

How To - Replace the Clearance/Running Lights with LED Fixtures

We wanted to replace the Clearance Lights at the top of our coach with LED Fixtures because the old incandescent bulbs were dull, the covers were fogged, the screws were rusty, and fixtures had water in them.

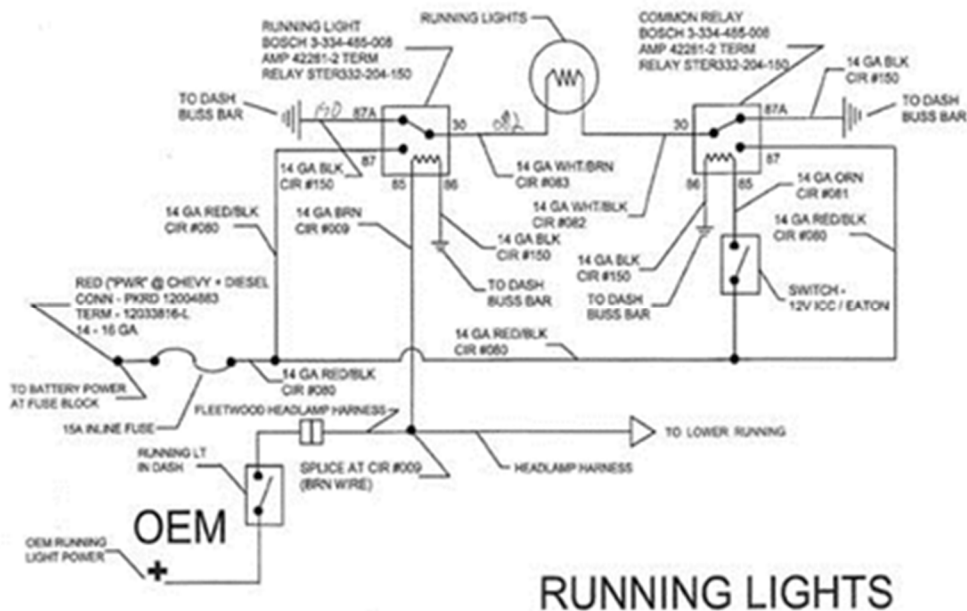
Parts: 5 MBCPC-R24: Red, and 5 MBCPC-A24: Amber at \$10 each from <https://www.superbrightleds.com/search/led-products/mbcpc-a24+amber/>

Here are the old and new upper clearance lights as we started the swap-over.



We soon discovered a problem. Clearance Lights should flash with the ICC switch at the driver's seat. If the clearance lights are ON, they should flash OFF. If they are OFF, they should flash ON so that they can send a 'Thank You' to other drivers day or night. Well, after replacing the original incandescent lights with LED lights they will flash OFF OK if the lights are ON but NOT the other way around.

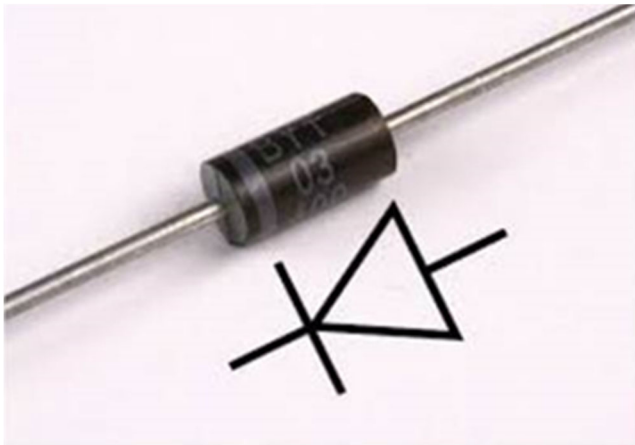
Looking at the schematic I realized why. They use two relays, one called Running Lights Relay and another called ICC Common Relay.



The Clearance/Running light position on the headlight switch activates the Running Light Relay and the ICC switch activates the Common Relay. Great, except that the way they work in effect reverses the 12 volt and ground polarity when the clearance lights are off and the ICC switch is activated. This is no problem for the old incandescent bulbs, but the LEDs have a fit over this voltage reversal and refuse to cooperate!

