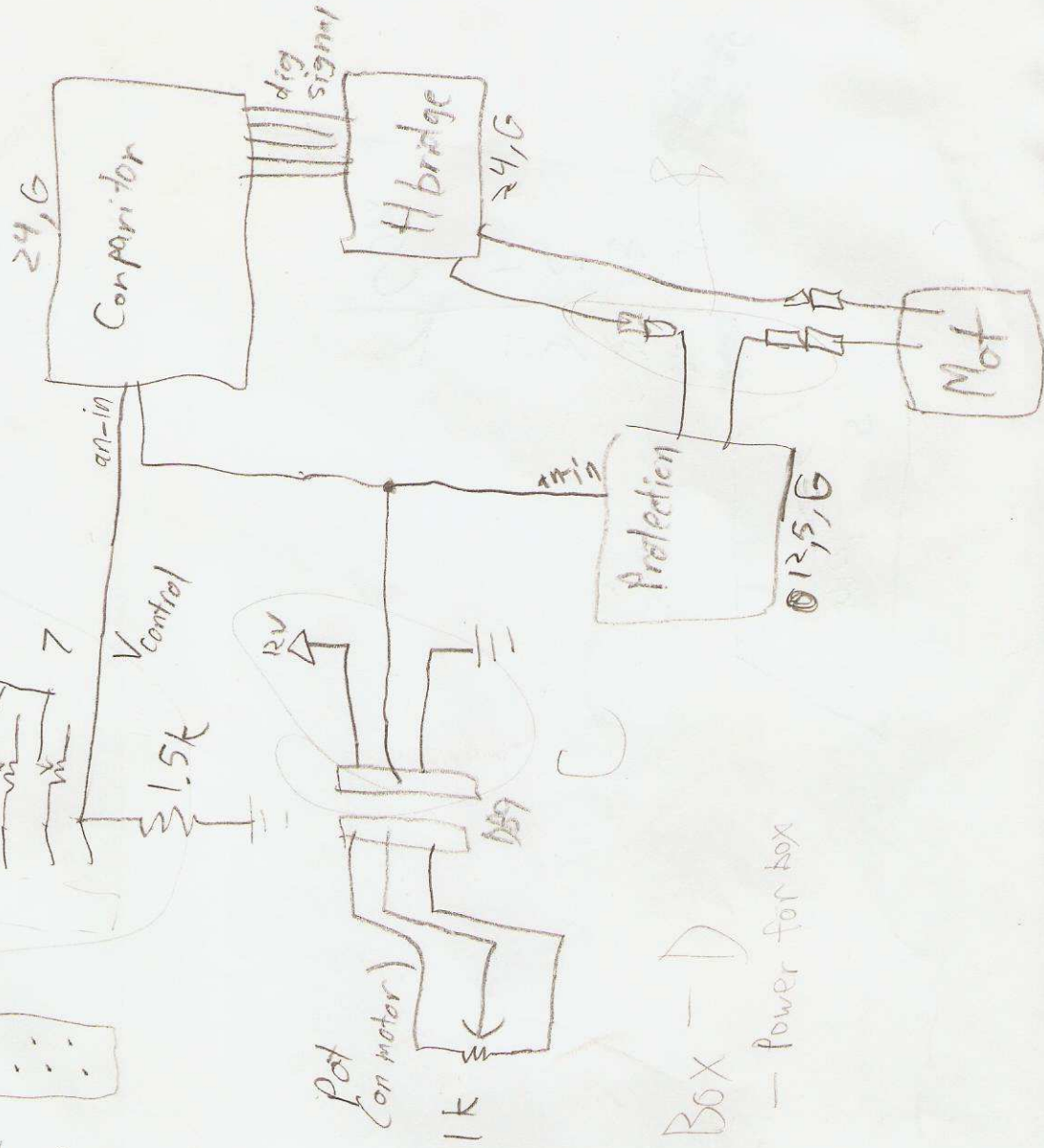
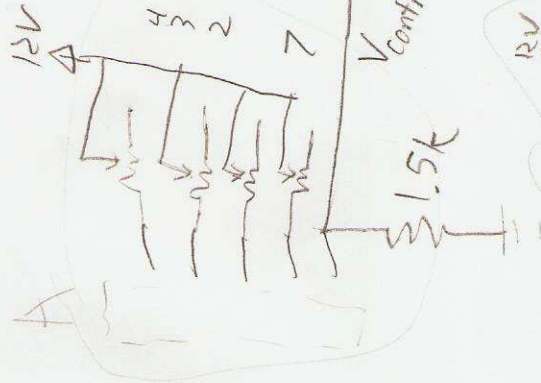
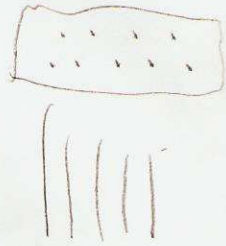
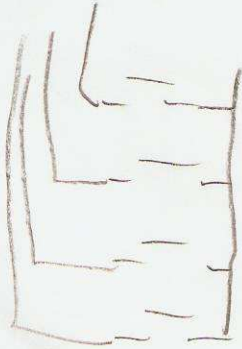


