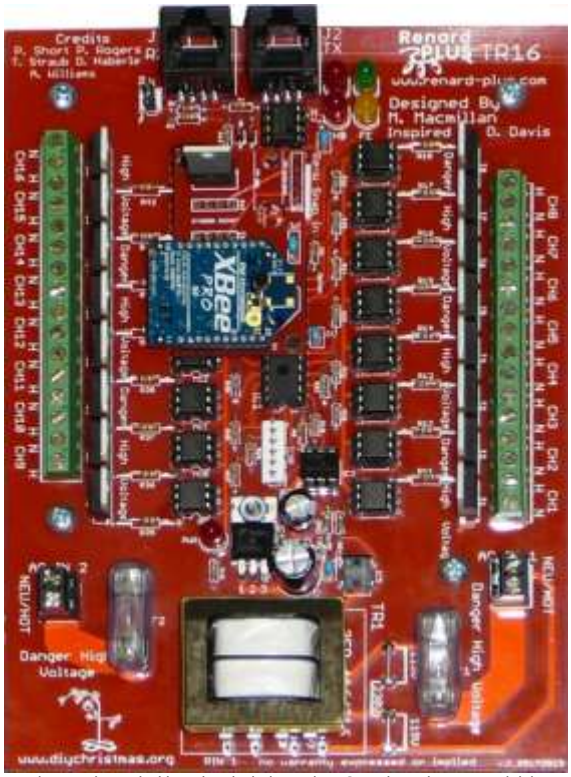
TR16 Controller



(Note: Pictured with optional wireless Xbee Snap-in and XBee module)

Sep 2017

Board Version 2.00 (v. 2_05172013)
Document Rev 1.11

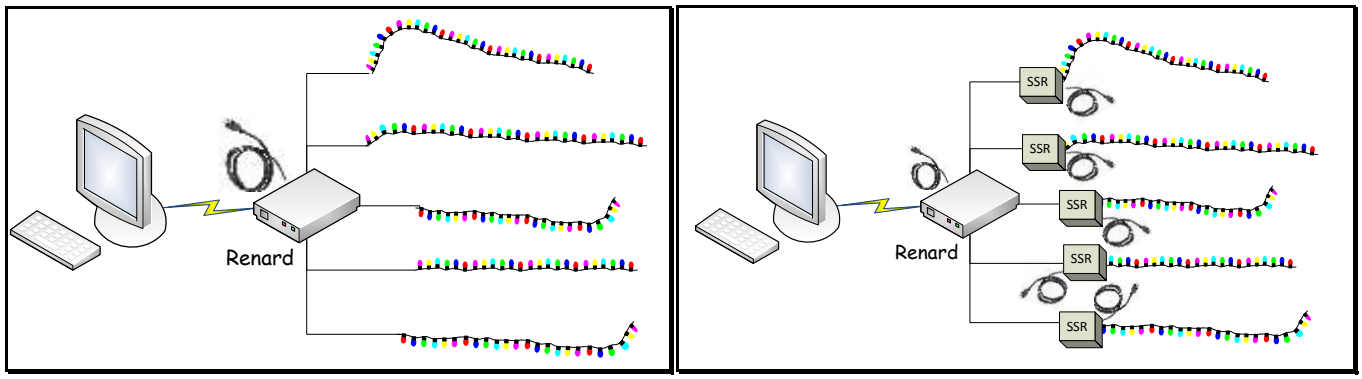
Table of Contents

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 '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).



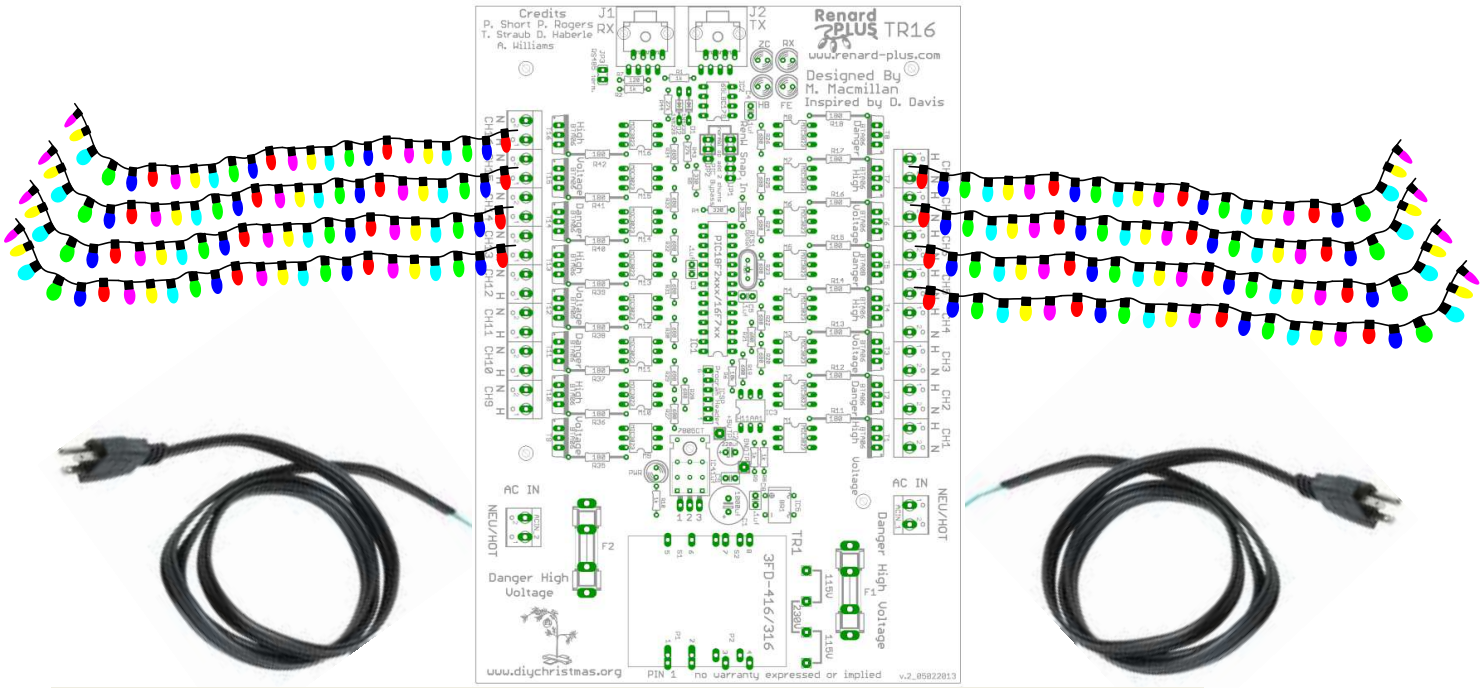
Example Renard configurations

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 Strip 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 DIYChristmas.org).

2. Overview of Renard Plus TR16

This guide covers the Renard Plus TR16. This board is designed to take “Renard” serial communications via RS485 from a control computer, and output line level AC to directly power lights/and light strings. The board outputs 16 individually controllable/dimmable channels. The



Feature	Detail
Name	**Renard Plus TR16**
Target use	AC line level light control
Channel Count	16
Power input	110v or 220v line level AC
Power output	Yes – direct line level AC out – 2 banks @ 15A max each, 4A max per channel up to bank max
Dimmable?	YES – PWM
Status Indicators?	YES
Channel Indicators?	NO – retro fit is possible
Control Input – Renard	YES – RS485, RS232 or optional wireless
Control Input – DMX	Planned
Daisy-chain output	YES – Renard RS485 pinout
Wireless	Option – w/add-on Wireless Snap-In board
On board programming	Yes through ICSP connector
Enclosure	CG1500 or CG1000 with slight modification to the stand-offs.
Heatsink?	Optional – see template

3. Assembly Instructions

This section covers the construction of the Renard Plus TR16 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

3.1 Renard Plus TR16 BOM / Parts List

The following is the Bill Of Material for building the Renard Plus TR16. The link to the Mouser project is: http://www.mouser.com/ProjectManager/ProjectDetail.aspx?AccessID=59f8c86984
Note: If you did not obtain a kit that some lighting vendors offer, Mouser is the most convenient place to order your needed parts. However, Mouser is not always the most cost effective source for parts- you may want to check alternatives like Tayda Electronics, DealExtreme, EBay, or other sources for alternatives.

