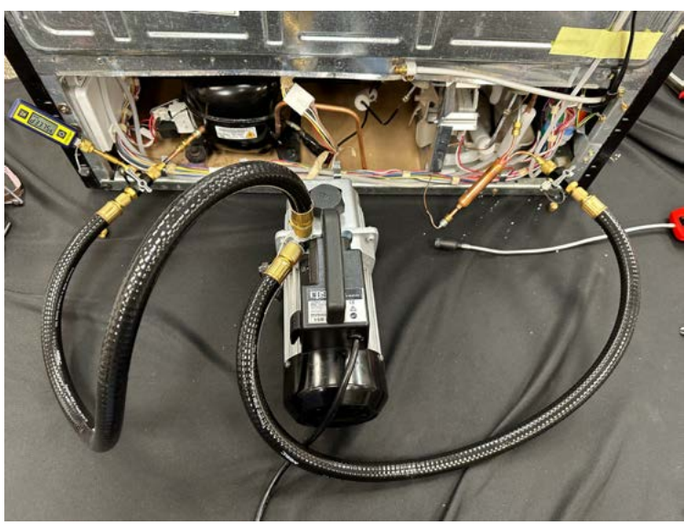
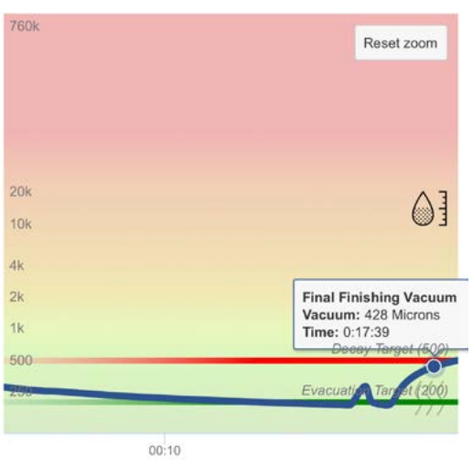
Whirlpool®

TECHNICAL MANUAL

R600a Refrigerant





W11105483

FORWARD

This Whirlpool Service Manual (Part No. W11105483) provides the In-Home Service Professional with service information for the “R600A Refrigerant Sealed System.”

GOALS AND OBJECTIVES

The goal of this Service Manual is to provide information that will enable the In-Home Service Professional to properly diagnose malfunctions and repair the “R600A Sealed system.”

The objectives of this Service Manual are to:

A. Understand and follow proper safety precautions.
B. Understand the R600a Refrigerant.
C. Successfully perform necessary sealed system evacuation and recharge.
D. Successfully return the refrigerator to its proper operational status.

WHIRLPOOL CORPORATION assumes no responsibility for any repairs made to our products by anyone other than authorized In-Home Service Professionals.

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SECTION 1: GENERAL INFORMATION

This section provides general safety, parts, and information for the R600a repair process.

REFRIGERATION SAFETY

Your safety and the safety of others are very important.

We have provided many important safety messages in this manual and on your appliance. Always read and obey all safety messages.

This is the safety alert symbol.

This symbol alerts you to potential hazards that can kill or hurt you and others.

All safety messages will follow the safety alert symbol and either the word “DANGER” or “WARNING.” These words mean:

DANGER **You can be killed or seriously injured if you don’t immediately follow instructions.**

WARNING **You can be killed or seriously injured if you don’t follow instructions.**

All safety messages will tell you what the potential hazard is, tell you how to reduce the chance of injury, and tell you what can happen if the instructions are not followed.

IMPORTANT SAFETY INSTRUCTIONS

WARNING: To reduce the risk of fire, electrical shock, or injury when using your refrigerator, follow these basic precautions:

- Plug into a grounded 3 prong outlet.
- Do not remove ground prong.
- Do not use an adapter.
- Do not use an extension cord.
- Disconnect power before servicing.
- Replace all parts and panels before operating.
- Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge,

unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

- Use nonflammable cleaner.
- Keep flammable materials and vapors, such as gasoline, away from refrigerator.
- Do not damage the refrigerant circuit.
- Do not hit the refrigerator glass doors (on some models).
- Do not use replacement parts that have not been recommended by the manufacturer (e.g., parts made at home using a 3D printer).
- Children should be supervised to ensure that they do not play with the appliance.

SAVE THESE INSTRUCTIONS

NOTICE TO THE TECHNICIAN

It is the responsibility of the Service Technician to comply with all EPA regulations and Standards and posses all necessary State and Federal licenses when servicing refrigerators.


R600a

Federal regulations and Standards can be found on the United States Government EPA website.

State Regulations and Standards and licensing requirements, in most cases, can be found on the State Government website.

⚠WARNING

Electrical Shock Hazard

Disconnect power before servicing.

Replace all parts and panels before operating.

Failure to do so can result in death or electrical shock.

⚠ DANGER

Explosion Hazard

Risk of Fire or Explosion. FLAMMABLE REFRIGERANT Used.

1) To be repaired only by Trained Service Personnel. Use only Manufacturer-Authorized Service Parts. Any repair equipment used must be designed for Flammable Refrigerants. Follow all Manufacturer Repair Instructions. Do Not Puncture Refrigerant Tubing.

2) Dispose of Refrigerant Properly in Accordance with the Applicable Federal or Local Regulations.

3) Risk of Fire or Explosion due to Puncture of Refrigerant Tubing: Follow Handling Instructions Carefully.

4) Keep open flame, such as a torch, away from refrigerant tubing. Failure to do so can result in death, explosion, or fire.

R600a INTRODUCTION

Whirlpool uses R600a (isobutane) as a refrigerant for new production household refrigerators and freezers. R600a is a hydrocarbon with the benefits of zero ozone depletion potential (ODP) and a very low global warming potential (GWP) as compared to other refrigerants. An important characteristic of R600a, a hydrocarbon, is its flammability. This Manual details the procedure for performing sealed system work on refrigerators and freezers utilizing R600a hydrocarbon refrigerant. Special attention is given to mitigating flammability concerns.

R600a VS R600

IMPORTANT: While R600 and R600a are similar, they are two distinctly different refrigerants with unique operating pressures, boiling points, and system design requirements. They are not interchangeable.

Using the incorrect refrigerant can result in poor performance, system damage, and potential safety risks. Furthermore, R600 is not authorized or certified for use in any Whirlpool products. The design, engineering, manufacturing, and certification of these units are explicitly intended for compatibility with R600a refrigerant only. The use of any alternative refrigerants, including R600, constitutes a breach of the product's intended specifications and may result in voiding of warranties and violation of applicable regulations.