Air gap Box

Driver Panel



Box - D

- Power for box

Pinout of
Driver Control
DB-9

1 male 5
6
7

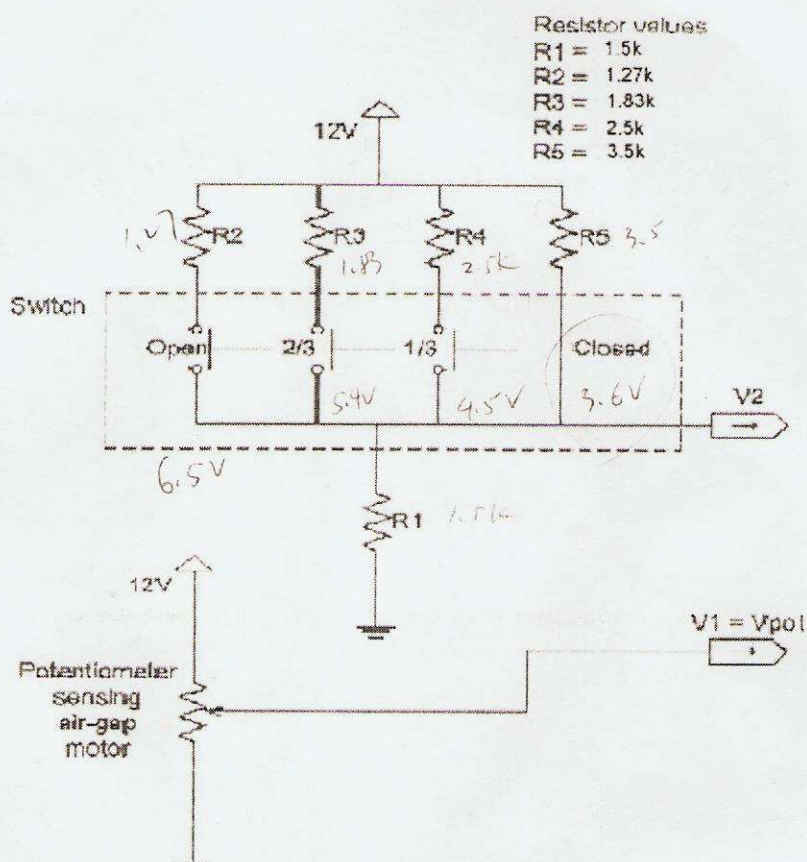
~~Female~~
~~Pin~~

AG 3 2 1 COM
~~Pin~~ 4 5 6 7 8

Driver Interface

Chi-haur Wu

From: "Kevin Huang" <kevinhuang@northwestern.edu>
To: "Deepak Ponnayolu" <deepak@northwestern.edu>
Cc: <chwu@ece.northwestern.edu>
Sent: Monday, January 24, 2005 3:54 PM
Attach: Airgap switch resistances.jpg; airgap op amp feedback resistance.jpg
Subject: Attached Schematics with updated resistance

