



# 6 VEHICLE LIGHTING

Why don't you fix your little problem and light this candle.

—ALAN B. SHEPARD, ASTRONAUT

Vehicles past, present, and future are a perennial favorite of toy makers, including the LEGO Group. Beyond their speed and power, vehicles offer a variety of unique lighting opportunities, including headlights, navigation lights, and engine lights. Each lighting technology through the years has had its own distinctive look: oil lamps and tungsten electric lamps give off a yellow glow, while fluorescent bulbs have a blue-green cast and arc lights and modern halogens are whiter. Accurately capturing the lighting of a prototype vehicle of any era can make a good MOC really stand out.

*Union Pacific EMD SD70 Ace Locomotive (Dennis Glaasker).* This supersized locomotive is built at 1/16 scale and measures a whopping 48 inches long, more than three times the size of a typical LEGO locomotive. It features a wealth of prototypical details, including cabin, navigation, and ground lights.



# VEHICLE LIGHTING TECHNIQUES

LEGO vehicle lighting utilizes many of the same components and techniques employed in lighting buildings and other brick creations. However, while many general-purpose lighting techniques apply, there are a few vehicle-specific details that merit special discussion, including headlights and lightbars. Additionally, because LEGO vehicles are often small and are expected to be mobile, they come with their own particular battery and wiring considerations.

## HEADLIGHTS

Many years ago, LEGO created a dedicated element for headlights on cars, popularly known as the *headlight brick* (BrickLink #4070). Not only does this brick make great-looking car headlights, but it works perfectly for actually lighting them too! Because

the brick is open on the back, you can slip a 3 mm through-hole LED through the back and into the circular opening on the front, as shown in the center example of Figure 6-1. You can then add a translucent plate to the front to color the light.

Other 1×1 LEGO bricks can also work as headlights. The left example in Figure 6-1 shows a pico LED inserted through the front of a 1×1 brick with stud on one side (BrickLink #87087). The example on the right shows a 5 mm through-hole LED inserted through a 1×1 Technic brick (BrickLink #6541) with a trans-clear 1×1 round plate inserted stud-first into the opposite side. Note that any element with a clip can also hold a 3 mm through-hole LED, while a 5 mm through-hole LED will usually fit into the open stud-size holes of Technic liftarms, connectors, and other elements.

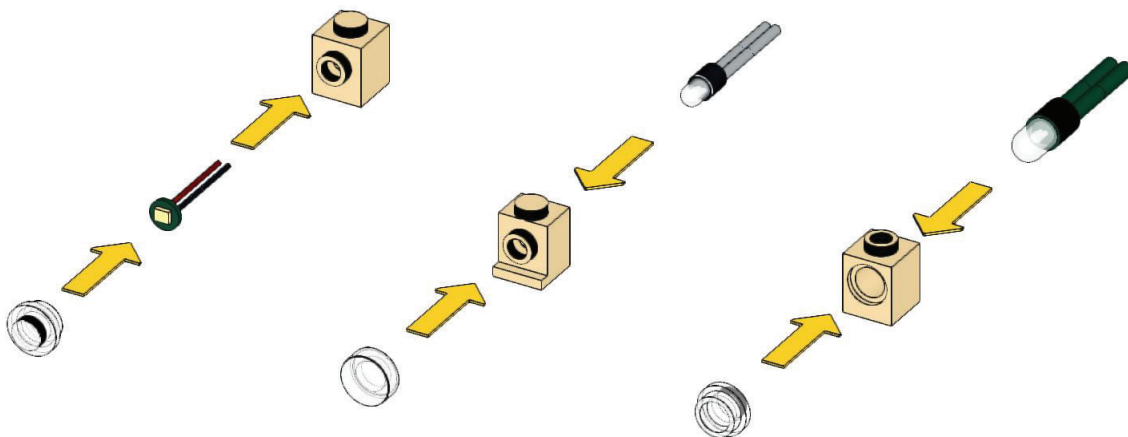


Figure 6-1: Creating headlights from 1×1 LEGO bricks



## LIGHTBARS

Emergency vehicles often have a lightbar on the roof that flickers and flashes. LEGO offers purists a few official options, including the Light & Sound elements made in the late 1980s (see left example in Figure 6-2) and the Light & Sound siren from 2019 (the center example in Figure 6-2). The former has a few disadvantages. While its lights do flash, they don't always flash in sync with each other. Also, if the lighting needs to be self-contained, you'll need space in the vehicle for a large (4×8×3) 9 V battery box. The latter solution is more compact: 2×6×1, with battery included. However, the siren only runs for 5 seconds with each press, and the LEDs aren't very bright.