REFRIGERANTS

The use of flammable refrigerants in refrigeration systems was discontinued after the appearance and large-scale production of CFC refrigerants. CFC refrigerants became the refrigerants of choice because they are low in cost, non-toxic, and are not flammable. However, studies have shown that CFCs have damaged, and continue to threaten, the Earth's delicate ozone layer. In light of this, the Montreal Protocol was established to manage the discontinuation of these refrigerants. Various alternative refrigerants to CFC12 were studied, and some are now being used by the refrigeration industry worldwide. Among them are some

flammable refrigerants. Refrigerants such as (R 600a) isobutane have increased in popularity with the consumer population primarily because of their environmentally benign properties. More specifically, hydrocarbon refrigerants are safe for the Earth's ozone layer.

THE ISOBUTANE REFRIGERANT

Like other alternative refrigerants, isobutane has different thermodynamic characteristics from those of R12 or R134a (see Figure 1).

Figure 1 shows that isobutane (R 600a) has lower vapor pressures than R12 or R 134a in a refrigeration system's standard operational temperature range. To better observe the impact of using R600a in refrigeration applications, please see the chart below.

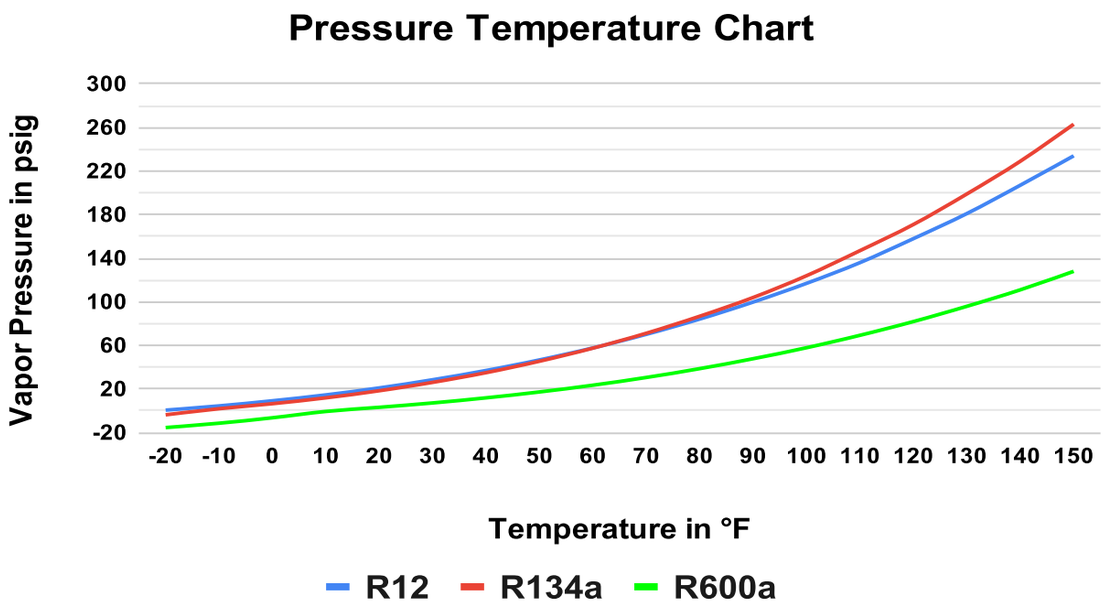


Figure 1. - Pressure Temperature chart of R12 vs R134a vs R600a.

HYDROCARBONS

Hydrocarbons are flammable organic compounds made up of hydrogen and carbon. Compared to other refrigerants, hydrocarbon refrigerants are desirable because they have zero ozone depletion potential (ODP) and a very low global warming potential (GWP). Hydrocarbon (HC) refrigerants have been used extensively in household refrigerators and freezers for over twenty years in countries such as Germany, the United Kingdom, Australia, and Japan.

SAFE HANDLING REQUIREMENTS R600a

The EPA is updating the safe handling requirements under Section 608 which currently applies to ozone-depleting refrigerants, and extending them to substitutes like hydro-fluorocarbons (HFCs). These changes strengthen the existing program, in particular, by requiring a number of industry best practices. Link to the EPA testing and regulations: https://www.epa.gov/section608. Isobutane is a hydrocarbon approved for use by the EPA as a refrigerant in household refrigerators and freezers. As a hydrocarbon, the EPA has exempted R600a from the requirement to recapture used refrigerant. This technical manual covers the procedure for venting R600a to the atmosphere. https://www.epa.gov/snap/snap-regulations. R600a is the designation given to refrigerant-grade isobutane by the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE). ASHRAE categorizes R600a in the A3 safety group. The A3 safety group is reserved for refrigerants with lower toxicity and higher flammability.

National Refrigerants, INC. Safety Data Sheet
Link: https://m9v7b6.a2cdn1.secureserver.net/wp-content/uploads/2019/12/SDS-R600a-Isobutane.pdf?time=1723765422.

USE CONDITIONS

The use conditions are:

A. R600a can only be used in new equipment designed specifically and clearly identified for the refrigerant.

B. Refrigerators or freezers using R600a must meet all requirements listed in Supplement SA to UL 250.

C. A 150-gram charge size limitation is imposed.

D. Refrigerators and freezers must meet labeling requirements identifying Refrigerators Containing R600a.

E. To implement the proper safety precautions, it is necessary to identify refrigerators using R600a refrigerant.

F. Check the Model and Serial Number tag inside the refrigerator compartment. This tag lists the type and quantity of refrigerant used.

TECHNICIAN CERTIFICATION

It is the responsibility of the Service Company and Service Technician to understand and comply with all Federal and local laws.

Technicians must:

A. Pass a certification EPA exam offered by an approved technician certification program in order to maintain, service, repair, or dispose of appliances containing ODS or substitute refrigerants.

