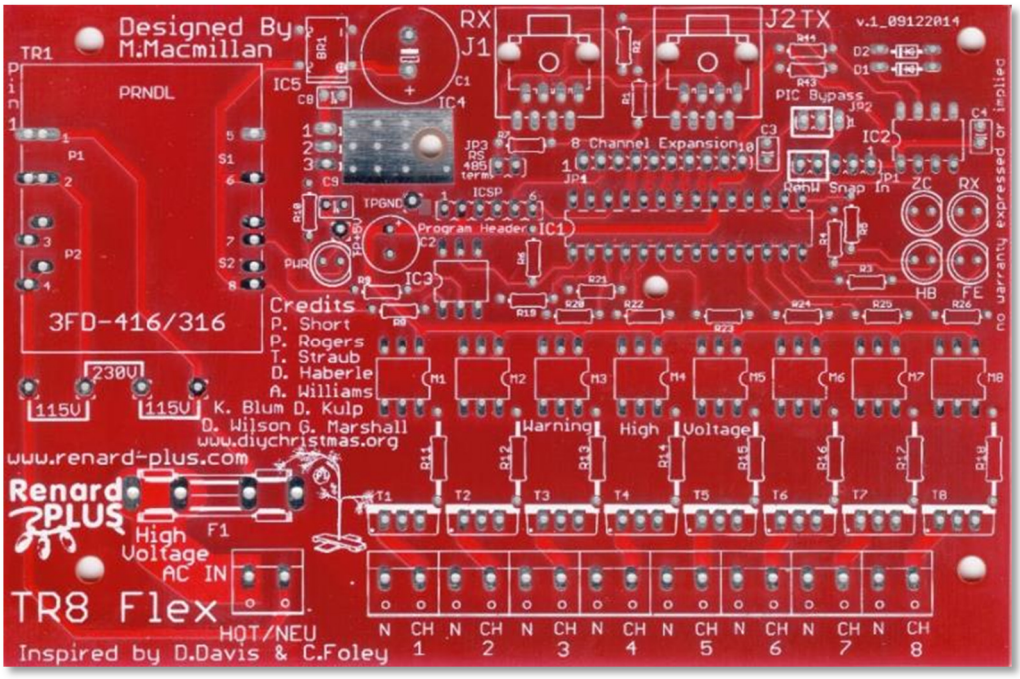
TR8 Flex Controller



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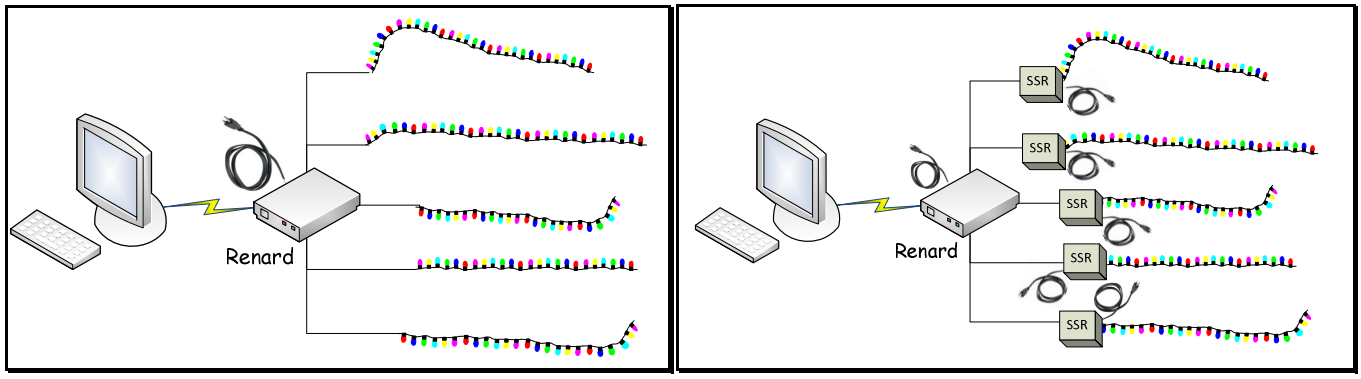
1. Introduction to Renard

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 '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).



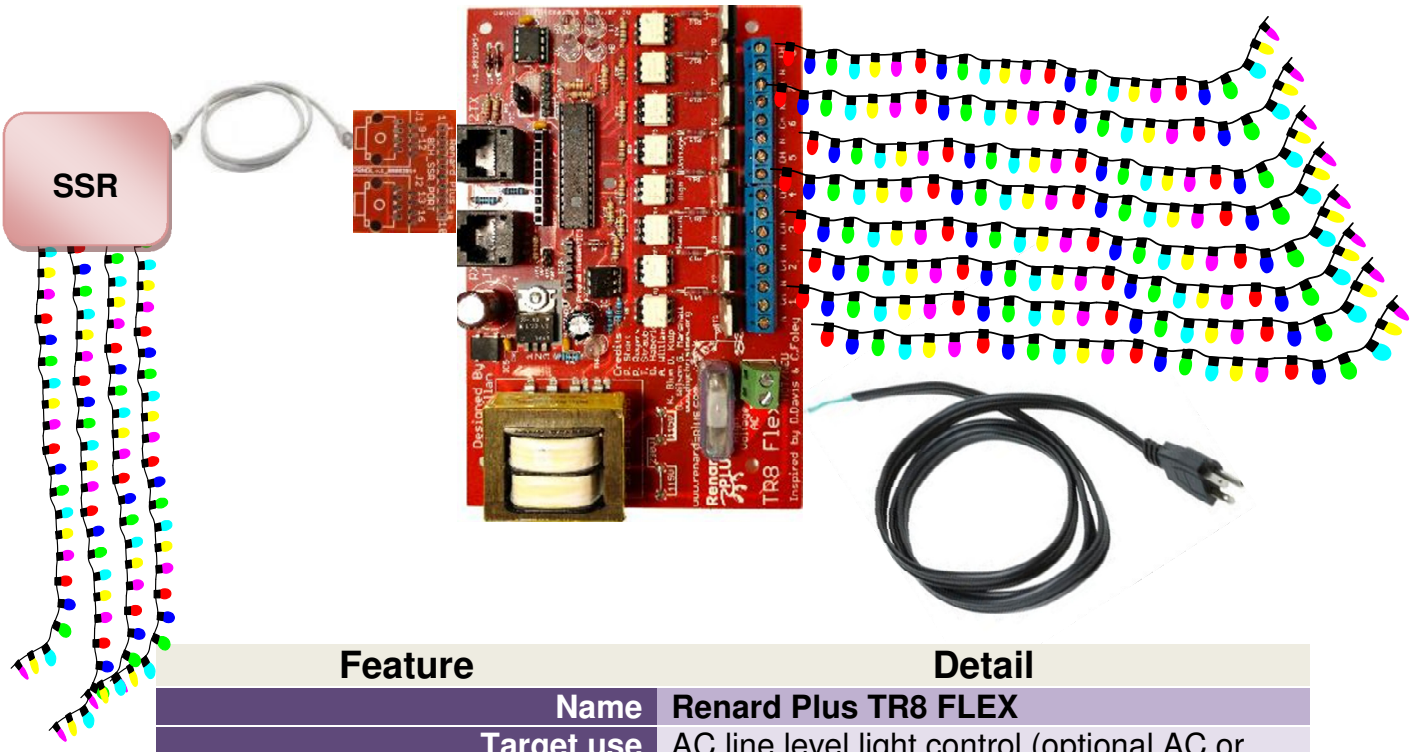
Example Renard configurations

Output of the Renard can be control signals (to an SSR), direct AC line voltage (110, 100/220, or 220), DC voltage or a combination of these 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 TR8 FLEX

This guide covers the Renard Plus TR8 FLEX. This board is designed to take "Renard" serial or DMX communications (depending on firmware used) via wired RS485 or special wireless from a control computer, and output 8 line level AC channels to directly power lights/and light strings. It also has an option (through a snap-in board) to control an additional 8 channels of SSRs (AC and/or DC) or LSD control (the FLEX part). All 16 outputs are individually controllable/dimmable channels.



