R-410A

Field Reference Guide

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Johnson Controls

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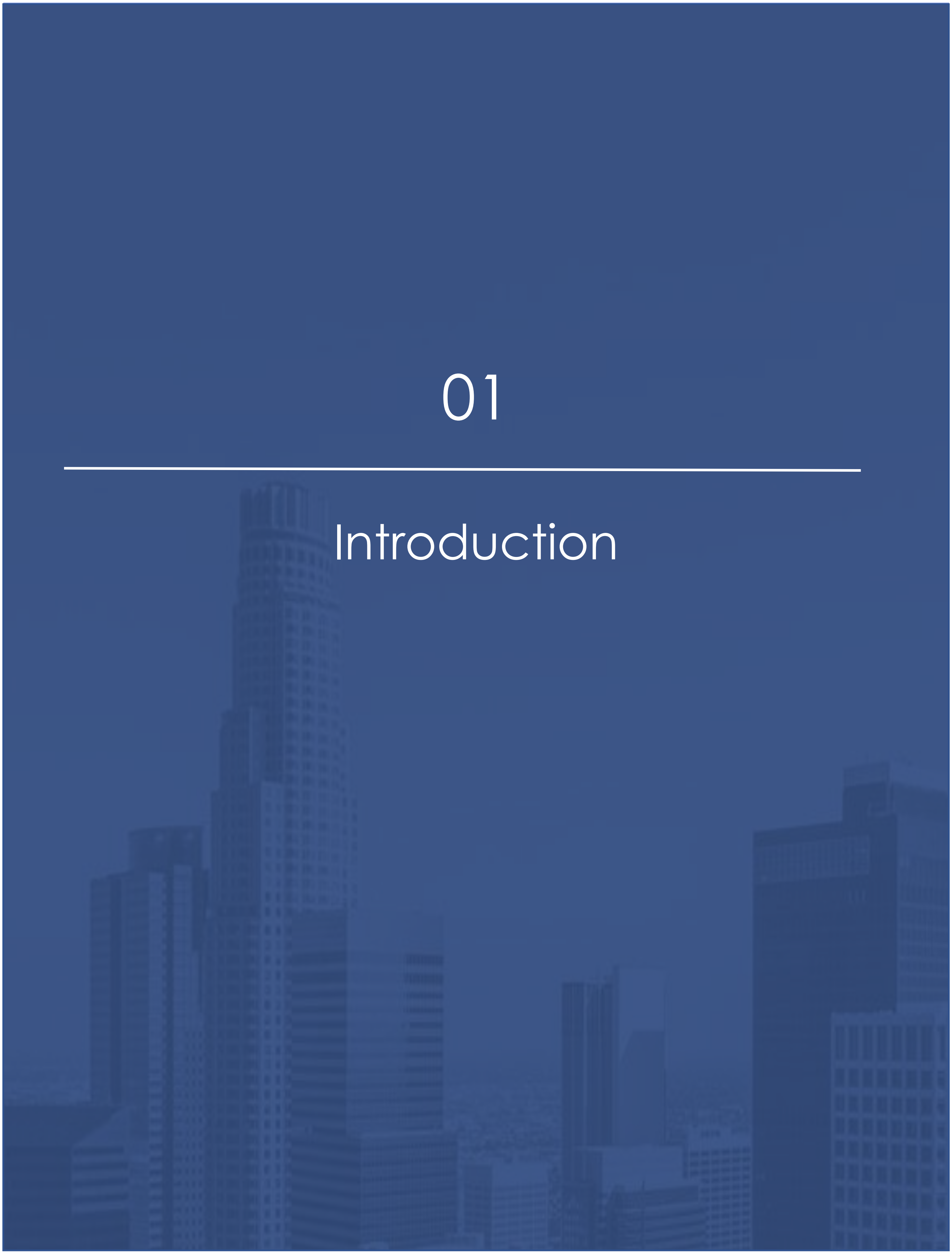

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Introduction

Introduction

Refrigerant 22 (R-22) was used in various refrigeration, industrial cooling, air conditioning and heating applications for over fifty years. Its relatively low ozone depletion potential and global warming effect, compared to CFC R-11 & R-12, along with its excellent heat transfer capabilities, have helped facilitate its use in a variety of industries.
R-22 is an **HFC**. This means it is a refrigerant that contains Hydrogen, Chlorine, Fluorine, and Carbon. Chlorine is an element known to damage stratospheric ozone ("ozone layer").

