

RTEX CARCASS - aining 3/06

- everything but power amp board for motor

0-12V

- \* 6 analog signals - control terminal voltage across motor via power amplifiers
- \* 6 encoders - digital quadrature input

1 week forward

→ can write control algorithm for PC/104 stack

- can write on PC/104 directly w/ keypad, etc.

→ PCMCIA wireless card

RTEX carcass <sup>unit-based</sup>

old: QNX RTOS (~~etc~~)

new: Linux

- calibration on power-up

- bring leg to known configuration

- reset encoder counts

- no need for sensors of parts for absolute positioning

↳ lying on flat ground  
- legs can't be backwards until "toes" hit

control system on PC is open source:

⇒

1. control RTEX via laptop via wired ethernet

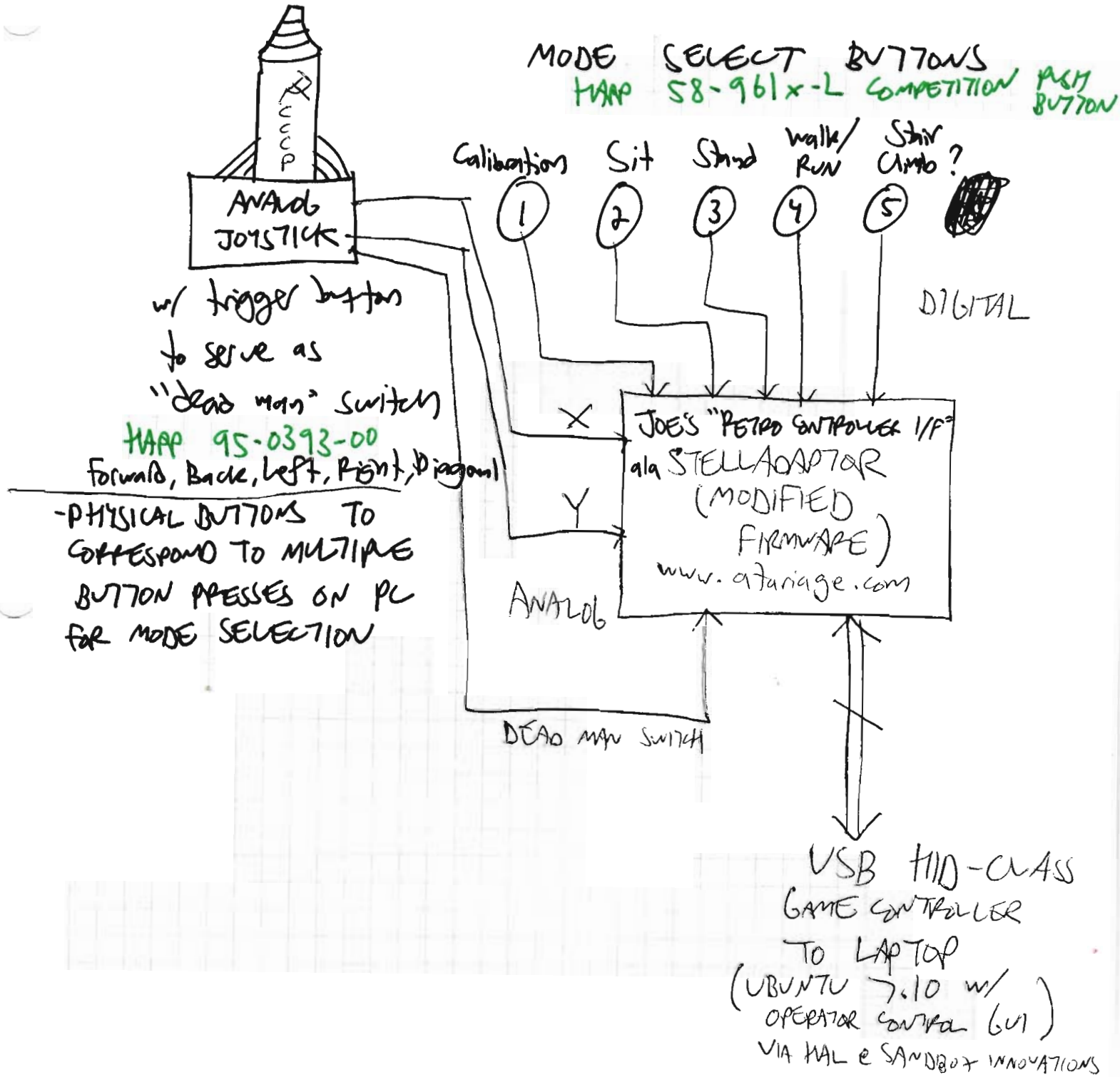
⇒

2. USB joystick → laptop → RTEX

3. encode ethernet data packets

- analog speed control?