Feature	Detail
Name	**Renard Plus TR8 FLEX**
Target use	AC line level light control (optional AC or DC with SSR expansion board)
Channel Count	8 on-board AC + 8 optional control
Power input	110v or 220v line level AC
Power output	Yes – direct line level AC out – 1 bank @ 15A max, 4A max per channel up to board max
Dimmable?	YES – PWM
Status Indicators?	YES
Channel Indicators?	NO – retro fit is possible for on-board
Control Input – Renard	YES – RS485, RS232 or optional wireless
Control Input – DMX	YES
Daisy-chain output	YES – Renard RS485 pinout
Wireless	Option – w/add-on Wireless Snap-In board
On board programming	Yes through ICSP connector
Enclosure	CG500 or larger.
Heatsink?	Optional – see template for TR16 and cut in half

3. Assembly Instructions

This section covers the construction of the Renard Plus TR8 FLEX 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 TR8 FLEX BOM / Parts List

The following is the Bill Of Material for building the Renard Plus TR8 FLEX projects. The link to the Mouser projects are

TR8 Flex:
http://www.mouser.com/ProjectManager/ProjectDetail.aspx?AccessID=3780bb115d

Flex Expansion SSR:
http://www.mouser.com/ProjectManager/ProjectDetail.aspx?AccessID=6d2dc70922

Flex Expansion LSD:
http://www.mouser.com/ProjectManager/ProjectDetail.aspx?AccessID=ad79797439

Note: If you did not obtain a complete parts kit (some lighting vendors may 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	Description	TR8		SSR		LSD		Mouser P/N
		Qty	Location	Qty	Location	Qty	Location	
	1k ohm resistor 1/8 watt Brn-Blk-Red	5	R1, R2, R8, R9, R10					299-1k-RC http://www.taydaelectronics.com/resistors/1-4w-carbon-film-resistors/10-x-resistor-1k-ohm-1-4w-5-carbon-film-pkg-of-10.html
	330 ohm resistor 1/8 watt Org-Org-Brn	3	R3, R4, R5					299-330-RC http://www.taydaelectronics.com/resistors/1-4w-carbon-film-resistors/10-x-resistor-330-ohm-1-4w-5-carbon-film-pkg-of-10.html
	10k ohm resistor 1/8 watt Brn-Blk-Org	1	R6					299-10k-RC http://www.taydaelectronics.com/resistors/1-4w-carbon-film-resistors/10-x-resistor-10k-ohm-1-4w-5-carbon-film-pkg-of-10.html
	120 ohm resistor 1/8 watt Brn-Red-Brn	1	R7					299-120-RC http://www.taydaelectronics.com/resistors/1-4w-carbon-film-resistors/10-x-resistor-120-ohm-1-4w-5-carbon-film-pkg-of-10.html
	180 ohm resistor 1/8 watt Brn-Gry-Brn	8	R11-18					299-180-RC http://www.taydaelectronics.com/resistors/1-4w-carbon-film-resistors/10-x-resistor-180-ohm-1-4w-5-carbon-film-pkg-of-10.html
	680 ohm resistor 1/8 watt Blu-Gry-Brn	8	R19 - 26					299-680-RC http://www.taydaelectronics.com/resistors/1-4w-carbon-film-resistors/10-x-resistor-680-ohm-1-4w-5-carbon-film-pkg-of-10.html
	27k ohm resistor 1/8 watt Red-Vio-Org	2	R43, R44					299-27k-RC http://www.taydaelectronics.com/resistors/1-4w-carbon-film-resistors/10-x-resistor-27k-ohm-1-4w-5-carbon-film-pkg-of-10.html
	820 ohm resistor 1/8 watt Gry-Red-Brn					8	R35-42	299-820-RC http://www.taydaelectronics.com/resistors/1-4w-carbon-film-resistors/10-x-resistor-820-ohm-1-4w-5-carbon-film-pkg-of-10.html

Picture	Description	TR8		SSR		LSD		Mouser P/N
		Qty	Location	Qty	Location	Qty	Location	
	1N5239 (9.1v) zener diode	1	D1					78-1N5239B http://www.taydaelectronics.com/diodes/zener/1n4739a-1n4739-zener-diode-9-1v-1w.html
	1N5229 (4.3v) zener diode	1	D2					78-1N5229B http://www.taydaelectronics.com/diodes/zener/1n4731-zener-diode-1w-4-3v.html
	1000uf 25V Electrolytic Cap	1	C1					647-UVZ1E102MPD http://www.taydaelectronics.com/capacitors/electrolytic-capacitors/1000uf-50v-105c-radial-electrolytic-capacitor-13x26mm.html
	220uf 25V Electrolytic Cap	1	C2					647-UVZ1E221MPD http://www.taydaelectronics.com/capacitors/electrolytic-capacitors/220uf-25v-105c-radial-electrolytic-capacitor-8x11mm.html
	.1uf/100nf ceramic bypass cap	5	C3, C4, C5, C8,C9					81-RDER71H104K0S1C03 http://www.taydaelectronics.com/capacitors/monolithic-ceramic-capacitor/0-1uf-50v-multilayer-ceramic-capacitor.html
	Terminal Blocks 5.08MM PCB	9	CH1-CH8, AC/NEU					571-2828372 http://www.taydaelectronics.com/connectors-sockets/terminal-blocks/pcb-mount/dg301-screw-terminal-block-2-positions-5mm.html
	Modular Jack 8 pin PCB TOP ENTRY	2	J1-J2	2	J1-J2	2	J1-J2	571-5556416-1
	28 pin IC Socket (optional)	1*	IC1					571-1-390261-9 http://www.taydaelectronics.com/connectors-sockets/sockets/dip-sockets/28-pin-dip-ic-socket-adaptor-solder-type.html
	8 pin IC socket (optional)	1*	IC2					517-4808-3004-CP http://www.taydaelectronics.com/connectors-sockets/sockets/dip-sockets/8-pin-dip-ic-socket-adaptor-solder-type.html
	6 pin IC sockets (optional)	9*	M1-M16, IC3					571-1-2199298-1 http://www.taydaelectronics.com/connectors-sockets/sockets/dip-sockets/6-pin-dip-ic-socket-adaptor-solder-type.html
	16 (or more) pin header cut to fit	1	ICSP, JP1, JP2, JP3	1	10 pin on back side of board	1	10 pin on back side of board	571-1-826646-6 http://www.taydaelectronics.com/connectors-sockets/pin-headers/40-pin-2-54-mm-single-row-pin-header-strip.html
	Shunts / Jumper Plug	3	JP1, JP2, JP3					649-63429-202LF http://www.taydaelectronics.com/connectors-sockets/pin-headers/mini-jumper-2-54mm-gold-plated-closed-cover.html
	10 pin FEMALE 1x10 (8Fx1)	1	JP4					517-929870-01-10-RA http://www.taydaelectronics.com/connectors-sockets/pin-headers/5-pin-2-54-mm-single-row-female-pin-header.html
	LM7805CT voltage regulator	1	IC4					512-LM7805CT http://www.taydaelectronics.com/lm7805-l7805-7805-voltage-regulator-ic-5v-1-5a.html
	Triac 6AMP snubberless BTA06-600CW	8	T1-T8					511-BTA06-600CW
	Transistor 2N2222AG					8	T11-16	863-PN2222AG
	PIC Microcontrollers (MCU) 48KB 3968	1	IC1					579-PIC18F2525-I/SP
	65LBC179	1	IC2					595-SN65LBC179P
	H11AA1	1	IC3					782-H11AA1
	Triac Output Opto MOC3023	8	M1-M8					859-MOC3023 http://www.taydaelectronics.com/moc3023-moc3023m-3023-triac-scr-output-optocoupler-ic.html

