# REFRIGERANT INSTALLATION QUICK REFERENCE GUIDE

***To be used only by experienced and licensed refrigeration technicians***

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## Preface:

This project objective is to replace existing CFC or HCFC refrigerants with all-natural Priority Cool hydrocarbon refrigerants. This Reference Guide includes recommended procedures for the installation of Priority Cool hydrocarbon refrigerants, and is to be used only by qualified licensed refrigeration technicians trained in the safe handling of flammable gasses and materials. Failure to adhere to these procedures or intentional misuse may result in serious injury or death.

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## Before You Begin:

- **Leak Test:** Prior to installing Priority Cool hydrocarbon refrigerants if there is any evidence or history of refrigerant leaks, it is imperative that the entire system be pressurized with dry nitrogen to a minimum of 1-1/2 times the high side working pressure. Any leaks found **MUST BE REPAIRED** before Priority Cool hydrocarbon refrigerant is installed. In addition, any inoperative components **MUST BE REPLACED**. Pay particular attention to safety and operating controls.

- **System Pressures:** Priority Cool hydrocarbon refrigerants operate at lower pressures on both high and low sides. Failure to consult the temperature/pressure chart may result in equipment damage and/or poor performance.

- **System Charge:** The amount of Priority Cool hydrocarbon refrigerant will be approximately 40% less than the CFC refrigerant removed. **DO NOT** replace CFC or HCFC refrigerants with Priority Cool hydrocarbon refrigerants in equal weight or equipment damage and/or poor performance may result.

- **Equipment Loading:** It is necessary to ensure the equipment is operating with the correct volume of air or water is entering the evaporator and condenser, and they should be cleaned if necessary. Fan belts must be checked and

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# STEPS IN REPLACING EXISTING CFC OR HCFC REFRIGERANTS:

**STEP 1:**

While system is operating check and record compressor amperage or wattage (all phases), suction and discharge pressures, condenser air temperature in and out (if air-cooled), condenser water temperature in and out (if water-cooled), evaporator temperature in and out, ambient temperature.

**STEP 2:**

Disconnect all electrical power to system. Recover the existing refrigerant into a suitable recovery tank is strict accordance with current EPA requirements and regulations, (40 CFR Part 82, Subpart F). Place the empty recovery tank onto an electronic scale and weigh it. Then recover the existing refrigerant and accurately weigh it. Record the amount of refrigerant recovered to the ounce.

**STEP 3:**

Pressurize the system with dry nitrogen to a minimum of 1-1/2 times the working high side pressure. Perform leak check while system is under pressure. Repair any leaks before proceeding. **Note: if the refrigeration system contains a relief valve, ensure the nitrogen pressure does not exceed the relief valve pressure setting.**

**STEP 4:**

Evacuate and dehydrate the system using guidelines and procedures below entitled **"Fundamentals of Dehydrating a Refrigerant System".** For reasons stated below it is imperative that these guidelines are followed to ensure that all moisture is removed from the system and the compressor refrigeration oil. As in all refrigeration systems moisture will adversely affect performance and may lead to compressor failure. Leaving the system in a deep vacuum with the vacuum pump disconnected for a period of time with no loss of vacuum will ensure that the system is tight. Holding a deep vacuum is the best way to determine the system is leak-free.

**STEP 3:**

After you have determined that the system is free of leaks and has been dehydrated, following the guidelines below, and with system electrical power disconnected, slowly introduce the proper Priority Cool hydrocarbon refrigerant into the system. **Priority Cool refrigerants must be added to the equipment as a liquid, not a gas.** The initial charge should be approximately 40% (by weight) of the refrigerant recovered. This will ensure the proper charge and peak efficiency of the equipment. The final amount of Priority Cool will likely have to be added while the compressor is running.

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# STEPS IN REPLACING EXISTING CFC OR HCFC REFRIGERANTS: (CONT.)

**STEP 4:**

Restore electrical power and start the system. Carefully observe operating pressures and temperatures. Adjustments to the initial Priority Cool hydrocarbon refrigerant charge should be made at this time. A suitable amount of time (at least 30 minutes) should be allowed for the system to stabilize. The proper charge is determined by evaporator pressures and leaving air (or water) temperatures.

**STEP 5:**

After the system is performing at optimum pressures and temperatures, check and record compressor amperage (all phases), suction and discharge pressures, condenser air temperature in and out (if air-cooled), condenser water temperature in and out (if water-cooled), evaporator temperature in and out, ambient temperature. Compare these readings to those recorded at the onset.

**STEP 6:**

Attach an **ATTENTION** tag to the equipment and inside the refrigeration room so that future technicians are aware that the system contains a Priority Cool refrigerant. We recommend using the Caution Label shown on the last page of this Guideline.

