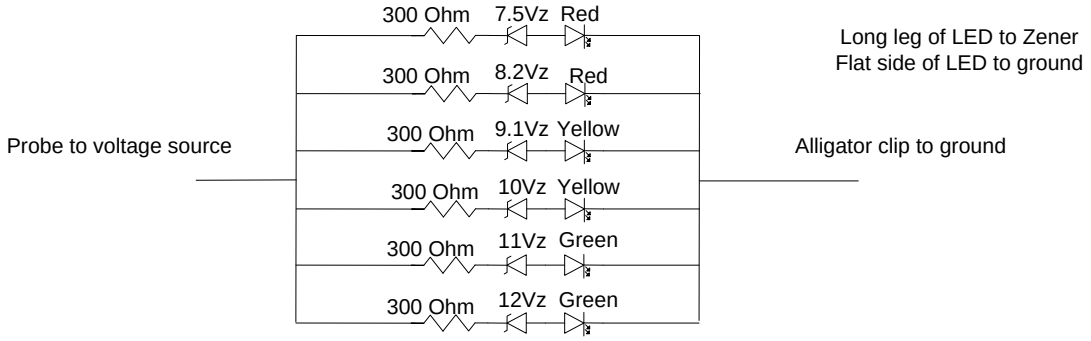

Design Notes:

1: The intent of this project was to have a simple, inexpensive easily used, hand held voltage checker for public service vehicles. Many of the devices in the vehicles have a low voltage drop out of about 10.2 VDC (In this Case, Top Hat Battery timer, Computer stand timer and video system all have low voltage drop out of about 10 to 10.2VDC). A standard trouble light, lights up regardless of the voltage. I trouble shot a problem on 12/21/2012 that fooled me with the standard trouble light and had to get the voltmeter out. I had a voltage drop across the Chevrolet battery isolator relay, then a voltage drop to the "Top Hat " battery timer causing the Top Hat to cycle on and off.

2: Each leg of the voltage checker has a break over voltage of the Zener diode voltage plus about 1.2V to 2.2V of forward voltage drop across the LED, so a 9.1V Zener lights up its indicator LED at about 10.5V to 11.3. Since I want a lower voltage indication then that (10.2V Minimum) had to change the Zener diode selections.

Original Zener selections of 9.1,10V,11V,12v,and 13V were changed to 8.2V, 9.1V 10V 11V and 12V

This should give indications of about 9.6V, 10,2V, 11.4V, 12.4 and 13.4V. Any voltage above 13V is fine so no further selection is needed. Any voltage below 9.6V will not light up the indicator meaning a serious problem in the vehicle.

3: Changed color selection of the LEDS. Red for low voltage, Yellow for marginal voltage and green for nominal voltage.

4:The forward voltage drop on the LED's I purchased surplus are all over the place. Found the series of Linrose Super bright LED's at FRY's that had about the same voltage drop per color LED of 2.1 to 2.2V and about the same light output. Changed the zener diodes to 7.5, 8.2, 9.1 10,11, 12v. Gave voltage indications of 9.7, 10.4, 11.3, 12.2, 13.2, 14.2.

Date	Revision/Addition/ Note	By:
Dec 22 2012	Inital Drawing	GSC
Dec 23, 2012	See design notes, changed zener diode selection and LED Color indication	GSC
Dec 28, 2012	See design notes, added 7.5 zener diode. Forward Voltage drop across LEDs vary widely. Use LEDs from same family to get a consistent drop.	GSC

1N5236 7.5v
1N5237 8.2V
1N5238 8.6V
1N5239 9.1V
1N5240 10V
1N5241 11V
1N5242 12V
1N5243 13V

Drawn By:	Gerald Crenshaw WD4BIS	Date: Dec. 22, 2012	From the bench of: Amateur Radio Station WD4BIS	Page 1 of 1
Designed By:	Gerald Crenshaw WD4BIS	Date: Dec. 22, 2012		
Checked By:	Janet Crenshaw WB9ZPH	Date: Dec. 22, 2012	Title: **Automotive Voltage Trouble Light**	Scale: