

Led Conversion Guide for MTH Pass Cars

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Foreword: This guide is for use in converting incandescent bulb lit MTH passenger cars to more efficient and realistic led lighting, using standard 8mm 12VDC 2835 led strip together with constant current lighting modules, available either ready-made, or in DIY kit format.

Note that warm white strip leds seem to represent mid-20th century incandescent passenger car lighting pretty well. White leds might be a better choice for newer cars such as Amtrack, Superliners, Metroliners, subway cars, etc. Also note that standard 300 led per 5m density strip (3 leds for each 2" section) is more than sufficient for our needs. There is also a double density 600 led per 5m variant, but these are not necessary.

Each 2" long section is a separate series circuit of 3 leds and a 150 ohm load resistor. So you should take care to not cut anywhere within the section, or you will ruin the circuit. Cut only at the solder pad pairs between sections. Most strips are marked where it is safe to cut.

A full 5 car Premier set plus 2 car addon and full vista dome will require about 66-2" sections of leds. A full 4 car RailKing set plus 2 car addon and full vista will need about 48 sections. A 5m reel has 100-2" sections. So one reel will do two RK sets, and 2 reels will do three Premier sets. You will of course also need one lighting module for each car.

You will likely find that dome and full vista dome cars will take the most time to convert. Next longest are observation cars, and regular coach/sleeper/diner/baggage cars take the least amount of time. It's a good idea to start with a couple of the latter easy conversions first.

Please refer to the separate lighting module and marker led board user notes elsewhere for more information and installation tips.

1. 70' ABS Premier Cars (Refer to the disassembly procedure that came with the cars)

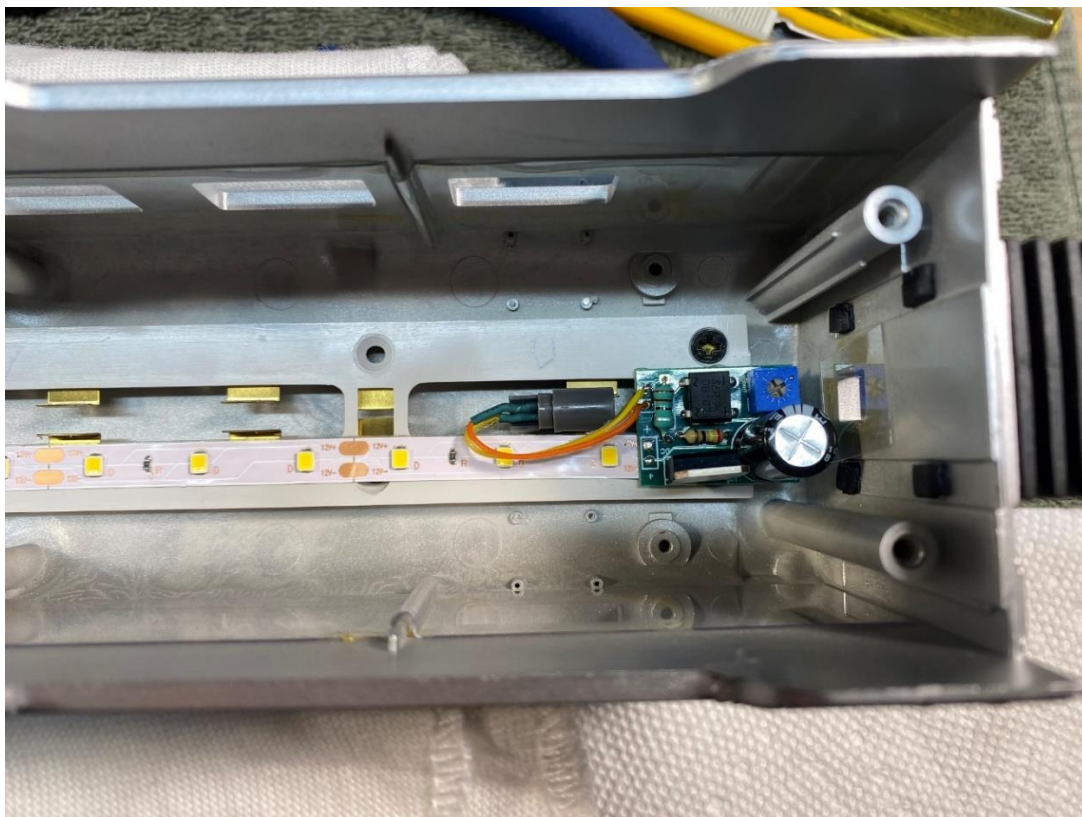
Floor and interior detail inserts are removed from the underneath after removing 10 or 11 screws from under the floor. The roof and car body are all one piece. There is a 2 pin spring power connector between the floor and the body of all Premier cars, which makes inter-connection easy. No additional M/F lighting connector is needed.

