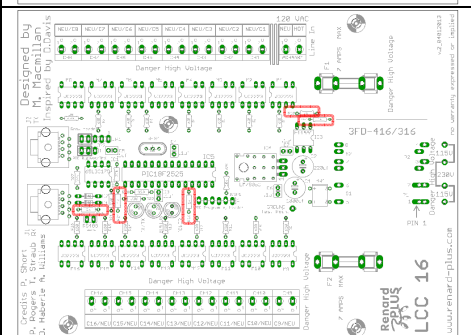
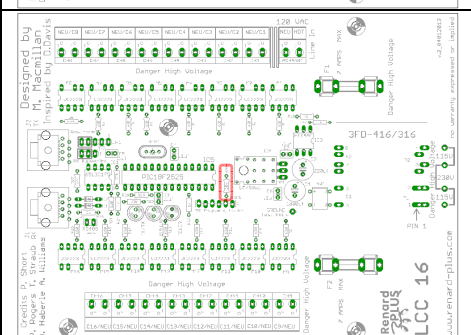
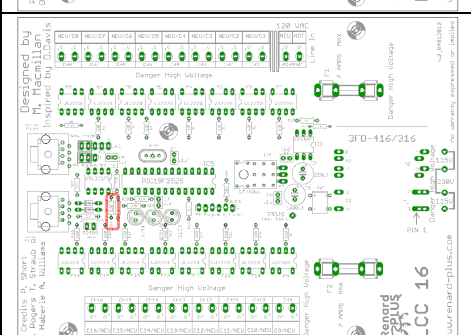
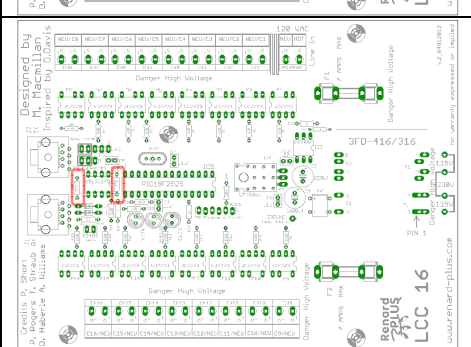
2. Next inspect and sort out the various parts for the board. Make sure you understand which parts are which, and things like resistor codes and component orientation. A separate document on these concepts is available at www.renard-plus.com/files/Tools_and_Parts_ID_Guide.pdf and on other resource sites like Wikipedia.
3. Follow the assembly guide as follows in the next section.

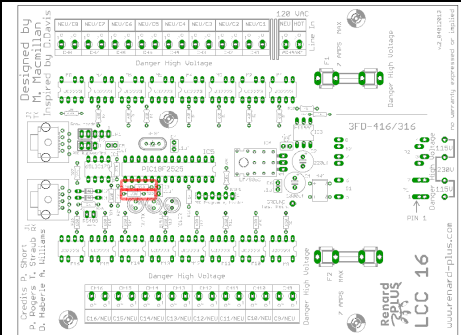

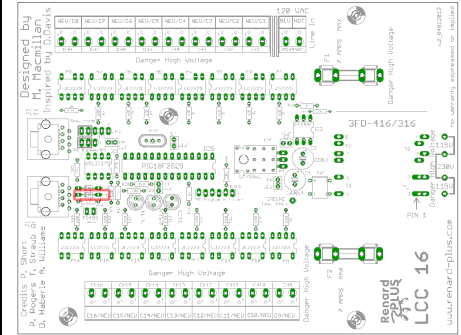
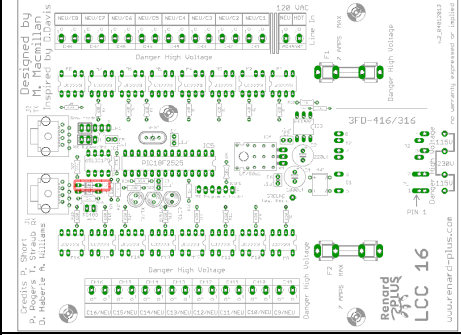
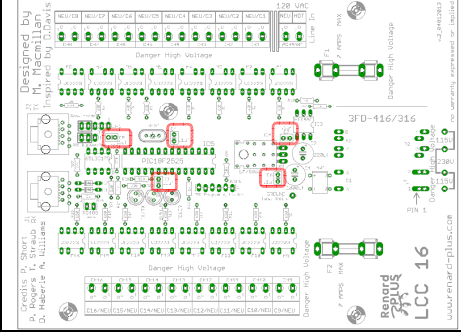
Note: The diagrams used are the standard LCC16, but the Torpedo board is built the same way as the standard board, just slightly different positions of the components. The board silkscreen for the Torpedo board should be followed for parts placement.