Picture	Description	TR8		SSR		LSD		Mouser P/N
		Qty	Location	Qty	Location	Qty	Location	
	4 pin Bridge rectifier 1amp dip	1	BR1					625-DF02MA-E3
	Yellow 3 MM LED	1	Status					78-TLHE4600 http://www.taydaelectronics.com/leds/round-leds/3mm-leds/yellow.html
	Red 3 MM LED	3	Power, HB, ZC					78-TLHF4600 http://www.taydaelectronics.com/leds/round-leds/3mm-leds/led-3mm-red.html
	Green 3 MM LED	1	RX/TX					78-TLHG4405 http://www.taydaelectronics.com/leds/round-leds/3mm-leds/led-3mm-green.html
	Fuse Clips and Holders 5 MM	2	F1					534-3517 http://www.taydaelectronics.com/circuit-protection/fuses/fuse-holders/fuse-holder-with-cover-5x20mm-m205-pcb-15a.html
	5mm x 20mm Fast Acting Fuse 125VAC 15Amp	1	F1					504-GMA-15-R http://www.taydaelectronics.com/circuit-protection/fuses/fuse-glass-fast-blow-acting-15a-250v-m205-5x20mm.html
	Fuse Cover (Optional)	1 Opt	F1					534-3527C
	Transformer: Pri.=115/230volts , Sec.=8volts 800ma.	***1***	TR-1					838-3FD-416 (Note: See other options)

Example cost savings (at time of publishing – prices may change!):

Mouser xxx-xxx-xxxx 36 pin header = $0.80
Mouser 512-LM7805CT 5v Regulator = $0.69
Mouser 78-TLHG4405 3MM Green LED = $0.47
Mouser 504-GMA-15-R 15a Fast Fuse = $1.94
Mouser 859-MOC3023 x8 = $3.52

Tayda 40 pin 2.54MM Header Strip = $0.15 (spares for other projects!)
Tayda LM7805 5v Regulator = $0.23
Tayda 3mm Green LED = $.02 (red and Yellow are $.02 also)
Tayda 15A Fast Acting Fuse = $0.18
Tayda MOC3023 x8 = $2.32

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 TR8 FLEX Heatsink

None

3.1.3 TR8 FLEX Enclosure

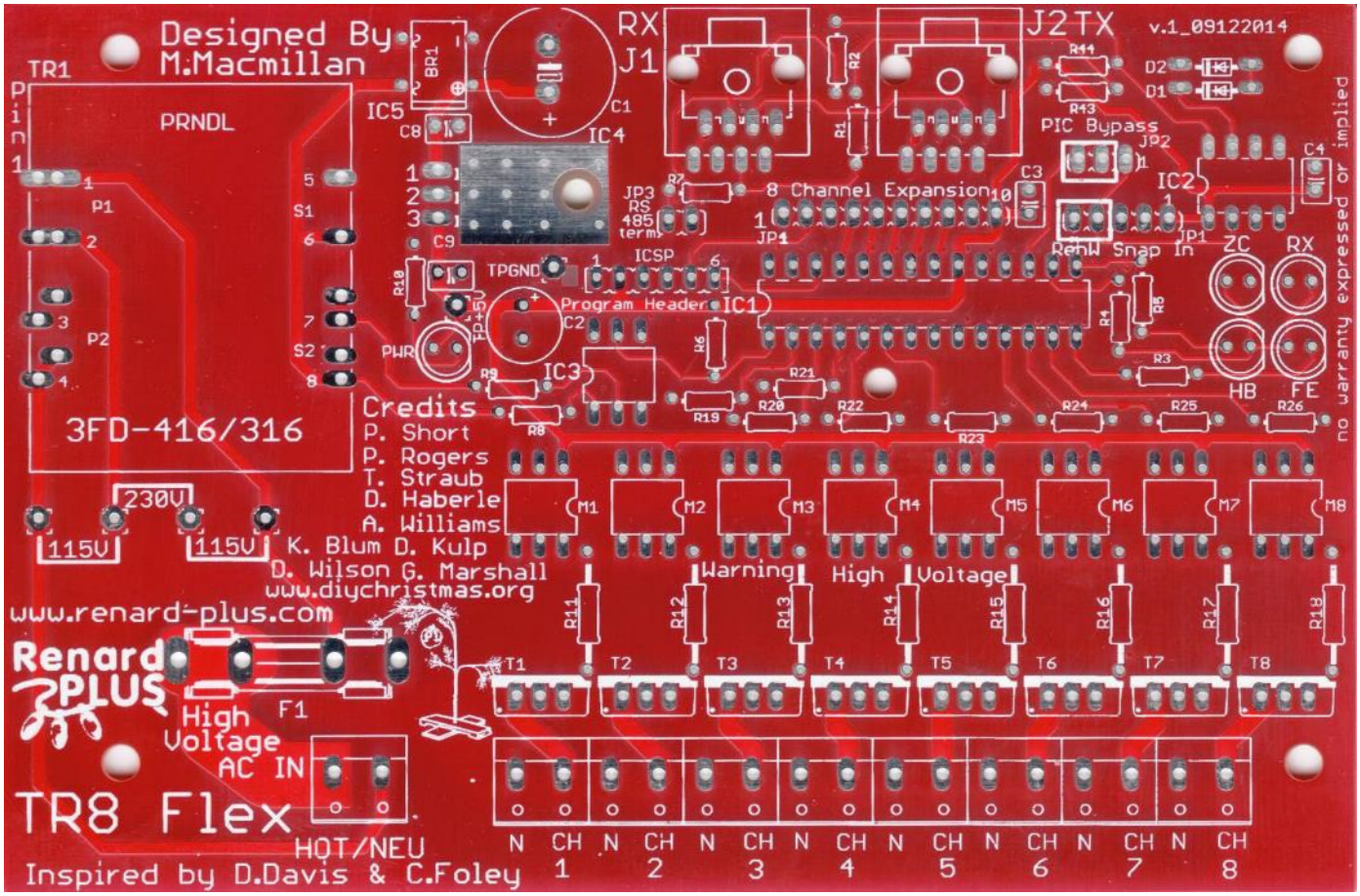
	TR8 FLEX
	CG500

3.2 TR8 Flex Parts Assembly

The Renard Plus TR8 FLEX 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.



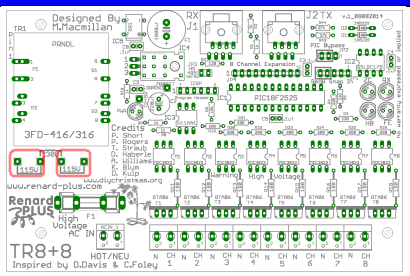
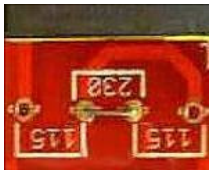
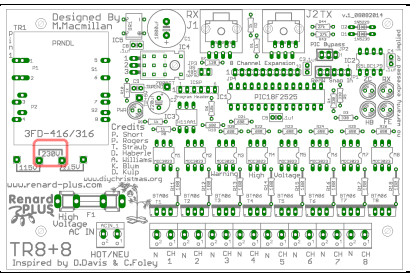
2. Next inspect and sort out the various parts for the board. Make sure you understand which parts are which, and things like resistor codes and component orientation. A separate document on these concepts is available at
   www.renard-plus.com/files/Tools_and_Parts_ID_Guide.pdf
   and on other resource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

3.3 TR8 FLEX Assembly Guide

Generally, the following component assembly order is grouped from shortest to tallest parts to make assembly easier. Special instructions for component orientation should be listed if a component has any. Don't stress it- we try to make this as easy as possible!