Enter the third-party lighting manufacturers. LifeLites makes a product called a StudLite that features tiny colored LEDs surface-mounted to a thin, flexible ribbon designed to fit on top of a 1× plate and wrap around back and underneath (see the right

example in Figure 6-2). This lets you place a translucent 1× round plate or tile on top of the StudLite and build the lightbar into a vehicle's roof. StudLites are a flexible solution literally and figuratively, in that they can be positioned to create whatever size lightbar you might envision. Brickstuff also makes a Universal Lightbar that features a 1× plate with LEDs preinstalled on top, ready to be covered by translucent elements. Universal Lightbars come with a small lighting effect controller board that offers several flashing patterns.

### ANIMATING VEHICLE LIGHTS

You can animate LifeLites' 3 mm through-hole LEDs using the LifeLites eLite Advanced lighting effect controller. In fact, from sirens to aircraft navigation lights to rocket engine exhaust, vehicles present many opportunities to incorporate animation effects. For more on animating LEDs, see Chapter 9.



Figure 6-2: Emergency vehicle lightbars



## WIRES AND BATTERIES

There typically isn't much space inside LEGO vehicles, especially minifig-scale cars. To make the most of the space available, use LEDs with thin wires and short leads and plan carefully. Start every lighting project by creating a wiring diagram. The diagram in Figure 6-3, for example, is the lighting plan for the truck shown in Figure 6-7. Your wiring diagram should include every LED, expansion board, adapter board, and wire needed, along with any lighting effect controllers. Once all the components are listed, you can determine the space required and locations where everything will be installed. You should also estimate the lengths of wires needed.

Powering your vehicle will also take some planning. If you're installing a vehicle permanently into a larger display, run a power cable out of the bottom and run it through the display to a power supply. If you want to keep the vehicle portable, however, you'll need to make room somewhere in your design for a battery pack. Eight-wide firetrucks, trains, and airplanes can probably fit a standard AAA battery pack, offered by LEGO or third-party manufacturers. Smaller 5-wide and 4-wide vehicles will need something more compact. Several third-party lighting manufacturers make small coin-cell battery packs. The smallest are the size of a 2x2 brick.