The Montreal Protocol, originally signed by most industrial the nations in 1987, dictates that as a "chlorinated" refrigerant, R-22 production must eventually be eliminated. Units using R-22 may no longer be manufactured. While R-22 is still available (though extremely expensive), its production will cease as of January 01, 2020.

What is R-410A

R-410A is a 50/50 blend refrigerant **HFC R-32** and 50% **HFC R-125**. R-410A is considered a "near-azeotrope" refrigerant, meaning that even though it is composed of two different refrigerants, it acts almost as a single compound when changing state from a liquid to a vapor or vapor to a liquid. R-410A is not subject to "fractionation," or breaking apart into the individual refrigerant components if a leak would occur in the system.

R-410A exhibits a "temperature glide" of less than 0.3°F over the entire operating range. On the temperature pressure chart, a single saturation temperature is provided for any given pressure.
The color code for R-410A is rose. This coding is used on refrigerant cylinders, equipment informational labels, expansion valves, and other system components. It is important for the technician to recognize R-410A systems, as there are specific service practices that MUST be followed to promote system efficiency and longevity, as well as customer comfort.

Primary Differences – R-410A vs. R-22

Higher Operating Pressure

The operating pressures of R-410A are 50-70% higher than those of R-22.

A typical R-22 system operating normally with a head pressure of 260 psig at a 120° condensing temperature and a low side pressure of 76 psig at a 45° evaporator saturation temperature will find the equivalent pressures in a R- 410A system to be much higher.

A normally operating R-410A system with the same condensing temperature of 120° and a 45° evaporator saturation temperature will have a high side pressure of 418 psig and a low side pressure of 130 psig.

The higher pressures do not change industry accepted service practices or charging methods. Systems with a thermostatic expansion valve (TXV) are still charged with the subcooling method. Fixed orifice systems are charged with the superheat method. Be sure to use the correct (R-410A) column on the temperature-pressure chart when determining system superheat or subcooling values. As always, prior to verifying the system refrigerant charge, the system airflow should be set up properly at 400 cfm per ton of air conditioning, or the cfm value required for the specific equipment as stated in the equipment Installation Manual.

The higher pressures require that service tools used on the refrigerant side of the system must be designed for the higher pressure. This includes the manifold gauge and hoses, recovery machine, and recovery cylinders. All system components (compressor, condenser, metering device, etc.) must also be approved for use with the higher pressures of R-410A.

POE Oil

Polyol Ester oil (POE) is used with R-410A systems. In the past, R-22 systems used mineral or Alkylbenzene oil (AE) as the system lubricant. POE is NOT compatible with mineral (MO) or alkylbenzene (AE) oils. Proper service practices must be performed during installation and service, particularly in retrofit applications, to ensure there is NO intermixing of the oils. The MO/AB oils are not miscible with R-410A refrigerant and will be pushed through the system as a liquid blob, which can create a restriction at metering devices, and subsequent pressure fluctuations.

POE is very hygroscopic, meaning that it readily absorbs moisture (about 15 times faster than mineral oil). This emphasizes the importance of proper system evacuation to 500 microns or less after system installation or after opening the system for service. Under no circumstances should an R-410A system be open to the atmosphere any longer than necessary. If left open, the POE oil in the system will absorb moisture from the surrounding air and become trapped in the oil. Once absorbed, the moisture cannot be removed through system evacuation, even at vacuum pressures of 500 microns. Over time, this moisture can lead to the formation of sludge in the system, leading to poor system performance, and eventual system failure. Therefore, it is important to prevent moisture from getting in the oil in the first place. The general recommendations for handling POE oil are to keep it in a metal container, transfer it with an oil pump, and keep the container sealed.

POE oil will irritate the skin (it removes moisture from the skin rapidly) and is a serious medical concern if it encounters the eyes. Gloves and safety glasses/goggles are essential items.

POE lubricants are a form of a mild organic acid, which will scrub oxides and contaminants from the interior of refrigerant tubing walls. If present, the oxides will be removed from the copper tubing walls and will circulate through the system. These oxides are likely to end up in the metering device and create performance issues. A low-pressure flow of dry nitrogen is recommended when brazing line connections in the field. This will prevent oxide formation.

Component Considerations

Compressors

Compressors used on R-410A systems use thicker metals to withstand higher operating pressures. Therefore, only a compressor designed for R-410A should be used in R-410A systems.

Metering Devices

It is imperative that only a metering device designed and properly sized for R-140A be used on an R-410A system. Capillary tube metering devices are NOT acceptable for use in R-410A systems. Fixed orifice metering devices may be acceptable but verify that the equipment selected allows it. With higher SEER ratings and utility rebate program requirements, extremely specific equipment and metering device matches are required to attain the stated system SEER. Fixed orifice metering devices are limited in their use with high efficiency equipment.

Refrigerant Lines

Refrigerant lines used for R-410A must be properly sized for R-410A systems. On retrofit applications, the lineset should be replaced if possible. This prevents cross contamination of mineral / AB oils from an old lineset into the R-410A. It is possible to use existing refrigerant lines from an R-22 system in an R-410A system installation if they are the correct size; however, they must be cleaned of all debris and oil.

Filter Driers

R-410A filter driers are designed to withstand the higher pressure of R-410A. Only use filter driers rated for use with R-410A, which are those rated for pressures no less than 600 psig.

When removing a filter-drier from a system, it should be cut out with a tubing cutter, not a torch flame. If the desiccant is heated, moisture may be driven out of the desiccant and into the system. This is of greater concern to R-410A systems because of the hygroscopic qualities of POE oil. Once moisture is absorbed in POE oil, it is difficult to remove.

The practice of replacing the filter drier every time the system is opened is particularly important on R-410A systems because of the hygroscopic nature of POE oil.

Pressure Control Settings

The high and low-pressure control settings are higher than those used on R-22 systems. The recommended high-pressure control settings are a cut-out pressure of 610 psig and a cut-in pressure of approximately 500 psig. The recommended low-pressure control setting is a cut-out pressure of 50 psig.

Tools and Test Instruments

Due to the higher pressure and POE oil used in R-410A systems, any tool or test instrument that contacts refrigerant and/or oil should be dedicated to R-410A systems, including the manifold gauge set.

A dedicated manifold gauge set should be used with R-410A equipment. There are manifold gauge sets on the market today that can handle both R-410A and R-22. If you own one of the “dual refrigerant” sets, it is recommended that it is used for only one refrigerant. The primary concern is the intermixing of oils. If a gauge set is connected to an R-22 system, mineral or alkylbenzene oils remain in the manifold. Connecting the same gauge set to an R-410A system will allow the mineral/AB oils to enter the R-410A system, which could lead to system performance issues.

Recovery machines should be dedicated to one refrigerant or the other, but not both, to avoid possible cross contamination of oils. If you use a single recovery machine for multiple refrigerants, make sure that you use it for refrigerant recovery only (not recycling). Follow the recovery machine manufacturer instructions regarding filter and oil maintenance for the machine being used.

Safety

If it is necessary to heat a cylinder of R-410A to raise its pressure in cooler weather, heat the cylinder with water no hotter than 90 degrees F and never heat the cylinder with a flame. Do not allow the cylinder to reach a temperature of more than 125 degrees F during transport or storage. A cylinder of R-410A at 125 degrees F exerts a cylinder pressure of 450 psig. Personal safety is always of utmost importance when working on any job or piece of equipment. Safety glasses/goggles and gloves should be worn no matter what refrigerant is being used.

Never exceed 80% of the capacity of a recovery cylinder. Doing so may cause the cylinder to rupture, causing possible physical injury or property damage.

Always wear gloves when connecting and disconnecting service hoses, or in any instance where refrigerant and/or refrigerant oil may encounter the skin. Safety glasses are also a requirement for air conditioning service.

Note
Recovery Cylinders must be rated for R-410A use. These cylinders meet the Department of Transportation DOT 4BA 400 or DOT 4BW 400 standards.