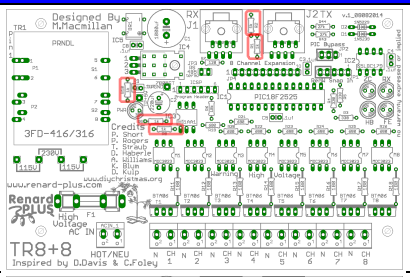
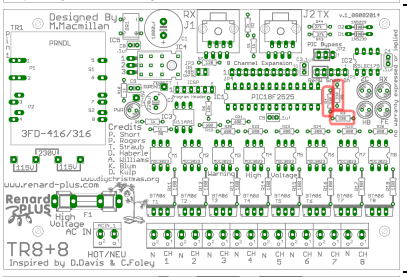
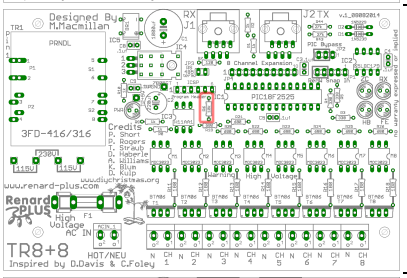
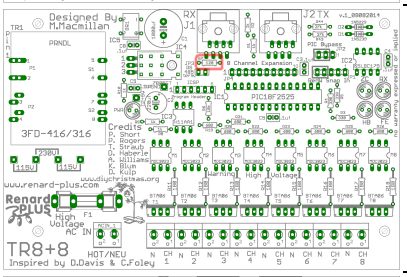
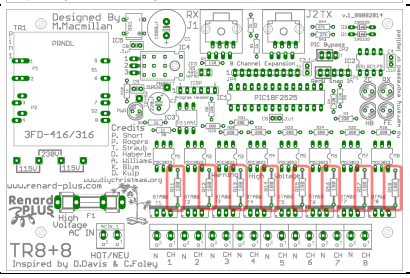
3.3.1 Select Voltage Setting

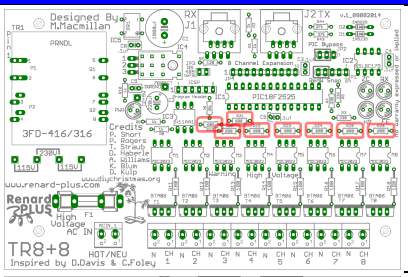
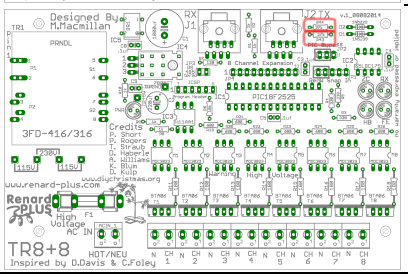
If you are using a dual voltage transformer from the list of transformer options (typically the 3FD versions), you have the option of strapping the on board power supply to operate from a line voltage of "115" (110-120 VAC) or "230" (220-240 VAC) line voltage. You must only strap one option (Note: the "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	TR8 FLEX
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.* 	

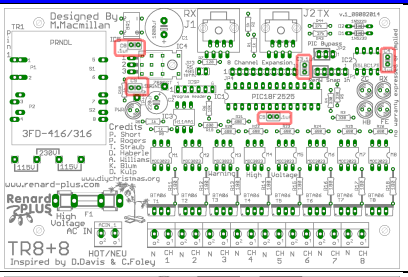
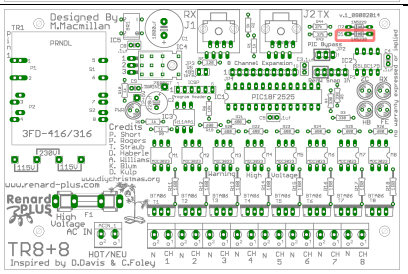
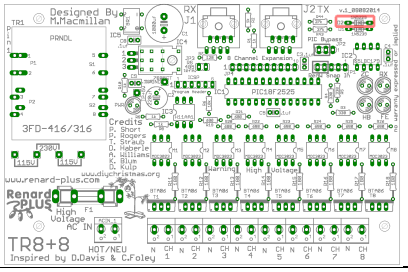
3.3.2 **Install Resistors**

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	TR8 FLEX
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.	
6 ☐	Install the 180 ohm resistor (brown-gray-brown) at locations R11-R18. Solder and clip leads.	

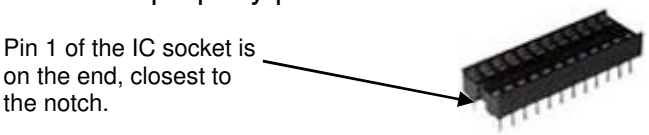
Step	Instructions	TR8 FLEX
7 ☐	Install 680 ohm resistors (blue-gray-brown) at locations R19-R26. Solder and clip leads.	
8 ☐	Install 27k ohm resistors (red-violet-orange) at locations R43, R44. Solder and clip leads.	

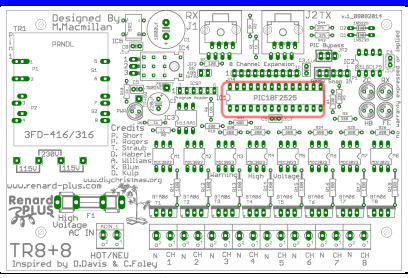
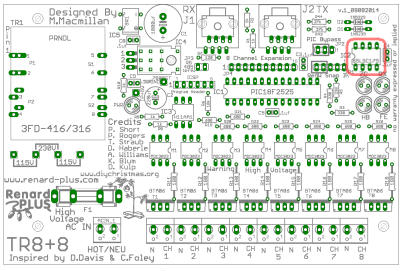
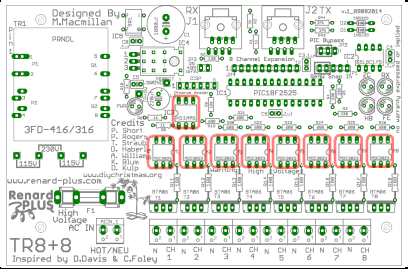
3.3.3 **Install By-pass Caps and Diodes**

Step	Instructions	TR8 FLEX
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 DO 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 as shown).* 	
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**