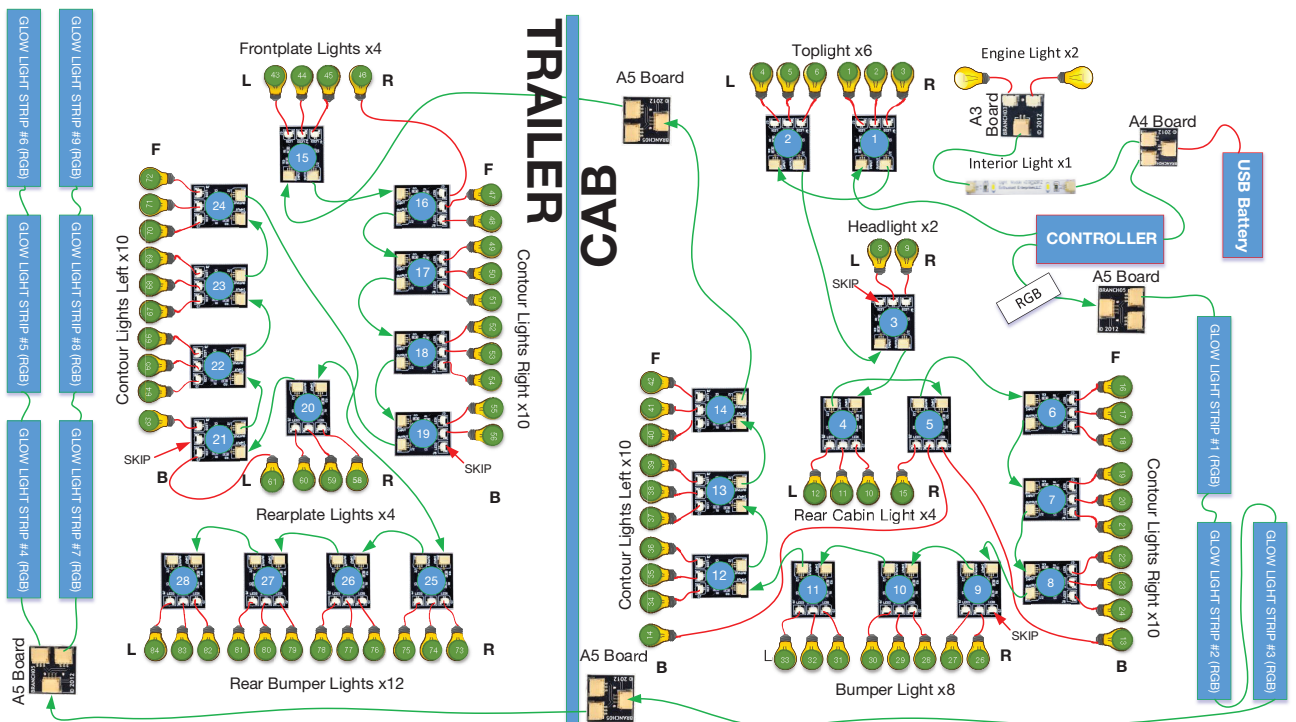
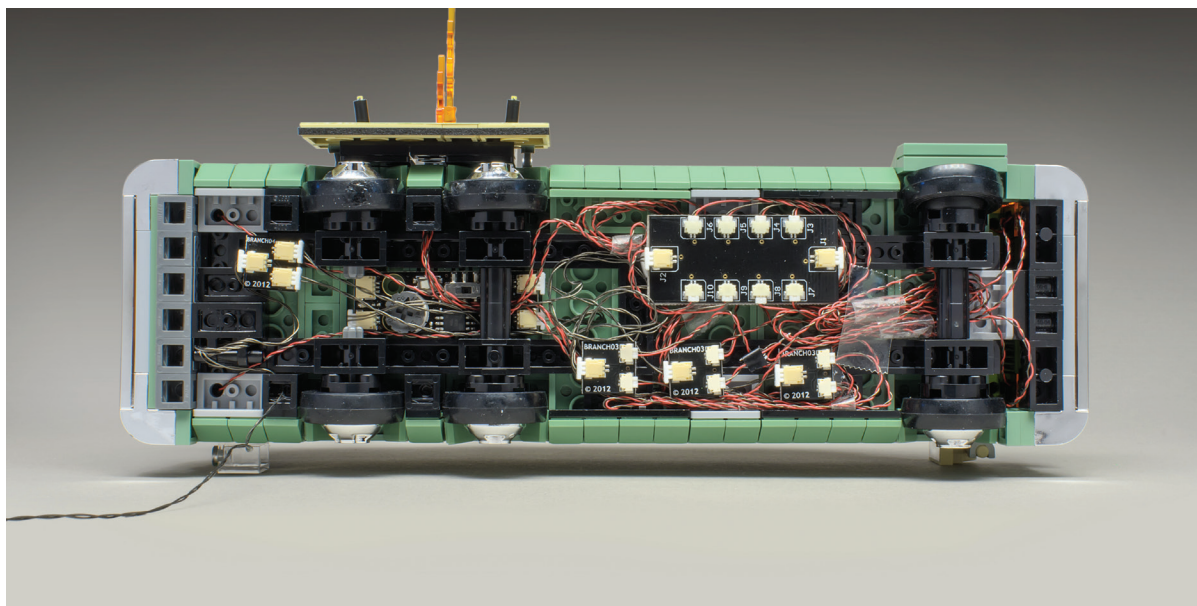


Figure 6-3: Wiring diagram (Brickstuff)

If your vehicle will be powered externally, don't let the power wire hang loose. If it catches on something, it may rip out or damage other wiring. To avoid this, attach any external power wires to a connector board firmly anchored to the

vehicle. This way, if the wire gets tugged it will detach from the connector. Alternatively, wrap a power wire around a brick or plate to secure it (BrickLink #2540 bar handle with free ends works well, as shown on the left of Figure 6-4).



**Figure 6-4:** Hiding wires on the underside of a vehicle. You can see more views of this vehicle in Figure 6-9.

# EXAMPLES OF VEHICLE LIGHTING

With a good understanding of the lighting needs for vehicles, let's now take a look at some great examples of custom-lighted vehicles made by AFOLs. These builds range from small cars to gargantuan spaceships, but they all have lighting techniques that you can learn from.

## FORD E-450 AMBULANCE

The ambulance in Figure 6-5 shows the value that flashing lights add to emergency vehicles. The builder used pico LEDs to create headlights, emergency lights, and even the

lightbar. They're all animated using a PFX Brick (see Chapter 9 for more on this device). Note the use of custom stickers for added realism.



**Figure 6-5:** Ford E-450 Ambulance (Michael Gale)





**Figure 6-6:** *Sandcrawler* (Marshal Banana)

## SANDCRAWLER

The alien vehicle in Figure 6-6 is as massive as it is beautiful. The builder spent nearly six months building this monster, which stands 18 inches tall. It features complete lighting using only standard LEGO Power Functions LEDs. Translucent yellow bricks filter some of the LEDs, giving them a yellow tint.