Picture	Designators	Description	Qty	Mouser P/N	Alternate Source
	R1, R2, R8, R9, R10	1k ohm resistor 1/8 watt	5	299-1k-RC	http://www.taydaelectronics.com/resistors/1-8w-metal-film-resistors/r-1k-ohm-1-8w-1-metal-film-resistor.html
	R19 – R34	680 ohm resistor 1/8 watt	16	299-680-RC	http://www.taydaelectronics.com/resistors/1-8w-metal-film-resistors/71861-dup-r-5-1-ohm-1-8w-1-metal-film-resistor.html
	R3,R4,R5	330 ohm resistor 1/8 watt	3	299-330-RC	http://www.taydaelectronics.com/resistors/1-8w-metal-film-resistors/r-330-ohm-1-8w-1-metal-film-resistor.html
	R6	10k ohm resistor 1/8 watt	1	299-10k-RC	http://www.taydaelectronics.com/resistors/1-8w-metal-film-resistors/r-10k-ohm-1-8w-1-metal-film-resistor.html
	R7	120 ohm resistor 1/8 watt	1	299-120-RC	http://www.taydaelectronics.com/resistors/1-8w-metal-film-resistors/17986-dup-r-5-1-ohm-1-8w-1-metal-film-resistor.html
	R43, R44	27k ohm resistor 1/8 watt	2	299-27k-RC	http://www.taydaelectronics.com/resistors/1-8w-metal-film-resistors/95833-dup-r-12-4-ohm-1-8w-1-metal-film-resistor.html
	R11-18, R35-42	180 ohm resistor 1/8 watt	16	299-180-RC	http://www.taydaelectronics.com/resistors/1-8w-metal-film-resistors/r-180-ohm-1-8w-1-metal-film-resistor.html
	D2	1N5229 (4.3v) zener diode	1	78-1N5229B	http://www.taydaelectronics.com/diodes/zener/1n4731-zener-diode-1w-4-3v.html
	D1	1N5239 (9.1v) zener diode	1	78-1N5239B	http://www.taydaelectronics.com/diodes/zener/1n4739a-1n4739-zener-diode-9-1v-1w.html
	C1	1000uf 25V Electrolytic Cap	1	647-UVZ1E102MPD	http://www.taydaelectronics.com/capacitors/electrolytic-capacitors/1000uf-16v-105c-radial-electrolytic-capacitor-10x16mm.html
	C2	220uf 25V Electrolytic Cap	1	647-UVZ1E221MPD	http://www.taydaelectronics.com/capacitors/electrolytic-capacitors/220uf-25v-105c-radial-electrolytic-capacitor-8x11mm.html
	C3, C4, C5, C8,C9	.1uf cap	5	81-RPEF51104Z2S2A03A	http://www.taydaelectronics.com/capacitors/monolithic-ceramic-capacitor/0-1uf-50v-multilayer-ceramic-capacitor.html
	CH1 – CH16,	Terminal Blocks 5.08MM PCB	16	571-2828372	http://www.taydaelectronics.com/connectors-sockets/terminal-blocks/pcb-mount/dg128-screw-terminal-block-2-positions-5mm.html
	ACIN_1, and ACIN_2	Terminal Blocks 5.08MM PCB	2	571-7969492	http://www.taydaelectronics.com/connectors-sockets/terminal-blocks/pcb-mount/dg300-screw-terminal-block-2-positions-5mm.html
	J1-J2	Modular Jacks 8 PCB TOP ENTRY	2	571-5556416-1	http://www.ebay.com/itm/10PCS-Black-RJ45-8P8C-Jack-Modules-PCB-Mount-Network-Internet-Connectors-Top-NEW-/182094580037

Picture	Designators	Description	Qty	Mouser P/N	Alternate Source
	IC1	28 pin IC Socket	1	571-1-390261-9	http://www.taydaelectronics.com/connectors-sockets/28-pin-dip-ic-socket-adaptor-solder-type.html
	IC2	8 pin IC socket (optional)	1	517-4808-3004-CP	http://www.taydaelectronics.com/connectors-sockets/8-pin-dip-ic-socket-adaptor-solder-type.html
	M1-M16, IC3	6 pin IC sockets (optional)	17	571-1-390261-1	http://www.taydaelectronics.com/connectors-sockets/6-pin-dip-ic-socket-adaptor-solder-type.html
	ICSP, JP1, JP2, JP3	16 pin header cut to fit	1	571-16404526	http://www.taydaelectronics.com/connectors-sockets/pin-headers/40-pin-2-54-mm-single-row-pin-header-strip.html
	XBheader and Bypass	Shunts for XBheader and Bypass	3	737-MSC-G	http://www.taydaelectronics.com/connectors-sockets/mini-jumper-2-54mm-gold-plated-closed-cover.html
	IC4	LM7805CT voltage regulator	1	512-LM7805CT	http://www.taydaelectronics.com/ic-integrated-circuits/voltage-regulators/lm7805-l7805-7805-voltage-regulator-ic-5v-1-5a.html
	T1-T16	Triac 6AMP snubberless	16	511-BTA06-600CW	http://www.taydaelectronics.com/triacs/bta06-600c-bta06-600-triac-600v-6a.html NOTE: not as good as the BTA06-600CW to prevent flickering
	IC2	65LBC179	1	595-SN65LBC179P	
	IC3	H11AA1	1	782-H11AA1	http://www.ebay.com/itm/2-pcs-H11AA1-H11AA-DIP-IC-CA-NEW-CA-/142073895248
	M1-M16	Triac Output Optocouplers MOC3023	16	859-MOC3023	http://www.taydaelectronics.com/moc3023-moc3023m-3023-triac-scr-output-optocoupler-ic.html
	BR1	4 pin Bridge rectifier 1amp dip	1	625-DF02MA-E3	http://www.taydaelectronics.com/dbl104g-c1-single-phase-diode-bridge-rectifier-400v-1a-db.html
	IC1	PIC Microcontrollers (MCU) 48KB 3968	1	579-PIC18F2525-I/SP	
	FE	Yellow 5 MM LED	1	78-TLHY5405	http://www.taydaelectronics.com/leds/round-leds/5mm-leds/led-5mm-yellow.html
	Power, HB, ZC	Red 5 MM LED	3	78-TLHR5401	http://www.taydaelectronics.com/leds/round-leds/5mm-leds/led-5mm-red.html
	RX	Green 5 MM LED	1	78-TLHG5401	http://www.taydaelectronics.com/leds/round-leds/5mm-leds/led-5mm-green.html
	F1, F2	Fuse Clips and Holders PC FUSE CLIP 5 MM	4	534-3517	http://www.taydaelectronics.com/circuit-protection/fuses/fuse-holders/fuse-holder-with-cover-5x20mm-m205-pcb-4a.html
	F1, F2	5mm x 20mm Medium Time Delay Fuse 125VAC 10Amp	2	504-GMC-10	http://www.ebay.com/itm/Glass-Fuses-5T-VDE-UL-10A-T10A-5x20mm-DELAY-ACTING-SLOW-BLOW-10-pcs-/352050825535
	F1, F2	Fuse Cover (Optional)	2 Opt.	534-3527C	
	TR-1	Transformer: Pri.=115/230volts, Sec.=8volts 800ma.	1	838-3FD-416 (Note: See other options)	