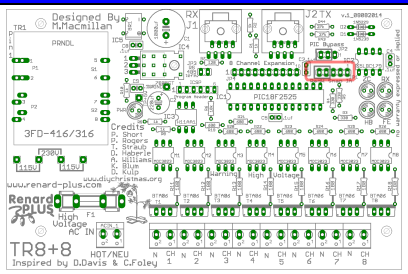
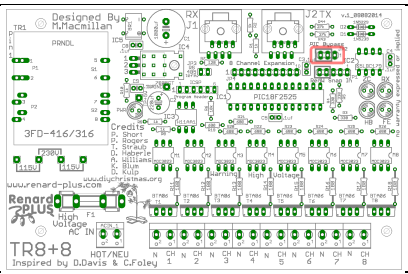
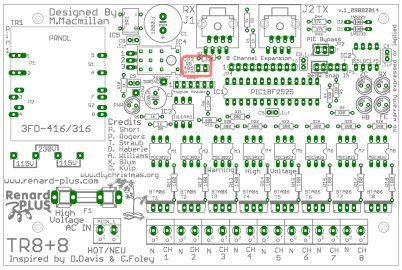
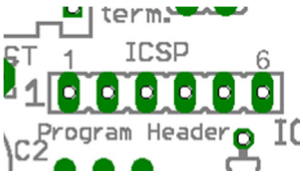
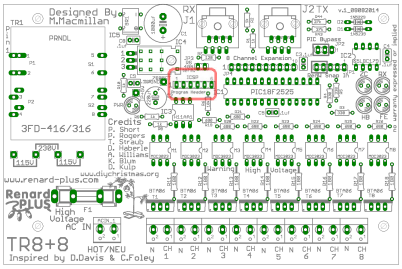
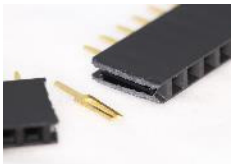
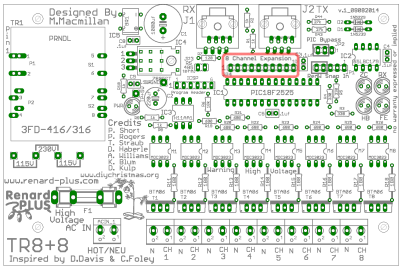
Even though sockets are optional we strongly recommend that sockets be used on all of the IC's. This allows easier testing, debug and repair down the road. Sockets should be installed with the Pin 1 of the socket aligned to the square solder pad on the PCB. If you get a socket backwards, it will work, 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.



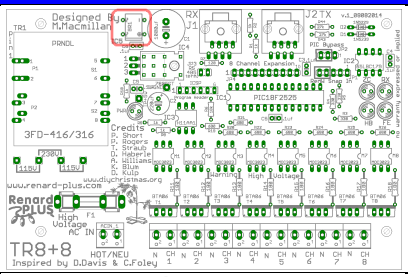
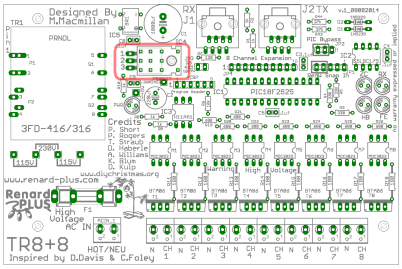
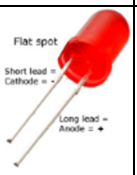
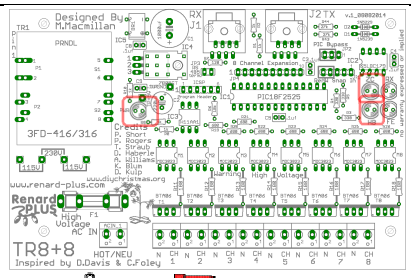
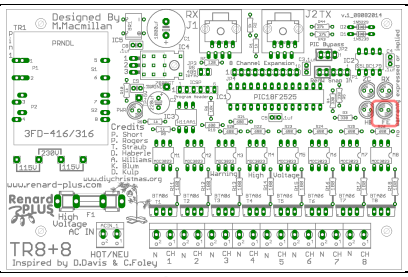
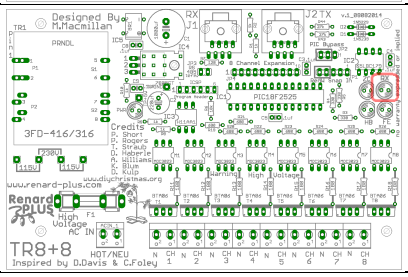
Step	Instructions	TR8 FLEX
12 ☐	Install the 28 pin IC socket at location IC1. Solder.	
13 ☐	Install the 8 pin IC socket at location IC2. Solder	
14 ☐	Install the 6 pin IC sockets at locations M1-M16, and IC3. Solder	

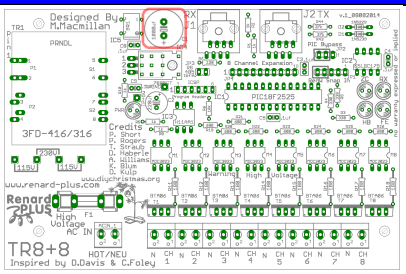
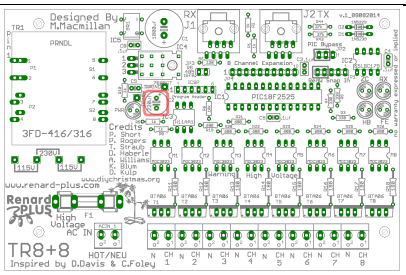
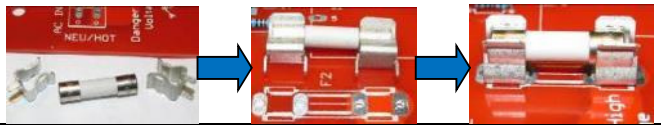
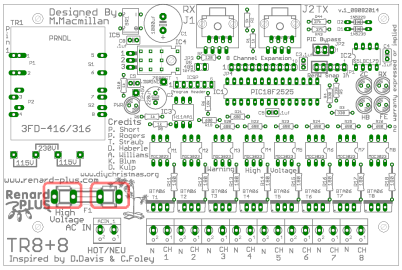
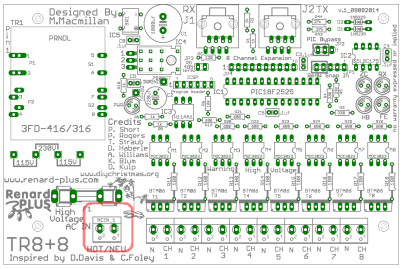
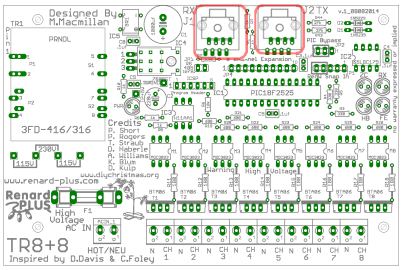
3.3.5 **Install IC Headers**

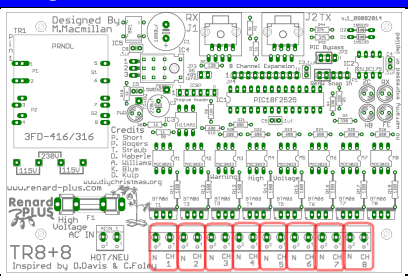
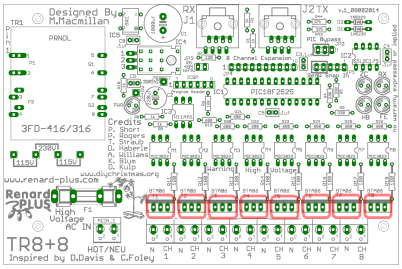
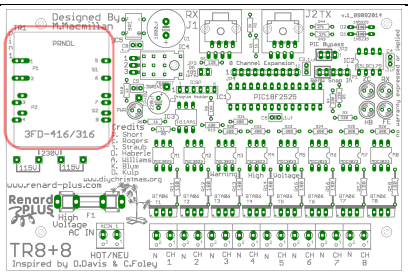
You may have purchased either a single 16 pin header or headers cut according to the board specifications. If you followed the BOM, you will have a single 16/26 pin (or more) header that needs to be cut into the appropriate lengths.