Figure 6-7: Peterbilt Quint Axle Dump Truck (Dennis Glaasker)

## DUMP TRUCK

Figure 6-7 shows a 1/16 scale truck. At over 4 feet long, it's large enough to incorporate full navigation and operational lighting. Over

100 Brickstuff LEDs were installed. They run off a USB battery power supply operated by remote control.



Figure 6-8: *Flying DeLorean* (author)

## FLYING DELOREAN

A lot of custom DeLorean MOCs have been built—many before, and some after, LEGO released its official *Back to the Future* set. The MOC in Figure 6-8 is unusual in that it features underside details and full lighting for the flying version. 24 Brickstuff LEDs were installed, along with 20 inches of blue EL glow wire. The green lights underneath are animated using a LifeLites eLite Advanced

controller. Three separate voltages drive all the lighting, which creates a lot of wires. These wires all run to the base through a hidden black support rod, just like the miniatures used in filming the movies. Another way that you can create the glowing wire effect is by using a filament LED, which provides brighter light than EL glow wire but may be thicker and shorter.





Figure 6-9: EM50 Urban Assault Vehicle (author)

## EM50 URBAN ASSAULT VEHICLE

Figure 6-9 shows a scale-accurate LEGO version of the customized GMC recreational vehicle from the Bill Murray and Harold Ramis film *Stripes*. Removable panels permit access to weapons systems and full interior details.

14 Brickstuff LEDs provide interior lights, headlights, taillights, and animated weapons systems. As you saw in Figure 6-4, the underside is crammed full of wires and a lighting effect controller.



## MILLENNIUM FALCON

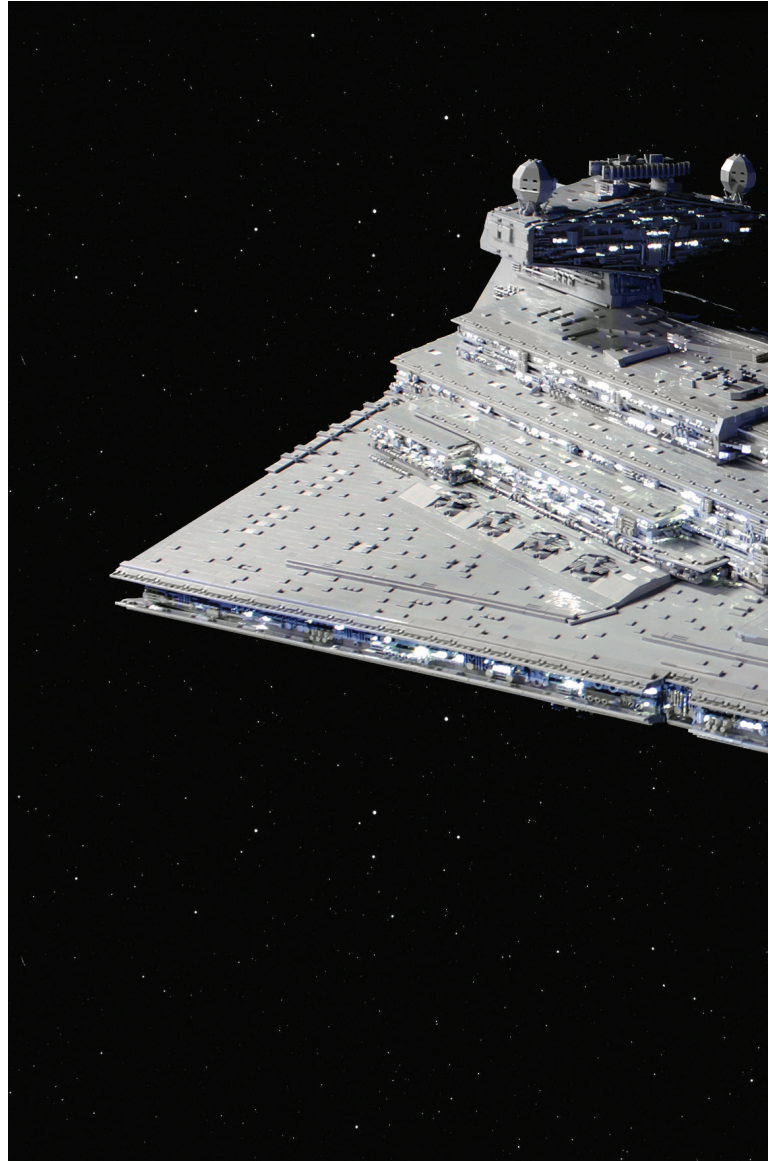
There have been many well-built minifig-scale *Millennium Falcons* over the years. Figure 6-10 shows one of the best. It features screen-accurate details and full lighting inside and out. The blue glow of the engines is made using Brickstuff LEDs backlighting a curved wall of trans-clear 1x plates.



