

# MGB's Illustrated Guide to Replacing the AC Condenser in a Lotus Evora

Revision A



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<https://inkstripe.com/lotus>



Figure 1: The victim



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## 1 Note from the Author

I wrote the following guide due to the difficulty of researching how to replace the condenser on my Evora—a job I put off for some years because of uncertainty in exactly what needed to be done, a lack of reference photos, if it was too difficult using the tools I had on hand, and because I’d encounter the occasional piece of (mis)information—such as differing opinions about how much of the car needed to be removed when doing the job. People would mention that the front clamshell could be removed to make life easier (or that it was even required), but I never found a good set of pictures or instructions that told me exactly how much easier, or just how much (or little) access was left if you didn’t take that step.

Although I spent about twice as much time on this guide than on the job itself, I found it satisfying to take a methodical and well-documented approach while working on the car, and enjoyed explaining things in a (hopefully) clear and thorough manner. If there’s demand for this sort of content I’d like to make more guides like this in the future.

You can download this guide for free from <https://inkstripe.com/lotus>

However, for all my shop manuals I greatly prefer to use a hard copy. If you’re like me, or just want to support my work, you can buy a hard copy in a binder for \$20 + \$5 shipping, which I would also greatly appreciate.

-MGB

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## 2 Overview

My 2011 NA Evora's AC stopped blowing cold, which led me to have it recharged (including UV dye). It blew cold for a week or two before once again refusing to work. I found three pinhole leaks in the condenser by using a UV light along with protective glasses.<sup>1</sup>

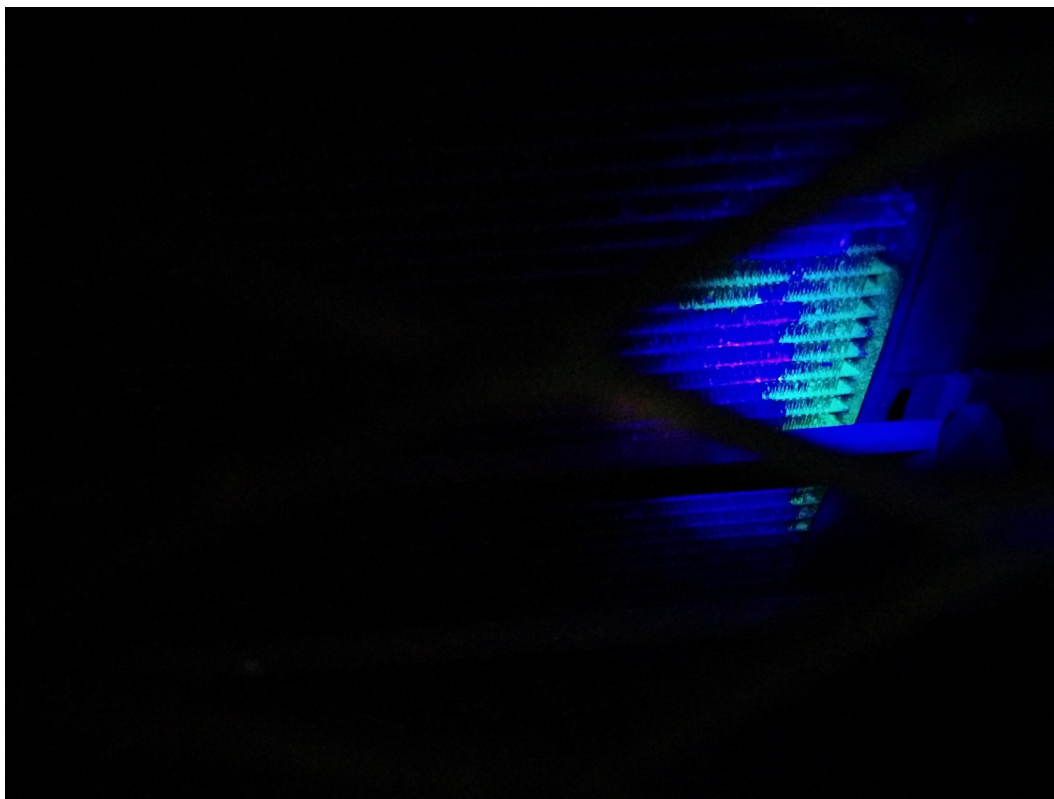


Figure 2: Old condenser showing leaked UV dye

The root cause of this is likely impact damage to the condenser caused by road debris. It's a known problem, considering that the mesh grill is wide enough to let stones through them.<sup>2</sup> If you're going to go through all the trouble necessary to replace the condenser, it's a good idea to put a finer mesh behind the grill to prevent the problem from recurring. This guide will include those steps.

I had put this job off for a few years because I didn't have access to a lift. As it turns out this was a good idea, as I couldn't imagine doing this job without one. I often had to raise and lower the car to get particular angles when messing with the condenser, cowlings, and hose fitment. The process was involved but no single step was especially difficult for a hobbyist. I made a number of mistakes and estimate it took me 20 hours to do the job over a week or two.

### 2.1 Applicability

My car is a 2011 Evora NA, but this guide should apply to all model year Evoras. It may apply to Evora 400s—I don't own a copy of the Evora 400 service notes, but it looks like they've only updated the Introduction section. I haven't seen updates to **GJ**, **BV**, **MR**, or **PN**, so the original instructions (and thus this guide) should apply. If you have a 400, double-check the jack-point and undertray instructions in **AA.1 p. 8** and **AA.1 p. 9** respectively. These possible changes have been noted in the relevant sections.

<sup>1</sup> <https://www.amazon.com/TaoTronics-Blacklight-Flashlights-Sunglasses-Batteries/dp/B015W17OSW/>

<sup>2</sup> <https://www.lotustalk.com/forums/fl70/c-condenser-replacement-264313/> (<http://archive.is/atW7C>)

### 2.2 WARNING

I've tried to write the guide I wish I had when starting this job, but I can't guarantee I didn't mess the steps up or forget something critical.

**Refer to the service notes in 2.5** and please note: **I'm not responsible for missing, misleading, or incorrect instructions in this guide.**

Though I tried to do a thorough and helpful job, proceed at your own risk, you may seriously damage or destroy your car, etc.

As an additional warning, I haven't found a method for jacking up the car without a lift that doesn't require you to be underneath the rear of the vehicle with only ramps supporting it. All methods to safely support the front seem to require removing the rear diffuser to access jack points "C" and "D", which means momentarily not having a failsafe if the ramps fail while you're under the rear. This is necessary, as I understand it, because with the front wheels removed the only place to put a backup stand is in the rear of the car. That means supporting the rear of the car with jack stands such that a failure in the front would still leave the car lifted from its side balance point.

The only other option I've seen that gives you a failsafe is to put shaped wooden blocks under the front calipers once the wheels are exposed. This is a custom tool, however.

So, considering this, and in the interest of safety, jacking up the car without a lift is outside the scope of this document.