B. The certification exam will be updated to reflect any new rules and new refrigerants prior to this date.

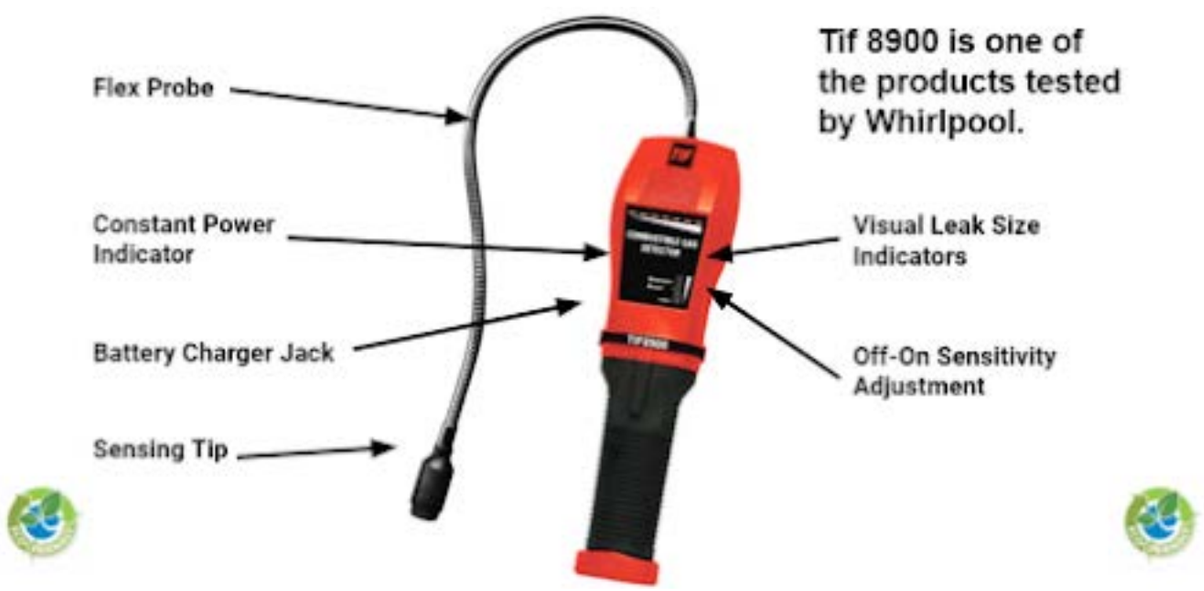
C. Keep a copy of their certificate at their place of business.

D. Maintain a copy until three years after no longer operating as a technician.

E. https://www.epa.gov/sites/default/files/2016-09/documents/608_fact_sheet_technicians_0.pdf

LEAK DETECTION

Most electronic leak detectors used for HFC and HCFC leak detection are not safe and sensitive for use with flammable refrigerants, so electronic detectors specifically designed for flammable gases (or leak detection spray) must be used.



The TIF TIF8900 is an appropriate tool for a situation where a combustible gas, vapor, or residue needs to be found. It is a highly sensitive, cordless, combustible gas detector that identifies a broad range of natural gases, including propane, methanol, butane, and gasoline. Its uses include Gas lines

and Pipes, Exhaust and Fuel leaks, Propane filling stations, Fuel in marine bilges, Heat Exchanger leaks, Checking manholes for safety, Detecting arson residue, IAQ (Indoor Air Quality) tests, and Liquid or gas-fired heating systems.

Use a combustible gas leak detector rated to 5 ppm to perform a background check around the appliance. Technicians must be trained in the use, and the device must be certified for use with the specific refrigerant class being serviced.

NOTE: The Gas detector needs to be activated before any repairs are attempted and is to remain on during the complete repair.

NOTE: Locate the Gas detector at the lowest point and close to the work being done.

OPERATING A GAS LEAK DETECTOR

A. Follow the manufacturer's instructions while operating the gas leak detector. Throughly read and understand any warnings and cautions.

B. The batteries should be fully charged or brand new to ensure the leak detector will operate during the complete sealed system repair.

B.1. **NOTE:** If a steady tick cannot be maintained, it is indicative that the batteries may need to be recharged or changed.

C. Search the general area of the suspected refrigerant leak. When a detectable compound enters the tip, the tick rate speeds up.

R600a RECOMMENDED TOOLS & SUPPLIES

- □ Fire Extinguisher: Rated for Class B fires
- □ Safety Glasses
- □ Certified and Calibrated Combustible Gas Leak Detector: Able to test for leaks if the system is charged with A3 refrigerant
- □ Ventilation Fan: Sparkless
- □ Manifold Hoses and Gauges for servicing R600a - Example: Mastercool 93524-TP - R600a, R290 & R134a

2-Way Aluminum Manifold Gauge Set with (x3) 24-inch Thermoplastic Capillary Hoses

- □ Vacuum-rated ½” to ¾” hoses for vacuum process - Example: NAVAC NH34AB Big Boy 3/4” Diameter Refrigerant Evacuation Hose 1/4” to 3/8” fittings
  - □ **NOTE:** Verify hose fittings as they are being ordered, you may need two different end sizes to attach to the vacuum pump (Example 1/4” to 3/8” fittings for one hose and 1/4” to 1/2” fittings for the other.) A “Y” adapter could also be used.
- □ 2 Schrader Valve Core Removal Tools - Example: Appion 1/4” Valve Core Removal Tool
- □ Micron Gauge with Graphing Capability- Example: BluVac+ Micro Wireless Digital Micron Gauge
- □ 20’ PVC Recovery Hose or Reclaim Bag
- □ Dual Stage Vacuum Pump: Rated and certified for use with A3 flammable refrigerants, recommended 6 CFM capacity - Example: CPS VPS6DU Premium Series Sparkless Vacuum Pump 6 CFM Two-Stage
- □ R600a Refrigerant Maximum 420 Gram Cylinder
- □ Nitrogen Tank & Regulator
- □ Refrigerant Charging Scale (Grams)
- □ LOKRING® Tool
- □ LOKPREP
- □ Calipers
- □ Quick Disconnect Fittings
- □ Liquid Charging Fitting

Assorted Hand Tools, Including:

- □ Tubing Cutters
- □ Deburring Tool
- □ Piercing Pliers
- □ Pinch Off Pliers
- □ Rubber Mallet
- □ Sandpaper
- □ Isopropyl Alcohol

- □ VOM / AMP Probe - Digital Multimeter
- □ Schrader Tool and Extra Valves
- □ Temporary Access Valves - Example
- □ Process Tube Valve

If brazing Copper to Copper or Copper to Steel:

- □ Glasses with an ANSI-recommended shade 3 tint for brazing
- □ Process Tube Adapter Kit - Example
- □ Brazing Equipment
- □ Brazing Alloy and Flux
- □ Welding Blanket with Metal Heat Shield
- □ Nitrogen Tank and Regulator

NOTE: Nitrogen must be used to flush the R600a system of residual gas and displace oxygen before brazing. It is also recommended to flow nitrogen through the system while brazing.

