

Adding the lighting controls to the Norfolk Southern Buena Vista car was accomplished by using a TCS (Train Control Systems) FL4 decoder. This decoder has 4 individually controlled outputs. Each output has a limit of 100 milliamps so only 2 lights were added to each output. The light bulbs used were 1.5 volts which need a dropping resistor. The low voltage bulbs were selected because they don't produce enough heat to melt plastic.

Since the decoder has 4 outputs and the car has 6 lights the center 2 lights (white) were wired in parallel and added to one of the outputs. The output options are Green, Purple, Brown, & Pink any one of the wires can be used. However, as already mentioned a dropping resistor has to be used to reduce the track voltage down to 1.5V to prevent the light from blowing out. Even though two lights were joined together each light needs to have its own resistor. The reason for this is if 1 of the 2 lights burns out the current draw will be cut in half and if the current is reduced by 50% the voltage drop on the resistor will be cut in half increasing the voltage to the good bulb and blowing it out. Using Ohms law, assuming about 16 Volts on the track, the DC output will be about 14 Volts.

The lights used were designated by the manufacturer as drawing 15 mA. Therefore, to drop 12.5V across the resistor, leaving 1.5V for the light, it needs to be 833.33 Ohms. Well, that is not a common value but 910 Ohms is so that value was tested before installation with clip leads to be sure that value will work. If you want to drop voltage for similar usage you may need a larger or smaller value of resistor if your track voltage is different or if using bulbs that draw a different current. A larger resistor will make the light dimmer and a smaller brighter but if is too bright the bulbs life will be reduced. The next consideration is the wattage of the resistor. The power consumption is a little over 1/8 Watt, therefore, a ¼ Watt resistor is needed. Remember that each light bulb will need its own resistor.

All six light must have one wire each tied together for the common wire (Blue). One long wire was used for the full length of the car since the decoder had to be put in the front vestibule to hide it. Each of the other five wires were spliced in about every inch so by the time the other end was reached there was only 1 wire to attach to the Blue wire. The next set of lights, the remaining two white lights were wired the same as the first two then added to a different decoder wire. The 2 remaining lights are the outside red lights. These were also 15 mA lights so all the calculations made remain the same. However, since there were 2 wires (circuits) left each light was put on its own circuit. This allows for many feature options on each of the different lighting outputs.

On the NS these red lights simply flash together in a single blink pattern so that is what was programmed to those two wire color outputs. On the subject of programming the different wire colors can be mapped to be controlled several different ways. All 4 outputs can be mapped to the same function or each out can be on its own function button. This unit has the center 2 white lights on 1 function, the other 2 white lights on a second function, and the red lights on a third function. This allows you to turn the lights on and off independently in pairs. With the 2 red lights being on their on output the lights could be programmed like ditch lights and alternate instead of flashing in sync. Special note in the mapping procedure don't use function 2 unless the goal is to only have the lights on while holding down the f2 button since it is a momentary not latching function.

There are two last notes to be mentioned. The first is an additional safety item. Even though all the resistors have a high enough wattage to not burn up with all six of them installed in the vestibule aluminum foil was installed on the floor to reflect the heat away from plastic. The floor was cleaned with alcohol, double sided tape put in place on the floor, and the foil on top of the tape to be sure the foil didn't move around. The other is weight. This car uses all 8 wheel for power pick up which is essential for good consistent lighting. However, the flashing of the red lights tends to make the white

lights to dim when the red lights are on. The solution is to weight this car as heavy as is practical. This increases the contact with the rails which increases current available to the lights and reduces if not eliminates the dimming of the white lights.