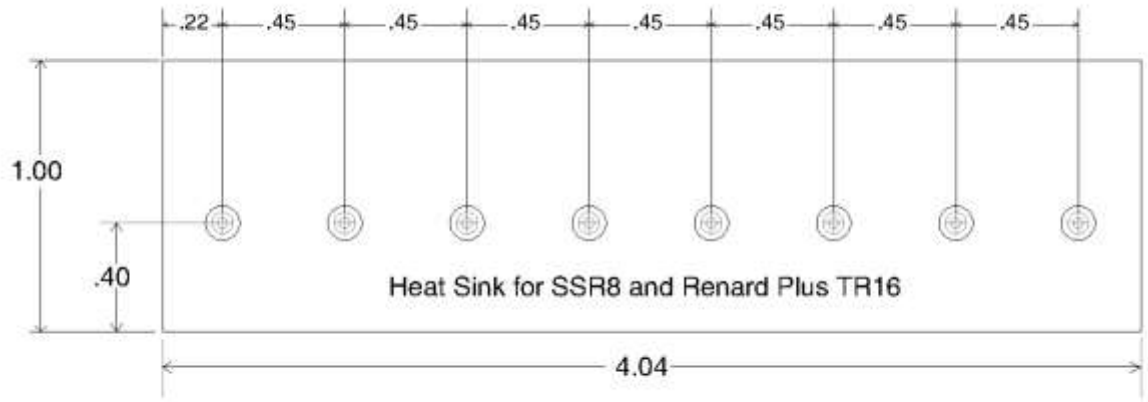
3.1.1 Transformer Options

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 TR16 Heatsink

(See template on: www.renard-plus.com)



All measurements are in inches and all mounting holes are .150

Material .125 Aluminum Stock

3.1.3 TR16 Enclosure

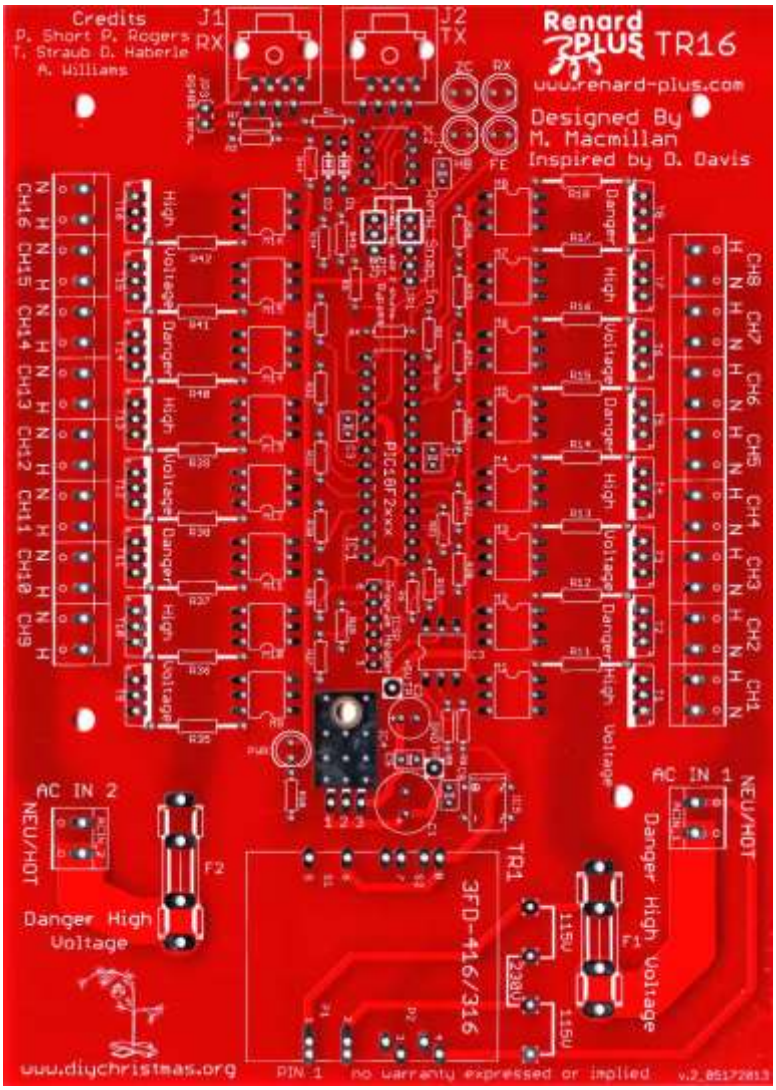
	TR16
	CG1500 or CG1000 (with slight modification to standoffs)

3.2 Parts Assembly

The Renard Plus TR16 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 PCBs to look for any defects such as cracks or breaks. The holes on the board should be open on both sides. Then inspect and sort out the various parts for the board.

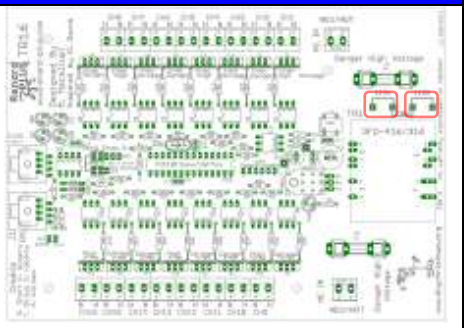
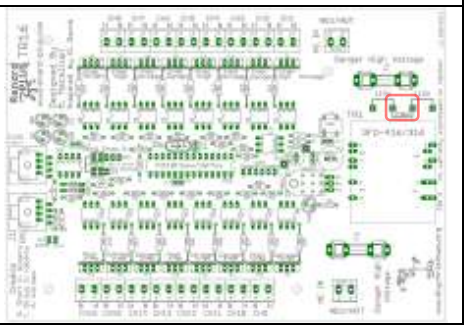


2. Next inspect and sort out the various parts for the board. Make sure you understand which parts are which, and things like resistor codes and component orientation. A separate document on these concepts is available at
   www.renard-plus.com/files/Tools_and_Parts_ID_Guide.pdf
   and on other resource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

3.3 TR16 Assembly Guide

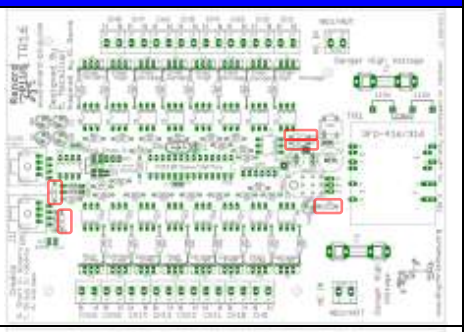
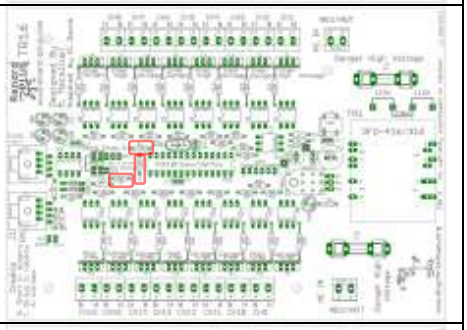
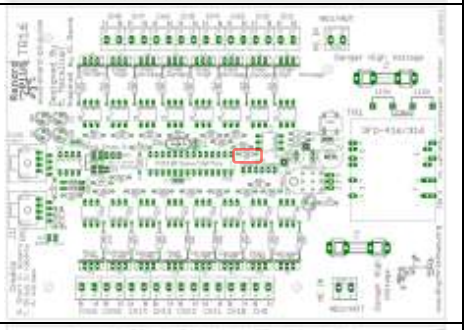
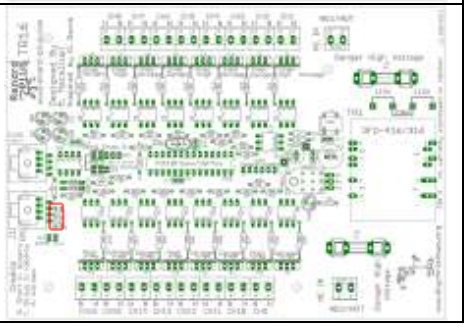
3.3.1 Select Voltage Setting