NOTE: All tools are suggested to be Sparkless tools. Whirlpool requires and AHAM recommends using a leak detector during the entire process. If gas or a leak is detected, stop work and do not use tools that could cause a spark during operation.

SECTION 2: SEALED SYSTEM REPAIR

This section provides an operational sealed system evacuation and charging process.

PRE-WORK CHECKS

Before working on an R600a refrigerator, ensure the immediate area is suitable for working safely and the appropriate precautions are in place. Proper safety checks before beginning work will minimize the potential for an ignition event. Take the following precautions before working on the sealed system:

Ensure the work environment is safe.

A. The work area should be sufficiently sized.

A.1. R600a refrigerators should not be serviced in small, poorly ventilated spaces such as very small ‘galley’ kitchens or storage closets.

A.2. Suggested that you not perform sealed system maintenance in spaces smaller than 6’ X 6’.

A.3. Refrigerators in insufficiently sized spaces should be moved to a larger area to work safely.

B. The work area should be properly ventilated. Proper ventilation allows any refrigerant inadvertently released to disperse safely.

C. When working behind the appliance, create as much clearance as possible between the appliance and the wall or other obstructions to allow proper air movement. Also, locate the leak detector behind the appliance.

D. Use supplemental ventilation, such as a fan. Ensure the fan is located at a maximum of 6 feet from the nearest sealed system component.

E. Ensure a fire extinguisher rated for Class B fires is accessible on-site.

F. Use of a suitable gas detector will alert the technician of the presence of flammable gas.

F.1. **IMPORTANT:** If flammable refrigerant is detected, immediately ventilate the room, evacuate the area, and notify the owner or customer.

G. Recheck with a combustible gas leak detector before proceeding.

H. If questioned, inform the customer the detector allows the work to be done safely.

I. Remove any ignition sources from the work area.

J. Disconnect power by unplugging the appliance before servicing.

J.1. **IMPORTANT:** An appliance on/off switch, or power button, is inadequate for removing power, as voltage will still be present in the unit.

K. The area should be free of open flame or burning materials, including cigarettes, candles, or similar materials.

L. While servicing appliances, do not operate appliances that utilize open flames or have hot surfaces, such as electric or gas ranges, electric or gas dryers, toasters, electric or battery-powered tools, and other small appliances.

M. Inform the homeowner/consumer that no open ignition sources, including cigarette smoking materials, should be present in or near the area.

N. Check the area and the appliance for any signs of ignition that might have occurred before the service.

N.1. **IMPORTANT:** If there are signs of ignition, stop work and ventilate the work area.

O. Maintain a safe zone around the appliance during service work to prevent ignition sources or entry by the customers.

P. Ensure all necessary supplies, tools, and parts are on hand.

Q. Maintain all equipment in accordance with manufacturer specifications.

R. Inspect all equipment and hoses for damage prior to each use. Do not use damaged equipment or hoses.

SEALED SYSTEM ACCESS

A. DO NOT access the sealed system by cutting or breaking the sealed system piping.

B. DO NOT access the sealed system by means of a torch or any type of open flame.

C. The sealed system should only be accessed through the compressor (process tube or suction line) and the drier.

D. If there is no direct means of accessing the sealed system, use piercing pliers.

E. If the sealed system is accessed by piercing, ensure the correct diameter fitting is selected based on the size of the sealed system pipe.

SEALED SYSTEM ACCESS PROCEDURE

1. First, Verify Failure

   1.1. If a leak is suspected, use bubbles or a combustible gas leak detector to try to find the leak before accessing the sealed system.

2. The Combustible Gas Detector must be activated before any work is started. Place the detector at the lowest point in the work area.
3. Ensure Pre-Work Checks starting on page 15 are Completed.
4. If you are working on a sealed system with a three-way valve, position the 3-Way Valve to the Home Position. Do this by plugging in the refrigerator, wait approx. 6 seconds, then unplug the refrigerator.
5. Remove the Machine Compartment Cover.
6. If the compressor is working and the Schrader valve is present on the high side, you will attach the recovery hose here. If no Schrader valve is present, use piercing pliers to access the high side of the sealed system. If the compressor is non-functional, connect a second pair of piercing pliers to the process tube if there is no Schrader valve present on the process tube.

VENTING PROCESS

Unlike traditional CFCs and HCFCs, the EPA allows the venting of R600a refrigerant to the outside atmosphere. Venting is the preferred method of removing refrigerant from a sealed system. When all requirements are met, venting allows the refrigerant to be safely dispersed in the natural environment, removing the hazard of concentrating and transporting flammable gas immediately. When venting, the gas expands to atmospheric pressure. Venting times will vary for many reasons, including but not limited to the size of the charge, atmospheric pressure, and whether the compressor is running.

IMPORTANT: Do not vent R600a refrigerant indoors.

IMPORTANT: Ensure there is no ignition source near the discharge hose.

R600a vent locations must meet the following criteria:

A. R600a must be discharged to the outside environment.

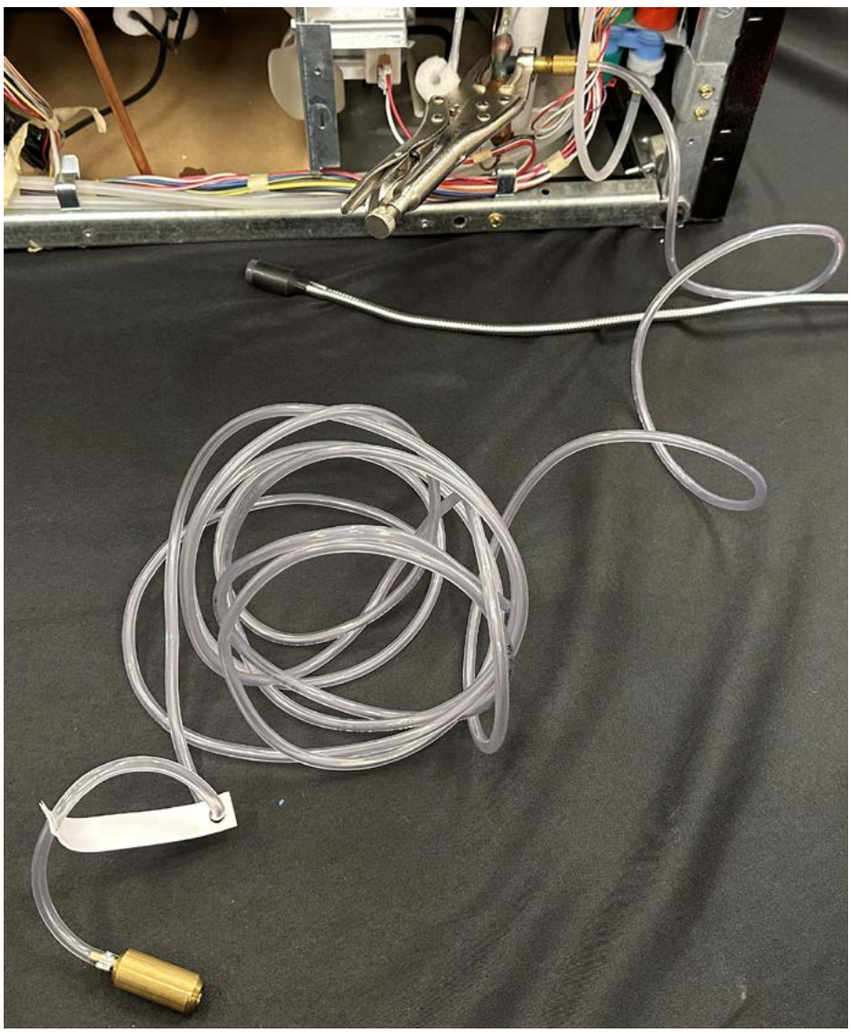
B. The discharge location must not be a public area or area where people are unaware of the procedure taking place.