### 2.3 Required Parts

With that in mind, I ordered the following parts:

1. **Condenser.** B132P0001F  
\$272 USD shipped from eBay (\$430.99 on LotusPartsOnline)
2. **Receiver Drier.** A132P6011F<sup>3</sup>  
\$180 USD shipped from LotusPartsOnline
3. **4x bolts and nuts.**  
For attaching the new condenser  
The old one has captive-nut rivets that make it easy to attach. I used nylon nuts, lock washers, and machine bolts  
\$5 from a hardware store
4. **O-Ring Set.** PN.12 p.12 says you'll need 2x 17mm A132P6012S and 2x 9mm A082P6078F  
LotusPartsOnline says 18MM OD A120P6002H  
You can get a green automotive AC O-Ring set from Amazon for \$15  
\$3.54
5. **Low-viscosity ISO 46 PAG oil.** I chose "Johnsen's 6812UV-6 ISO 46 Premium PAG Lubricant with UV Dye - 8 oz."  
\$12 - <https://www.amazon.com/gp/product/B00C874FH2/>
6. **22oz. of R134a refrigerant.**  
**PN.9 p.18** specifies 0.625 kg of R134a., which is 22.0462 oz  
\$37 - <https://www.amazon.com/gp/product/B002S70MP6/>
7. **Self-adhesive automotive foam.**  
Used for reconstructing foam that you'll damage when removing the condenser, cowlings, and horns, and for adding foam if you decide to cut the plastic cowlings in Section 3.8  
\$10 from an auto parts store
8. **Stainless steel mesh, #10 x .025 Wire, 24" x 36" Sheet.**  
Used for shaping a second grill behind the first one on the bumper  
This is a fairly fine mesh. Any mesh will negatively impact airflow to the condenser and radiator. I'm not sure if this mesh is too fine yet. It's not very noticeable when installed, but find a black mesh if you want to minimize its visual impact.  
\$45.22 from PegasusAutoRacing.com
9. **Black zip-ties.**  
For side-lamp wiring brackets and attaching the grill  
\$5
10. **Rust converter.**  
I discovered rust on the bottom of the supports behind and in front of the wheel arches. Rust converter will convert iron oxide to iron tannate and also apply a primer coating. (Figure 18.) You could also add black spraypaint and/or rubberized undercoating.  
\$6 - <https://www.amazon.com/gp/product/B003HG48AC/>
11. **OPTIONAL: ATF Dexron III fluid.**  
If you decide to drain the power steering fluid in Section 3.8 instead of cutting the cowlings, you'll need up to 1.5 liters (1.585 quarts) of ATF fluid that meets Dexron III.<sup>4</sup>  
\$10

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<sup>3</sup>Alternative driers: You should be able to use any drier that has a 5/8 - 18 UNF male thread fitting with a thread pitch of 1.6mm, as specific in PN. 4, p. 12. It's pretty standard, I'm led to believe, but I didn't personally verify it. Here's one for 22.50 euros: <https://www.hattink-thermoparts.com/drier-filter-%C3%9864mmx210mm-5-8-18unf-2a-5-8-18unf-2a>

<sup>4</sup>You may also need two o-rings for the pipes, but I don't see them listed on LotusPartsOnline, and I'm not sure their diameter or part number.



Figure 3: Condenser from eBay – note the lack of rivets



Figure 4: Old condenser rivet



### 2.4 Required Tools

Beyond the usual wrenches, torque wrenches, sockets, etc. that you'll need for any general automotive job, you'll also need these speciality tools towards the end:

1. **Vacuum Pump.**

Available for rent at an auto parts store

Example: <https://www.oreillyauto.com/detail/b/evertough-4771/tools—equipment-16488/rental-tools-16837/rental-tools—air-conditioning—cooling-19163/26fcb01856e7/rental-tools-evertough-vacuum-pump-not-stocked-in-all-stores/67128/4700299>

You may also have to buy vacuum pump oil separately (usually online). Don't use the pump with no, low, or old oil.

Free after returning it

2. **A/C Manifold Set.**

Available for rent at an auto parts store

Example: <https://www.oreillyauto.com/detail/b/interdynamics-3992/tools—equipment-16488/mechanics-tools-16816/air-conditioning-tools-16499/gauges—specialty-tools-17979/506fdb976271/interdynamics-r-134a-manifold-gauge-set/429/4384816>

Free after returning it

3. **Teflon Tape.**

Essential for ensuring you get a good seal between the vacuum pump, manifold, and car.

\$7 - <https://www.amazon.com/Everflow-811-5-Thread-Plumbers-White/dp/B00538ITFW/>

4. **Syringe.**

Not required if you have an alternate method, but I found it useful to have a syringe I could measure precise amounts of PAG oil with and inject it into the drier and condenser.

\$8 - <https://www.amazon.com/BSTEAN-Syringe-Blunt-Tip-Needle/dp/B01HFTYINS>

5. **OPTIONAL: High quality digital thermometer.**

Useful if you want to record the temperature coming out of the vents. They say that with max AC on a hot day you should get cold air that's somewhere around 40-45 degrees Fahrenheit. See Section 5 for my testing.

\$26 - <https://www.amazon.com/gp/product/B00KDQ2ED2/>

6. **OPTIONAL: 4-post lift.**

I believe this job can be accomplished without the use of a lift, but your life will be made significantly easier by using one. During the extraction of the condenser in Section 3.8, for example, I lifted and lowered the car about four times to find the perfect angle to access the various mounting bolts.

If getting time on a lift isn't a possibility for you, then you'll need a solution to jack the car up and put it on jack stands. I use the following for car work, but didn't for this job:

(a) 10" Race Ramps

\$105 - <https://www.amazon.com/gp/product/B003ZAGPWO/>

(b) Jack stand pads similar to these

\$11 - <https://www.amazon.com/2-Pack-Rubber-Jack-Pads-Slotted/dp/B06WRMSHP2/>

(c) A floor jack of your preferred brand (low profile is nice to have) \$ 100

(d) 4x jack stands of your preferred brand \$ 50

### 2.5 Required Reading

The following sections of the service notes will **mostly** be followed, in the following order:

- **A. p.9<sup>5</sup>** jacking up the car - Section 3.2 for 4-post lifts
- **A. p.10<sup>6</sup>** removing the undertray - Section 3.3
- **GJ.4 p.7** removing the wheels - Section 3.4
- **BV.17 p.56** removing front wheel arch liners - Section 3.5
- **MR.11 p.46** removing headlamps<sup>7</sup> - Section 3.6
- **BV.5 p.19** removing bumper<sup>8</sup> - Section 3.7
- **PN.8 p.17** removing plastic cowl and condenser - Section 3.8
- **PN.8 p.12** for o-ring sizes and locations and torque values for the hose fittings

**You must read these sections!** There are a number of warnings in them, such as reminders to treat the condenser and hoses with great care, to replace all O-ring seals, to lubricate them with PAG oil, to add PAG oil to the new condenser and drier in specific amounts, and to only expose the drier to atmosphere once necessary.

I've tried to repeat these warnings in the following steps, but I can't guarantee I haven't forgotten something essential.

Pause now and read the above instructions. Service notes can be purchased in digital form online for £26<sup>9</sup>. My service notes were updated January 21st, 2014.