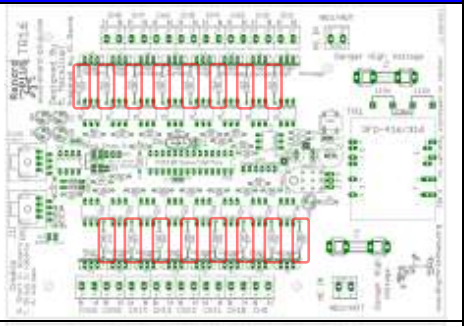
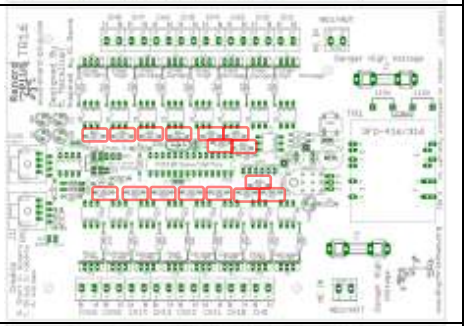
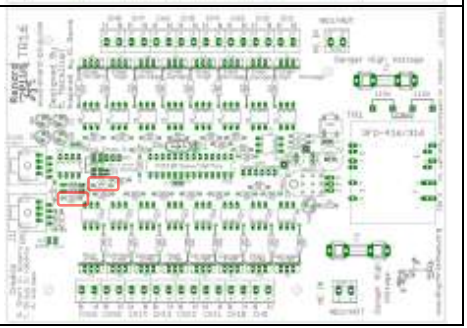
If you are using a dual voltage transformer from the list of transformer options (typically the 3FD versions), you have the option of strapping the on board power supply to operate from a line voltage of “115” (110-120 VAC) or “230” (220-240 VAC) line voltage. You must only strap one option (Note: the “115” option uses two jumper wires and the “230” option is only one). If you are running a single voltage transformer, you must strap for “115” and run from 115 VAC line voltage.

Step	Instructions	TR16
1a ☐ **115 VAC Option**	If the controller will be used with 110-120 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. *Note: **DO NOT** JUMPER ALL of the voltage selection pads. Use one set or the other!* 	
1b ☐ **220 VAC Option**	If the controller will be used with 220-240 VAC main power, only jumper the “230” position. *Note: **DO NOT** JUMPER ALL of voltage selection pads.* 	

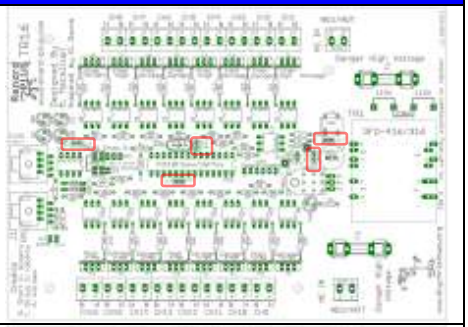
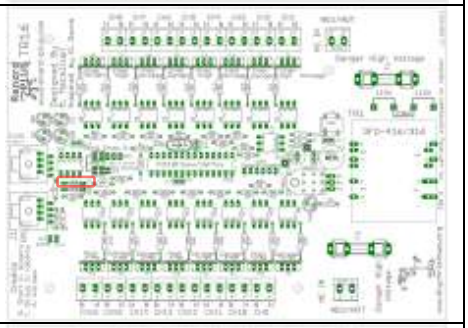
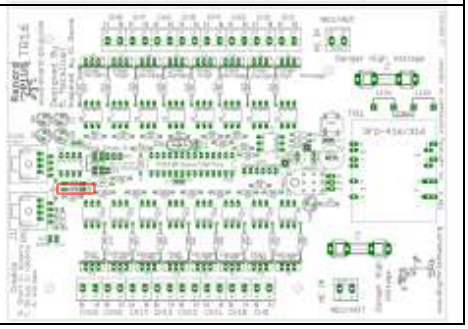
3.3.2 Install Resistors

Resistors do not have a specific orientation and can be installed either direction. The VALUE is important and that is indicated by the colored strips. See the Tools and Parts ID document on www.renard-plus.com for details.

Step	Instructions	TR16
2 ☐	Install 1K ohm resistors (brown-black-red) at locations R1, R2, R8, R9, R10. Solder and clip leads.	
3 ☐	Install 330 ohm resistors (orange-orange-brown) at locations R3, R4, R5. Solder and clip leads.	
4 ☐	Install the 10k ohm resistor (brown-black-orange) at locations R6. Solder and clip leads.	
5 ☐	Install the 120 ohm resistor (brown-red-brown) at locations R7. Solder and clip leads.	

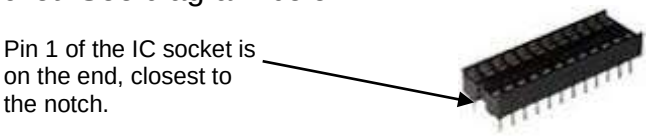
Step	Instructions	TR16
6 ☐	Install the 180 ohm resistor (brown-gray-brown) at locations R11-R18, R35-R42. Solder and clip leads.	
7 ☐	Install 680 ohm resistors (blue-gray-brown) at locations R19-R34. Solder and clip leads.	
8 ☐	Install 27k ohm resistors (red-violet-orange) at locations R43, R44. Solder and clip leads.	

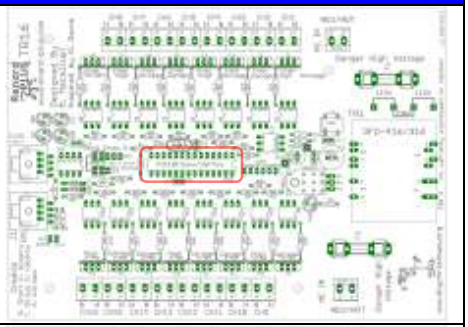
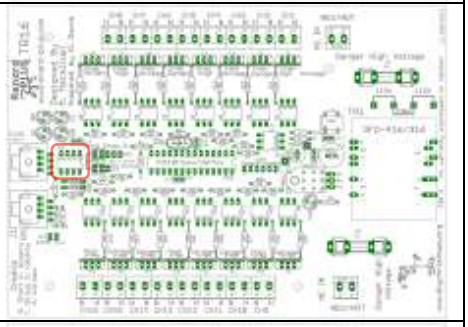
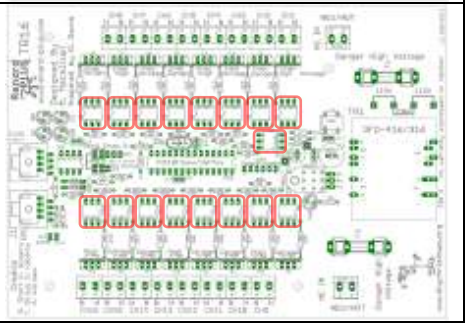
3.3.3 Install By-pass Caps and Diodes

Step	Instructions	TR16
9 ☐	Install the five .1uf (usually marked 104) capacitors at locations C3, C4, C5, C8, C9. Solder and clip leads. *Note: Bypass caps do NOT have a specific orientation. .1uf is also known as 100nf.*	
10 ☐	Install the small glass diode 1N5239 at locations D1. Solder and clip leads. *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 toward the center of the board).* 	
11 ☐	Install the small glass diode 1N5229 at locations D2. Solder and clip leads. *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 toward the center of the board).*	

3.3.4 Install IC Sockets

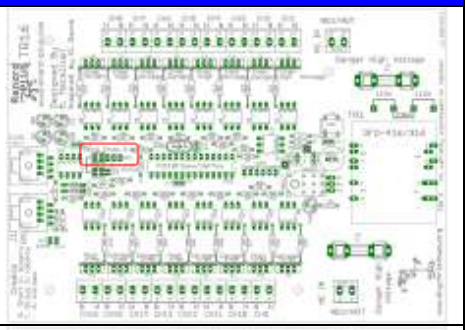
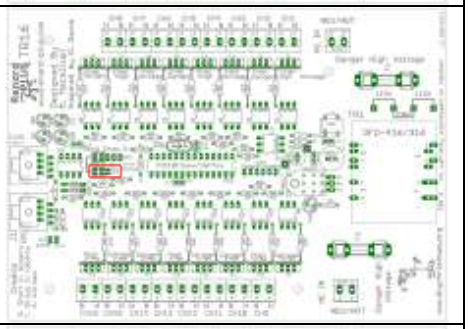
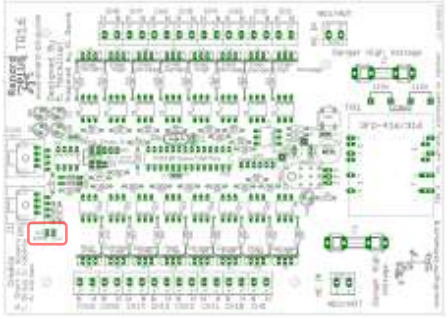
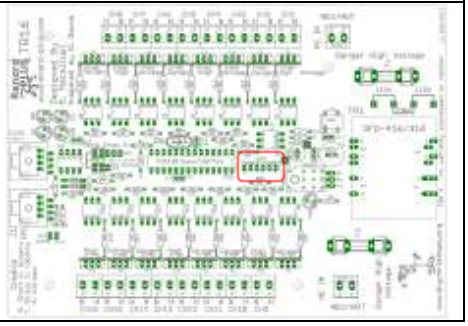
Even though sockets are optional we strongly recommend that sockets be used on all of the IC's. This allows easier testing, debug and repair down the road. Sockets should be installed with the Pin 1 of the socket aligned to the square solder pad on the PCB. If you get a socket backwards, it will work, but later you will need to be careful to install the IC properly per the board indication of pin 1, not the socket. See diagram below.