I find it's easiest to retain the OEM light rack and pry/pull all the OEM bulbs out of the sockets first. Then you can direct connect the lighting module to the nearest lighting socket along the rack using the method in section 4. Or solder 2 short wires directly to the full length power strips along the rack for power.

See [pic 1](#). Prior to installation the lighting modules can be direct soldered to the end of the led strips per point 5, then fastened upside down to the OEM lighting rack using hot melt or other glue. The led strip (8 sections) should be aligned to run along one side of the lighting rack for the entire car length. This positions the module up against the roof right at the end of the car and nicely out of sight per [pic 2](#), and makes the strip & module removable if needed. Car lighting is not adversely affected by the strip being slightly offset from car center. Standard baggage cars, coaches, diners, & observation cars can all be done as above; 8 led sections each.



Pic1: Module soldered directly to led strip, being tested; for Premier cars.



Pic 2: Module and strip fastened to OEM light rack; for Premier cars.

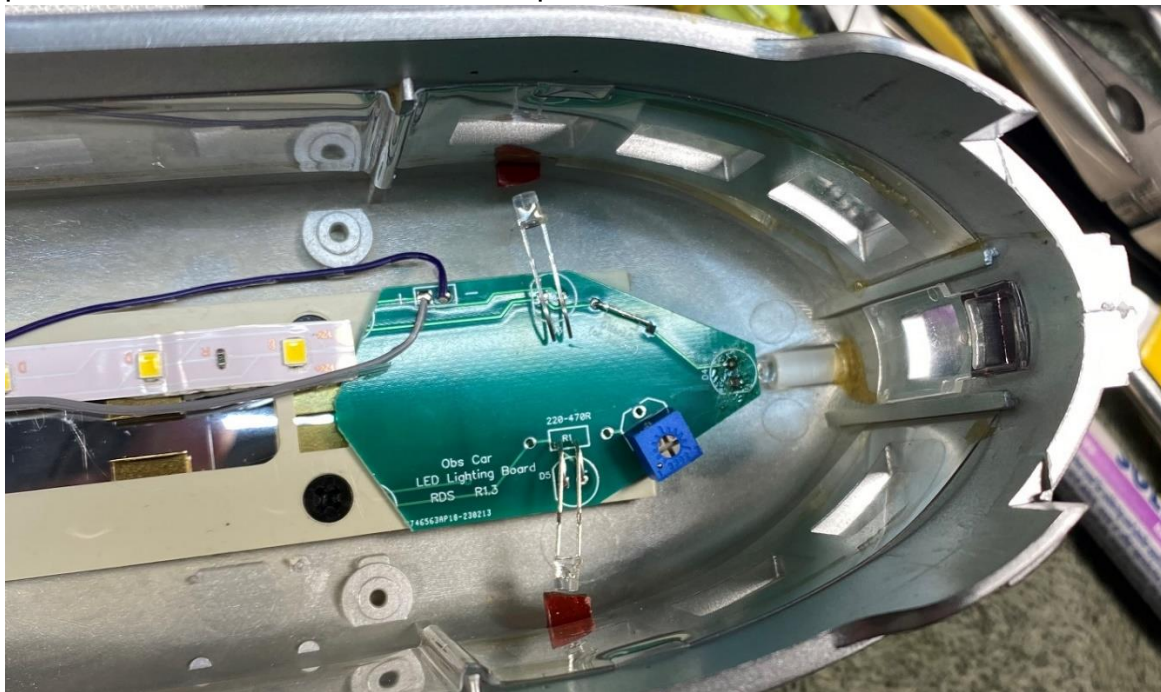
For sleeper cars it is best to offset the led strip directly over the partition wall that separates the staterooms from the full length hallway. This will assure all are lit. Alternately you can use separate led strips over the staterooms and the hallway. Note that depending on the car, you may have to slightly trim a partition wall on the seating insert for clearance. This will be inconspicuous once the car is reassembled.