BIG PIXE ~~PHYSICAL~~ CONTROL INTERFACE 3.28.08



3.27.08 Bib PAX DESIGN MEETING w/ SPECK

Speak battery for PC/IO stack - ~~data stack~~

- Remote control interface from HAL ~~data stack~~  
Laptop → PC/MCA wireless to PC/IO stack
- Laptop accessibility? User see screen at all times  
Keyboard for back-up/Debug

?  
12-40V input DC  
Common Ground

NimH battery pack - 2x 7 cell mit  
1x 6 cell mit  
↓  
24V

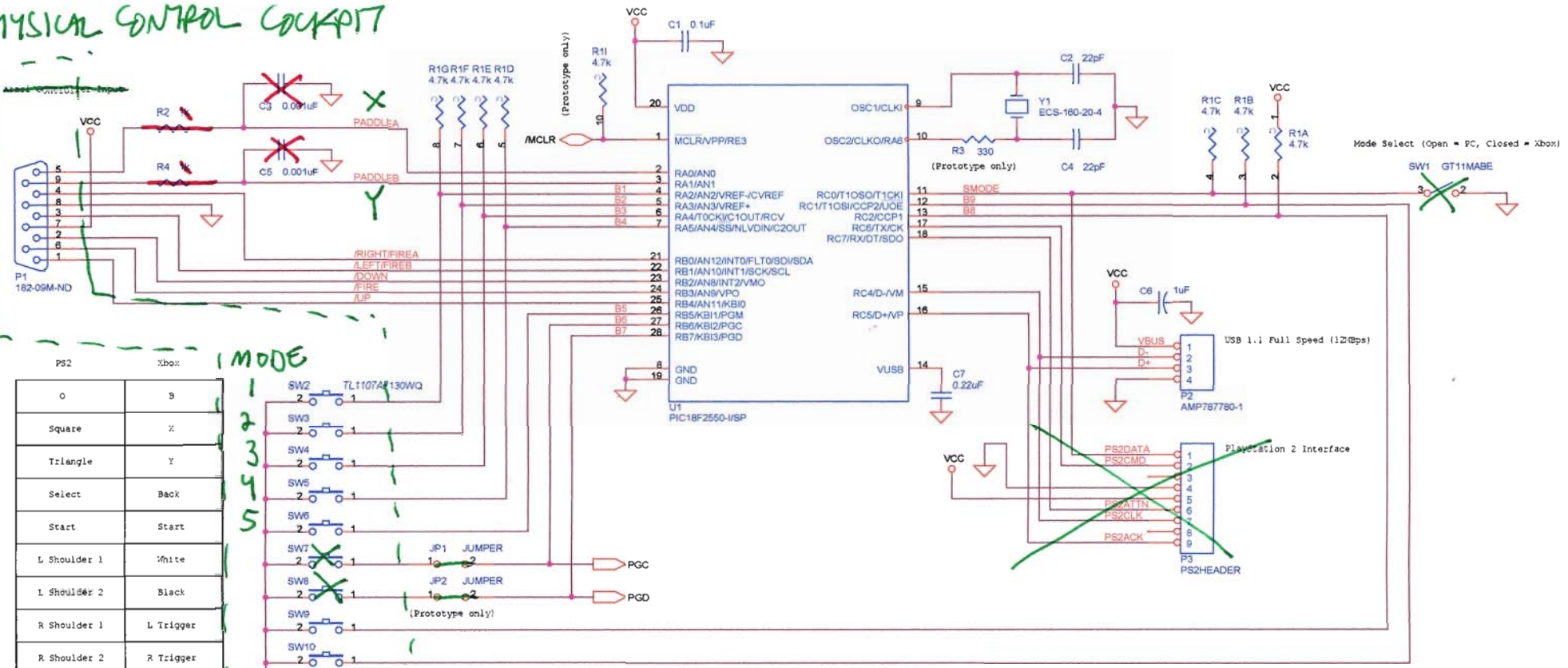
could run on same battery pack as motors,  
but might be noisy?

~~✓ PURCHASE 2x STELLADAPTERS (UI & PI) ASAP~~

✓ VERIFY Encoder Spec. w/ HAL  
"RETRO CONTROLLER I/F" PCBs & Components

✓ KILL SWITCH to kill motors - SUPPLY CENTER → 600A per motor

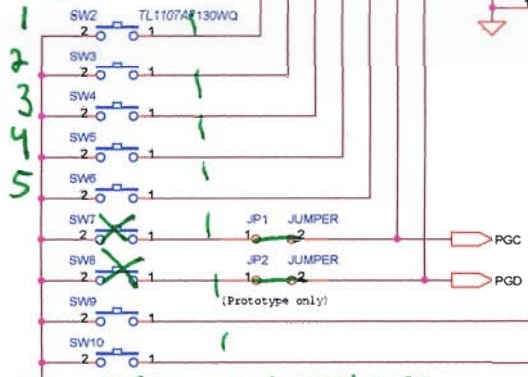
TO BIG PHEX  
PHYSICAL CONTROL COCKPIT



PS2 Xbox

0	9
Square	X
Triangle	Y
Select	Back
Start	Start
L Shoulder 1	White
L Shoulder 2	Black
R Shoulder 1	L Trigger
R Shoulder 2	R Trigger

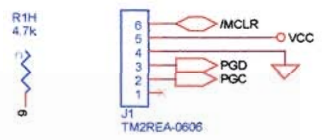
MODE



DEAD MAN TRIGGER

LOCKING CONNECTOR  
DB15 EXTENSION CABLE

Microchip PIC Programming Interface (ICD2)



NOTE: RESISTORS ARE IN OHMS +/- 5% AND CAPACITORS ARE IN MICROFARADS +/- 20% UNLESS OTHERWISE NOTED. SEE BOM FOR ACTUAL VOLTAGE.