Step	Instructions	TR16
12 ☐	Install the 28 pin IC socket at location IC1. Solder.	
13 ☐	Install the 8 pin IC socket at location IC2. Solder	
14 ☐	Install the 6 pin IC sockets at locations M1-M16, and IC3. Solder *Note: The two rows of sockets point opposite directions. As shown, the top row faces left, and the bottom row faces right.*	

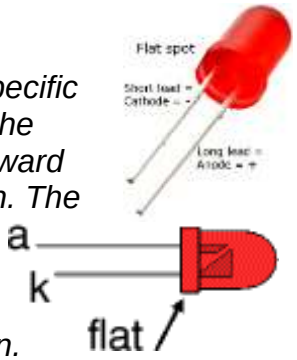
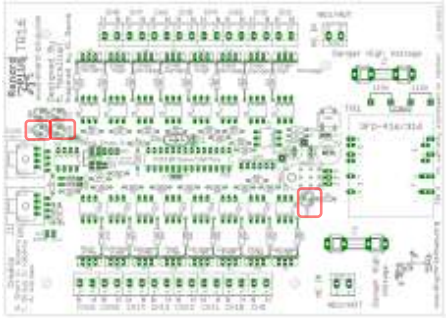
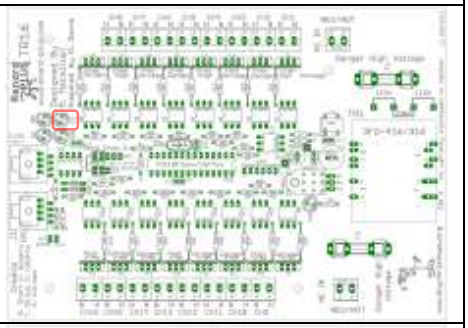
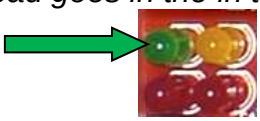
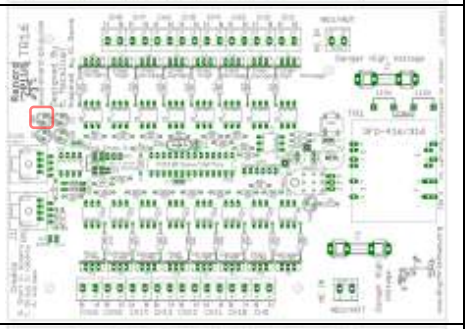
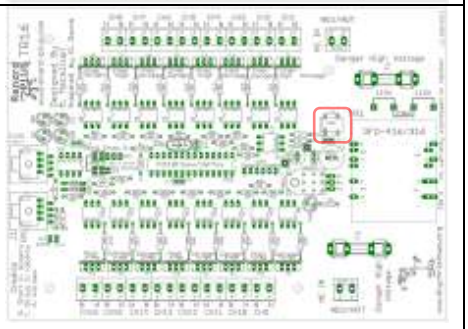
3.3.5 Install IC Headers

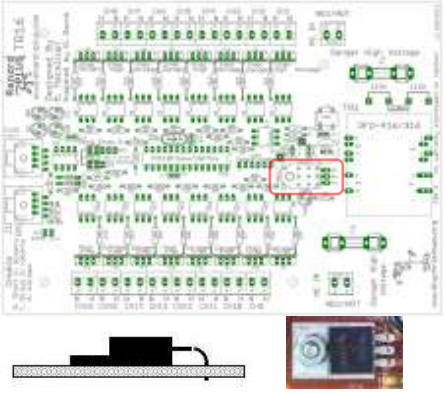
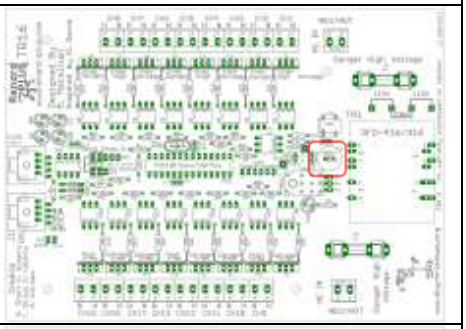
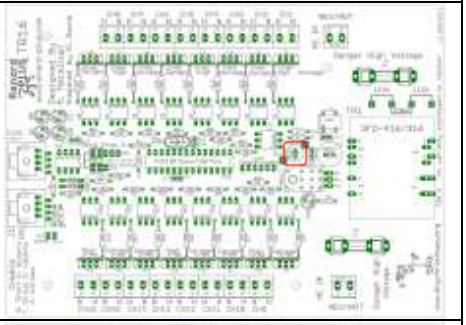
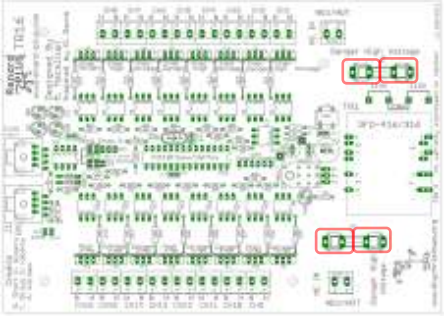
You may have purchased either a single 16 pin header or headers cut according to the board specifications. If you followed the BOM, you will have a single 16 pin header that needs to be cut into the appropriate lengths.

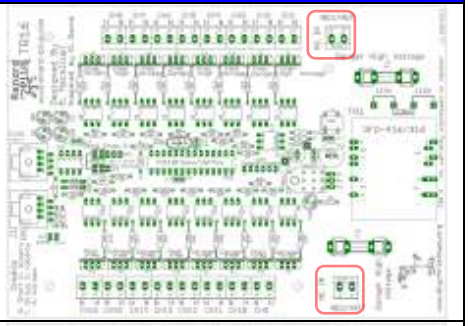
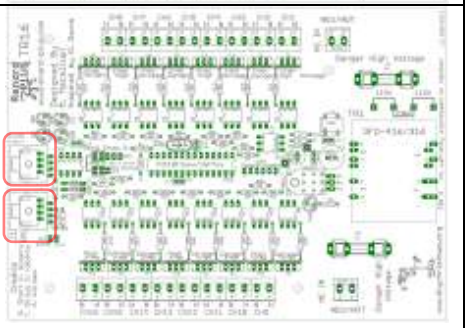
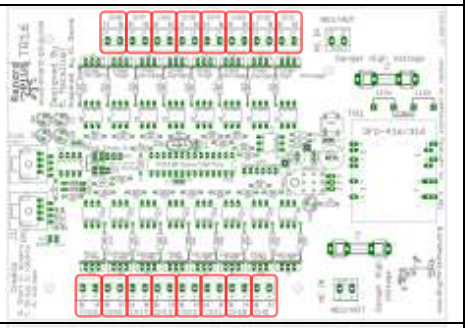
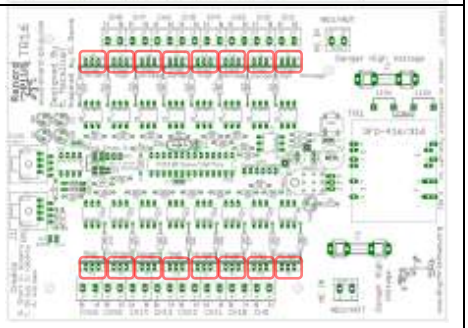
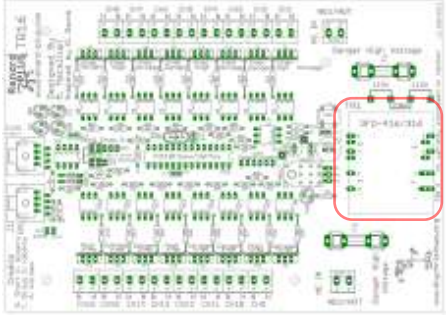
Step	Instructions	TR16
15 ☐	Install 5 pin header at location JP1 / RenW Snap In. Solder Install a shunt jumper on the two left most pins of the header as indicated on the silkscreen. 	
16 ☐	Install 3 pin header at location JP2 / PIC Bypass. Solder Install a jumper on the two left most pins of the header as indicated on the silkscreen. 	
17 ☐	Install 2 pin header at location JP3 RS485 term. Solder. 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. 	
18 ☐	Install 6 pin header at location ICSP. Solder. 	