C. There must be no sources of ignition near the hose discharge.

D. Ensure there is no possibility for refrigerant to be blown back into any buildings or to a location below ground level.

SEALED SYSTEM REFRIGERANT VENTING PROCEDURE (PREFERRED)

1. Route the weighted end of the 20’ PVC Recovery Hose to an outdoor location.
2. To begin venting, connect the opposite end of the 20’ Recovery Hose to the quick disconnect fitting on the High-Side piercing pliers or Schrader Valve fitting with Schrader Valve removed.



3. If the compressor is functional, run the compressor for 2 minutes max to speed up the venting process.

   3.1. **NOTE:** If there was a leak in the system, do not run the compressor to avoid contaminating the oil.

   3.2. Reset the 3-way valve if needed after running the compressor (see Page 17, step 4).

4. Monitor the Recovery Hose and discharge point. Ensure the hose remains kink-free. Ensure the Refrigerant Venting Requirements are met continually throughout the venting process.
5. Observe the mirage effect at the hose discharge as the

R600a refrigerant exits.

NOTE: Observe when the mirage effect stops. A mirage is a naturally occurring optical phenomenon in which light rays are bent to produce a displaced image of distant objects or the sky.

5.1. Tapping the compressor with a Rubber Mallet at this time will help remove any trapped R600a from the oil.

6. Once the mirage effect stops and there is no more apparent flow, nitrogen must be used to flush the system.

6.1. Using the quick disconnect or a temporary access valve on the process port, attach the line from the nitrogen tank.

6.2. Turn on the nitrogen at a low 2-3 CFH or 1.5-2 psi. Wait 1 minute for the nitrogen to help flush out the R600a.

7. Now the system should be fully vented. After the sealed system is fully vented, disconnect the Recovery Hose from the quick disconnect fitting.

REFRIGERANT TEMPORARY RECOVERY PROCEDURE

If direct venting is impossible due to the appliance location or other reasons, the refrigerant must be captured. The captured refrigerant should be vented outdoors before leaving the premises. Do not travel with any reclaimed R600A Sealed System Refrigerant. Venting is the Preferred Method.

1. Connect one end of the Recovery Hose to the quick disconnect fitting on the approved Recovery Vessel.

2. Connect the other end of the Recovery Hose to the quick disconnect fitting on the piercing pliers or Schrader valve.
3. If the compressor is functional, run the compressor for 2 minutes max to speed up the venting process.

   3.1. **NOTE:** If there is a leak in the system, do not run the compressor to avoid contaminating the oil.

   3.2. Reset the 3-way valve if needed after running the compressor (see Page 17, step 4).

4. Monitor the hose to ensure it remains kink-free.
5. Once the noise from the pressure of the R600a being released is not heard, the system will need to be flushed with nitrogen.

   5.1. Using the quick disconnect or a temporary access valve on the process port, attach the line from the nitrogen tank.

   5.2. Turn on the nitrogen at a low 2-3 CFH or 1.5-2 psi. Wait 1 minute for the nitrogen to help flush out the R600a.

6. Now the system should be fully vented. After the sealed

system is fully vented, disconnect the Recovery Hose from the quick disconnect fitting.

7. Immediately remove the approved Recovery Vessel to a suitable outdoor location and vent the bag to the atmosphere, removing all R600a refrigerant.

USING NITROGEN TO CHECK FOR LEAKS AND REPAIRS

Once all of the R600a has been vented, nitrogen can be used to check for leaks.

1. Hoses from the nitrogen tank can be connected to the piercing pliers or Schrader valve on the high side and the low side.
2. Starting with the high side open, slowly raise the pressure to 250 psi max, then open the low side (except for Wisemotion compressors, which are also R134a; see pointer W11734285).

   2.1. Sometimes, using various lower pressures, like 100 psi, may help detect leaks.

3. Use soap bubbles and monitor the system for pressure decay to look for leaks.

When completing repairs and brazing, flow nitrogen through the system at a low 2-3 CFH or 1.5-2 psi. Ensure the Schrader valve is removed from both the high side and low side before flowing nitrogen. The nitrogen flow will prevent oxidation inside the copper tube during brazing. Avoid excessive flow rates that could cause pressure to build or reduce brazing efficiency.

After a repair is completed, nitrogen should be used again to check for leaks in the system. Pressurize the system to 250 psi and use soap bubbles and pressure decay to look for leaks, especially where repairs or new connections were made.

SEALED SYSTEM EVACUATION

ATTENTION: Ensure that refrigerant measuring equipment is maintained and calibrated in accordance with manufacturer specifications.

Utilize vacuum pumps, recovery equipment, and other tools

that are rated for and certified for use with A3 flammable refrigerants. Vacuum pumps must be certified for the refrigerant being used. Ensure the vacuum pump used for evacuation is rated for A3 refrigerant. Due to the narrow charging tolerances associated with R600a refrigerant, it is necessary to draw a deep vacuum down to under 500 microns to ensure proper evacuation.