**GRAND**  
idea studio

TITLE: Retro Controller Interface (PC/Xbox)

DATE: Sunday, June 05, 2005	SIZE: B	SHT: 1	DF: 1	DRAWN BY: J. Grand	REV: P1.0
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4.9.08

## Rhex Interface

X-Axis : Minimum = 15, Default = 89, Maximum = 180

Y-Axis : Minimum = 3, Default = 77, Maximum = 139

Button #1 : Minimum = 0, Default = 0, Maximum = 1

Button #2 : Minimum = 0, Default = 0, Maximum = 0

X AXIS:

$$\text{LEFT} = 0.3\text{V}$$

$$\text{RIGHT} = 3.6\text{V}$$

Y AXIS:

$$\text{UP} = 2.7\text{V}$$

$$\text{DOWN} = 0.1\text{V}$$

X AXIS SCALING:

$$\text{MAX-MIN} = 180 - 15 = 165$$

$$\text{Scale } 0 \rightarrow 165 \text{ to } 0 \rightarrow 255$$

$$\frac{255}{165} \times 11 = 17 \Rightarrow \text{value} = \frac{\text{value} \times 17}{11}$$

Y AXIS SCALING:

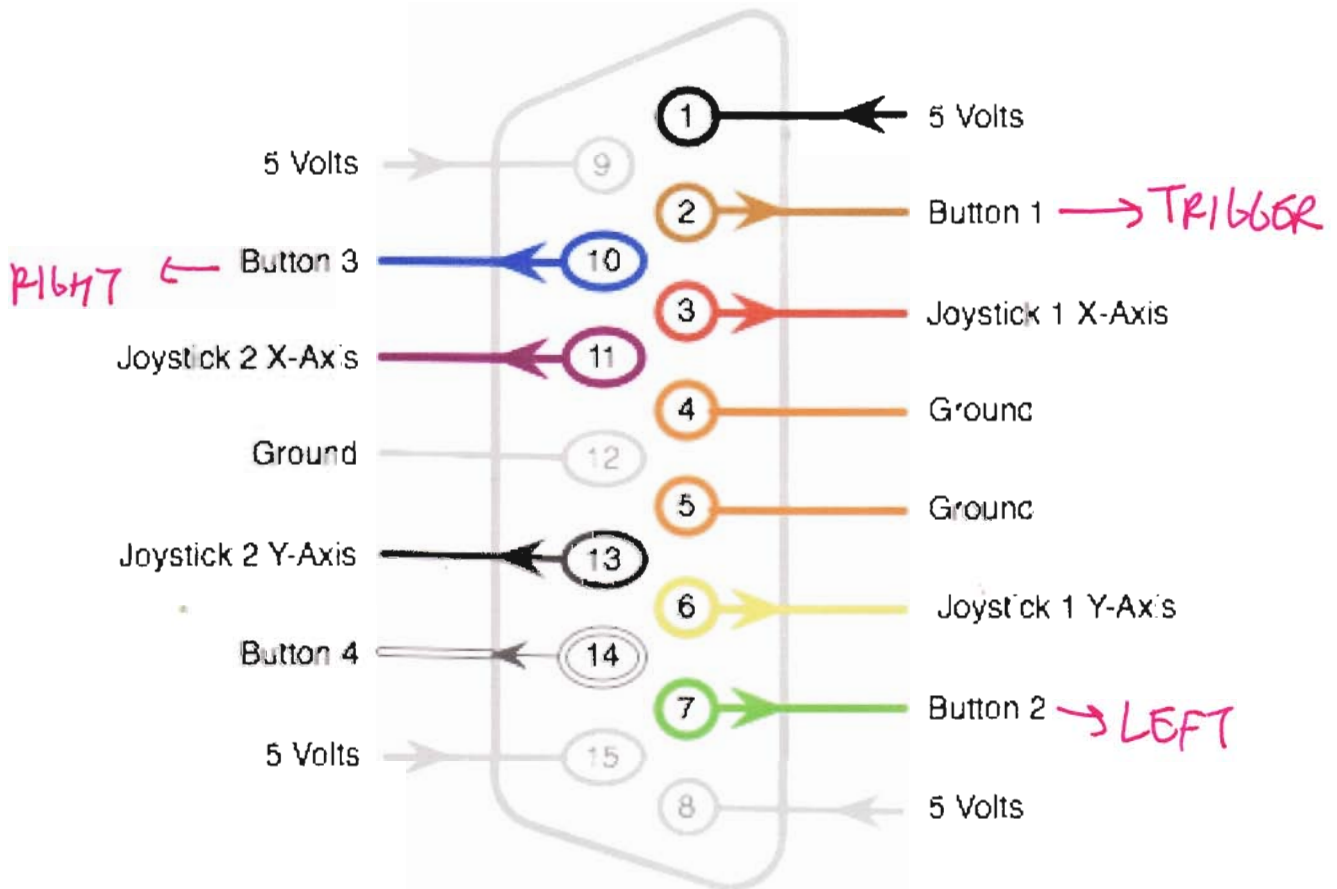
$$\text{MAX-MIN} = 139 - 3 = 136$$

$$\text{Scale } 0 \rightarrow 136 \text{ to } 0 \rightarrow 255$$

$$\frac{255}{136} \times 8 = 15 \Rightarrow \text{value} = \frac{\text{value} \times 15}{8}$$