Getting the LEDs to light with polarity that gets reversed (as it does in this case) can be addressed with the use of diodes. An arrangement of 4 diodes (called a Bridge Rectifier) is usually used to convert AC power to DC power but it will also work for this issue.

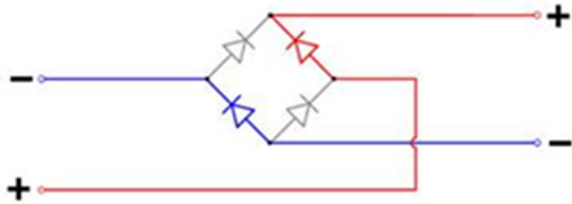
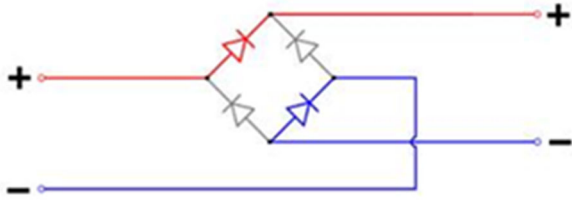
Diodes are devices that will pass current in only one direction (like a check valve in a water line) and will block current when the voltage is reversed. The diodes I used here can handle up to 3 Amps. The 20 LED assemblies I am powering use a total of about 1.5 Amps. 3 Amp diodes are twice the capacity needed for all of these LED light assemblies. The current will only flow through the diode in the direction of the arrow. If voltage is applied in the opposite direction, no current will flow.



Parts: 3 amp 1N4001 diodes, a 20 pack for \$10 from https://www.amazon.com/gp/product/B0068AF32Q/ref=ppx_yo_dt_b_asin_title_o04_s00?ie=UTF8&psc=1

Using these diodes, a bridge rectifier can be created by connecting the diodes as shown in the diagram below. Follow the RED line from the relays on the left to the LEDs on the right. In both examples, current can flow from the +12 volt source in the direction of the triangle (arrow) to ground but is blocked if the +12 Volts is applied to the banded side of the diode. The blocked diodes are shown in grey. Here are the two possible conditions for the relay output voltage.

Wires from Pin 30 of both relays are connected on the left and the wires going out the LEDs are connected on the right.

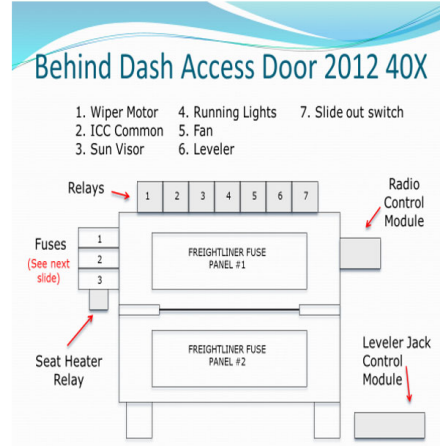
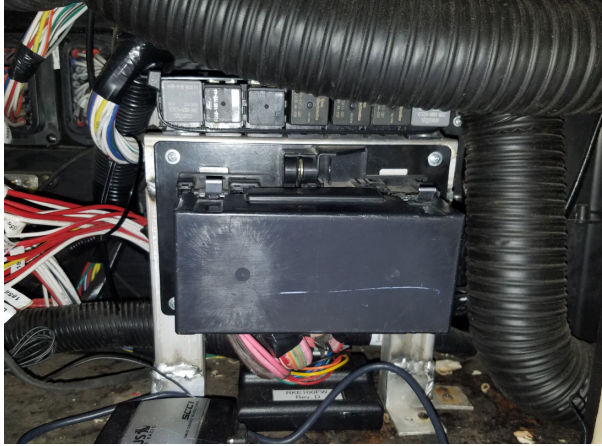


This is what the diode bridge looked like before I attached it between the relay's pin 30 wires and the running lights. I used heat-shrink on the diode leads to ensure that they did not touch the wrong thing and pop a fuse and soldered the lead ends together for testing and to hold them together until they could be crimped to the relay wiring with butt connectors.



