
Reference for details:

Project: Microboone PMT to Laser PS Interlock System

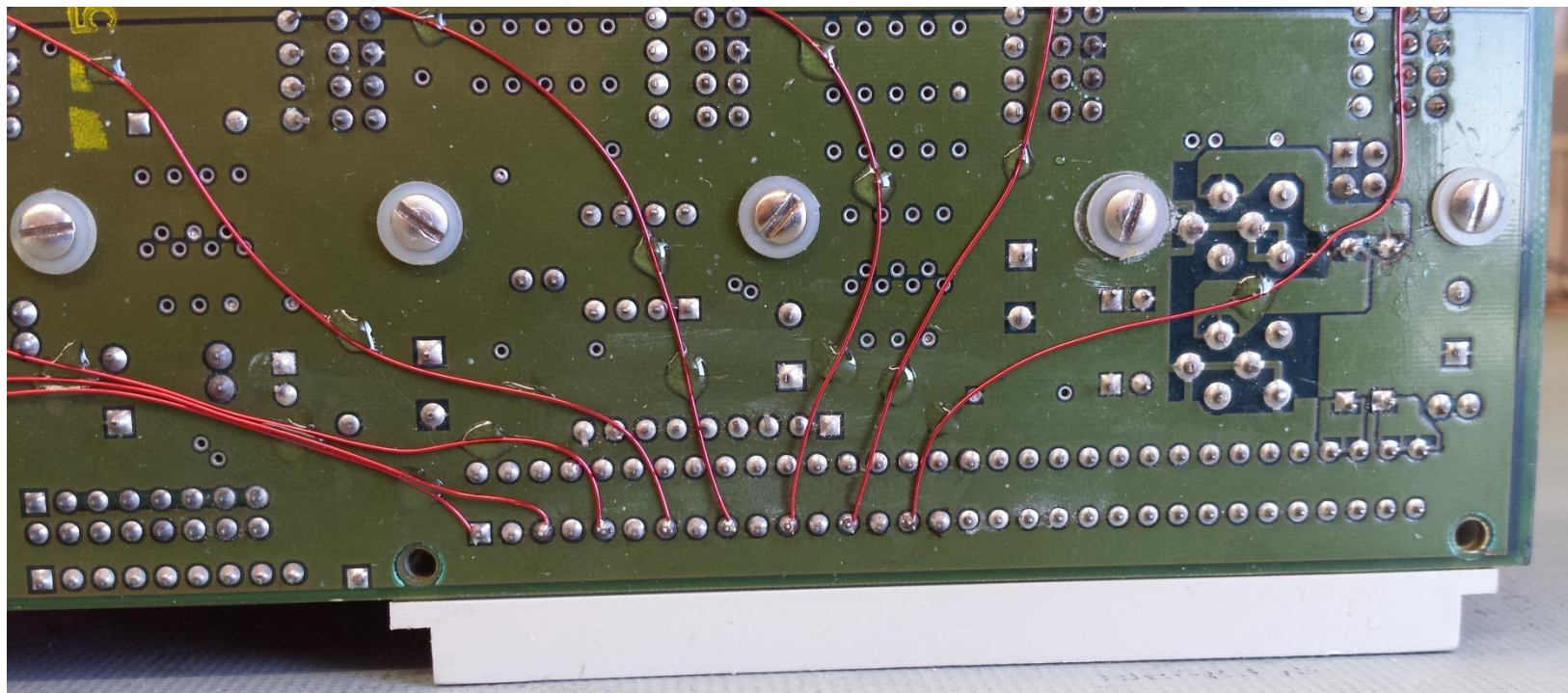
Doc. No: B060514PMT_Laser_Intlk

- The interlock system has three parts.
 1. The High Voltage Pod

Requires addition of wiring to bring the HV status to spare pins on the back plane connector
 2. Back plane DIN to Header Adapter

Provides a convenient way to get the signals to the Laser Interlock chassis on a 20 conductor twist-n-flat ribbon cable.
 3. Laser Interlock Chassis

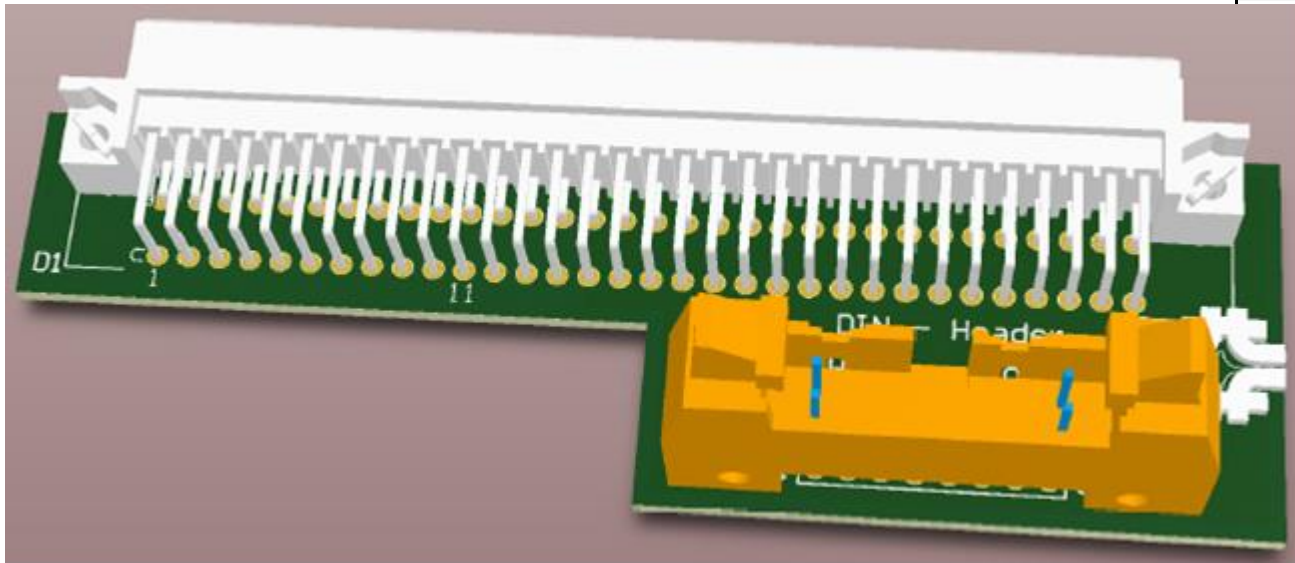
Logically gathers all the HV status, Argon liquid level and yet To Be Determined signals to provide an enable for two lasers.



Wires added to bring the On/Off status to the back plane connector.

- Fermilab Drawing Number 173931
 - Schematic
 - PCB
 - BOM

AS VIEWED FROM BOTTOM OF BOARD				
Signal	A	P02 on schematics		Return
Channel 7	A1	1	33	C1
	A2	2	34	C2
Channel 6	A3	3	35	C3
	A4	4	36	C4
Channel 5	A5	5	37	C5
	A6	6	38	C6
Channel 4	A7	7	39	C7
	A8	8	40	C8
Channel 3	A9	9	41	C9
	A10	10	42	C10
Channel 2	A11	11	43	C11
	A12	12	44	C12
Channel 1	A13	13	45	C13
	A14	14	46	C14
Channel 0	A15	15	47	C15
	A16	16	48	C16
	A17	17	49	C17
	A18	18	50	C18
	A19	19	51	C19
	A20	20	52	C20
	A21	21	53	C21
	A22	22	54	C22
	A23	23	55	C23
	A24	24	56	C24
	A25	25	57	C25
	A26	26	58	C26
	A27	27	59	C27
	A28	28	60	C28
	A29	29	61	C29
	A30	30	62	C30
	A31	31	63	C31
	A32	32	64	C32

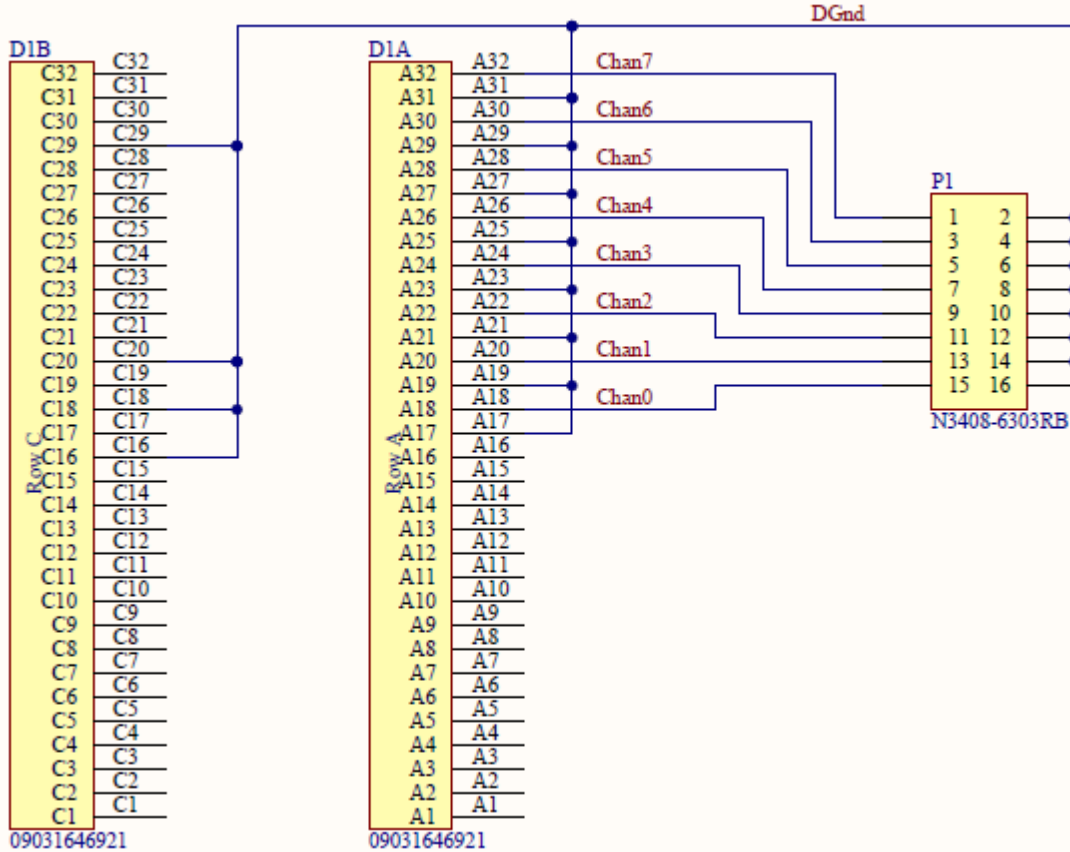


DIN-Header Adapter

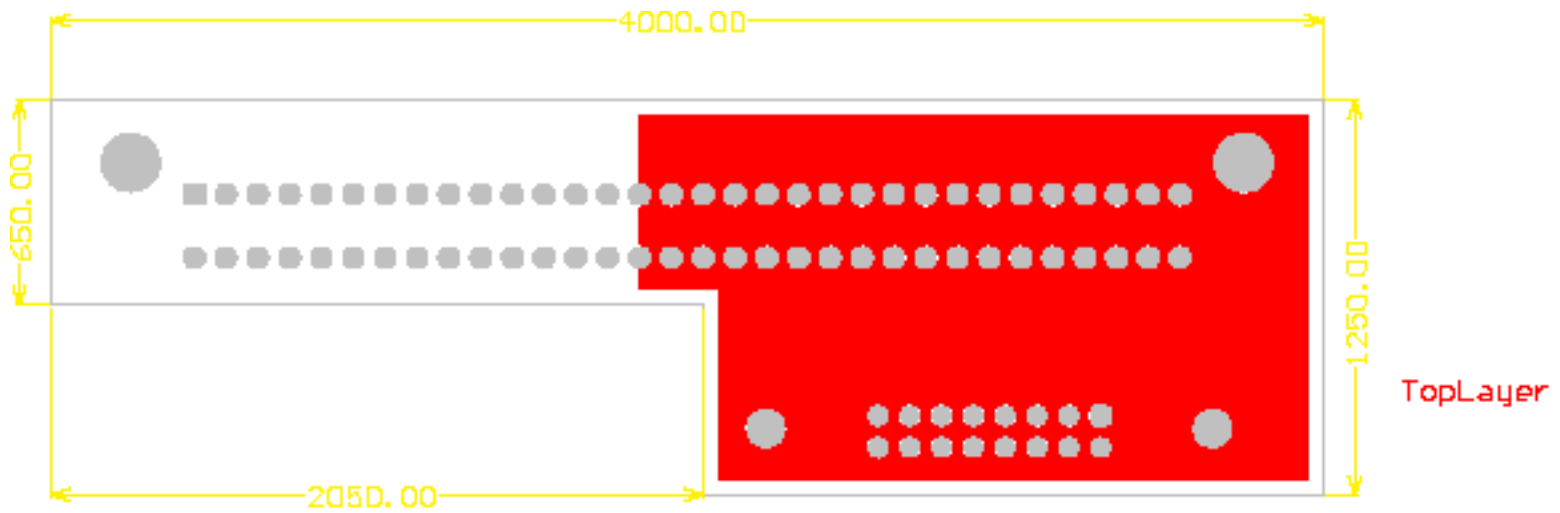
Male



Female



NOTE: Because we are mating with pins on the back plane the order of the pins will be reversed.