HAPP CONTROLS HEAVY DUTY ANALOG  
TRIGGER JOYSTICK  
#95-0393-00

(POTENTIOMETERS MODIFIED FOR 0-5V OUTPUT ON X&Y)



JOYSTICK CABLE CONNECTOR

DB-15 MALE

J. Grand

Bill Of Materials May 11,2005 21:38:48 Page1

Item	Quantity	Reference	Part
<del>1</del>	1	C1	0.1uF
<del>2</del>	2	C4,C2	22pF
<del>3</del>	2	C5,C3	0.001uF 399-4449-1-ND
<del>4</del>	1	C6	1uF
<del>5</del>	1	C7	0.22uF
<del>6</del>	2	JP1,JP2	JUMPER
<del>7</del>	1	J1	TM2REA-0606 411297-ND
<del>8</del>	1	P1	182-09M-ND
<del>9</del>	1	P2	AMP787780-1
<del>10</del>	1	P3	PS2HEADER
<del>11</del>	1	R1	4.7k
<del>12</del>	2	R4,R2	1k
<del>13</del>	1	R3	330
<del>14</del>	1	SW1	G711MABE
<del>15</del>	9	SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW9, SW10	TL1107AF130WQ EG2510-ND
<del>16</del>	1	U1	PIC18F2550-I/SP
<del>17</del>	1	Y1	ECS-160-20-4 X176-ND or X1103-ND

- SOCKET (DIP28N) ED3128-ND

# 11 buttons

1) 1 + 8 = ~~CALIBRATE~~ ~~MADE~~

yellow  
~~bottom red~~

~~CALIBRATE~~

2) 2 + 8 = ~~STAND UP~~ ~~MADE~~

top red  
~~bottom red~~

3) 4 : STAND UP top blue

4) 5 : SIT DOWN ~~bottom blue~~ bottom blue

5) 9 + 8 = WALK MODE - smile speed ~~bottom red~~ bottom red

7 + 8 + 10 + 11 = EMERGENCY (SHUTDOWN)  
(KILL SWITCH / SOFTWARE)

Pin	CABLE COLOR	To BUTTON
1	PURPLE	<del>1</del> 1
2	BLUE	2
3	WHITE	3
4	GREEN	4
5	YELLOW	5
6	ORANGE	6 (unused)
7	RED	GND

5/12/08



4.21.08

# BIG PHEX - LITHIUM IRON PHOSPHATE BATTERY MANAGEMENT SYSTEM

→ SIMPLE & TO THE POINT:

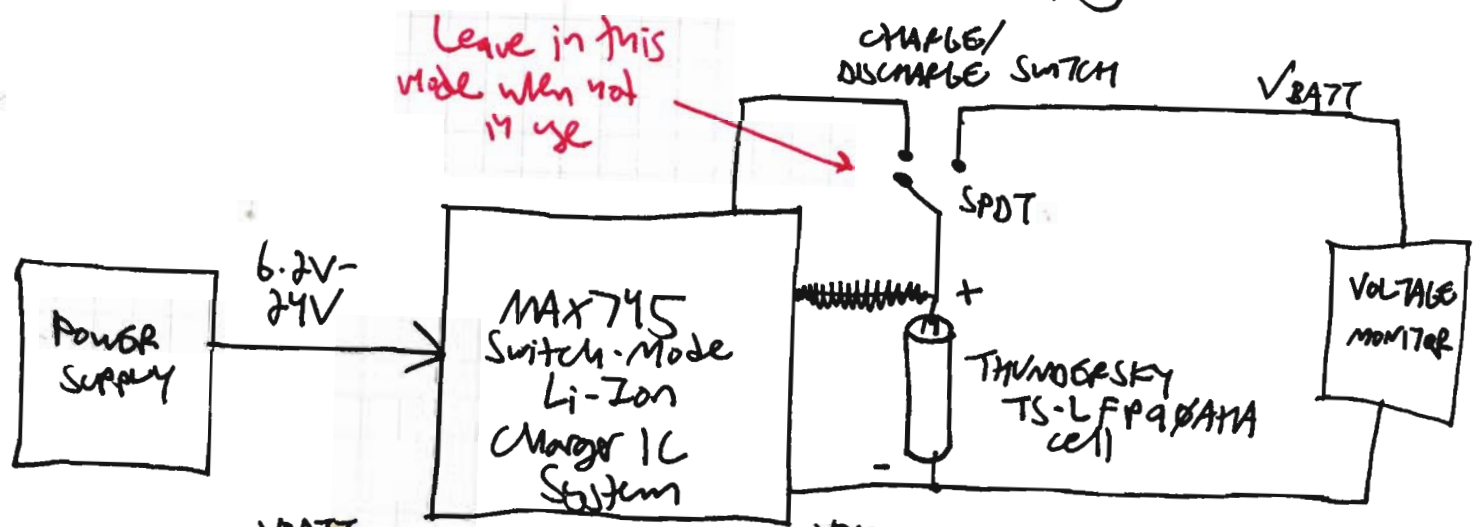
\* Li-Ion charging 4A max ⇒ ~2.5 hours/cell for full charge