See [pic 3](#). For a dome car remove and discard the OEM stepped lighting rack. Run a short 2 section strip along the roof of the dome and use clear plastic cement to affix the 2 wire jumper to the clear plastic behind a roof rib, so that it is as inconspicuous as possible. Run short sections of led strip in all open areas under the roof and dome floor and interconnect using short soldered wire jumpers as shown. Observe polarity.



Pic 3: Typical dome car strip wiring details; both Premier and RK cars.

See [pic 4A](#). For observation car markers cut down the long red plastic side marker bezels, to about 2mm as shown. Then use the *middle* side marker pads on the marker pcb. You can butt a white led up to the end of the rear bezel to light it, or the rear marker bezel can be pressed out and a 5mm round led inserted in the hole instead. Use the led color of your choice for the rear; red, white, amber, etc. Glue the board in place and bend the side leds to butt up to the cut down side marker bezels.

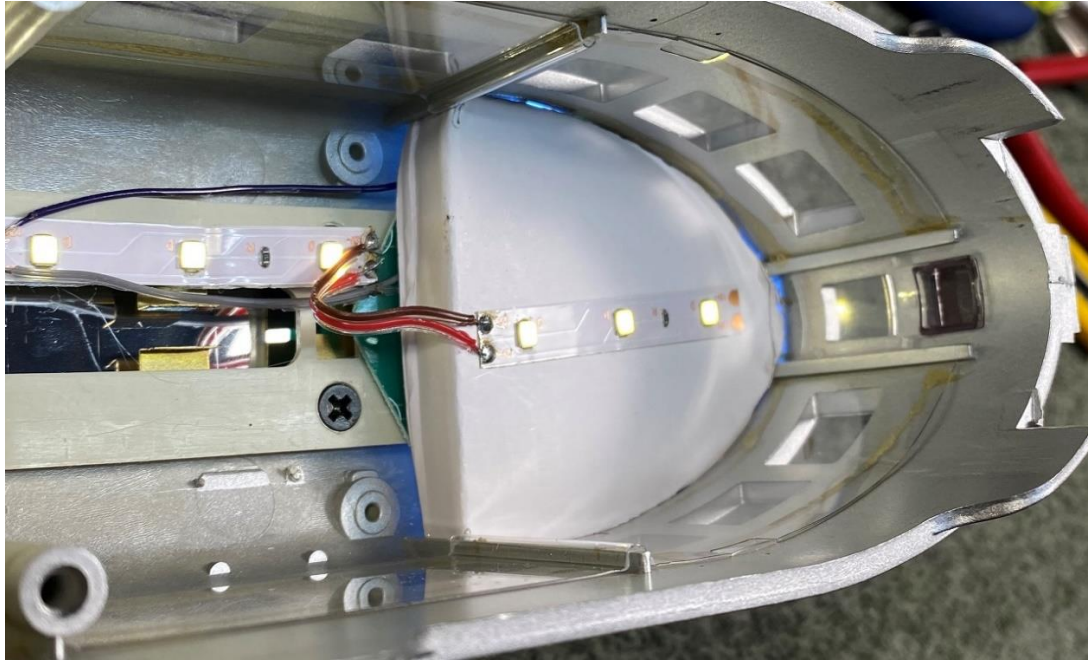


Pic 4A: Marker led board in a Premier observation car. Use mid-side led pads.