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Service Techniques

Introduction to Service Techniques

The service techniques discussed in this manual include many that have been used successfully throughout the years and are considered “industry standard” practices. The transition to R-410A is not difficult with a firm foundation and understanding of these fundamental practices. The practices are presented in a logical order – from equipment to selection to final refrigerant charge adjustment.

Failure to follow these recommendations can lead to misapplied equipment, reduced capacity, equipment failure, and in some cases, personal injury. Not all items are specific to R-410A but are included to ensure a successful installation and promote equipment longevity, performance, and customer satisfaction.

Equipment Selection

Always perform a heat loss/gain load calculation to ensure the correct sized components are used. For residential/light commercial, the ACCA Manual J provides reliable and accurate results. Computer software for load calculations, based on the Manual J, is available through a local distributor. Refer to the Tech Guide for help in selecting the correct equipment match ups.

For duct sizing, follow the principles outlined in ACCA Manual D to assure adequate air deliver to each room. Computer software for duct sizing, based on the Manual D, is available through a local distributor.

Retrofit Applications

Depending on the age of the system being retrofitted, the indoor coil and outdoor unit combination efficiency may have provided 10 SEER, 8 SEER, or even lower. The evaporator coild should be changed to provide the properly matched SEER rated system. A 13 SEER outdoor unit matched with a 10 SEER indoor coil will not provide 13 SEER. For the latest ARI rated coil and condensing unit combinations, go online to www.aridirectory.org.

In addition to properly matching the evaporator coil to the condensing unit, existing evaporator coils should be replaced. This prevents residual mineral or AB oil from moving from the coil into the new system.

Lineset Considerations

Lineset should always be replaced with retrofit applications to prevent intermixing of the mineral or alkylbenzene oils with the POE oils. If replacing the line set is not practical, then the following precautions should be taken:

- Inspect the line set for kinks, corrosion, sharp bends, or other restrictions.
- Determines if there are any low spots which might be serving as oil traps.
- Flush the line set with a commercially available flush kit to remove as much of the existing oil and contaminants as possible.
- Install a suction line filter-drier to trap any remaining contaminants and remove the drier after 50 hours of operation.

Sizing of line sets should always be verified through the provided Tabular Data Sheet and/or the Unitary Products Comfort Cooling Piping software. The software allows the user to input job data including line lengths, number of elbows, etc., and will calculate the refrigerant pressure drops and velocities automatically.

When calculating line sizes manually, size suction lines to prevent the pressure drop from exceeding 5 pounds. Size liquid lines to prevent the pressure drop from exceeding 60 pounds. To assist in oil return during the off cycle, horizontal runs on suction lines must be sloped back to the compressor.

Recommended minimum suction line velocity for both R-22 and R-410A systems is 800 fpm for horizontal lines and 1000 fpm for vertical lines, with a maximum of 3000 fpm. Because of the excellent miscibility of R-410A and POE oils, the customary practice of providing oil traps for suction risers greater than three feet is not required on R-410A systems. Never leave refrigeration lines open to the atmosphere to prevent moisture and other non-condensable contaminants from entering the system. Always seal refrigerant lines by crimping or capping if it will be exposed to the atmosphere for any length of time.

Line Connections

Soft solder is not to be used. A brazing alloy with a minimum 5% silver content is recommended. It is highly recommended that a low-pressure flow of dry nitrogen is used when brazing line connections in the field. This will prevent oxide formation on the walls of the copper tubing. POE lubricants used in R-410A systems are a form of mild organic acid, which will scrub oxides and contaminants from the interior of refrigerant tubing walls. If present, the oxides will be removed from the copper tubing walls and will circulate through the system. These oxides are likely to end up in the metering device and create performance issues.

Leak Testing

While the dry nitrogen used during brazing is still connected to the system, use it to pressurize the lineset and evaporator coil to 250 PSI to check for leaks. Use soap solution to test the field joints for leaks. Repairing leaking field joints is much less time consuming at this point than after refrigerant and oil is in the system.

