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What You Need to Know When Recovering R-410A

The high pressures involved with recovering R-410A refrigerant requires using the proper equipment to avoid serious injury

BY RALPH VERGARA

The U.S. Clean Air Act of 1990 and the Montreal Protocol call for the phaseout of HCFC-22 (commonly known as R-22). This has made it necessary for manufacturers to find a replacement for the standard R-22 refrigerant we all know so well.

The replacements available today are HFCs R-407C or R-410A. Whether you work with R-410A or not, chances are that most service technicians will work with it in the future.

Since Carrier first introduced newly designed systems charged with its version of R-410A called Puron in 1996, the industry has rapidly moved toward the use of the refrigerant. It is important to note that R-407C also is widely accepted as a retrofit refrigerant for new designs, though it is used more frequently in Europe than in North America. It also is important to note that R-410A is not to be used in retrofit applications.

Many manufacturers of residential and commercial hvac systems are switching to or currently use R-410A in their systems. The refrigerant is an HFC azeotropic mixture of HFC-32 and HFC-125 and is now universally accepted in the hvacr industry. One more note is that the Copeland scroll compressor is the only compressor designed to be used with R-410A.

Safety first

Before discussing the R-410A recovery process it is important to address safety. The major difference between R-22 and R-410A is the significantly higher pressures involved with using R-410A. Working with R-410A requires some additional tools that you may not already have in your service vehicle.

The pressure-temperature chart for R-410A compares the pressures of R-410A versus R-22 (see chart on the next page). This chart will show you how high the pressures are that you will be working with. In general, R-410A pressures are 1.8 times higher than those of R-22.

Your standard manifold set, hoses, recovery equipment and recovery cylinder cannot be used when recovering R-410A. The pressures you will see when working with

R-410A are too high for your standard equipment.

Here are the items a technician will need to safely work with R-410A.

• **Manifold set.** The pressures encountered while working with R-410A require a manifold gauge set that has a low-side gauge that reads up to 500 psig and a high-side gauge that reads up to 800 psig. This is higher than your standard manifold set.

• **Hoses.** R-410A hoses and assemblies should be UL-recognized and have a minimum of 800-psi working pressure and a 4,000-psi burst. This provides a five-to-one safety factor.

Temperature °F	Pressure R-22 (psi)	Pressure R-410A (psi)
70	121.5	201.5
75	132.2	218.2
80	143.7	235.9
85	155.7	254.6
90	168.4	274.3
95	181.9	295.0
100	196.0	316.9
105	210.8	339.9
110	226.4	364.1
115	242.8	389.6
120	260.0	416.4
125	278.1	444.5
130	297.0	474.0
135	316.7	505.0
140	337.4	537.0
145	359.1	571.7
150	381.7	607.6
155	405.4	645.2

Manufacturers also recommend that you use a ball-valve-type connection rather than an anti-blowback connector. An anti-blowback connector acts like a check valve and traps the refrigerant in the hose. This can make it difficult to disconnect the hose under high-pressure conditions. A ball valve connector is much easier to control under high-pressure conditions.

Although most R-410A units come with the standard 1/4-inch fittings some manufacturers use 5/16-inch access fittings.

When buying new hoses make sure that you buy a complete hose assembly that has been recognized by Underwriters Laboratories. Some hose manufacturers use UL-recognized hose but fail to have the complete assembly certified for R-410A pressures.

• **Recovery equipment.** Refrigerant recovery equipment needs to be R-410A compatible. To determine if your existing unit is approved, check the Air-Conditioning and

Special equipment is needed when recovering R-410A to accommodate the high pressures involved.

Refrigeration Institute's (ARI) website at www.ari.org or the UL website at www.ul.com.