**Figure 6-10:** *Millennium Falcon* (Marshal Banana)

## STAR DESTROYER CHIMAERA

At over 6 feet long, the Star Destroyer in Figure 6-11 is the largest made in LEGO to date. With tons of greebling (complex details added to the exterior) and extensive use of LED under-cabinet lighting, it appears eerily like the scale filming miniatures used in the *Star Wars* movies. LEDs typically run relatively cool, but those used in this ship are so bright and numerous that the operating temperature inside the model is 104 degrees Fahrenheit. The ship requires special vent holes in the top and bottom to dissipate the heat by convection!








**Figure 6-11:** *Imperial Star Destroyer Chimaera (Jerac)*



Figure 6-12: Project 6: Mini monster truck



# PROJECT 6: BUILD A MINI MONSTER TRUCK

Now it's your turn to experiment with vehicle lighting by lighting your own mini monster truck (see Figure 6-12). This build utilizes six pico LEDs (four warm white and two red). You'll get practice running the wires between plates and bricks and then gathering all the wires to run to the battery pack in the center.

The cab of this truck contains a 2×2 stud opening, three bricks high, where you can fit a small battery pack. Alternately, you can place a small distribution board in this space, connect all the lights to it, and then run a single wire out of the bottom of the truck to a larger battery pack or other power supply.

## Requirements

- Four warm white pico LEDs, available from Brickstuff or equivalent third-party lighting manufacturers
- Two red pico LEDs
- One power supply and associated connecting wires and distribution board, as needed





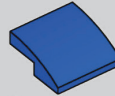
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4x  
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Light Bluish Gray



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Blue



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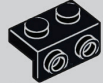
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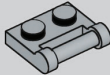
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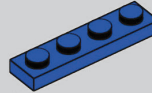
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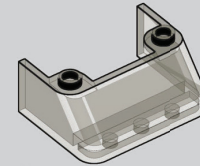
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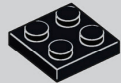
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1x  
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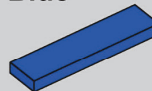
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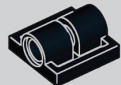
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2x  
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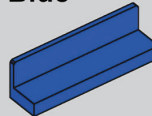
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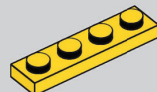
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3x  
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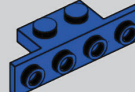
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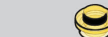
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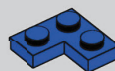
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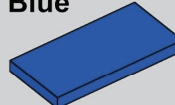
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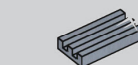
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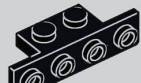
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Metallic Silver



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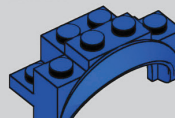
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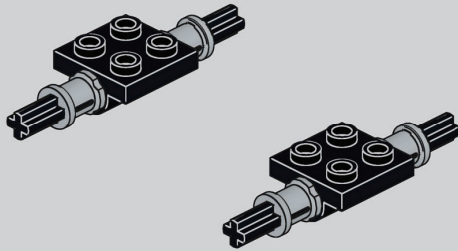
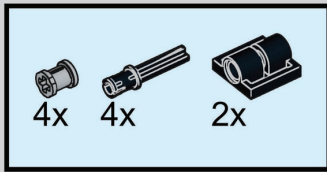


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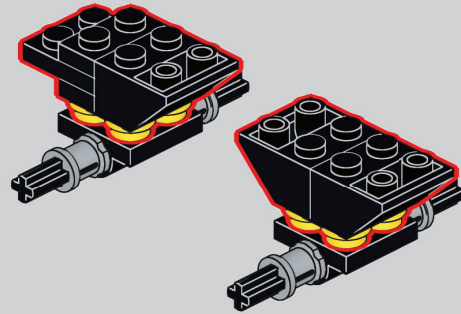
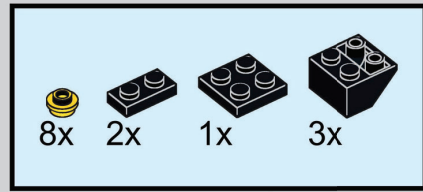


