

DIRECTIONS FOR CONVERTING R-134a EQUIPPED VEHICLES TO R-1234yf REFRIGERANT



Notes:

- This retrofit is not intended for R-134a equipped **electric vehicles** or **hybrid vehicles with electric compressors**.
- Solstice recommends that any retrofit of these electric vehicles be completed at a certified OEM dealer and at the direction of the OEM.
- This retrofit is also not intended (and will not work) for any vehicle originally equipped with R-12 that has or has not gone through a retrofitting process already.

GENERAL SAFETY NOTES:

As with all automotive air conditioning service work:

1. It should be performed by professional, certified technicians for automotive AC service.
2. The work should be done in a well-ventilated area.
3. Common safety equipment should always be used – safety glasses with side shields must be worn and chemical-resistant gloves, made from materials like nitrile or neoprene should be used. Simple cotton gloves frequently leave threads or debris, that can impact sealing.
4. Direct skin contact with refrigerant oils should always be avoided and hand washing after contact is advised.
5. Smoking (and ignition sources) near the service area should always be avoided with any refrigerant and especially R-1234yf which is considered mildly flammable.
6. The main concern with unintentional releases of refrigerants is frostbite. Refrigerants are very cold at atmospheric pressure and skin areas exposed should immediately be flushed with water to avoid complications from extreme cold. Note: It is illegal to release refrigerants into the atmosphere in most countries including the EU.

INITIAL EVALUATION

Note: Only certified Reclaim, Recycle and Recharge (RRR) equipment designed for R-134a should be used to recover any existing refrigerant from the automotive system.

Talk to the customer to understand if the AC is not functioning at all or only functioning at a reduced level. If the customer states that the AC is functioning but at a reduced level, open the hood, start the vehicle and see if the AC clutch is engaging. If it is engaging, then it can be assumed that the system has some R-134a that must be recovered. Please skip the next paragraph.

If the compressor is not engaging, shut the vehicle off and hook up a pressure gauge set to the vehicle (or use the RRR machine with built in gauges) to see if there is

pressure in the system. If there is no pressure in the system, then look for a line break, condenser failure or other system breach. These types of failures must be repaired before continuing. It is not necessary to change the desiccant for this retrofit, but it is a good service practice to change the desiccant when major components are replaced or if a line has been broken.

If the compressor does engage or if the gauges show some pressure above atmospheric pressure (with the vehicle off) use a leak detector to help determine where the leak(s) are.

Note: many R-134a automotive AC systems (and R-1234yf systems) use a fluorescent dye to help identify where leaks are occurring. Using an ultraviolet light to observe components and connections can be helpful to identify leaks. The dye is

carried in the refrigerant oil and can give an indication of where the major leaks are located. Refrigerant and a small amount of refrigerant oil will generally leak together.

Important: If the compressor engages or the system shows pressure you must check for leaks at the evaporator. This is done with the engine off, the HVAC blower on low and the heater mode selected for air delivery. An R-134a leak detector should be used to check for leaks at the evaporator by inserting it into the heater outlet (driver or passenger side). Evaporator leaks should always be repaired (which can be time consuming and expensive) to reduce the chance of large R-1234yf refrigerant leaks from getting into the vehicle interior.

R-134A REFRIGERANT RECOVERY

Using R-134a certified equipment, recover the remaining R-134a – making sure to measure the oil amount that is removed in the process. It is recommended to document this. The old oil will not be reused in the retrofit process and should be disposed of properly.

Repair or replace any leaking components or seals found above. It is highly

recommended that leaks at connections or components be fixed before continuing. Pull a deep vacuum and hold to ensure that there are no noticeable leaks after repair. This is recommended even if there were no significant part changes as this will also help to ensure that the R-134a is completely removed from the system.

MANAGING THE SYSTEM OIL

Component changes will also remove oil from the system. Generally, hose and line changes will not remove much oil from the system – they should be drained (as much as possible) and that amount added to the total from above.