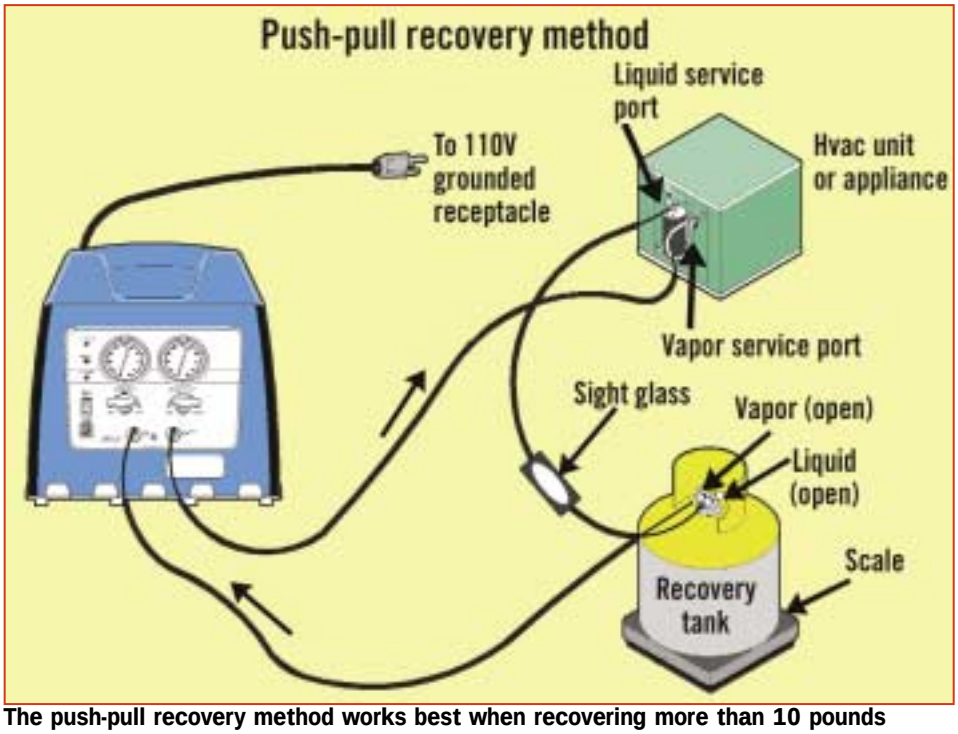
Recovery units must be approved for Class V refrigerants including R-407C, R-404A and R-507 and others per ARI 740-98. For best performance with your R-410A recovery equipment, it should have the following features: oversized condenser; oversized fan; crankcase pressure regulator (CPR) valve; and a high-pressure cutout switch rated for at least 510 psi.

Recovery equipment also is available with a subcooling feature, which can be helpful when trying to recover R-410A. Subcooling keeps the recovery tank pressure down by ensuring that the refrigerant is fully condensed before putting it into the recovery cylinder. Keeping recovery tank pressures down will increase the rate of recovery and reduce the wear and tear on recovery equipment. Subcooling also can be accomplished by submerging the recovery cylinder in a bucket of ice.

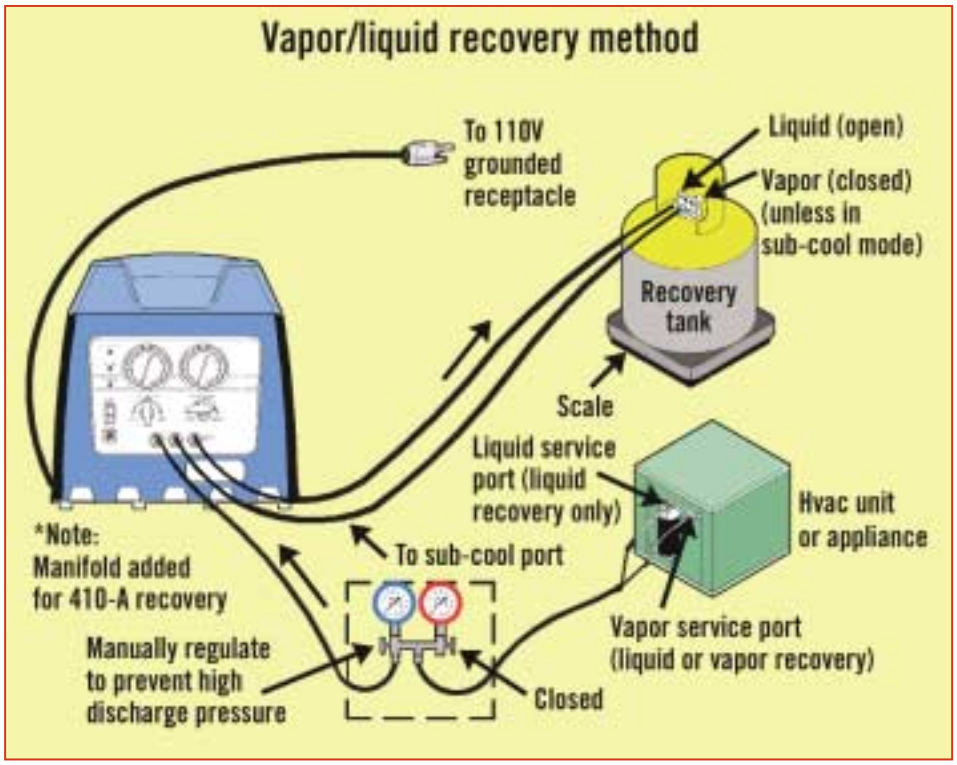
• **Oversized condenser.** Helps completely condense the refrigerant and to keep the tank temperatures down.