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<sup>5</sup>Evora 400: **AA. 1 p. 8**

<sup>6</sup>Evora 400: **AA. 1 p. 9**

<sup>7</sup>We'll diverge from the steps here for removing the headlamp washer unit hoses, which were stuck in my case

<sup>8</sup>I found it fully possible to remove and install the bumper by myself

<sup>9</sup><http://vsic.lotuscars.com/>



### 3 Disassembly

#### 3.1 Prerequisites

- Positively identify that you want to replace the condenser. (A positive result from a leak test like in Figure 2 is a great reason to undertake this job.)
- Take the car to a shop and have them reclaim the refrigerant in the AC lines. They can be accessed by fully or partially removing the RH side wheel liner (Section 3.5). Even a system with a leaking condenser will still have some pressure left in the lines. The lines contain R134a, and though it's a mild irritant for lungs and eyes, the real problem is that it's a potent hydrofluorocarbon and difficult to produce; releasing it into the atmosphere negatively impacts the environment more than other greenhouse gases (1,430x more potent than CO<sub>2</sub> by mass, for example). For this reason, and because it requires a great deal of input energy to create, it's actually a crime in the US to purposefully release R134a directly into the atmosphere rather than recycle it.
- Disconnect the battery, as instructed by the service notes when dealing with the headlamps.

#### 3.2 Jacking up the Car with a Lift



Figure 5: The Evora jacked up using a Challenger 4-post lift with a sliding jack underneath

If you're not able to get time on a lift (which is highly recommended—see item 6 in Section 2.4), you'll need to jack the car up in a way that's still safe, gives enough clearance, and lets you remove the undertray. You'll want enough room under the car to slide the replacement condenser into position and angle it upwards without scraping it against anything. Bringing the wheels about a foot off the ground might be sufficient.

Refer to service notes **A. p. 9** (**AA. 1 p. 8** for an Evora 400) to remind yourself of the jacking points.

As noted in the WARNING section (Section 2.2), there are safety concerns/tool-availability problems with the methods I've seen for jacking up the car in a way that provides a failsafe at every step. Repeated from that section:

As an additional warning, I haven't found a method for jacking up the car without a lift that doesn't require you to be underneath the rear of the vehicle with only ramps supporting it. All methods to safely support the front seem to require removing the rear diffuser to access jack points "C" and "D", which means momentarily not having a failsafe if the ramps fail while you're under the rear.

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This is necessary, as I understand it, because with the front wheels removed the only place to put a backup stand is in the rear of the car. That means supporting the rear of the car with jack stands such that a failure in the front would still leave the car lifted from its side balance point.

The only other option I've seen that gives you a failsafe is to put shaped wooden blocks under the front calipers once the wheels are exposed. This is a custom tool, however.

So, considering this, and in the interest of safety, jacking up the car without a lift is outside the scope of this document.

### 3.3 Removing the Undertray

The following are illustrated steps from **A. p.10**. Evora 400 owners should refer to **AA. 1 p. 9**, but the following steps should still apply. Double-check the positions of the washers on re-assembly, however. (As noted in the reassembly section.)



Figure 6: These side panels are held on with 2x M8x20mm bolts (12Nm) and 1x M8x30mm (12nM)





Figure 7: Each side has a push-fit rivet that goes to the wheel-arch liners



Figure 8: Each side has 2x M6x16 screws, washers, and flange nuts. Mine required PB blaster and were scraped up from bottoming out the car. You may need to remove these after removing the wheel arch liners



Figure 9: These are from the front bumper area, 8x M6x16mm (two not pictured), (8 Nm). Don't lose the captive nut clips that remain on the undertray





Figure 10: Front bumper M6x16mm bolts removed, and you can see the undertray rubbing block. You can also notice a crack in the bumper's plastic, perhaps the result of flexion while bottoming out



Figure 11: Each rubbing block is held on with 1x M6x16mm bolt (8Nm)



Figure 12: Slide the undertray towards the back of the car and wiggle the front out from under the bumper, being careful not to bend or crack the bumper. Here's the removed undertray filled with road grit. You can see some of the various spacers. These fit on in specific locations later



Figure 13: Close-up of spacers. There are four sizes that are placed in back-to-front: 4x 4.6mm, 2x 3mm, 2x 10.6mm, and 2x 13.7mm which are on the inner-most and most-forward area. Refer to service notes **A. p.10**



Figure 14: The exposed underbody



### 3.4 Removing the Wheels



Figure 15: Removing the wheels is similarly straight-forward. Loosen them on the ground first

### 3.5 Removing the Wheel Liners

The wheel liners are easily removed and contain no real surprises. I don't worry about breaking the plastic fir tree fittings, as I bought a replacement set that I always use rather than reusing the old ones.<sup>10</sup> Follow the steps in **BV. 17, p. 56** and you'll be fine. I recommend vacuuming them while you have them out.



Figure 16: I found it easy to strip the screws for the mudflaps. You can replace them with M5x16 screws.

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<sup>10</sup><https://www.amazon.com/gp/product/B0745D277N/>



Figure 17: It's not necessary to remove the headlamp access panel.



Figure 18: Inspect the bottom of the supports near the wheel arch. Mine had rust under the paint. Either before or after removing the bumper, scrape the affected paint and rust away with a wire brush, clean the dirt, and spray with rust converter. Be sure to mask the surrounding area.





Figure 19: Masked mudflap bracket with rust converter applied



Figure 20: Support that's been treated with rust converter (and I think I sprayed some underbody coating on this one too). Note that the bumper has already been removed in this photo.



Figure 21: Inspect this crevice in the frame, behind where the top of the shock absorber is mounted. These were totally filled with pebbles on both sides of my car.



Figure 22: It's quite satisfying to vacuum these out. Your car is now lighter.



### 3.6 Removing the Headlamps

Service Notes section **MR. 11, p.46** is straight-forward, but I had a problem detaching the headlamp washer unit hoses as instructed. This is illustrated, explained, and remedied below. **NOTE:** At this point you should also take photos of the headlamp apertures and the body seams of the bumper, to make it easier to align upon reassembly.

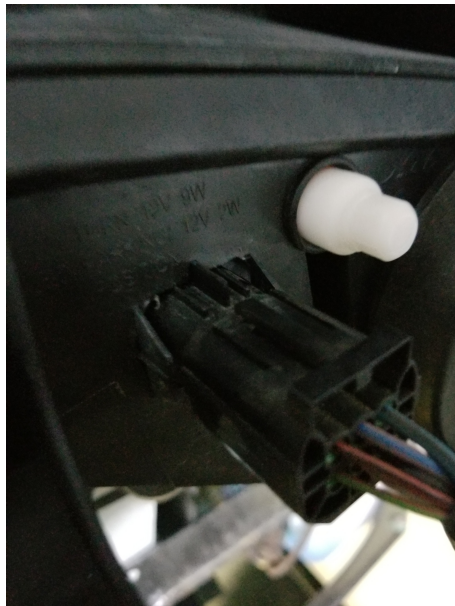


Figure 23: Detach the headlamp wire connector by squeezing down on the top retainer and pulling back with light force.