Clickable PDF object

Component list

Laser Intlk DIN-Header Adapter

Source Data From:

Backplane2TwistnFlat.SchDoc

Project:

Backplane2TwistnFlat.PrjP

Variant:

CB

None

Report Date: 11/11/2014

7:27:19 AM

Print Date: 21-Nov-14

8:00:24 AM

#	Designator	Description	Manufacturer	PartNumber	Comment	Quantity
1	D1	Conn DIN 41612 PL 96 POS Female Solder RA Thru-Hole	HARTING	09031646921	09031646921	1
2	P1	Connector Male Header, 8-Pin, Dual row	3M	N3408-6303RB	N3408-6303RB	1
3	W	Twist-n-Flat cable, 16 conductor	3M	MC16F-100	MC16F-100-ND	1
4	J1, J2	IDC 16pin female connector w/strain relief	3M	MKC16A, MKSR16	MKC16A-ND, MKSR16-ND	2
Approved						2
Notes						

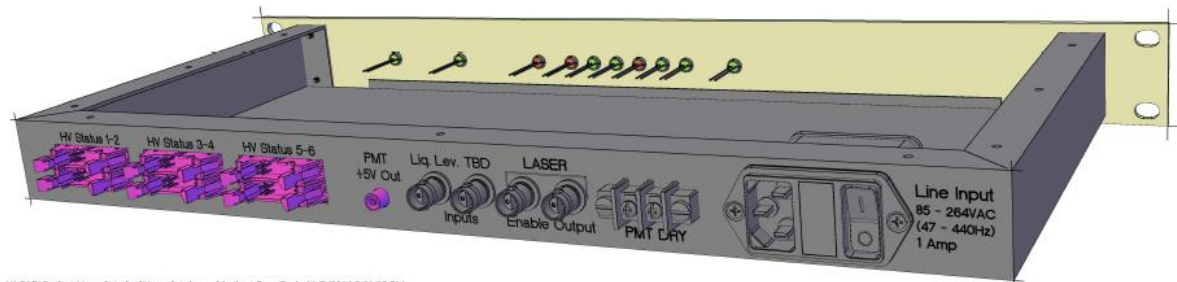
-
-
- A 16 conductor ribbon cable is needed to connect between the HV crate and the Laser Interlock chassis.
 - Five (5) cables will be needed.
 - A shorting connector is needed to by-pass the extra input.