• **Fan.** The larger the fan and the more aggressive the

Subcooling, which keeps recovery tank pressure down by ensuring that refrigerant is fully condensed before putting it into the recovery cylinder, can be accomplished by submerging the cylinder in a bucket of ice.



The push-pull recovery method works best when recovering more than 10 pounds of refrigerant.



Liquid recovery is fast, but not all equipment can handle the process. Vapor recovery is slower, but is the most common recovery method used.

pitch of the blades, the more air is moved over the condenser. More airflow also keeps critical internal components cool, increasing their life expectancy.

• **Crankcase pressure regulator (CPR).** This device will ensure that you do not overwhelm the recovery equipment with high pressures when working with R-410A. Units that use a CPR valve do not require the technician to throttle or regulate the flow of refrigerant to the recovery unit to prevent damage to the compressor.

• **Recovery cylinders.** You must use a U.S. DOT 400 recovery cylinder when recovering R-410A. As mentioned above, a standard DOT 350 recovery cylinder will not safely handle the high pressures seen with R-410A. Your R-410A recovery cylinders should be clearly marked to prevent any chance of misuse. DOT 400 tanks should be readily available at your local refrigeration wholesaler.

• **High-pressure cutout.** A high-pressure switch rating higher than 510 psi will keep the recovery unit from prematurely relieving on high pressure when recovering R-410A. Some manufacturers offer equipment with an override switch so that you can change over to a higher-pressure switch when recovering R-410A.

The problem with having a dual switch (550 or higher) is that an R-410A recovery cylinder (DOT 400) and a standard recovery cylinder (DOT 350) are virtually indistinguishable. Using recovery equipment with a high-pressure switch rated at 550 with a standard DOT 350 recovery cylinder can cause the relief valve to blow. This can cause a dangerous situation for you or your customers.

Proper maintenance of these pieces of equipment is critical for your safety. Calibrate the gauges on your manifold set before every use and annually check manifold set for leakage. Check for nicks or cracks in your hoses. Make sure that the valve assemblies are not leaking and that the gaskets in your hoses are in good shape.

Check your recovery unit periodically to ensure that it is safe to use. If you notice degradation in the rate of recovery, check the built-in or external filter. Clearly mark

all of your R-410A tanks and have them re-certified every five years.

Recovery methods

Once acquiring the proper equipment, it is time to get started with the recovery process. Although refrigerant properties are different, the basic recovery process is the same for R-410A and R-22.

R-410A is much more dense than R-22 and has a higher vapor pressure making it more difficult to recover. You must understand that the information in this article does not apply to all refrigerant recovery equipment. The hook-up and recovery instructions will vary from manufacturer to manufacturer so be sure to read and understand all of the operation instructions for your refrigerant recovery unit.

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Which recovery method should you use? Here are a few to choose from.

• **Push-pull recovery.** Quickly removes the liquid refrigerant, but you must change the hose connections to recover the vapor refrigerant after all of the liquid is removed. This method is not recommended unless you are trying to recover more than 10 pounds of refrigerant.

• **Liquid recovery.** This is the fastest method of refrigerant recovery. However, not all recovery equipment is capable of handling direct liquid recovery. Check with the manufacturer of your recovery equipment to find out if your unit is capable of direct liquid recovery and if there are any special instructions for direct liquid recovery.

• **Vapor recovery.** This method is slower than liquid recovery, yet is the most common method used to recover refrigerant.

Here are a few tips to follow when recovering R-410A refrigerant:

• Always use the shortest hoses possible.

• Using 3/8-inch hose will greatly increase your recovery rates.

• Use a heat gun to get refrigerant to boil off.

• Use liquid recovery when possible.◆

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