Components like evaporators, condensers, receivers or accumulators are difficult to drain and you should refer to the manufacturers' oil balancing procedures. Note the amount of oil that should be added back to the system when these components are replaced and add this amount to the total from above.

AC compressor replacement is a special case because the new compressor is generally shipped with oil inside. Much of the existing system oil will be removed with the old compressor. Refer to the specific manufacturer's oil balancing procedure.

Most procedures will have the technician drain both compressors and add back the quantity of oil drained from the old compressor with new oil into the new compressor. Some compressors are easier to drain oil from than others. Do not reuse any of the old oil or the new R-134a oil from the new compressor. Determine the quantity of oil based on the compressor change that needs to be put back into the system and add that to the total from above.

Chart for oil recovery (ml)

Oil recovered during R-134a refrigerant recovery	_____
Oil recovered if lines are replaced	_____
Oil needed if components are replaced	_____
Oil needed if AC compressor is replaced	_____
Total	



For the retrofit, an oil/additive is used to ensure that there is miscibility of the oil in R-1234yf. This is important because the circulation of oil is necessary to lubricate the compressor to prevent significant wear. This oil/additive was developed to improve miscibility with older R-134a PAG oils.

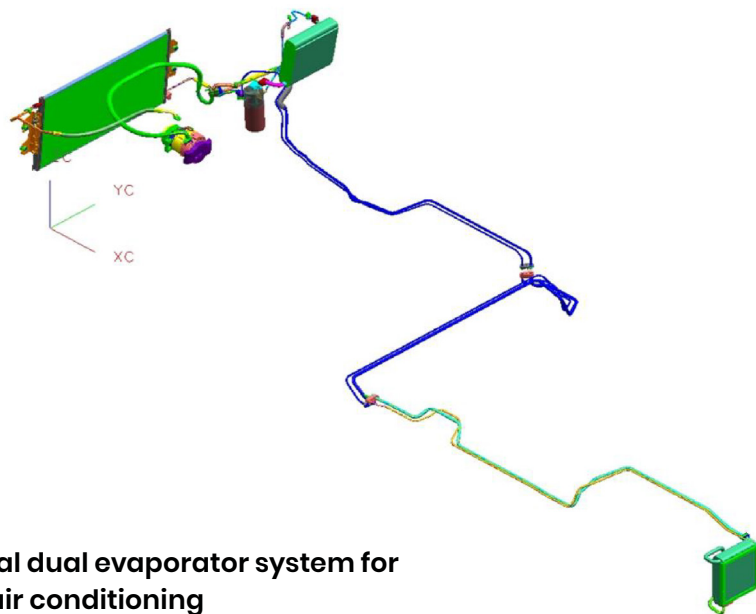
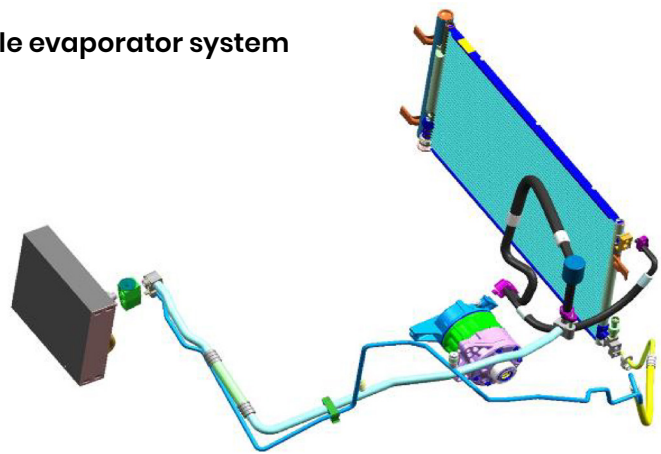
Important: This oil/additive is not intended to be and should not be used as a complete substitute for the existing oil.

Solstice worked with Idemitsu to develop the oil/additive package. It is available for this retrofit and is traded R1234yf (retrofit).