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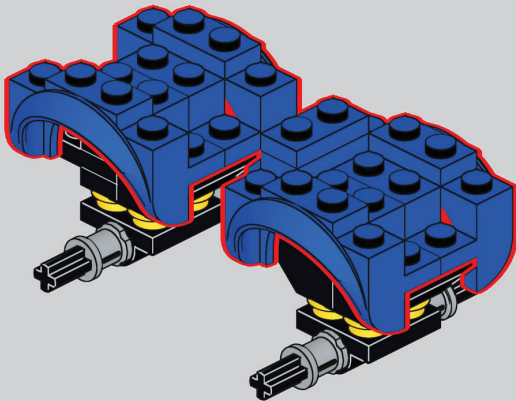
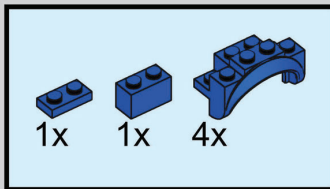
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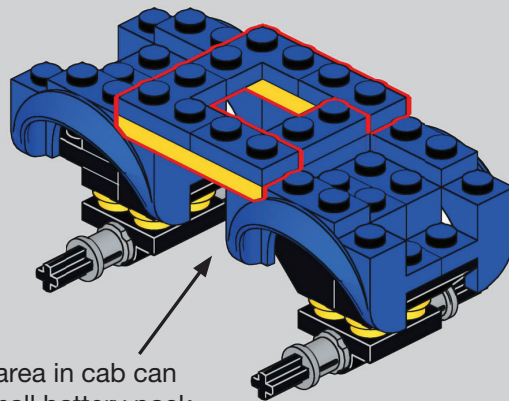
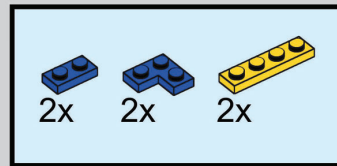
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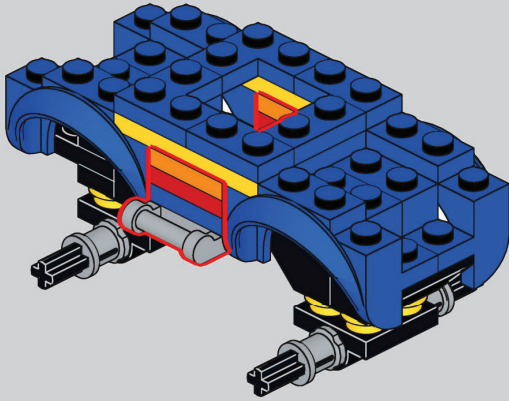
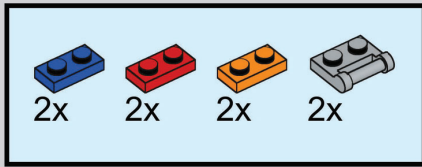


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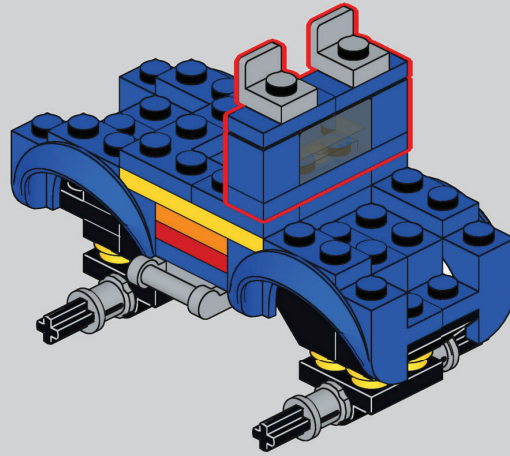
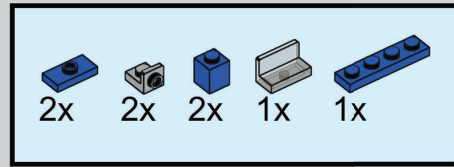


Open area in cab can fit a small battery pack.