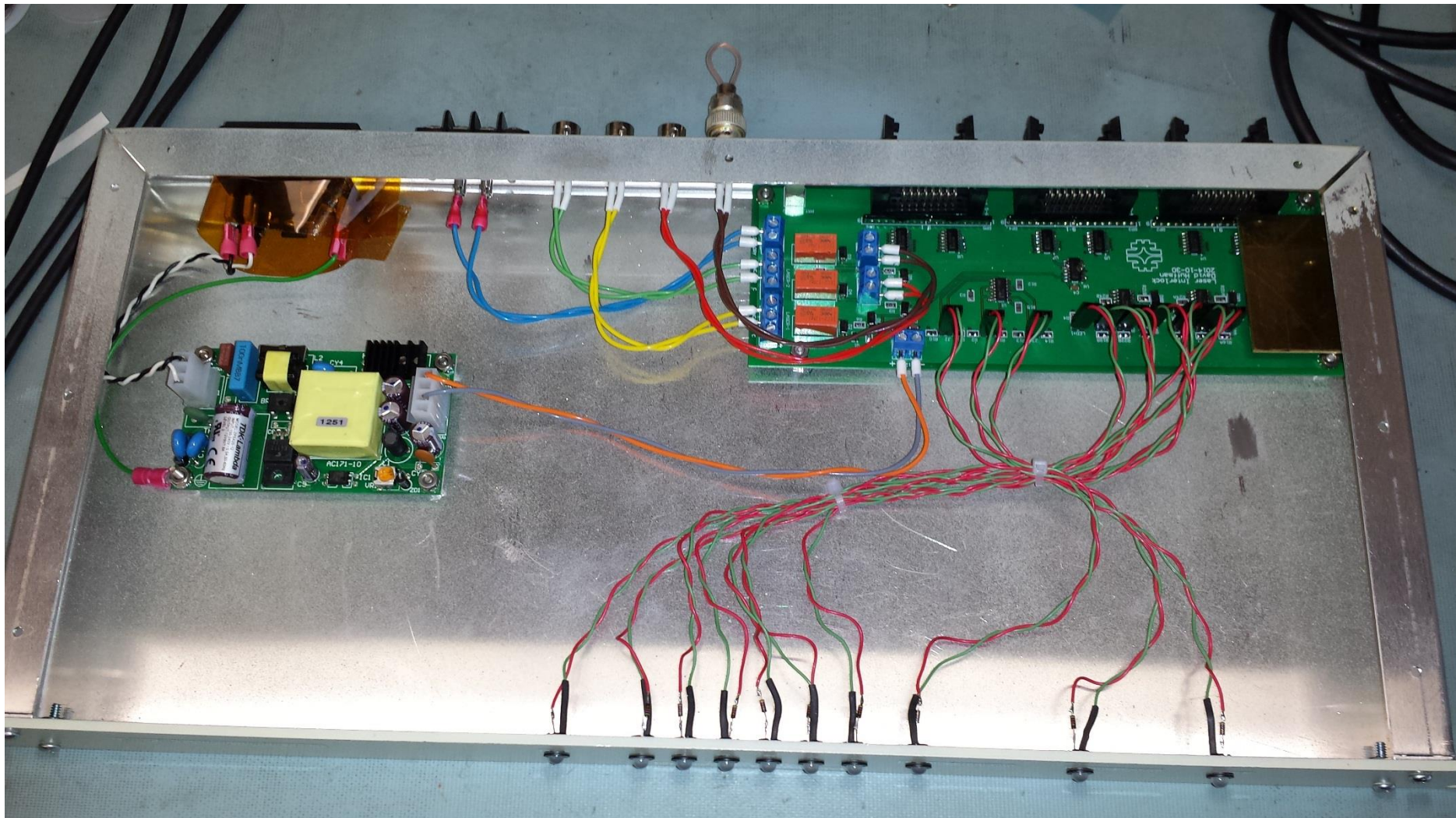
SPECIAL NOTE:

One end of this cable needs to be flipped to correct an error on the chassis PCB.

- Fermilab Drawing Number 173930
 - Chassis 173930-1
 - Schematic 173930-2
 - PCB 173930-3
 - BOM



U:\CAD\Projects\LaserInterlock\LaserInt-Assembly.dwg, FrontBack, 11/3/2014 3:01:02 PM



Component list

Laser Interlock Chassis

Source Data From:

LaserChassis.PrjPCB

Project:

LaserChassis.PrjPCB

Variant:

None

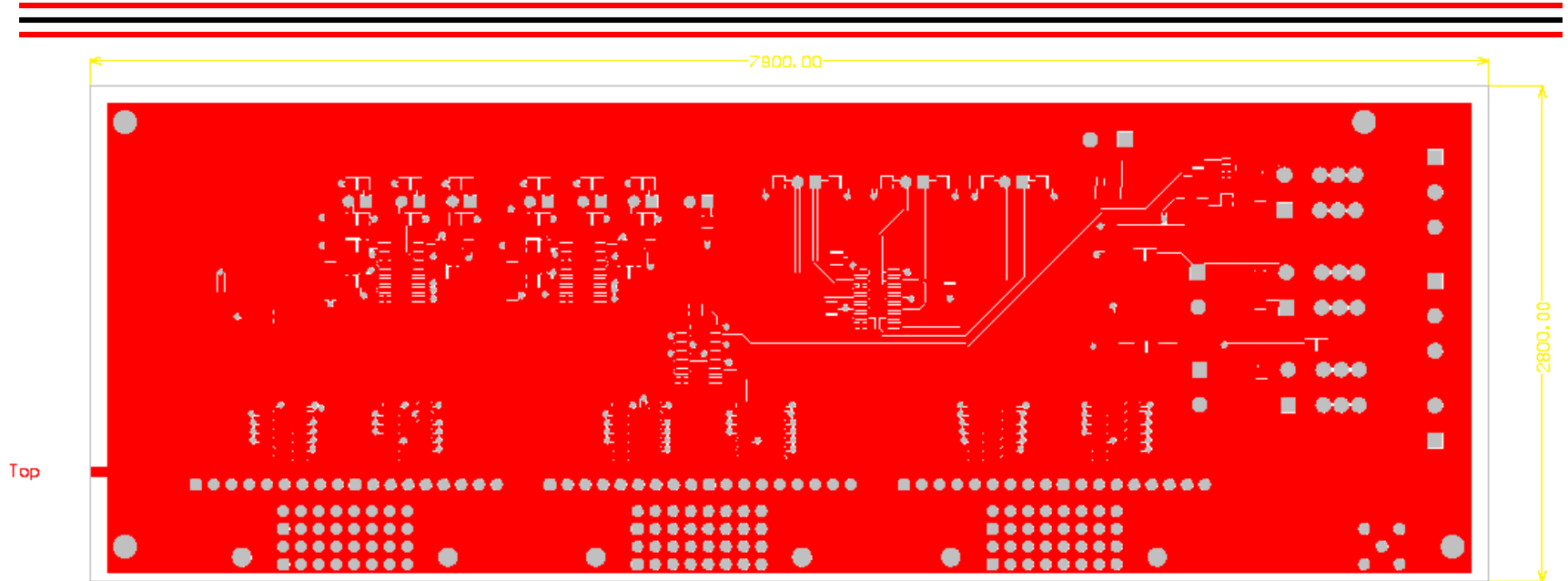
Report Date: 11/11/2014

10:34:45 AM

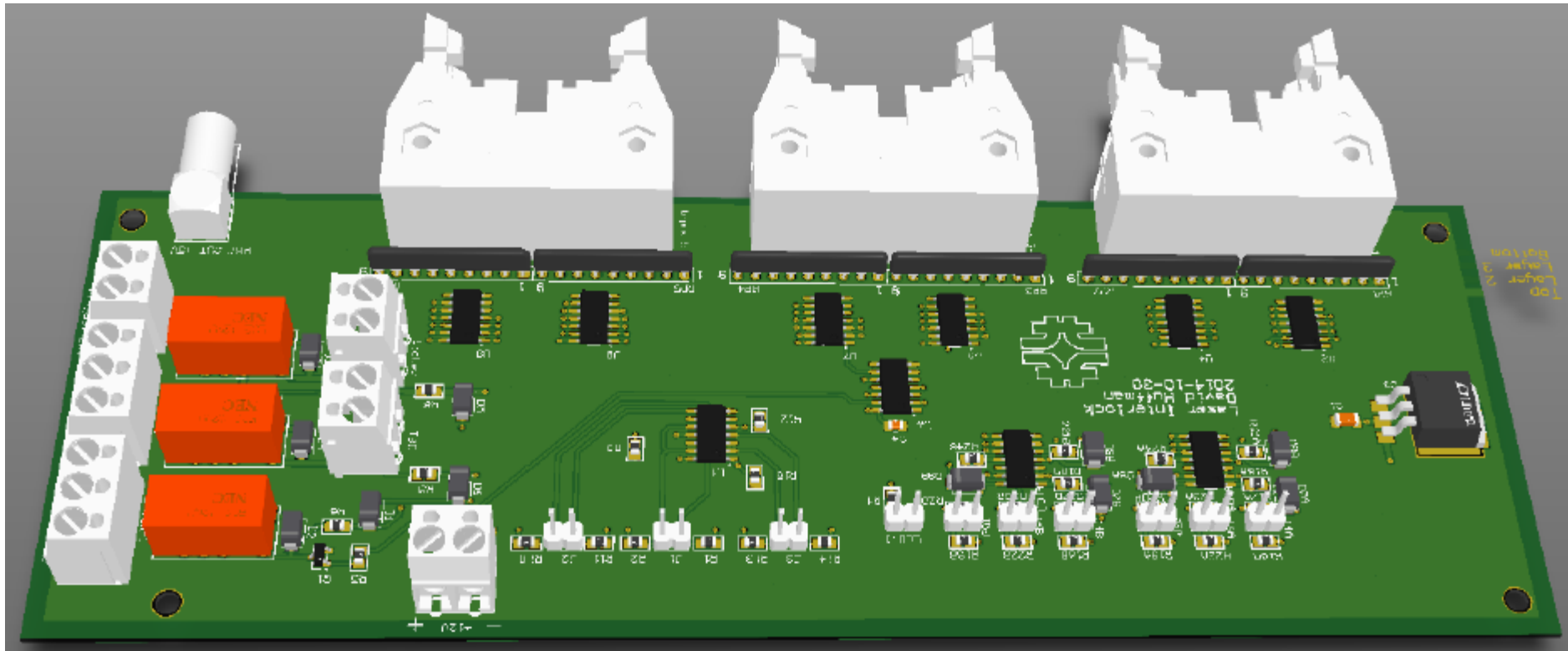
Print Date: 11-Nov-14

1:10:56 PM

#	Designator	Description	Manufacturer	PartNumber	Footprint	Comment	Qty	Quantity
1	AC1	AC Entry Module	Schurter Inc.	DD11.0111.1110		DD11.0111.1110		1
2	HV-1, HV-2, HV-3, HV-4, HV-5, LASER, Liquid Level, Power, TBD, TBD	LED Indicator	Lumex	SSL-LX5093IGW		RG-LED		10
3	J1	PMT Dry Contacts	AMP	(see PCB)		PMT_Out2		1
4	JJ1, JJ2, JJ3	HV ON/OFF STATUS INPUTS	AMP	(See PCB)		(See PCB)		3
5	Laser-1, Laser-2, LiqLev, TBD-in	Connector, BNC Twinax	AMP	4958		4958		4
6	M1	MOUNTING CLIP FOR T1-3/4 LED	Visual Communications Company	4304MC		4304MC	10	1
7	M2	Board Standoffs 1/4"	Keystone	1480		1480	8	1
8	MB1	Back Panel FNAL Design	FNAL	176930-2		176930-2		1
9	MF1	Front Panel FNAL Design	FNAL	176930-1		176930-1		1
10	P0, P1, P2, P3, P4, P5, P6, P7, P8, P9	2-pin socket wired to LED	TE Connectivity	5-87456-3		Socket-2pin		10
11	PMT_DRY	Back Panel Terminal Block	Molex	38721-6702		38721-6702		1
12	PS1	DC power supply, 12V 1A	TDK-Lambda	ZPSA2012		ZPSA2012		1
Approved								35
Notes								



Double click image above to open PDF



Component list

Bill of Materials For Project [LaserInterlock.PrjPcb] (No PCB Document Selected)

Source Data From: LaserInterlock.PrjPcb
 Project: LaserInterlock.PrjPcb
 Variant: None

Report Date: 11/11/2014 1:13:27 PM
 Print Date: 11-Nov-14 1:13:30 PM

#	Designator	Description	Manufacturer	PartNumber	Footprint	Comment	#Column Name Error:Qty	Quantity
1	C1	Capacitor	TDK Corporation	C3216X5R1A107M160AC	C1206_MED	100uF		1
2	C2	Capacitor	TDK Corporation	C3216X5R1C476M160AB	C1206_MED	47uF		1