3.3 LCC16 Assembly Guide

3.3.1 Install Voltage option, Resistors, Diodes and Bypass Caps

Step	Instructions	LCC16
1a <input type="checkbox"/> 115 VAC Option	<p>If the controller will be used with 115 volt AC main power, use 2 leftover leads that were clipped and form them to individually jumper the two sets of “115” positions near the transformer.</p> <p><i>Note: DO NOT JUMPER ALL of the voltage selection pads.</i></p>	
1b <input type="checkbox"/> 220 VAC Option	<p>If the controller will be used with 220 VAC main power, only jumper the “230” position.</p> <p><i>Note: DO NOT JUMPER ALL of voltage selection pads.</i></p>	

2 <input type="checkbox"/>	Install the 680 ohm resistors (blue-gray-brown) at locations R1-R16. Solder and clip leads	
3 <input type="checkbox"/>	Install the 1K ohm resistors (brown-black-red) at locations R17, R18, R19, R24 and R26. Solder and clip leads.	
4 <input type="checkbox"/>	Install the 10k ohm resistors (brown-black-orange) at locations R20. Solder and clip leads.	
5 <input type="checkbox"/>	Install the 120 ohm resistors (brown-red-brown) at locations R21. Solder and clip leads.	
6 <input type="checkbox"/>	Install the 27k ohm resistors (red-violet-orange) at locations R23, R27.	

7 <input type="checkbox"/>	<p>Install the 330 ohm resistors (orange-orange-brown) at locations R28 and R29. Solder and clip leads</p>	
8 <input type="checkbox"/>	<p>Install the small glass diode 1N5239 at location D1. Solder and clip lead.</p> <p><i>Note: diodes have a specific orientation. The diode has a band on one end and should be installed matching the silkscreen on the board (band should be nearest J1).</i></p> 	
9 <input type="checkbox"/>	<p>Install the small glass diode 1N5229 at location D2. Solder and clip lead.</p> <p><i>Note: diodes have a specific orientation. The diode has a band on one end and should be installed matching the silkscreen on the board (band should be nearest J1).</i></p>	
10 <input type="checkbox"/>	<p>Install the .1uf (Marked 104) capacitors at locations C3, C4, C5, C6, C7. Solder and clip leads.</p> <p><i>Note: Bypass caps do NOT have a specific orientation.</i></p>	

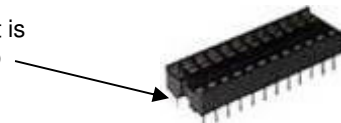
3.3.2 Install IC Sockets

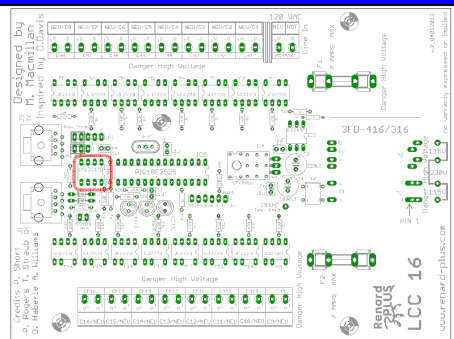
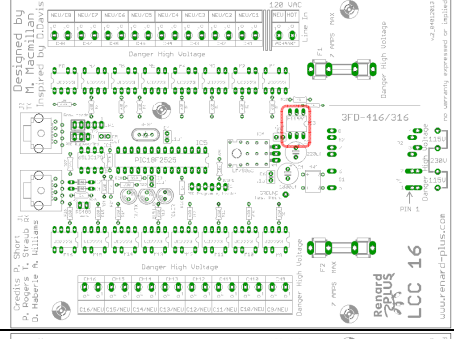
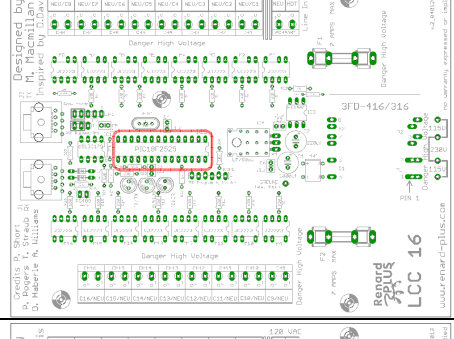
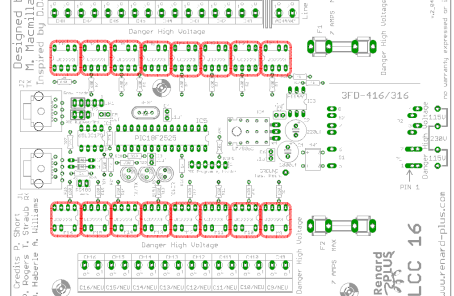
Even though these parts are optional we strongly recommend that sockets be used on all of the IC's.

Note: If you are not installing sockets, it is recommended you wait to install the ICs until AFTER you test power. Please see "Installing ICs" section later in this chapter.

Pin 1 of the IC socket aligns to the square solder pad on the PCB. Also, if the socket has a notch at one end, that will align with the notch on the silkscreen for the IC location on the board. See diagram.