NOTE: Front corners of pcb trimmed to clear light rack mounting screws.

Pcb mounts a 500R 3362P pot, but a fixed resistor R1 can also be used.

See [pic 4B](#). If you use bright white marker leds the light will look too bright in the rear passenger area. You can enclose the markers with a thin cardboard enclosure as shown, cut and press fitted into the rear of the shell to conceal the marker leds. A separate 3-led strip section can be affixed to the cardboard enclosure and jumpered to the main strip as shown, so the rear of the car is illuminated to match the rest.



Pic 4B: Marker led enclosure pressed into place; Premier car.

For Premier cars you can optionally drill a 3/16" access hole for the adjustment pot in the car floors per [pic 5](#). Hole is on centerline and about 1/2" from the end.

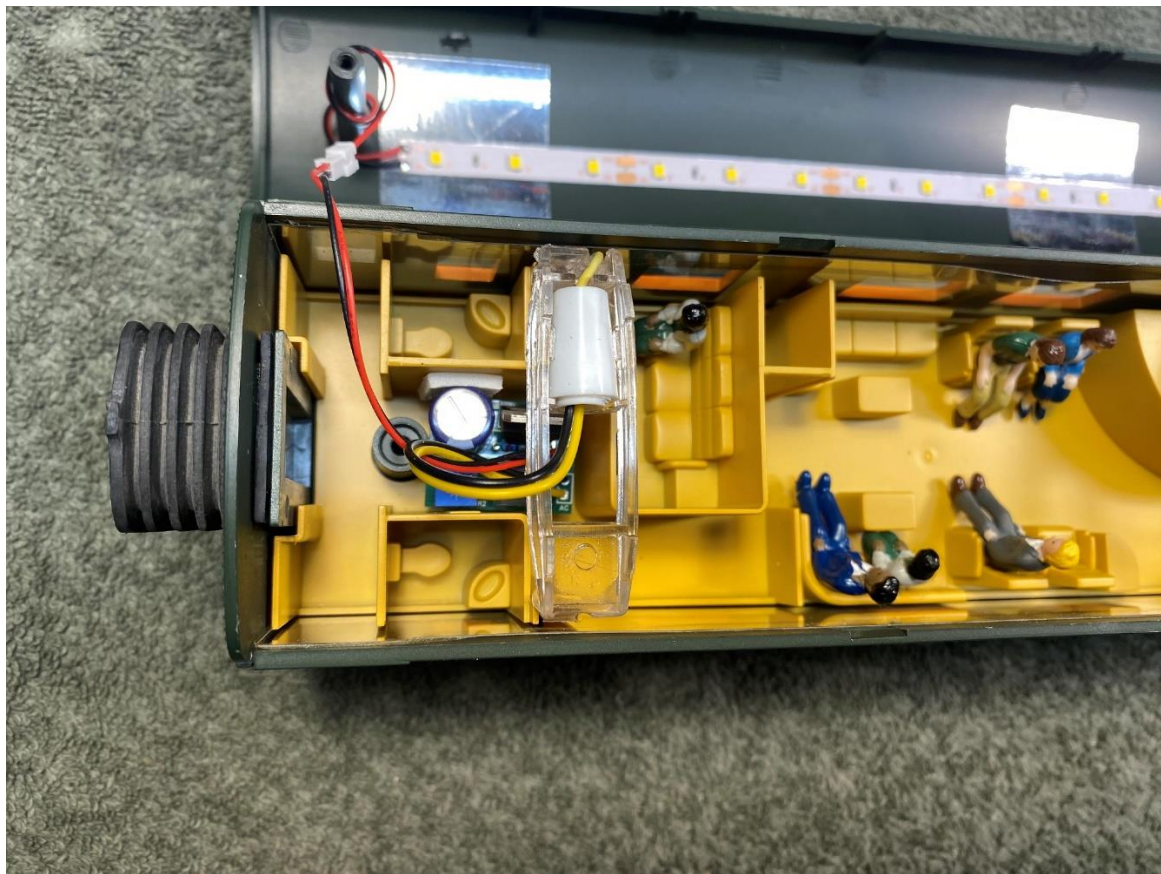


Pic 5: Optional pot adjustment access hole in floor; for Premier cars.