Figure 24: The headlamps are retained with three screws that you should now remove, the furthest one being tricky to reach

Here the instructions will tell you to withdraw the headlamp washer hose from the headlamp washer unit. Try this, but if it doesn't easily twist and loosen then **STOP**. The bottom of the unit will rotate freely, and though I thought I was securing it while tugging the hose, I managed to break the plastic hose adapter off the bottom of the washer unit. The washer unit is expensive and hard to find. Don't do what I did.

Instead, if you can't immediately withdraw the hose (common after a few years of the rubber hardening on the plastic) then do the following:

1. Put a 10mm socket on a long extension and ratchet
2. Reach into the gap in the headlamp/bumper support
3. Remove each of the two hex-head screws securing the headlamp washer unit to the headlamp assembly
4. Carefully tilt the headlamp washer unit side-to-side while drawing it downwards. You have to unclip the plastic cover that sits on the top of the headlamp, which is retained on either side by small plastic nubs. It shouldn't require much force to detach the plastic clips. At this point you can withdraw the unit
5. Drain any dripping washer fluid into a receptacle (I held it low and let it all drain out)



Figure 25: A dangling headlamp washer unit. It's much safer like this than trying to yank or pry a stubborn hose off the delicate hose fitting

You can carefully withdraw the headlamp back, over the top of the aluminum bracket. Be careful to not drop any washers that may be sitting between the headlamp and the bracket. **NOTE:** The instructions here tell you to remove the rear bracket from the bumper support bracket (service notes step 4). I didn't find this necessary and didn't want to modify the fitment of the headlamps.

Store the headlamps in a safe area, such as on a blanket or in boxes.



Figure 26: One of the two hex-head screws that hold the headlamp washer unit.



Figure 27: The area where the headlamp sits. You can see rust on the bottom of the support, and note the four bolts on the left side of the seam between the clamshell and the bumper, which will need to be removed in the next section.



### 3.7 Removing the Bumper

Service Notes section **BV.5 p.19** covers removing the bumper. It recommends having two people, but I found it easy enough alone. The bolts on the bottom and side support should already be removed.



Figure 28: On either side of the car, clip the zip-tie that holds the wire harness that goes to the side lamp. Pictured is the LH side



Figure 29: This is how the wiring on the RH side looked



Figure 30: Remove four bolts from each side of the bumper. The central one is an M6x16 screw & nut and goes through the aluminum support. The other three are M5x16 screws & washers that go into clips



Figure 31: From the headlamp area, reach in and slacken (but don't remove) two M6 flange nuts that clamp down on the top of the bumper. These bolts aren't quite visible in this photo, but are easily accessed at the narrow corner of the headlamp apertures.



Figure 32: Slacken the nuts on either side that clamp the bumper in place



From each side of the car remove the M6x16 screws, washers, and flange nuts that secure the rear corners of the bumper to the support brackets.

Remove the Lotus badge from the clamshell. I accomplished this partially by using dental floss and sawing back and forth to get underneath the glue. I also used some prying tools<sup>11</sup> to wiggle underneath the badge and peel it up. I put cloth wherever I was levering against, to protect the clamshell.



Figure 33: Back of the Lotus badge. Mine glued back on without applying any additional adhesive



Figure 34: You'll need to remove this nut.

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<sup>11</sup>Like these: <https://www.amazon.com/Kaisi-Professional-Electronics-Non-Abrasive-Anti-Static/dp/B015CMAJVK/>

You can now withdraw and remove the bumper.



Figure 35: Removed bumper



Figure 36: Remove this foam bumper pad



### 3.8 Removing the Cowling

**PN.8 p.17** covers removing the cowling, but I modified the steps slightly, similar to what others have done in this situation. If you can see two metal lines running through the black plastic cowling that's now exposed, you'll have to make a choice: either drain the ATF fluid from the PAS cooler pipe assembly and remove the pipes, or make two cuts in the plastic cowling so that it can be withdrawn with the PAS cooler pipes in situ.



Figure 37: The plastic cowling that directs air over the condenser, radiator package, and PAS cooler pipes (if fitted)

The plastic is easy to cut using a hacksaw blade or similar, and the subsequent areas can be covered over with insulating foam (Section 2.3) if you create any large gaps. However, you'd be damaging part of your car. Even though your modifications will be invisible upon refitment and likely not cause any disruption in airflow, the knowledge of what you've done may stay with you or theoretically affect resale value.

Personally I decided to make the cuts in the plastic, and it doesn't bother me.

If you proceed with draining, you can follow the steps in **HI.3 p.7** for draining and refilling afterwards.

As of this writing the cowling (G132U0112F) is \$205 USD on LotusPartsOnline.com. If you drain the PAS fluid you'll need up to 1.5 liters (1.585 quarts) of PAS or ATF fluid that meets Dexron III, which is approximately \$10. You may also need two o-rings for the pipes, but I don't see them listed for sale on LotusPartsOnline, so I'm not sure their diameter or part number.



Figure 38: Using a screwdriver and hammer, poke or slide these clips out from the cowling. There are four on each side.



Figure 39: Remove the horns from either side of the cowling. Pictured here is the bracket that holds them in place; I removed the screw from the bracket, withdrew the horns, then reattached them to the bracket for safe keeping.



Figure 40: Remove two screws from the bottom of the cowling and three under the top lip

1. Slide the headlamp power washer hose out from the two P clips underneath the cowling.
2. Remove the two plastic fir tree clips from the front of the cowling.

If you haven't removed the PAS hoses, at this point the cowling will be retained by the plastic and foam (likely deteriorating to some degree if your car is a few years old and/or has seen a lot of rain). Remove the foam, take a hacksaw blade or any suitably sharp-toothed tool (I used a multitool), and insert the blade into the space in the cowling where the PAS lines are. Saw upwards towards the seam, creating a slot through which the lines will go. It'll require some mechanical persuasion to draw the plastic cowling downwards.

I forgot to take pictures of this step, but the plastic sawed away very easily and the cowling could be wiggled free without much trouble. This process has been undertaken by other LotusTalk forum members who have done this job, but if it bothers you then drain the PAS fluid and remove the lines.

Either way, at this point you now finally have unobstructed access to the drier, refrigerant lines, mounting screws, and the all-important condenser.



### 3.9 Removing the Condenser and Drier

Congratulations! You're at the last step of disassembly. The condenser will be removed after you remove a clamp plate for the refrigerant pipes, two screws at the top, and two at the bottom. The following steps are from **PN.8 p.17**.

It's important at this point to remember that refrigerant lines should be exposed to ambient air for as little time as possible. You don't have to rush the steps, but I've been told it's unwise to leave the hoses disconnected overnight; you don't want moisture to migrate into the system.



Figure 41: Remove the upper bolts to the condenser

Reach into the RH headlamp aperture and remove the central bolt that secures the clamping plate onto the fitting for the pipes. The pipes are pressed into place and held down by the plate.





Figure 42: Removed condenser bolt



Figure 43: A top-down view of one of the hoses going into the fitting for the pipes, with the clamping plate removed

At this point I removed the hose running from the drier to the pipe fitting and replaced the o-ring on it. Be sure to lubricate the o-rings with PAG oil when you're ready to replace it. Do the same thing for the other pipe, which you'll have to wiggle and rotate upwards to get access through the aperture.

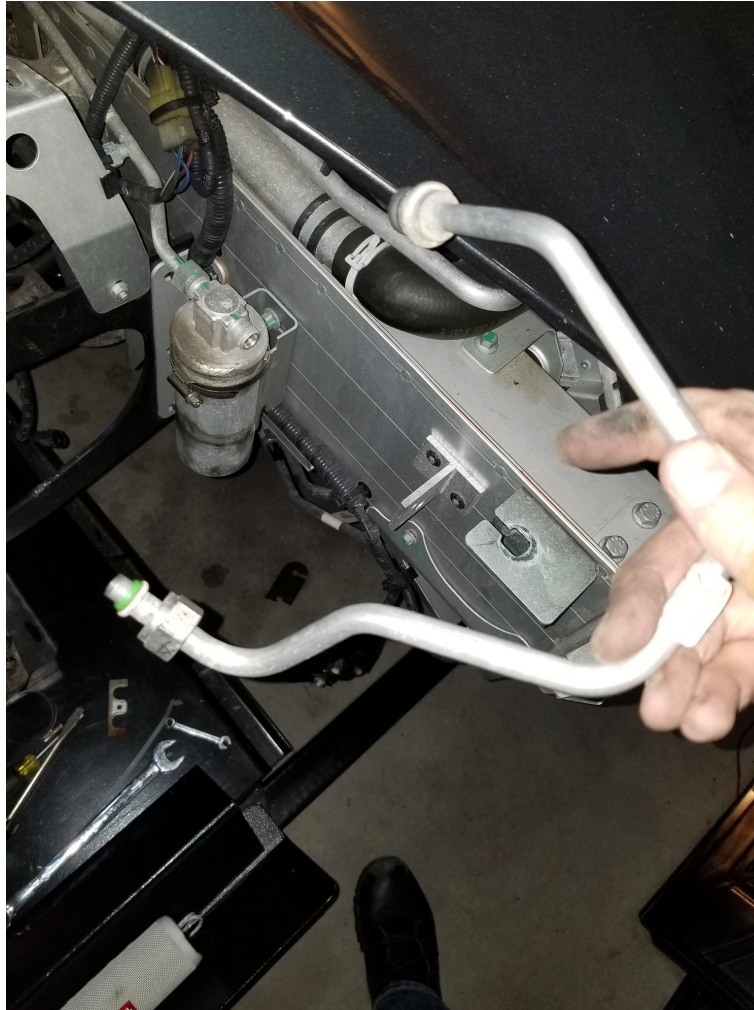


Figure 44: Pipe running from the drier to the condenser. Replace its o-rings and lubricate them before refitting it

## Illustrated Guide to Replacing the AC Condenser

You can now remove the two bolts at the bottom of the condenser and withdraw it from the car!



Figure 45: Removed condenser



Figure 46: You can also unscrew the clamps that hold the drier to the bracket and remove it now. Note the flow arrow on the back of the drier! I don't have a photo to prove which direction it should go in, sadly, and I don't want to guess at this point.



### 4 Reassembly

If you've made it this far, you're ready to reassemble everything! Reassembly is mostly reversing the above steps.

#### 4.1 Drier



Figure 47: Install the new drier into the brackets, making sure that the flow arrow on the back is pointing in the same direction as the one you removed

Measure out an appropriate amount of PAG oil for the drier. **PN. 6 p.13** says you need 30 cm<sup>3</sup> (30 mL) of oil for the drier, and 30 cm<sup>3</sup> for the condenser. I recommend filling a syringe and injecting 30 mL into one of the orifices in the drier.

Replace the o-ring on the pipe that goes into back side of the drier, oil the o-ring, and insert the pipe into the drier. Torque it down as specified, 25-30 Nm.

Leave the end-cap on the other end of the drier until ready to refit the pipe to the condenser.



### 4.2 Condenser



Figure 48: New condenser! Note the plate that keeps the pipes sealed—become familiar with how to loosen it, and you can slacken the bolt/screw now, to make it easier in a few moments. Also take care to not damage the heat-exchanging fins.

Very carefully maneuver the new condenser into the car. Try not to scrape or even touch any portion of the fins, which will easily bend and could even break. Worst case, you could damage the underlying tubing and introduce a leak into your new AC system.

Using the four bolts you procured earlier (or captive-nut rivets, if you have those), secure the condenser to the brackets via the four mounting tabs. I had to bend my tabs, sometimes with a screwdriver, to get the condenser to fit properly.

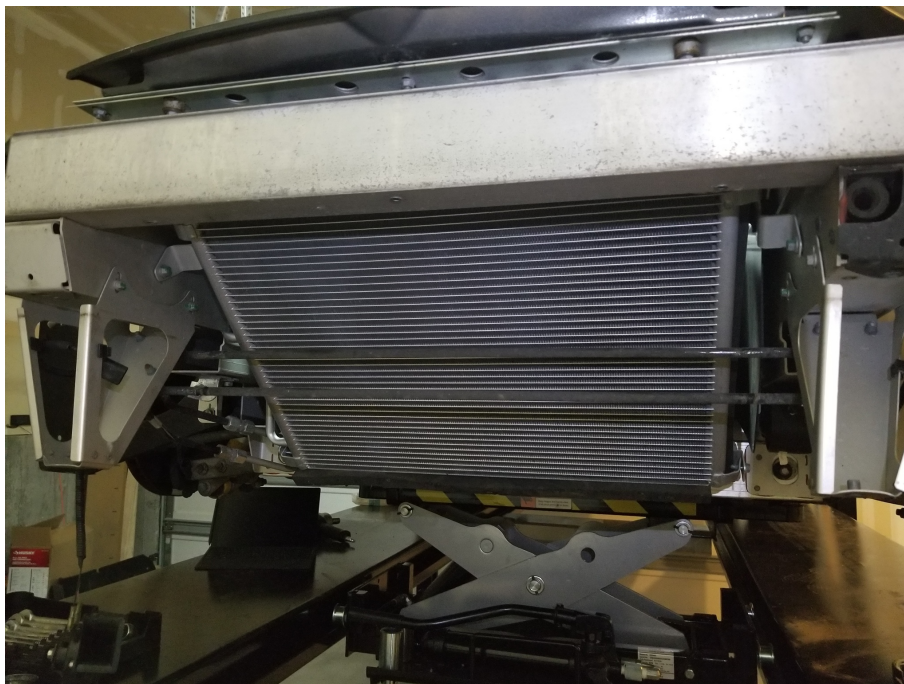


Figure 49: The installed condenser

Reach into the RH headlamp aperture and remove the plate that seals the condenser's pipes, then put the appropriate amount of PAG oil into the condenser. **PN. 6 p.13** says 30 cm<sup>3</sup> (30 mL) for the condenser too. I carefully injected the oil in with a syringe.