cell not to exceed 4.2V

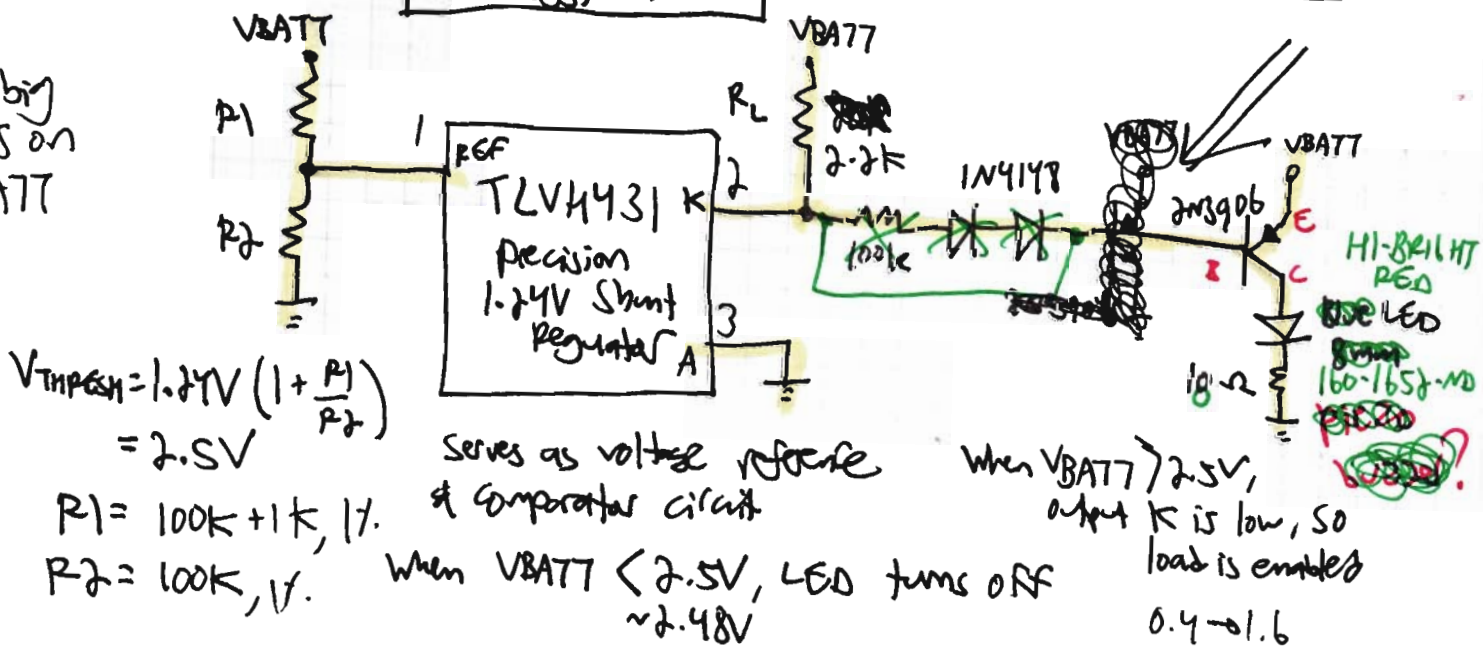
\* Discharge monitoring: Alert/Alarm if cell voltage drops below 2.5V (ignore during high load activities)