2. 60' ABS Railing Cars (Refer to the disassembly procedure that came with the cars)

These cars typically disassemble by removing 2, 3 or 4 screws from under the floor. Then grasp the car ends in both hands and gently twist to pop the roof free. The floor and body are all one piece. The interior seating insert is now removable, but most wiring is under the insert and does not need to be disturbed. Just leave it in place.

See **pic 6**. It's generally best to fit the lighting module into a suitable small compartment in one end or the other of the seating insert, wherever it fits best. Usually no modifications are needed. Power for the lighting module can be direct connected to the nearest OEM lighting socket as shown, using the method in section 4. There is normally no need to disturb the underfloor wiring or remove the 3 overhead clear plastic light mounts. Remove the bulbs from all 3 sockets (just pry and pull out) and use the nearest one for power to the module. Simple.



Pic 6: Direct power connection to OEM light socket; for RK cars.

Note the M/F pigtail connectors leading to the led strip mounted in the roof.

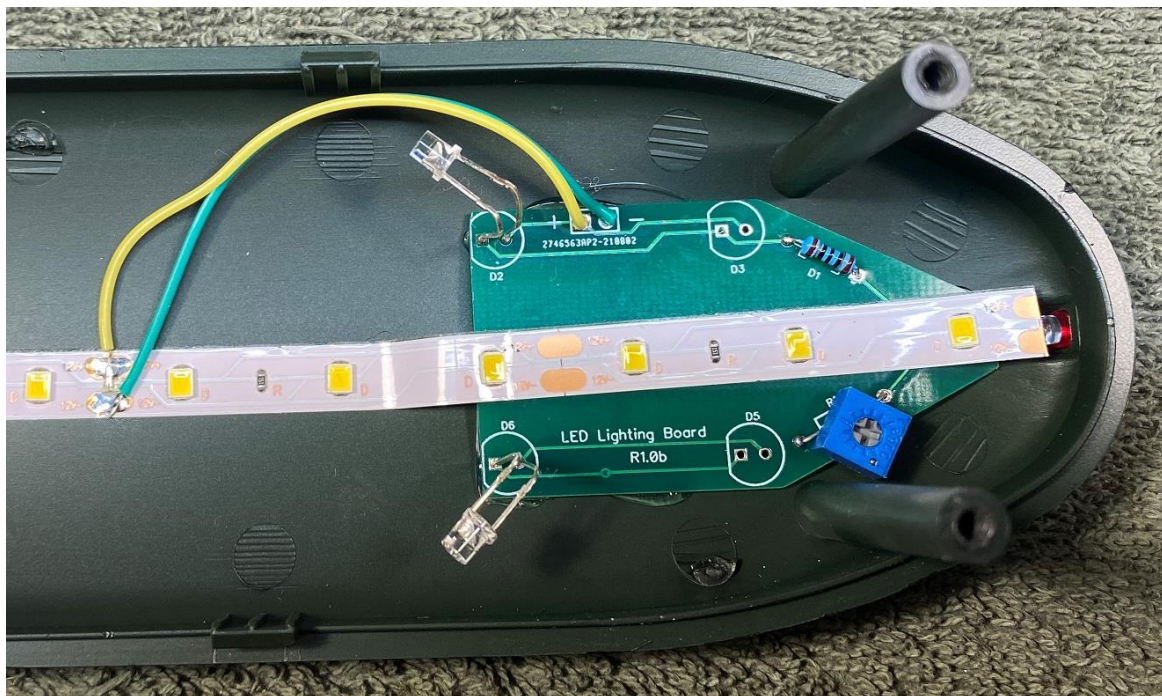
For future roof removal its best to connect the strips to the modules using an M/F connector pair such as the JST micro 1.25. It saves time to pre-build the led strips (7 sections each) with one end of the pigtail soldered on. The mating connectors are soldered to the module outputs. Observe polarity! Affix the led strips directly along the