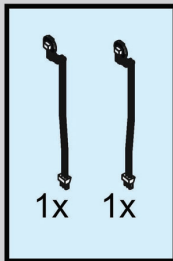
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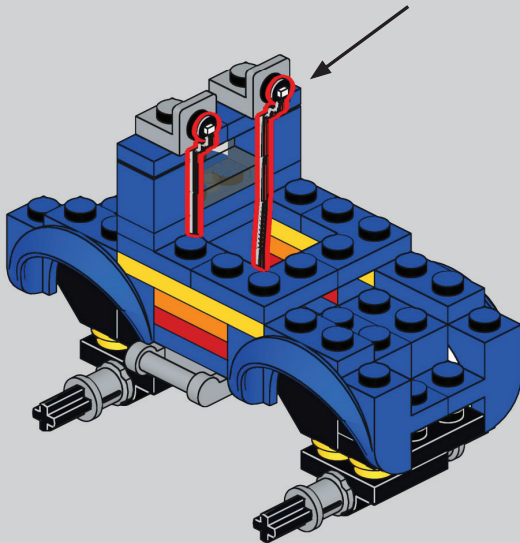
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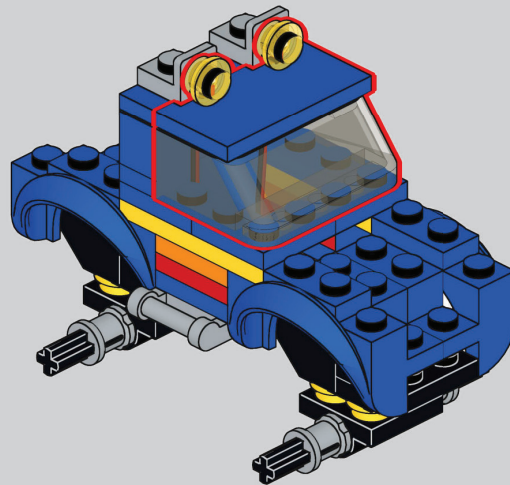
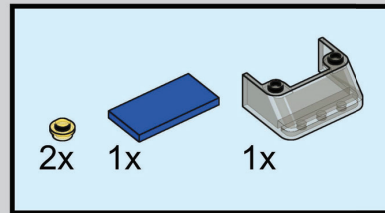
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Carefully thread LED wires between plates into cab.



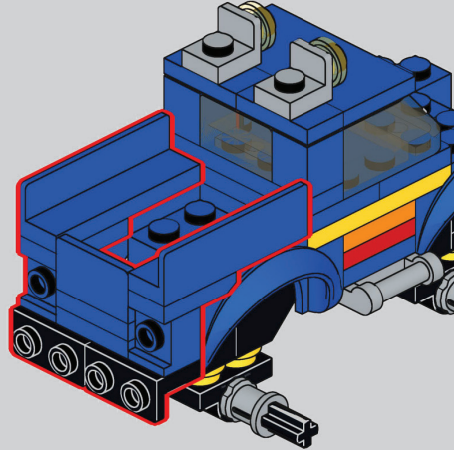
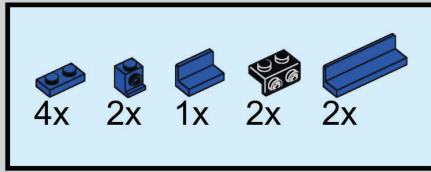
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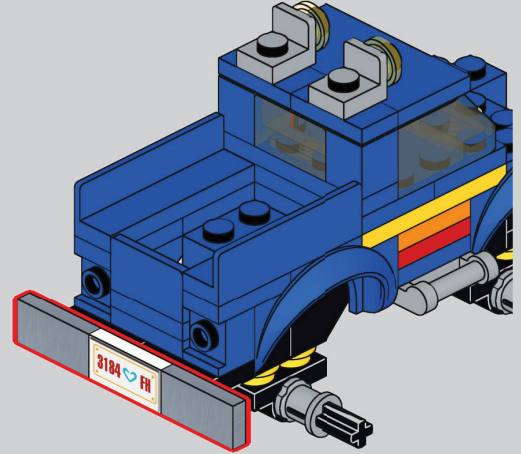
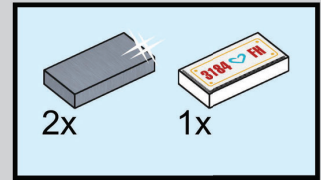




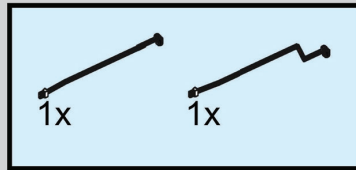
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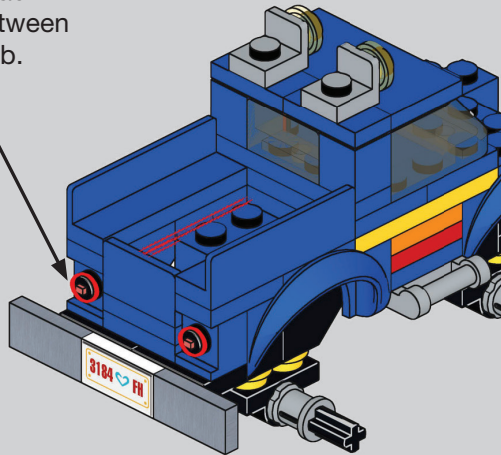
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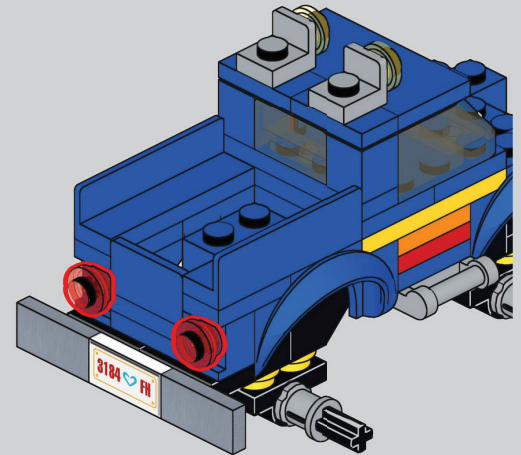
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Carefully thread LED wires between bricks into cab.