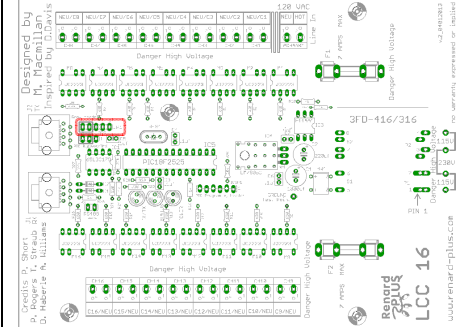

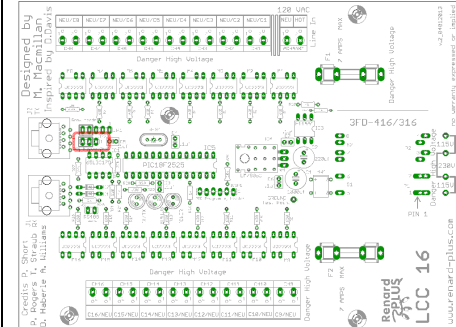

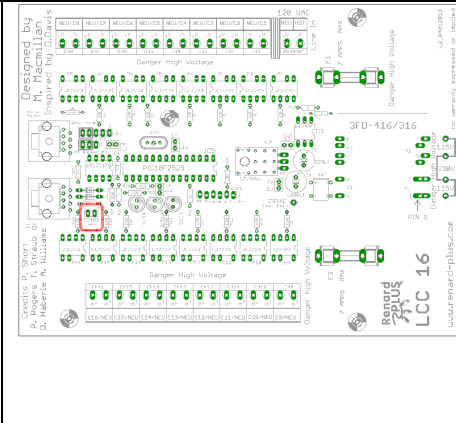
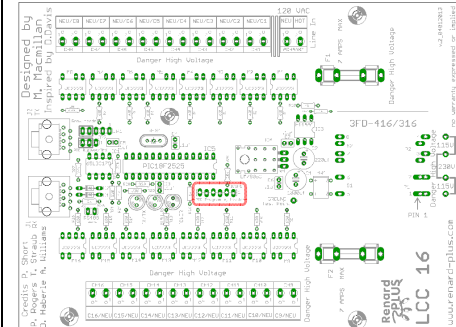
Pin 1 of the IC socket is on the end, closest to the notch.



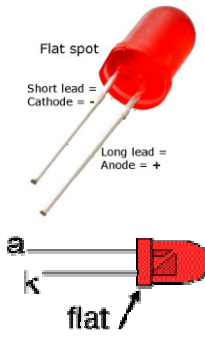
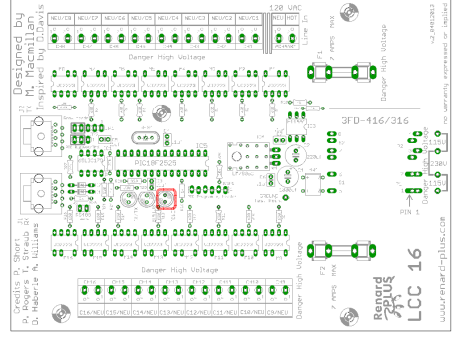
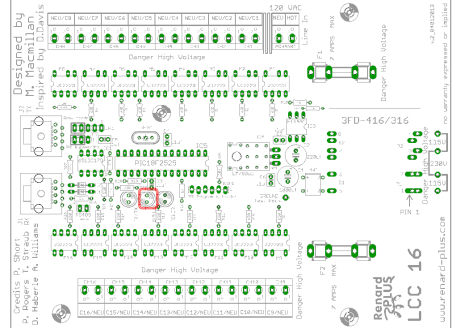
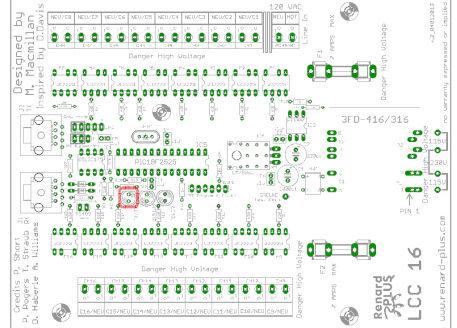
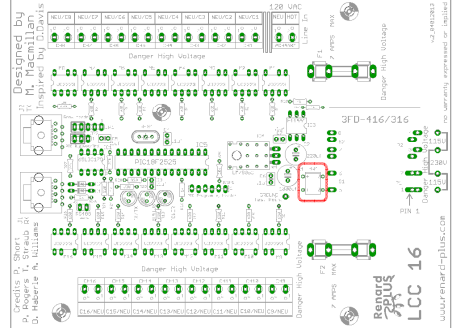
Step	Instructions	LCC16
11 <input type="checkbox"/>	Install one 8 pin IC sockets at location IC1. Solder. <i>Note OPTIONAL but recommended. If you are not installing sockets, do not install the chips until AFTER testing later in assembly.</i>	
12 <input type="checkbox"/>	Install the one 6 pin IC socket at locations IC3. Solder. <i>Note OPTIONAL but recommended. If you are not installing sockets, do not install the chips until AFTER testing later in assembly.</i>	
13 <input type="checkbox"/>	Install the one 28 pin IC socket at location IC5. Solder. <i>Note OPTIONAL but recommended. If you are not installing sockets, do not install the chips until AFTER testing later in assembly.</i>	
14 <input type="checkbox"/>	Install sixteen 8 pin IC sockets (with pin 7 removed) at locations M1 – M16 . Solder <i>Note OPTIONAL but recommended. If you are not installing sockets, do not install the chips until AFTER testing later in assembly.</i>	