center of the underside of the roof, so as to fit between the end mounting posts. The M/F connectors are joined just before car close up per pic 6 above. Standard baggage cars, coaches, diners, & observation cars are all done as above; 7 led sections each.

For sleeper cars it is best to offset the led strip directly over the partition wall that separates the staterooms from the full length hallway. This will assure all are lit. Alternately you can use separate strips over the staterooms and the hallway.

See [pic 3](#) (earlier). For a dome car run a short 2 section strip along the roof of the dome and use clear plastic cement to affix the 2 wire jumper to the clear plastic behind a roof rib, such that it is as inconspicuous as possible. Then use separate short sections of led strip in all open areas under the main roof and dome floor, and interconnect them using short soldered wire jumpers. Jumper the short dome roof led strip to the main strip the same way.

See [pic 7](#). For observation car markers you can use the OEM side and rear marker bezels as is. Use the *front* marker led pads on the pcb as shown. You can butt a white led up to the end of the rear bezel to light it. Or you can replace it with a 3mm round led (color of your choice), though it will be a loose fit. Glue the board in place and bend the leds to place them close to the marker bezel positions. For the side markers you will need to do some measuring to get the leds as close to the bezels as possible. The bezels are located in the car body and precise alignment is not possible prior to car close up.



Pic 7: Marker led board mounted in an RK observation car. Use front led pads.

Bright white marker leds will tend to be too bright in the rear passenger area. To avoid this you can use warm white marker leds instead, or paint the bottoms of the led bodies black to mask most of it. The led strip can be extended (or added to) over the marker pcb as shown (pic 7 above) so the rear of the car is illuminated like the rest.

3. Full Vista Dome Cars-Premier and RK

Refer to disassembly procedure that came with the car. These cars are built totally different from all others in the set. Disassemble by removing several screws from the underside. For the RK version the roof comes off by twisting like other RK's. The Premier roof and car body is one piece and the interior module is removed in one piece from below. In both cases the lower floor separates from the upper floor by removing 4 screws, to allow full access to the lower level. For RK cars the lower floor can now be re-installed in the car body (2 screws) and the underfloor wiring left intact.

Typically we want to add full length leds under the vista dome roof, as well as shorter led sections (3 or 4 sections) to illuminate the central seating area beneath the dome floor, though this is entirely optional.

Premier full vistas can accommodate 8 upper and 4 lower led sections; total 12.

Railking full vistas can accommodate 6 upper and 3 lower led sections; total 9.

Both ends of the lower floor have closed off open compartments without windows.

Either one is suitable for installing the lighting module. Bring the upper and lower led strip wiring connectors to this compartment and make board connections as needed.

For Premier cars you can reuse the OEM bent metal tie strips to power the dome leds. Solder module outputs to the lower ends of the strips in place of the OEM power wiring; use this for module power instead. For RK cars you can run a light 2 wire pigtail along the same recess channel in the clear plastic window insert as used for OEM wiring. Both these methods keep the dome wiring connections inconspicuous.

The lighting rack on the lower ceiling of Premier cars ties the two truck hots and grounds together, so it's advisable to leave it intact. Run the led strip along one side of the rack and power it separately from the module. RK lower ceilings are bare and suitable for led mounting. For RK direct connect the lighting module to the nearest OEM lower floor light socket for power, just like a standard coach car.