\* PCB mount to terminals of battery

Leave in this mode when not in use



Add big caps on V\_BATT



$$V_{THRESH} = 1.24V \left(1 + \frac{R1}{R2}\right) = 2.5V$$

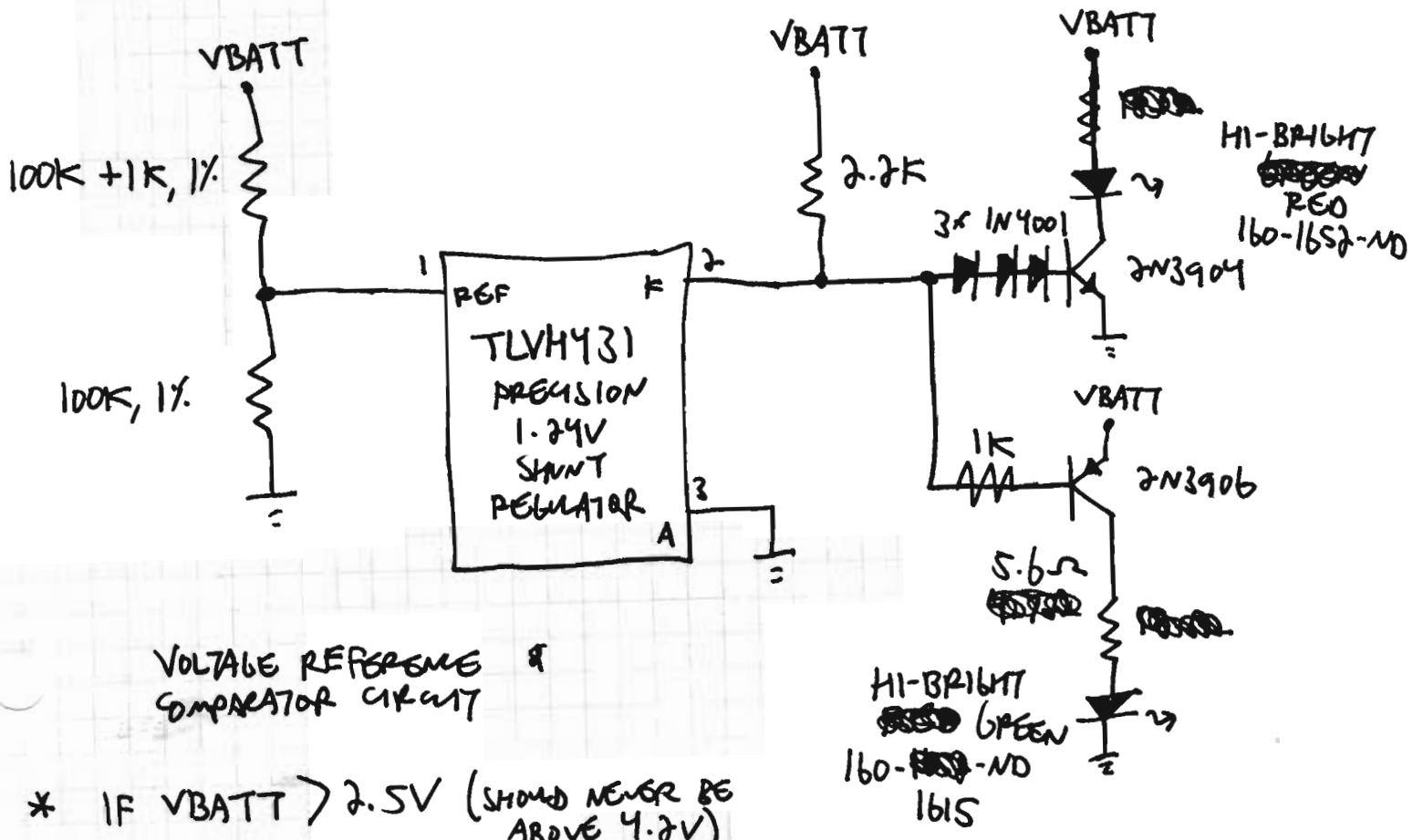
R1 = 100k + 1k, 1%  
R2 = 100k, 1%

Serves as voltage reference & comparator circuit

When V\_BATT < 2.5V, LED turns OFF ~2.48V

When V\_BATT > 2.5V, output K is low, so load is enabled 0.4-0.6

# BIB PHEX - BMS DISCHARGE MONITOR #2 4.25.08

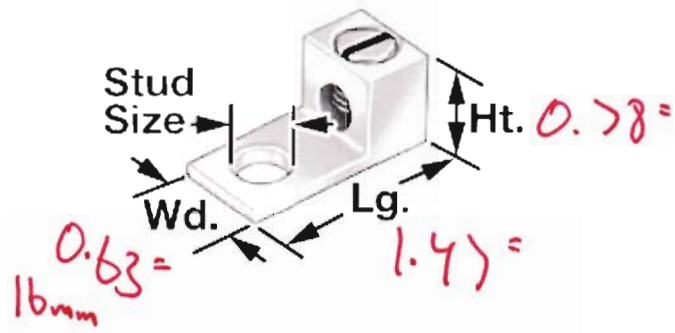


\* IF  $V_{BATT} > 2.5V$  (SHOULD NEVER BE ABOVE 4.2V)

- GREEN LED ON
- RED LED OFF

\* IF  $V_{BATT} \leq 2.5V$

- GREEN LED OFF
- RED LED ON "DANGER, WILL ROBINSON!"

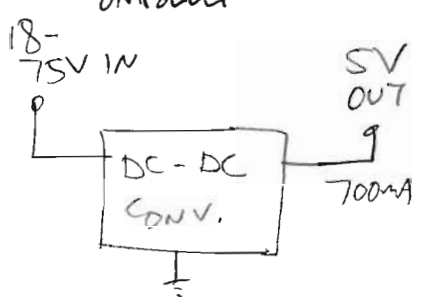
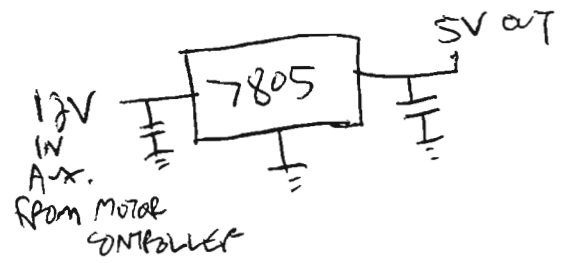


