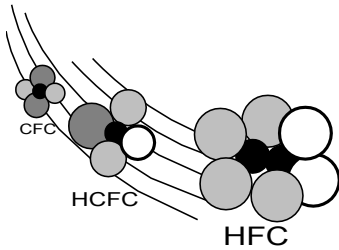


# Refrigerant Changeover Guidelines CFC-12 to HFC-134a

Leading the Industry with Environmentally  
Responsible Refrigerant Solutions







Emerson Climate Technologies, Inc. does not advocate the wholesale changeover of CFC refrigerants to HCFCs or HFCs. If a system is not leaking

refrigerant to the atmosphere, and is operating properly, there is no technical reason to replace the CFC refrigerant. Changing the refrigerant may void the UL listing of the unit; however, once the decision has been made to make the change from CFC-12 (R-12) to HFC-134a (R-134a), the following guidelines are recommended.

#### CONSIDERATIONS

1. Retrofitting systems that employ compressors manufactured prior to 1973 is not recommended. This is due to the different materials used in motor insulation that have not been evaluated for compatibility with the new refrigerants and lubricants. Failure to heed this advice will violate UL Standard for Field Conversion/Retrofit of Alternate Refrigerants in Refrigeration and Air Conditioning Equipment (UL 2170-2172).

2. The lubricant that Emerson Climate Technologies, Inc. recommends for use with HFC-134a is a Polyol Ester (POE). For a complete list of lubricants approved by Emerson Climate Technologies, Inc., refer to Form 93-11. The use of any other POE lubricant may void the compressor warranty.

3. Compressor capacity will be comparable to R-12 in medium temperature applications; however, there can be a significant increase in compressor capacity for low temperature applications. This could result in the condenser being undersized.

4. R-134a should be used only in systems where the saturated suction temperature is maintained at -10°F or higher. **It should not be mixed with any other refrigerant!**

5. The expansion valve may need to be changed. When used with R-134a, the existing R-12 valve will have approximately 15% more capacity. Oversized expansion valves can result in hunting and refrigerant floodback. Consult with the thermostatic expansion valve manufacturer for the correct valve and size.

6. Filter driers must be changed at the time of conversion. This is proper air conditioning/refrigeration practice.

a. The recommended drier for use with all HFC refrigerants is Emerson Climate Technologies UltraFlow.

b. Solid core driers, such as Emerson Climate Technologies ADK, are compatible with either R-12 or R-134a.

c. Compacted bead type driers can use an XH6 or XH9 molecular sieve material, such as found in the Emerson Climate Technologies UK series.

d. If a loose fill type drier is to be used, an XH9 molecular sieve is required.

7. R-134a exhibits marginally higher pressures than R-12 at normal condensing temperatures. We do not believe this will require readjustment of safety controls; however, you should verify this with the system manufacturer or component suppliers.

8. Systems that use a low pressure controller to maintain space temperature may need to have the cut-in and cut-out points changed due to the difference in pressure/temperature relationships.

9. Systems using R-134a may have a lower system pressure drop than when using R-12. Because of the lower pressure drop, check with the manufacturer of any pressure regulators and pilot-operated solenoid valves used in the system to be sure that they will operate with the lower pressure drop. It is possible that these controls may have to be downsized in order to operate properly.

10. Mineral oil lubricants, such as 3GS, must not be used as the compressor lubricant. Polyol Ester (POE) lubricants are the only lubricants that can be used in a Copeland™ compressor when using R-134a.

Before starting the changeover, it is suggested that at least the following items be ready:

1. Safety glasses
2. Gloves
3. Refrigerant service gauges
4. Electronic thermometer
5. Vacuum pump capable of pulling 250 microns
6. Thermocouple micron gauge

**WARNING:** Use only Emerson Climate Technologies, Inc. approved refrigerants and lubricants in the manner prescribed by Emerson Climate Technologies, Inc. In some circumstances, other refrigerants and lubricants may be dangerous and could cause fires, explosions or electrical shorting. Contact Emerson Climate Technologies, Inc., Sidney, Ohio for more information.

