

## Introduction

As the air conditioning industry continues to move away from the use of HCFCs, refrigerant service personnel will play a key role in the transition to HFC alternatives through retrofitting. Honeywell has produced this guide to help service technicians better understand the various technical and operational aspects of carrying out retrofit procedures using Honeywell Genetron® 407C and Genetron® 422D.

Although this information can be helpful as a general guide, it should not be used as a substitute for the equipment manufacturer’s specific recommendations. Also, retrofitting should be considered system specific. Since systems can differ in condition and configuration, retrofit actions applied to one system will not necessarily result in the same level of success in another system. For this reason, Honeywell strongly recommends contacting the equipment manufacturer for detailed information on retrofitting the specific model under consideration. Also, refer to the Material Safety Data Sheet (MSDS) for safety information on the specific Genetron® refrigerant you will use.

## Genetron HFC Refrigerants

Genetron 407C and Genetron 422D are HFC refrigerants and are not scheduled for phaseout under current law. Descriptive information including refrigerant type, ASHRAE number, constituents and applications appear in the table below.

Genetron Refrigerant	Type	Replaces	Applications	Comments
R-407C 32/125/134a	Blend	HCFC-22	Unitary Air Conditioning Chillers without flooded heat-exchangers	Oil change To POE
R-422D 125/134a/600a	Blend	HCFC-22	Unitary Air Conditioning Chillers without flooded heat-exchangers	Use of POE oil will enhance oil return, if required

## Genetron 407C is not a “drop-in” Replacement. Genetron 422D is a “near drop-in” replacement.

Genetron 407C and Genetron 422D are HFC-based refrigerants that normally utilize synthetic lubricants. The mass flow differences as well as the slightly different operating pressures should be evaluated. Check with the compressor manufacturer to determine if the existing lubricant is acceptable. The retrofit procedures listed here have been developed by Honeywell to address these issues and to help technicians perform successful retrofits of HCFC-22 systems utilizing positive-displacement (reciprocating, rotary and scroll) compressors.

## Retrofit Procedures

In retrofitting an existing air conditioning system, material compatibility and the condition of the existing seals and gaskets must be taken into account. It is recommended to change any O-rings, seals and other elastomers used in the system, (as expected in any retrofit to HFC). In most air conditioning and heat pump systems this only applies to the Schrader valve seal and cap seal material.

### 1. Record Baseline Data

Before making any hardware changes, compare current system operating data with normal operating data. Correct any deficiencies and record final data as a performance baseline. Data should include temperature and pressure measurements throughout the system including the evaporator, compressor suction and discharge, condenser and expansion device. These measurements will be useful when adjusting the system with an alternative Genetron refrigerant.

## 2. Isolate R-22 Refrigerant Charge

The HCFC refrigerant charge should be removed from the system using an approved recovery machine capable of meeting or exceeding the required levels of evacuation. The charge must be collected in a recovery cylinder.

### DO NOT VENT THE REFRIGERANT

Knowing the recommended R-22 refrigerant charge size for the system is helpful. If it is not known, weigh the entire amount of refrigerant removed. This amount can be used as a guide for the initial quantity of alternative Genetron® Refrigerant to be charged to the system.

## 3. Choose Compressor Lubricant

In most instances, the lubricant in use with R-22 is a mineral oil or alkyl benzene. Polyol ester lubricants are recommended for use with Genetron® 407C by the equipment manufacturers. Genetron 422D retrofit of a system with short connecting lines typically will not require an oil change or modification. Honeywell recommends using a miscible lubricant approved by the compressor manufacturer. In this case, POE oil is recommended for R-422D. Differences among lubricants make it difficult to assume that they are interchangeable. Check with the compressor manufacturer for the correct viscosity grade and brand for the compressor in the system being retrofitted. If the lubricant is contaminated or an acid test indicates high levels of acidity, then a lubricant change is warranted.

Field trials have indicated that adequate oil return can occur in HFC retrofit systems when 15% -20% of the lubricant operating charge is synthetic oil. Systems with receivers or low-side accumulators (heat pumps) will require a higher ratio of POE to mineral oil.

## 4. Evaluate the Expansion Device

Honeywell recommends consulting with the equipment manufacturer before retrofitting. Most HCFC-22 A/C systems with either expansion valves or capillary tubes will operate satisfactorily with Genetron 407C or 422D.

	R-422D	R-407C
Expansion Valve G Valve	No Adjustment anticipated	May need minor Adjustment (close)
Capillary Tube	Need to optimize charge superheat @ evaporator outlet to prevent liquid floodback (compressor)	Need to optimize charge superheat @ evaporator outlet to prevent compressor floodback (compressor)

For blend refrigerants, pressure-temperature data will include bubble pressure and dew pressure data. To determine superheat, use the dew pressure column. To determine subcooling, use the bubble pressure column. To find average evaporating or condensing temperature, find the measured pressure in both the bubble and dew columns and take the average of the two corresponding temperatures.

## 10. Label Components and System

After retrofitting the system with Genetron® 407C or 422D, label the system components to identify the specific refrigerant and specify the type of lubricant (by brand name) in the system. This will help ensure that the proper refrigerant and lubricant will be used to service the equipment in the future.

Unit Charge labels are available through your Genetron® Wholesaler.