Evacuation

When the field joints have been verified as leak-free, it is time to evacuate the lineset and evaporator coil. A vacuum pump and micron gauge must be used together to ensure the proper vacuum level is reached. All installations must be evacuated to 500 microns or less. At 500 microns of vacuum, the boiling point of water is reduced to -12 degrees F. This causes moisture in the lineset and evaporator coil to boil off and exit the system through the exhaust port of the vacuum pump.

Here are some ways to reduce the amount of time it takes to evacuate an air conditioning system:

- Use a properly sized vacuum pump. Follow the pump manufacturer's recommendations based on system tonnage.
- Use short, large diameter hoses.
- Remove the schraeder cores from the service valves with core removal tools. The cores add a lot of restrictions and slow down the evacuation process.
- Maintain the oil pump with regular oil changes.
- Make sure all fittings are tight, including those made at the vacuum pump and the micron gage.
- Evacuate from both the high and low sides of the system simultaneously.

After a vacuum of 500 microns or less has been reached, the vacuum pump is shut off and the valve on the pump is closed. This allows the micron gauge to monitor the vacuum in the system. If the micron level rises to atmospheric pressure, a leak is present and must be repaired. If the micron level rises to an intermediate micron level (such as 1500 microns) and stops, moisture is still present, and the evacuation process should be continued.

Initial System Charge

Each residential condensing (outdoor) unit ships with enough refrigerant for a matching evaporator coil and 15’ of lineset. Commercial split systems ship with enough refrigerant for a matching evaporator coil and 25’ of lineset. The Tabular Data Sheet will indicate the amount of refrigerant that should be added for additional lineset.

For instance, if the installed lineset length is 25 feet, additional refrigerant charge must be added for the extra 10 feet of lineset. If the Tabular Data Sheet states that .67 ounces of refrigerant is required per foot of lineset over 15 feet, the technician should weigh an additional 6.7 ounces of refrigerant (10’ x .67 oz) into the system on initial startup. Doing so will get the system refrigerant charge very close to where it is designed to be and will save a lot of time during the refrigerant charge verification process.

Remember that R-140A refrigerant must be removed from the cylinder in liquid form. Use a liquid charge adapter on the manifold gauge set to flash the liquid R-410A to vapor prior to allowing the refrigerant into the suction side of the system.

Systems with no refrigerant (such as after a compressor replacement) are charged in the liquid form into the liquid line after proper system evacuation. When the pressure in the system equals the pressure in the refrigerant cylinder and refrigerant is no longer flowing into the system, start the system and continue charging the refrigerant into the suction line with the liquid charging adapter.

Cooling Mode Airflow Setup

Prior to verifying the system refrigerant charge, the system airflow must be properly set up. It is a common misconception that the cooling blower speed on a residential air conditioning system should always be set to “high.” In many cases, high speed cooling will not provide the best possible performance and customer comfort. For optimum performance, most manufacturers recommend 400 cfm (cubic feet per minute) per ton of air conditioning. For example, a 2-ton system should have 800 cfm of air moving through the evaporator coil.

If the blower speed is set too high for the application, the evaporator coil will not be able to do an adequate job of dehumidification and may result in a customer complaint (i.e., “clammy” or muggy” living space). If the blower speed is set too low, there will be inadequate heat transfer between the warm return air and the evaporator coil. Frost (and eventually ice) will form on the coil, resulting in inadequate performance and possible compressor failure due to liquid refrigerant flood back.

In addition to the blower speed selection, improperly sized duct and other system restrictions can affect system airflow. Therefore, it is important to evaluate the air distribution system by measuring the total system external static pressure (ESP) and applying the ESP value to the furnace or air handler blower performance chart.

External Static Pressure (ESP)

External Static Pressure (ESP) is a force imposed by the system blower that is pushing in all directions on the duct system. On the supply (positive) side of the blower, this pressure is pushing out in all directions on the interior of the supply system. On the return (negative) side of the blower, this pressure is pulling inward on the interior of the return system. This pressure is measured in inches of water column (wc).

Restrictions in the duct system, such as an undersized duct, dirty filters, dirty evaporator coil or closed or blocked registers or grilles, will cause the external static pressure to increase. As the external static pressure increases, the furnace or air handler blower's ability to move air decreases.