3	C3, C4	Capacitor	TDK Corporation	C3216X7R1E105K085AA, C0805	CAP0805N	1uF		2
4	D1, D2, D3, D4, D5, D6, D7A, D7B, D8A, D8B, D9A, D9B	Diode, General Purpose 1A 100V	Fairchild Semiconductor	S1A	DO-214AC	S1A		12
5	Input 1-2, Input 3-4, Input 5-6	Connector Male Header, 8-Pin, Dual row Dual Stack	AMP	N3408-D202RB	HDR2X8X2	N3408-D202RB		3
6	J1, J2, J3, J4A, J4B, J5A, J5B, J6A, J6B, LED+1	Jumper 2Pin		Jumper	jumper	Jumper		10
7	LASER-1, LASER-2	Connector Header, 3-Pin	On Shore Technology Inc	ED500/3	TBLOCK_5MM-3	ED500/3		2
8	LqLev, PMT_OUT DRY, Supply1, TBD	Connector Header, 2-Pin	On Shore Technology Inc	ED500/2	TBLOCK_5MM-2	ED500/2		4
9	PMT_OUT +5V	LEMO PCB mount	Lemo	EPL-00-250-NTD	LEMO	EPL-00-250-NTD		1
10	Q1	NPN Switching Transistor	NXP	PMBT3904	SOT23_L	PMBT3904		1
11	R1, R10, R13, R17A, R17B, R20A, R20B, R23A, R23B	Resistor	Panasonic	ERJ-6ENF3740V	Res0805N	374		9
12	R2, R11, R14, R16A, R16B, R19A, R19B, R22A, R22B	Resistor	Panasonic	ERJ-6ENF4420V	Res0805N	442		9
13	R3, R7, R12, R15, R18A, R18B, R21A, R21B, R24A, R24B	Resistor	Panasonic	ERJ-6ENF4990V	Res0805N	499		10
14	R4	Resistor	Panasonic	ERJ-6ENF3010V	Res0805N	301		1
15	R5	Resistor	Panasonic	ERJ-6ENF4991V	Res0805N	4.99K		1
16	R6, R8, R9	Resistor	Panasonic	ERJ-6ENF7150V	Res0805N	715		3
17	RLY1, RLY2, RLY3	Relay DPDT 12V 2A	Kemet	EC2-12NU	EC2-12NU	EC2-12NU		3
18	RP1, RP2, RP3, RP4, RP5, RP6	resistor, 9pin, 8 resistors	TT Electronics/IRC	L091S103LF	SIP9	L091S103LF		6
19	U1, U10A, U10B	Hex Inverter	ON Semiconductor	MC14069UB	SOIC-14	MC14069UB		3
20	U2, U4, U5, U6, U7, U8, U9	IC 8-Input OR / NOR Gate	TI	CD4078	SOIC-14	CD4078		7
21	U3	IC Low Drop Out 5V Regulator DD-PAK	Linear Tech	LT1117CM-5	DD-Pak_3P	LT1117CM-5		1
Approved								90
Notes								