3.3.6 Install Misc. Parts

LED's (light emitting diodes) must be installed according to the silk screen pattern on the board. In looking at an LED you will notice a flat spot on one side of the LED:

Step	Instructions	TR16
19 ☐	Install the 3 red LED's at location Power, HB, ZC. Solder and clip leads. *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 LED, and in the upper hole for HB and ZC as shown.* 	
20 ☐	Install the yellow LED at location FE. Solder and clip leads. *Note: This part has a specific orientation. The negative lead goes in the in the upper hole.* 	
21 ☐	Install the green LED at location RX. Solder and clip leads. *Note: This part has a specific orientation. The negative lead goes in the in the upper hole.* 	
22 ☐	Install the bridge rectifier at location BR4. Solder and clip leads (if needed). *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 in the lower left hand side as shown.* 	

Step	Instructions	TR16
23 ☐	Install the 5v linear regulator LM7805CT 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. 	
24 ☐	Install the 1000uf 25V electrolytic capacitor at location C1. Solder and clip leads.  *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 usually identified by a black or white stripe on the capacitor.*	
25 ☐	Install the 220uf 25V electrolytic capacitor at location C2. Solder and clip leads. Solder and clip leads. *Note: This part has a specific orientation just like C1.*	
26 ☐	Install the 4 fuse clips at location F1, and F2. Solder. Install Fuses at F1 and F2. Fuses do NOT get soldered. *Note: The fuses can be used to align the fuse clips for soldering as long as you do not overheat them.* 	

Step	Instructions	TR16
27 ☐	Install 2 terminal blocks at the two AC IN locations ACIN_1 and ACIN_2. Solder. *Note: The terminal blocks must be oriented facing outward.*	
28 ☐	Install the RJ45 modular jacks at location J1 and J2. Be careful as the pins are somewhat close together making alignment difficult. Once the pins are lined up, pop the jack onto the board. Solder. *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.*	
29 ☐	Install the remaining terminal blocks at locations CH1 – CH16. Solder. *Note: The terminal blocks must be oriented facing outward.*	
30 ☐	Install the 16 Triacs in locations T1 – T16. Solder and clip leads. *Note: These parts have a specific orientation. The tab side of the Triac should be towards the center of the board as illustrated in the silk screen. The thicker black line on the part location indicates where the silver tab on the part should go.*	
31 ☐	Install the Transformer at location TR1. Solder and clip leads (as needed). *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.*	

3.3.7 Initial Testing

At this point you have completed the assembly of the board (less ICs) 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.

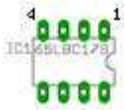
If you have any of the IC's (IC1, IC2, IC3, M1-M16) installed – **remove them now**.

Connect a line cord (either 115v or 230v AC) to the "line in" terminal ACIN-1 (the one toward closest to the CH1 connector location.

Warning

High Voltages Present

When you plug in the controller, verify the power LED lights up. If you see lights, use your DMM and verify you have 5 volts DC between the 5V TP (near C2 and the ICSP header) and the GND TP (on the other side of C2). Next, verify you have 5 volts DC between pins 19 (Gnd) and 20 (Vdd) on the PIC socket (IC1) as well as between pins 1 and 4 on the 65LBC179 chip socket (IC2). You can use the GND TP for the ground for the IC socket tests if you like.



If the voltage does NOT measure around +5 (4.8 – 5.2) at each test point, 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 and bridge rectifier are installed in the correct orientation. Make sure all the pins of the sockets project through the PCB and are soldered. 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.

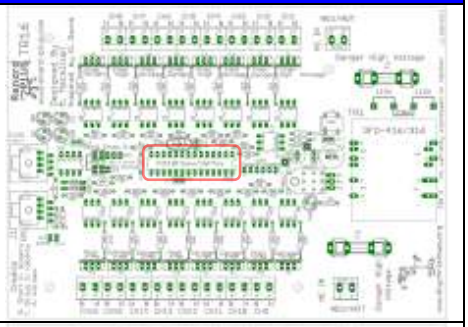
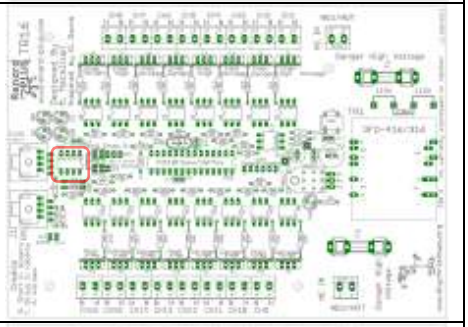
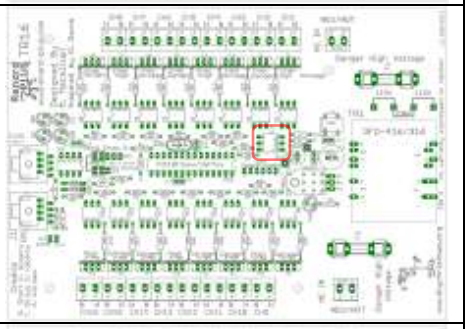
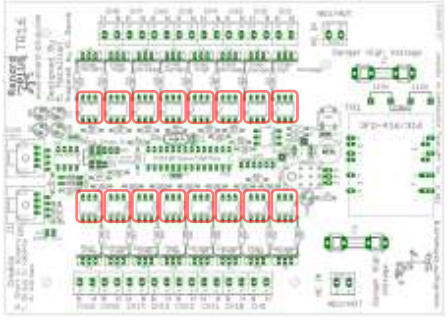
When power measures properly, disconnect power and continue assembling.