single wire, one mounting hole  
#6920K24



Quantity	Designator	Description	Value
4	C1, C4, C6, C8	Capacitor, 0805	0.1uF
2	C2, C3	Capacitor, Electrolytic, SMT	150uF
1	C5	Capacitor, 0805	4.7uF ceramic
1	C7	Capacitor, 0805	0.22uF
1	C9	Capacitor, 0805	0.001uF
1	C10	Capacitor, 0805	0.047uF
1	C11	Capacitor, Tantalum, size D	68uF, 20V, low ESR
3	D1, D7, D8	Diode Schottky, MBRS340T3, SMC	
1	D2	High-Bright Red LED, T1 3/4	
1	D3	Diode, 1N4148, SOD-323	
3	D4, D5, D6	Diode, 1N4001, SMA	
1	D9	Red LED, 1206	
1	D10	High-Bright Green LED, T1 3/4	
1	J1	Power Jack, SMT	KLDX-SMT2-0202-A
1	L1	Inductor, CDRH125, SMT	10uH, 4A
1	Q1	Transistor, MMBT3904, SOT23-3	
1	Q2	Power MOSFET, IRF7303, SOIC8	
1	Q3	Transistor, MMBT3906, SOT23-3	
1	R1	Resistor, 0805	24 ohm
4	R2, R4, R6, R13	Resistor, 0805	100k, 1%
2	R3, R10	Resistor, 0805	10k
1	R5	Resistor, 0805	2.2k
1	R7	Resistor, 0805	270
1	R8	Resistor, 0805	1k
1	R9	Resistor, 0805	1k, 1%
1	R11	Resistor, 0805	5.6 ohm
1	R12	Resistor, 2010	0.05 ohm precision
1	S1	DP3T Slide Switch, Thru-Hole	
1	U1	MAX745, SSOP20	
1	U2	TLVH431, SOT23-3	

# S/16/08 B16 PHEX OPTICAL COMMUNICATIONS INTERFACE

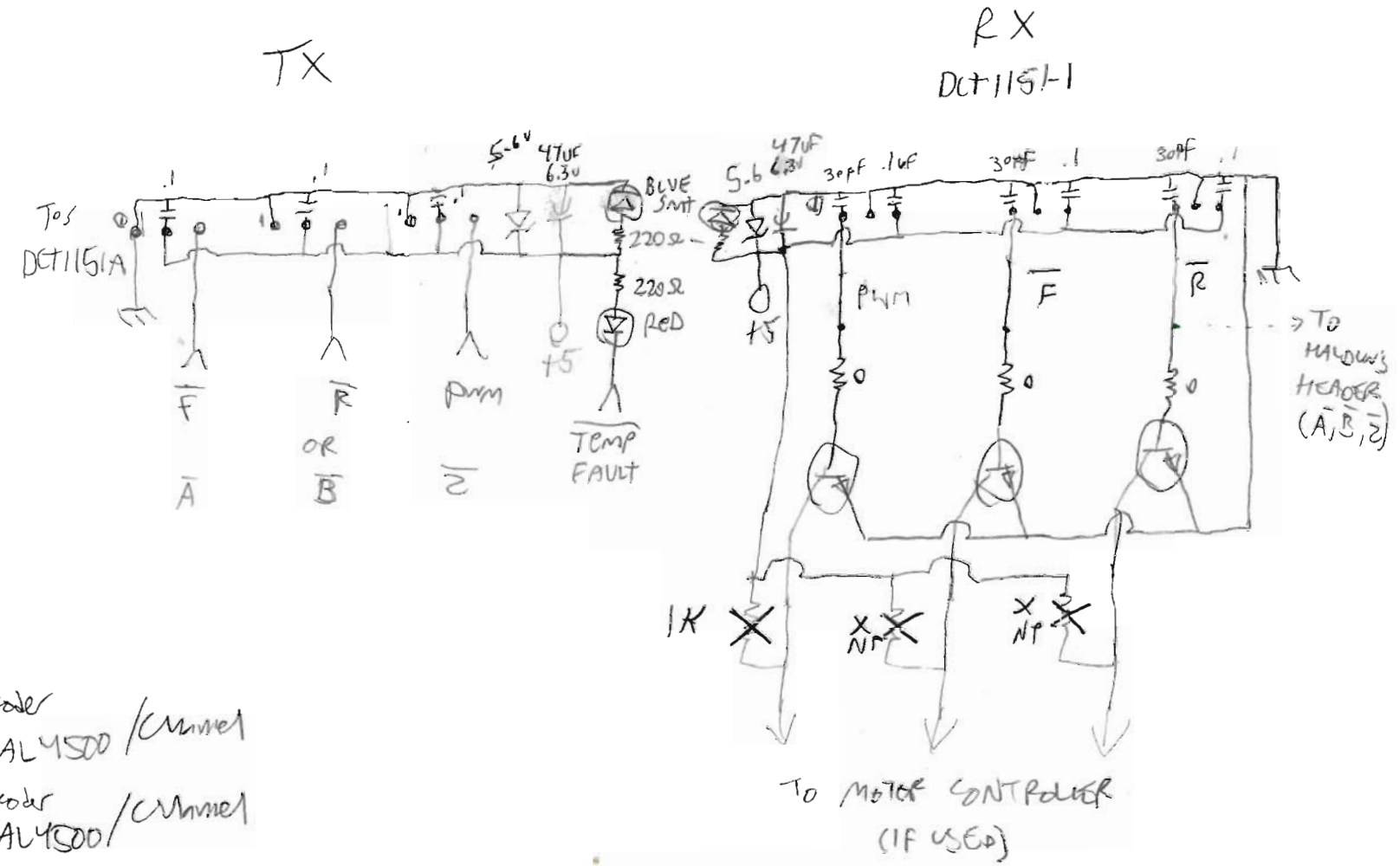


POWER ONE  
NVS 0.7E6-M6  
DK#179-2189-MD

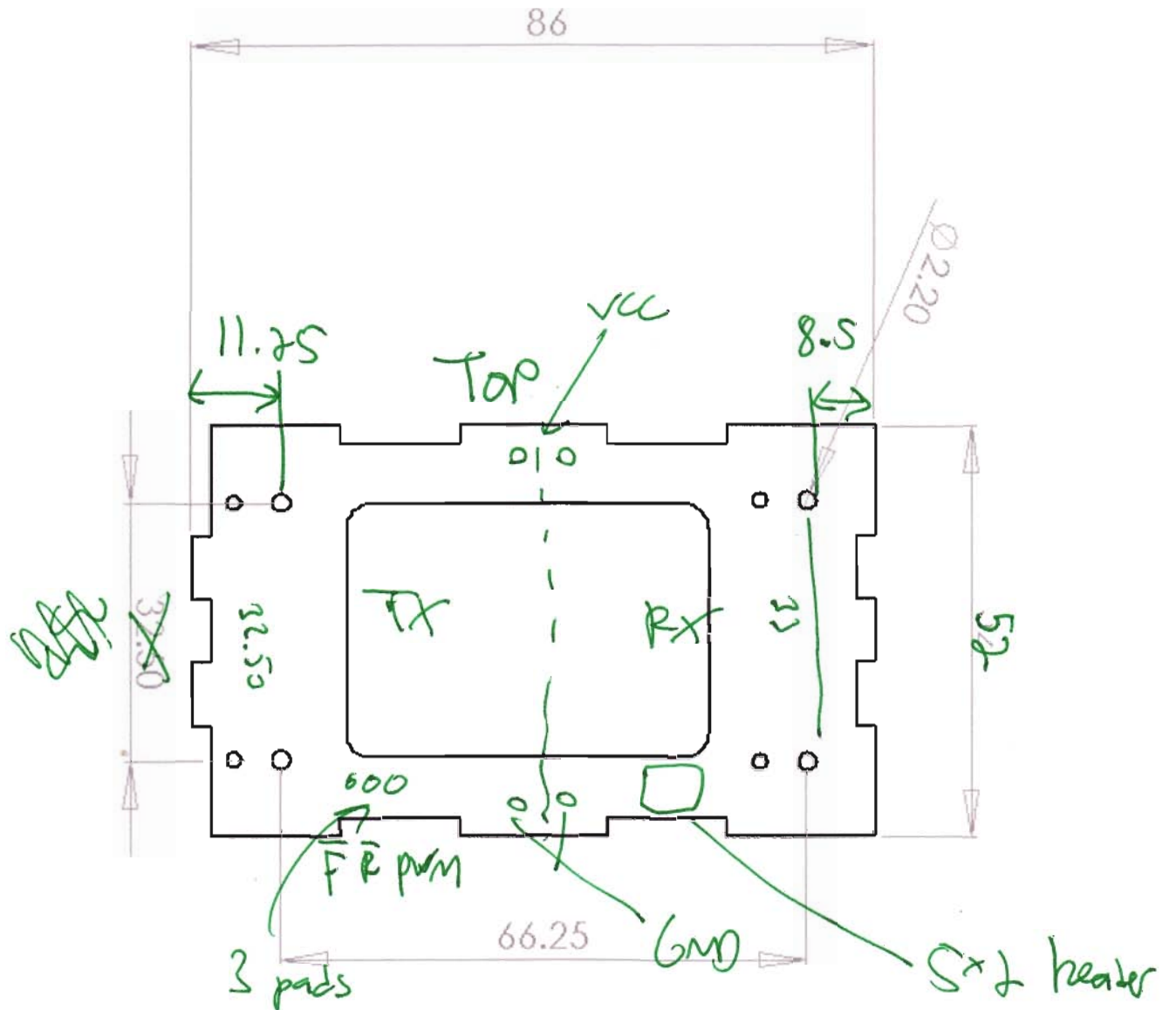
12 BOARDS  
6 CHANNEL

36 TX: 3 each encoder  
3 each HAL4500 / channel  
36 RX: 3 each encoder  
3 each HAL4500 / channel

12 sets of components for TX & RX  
6x TEMP. SENSOR 783-1194-MD



# BIG PHEX OPTICAL COMMUNICATIONS INTERFACE S/16/08



 0  
 PAD      0  
             Stam-relief hole

0.2 pitch

encoder input