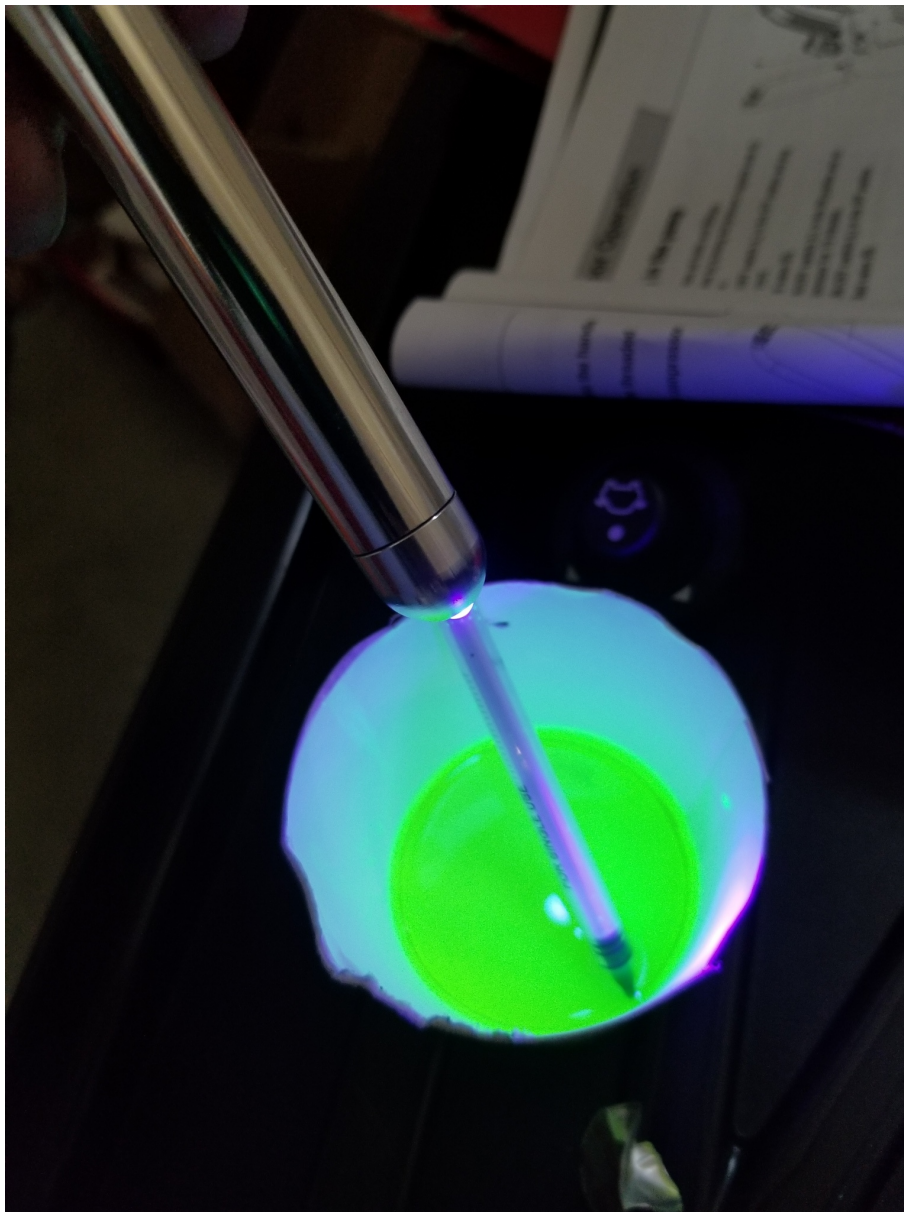


Figure 50: The Low-viscosity ISO 46 PAG oil I found has a UV-fluorescent dye in it. I also only had a 1 mL syringe on hand—it took quite a while to add the oil! Use UV-protective goggles if you're going to play with a UV light like this.

You can now remove the remaining cap on the drier. Replace the o-rings on both ends of the short hose and oil them. Fit the hose into the front-side of the drier and hand-tighten the nut.

Remove the temporary clamping plate from the condenser's fitting.

Maneuver both hoses back into place in the condenser fitting. Verify that you've replaced the o-rings on each and oiled them! The angle will likely be slightly off on the new condenser. You may have to pull, wiggle, and twist the pipes, and perhaps even push the fitting that goes into the condenser. After enough wiggling you should be able to press the hoses in with your fingers nearly all the way. They should sit deep in the fitting.

Now take the clamp plate you took off previously, and using either the screw that came with the temporary clamp plate (since it's designed for the new condenser) finger-tighten the clamp plate down. Wiggle the pipes and ensure a good fit by both feel and visually. (Shine a flashlight up through the bumper area.) The clamp plate is also easy to misalign, so be sure that the lip is fitting on the edge of the pipe properly, and not up at an angle. It can help to tape on the plate to make sure it's seated firmly too.



Figure 51: The new drier and condenser with the lines reattached

Once everything is seated nicely, tighten the clamp plate down to the specified torque: 9 Nm.

Tighten the pipe to the front-side of the drier to the specified torque: 25-30 Nm.

Both pipes should now be securely fitted by the clamp plate, and both sides of the drier should be installed and tightened. If you're using PAG oil with UV-fluorescent dye like mine, now's a good time to use soapy water to rub the fittings, so that you don't get a false positive the next time you look for leaks.



### 4.3 Leak Test and Adding Refrigerant

At this point the AC system should be fully closed and ready for a leak test. Go rent the vacuum pump and A/C manifold set listed in 2.4, unless you already have them.

This part of the process is very standard, and there are a number of YouTube videos that will explain it. I used <https://www.youtube.com/watch?v=kUdCa3feGvg>, *How to Pull a Vacuum on an AC System - Step by Step* by “Ratchets and Wrenches,” 7m11s, last accessed August 13th, 2019. The overview is:

1. Wrap all the fittings on the manifold set with new Teflon tape
2. Ensure the vacuum pump has a proper amount of clean oil (special vacuum pump oil)
3. Attach the lines to the manifold and the vacuum line to the vacuum pump
4. Remove the dust caps from the high and low pressure lines on the car and attach the fully-disengaged hose fittings
5. Fully open the high and low pressure fittings and fully open the manifold set valves
6. Turn on the vacuum and ensure it's pulling a vacuum. Note that the indicated pressure will vary based on your elevation. You can use a chart to determine the maximum vacuum that's attainable at your altitude: <https://anver.com/vacuum-lifters/atmospheric-pressure/>
7. Wait an hour or more to pull vacuum. By creating a vacuum in the system you significantly lower the temperature at which water boils, resulting in near-immediate evaporation of any moisture in the system. The goal is to have the vacuum pump slowly draw the moisture out entirely. Note some people pull vacuum for 12 hours! It's unclear to me if this helps more than an hour.
8. Close the valves on the manifold set and then turn off the vacuum pump.
9. Ensure the pressure reading remains at vacuum for your elevation. Wait an hour or more and check again. If the readings change whatsoever you have a leak you need to fix before continuing.
10. Close the valves on the fittings (rotating them counter-clockwise to screw the plunger out) and withdraw them. Your AC system is now empty and ready for refrigerant. Note that a vacuum pump used in a system that's empty of refrigerant doesn't withdraw any oil. If you were to fill the system with refrigerant, run it, and then pull vacuum again, you'd have to replenish some amount of oil.