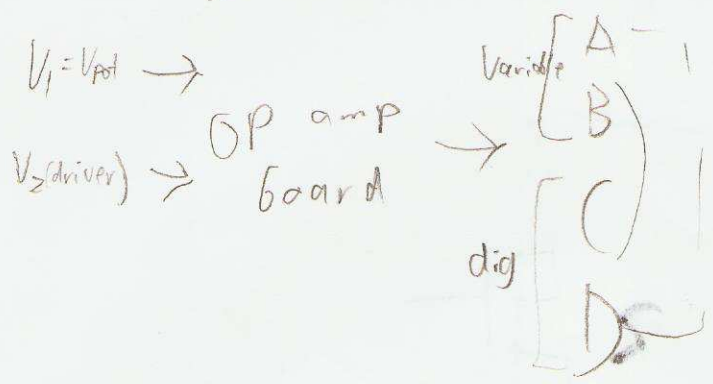


Note: See the airgap Box page for exact wiring.

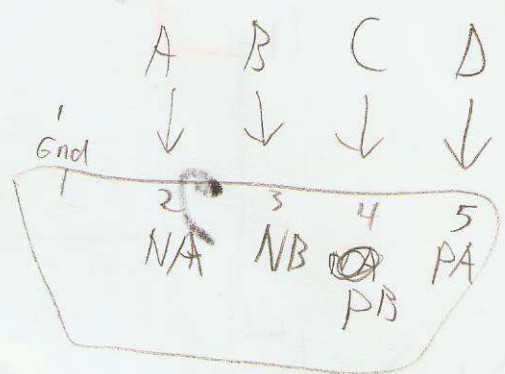
Pinouts of DB-9 Connectors

AD
BC

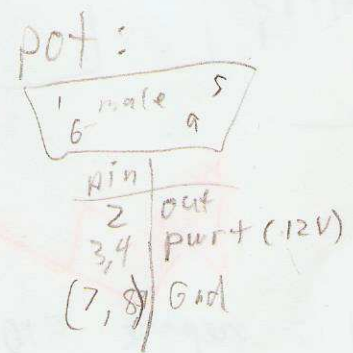
MOS A
MOS B



(Internal)