The oil/additive is intended to be used up to 25ml for a typical single or dual evaporator system (most vehicles have a single evaporator). If additional oil is needed based on replaced components, ND8 or ND12 oil also from Idemitsu may be used. Both oils are PAG based and work well with R-1234yf.

Typical single evaporator system



Typical dual evaporator system for rear air conditioning

There are several ways to add oil to the system and certified automotive AC technicians will understand the best way

to do this depending on how the oil is packaged and what components have been changed.

MAKING THE CONVERSION

Solstice worked with Schrader Pacific to develop adaptor service fittings to convert the R-134a service fittings (high and low side) to R-1234yf fittings. These adaptor fittings will comply with SAE J3332 (currently being written) to

ensure an effective leak tight and permanent configuration. There are two types of adaptor fittings available for both the high and low side service ports. The first requires a crimp tool to install and the second is a snap clip design.

Important: Before converting the R-134a fittings to R-1234yf fittings – the R-134a valve cores need to be removed (high and low side)! The adaptor fittings will not allow for evacuation and charging if the R-134a valve cores are not removed. The R-1234yf adaptor fittings are also designed to be very difficult or impossible to remove once installed. Make sure the R134a valve cores are removed. A standard AC valve core service tool should be used.

Note: Some R-134a vehicles have high side 2-piece service ports. After removing the R-134a charge, simply unthread the upper portion and replace with the corresponding R-1234yf fittings that are commercially available everywhere. The high side port now is adapted for R-1234yf and the Schrader adaptor fitting is not necessary.

Note: Low side 2-piece service ports are very uncommon, and they employ valve cores that are generally not serviceable. There is a clip that holds the valve core in place. In this case, the top portion of the valve assembly should be removed. The valve core can be removed by using a punch to knock out the valve core from the top to the bottom which will push out the clip. This portion of the valve (without the valve core) can now be installed back to the car. Ensure the O-ring (to seal to the top half to the bottom half) is not damaged. The Schrader adaptor fittings will be installed over the top of this fitting.