-
-
- Powering the chassis revealed only one LED lit, +5V indicator.
 - Checking the PCB project I found the diode silkscreen is labeled wrong.
 - Corrected library and will have to **reverse all the diodes**.
 - Hopefully none of the components are fried.
 - Changed the diodes, no better, something else is wrong.
 - Seems like the LED readout is drawing too much current.
 - Not the case! With or without the LED attached the voltages are the same.

 - NOTE: the resistors R6,8 & 9 are too small. They keep the relay on because the coil is 1440 Ohm.
 - Will see about raising the value to let the relay operate properly.

 - MC14069 chips are not working as expected. The output current is <2mA
 - Ordering SN74LV14APWR SOIC-14 that will have enough drive current.
 - **Changed MC14069 with SN74LV14APWR**

 - Change the input resistors that go to the LED circuit to minimize loading.
 - Thinking 15K Ohm will be about right.

 - Labeled the unit.

 - DIN-Header cards have a problem with the DIN connector not close enough to the board edge.
 - The boards will need to be cut or sanded to remove material up to the silkscreen line.

 - Replaced the LED drivers and things look okay except the regulator is getting very hot.

-
-
- Error on the heatsinking of the 12V to 5V regulator. The tab copper is too small. Need to add an external heatsink.
 - Will also lower the current drive of the LEDs. The design is for 10mA will see if 5mA is better.
 - This will lower the power from 700mW to 350mW.
 - Okay there was a SNAFU with the hex inverters. The outputs of a 74lv14APWR can sink and source 20mA.
 - This bypasses the current limiting resistors and draws more current than expected.
 - I added a series resistor (470 Ohm) to limit the LED current.
 - Removed R1-3, R10-12, R13-15 and R16-24 both A&B sections 24 total

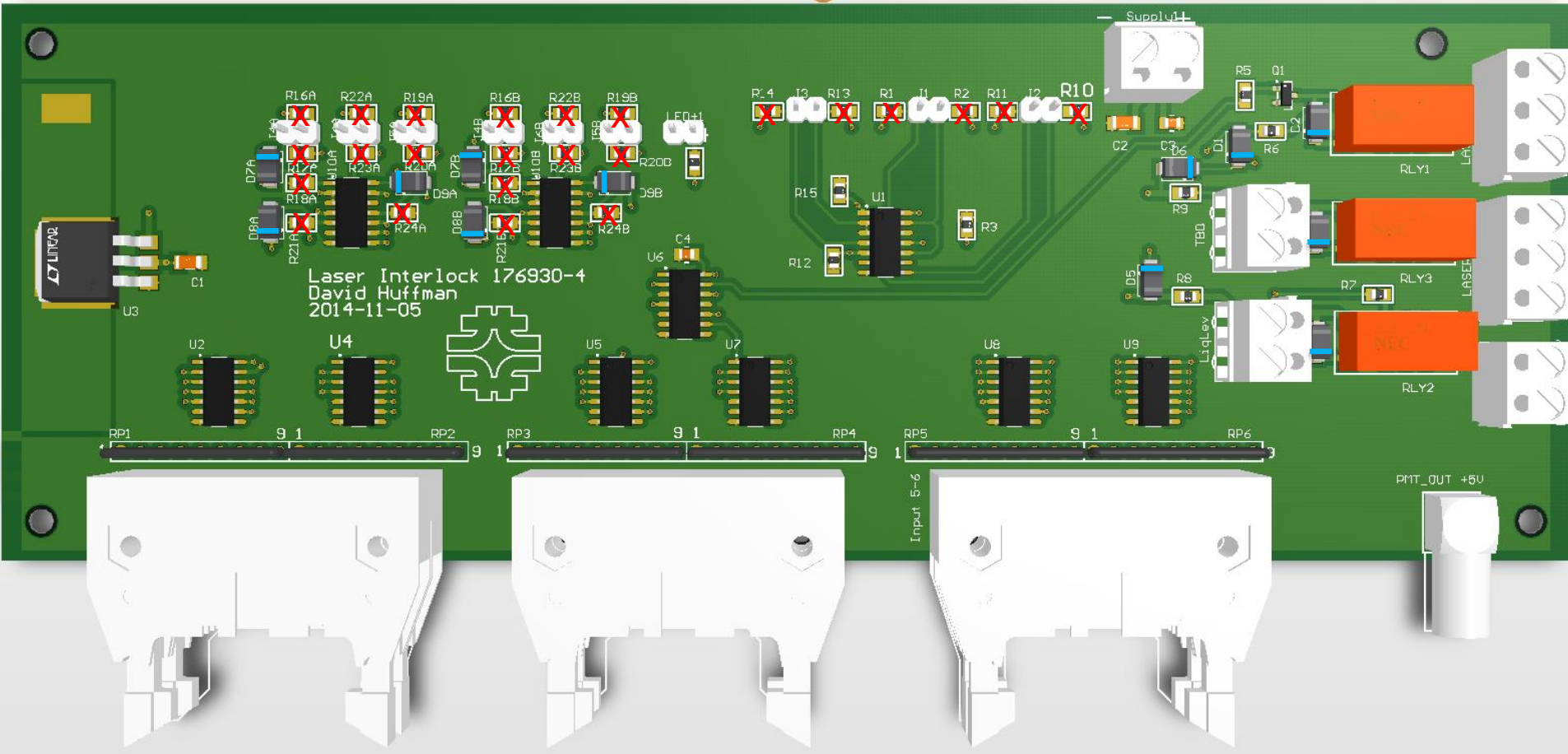
 - Discovered the condo connectors have a bad footprint. Rows are swapped causing the signal from the MPod to be shorted to ground.
 - We will flip one of the header connectors to fix the problem. We can do this because the order of the signals is unimportant. Need a note that indicated the cables are special.