Step	Instructions	TR8 FLEX
15 ☐	Install 5 pin male 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 male header at location JP2 / PIC Bypass. Solder Install a jumper on the two left most pins of the header indicated on the silkscreen.  as	
17 ☐	Install 2 pin male 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 male header at location ICSP. Solder. 	
19 ☐	Install 10 pin FEMALE header at location JP4 “8 Channel Expansion”. Solder. *Note: you may need to cut down a larger connector to 5 pins. Using diagonal cutters, cut on the 6th pin position to get 5 pins.*  	

3.3.6 **Install Misc. Parts**

Step	Instructions	TR8 FLEX
20 ☐	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 right hand side as shown.*	
21 ☐	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. 	  
22 ☐	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 PWR, HB and ZC as shown.*	
23 ☐	Install the yellow LED at location FE. Solder and clip leads.  *Note: This part has a specific orientation. The negative lead near the flat spot goes in the in the right hole.*	
24 ☐	Install the green LED at location RX. Solder and clip leads.  *Note: This part has a specific orientation. The negative lead near the flat spot goes in the in the upper hole.*	

Step	Instructions	TR8 FLEX
25 ☐	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.*	
26 ☐	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.*	
27 ☐	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.* 	
28 ☐	Install 1 terminal block at the AC IN (ACIN_1) location HOT/NEU location. Solder. *Note: The terminal blocks must be oriented facing outward.*	
29 ☐	Install the 2 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.*	

Step	Instructions	TR8 FLEX
30 ☐	Install the remaining terminal blocks at locations CH1 – CH8. Solder. *Note: The terminal blocks must be oriented facing outward.*	
31 ☐	Install the 8 Triacs in locations T1 – T8. Solder and clip leads. *Note: These parts have a specific orientation. The thicker black line on the part location indicates where the silver tab on the part should go. The tab side of the Triac should be up towards the center of the board as shown and illustrated in the silk screen.*	
32 ☐	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.

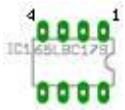
If you have any of the IC's (IC1, IC2, IC3, M1-M16) installed – **remove them now**.

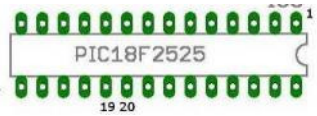
Connect a line cord (either 115v or 230v AC) to the "line in" terminal ACIN-1 (the one toward closest to the CH1 connector location.

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.

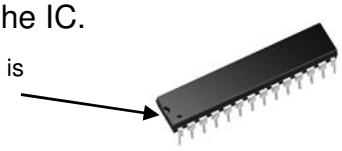
When power measures properly, disconnect power and continue assembling.

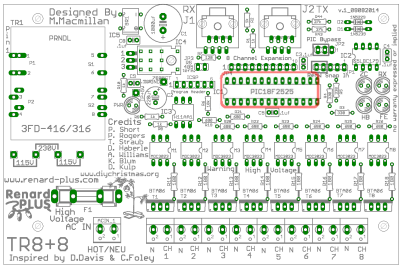
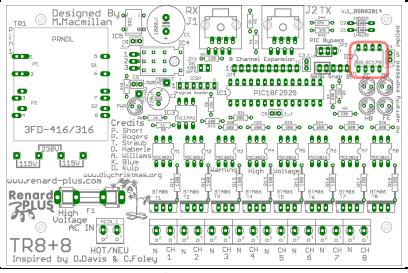
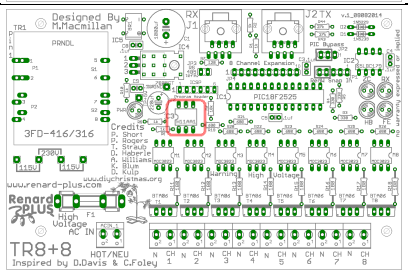
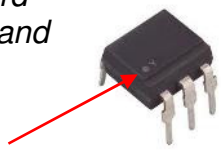
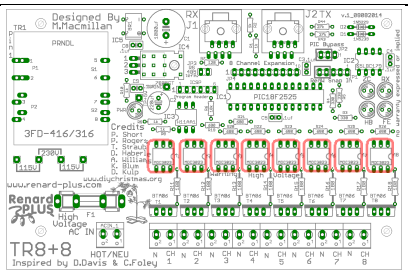
3.3.8 **Install IC's**

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.

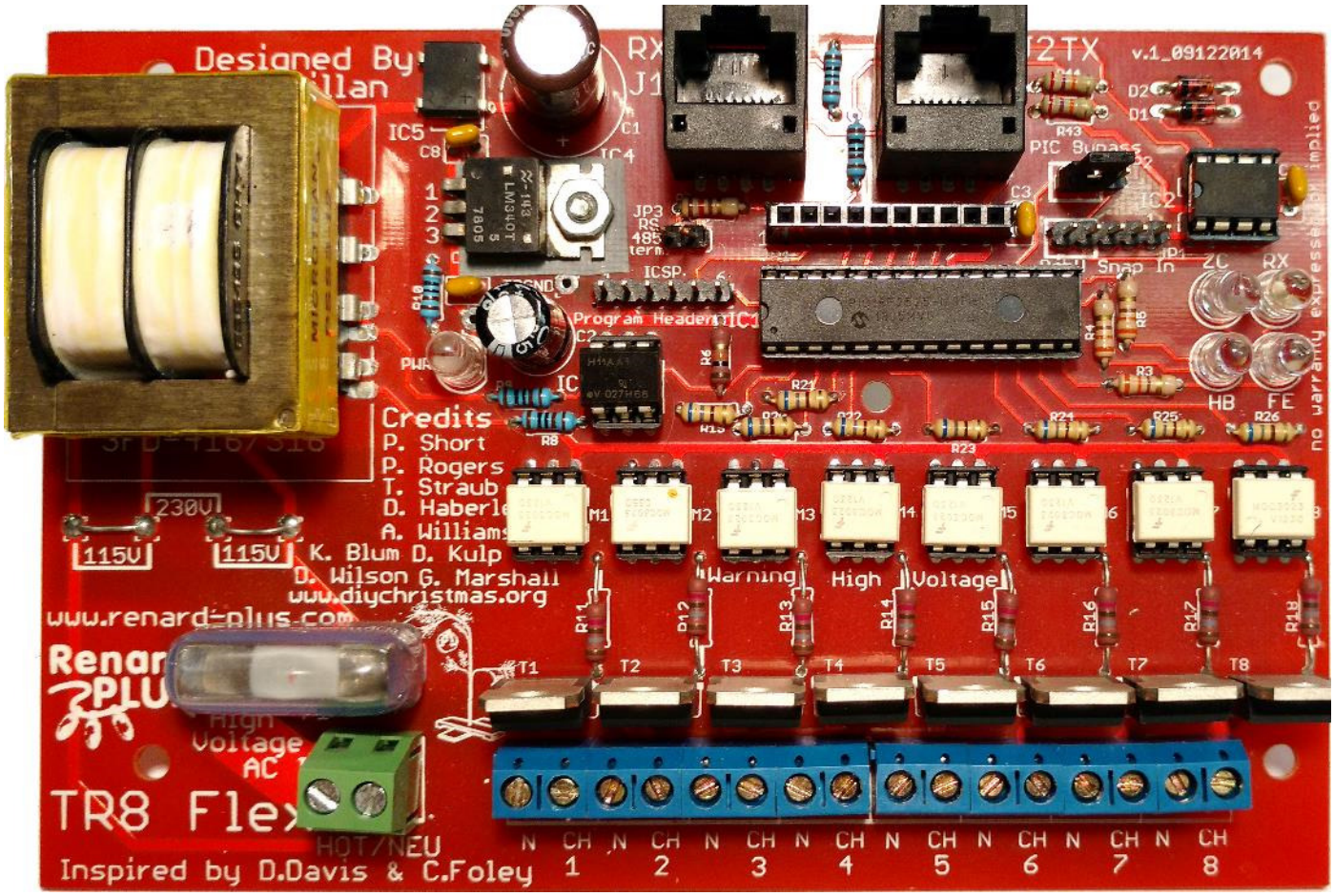
Pin 1 of the IC socket is on the end, closest to the notch.