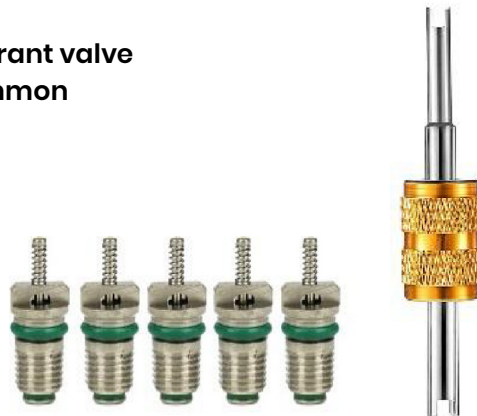
Crimp design as received



Snap clip as received



Typical refrigerant valve cores and common removal tool



Typical high side 2-piece adapters

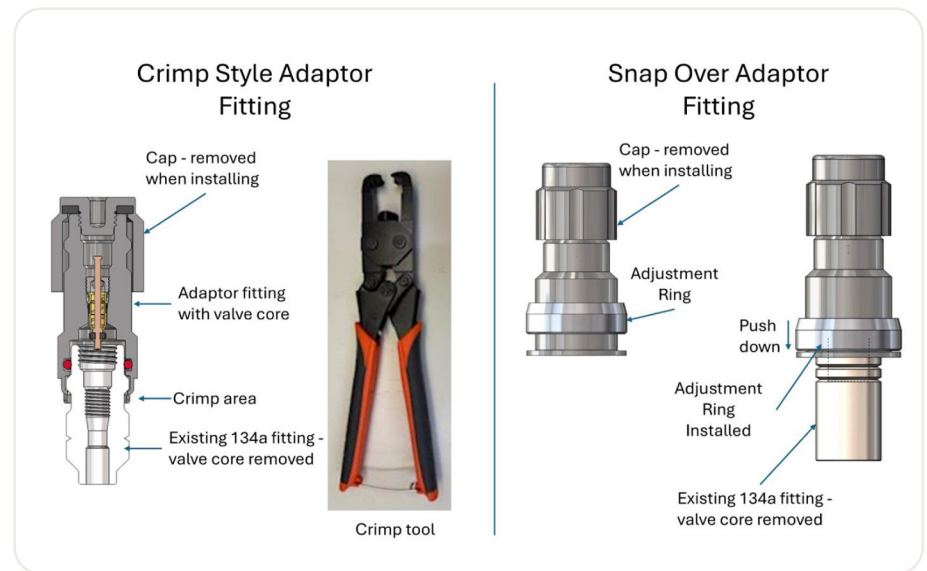


There are two different types of adaptor fittings offered by Schrader-Pacific (for both the high side and low side). The first is a design that requires a tool to install and uses a swage locked feature to retain the fitting. The sealing cap needs to be removed to use the swage lock tool. The second type of fitting does not require a tool to install and has a snap-click feature. Neither type is designed to be serviceable once engaged. Again, removing the R-134a valve core is required BEFORE installing the adaptor fittings.

Typical two-part service connection with non-maintainable valve inserts



In the engine compartment, it is not always easy to view the R-134a fittings while installing the adaptor fittings. To ensure that the new adaptor fittings are installed correctly, give the new fitting a light tug to make sure they are installed correctly. If the adaptor fitting comes off, they were not installed properly. The fitting may rotate but it is sealed



CHARGING WITH R-1234yf

Once the new fittings are installed, pull a deep vacuum on the system using an approved R-1234yf RRR machine. Charge the system with R-1234yf to the same amount as is identified on the original R-134a label. Reinstall the sealing caps that came with the R-1234yf adaptor fittings.

Start the vehicle and ensure that the refrigeration system is making cold air to the manufacturers specification. There can be a very slight

reduction in performance at extremely hot temperatures, but no performance reduction would be noticeable under normal AC conditions.

Shut the vehicle off and leak check the system again to ensure that the joints and components are leaking tight.

Important: as above, with the vehicle off and the blower on low and in heater mode, check for leaks at the heater outlet with an R-1234yf leak detector.

Note: If a leak is determined, the evaporator should be replaced with a new evaporator that meets SAE J2842 (never use a salvaged evaporator from a used vehicle).

Install the caps on both adaptor service fittings. The fitting may rotate when the cap is installed – this is normal and not a leak issue. Hold the fitting when installing the cap if needed.

FINAL STEPS

Locate an area as close as possible to the existing R-134a label where the retrofit label can be installed. Use an alcohol-based cleaner to remove any dust, oil or residue where the new label will be installed. Install the retrofit label to ensure future service technicians will be informed of the change.

As part of the retrofit process converting existing vehicle air-conditioning systems from R-134a to R-1234yf (Solstice® yf), the system labeling is updated to reflect the new refrigerant type. R-1234yf is an HFO (Hydrofluoroolefin). Each new label includes a QR code that provides full digital documentation of the retrofit process. By scanning the



Summary: R-134a to R-1234yf Retrofit Process and System Relabeling

QR code, users and service technicians can access detailed information such as: Refrigerant specifications for yf