VACUUM PUMP BEST PRACTICES

Regular oil maintenance is one of the best ways to ensure your pump is working correctly. Oil in the vacuum pump should be changed frequently to ensure the ability to draw a deep vacuum. Follow the manufacturer's recommended schedule for oil changes. Using a Micron Gauge to check the vacuum level at the pump before each use will help verify that the vacuum pump is working correctly (Recommended 50 microns or lower). Let the vacuum pump warm up for a few minutes before reading the micron level. Keep a record of the micron level the vacuum reaches (check with the manufacturer for micron level ratings) and when it isn't reaching low enough, it may be time to change the oil.

NOTE: Vacuum Pumps are very sensitive to oil level, the pump may require the oil level to be to the full or max mark for best vacuum.

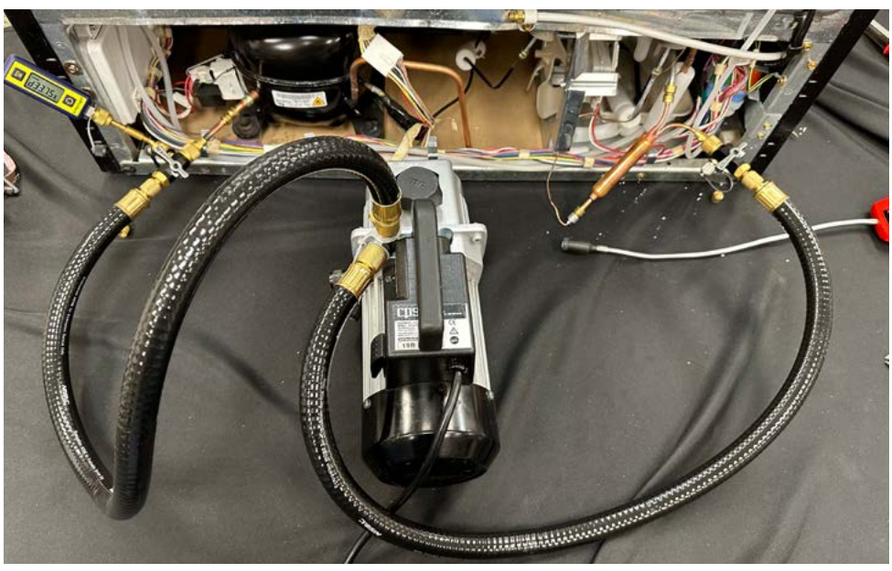
SEALED SYSTEM EVACUATING PROCEDURE

1. Turn on the vacuum pump to let it warm up for a few minutes before pulling the vacuum.
2. Install the Schrader valve core removal tools to both the high and low sides.

   2.1. Follow the instructions provided by the manufacturer when installing or removing the Schrader valve to prevent loss of vacuum or contaminants entering the system after charging.

3. Attach the micron gauge to the side port of the valve core removal tool on the low side (process port).

4. Attach the vacuum rated ½” to ¾” hoses from the vacuum to the high and low side valve core removal tools.



5. Open the ball valves on both valve core removal tools to start the vacuuming process.

6. Once the micron gauge is reading a vacuum in microns, approximately 1 minute into process, cycle the ball valves on both valve core removal tools off and then back on to help remove any trapped gas.

   6.1. If the micron gauge is not reading in microns after running for a few minutes, there may be an issue with connections/equipment or a leak in the system. Verify all connections are tightened correctly and equipment is functioning correctly. If equipment is working properly and still not reading in microns, use nitrogen to pressurize the system to look for or verify leaks.

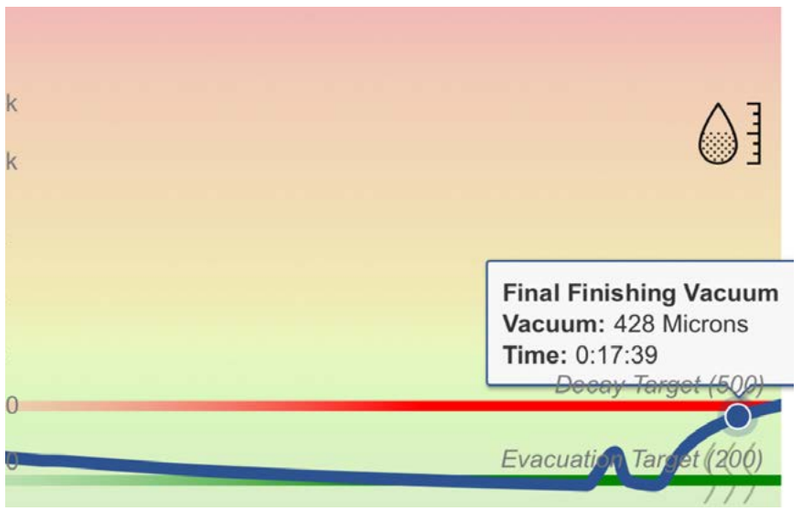
NOTE: If nitrogen is used, start vacuum process from step 1.

7. Run the vacuum pump for a minimum of 15 minutes (allow for up to 30 minute vacuum time) or until a micron level of below 500 is achieved (optimally 250 microns).

8. Turn off the ball valves on both valve core removal tools.

9. Watch the decay of the vacuum using the micron gauge.

   9.1. If the vacuum decay stays under 1000 microns (optimally 500 microns) within 60 seconds, the vacuum level is good.



   9.2. If the vacuum level rises to over 1000 microns within 60 seconds:

      9.2.1. Moisture may be present in the system, and more time is needed to reduce it.

      9.2.2. There may be a small leak in the system. Verify all connections are tightened correctly and equipment is functioning correctly. If equipment is working properly, use nitrogen to pressurize the system to look for or verify leaks.

NOTE: If nitrogen is used, start vacuum process from step 1.