Most residential furnaces and air handlers are designed to deliver their rated airflow up to .5" wc total external static pressure. This means that a furnace capable of moving 1200 cfm (3 tons) of airflow can do so on its highest speed and the total ESP is .5" wc or less. Higher ESP values can result in greatly reduced blower performance.

A common tool of choice for measuring ESP is the Magnehelic© gauge. The Magnahelic© gauge has two ports, labeled "high" and "low". The "high" port causes the value shown by the needle to increase if a positive pressure is being put into the port. This port is connected to the supply side of the system. The port marked "low" causes the value shown by the needle to increase if there is a negative pressure on the port. The port is connected to the return side of the system. The Magnahelic© gauge can measure supply static, return static and both added together (representing the total system static). The supply system, when properly sized, should be near .1" wc (without the evaporator coil). A clean, dry evaporator coil will add about .2" wc static, bringing the supply static to a total of .3" wx (.1" + .2" = .3"). To measure the supply static pressure, the technician should connect the Magnahelic© gauge probe to the port marked "high." The probe should be inserted perpendicular to airflow immediately off the supply duct connection, under the evaporator coil, if possible. This will measure supply static and resistance to airflow, imposed by the evaporator coil, supply duct, fittings, and registers.

To measure the return static pressure, the technician should connect the Magnahelic© probe to the port marked "low." The probe should be inserted between the filter and the furnace. This will allow the measurement of return static imposed by the filter, return drop, return duct, fittings, and grilles. If probe access cannot be obtained between the furnace and the filter, the blower deck provides a noninvasive place to measure return static.

The total external static pressure can be determined by taking the supply and return static pressures, individually, and adding them, or simply using two probes and noting the reading on the gauge.

Using the Static Measurement Data

After the total external static pressure has been measured, the furnace or air handler blower performance chart may be used to determine the system airflow. To determine the airflow, start by locating the furnace model that you are working with. Next, locate the measured static and the blower speed that is being used for cooling. The resulting value is the airflow in cfm. Remember that 400 vfm per ton of air conditioning is recommended. If the system airflow is in excess of 400 cfm per ton, select a lower blower speed to reduce the cfm. If the system airflow is below 400 cfm per ton, select a higher blower speed to increase the cfm. After changing the cooling blower speed, measure the system's total external static pressure once again, as this value will change with the new blower speed. Recheck the cfm on the manufacturer's blower performance chart to ensure the system airflow is near the 400 cfm per ton goal.

An Alternate Formula

If the blower performance charts are not available for the furnace that the air conditioning system is being added to (or for belt drive equipment), use the following procedure to determine an approximate cfm.

- Make sure the furnace is firing at 100 percent of its nameplate input.
- Set the blower speed with the appropriate speed tap for cooling operation.
- After 15 minutes of furnace operation, measure the temperature rise across the furnace.
- The temperature rise should be placed into this formula: Btu Output / 1.085 x Temp Rise.
- The resulting value is the cfm being delivered.
- 400 cfm/ton is the desired target value.

After the proper cooling blower has been selected, verify the system refrigerant charge.

Refrigerant Charge Verification

The method of refrigerant charge verification is determined by the type of metering device present in the system. Systems with a fixed orifice type metering device use the superheat method, and systems with an expansion valve (TXV) use the subcooling charging method.

For both charging methods, a manifold gauge set is required to read the system suction and discharge pressures. A sling psychrometer (or digital psychrometer) is required to measure the indoor wet bulb (WB) temperature. In addition, a thermometer is required to measure refrigerant line temperature and outdoor dry bult (DB) temperature. A digital thermometer with a wire-probe attachment or an infrared thermometer works well for reading refrigerant line temperatures. It is not recommended to attempt to use a stem thermometer to measure refrigerant line temperatures, since adequate line contact cannot be attained.

Superheat Method

The required superheat value will vary, depending on the ambient conditions. For systems that use fixed orifice metering devices in the outdoor unit / indoor coil combinations, a “target superheat” chart is provided in the outdoor unit Installation Manual.

The technician should find the outdoor dry bulb temperature (DB) across the top of the chart, and the indoor wet bulb temperature (WB) at the left side of the chart. The intersection of these values provides the required superheat value. With the target superheat value known, the actual system superheat may be measured. To do this, the system must be in steady-state operation (10-15 minutes of run time), and the outdoor ambient temperature must be high enough to set up the system charge.