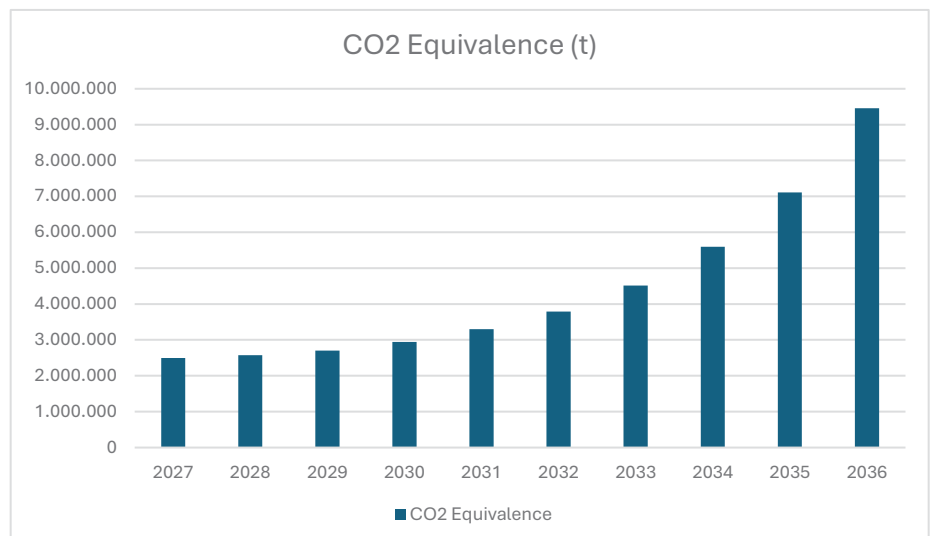
Installation instructions for retrofitting from 134a to yf This relabeling system ensures clear compliance, safety, and transparency for all vehicles

retrofitted to R-1234yf in the aftermarket. It also helps prevent misidentification during future service and supports proper environmental documentation and regulatory tracking.

The vehicle should now be ready for the customer.

REFRIGERANT RETROFIT POTENTIAL AND CLIMATE IMPACT ASSESSMENT FOR THE EUROPEAN VEHICLE FLEET (EU27 + UK)

This analysis assesses the potential greenhouse gas emission reductions achievable through the large-scale conversion (retrofit) in the Aftermarket of mobile air conditioning systems in vehicles currently operating within the European Union (EU27) and the United Kingdom. The retrofit involves replacing the existing refrigerant R-134a with the low-GWP alternative R-1234yf.



R-134a, which remains widely used in the existing vehicle fleet, has a Global Warming Potential (GWP) of approximately 1,430 (AR4), while R-1234yf exhibits a GWP of only 4 (AR4). To quantify the climate impact, the total mass of R-134a currently in circulation (in kilograms) was multiplied by its GWP, yielding the total CO₂-equivalent emissions associated with the existing refrigerant stock.

By substituting R-134a with R-1234yf, the same calculation yields a drastically reduced CO₂-equivalent value, reflecting the substantial mitigation potential of this conversion. The resulting difference represents the avoided greenhouse gas emissions that can be achieved through a complete or partial fleet retrofit.

Projections for the period 2027–2036 illustrate the expected

decline in cumulative CO₂-equivalent emissions as the retrofit program progresses, based on estimated replacement rates and refrigerant volumes per vehicle. This assessment highlights the environmental benefits of accelerating the transition to low-GWP refrigerants in mobile air conditioning systems, in line with the European Green Deal, F-Gas Regulation objectives, and long-term climate neutrality targets.

SOLSTICE ADVANCED MATERIALS – COMPANY OVERVIEW

Background and Formation

Solstice Advanced Materials is a spin-off of Honeywell International's former Advanced Materials division. Solstice officially became an independent, publicly traded entity on November 1, 2025 (effective October 30 in filings).

Business Focus and Activities

Solstice Advanced Materials operates as a global specialty chemicals and materials company, with around 4,000

employees, 21 manufacturing sites, and multiple R&D centers worldwide. Its mission centers on developing sustainable, high-performance materials that address global challenges in energy efficiency, climate protection, and advanced technology manufacturing.

The company's main business areas include: Refrigerants and thermal solutions – including the Solstice® line of next-generation, low-GWP refrigerants (notably Solstice® yf, also known as

R-1234yf), used in automotive and commercial cooling systems. Semiconductor and electronics materials – supplying advanced chemicals and films for chip manufacturing, data centers, and AI computing applications. Advanced fibers and protective materials – such as Spectra® fibers for defense, safety, and healthcare packaging. Specialty chemicals – for healthcare, industrial processes, and sustainable packaging applications.

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