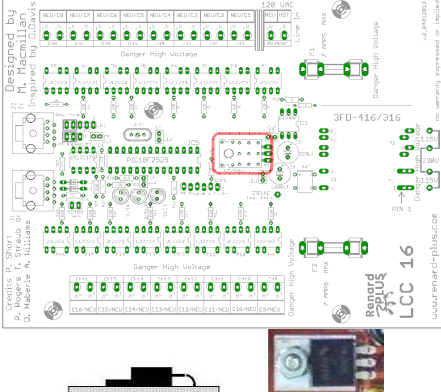

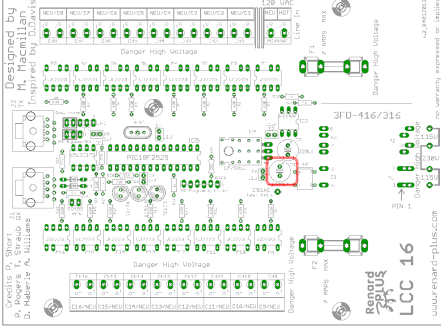
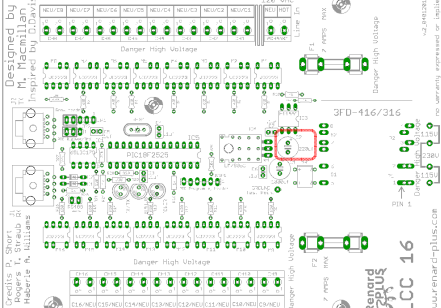
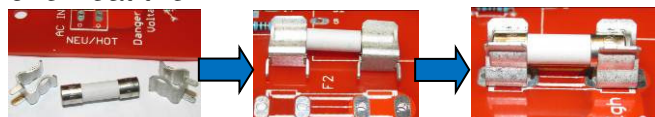
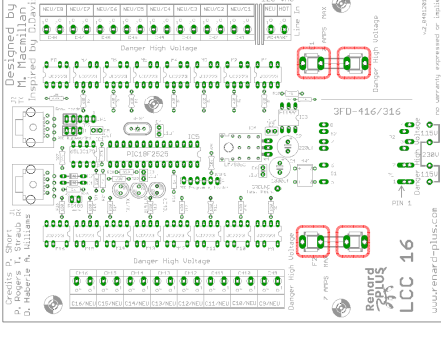
3.3.3 Install Headers

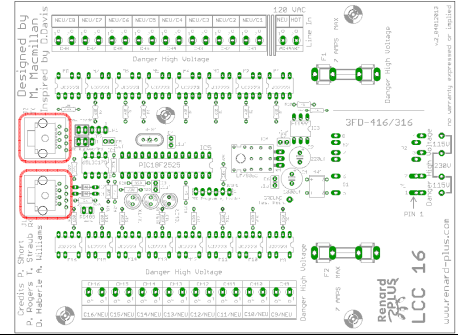
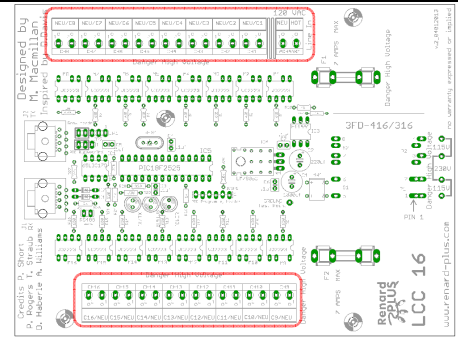
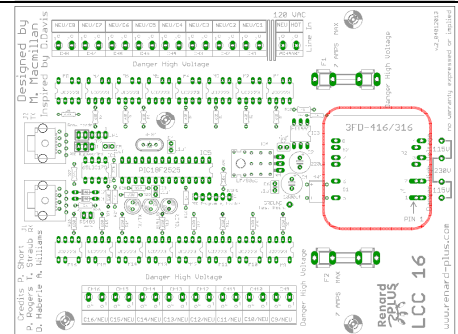
You may have purchased either a single 16 pin header (most cost effective) or headers cut according to the board specifications. If you have the single 16 pin header, cut it into sets of 2, 3, 5, and 6 pins for their respective spots.