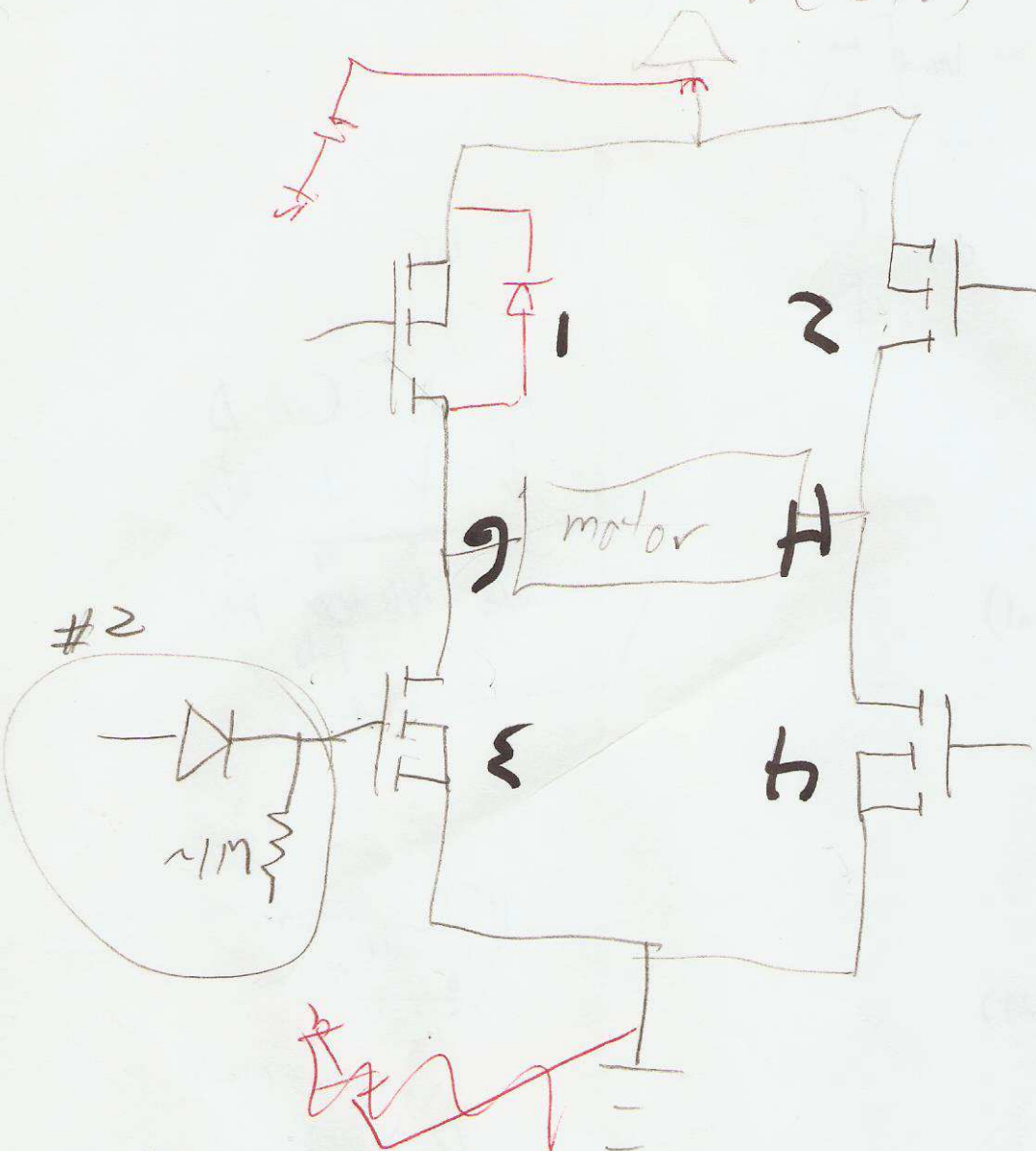


(To pot)



H-bridge

+V ($\approx 4V$)



#1 : replace 510 with ~~IRF9140~~

IRF 9540N (P-type)

#2 add (circled component)