3.3.8 Install IC's

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

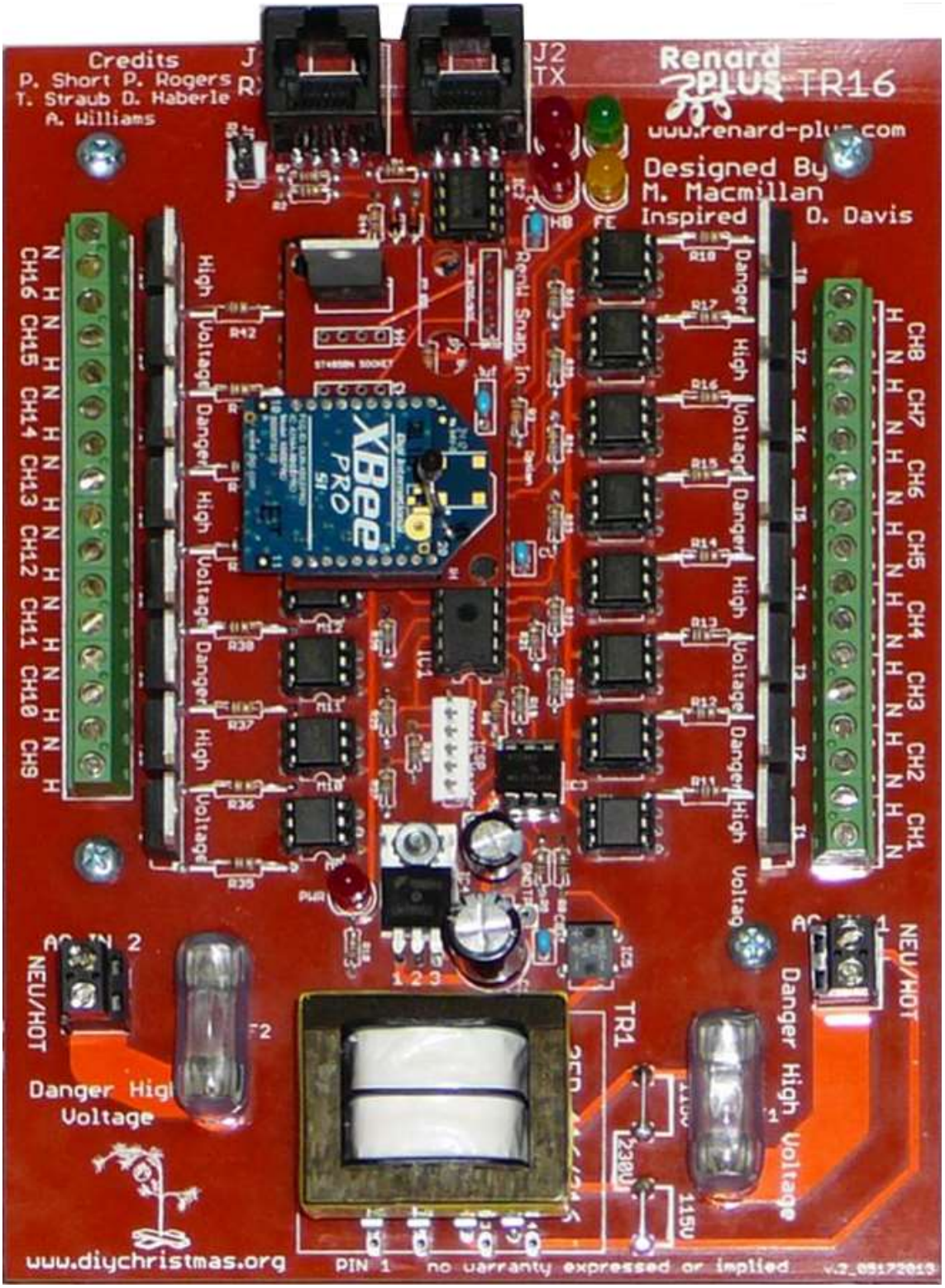
IC's pins are numbered from 1 to the number of pins counter clockwise with pin 1 being just to the right of either a notch or dimple on the IC.

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

Step	Instructions	TR16
32 ☐	Install the 28 pin **PIC18F2525** microprocessor at IC1. *Note: Pin one goes toward the pin one / notch on the silkscreen. That is toward the right edge of the board as shown.*	
33 ☐	Install the 8 pin **65LBC179** RS-485 at IC2. *Note: Pin one goes toward the pin one / notch on the silkscreen. That is toward the right edge of the board as shown.*	
34 ☐	Install the 6 pin **H11AA1** zero cross output optocoupler at IC3. *Note: Pin one goes toward the pin one / notch on the silkscreen. That is toward the bottom edge of the board as shown.* *Note: It is easy to mix up the H11AA1 with the MOC 3023's so check the part carefully.*	
35 ☐	Install 6 pin **MOC3023** optocouplers at M1 – M16. *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 MOC parts indicate pin 1 with a dot which goes toward the notch on the silkscreen.* 	

3.3.9 Picture of Finished Board

(Note: Pictured with optional Ren Wireless Snap-in and XBee module)



4. Final Steps

At this point you will have now completed the installation of all of the parts to the controller. Again, it is a good idea to gently clean off any final soldering residue and then visually inspect the board and check to make sure there are no solder bridges between the solder pads, and that the solder joints are all a good quality.

4.1 Programming the PIC

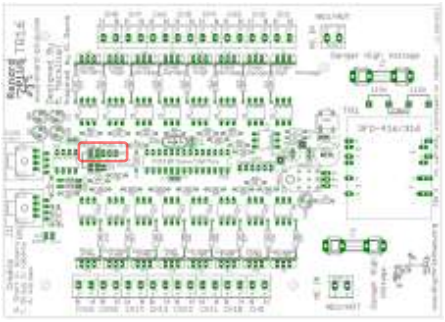
*Note: The Renard Plus TR16 **does not** use the default Renard firmware used on other Renard devices. Make sure you use the Renard Plus version of the code from the Renard-Plus.com website!*

Programming the PIC can be done with the PIC chip plugged into a PIC programmer such as the PICStart from MicroChip or onboard using a programmer like a PicKit3, PicketIII or PicKit2. Programming PIC's using standard assembly is written up in our PIC Programming Manual available on www.renard-plus.com.

4.2 Jumper Settings / Headers

4.2.1 JP1 XBee Header

This header can be used to connect a XBee Wireless module directly to the Renard Plus using a Xbee Snap-in board or indirectly using 3 wires to a board such as the REN-W. If you are not using XBee Wireless then you must jumper pins 4/5 using a shunt jumper. The following are the pinouts for the Xbee header:



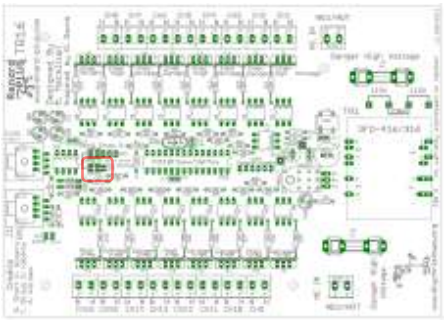
Pin Layout
1 = +5VDC
2 = N/C
3 = GND
4 = RX from 485 chip
5 = RX in to PIC

Option - Xbee using Snapin Board

Note: When assembling the DIGWDF Xbee SnapIn board (http://diychristmas.org/store/) install the female 5 pin header block on the bottom side of the board. Once assembled the SnapIn board can only be plugged in one direction.

4.2.2 JP2 PIC Bypass / DMX

If you are using Start Address Programming, you can use the PIC bypass to allow the data to flow thru the Renard Plus without the usual Renard "address eating". If you use a jumper across pins 1/2 then the data stream that comes into the device goes out exactly as it came in with no addresses consumed by the Renard Plus board. The default position is a jumper across pins 2/3.

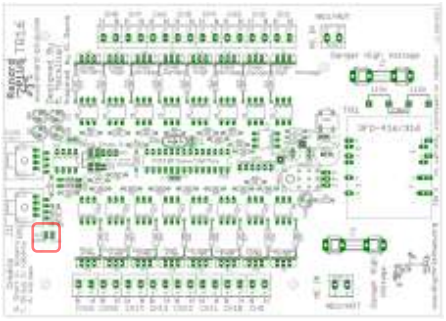


Pin Layout

1 = Data In From RS485 IC
2 = Data Out to RS485 IC
3 = Data Out from PIC

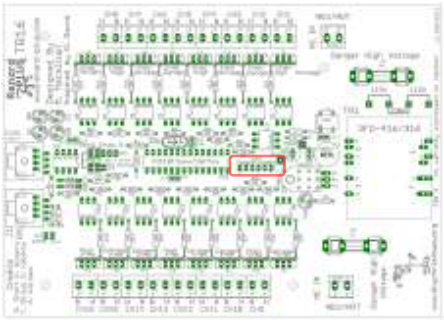
4.2.3 JP3 RS485 Terminator

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

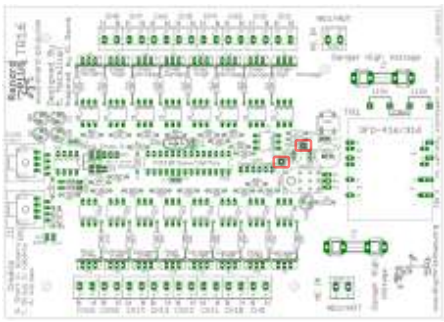


Pin Layout

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

4.2.5 +5V and Ground Test Point

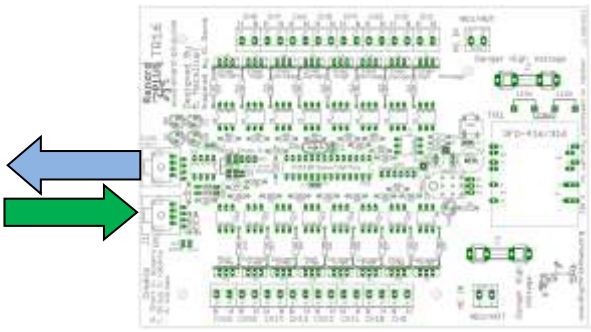
These location allow you easy spots to get a ground reference or +5V DC while testing or debugging the board. You can place the tip of the black negative lead of your DMM on “GND TP” to get ground and the red lead on the “5V TP” to measure the board +5 power. If you wish to be able to attach to these locations, 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	RS232/485 incoming data from either a serial port/ RS485 converter or another Renard board.