 - Fixed the library part but did not update the PCB.

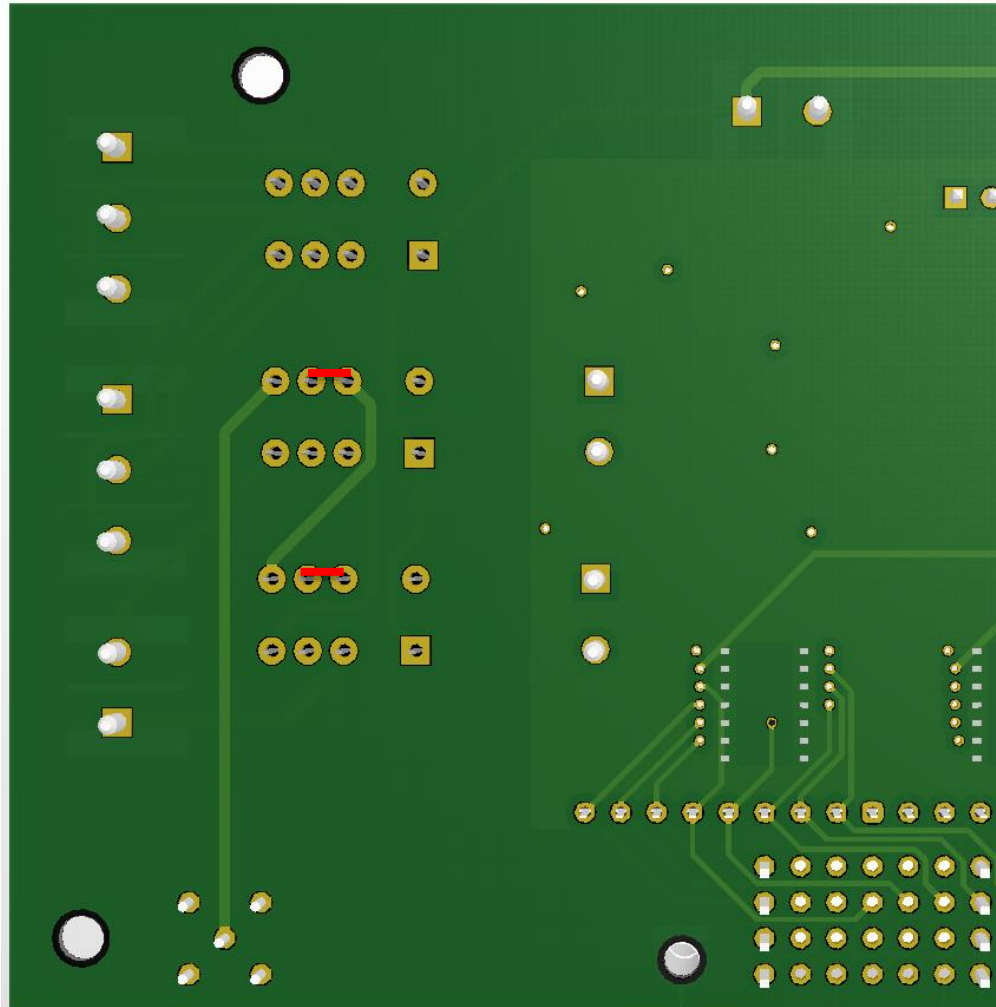
 - 12/4/2014 11:22:52 AM
 - errors! Found two inputs on the final OR gate tied high. They should have been pulled low. Lifted the pins and tied it to its neighbor(4&5)(9&10).
 - The outputs of the relays are incorrect. The Laser outputs were moved to the NO NC terminals. The PMT outputs +5 and dry contacts are wrong.
 - The relay footprint is in question...
 - Footprint was wrong. Changed the library but did not update the project.
 - Added a jumper on the bottom of the board to fix the problem.
 - Changed R7, the PMT_OUT +5V signal, to 200 Ohms. This gives the maximum current and power if the output is shorted.
 - Replaced R7 with 0 Ohm resistor. This relies on the LDO regulator's over current and temperature protection. Smallest trace is 15mils. with 1/2oz copper there is 10sq mils, IPC table shows outside trace good for 1Amp with 22°C temperature rise.

Top View

Do Not Load Reverse Direction



Bottom Correction Wires



Laser Interlock Chassis

Modifications since ORC review