The point at which the refrigerant in the evaporator coil is changing state form a liquid to a vapor (“saturation point”) is determined by taking the system suction pressure (“low side” pressure) on the temperature – pressure (TP) chart and finding the corresponding temperature. Next, the actual suction line temperature is taken. This is often done at the suction service valve. The technician should then subtract the value obtained from the TP chart from the temperature measured at the suction service valve.

The resulting value is the system superheat. If the measured system superheat is higher than the target superheat value, a refrigerant undercharge is indicated, and additional refrigerant should be added to the system. If the measured system superheat is lower than the target superheat value, a refrigerant overcharge is indicated, and refrigerant must be removed, using approved refrigerant recovery techniques.

Subcooling Method

The subcooling method is used on systems with TXV metering devices. The superheat method cannot be used with TXVs, since TXVs attempt to maintain a constant system superheat value (10-12 degrees Fahrenheit), regardless of system load or refrigerant charge.

The required subcooling value will vary depending on the ambient conditions. A “target subcooling” chart is provided in the outdoor unit Installation Manual.

The point at which the refrigerant in the condenser coil is condensing to a liquid (“saturation point”) is determined by taking the system liquid line pressure (“high side” pressure) on the TP chart and finding the corresponding temperature. The actual liquid line temperature is measured at the liquid line service valve. The technician should subtract the temperature measured at the liquid line service valve from the temperature value on the temperature pressure chart. The resulting value is the system subcooling.

If the measured system subcooling is higher than the target subcooling value, a refrigerant overcharge is indicated, and refrigerant must be removed using approved refrigerant recovery techniques. If the measured system subcooling is lower than the target subcooling value, a refrigerant undercharge is indicated, and additional refrigerant should be added to the system.

For optimum performance, R-410A should be removed from the cylinder as a liquid and charged into the suction line during equipment operation. This can be done with a liquid charging adapter, which causes the liquid refrigerant to flash to a vapor prior to entering the system.

Allow the System to Stabilize

After adding or removing refrigerant, the technician should allow 10-15 minutes of run time before measuring the system superheat or subcooling again. This will allow the system to stabilize and provide the most accurate information regarding the refrigerant charge status.

Completion of Setup

The dry bulb temperature drop across an evaporator coil varies widely depending on the load placed on the coil. A 20 degrees dry bulb drop across the coil is a value which might be found in many situations, though it will vary according to conditions. Higher humidity conditions tend to result in a lower temperature drop across the coil.

03

Frequently Asked Questions

Frequently Asked Questions

R-410A has no chlorine. Does it need to be recovered?

Federal Law mandates that the refrigerants may not be vented into the atmosphere. R-410A must be recovered. Make sure the recovery machine and cylinder used is compatible with R-410A.

What precautions must be taken with R-410A?

When handling any refrigerant, care must be taken to ensure the technician's safety. Toxicity levels of R-410A are comparable to those of R- 22. R-410A is non-flammable at atmospheric pressure and is considered non-flammable by the Department of Transportation (DOT). It is also considered non-combustible under normal usage.

However, mixtures of air and R-410A at elevated pressures can become flammable in the presence of an ignition source. Because of that possibility, never use a mixture of air or oxygen and R-410A to check for leaks. When leak checking with dry nitrogen keep all ignition sources away as a precaution.

The thermal stability of R-410A is such that when exposed to high temperatures, its vapor will decompose, resulting in toxic and irritating compounds. The lack of chlorine in R-410A prevents phosgene gas from forming when exposed to high temperatures, but the gases that form are nonetheless very toxic. Avoid inhalation and use only in well-ventilated areas as mentioned above.

Will installation practices need to change?

Johnson Controls stresses the importance of proper installation and start up procedures. The extremely hygroscopic nature of POE oil, coupled with the higher operating pressures of R-410A, it is necessary for dealers and contractors to raise the bar on how their technicians perform installation and service in the field.
See the "Service Techniques" chapter of this manual for additional information and recommendations.

Will the filters/driers change?