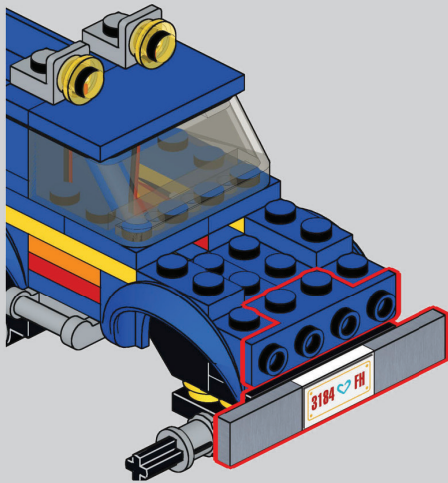
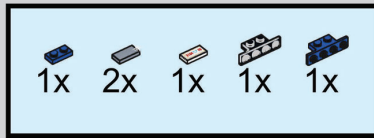


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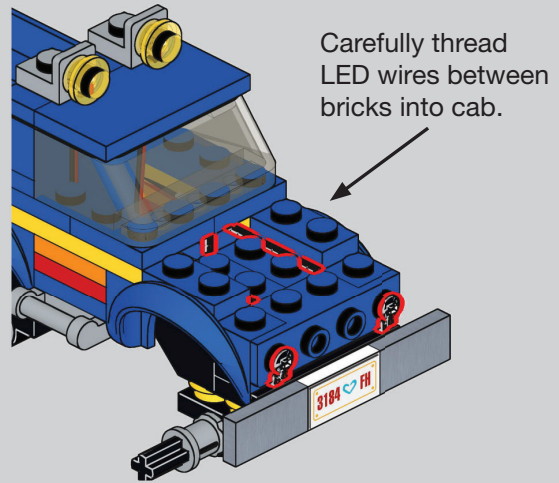
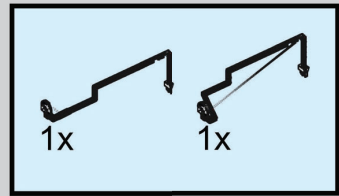




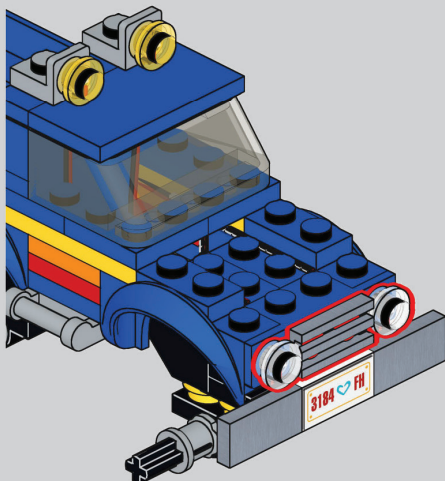
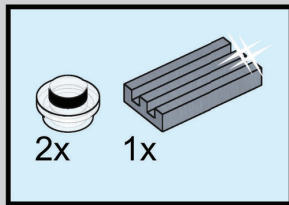
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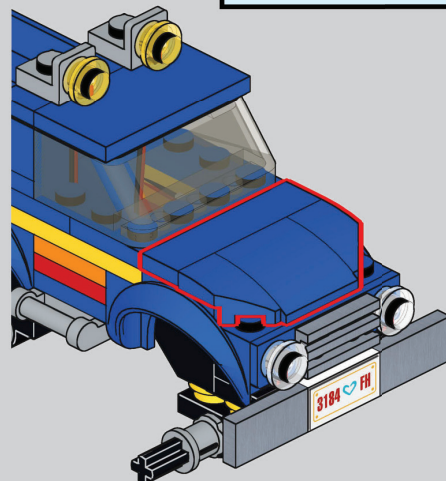
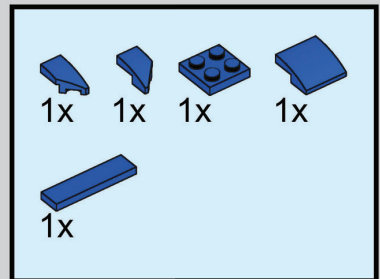
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# 15



# 16





17