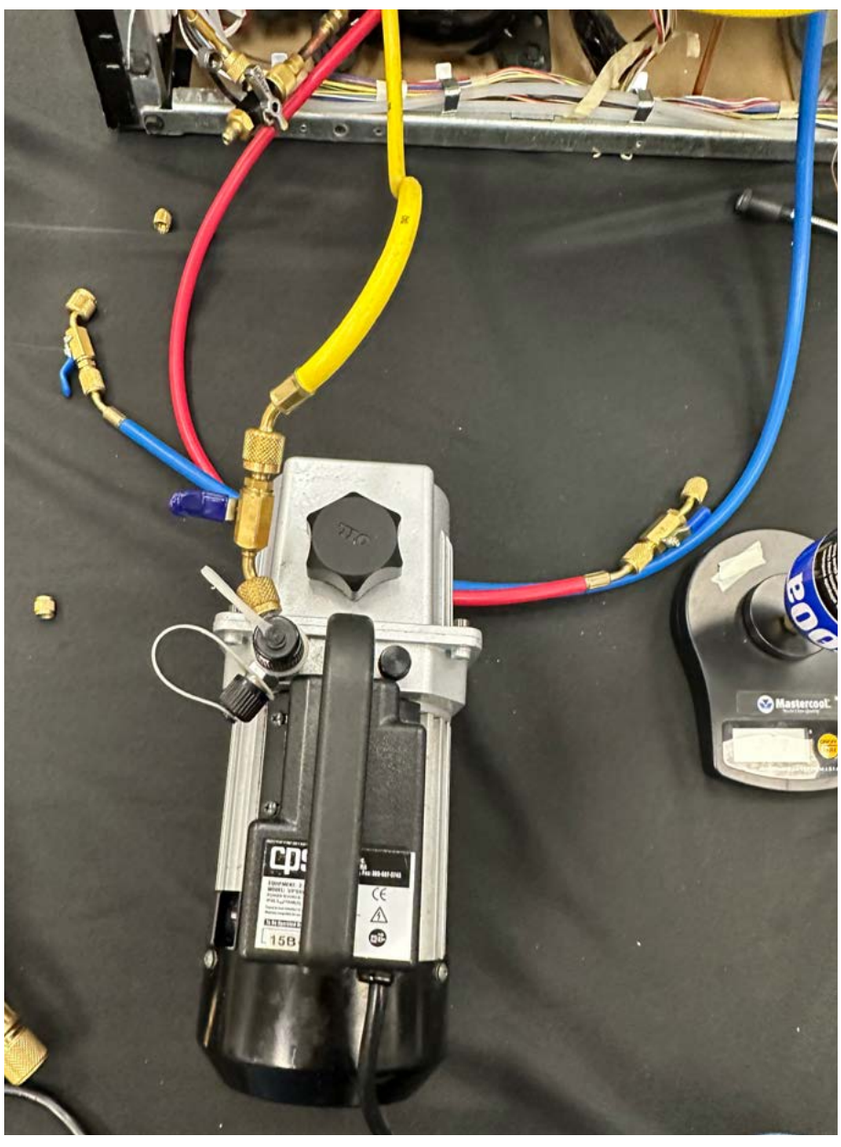
10. Ensuring the ball valves are off on the valve core removal tools, remove the vacuum hoses from the valve core removal tools then turn off the vacuum pump.

CHARGING PROCESS

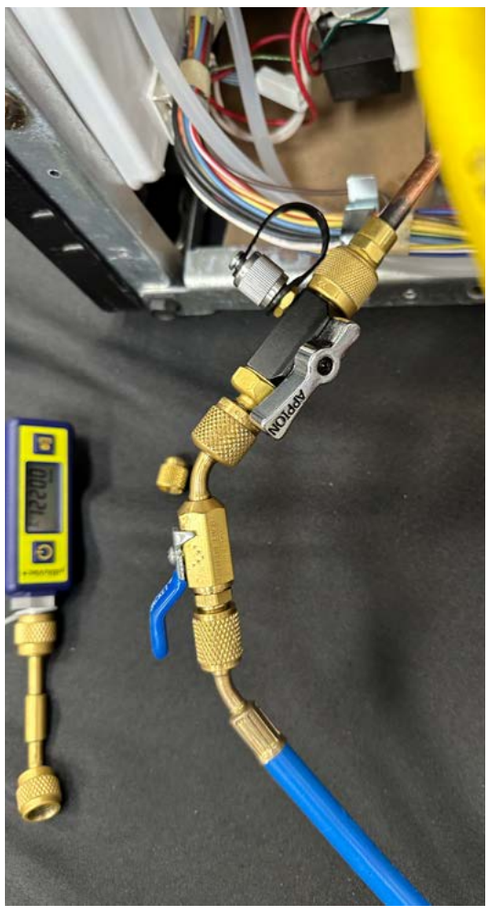
R600a is an extremely efficient refrigerant. This high efficiency means refrigerators using R600a refrigerant use a much smaller charge size than a comparable refrigerator with CFC refrigerant. This small charge size increases the significance of any error in the quantity charged. To obtain the precise charge required, use a high-accuracy digital scale and the other required hoses and connections. Condensation forming on the refrigerant bottle will add weight to the bottle, resulting in charging errors.

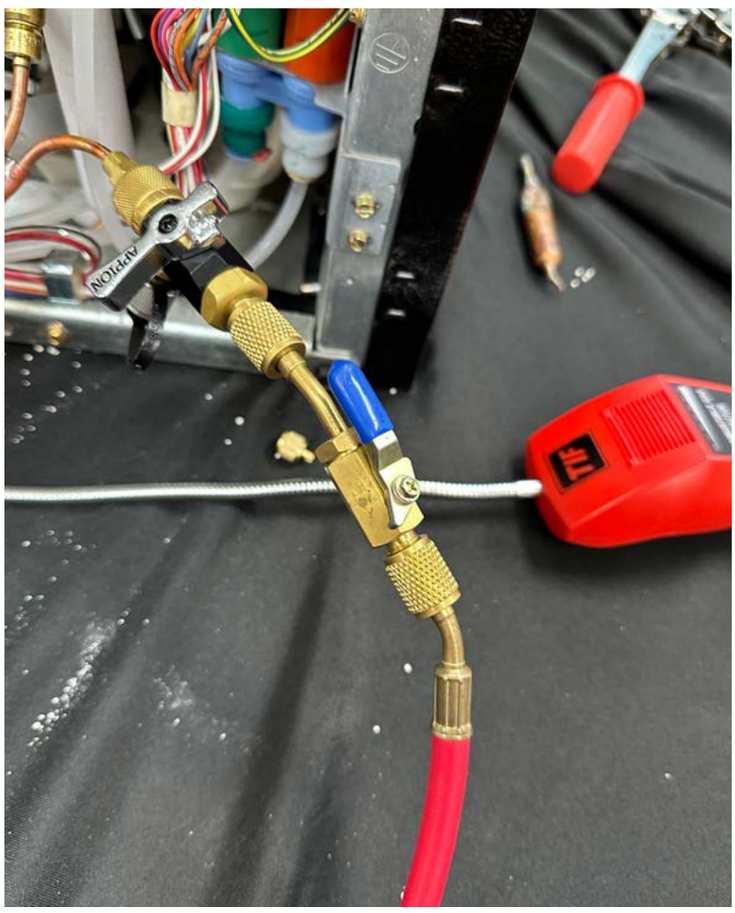
For liquid filling (this is the preferred process), when filling with liquid refrigerant, the bottle is screwed into the holder with the closed extraction valve in place on the bottle. The bottle is placed upside down on the scale.