Figure 52: The manifold set attached to my car. I watched about five seasons of *It's Always Sunny in Philadelphia* while doing this job. The uncapped drier in the bottom right of the picture is the old drier. Never expose the AC components to air for any longer than you have to! Especially the drier, which contains a silica desiccant that will rapidly become saturated if exposed to atmosphere.

### 4.4 Adding Refrigerant

If drawing a vacuum and maintaining it proved successful, you're ready to add refrigerant to the car. The process is again best described by a video like this: <https://www.youtube.com/watch?v=zAageqHBj4k>, *How to Safely and Easily Add Refrigerant to Your Cars AC System* by "Ratchets and Wrenches," 10m7s, last accessed August 13th, 2019.

The overview is:

1. Reconnect the battery and start the car. Put the fan to max, direct all air out of the front vents, activate the recirculating air, set the thermostat to its coldest setting, and activate the AC.
2. Attach the can of R134a to the low side of the AC system (where the blue hose went during the leak test—Section 4.3).
3. If you're lucky enough to have a 22 oz. can like I did, slowly discharge the entire contents of the can into the system. Note that there are apparently some differing opinions on this step: some say that you should fill the system to within 95% of the maximum (95% of 0.625 kg (22.0462 oz) as listed by **PN.9 p.18**, or 20.944 oz), then use a thermometer to measure the vent temperature. Slowly add more of the refrigerant until the air stops getting colder. Using the type of consumer can I had, I had no way to measure exactly how much was going in.
4. Once the refrigerant is in the system you should feel very cold air blowing out. You can now turn off the car, replace the dust caps on the hoses, and proceed with reassembly.
5. Disconnect the battery so that you can reconnect the headlamps later, in accordance with the service notes' directions.

You can jump to the testing section now (Section 5) and return here to continue reassembly.

### 4.5 Replacing the cowling

At this point you can put the top cowling back in place. Follow **PN.8 p.17** in reverse.

1. Begin with the top cowling half. You'll want to use the foam you procured (Section 2.3) to line the edge of the cowling so that there's no air gap between the cowling and the condenser. You'll have to do this for the top and bottom halves, as well as the spots where the PAS lines go, and any other gaps you see. Screw the three screws into the top of the cowling.
2. Replace the bottom cowling now. Slide it around the PAS lines in situ if necessary (depending on what you did in Section 3.8). Screw the bottom lip in.
3. If you removed the PAS cooler pipes, follow **HI.3 p.7** to reinstall them and refill the system. You should need 1.5 liters (1.585 quarts) of PAS or ATF fluid that meets Dexron III, assuming you drained the entire system. Apply foam to the spot where the pipes run through the cowling, as well as the gap between the condenser and cowling plastic.
4. Replace the clips that help sandwich the halves together—four on each side.
5. Replace the horns on each side, removing rotting foam and replacing it with new foam as necessary.
6. Add two new fir tree clips to the front of the cowling.

### 4.6 Modifying the Bumper's Grill

The bumper can be refitted by reversing the steps in **BV.5 p.19**, referring to Section 3.7 again if necessary. Before doing so, however, it's almost certainly in your best interest to add a finer mesh to the grill to prevent road debris from kicking up into your new condenser and necessitating repeating this entire guide. Fortunately it's not that hard to do this, and takes maybe thirty minutes to an hour of seated work.

1. Begin by laying out the sheet of mesh you procured in Section 2.3. I used a 24" x 36" sheet of #10 x .025 wire mesh. I cut it roughly in half. Use a pair of tin snips, wire cutters, shears, or similar to cut the mesh. You'll have to go slowly and make creases to get the tool to cut cleanly.
2. Lay the mesh on the back of the existing grill and note which parts you have to trim off to make it possible to fold the edges around the big lip. Make little creases, then cut them all off. You'll likely need to do this a few times.
3. Lay the shaped mesh on the grill again and fold the edges around as tightly as possible.
4. Using the black zip-ties, work them through the holes in the mesh and loop them around the existing brackets as close as possible, to hold the mesh tight. I used maybe two dozen zip-ties around the entire thing. Trim the ends off the zip-ties and the method of attachment should be imperceptible from the front. Leave the edge unconnected that's closest to the gap in the old mesh.
5. Cut a hole in the mesh to line up with hole that allows the tow attachment to screw into the car's frame.
6. You can now finish attaching the new mesh on that side.

Any obstruction of the existing grill will decrease the airflow to the condenser, radiator, etc. I haven't noticed an impact to my engine temperatures when driving without the AC. With the AC on my fans often switch on when stopped at lights, but the temperature gauge doesn't rise more than one notch above the middle. I rarely drove with functioning AC before this, so I don't know if this is caused by the mesh, but I suspect it's only partially a factor. I've driven the car in temperatures as high as 107 °F (20% RH) on the highway with the temperature gauge staying in the middle or slightly above the whole time.





Figure 53: The partially installed mesh. Note the hole in the mesh, the zip-ties, and the unfinished left and right sides (needs more trimming, folding, and then zip-ties). If you leave the edges too long they can scrape the plastic, which should be avoided.



Figure 54: The mesh as seen from the front. It's not particularly noticeable under the car, especially when the bumper is placed against the dark background of the condenser, cowling, etc. If you're especially concerned about the appearance try to find a black mesh or even consider painting it (though it would look worse to me if the paint began to flake off).

### 4.7 Replacing the bumper

1. Replace the foam in the front of the clamshell (Figure 36). Lift the completed bumper up to the front of the car and slot it into place. Though the service notes recommend two people, I found it entirely possible with just one. Recall from Figure 32 that you need to slot both sides of the bumper under the M6 flange nuts near the headlamp apertures.
2. Carefully position the bumper, which is made easier by slightly tightening the two M6 flange nuts in the headlamp apertures to add some friction. Be sure the bumper is supported on both sides by the side supports (visible in Figure 3.7).
3. Reinstall the M6x16 screws, washers, and flange nuts that secure the bottom side of the bumper to the supports in the wheels arches.
4. Tighten the M6 flange nuts, reinstall the M6x16 screw & nut on each side, and reinstall the M5x16 screws & washers (two on each side), which you removed in the steps around Figure 3.7.
5. Reinstall the nut under the Lotus badge and replace the badge.
6. Reinstall the wires you disconnected around Figure 3.7. Attach new zip-ties and trim the ends.

### 4.8 Replacing the Headlamps

Service Notes section **MR. 11, p.46** covers the removal steps of the headlamps. Refitting them is straight-forward.