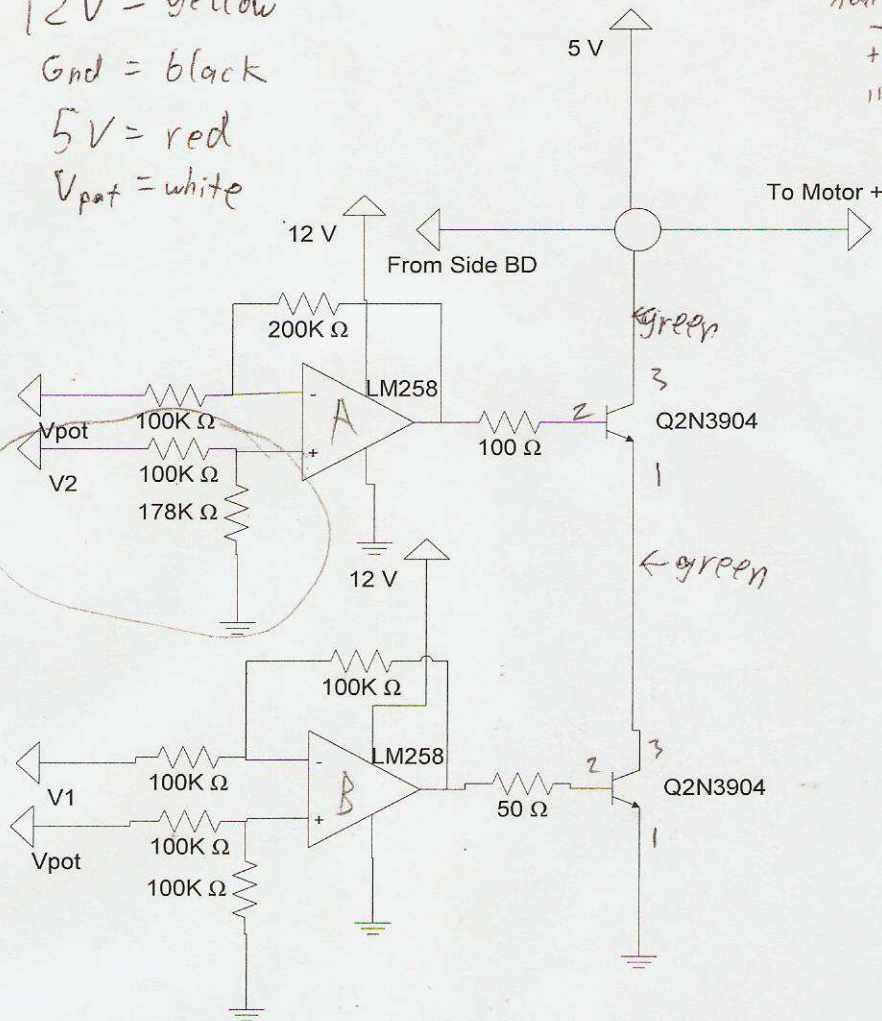
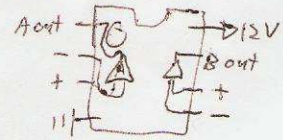
#1 : TODO for next design

#2 : implemented - fixed the issue of burning the box (overheat when 1+3 both slightly on)

Protection Circuit

12V = yellow
Gnd = black
5V = red
V_{pot} = white

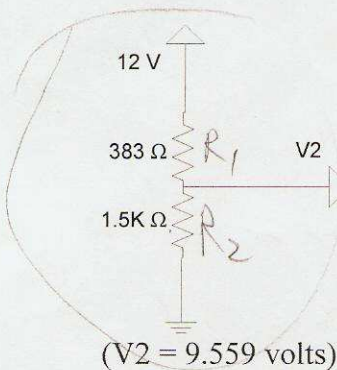
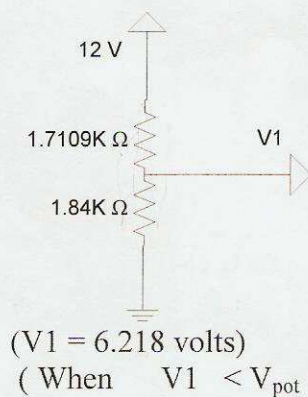
LM358N



$$\frac{12}{6.1206} = 1 + \frac{R_1}{R_2}$$

$$\frac{6.1206}{12} = \frac{R_2}{R_1 + R_2}$$

The amplification values were chosen in order to have quick turn off (in a voltage sweep), while also making sure that not too much current is drawn from the op-amps. Here are the reference voltages we calculated for crunch values:



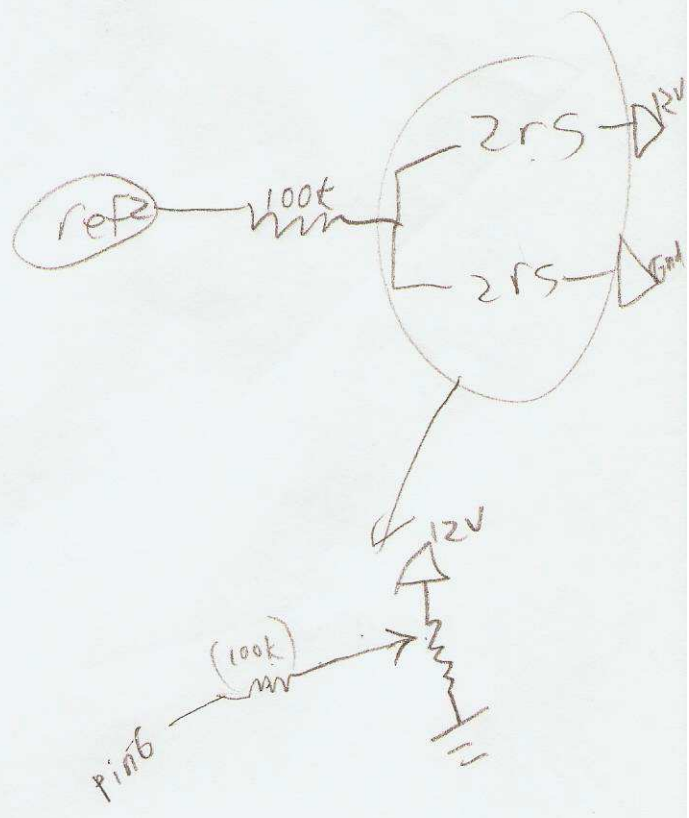
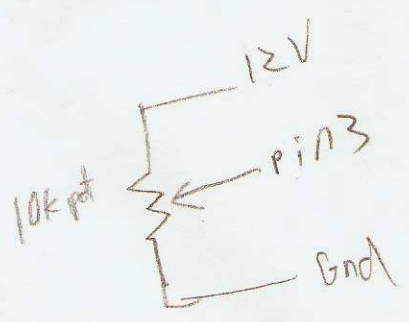
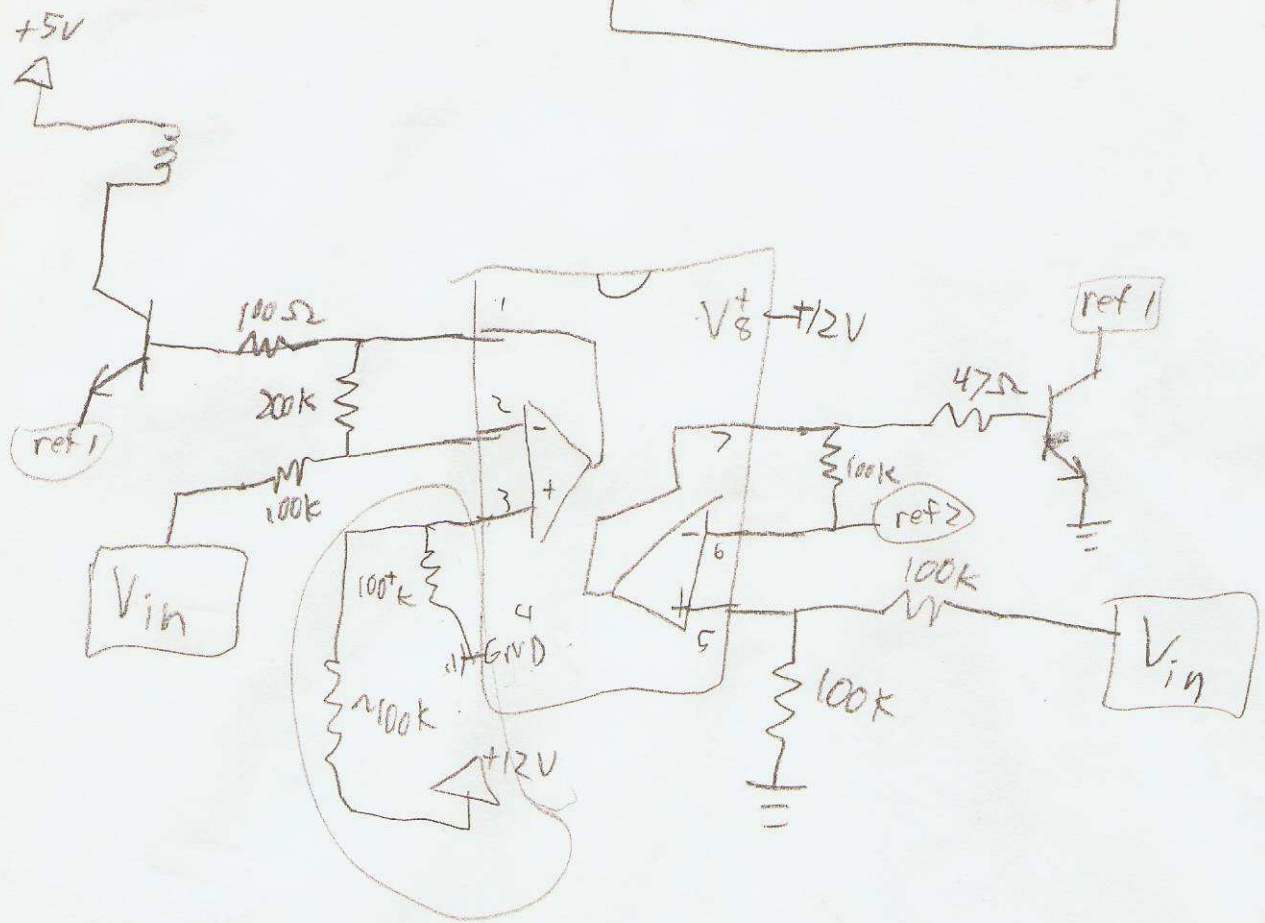
$$V_2 = \frac{R_2}{R_1 + R_2} V_s$$