4. Making the Direct Plugin Power Pigtails (Thanks to Hokie71 for this great idea!)

See **pic 8**. It's faster to pre-build batches of 6 or 12 of these at a time, or whatever number will be needed for the conversions at hand. After you remove the OEM bulb holders from the sockets, simply bend the bulb wire leads out straight and pull the bulbs out of the holders. Discard the bulbs. Now cut a few sets of wire pairs, about 4" long. #26 insulated solid core wire is best for this, and matches the size of the OEM bulb leads. Note stranded wire is **not** recommended as it tends to get severed by the metal socket contacts. Tinning the wire before insertion helps.



Pic 8: Typical batch of direct power connection pigtails using OEM bulb holders.

Bare about 3/8" of one end of each wire, and insert a pair through the holes where the bulb was, until the insulation is just showing at the other end. Now bend the two short bare wires back along both sides of the holder, and you're done. See above pic.

To install in the bulb socket simply align the wires with the contact plates inside the socket opening, and gently push straight in until it bottoms, as shown in pic 6 earlier. Solder the other ends to the AC connection pads on the lighting module. Polarity is not important here because the module supply is track AC. The plugin connectors can easily be disconnected for service when/if needed.

5. Direct Soldering Led Strips (to modules)

This method allows you to mount the lighting module directly to the led strip, and saves the time and bother of connecting a pigtail jumper. It is best suited to Premier passenger cars where the module can be mounted upside down at one end of the OEM light rack. It works best with small solder blobs on the strip pads as well as on the bottom of the board pads. The blobs should be not much larger than a pin head.

See **pic 1** above in section 1. Place the led strip flat on an old towel or wooden surface (not a heat sink type surface) such that the + board output pad aligns with the + strip pad. Align the side of the board straight relative to the side of the strip. Hold the module in this position on the tape with one hand using light pressure (such that the respective +/- blobs are touching), whilst applying the iron flatwise across the tops of both board pads simultaneously. The heat flows thru the solder down to the junction spots and melts all. Hold the heat for 2-3 seconds, you should see/feel when the solder melts.

Remove the heat and hold still for several seconds. Should set just fine. After 2 or 3 goes at it you should have no trouble. The trick is to work on a surface that won't steal the heat from the bottom of the led strip. A block of wood or a towel works fine.

Test with a DVM after done to make sure the + and – is not shorted together by solder flow. If shorted, unsolder the joint, shake off the excess solder and start over. No big deal, you haven't lost or ruined anything.

When done you can apply 14-18 VAC to the module AC inputs to test and adjust before installation as per pic 1. Since measuring the module output current is impossible with this setup, you will have to measure the DC voltage at the strip instead. Use the 20VDC setting on your DVM. A reading of 9.0 VDC will result in a current of about 3.15ma to each section of led strip which I find looks about right. The range that seems to work best for warm white leds is about 8.8 to 9.3VDC; which gives from 2.45 to 3.85ma current per section. This can be increased or decreased as desired, but you should use a consistent output so all cars in the set will have similar lighting levels. (Note that a voltage less than 7.5V will be too low to light the strip at all)

Regarding baggage cars; you don't necessarily need to light them at all because they often ran dark in real life. They do look good lit up though when parked in a station; so either way is fine. It's also OK to install only a couple of led sections at each set of doors, rather than a full length strip. This will light up the immediate door area, which is all that's needed. If you elect to run it dark, simply remove the hot wire from each truck power roller and poke them up into the holes in the car floor out of the way.

Another small general hint is to always work with clean hands, and try to avoid getting fingerprints on the car bodies, and especially the clear plastic window inserts. They are really hard to remove.

In Closing: Please bear in mind that there is really no wrong way of doing led lighting conversions. Once you have done a few you will find your own best procedure that works for you. While this guide is specific to MTH Premier and RailKing passenger cars, many of the techniques used here are also applicable to other makes of passenger cars.

These notes are a compilation of experiences the author has gained whilst performing many set conversions, but it's not the only way by any stretch. It is offered here merely as guidance for the hobbyist who wants to start converting his/her own cars. The result is well worth the effort; your passenger cars will look much better for it, plus the power consumption will be a fraction of what it was with the old incandescent lighting.

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