1. Following the advice of the service notes, use some tape to secure the washers to the bottom of the headlamp assembly. Poke holes in the tape to allow the screws to screw into the assembly.
2. Carefully maneuver the headlamp into the aperture the same way you took it out: through the wheel arch area.
3. If necessary (see Section 3.6), reinstall the two M6x16 bolts and flanged nuts to the rear bracket.
4. At this point I found it easiest to screw the headlamp back into place: use 2x M6x12 button headed screws on the rear bracket and 1x M6x12 button headed screw on the slotted front bracket. I didn't fully tighten these down yet.
5. If you had to remove the entire headlamp washer unit like I did, reverse the steps in Section 3.6. I believe I manually extended the spout, held it in place with my fingers, attached the clip on top, and only then did I slot the washer unit up and screw it in. This made it easier to get the top cover on.
6. Tighten down the headlamp unit. Go to the front of the car and check the seam all along the clamshell and bumper. Make adjustments as necessary, referring to photos you took in the disassembly section.
7. Reconnect the headlamp wire.
8. Repeat this for the other side of the car.
9. Reconnect the battery

Once everything is done you'll want to do the headlamp beam adjustment as described by Service Notes section **MR. 11, p. 47**.

### 4.9 Replacing the Wheel Liners

Replacing the wheel liners is as simple as following the steps in **BV. 17, p. 56**. I vacuumed my liners clean and used new fir tree fasteners.

### 4.10 Replacing the Undertray

The undertray is the last major item to be installed, and also a bit of a pain to maneuver into place. Its installation is covered in **A. p. 10**. Evora 400 owners should refer to **AA. 1 p. 9** instead. You'll need to refer to these sections to verify the all-important locations of the various-sized washers and bolts. Section 3.3 also covers where each of these nuts and washers go on non-400 Evoras.

For the washers, I found it easiest to tape them to the proper spots (little raised cylindrical areas that have an outer diameter that matches the inner diameter of the washers). Once taped, use a punch or similar tool to pierce a hole for the bolt.



Figure 55: Close-up of spacers. There are four sizes that are placed in back-to-front: 4x 4.6mm, 2x 3mm, 2x 10.6mm, and 2x 13.7mm which are on the inner-most and most-forward area. Refer to service notes **A. p.10**

Lift the undertray and angle the front in first, being careful to not dislodge the 8 clips along the front lip. Be especially careful to not put too much pressure on the bottom lip of the bumper and crack the plastic. Slide the back end of the undertray into the lip in the frame. You can then screw it in using the proper bolt locations as listed above and in the service notes.

### 4.11 Replacing the Wheels

The only thing to note when replacing the wheels (other than perhaps taking this opportunity to do a tire rotation) is that the torque specs are listed in Service Notes section **GJ.4 p.7**: 105 Nm (77.44 ft. lbs.)

## 4.12 Finishing reassembly

You can now put the car back on the ground and proceed to driving and testing your AC in daily conditions.

## 5 Testing

With your car disassembled you might want to do limited testing, but once mine was complete I put a digital thermometer in the vent and recorded the vent temperature with the AC at max. (Max fan, AC on, recirculating cabin air, thermostat to its lowest setting, only two center vents open, and the thermometer inserted into the central left vent.)

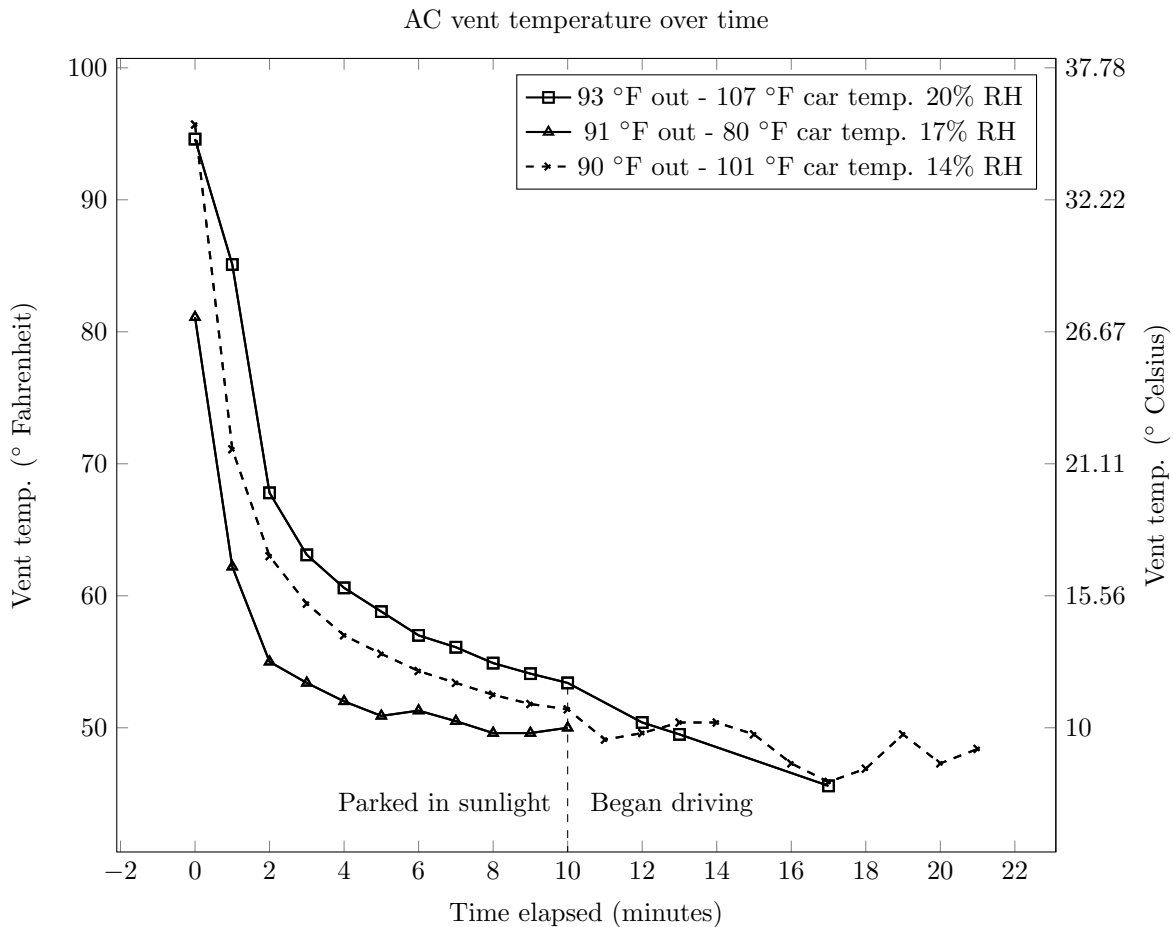


Figure 56: Results of testing the AC on three different days. Note that the vent temperature actually decreases as you lower the fan speed (less air to cool), such that you'd see temperatures  $\approx 3\text{-}5^\circ\text{F}$  lower than these if I was on the middle fan speed. During normal use I'd probably lower the fan at about the 4 minute mark.





Figure 57: Thermometer in vent



Figure 58: The completed car!

Congratulations! It's done.