$$V_{A+} = V_2 \frac{178}{278}$$

This is the simulation of the protection circuit. Outside 6.9 V – 8.8 V, the relay will shut off and subsequently shut off the air-gap motor. (?????? Ranges are different from selected V1 and V2)

$$V_{A+} = \left(\frac{178}{278} \cdot \frac{1500}{(383 + 1500)} \right) 12$$

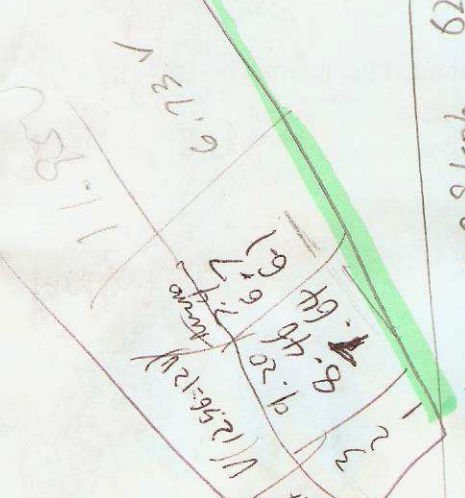
Protection Circuit



Calibration 4/3/70

left most 51.7 kph
 right most 51.7 kph

X#	Vg	pot # of turns
#1	6.444V	5.375 turn
#2	7.90V	6.61 turn
#3	9.09V	7.6 turn



turn 3 turn 100.8 kph 62.7 mph
~~turn 3 turn~~ 101.1 kph 63 mph

turn left → open air gap

turn 1/4 turn 54.8 kph → 34 mph
 turn 1/2 turn 59.7 kph 37.31 mph
 turn 3/4 turn 63.5 kph 39.7 mph

turn 1 turn 67.7 kph 42 mph
 turn 1 1/4 turn 71.3 kph 44.3 mph
 turn 1 1/2 turn 76.11 kph 47.56 mph
 turn 1 3/4 turn 79.9 kph 45.8 mph
 turn 2 turn 83.8 kph 52 mph

#1 0-35 m
 #2 35-45 mph