Parts: Butt Connectors from Amazon (smaller quantities are available at Lowes or Home Depot). Use a crimping tool to ensure tight connections.
https://www.amazon.com/WGCD-Insulated-Terminals-Electrical-Assortment/dp/B06XRCJCHP/ref=sr_1_4?crid=2PHQQPZ5WCFFG&keywords=butt+connectors&qid=1555680949&s=gateway&srefix=butt+%2Caps%2C136&sr=8-4

In my coach, the relays are under the dashboard in a row of 7 black relays across the top of the relay and fuse block frame. If I unscrew the fuse block frame from the floor, I can tip it toward me to access the back of the 2 – ICC Common and 4 - Running Lights relays to connect to the two, pin 30 wires coming from of these two relays. Your relays may be in a different location.



When I made the diode connections, I also added a separate line that went through the firewall for the new lower clearance/running LED lights to be added later.

The Clearance/Running light LEDs are much happier now and light as intended regardless of the voltage polarity coming from the relays.

Moving on...

Folks on the iRV2 forums were also adding a lower set of clearance lights similar to what we see on trucks.



These small lights are only $\frac{3}{4}$ " in diameter and fairly inexpensive. Adding Stainless Chrome bezel rings to these lights hides the black mounting grommets.

Parts: 5 Amber and 5 Red $\frac{3}{4}$ " round LED Clearance Lights for \$9
https://www.amazon.com/Purishion-Clearance-Indicators-Trailer-Taillight/dp/B01MEG40NI/ref=pd_day0_hi_263_1/139-1861183-8083103?encoding=UTF8&pd_rd_i=B01MEG40NI&pd_rd_r=36932278-62ac-11e9-8c99-472c1499fd9d&pd_rd_w=A6xzQ&pd_rd_wg=isvXM&pf_rd_p=ad07871c-e646-4161-82c7-5ed0d4c85b07&pf_rd_r=C52K877N6W0EHDYZ42Y5&psc=1&refRID=C52K877N6W0EHDYZ42Y5

Parts: Stainless Chrome Bezel Covers for \$7

https://www.amazon.com/gp/product/B01I88WGP2/ref=ppx_yo_dt_b_asin_title_o02_s00?ie=UTF8&psc=1

After drilling 3/4" holes in the front and rear coach caps at spacing that matched the upper Clearance/Running lights, 18 gauge lamp cord, wrapped in wire wrap for protection was routed and secured with tie wraps.

Parts: Wire Wrap in 1/4", and 3/8" diameter for \$4 at <https://www.harborfreight.com/1-4-quarter-inch-x-14-ft-protective-wire-wrap-66985.html>

Parts: Tie Wrap for \$6 at https://www.amazon.com/Multi-Purpose-Self-Locking-Tie-Wraps-Cable-Tie-Strength/dp/B0793HMK2H/ref=sr_1_1_sspa?crd=32DKNCRDSYLAV&keywords=tie+wrap&qid=1555685350&s=gateway&sprefix=tie+wrap%2Caps%2C141&sr=8-1-spons&psc=1

Parts: Bullet - Wire Crimp Connectors for \$11

at https://www.amazon.com/gp/product/B01CAH40UQ/ref=ppx_yo_dt_b_asin_title_o02_s00?ie=UTF8&psc=1

Parts: Quick Splice Wire Terminals T-Tap Self-stripping with Insulated Male Quick Disconnects for \$11 at https://www.amazon.com/gp/product/B01CDWC60Y/ref=ppx_yo_dt_b_asin_title_o03_s00?ie=UTF8&psc=1

The wires for the front cap went from the diode connections behind the fuse panel under the dashboard, through an existing opening in the firewall, following the slide-out generator wiring down and across the bottom of the generator slide-out.

The wires for the rear cap went from the existing Clearance/Running light lines in the bottom of the right side of the rear cap to across the bottom of the rear cap. In all cases, the wires were wrapped in wire wrap, securely fastened with tie-wraps and connected with quick disconnects connections. All exposed wiring connections were sealed with electrical tape.