Step	Instructions	TR8 FLEX
33 ☐	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.*	
34 ☐	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.*	
35 ☐	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.*	
36 ☐	Install 6 pin **MOC3023** optocouplers at M1– M8. *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 8CH_SSR_Port Flex Snap-In 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

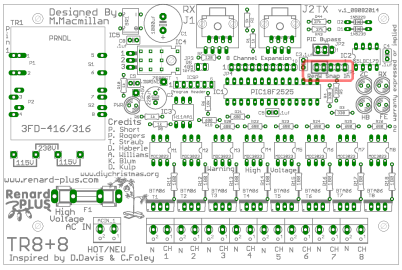
*Note: The Renard Plus TR8 FLEX **does not** use the default Renard firmware used on other Renard devices. Make sure you use the Renard Plus version of the code indicated on the Renard-Plus.com website! Look for the "RPTR8Flex" version specific to your application- like if you will be adding the optional SSR, select the hex file from the code folder marked RPTR8Flex SSR_xxxxxx. There is firmware available for either Renard serial operation, or DMX.*

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 PicketIII or PicKit2. Programming PIC's using standard assembly is written up in our PIC Programming Manual available at http://renard-plus.com/files/Pic%20Programming%20Guide.pdf .

4.2 Jumper Settings / Headers

4.2.1 JP1 Wireless Header

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

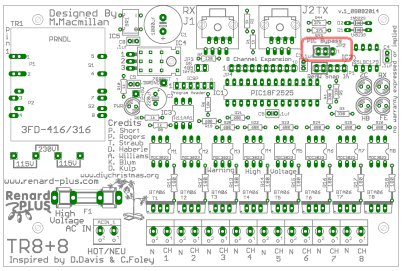


Pin Layout
1 = +5VDC
2 = N/C
3 = GND
4 = RX from 485 chip
5 = RX in to PIC

Option - Xbee using Snap-in Board

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

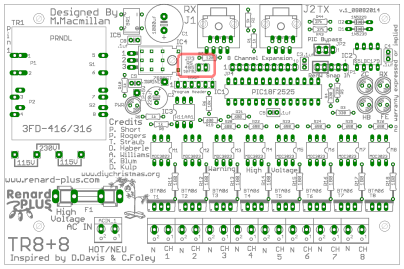
4.2.2 JP2 PIC Bypass / DMX



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. For DMX, jumper 1 & 2.

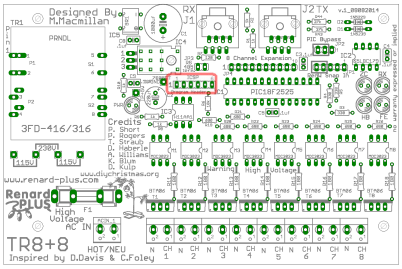
Pin Layout
1 = Data In From RS485 IC **2** = Data Out to RS485 IC **3** = Data Out from PIC

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. If you are using DMX, and this is the last controller in the daisy-chain of devices, place a jumper on this option.

4.2.4 Programming (ICSP Header)

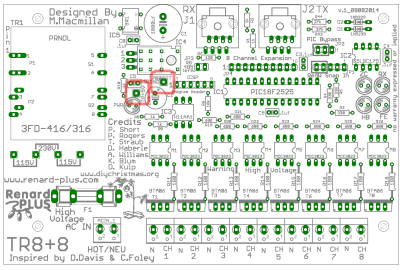


This header allows the PIC to be programmed while the PIC is installed on the board

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

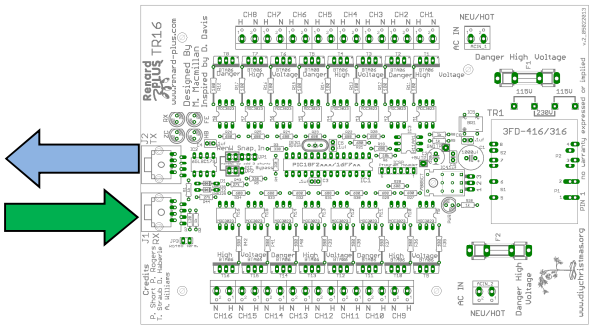


These location allow you easy spots to get a ground reference or +5V DC while testing or debugging the board. You can place the tip of the black negative lead of your DMM on “GND TP” to get ground and the red lead on the “5V TP” to measure the board +5 power. If you wish to be able to attach to these 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.

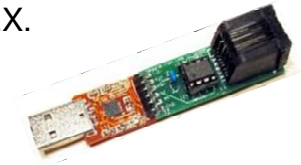
J2 TX	RS485 outgoing data to next controller
J1 RX	RS232/485 incoming data from either a serial port/ RS485 converter/DMX dongle, or another Renard board.



The data wiring of the Renard Plus TR8 FLEX 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, TR8 FLEX 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.

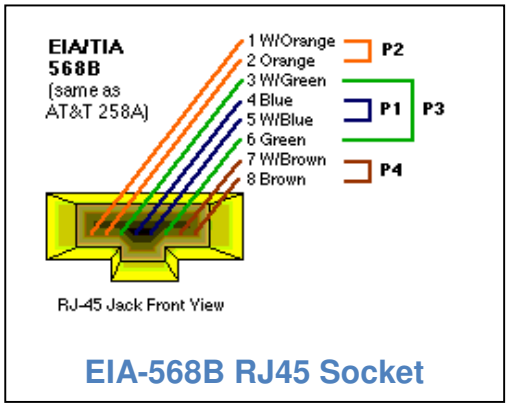
There are many options to connect your computer to the Renard Plus TR8 FLEX. Pictured here is the Renard Plus USB to RS485 adapter with an RJ45 output that connects directly to a Renard/Renard Plus controller with a standard Ethernet CAT5 cable. If selecting other RS485 adapters, look for ones that have a screw terminal to make your custom connection less difficult to handle.



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 (TR8 FLEX does not).



EIA-568B RJ45 Socket

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.

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!

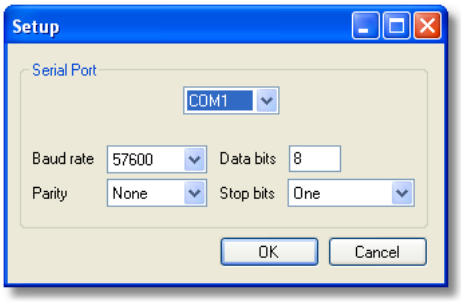
Signal	Renard RJ45	DMX RJ45
Data +	5	1
Data -	4	2
GND	1	8
GND	2	7

4.3.2 Computer Setup

If you are using the Vixen sequencing software to drive your Renard Plus with Renard firmware, 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.



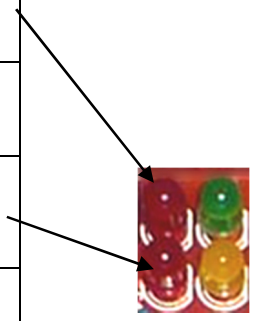
Suggested Renard Plug-In Settings

4.4 Final Testing

The Renard PlusTR8 FLEX 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.