Step	Instructions	LCC16
15 <input type="checkbox"/>	<p>Install 5 pin header at location JP1 RenW. Solder.</p> <p>Install a shunt jumper on the two left most pins of the header as indicated on the silkscreen.</p> 	
16 <input type="checkbox"/>	<p>Install 3 pin header at location JP2 PIC Bypass/DMX. Solder.</p> <p>Install a shunt jumper on the two left most pins of the header as indicated on the silkscreen.</p> 	
17 <input type="checkbox"/>	<p>Install 2 pin header at location JP3 RS485 term. Solder.</p> <p>Install a shunt jumper on the two pins of the header to enable Terminate of the RS485 communications on the last board in a daisy-chained set of boards. Leave un-jumpered for RS232.</p> 	
18 <input type="checkbox"/>	<p>Install 6 pin header at location ICSP. Solder.</p> <p><i>Note: If you are planning on using the RenW Snapin board to add wireless, you will want to remove ICSP header pin 6 (left most one as illustrated – near R19) as it can contact the Snapin board. That pin on the ICSP is not used for programming and can be safely omitted.</i></p>	

3.3.4 Install Misc. Parts

Step	Instructions	LCC16
19 <input type="checkbox"/>	<p>Install the red LED at location Power. Solder and clip leads.</p> <p><i>Note: These parts have a specific orientation. The flat side of the LED is negative and goes toward the flat side on the silkscreen. The negative lead goes in the right hand hole for the PWR and STATUS LEDs as shown.</i></p> 	
20 <input type="checkbox"/>	<p>Install the yellow LED (w/orientation as above) at location Status. Solder and clip leads.</p>	
21 <input type="checkbox"/>	<p>Install the green LED (w/orientation as above) at location RX/TX, Solder and clip leads</p>	
22 <input type="checkbox"/>	<p>Install the bridge rectifier at location BR1. Solder.</p> <p><i>Note: this part has a specific orientation. Notice that one pin on this device has a small + on it and this corresponds to the plus on the board. This on the upper left hand side as shown.</i></p>	

Step	Instructions	LCC16
23 <input type="checkbox"/>	<p>Install the 5v linear regulator at location IC4 forming the leads as indicated below. Fold the pins over the shaft of a small screwdriver to create smooth bends. Apply an even layer of heat sync compound on the back of the regulator and after inserting the leads into the proper holes, secure the IC with a 4-40 bolt, #4 lock-washer, and 4-40 nut. Solder and clip leads.</p> 	
24 <input type="checkbox"/>	<p>Install the 470uv 25V electrolytic capacitor at location C1. Solder and clip leads.</p> <p><i>Note: Be sure that the (+) lead is installed in the hole marked with a “+” symbol. The (+) lead is usually longer than the (-) lead, and the (-) lead is identified by a black or white stripe on the capacitor.</i></p> <p><i>Note: the silkscreen might call out 1000uf but C1 should be 470uf 25V.</i></p> 	
25 <input type="checkbox"/>	<p>Install the 220uf 25V electrolytic capacitor at location C2. Solder and clip leads.</p> <p><i>Note: This part has a specific orientation just like C1.</i></p>	
26 <input type="checkbox"/>	<p>Install the 4 fuse clips at location F1, and F2. Solder.</p> <p>Install Fuses at F1 and F2. Fuses do NOT get soldered.</p> <p><i>Note: The fuses can be used to align the fuse clips for soldering as long as you do not overheat them.</i></p> 	

Step	Instructions	LCC16
27 <input type="checkbox"/>	<p>Install the RJ45 modular jacks at location J1 and J2. Be careful as the pins are somewhat close together.</p> <p><i>Note: it is a good idea to inspect the jacks to make sure all the pins and wires inside the connector look straight and nothing is out of place.</i></p>	
28 <input type="checkbox"/>	<p>Install the 17 terminal blocks at locations CH1 – CH16, and Line In. Solder.</p> <p><i>Note: The terminal blocks must be oriented facing outward.</i></p>	
29 <input type="checkbox"/>	<p>Install the Transformer at location TR1. Solder.</p> <p><i>Note: Line up pin 1 marked on the transformer with the pin 1 on the board silkscreen layout. Be careful as it is possible to install the transformer backwards with bad results.</i></p>	

3.3.5 Initial Testing

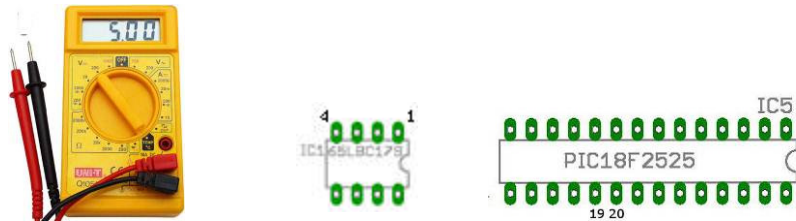
At this point you have completed the assembly of the board and you should gently clean the board of any residue and inspect for solder bridges or cold solder joints. What you are looking for are any solder bridges especially around the IC's and other closely spaced parts, or pins that are not fully and cleanly soldered.

If you have any of the IC's (IC1, IC3, IC5, M1-M16) installed – **remove them now.**

Connect a line cord (either 115v or 230v) to the “line in” terminal (115/230 VAC).



When you plug in the controller, verify the power LED lights up. Verify you have 5 volts DC between pins 19 (Gnd) and 20 (Vdd) on the PIC socket as well as between pins 1 and 4 on the 485 chip socket. There is a ground (-) testpoint on the board near C1 if you wish to test between that and the +5 on other points on the board.