### Recommended Retrofit Checklist

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|---|---|
| <p>1. Record baseline data on original system performance. <input type="checkbox"/></p> <p>2. Recover refrigerant charge using appropriate recovery equipment. <input type="checkbox"/></p> <p>3. Record the amount of refrigerant recovered. <input type="checkbox"/></p> <p>4. Choose compressor lubricant. Consult the compressor manufacturer's data to verify that the same synthetic grade and weight is suitable for use with R-407C / R-422D. <input type="checkbox"/></p> <p>5. R-422D: Use of POE will enhance oil return if required. <input type="checkbox"/></p> <p>6. R-407C requires minimum of 15% POE oil. <input type="checkbox"/></p> <p>7. If required, drain the existing lubricant from the compressor's separators and oil reservoirs. <input type="checkbox"/></p> <p>8. Measure amount (volume) of lubricant removed. <input type="checkbox"/></p> <p>9. Change lubricant filters if present <input type="checkbox"/></p> <p>10. Recharge the system with polyol ester lubricant, use the same amount (volume) that was removed. <input type="checkbox"/></p> <p>11. Evaluate the expansion devices: consult the valve manufacturers for recommendations. No change is necessary in most cases. <input type="checkbox"/></p> | <p>12. Evaluate and replace all elastomer seals including Schrader valves. <input type="checkbox"/></p> <p>13. Replace filter driers and suction filters. <input type="checkbox"/></p> <p>14. Leak check the system. <input type="checkbox"/></p> <p>15. Evacuate the system. <input type="checkbox"/></p> <p>16. Charge the system with the new refrigerant. In the case of R-407C / R-422D remove only liquid from the charging cylinder. <input type="checkbox"/></p> <p>17. Initial charge should be approximately 85% of the R-22 charge by weight record the amount of refrigerant charged. <input type="checkbox"/></p> <p>18. Adjust refrigerant charge if necessary in increments of 5 percent of original charge weight. <input type="checkbox"/></p> <p>19. Label components and the system with the type of refrigerant and lubricant. <input type="checkbox"/></p> |
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#### Genetron® 407C/422D

#### Compatibility: Plastics and Elastomers

Neoprene (Chloroprene) S

EPDMs

Butyl Rubber D

S: Suitable D: Suitability dependent on formulation

## Genetron® Temperature Pressure Tables

### Genetron HCFC-22

Temperature (°F)	Pressure (psig)
-40	0.6
-35	2.6
-30	4.9
-25	7.4
-20	10.2
-15	13.2
-10	16.5
-5	20.1
0	24
5	28.3
10	32.8
15	37.8
20	43.1
25	48.8
30	55
35	61.5
40	68.6
45	76.1
50	84.1
55	92.6
60	101.6
65	111.2
70	121.4
75	132.2
80	143.6
85	155.7
90	168.4
95	181.8
100	195.9
105	210.8
110	226.4
115	242.8
120	260
125	278
130	296.9
135	316.7
140	337.4
145	359
150	381.7

### Genetron R-407C

Temperature (°F)	Bubble	Dew
	Liquid Pressure (psig)	Vapor Pressure (psig)
-40	2.7	4.6
-35	5.1	0.9
-30	7.7	1.6
-25	10.6	3.9
-20	13.7	6.5
-15	17.2	9.3
-10	20.9	12.3
-5	25	15.7
0	29.5	19.4
5	34.3	23.5
10	39.5	27.9
15	45.2	32.7
20	51.2	37.9
25	57.7	43.5
30	64.7	49.6
35	72.2	56.1
40	80.2	63.2
45	88.8	70.7
50	97.9	78.8
55	107.6	87.5
60	117.9	96.8
65	128.9	106.7
70	140.5	117.3
75	152.8	128.5
80	165.8	140.5
85	179.6	153.2
90	194.1	166.7
95	209.4	181
100	225.5	196.1
105	242.4	212.1
110	260.3	229
115	279	246.9
120	298.6	265.8
125	319.2	285.7
130	340.7	306.6
135	363.3	328.8
140	386.9	352.1
145	411.7	376.6
150	437.5	402.5

### Genetron R-422D

Temperature (°F)	Bubble	Dew
	Liquid Pressure (psig)	Vapor Pressure (psig)
-40	2.4	2.3
-35	4.6	0.8
-30	7.1	3
-25	9.9	5.4
-20	12.9	8.1
-15	16.2	11
-10	19.8	14.3
-5	23.7	17.8
0	27.9	21.7
5	32.5	25.8
10	37.5	30.4
15	42.8	35.3
20	48.5	40.7
25	54.7	46.4
30	61.3	52.6
35	68.4	59.3
40	75.9	66.4
45	84	74
50	92.6	82.2
55	101.7	90.9
60	111.4	100.2
65	121.7	110.1
70	132.6	120.7
75	144.1	131.8
80	156.3	143.7
85	169.2	156.2
90	182.8	169.5
95	197.1	183.6
100	212.2	198.4
105	228	214
110	244.7	230.5
115	262.3	247.9
120	280.7	266.2
125	300	285.5
130	320.2	305.8
135	341.5	327.2
140	363.7	349.6
145	387	373.3
150	411.4	398.2

\* HCFC-22 For Reference\*

Blue figures-inches mercury vacuum