Dash LED lights analysis test

I'm aware that this particular topic was previously discuss at length on the CLC board with a few inconclusive reviews and comments. I wanted to take this particular issue and do an analysis to validate and verify that we could or not replace the dash lights on our instrument panel with LEDs bulbs.

I first have to do a basic electrical testing with a working headlight switch rheostat, since I rebuild several ones before I have a few 071 (199 5071 older which was replaced with 199 5080) on the 1956-1957 models. All the rheostats were wound with a similar resistance value of approximately 4 ohms.

A total of 10 standard filament bulbs were used with the 57 bulb type for the test, although only 9 are present on the original panel, I used 10 to simplify the operational/functionality testing.

My first bench test was to wire all of the lights in parallel (to mimic the same wiring layout on the panel) and to take reading.

Since I only have available a few new and older bulbs the overall resistance measure was around 1.4 ohms (with the clip wires, wires at the sockets and the test lead resistance having around 0.5 ohms) the overall resistance would be closer to 0.9 ohms.

Fig. 1 below shows the resistance value as measure.

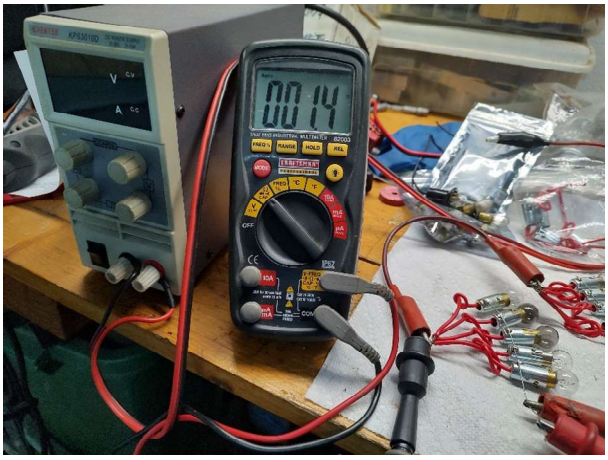

Fig. 1

Next I connected my bench power supply set at 13V to measure the overall current on the load of the bulbs.

Fig. 2 below shows the current on both my power supply and the voltmeter both were close so the final rest was measure at around 2A.

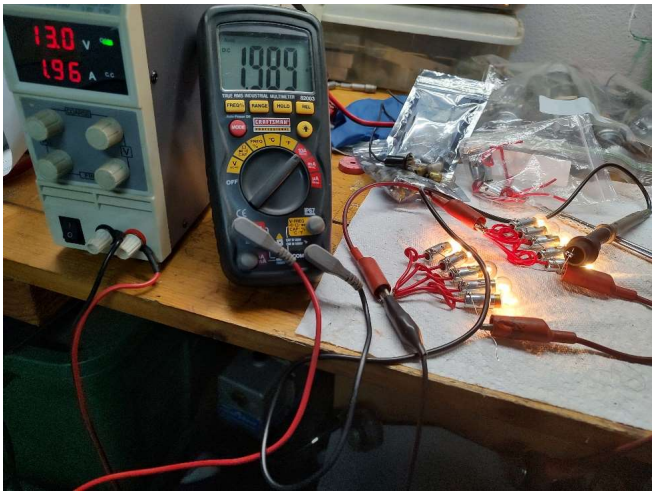

Fig. 2

My next layout was to wire the headlight switch in series with the bulbs again to mimic the wiring layout on the dash, the rheostat on the headlight switch has the +12V source feeding the dash lights.

I then took reading to both current and voltages across the bulbs with the rheostat set at different settings full about 1 ohm (not touching the bypass tip), half about 2.5 ohms and lower about 3.6 ohms (maximum resistance to dim the lights).

Fig. 3 below shows the overall current drawn by the bulbs with the rheostat set at low 1.63A (left side picture), half 1.8A (center picture) and full 2.0A (right side picture)

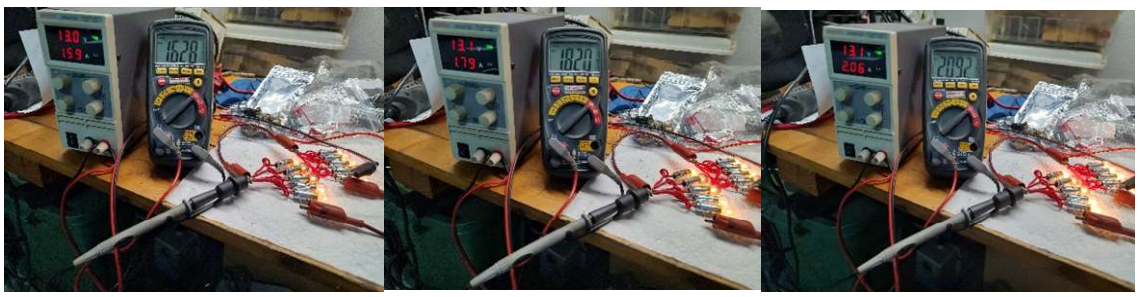

Fig. 3

Next test was to measure the overall voltage drop across the bulbs while the rheostat was set at the same ranges as above.