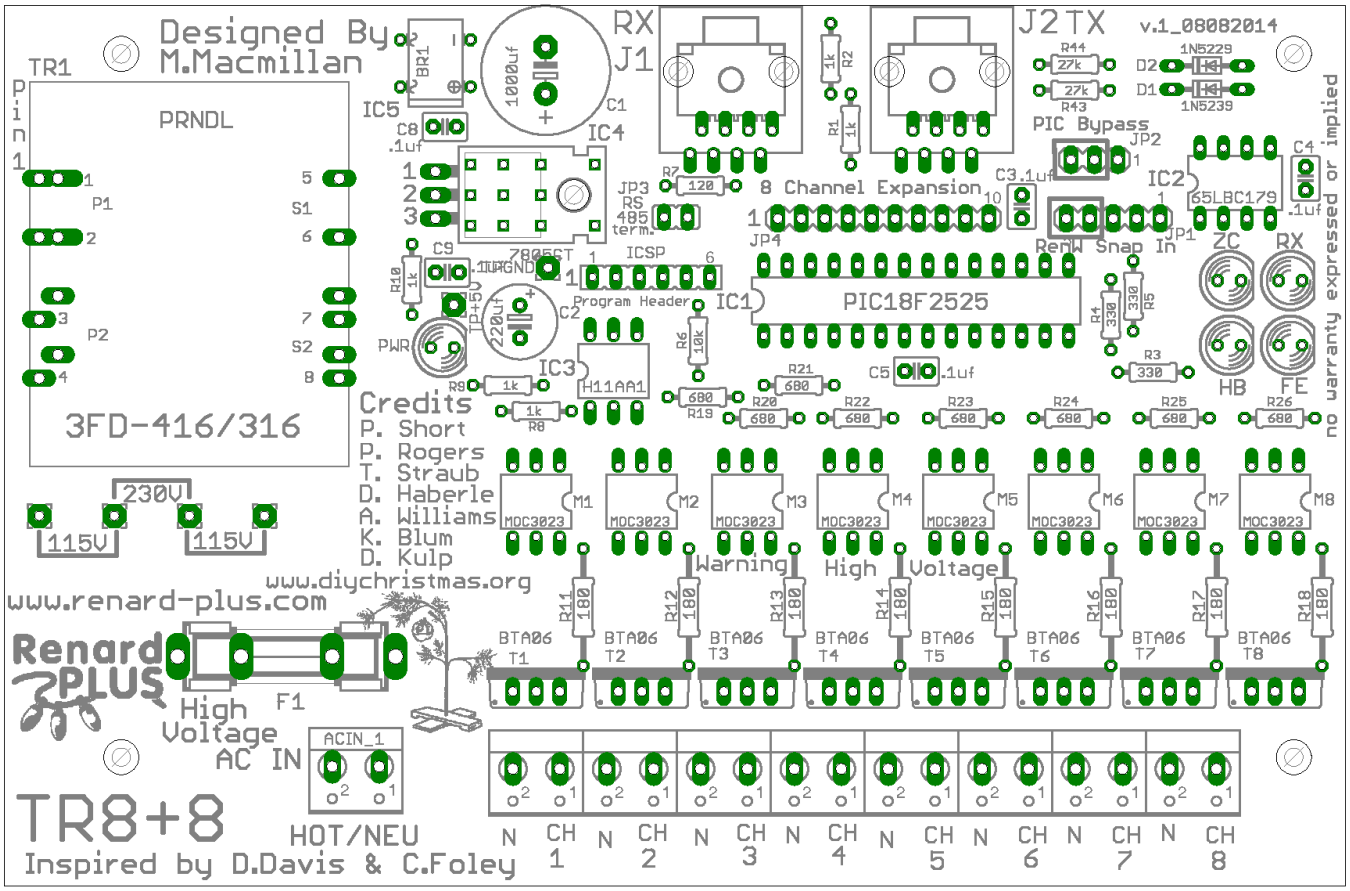
PWR	**Power** - Will be on when power is applied.	
ZC	**ZC** – **"Zero Cross"** Will be on when the AC "zero cross" is detected.	
RX	**RX** – **"Receive"** Active when a sequence is running.	
HB	**HB – "Heart Beat"** Blinks every few seconds to indicate the microprocessor is active.	
FE	**FE** – "Framing 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.

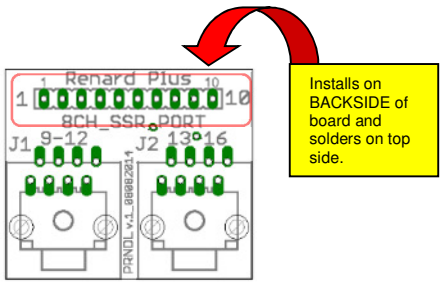
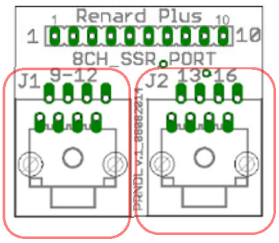
Congratulations, with a successful test, you have completed your build of your Renard Plus controller and are ready for the wonderful world of light animation sequencing!

5. Parts Placement Diagram



6. Flex Expansion – SSR Assembly

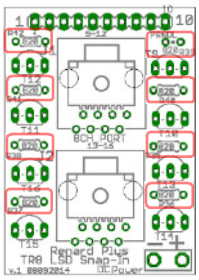
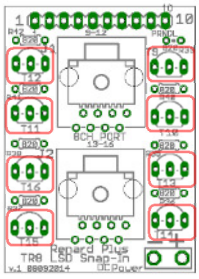
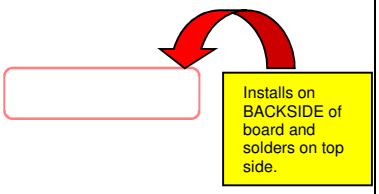
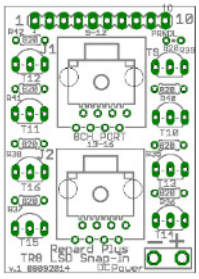
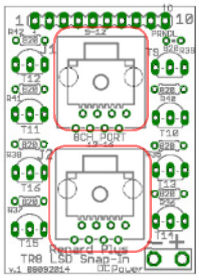
The SSR Expansion Board adds the ability to attach 8 more channels of SSR control to the TR8 Flex (thus the FLEX, as in Flexible, in the name). It is VERY simple and consists of the board and three additional parts.

Step	Instructions	SSR Expansion
1 ☐	Install 10 pin (10Mx1) MALE header on the BACK side of the board. Solder on top side.  *Note: The shorter pins go thru the board from the back! The longer pins of the male header will insert into the female connector on the expansion port of the TR8 board.*	
2 ☐	Install the 2 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.*	

Double check soldering for any solder bridges or cold solder joints and clean off any flux residue and it is ready to use. Just plug it into the TR8 Flex board expansion header and you have the ability to drive Renard SSRs (either DC or AC) for 8 additional channels. Pinout is standard Renard SSR RJ45 output.

7. Flex Expansion – LSD Assembly

The LSD Expansion module is designed to plug into the Expansion slot and provide higher current control needed for two RGB+W Floods or any other of that type of light control. The two outputs provide control for 4 channels on each connector for a total of 8 LSD channels which controls the two banks of RGB+W floods. The outputs are identical to the Renard Plus Simple RGB+W board that can be found here: http://renard-plus.com/renardplusrgbw.html but only two outputs are provided instead of the 8 that the Simple RGB+W board provides.

Step	Instructions	SSR Expansion
1☐	Install eight 820 ohm resistors (Grey-Red-Brown) at R35-R42	
2☐	Install eight 2n2222 NPN Transistors (or equiv) at T9-T16. *Note: Transistors do have a polarity. The flat side of the transistor should match the flat side shown on the silkscreen. Flat side toward bottom as shown on right.*	
3☐	Install 10 pin (10Mx1) MALE header on the BACK side of the board. Solder on top side.  *Note: The shorter pins go thru the board from the back! The longer pins of the male header will insert into the female connector on the expansion port of the TR8 board.*	 
4 ☐	Install the 2 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.*	

Double check soldering for any solder bridges or cold solder joints and clean off any flux residue and it is ready to use. Just plug it into the TR8 Flex board expansion header and you have the ability to drive two RGB+W flood lights like the DIYC Flood or others.

8. Notes

Use this page for YOUR notes about the boards.