Liquid line driers and suction line filter driers (when needed) must be rated for use with R-410A. The desiccant used in driers designed for R-410A is significantly different than those designed for R-22. The driers may also contain more desiccant than used in their R-22 counterparts, to offset the higher moisture content expected of POE oils. Once a drier absorbs its capacity of moisture, any additional moisture in the system simply passes through the drier. Left unchecked, the moisture reacts with the oil, refrigerant and heat in the compressor to form acid and in extreme cases, sludge.

How should R-410A be charged into the system?

For optimum performance, R-410A should be removed from the cylinder as a liquid and charged into the suction line during equipment operation. This can be done with a liquid charging adapter, which causes the liquid refrigerant to flash to a vapor prior to entering the system.

Systems with no refrigerant (such as after a compressor replacement) are charged in the liquid form into the liquid line after proper system evacuation. When the pressure in the system equals the pressure in the refrigerant cylinder and refrigerant is no longer flowing into the system, start the system and continue charging of the refrigerant into the suction line with the liquid charging adapter.

What are the qualifications of R-410A?

Proven performance; widely available; broad equipment manufacturer testing and support; cost-effective use and retrofit: EPA accepted, UL recognized, and ASHRAE-classified.

What is the difference between ozone depletion and global warming?

Ozone depletion is the process of damaging the stratospheric ozone layer, which protects Earth from excessive ultraviolet radiation. The thinning and/or destruction of this protective layer has many damaging consequences to Earth's inhabitants. The Montreal Protocol called for the reduction and eventual phaseout of chlorinated refrigerants, which are believed to deplete the ozone layer.

Global warming (also known as the "greenhouse effect") prevents heat from the Earth from being radiated out into space. Certain gases are believed to contribute to the retention of heat within our atmosphere, thereby causing an overall "warming", or temperature increase.

Additional information about ozone layer depletion, global warming and the Montreal Protocol can be found on the Environmental Protection Agency's web site at www.epa.gov.

What are the refrigerant names & numbers all about?

With the considerable number of new refrigerants comes a confusing assortment of new refrigerant names and numbers. Most refrigerants have an official number assigned under ASHRAE Standard 34, e.g., R-12, R-410A, R-22. Many new refrigerants have a trade name in addition to the ASHRAE number. These names and numbers are often used interchangeably, so be careful and stick to the ASHRAE R#.

Is R-410A a blend refrigerant?

Yes. It is a blend of HFC R-32 and HFC R-125 (50/50 wt%) that performs very much like a single component refrigerant.

Why are so many of the new refrigerant's "blends"?

Manufacturers combine refrigerant components into blends to develop safe and cost-effective alternatives that match CFC performance and properties. Blends are not new; R-502 is a blend of R-22 and R-115 developed in the 1950s to improve on R-22's low-temperature performance. Blends have 400 or 500 series ASHRAE numbers, e.g., R-410A.

Can R-410A systems be "topped off" after a leak?

Yes. There is still some confusion in the marketplace concerning separation of the blend components (also known as fractionation) during a leak and resultant system performance loss. All blends, even R-502, can fractionate under certain conditions. Blends exhibit very little fractionation in use and, therefore, will show no noticeable change in performance after topping off. After locating and repairing a leak, additional R-410A refrigerant can be added to the system.

Are oil traps required with R-410A?

With the excellent miscibility of R-410A with POE oils, the customary practice of installing oil traps if the condenser is more than three feet above the evaporator is no longer required.

Is there a "drop-in" refrigerant to replace R-22?

Many refrigerants are being promoted as "drop-ins" that do not require an oil change from mineral oil to the new oils. The major compressor manufacturers do not support a "no oil change" position and recommend/require converting to POE to maximize compressor life and retain warranty coverage.

What type of material is used to connect line sets on R-410A systems?

Soft solder is not to be used. A brazing alloy with a minimum 5% silver content is recommended.

With the higher pressures, are these systems safe?

These systems have typically been rigorously tested by Johnson Controls, as well as by independent safety testing laboratories such as Underwriters Laboratories.

With millions of R-410A based air conditioners operating worldwide, and more than a decade of field testing and product history, there is no evidence to suggest that R-22 systems are any safer than systems that contain R-410A.