Fig. 4 below shows the voltage taken when the rheostat was set at low 7.6V (left side picture), half 9.6V (center picture) and full 12.3V (right side picture).

Fig. 4

These tests provided me with a bench mark for the next scenario of replacing the older filament bulbs with regular LEDs bulbs. The LEDs used for the next test were the BA9S base (same base as the older filament bulbs) with a SMD chip set which could be dimmed by dropping the voltage within limits to dim them.

All the filament lights were replaced with the LEDs under the same test bed while rotating the rheostat to the same settings use above under Fig. 3 and Fig. 4. For this test I did not used or care for the current drawn layout since the LEDs use very low current and for diming they need the voltage to be dropped.

As you can see under Fig.5 below the voltage drop across the LEDs while the rheostat was set at these ranges was around 0.5V so the LEDs have a very limited dim intensity which was not too obvious visually.

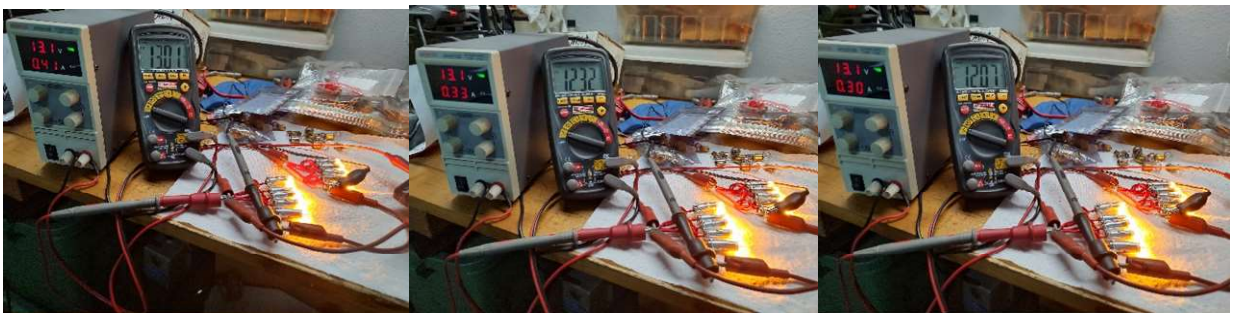

Fig. 5

So by just replacing the older filament bulbs with newer LEDs bulbs would not provide the same dimming functionality as with the older filament lights while using the same old rheostat on the headlight switch.

Options for converting the dash lights to LEDs are (as other folks have used/suggested);

a- Replace the bulb with LEDs and just leave the option of dimming out, just rotate the rheostat to the max setting (bypass setting) and forget about dimming.
b- Leave the older filament bulbs in place and continuing using the dimming feature.

Well while doing this experiment I've try to see if there is (or not) and third alternative without performing a major modification to convert the dash lights to LEDs.

My first approach was "can I add a load across the LEDs for the rheostat to drop down the voltage during the rotation for dimming the lights" this to emulate having the same number of filament bulbs in-line (as the original setup).

I have a load resistor which I used on my previous experiments with the turn signal lights conversion to LEDs. This resistor is a 6 ohm 50W type since as the resistor would be connected in-line I've added an extra heat sink (a small aluminum piece and some silicon heat sink paste) to dissipate the heat when in use for protection.

I then wired this resistor across the lights and the results were similar to the ones with the older filament bulbs while rotating the rheostat. Since the overall resistance of the filament bulbs was around 1 ohm the load resistor having 6 ohms would be acceptable for the test.

Fig. 6 below shows the layout and the voltage results while the rheostat was place at the similar position as it was during the test under Fig.4 above.

Fig, 6

The voltage taken when the rheostat was set at low 8.1V (left side picture), half 9.1V (center picture) and full 12.1V (right side picture). One note is the break down voltage for these LEDs to turn off (with all 10 in-line) is around 6.6-7.0V, so the dimming in the low setting at 8.1V was a bit low. Adding a second load resistor in series with the first one making the total resistance to 12 ohms increased the voltage across the same range on the rheostat to about 0.9V-1.0V making the low dim a bit better.

Changing the bulbs on a working instrument panel would be a huge endeavor and adding either one or two load resistors would be an additional challenge as well. One key item is adding the load resistor(s) these can be clipped to any of the “gray wire” at the sockets and the ground solder to the socket itself, so there is no need to deal with them at the headlight switch side.

One final note to add, while testing both of these scenarios I’ve notice the rheostat was a bit cooler (by touch) with the LEDs (with just one load resistor in-line) than with the older filament bulbs. This can be also be notice under the max dim settings under Fig. 3 (left side picture) with filament bulbs showing around 1.6A versus Fig. 6 (left side picture) with LEDs bulbs showing 1.4A so a drop of 200ma across the rheostat.

Again these are just my personal results for testing a conversion to LEDs if anyone is to take this approach and want to have the same setup to dim them as they are with the older filament lights. If anyone is to take the task in replacing the bulbs with LEDs you will need to take in consideration your existing wiring and the rheostat condition, during my testing the rheostat was rewound with new nichrome wire.

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