If the voltage does NOT measure +5, remove power and start troubleshooting. Look for solder bridges around the bridge rectifier, or regulator. Double check the regulator number to make sure it is what you expect (something like LM7805 or LM340T-5). Verify the transformer is installed in the correct orientation. Check the Voltage Selection straps for the correct selection. Look for cold solder joints – retouching all solder connections, especially in the power supply area, will often help solve issues like this.

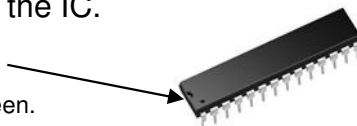
When power measures good, disconnect power and continue assembling.

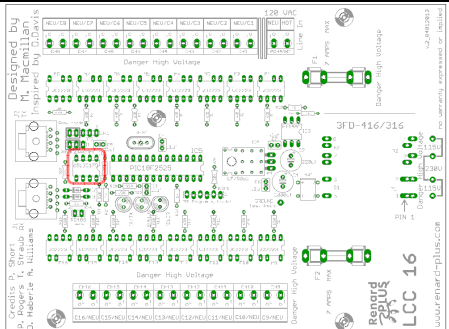
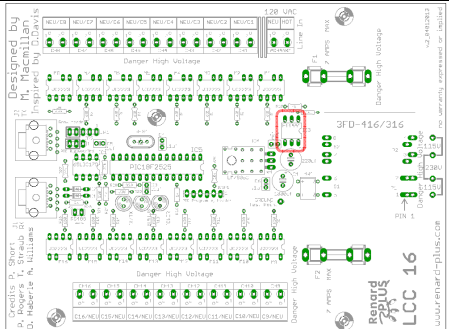
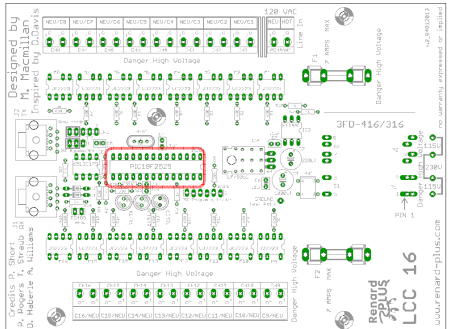
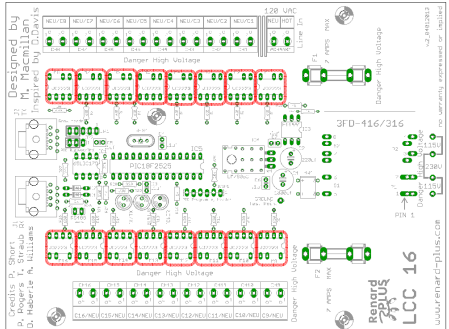
3.3.6 Install IC's

Note: Before handling any IC, touch the bottom of the board or use a conductive wrist-strap attached to the board.

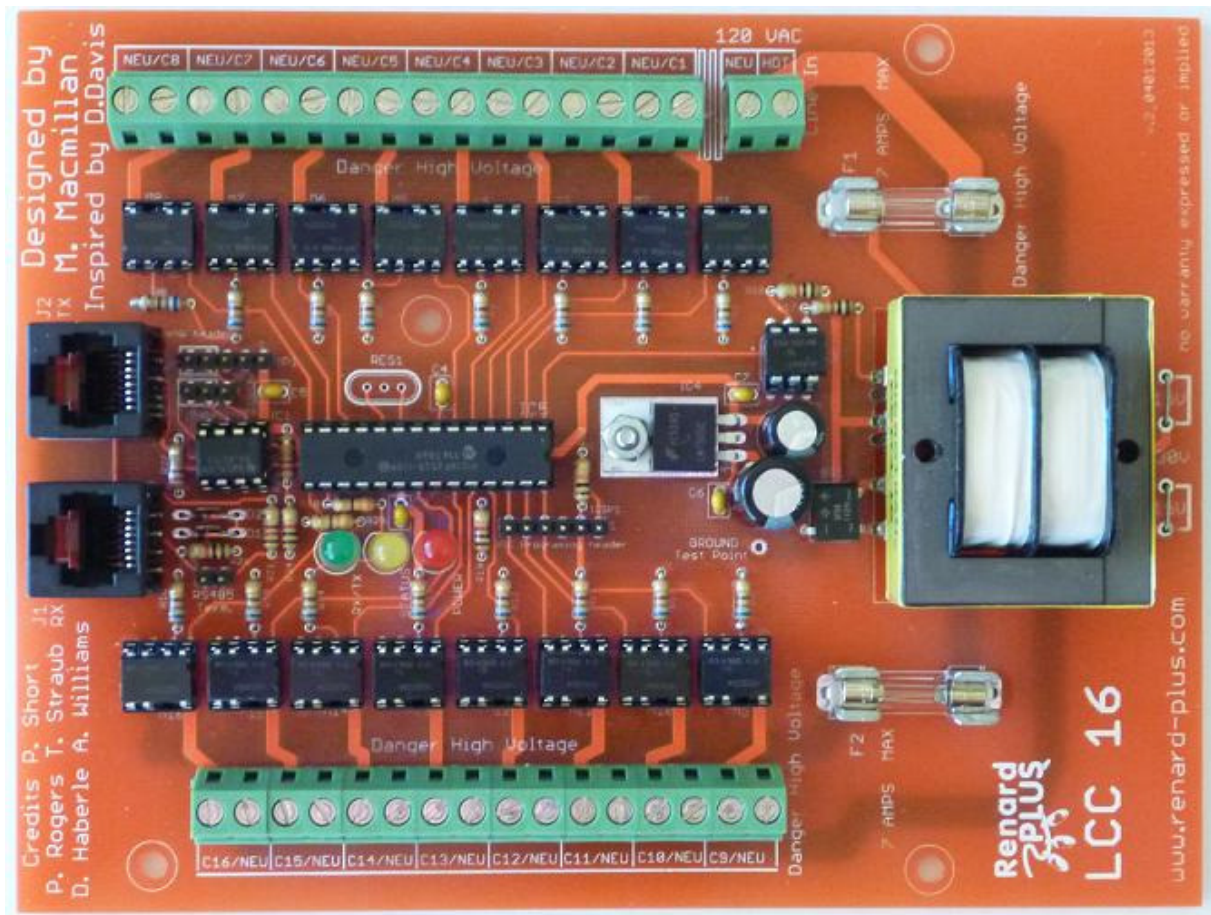
IC's pins are numbered from 1 to the number of pins counter clockwise with pin 1 being just to the right of either a notch or dimple on the IC.

Pin 1 of the IC is on the end, closest to the notch. It should match the notch on the silkscreen.



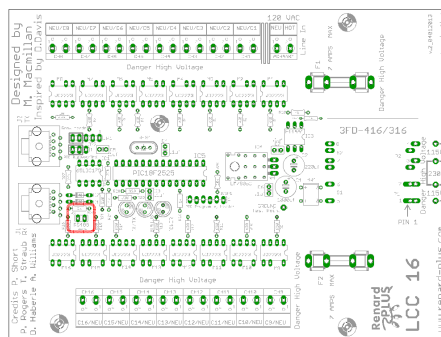
Step	Instructions	LCC16
30 <input type="checkbox"/>	Install the 8 pin 65LBC179 RS-485 at <u>IC1</u> . <i>Note: Pin one goes toward the pin one / notch on the silkscreen. That is toward the right edge of the board as shown.</i>	
31 <input type="checkbox"/>	Install the 6 pin H11AA1 zero cross output optocoupler at <u>IC3</u> . <i>Note: Pin one goes toward the pin one / notch on the silkscreen. That is toward the right edge of the board as shown.</i> <i>Note: It is easy to mix up the H11AA1 with the MOC 3023's so check the part carefully.</i>	
32 <input type="checkbox"/>	Install the 28 pin PIC18F2525 microprocessor at <u>IC1</u> . <i>Note: Pin one goes toward the pin one / notch on the silkscreen. That is toward the right edge of the board as shown.</i>	
33 <input type="checkbox"/>	Install the sixteen 7 pin VO2223A optocouplers at <u>M1 – M16</u> . <i>Note: Pin one goes toward the pin one / notch on the silkscreen. That is toward the left edge on the top group, and toward the right on the bottom group as shown. Some VO parts indicate pin 1 with a dot which goes toward the notch on the silkscreen.</i> <i>Note: the pins tend to be soft and easy to bend-install carefully.</i>	

3.3.7 Picture of Finished Board



4.2.3 JP3 RS485 Terminator

There are situations where the communications from the computer might require termination. Usually line reflections or other environmental conditions might disrupt communications to the controller. You might see missed light transitions, jumpy animation, or complete no operation. In this case, adding termination by adding a jumper *may* return reliable communications assuming everything else is working right.



4.2.4 Programming (ICSP Header)

This header allows the PIC to be programmed while the PIC is installed on the board

Pin Layout

- Pin 1 = MCLR
- Pin 2 = +5 volts
- Pin 3 = GND
- Pin 4 = PGD
- Pin 5 = PGC
- Pin 6 = PGM/RB5*

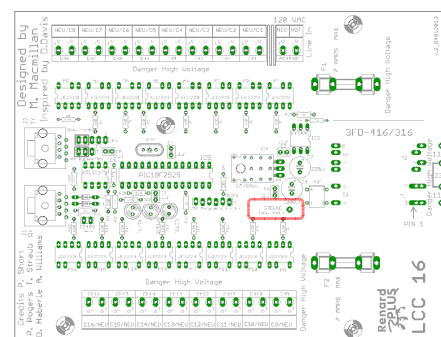


*Omit or clip off this pin if using a RenW Snapin wireless board. It is not used for programming.