7. Leak detector
8. Refrigerant recovery unit, including refrigerant cylinder
9. Proper container for removed lubricant
10. New liquid control device
11. Replacement liquid line filter drier(s)
12. New lubricant, Emerson Climate Technologies, Inc. approved
13. R-134a pressure temperature chart
14. R-134a refrigerant

## CHANGEOVER PROCEDURE

Consult your Authorized Copeland™ Wholesaler for the proper part number.

1. The system should be thoroughly leak tested with the R-12 still in the system. All leaks should be repaired before the R-134a refrigerant is added.
2. It is advisable that the system operating conditions be recorded with the R-12 still in the system. This will provide the base data for comparison when the system is put back into operation with the R-134a.
3. It is necessary to thoroughly remove the existing mineral oil lubricant from the system before the refrigerant is changed. No more than 5% residual mineral oil may be left in the system when it is recharged with R-134a for proper compressor operation. No more than 1 to 2% residual mineral oil may be required to ensure no loss of heat transfer if enhanced tube heat exchangers are used in the system.

### ***I. Systems with service valves***

- a. Disconnect electrical power to system.
- b. Front seat the service valves to isolate the compressor.
- c. Properly remove the R-12 from the compressor.
- d. Remove the mineral oil lubricant from the compressor. Hermetic compressors will have to be removed from the system and tipped up to drain the lubricant out through the suction stub.
- e. Those systems that have oil separators, oil reservoirs, oil floats and suction line accumulators must have the mineral oil drained from them. Add POE lubricant to the oil separator and to the oil reservoir.
- f. Replace the liquid line filter drier with one that is compatible with R-134a.
- g. Fill the compressor with the proper amount of POE lubricant. The oil charge is on the label of the

compressors. If the lubricant charge is unknown, an Authorized Copeland™ Wholesaler can provide the technician with the information.

h. Reinstall the compressor in the system. Evacuate it to 250 microns. A vacuum decay test is suggested to ensure the system is dry and leak free.

i. Recharge the system with R-12.

j. Operate the compressor in the system for a minimum of 24 hours, one to two weeks maximum.

k. Repeat steps 3.l.a through j two more times. This will have provided three flushes of the system's lubricant.

l. To date, three complete flushes of the lubricant have shown to lower the mineral oil content down to 5% or less in the system. To be sure of the mineral oil content between flushes and to be sure that the system ultimately has 5% or less mineral oil, Emerson Climate Technologies, Inc. recommends the use of a refractometer.

m. Properly dispose of the lubricant removed from the system after each flush.

### ***II. Systems without service valves***

- a. Disconnect electrical power to system.
- b. Properly remove the R-12 from the system.
- c. Remove the mineral oil lubricant from the compressor. Hermetic compressors will have to be removed from the system and tipped up to drain the lubricant out through the suction stub.
- d. It may be advisable to add service valves at the compressor suction and discharge connections. Generally, the compressor will have to have its lubricant changed three times.
- e. Those systems that have oil separators, oil reservoirs, oil floats and suction line accumulators must have the mineral oil drained from them. Add POE lubricant to the oil separator and to the oil reservoir.
- f. Replace the liquid line filter drier with one that is compatible with R-134a.
- g. Fill the compressor with the proper amount of POE lubricant. The oil charge is on the label of the compressors. If the lubricant charge is unknown, an Authorized Copeland™ Wholesaler can provide the technician with the information.
- h. Reinstall the compressor in the system. Evacuate it to 250 microns. A vacuum decay test is suggested to ensure the system is dry and leak free.
- i. Recharge the system with R-12.

j. Operate the compressor in the system for a minimum of 24 hours—longer is better.

k. Repeat steps 3.II.a through j two more times. This will have provided three flushes of the system's lubricant.

l. To date, three complete flushes of the lubricant have shown to get the mineral oil content down to 5% or less in the system. To be sure of the mineral oil level between flushes and to be sure that the system has 5% or less mineral oil, Emerson Climate Technologies, Inc. recommends the use of a refractometer (P/N 998-RMET-00) is available from your Authorized Copeland™ Wholesaler.

4. With the proper amount of Polyol Ester in the system, the R-12 can now be removed. Measure and note the amount removed.