# FUNDAMENTALS OF DEHYDRATING A REFRIGERANT SYSTEM

**The two most frequent questions service technicians ask about dehydration are:**

1. What size vacuum pump should be used to perform a good refrigeration/air conditioning system dehydration job?

2. How long should the pump be left on the system to assure removal of all moisture?
   To give specific answers to these questions, you need to know the cubic capacity of the system to be dehydrated; amount of moisture both visible and invisible present in the system; I.D. and length of the connecting line as well as the restrictions within the system itself (cap tubes, valves, etc.) which might cause back pressures.
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### Moisture in a Refrigerant System

- Effects of Pressure and Temperatures on the Boiling Points of Water
- High Vacuum / Deep Vacuum
- Gas Ballast or Vented Exhaust Vacuum Pumps
- Factors Affecting the Speed at which a Pump Can Hydrate a Refrigerant System

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# MOISTURE IN A REFRIGERANT SYSTEM

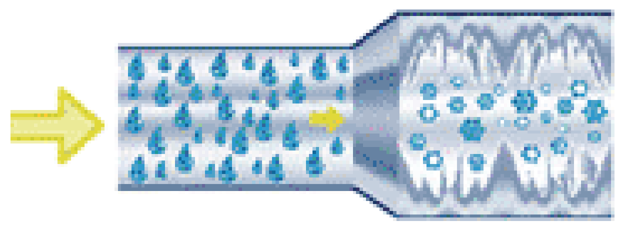
While it is important to realize that moisture in a refrigerant system is the underlying cause of most problems and complaints, it is equally important to learn why.

Basically, moisture can be classified as visible and invisible. Occasionally, liquid water is found in systems, but this is unusual. Invisible moisture, or water vapor, is the culprit which causes the greatest trouble in refrigeration and air conditioning systems.

A single drop of water may look harmless, but to a refrigerant system, it is a monster, the number one enemy of service technicians. What makes it so formidable is the fact that moisture enters a system easily and is hard to remove. Here is what it does to a system:

First, it creates “freeze-ups.” Moisture will be picked up by the refrigerant and be transported through refrigerant lines in a fine mist which forms ice crystals at the point of expansion.

Ice crystals retard or stop the flow of the refrigerant, causing loss of cooling. As the expansion valve warms, due to the lack of refrigerant, the ice melts and passes through the expansion valve. The refrigerant will then start again until the moisture returns to the expansion valve and once more builds ice crystals. The result is intermittent cooling.



Whether a “freeze-up” actually occurs depends primarily upon the amount of water and the size of the ice particles formed. But, a “freeze-up” is not the only problem caused by moisture. It can also cause corrosion, which can present serious trouble.

Moisture in the form of water can cause corrosion after a period of time. However, moisture mixed with refrigerant creates much more corrosion trouble. Refrigerant such as R-12, containing chlorine, will slowly hydrolyze with water and form hydrochloric acids. This acid greatly increases the corrosion of metals and could corrode copper plating, and destroy compressor motor windings leading to a burn out.

Heat increases the rate of corrosion due to acids because higher temperatures accelerate the acid-forming process. This acid attacks all the materials it contacts.

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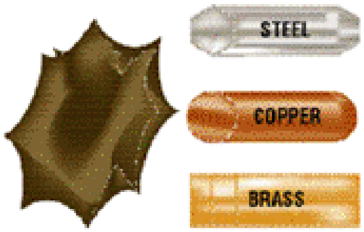


Acid Affects Metals

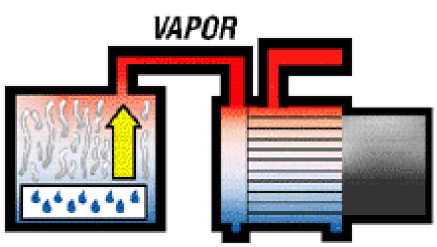
Refrigerant oil presents another problem caused by moisture. Refrigerant oil is an exception to the rule that "oil and water don't mix." In fact, refrigerant oil attracts moisture and will absorb it rapidly if left open to the atmosphere. Water-formed acid mixes with refrigerant oil, forming a closely bonded mixture of fine globules.

The effect is called "sludging" and greatly reduces the oil's lubricating ability.

Corrosion becomes troublesome from the operating standpoint when metallic surfaces are eaten away and a solid, detachable product is formed. This formation is also known as a "sludge." Sludge can cause a variety of problems. It will plug fine strainers, expansion valves and capillary tubes. And because it usually contains acids, sludge corrodes whatever it clings to, accelerating system damage.

The most effective way to eliminate moisture from a system is with a good, high vacuum pump.

# EFFECTS OF PRESSURE AND TEMPERATURE ON THE BOILING POINTS OF WATER




A high vacuum pump is capable of removing all moisture from a hermetic system by reducing internal system pressures to the boiling point of water at normal temperatures. For those being introduced here to high vacuum work, it should be stated that a vacuum pump does not "suck out" the liquid moisture, but rather causes it to boil in to a vapor state which can be harmlessly removed from the system and exhausted through the vacuum pump.

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# ATTENTION TAGS

## Important:

**Upon completion of the refrigerant installation install identification tags like those illustrated below be installed on all unit charging ports to alert all service technician that a hydrocarbon refrigerant has been installed.**



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