4.2.5 Ground Test Point

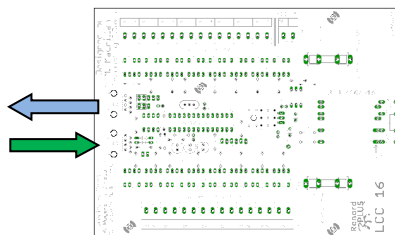
This location allows you an easy spot to get a ground reference while testing or debugging the board. You can place the tip of the black negative lead of your DMM on this spot to get ground. If you wish to be able to attach to this location, you can solder a short cut off lead from a resistor or other component to provide you a spot to connect.



4.3 Connecting the Renard to your PC

This board contains 2 RJ45 connectors that are used to receive data and pass data to the next controller.

J2 TX	RS485 outgoing data to next controller
J1 RX	RS485 incoming data from either a RS485 converter or another controller



The data wiring of the Renard Plus LCC16 is the same as other Renard boards including the Renard SS series so you can follow the same cabling requirements between other Renards and Renard Plus boards as follows:

For RS232, LCC16 J1 RX pin 4 connects to the serial TX pin (pin 3 of a DE9 female) and J1 pins 5 and 2 and/or 1 connect to serial GND (pin 5 of a DE9 female). For RS485 operation, J1 pins 1 and 2 are GND, pin 4 is Data-, and pin 5 is Data+ on the RS485. RS485 connections vary.

There are many options to connect your computer to the Renard Plus LCC16. Pictured here is a Hexim HXSP-2018F USB to RS485 adapter. When selecting an adapter look for ones that have an easy to use screw terminal like this one.



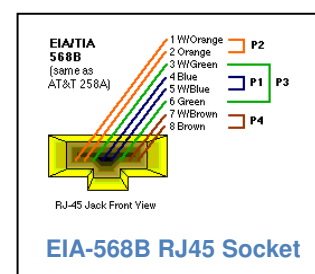
4.3.1 RJ45 Wiring

A standard CAT5 (or better) RJ45 networking cable can be used to connect the Renard to to:

1. Your PC RS485 or RS232 adapter
2. Another Renard for daisy chain operation or
3. SSRs if your board requires the use of SSRs (LCC16 does not).

The cable must be a straight thru style and NOT a cross-over type cable. Just check and make sure that the pins on one end of the cable connect to the same pin on the other end of the cable (the wire colors in the connector are a way to tell- look for the same color pattern on both connectors).

This is an example of a data cable wired to the EIA-568B standard. There are eight pins, numbered from left to right, looking at the jack.



4.3.1 DMX wiring

If you are using Renard Plus DMX firmware on your board, and will be using a “standard” DMX source, you may need to create a special interconnect cable, or adapter to get the DMX data into the correct pins on your Renard Plus. DMX adapters with an RJ45 output typically have data on pins 1(data+) & 2(data1) with GND on 7 or 8 of the connector, and Renards have data on pins 4 (data-) & 5(data+) with GND on pins 1 & 2. DMX configurations will vary so check carefully!

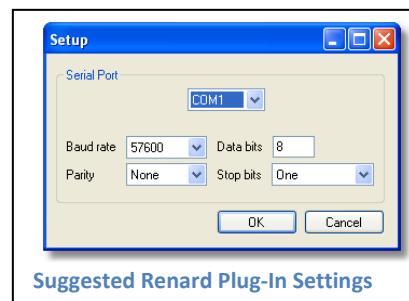
Signal	Renard RJ45	DMX RJ45
Data +	5	1
Data -	4	2
GND	1	8
GND	2	7

4.3.2 Computer Setup

If you are using the Vixen sequencing software to drive your Renard Plus, it will require either one of the following plugins:

- Renard Dimmer [Vixen 1.1.*]
- Renard Dimmer (modified) [Vixen 2.*]

If you are using an Xbee, the baud rate must be 57600.






4.4 Final Testing

The Renard Plus LLC16 has 3 diagnostic LED status lights which are used as follows.

4.4.1 Diagnostic LED Status Lights

For normal operation you should have the power LED on and the status “STATUS” LED blinking every few seconds (the PIC must be programmed). If you are running a

	Power - Will be on when power is applied
	Status – Will blink every few seconds to indicate the microprocessor is active
	RX/TX – Active when sequence is running



sequence you should also see the RX/TX LED flashing as well.

4.4.2 Test Procedure

The data wiring of the Renard Plus LLC16 is the same as other Renard boards. Standard non-crossover CAT5 network cables can be used to inter-connect with other controllers or the PC. Connect the Renard Plus LLC16 to your PC using a CAT5 from the controller RX jack to a RS485 connection on your PC.

Program a Vixen sequence to turn on/off each of the channels on the controller. We would suggest that each channel is turned on for 4 or 5 seconds.

Connect a set of dimmable lights to channel 1 on the controller. Once that is complete you change the on/off to ramp up/downs to verify dimming operation. Finally, you can perform a full load test with 16 sets of lights installed. Observe that each channel responds as programmed.

Congratulations, with the completion of a successful test, you have assembled your Renard Plus LCC16 – now the fun part starts, sequencing to use your new channels!

6. Notes

Use the following page(s) for notes about the board.