The data wiring of the Renard Plus TR16 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, TR16 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.

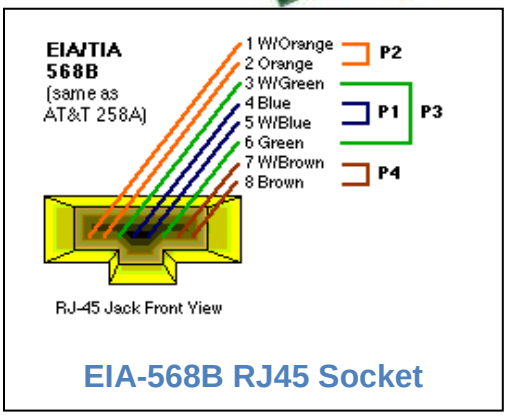
There are many options to connect your computer to the Renard Plus TR16. Pictured here is a Hexim HXSP-2018F USB to RS485 adapter. When selecting an adapter look for ones that have an easy to use screw terminal as shown.

4.3.1 RJ45 Wiring

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

1. Your PC RS485 adapter
2. Another Renard for daisy chain operation or
3. SSRs if your board requires the use of SSRs (not applicable for TR16).

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). The diagram 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.



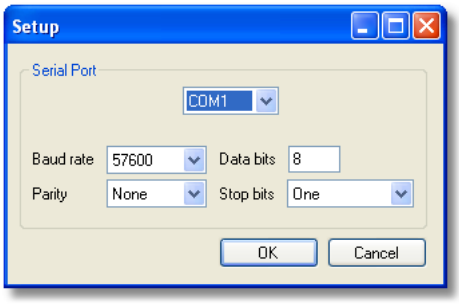
EIA-568B RJ45 Socket

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.



Suggested Renard Plug-In Settings

4.4 Final Testing

The Renard PlusTR16 has 5 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 lighted, ZC led active and the status LED blinking every few seconds (the PIC must be programmed). If you are running a sequence, you should see the FE led OFF, and the RX LED flashing.

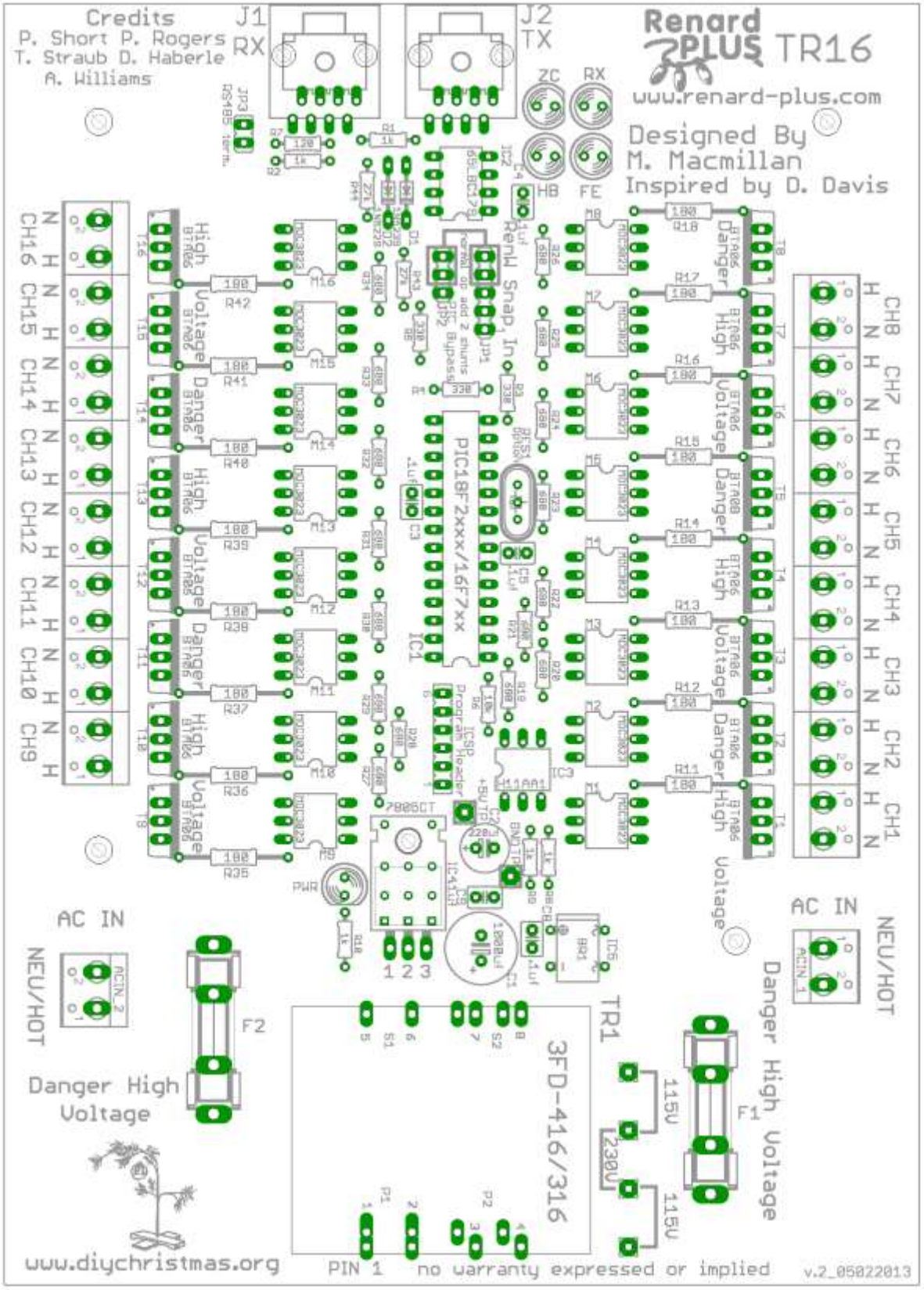
PWR	**Power** - Will be on when power is applied.	
ZC	**ZC** – **"Zero Cross"** Will be on when the AC "zero cross" is detected.	
RX	**RX** – **"Receive"** Active when a sequence is running.	
HB	**HB – "Heart Beat"** Blinks every few seconds to indicate the microprocessor is active.	
FE	**FE** – "Framing Error" will light if the serial communication is incorrect. Typically this indicates a mismatch between the baud rate in the PIC firmware and the baud rate setting on the PC for the RS485 adapter.	

4.4.2 Test Procedure

The data wiring of this board is the same as other Renard boards. Standard non-crossover CAT5 network cables can be used to connect to other controllers, and/or the PC. Connect your Renard Plus to your PC using a standard CAT5 cable from the controller RX jack to a RS485 connection on your PC. Attach one set of dimmable lights. Program a Vixen sequence to turn on/off each of the channels on the controller and run it. We would suggest that each channel is turned on for 4 or 5 seconds. Observe that the connected channel responds as programmed. Next, do a full load test by attaching lights to the rest of the outputs and observe all lights are being controlled. Next, change the sequence from on/off to slow ramp up/downs to verify dimming.

Congratulations, with a successful test, you have completed your build of your Renard Plus controller and are ready for the wonderful world of light animation sequencing!

5. Parts Placement Diagram



6. Notes

Use this page for YOUR notes about the boards.