5. Before the final flush, be sure all leaks are repaired and liquid control devices and any other system components are changed. Install the correct liquid line filter drier. Driers must be compatible with the refrigerant and lubricant.

6. Be advised that POEs are very hygroscopic. They will very quickly absorb moisture from the air once the container is opened. Once the lubricant is added to the compressor, the compressor should be quickly installed. Like an open container, an open compressor with POE will absorb moisture. Add the correct amount of lubricant to the compressor. It is important that the system contain not more than 5% mineral oil. More than 5% may contribute to premature compressor failure and/or system capacity problems. Mineral oils are not miscible with R-134a. The lubricant may log in the evaporator resulting in system capacity loss. It is for this reason that the flushing process must be done with the R-12 in the system.

7. Once the compressor is installed and the system is closed, the system must be evacuated to and hold 250 microns or lower.

8. Charge the system with the R-134a. Charge to 90% of the refrigerant removed in item 4.

9. Operate the system. Record the data and compare to the data taken in item 2. Check and adjust the TEV superheat setting if necessary. Make adjustments to other controls as needed. Additional R-134a may have to be added to obtain optimum system performance.

10. Properly label the components. Tag the compressor with the refrigerant used (R-134a) and the lubricant used. The proper color code for R-134a is Light Sky Blue PMS (Paint Matching System) 2975.

11. Clean up and properly dispose of the removed

lubricant. Check local and state laws regarding the disposal of refrigerant lubricants. Recycle or reclaim the removed refrigerant.

**CAUTION: These guidelines are intended for use with R-134a only, not for refrigerants which are similar to R-134a. Other refrigerants may not be compatible with the materials used in our compressors or the lubricants recommended in this bulletin; their use may result in unacceptable reliability and durability of the compressor.**

*Note: Videos on retrofitting are available from your Authorized Copeland™ Wholesaler. Ask for VT-026.*

## ADDENDUM

The contents of this publication are presented for informational purposes only and are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. Emerson Climate Technologies, Inc. and/or its affiliates (collectively “Emerson”), as applicable, reserve the right to modify the design or specifications of such products at any time without notice. Emerson does not assume responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use and maintenance of any Emerson product remains solely with the purchaser or end user.

**CAUTION** POE must be handled carefully and the proper protective equipment (gloves, eye protection, etc.) must be used when handling POE lubricant. POE must not come into contact with any surface or material that might be harmed by POE, including without limitation, certain polymers (e.g. PVC/CPVC and polycarbonate).

## P-134a Saturated Vapor/Liquid Temperature/Pressure Chart

Temperature °F	Pressure PSIG	Temperature °F	Pressure PSIG
-10	1.8	30	25.6
-9	2.2	31	26.4
-8	2.6	32	27.3
-7	3.0	33	28.1
-6	3.5	34	29.0
-5	3.9	35	29.9
-4	4.4	40	34.5
-3	4.8	45	39.5
-2	5.3	50	44.9
-1	5.8	55	50.7
0	6.2	60	56.9
1	6.7	65	63.5
2	7.2	70	70.7
3	7.8	75	78.3
4	8.3	80	86.4
5	8.8	85	95.0
6	9.3	90	104.2
7	9.9	95	113.9
8	10.5	100	124.3
9	11.0	105	135.2
10	11.6	110	146.8
11	12.2	115	159.0
12	12.8	120	171.9
13	13.4	125	185.5
14	14.0	130	199.8
15	14.7	135	214.8
16	15.3		
17	16.0		
18	16.7		
19	17.3		
20	18.0		
21	18.7		
22	19.4		
23	20.2		
24	20.9		
25	21.7		
26	22.4		
27	23.2		
28	24.0		
29	24.8		

The information contained herein is based on technical data and tests which we believe to be reliable and is intended for use by persons having technical skill, at their own discretion and risk. Since conditions of use are beyond the control of Emerson Climate Technologies, Inc., we can assume no liability for results obtained or damages incurred through the application of the data presented.

**EmersonClimate.com**

93-04 R9 (3/12) Emerson and Copeland are trademarks of Emerson Electric Co. or one of its affiliated companies.  
©2012 Emerson Climate Technologies, Inc. All rights reserved. Printed in the USA.