1. Take the R600a manifold and charging hoses and connect the middle hose to the vacuum pump. Ensure the ball valves on the end of the other two hoses are closed.



2. Turn on the vacuum pump and turn on the ball valve to the middle hose to evacuate the hoses and the manifold.
3. Connect the low-side and high-side hoses to the Schrader valve removal tool on each side.
4. With the vacuum still on, open the ball valves on both the hoses and the Schrader valve removal tools, cycle all the ball valves on and off, and then back on.

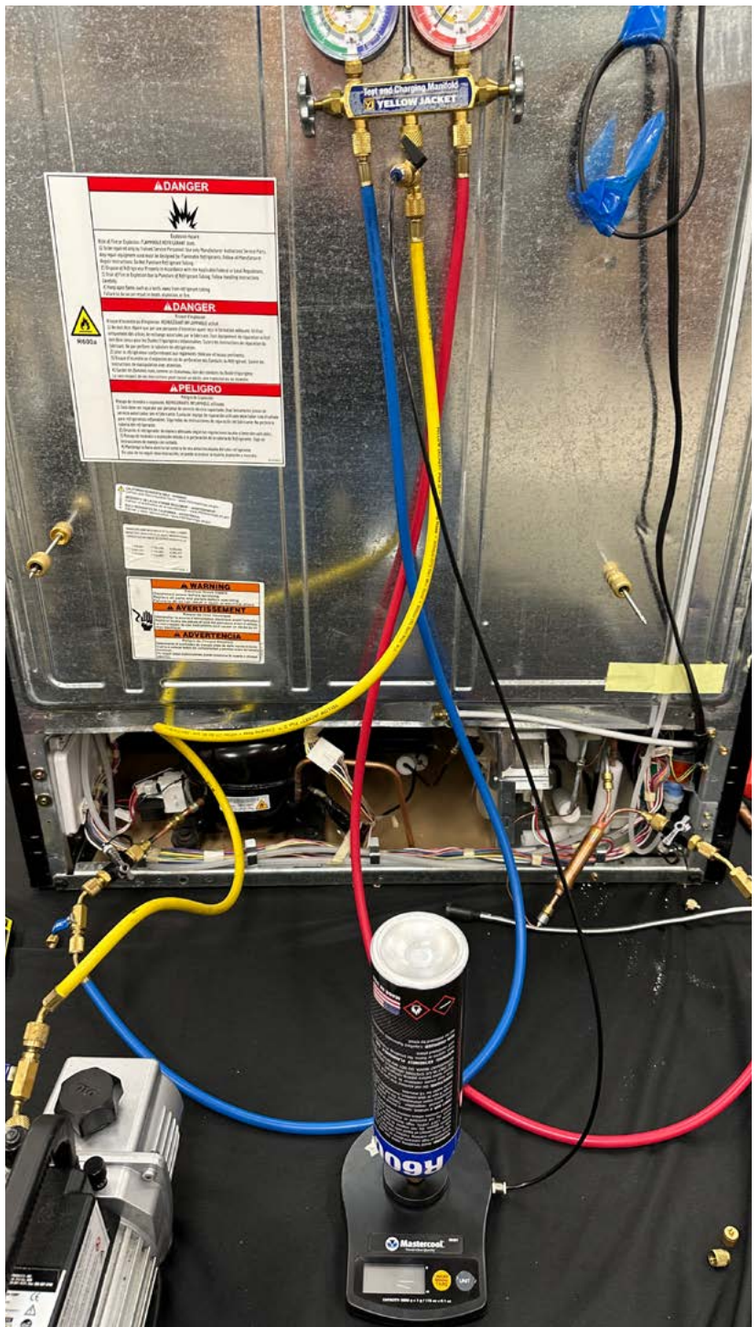




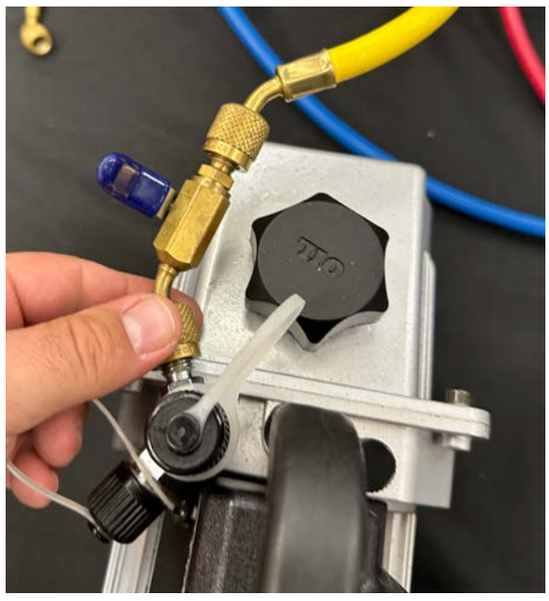
5. Ensure the refrigerant bottle is on the scale correctly and is bled into the hose.

   5.1. **NOTE:** Purge the gas in the headspace prior to connecting to scale. The bottle must be in the upright position.

6. Connect the refrigerant hose line to the manifold.

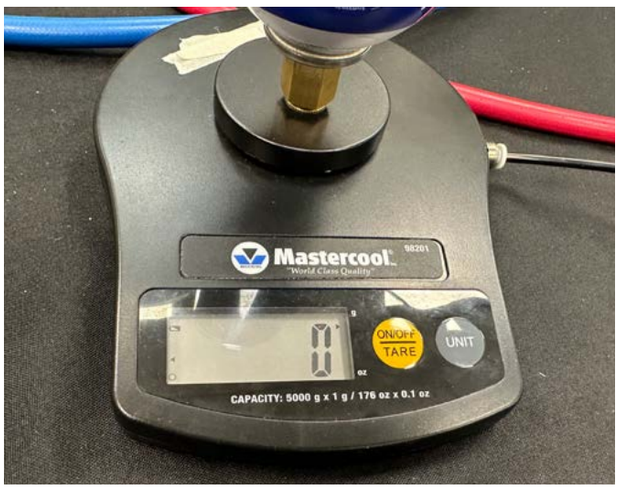


7. Turn the ball valve to the vacuum hose off and turn the vacuum pump off.

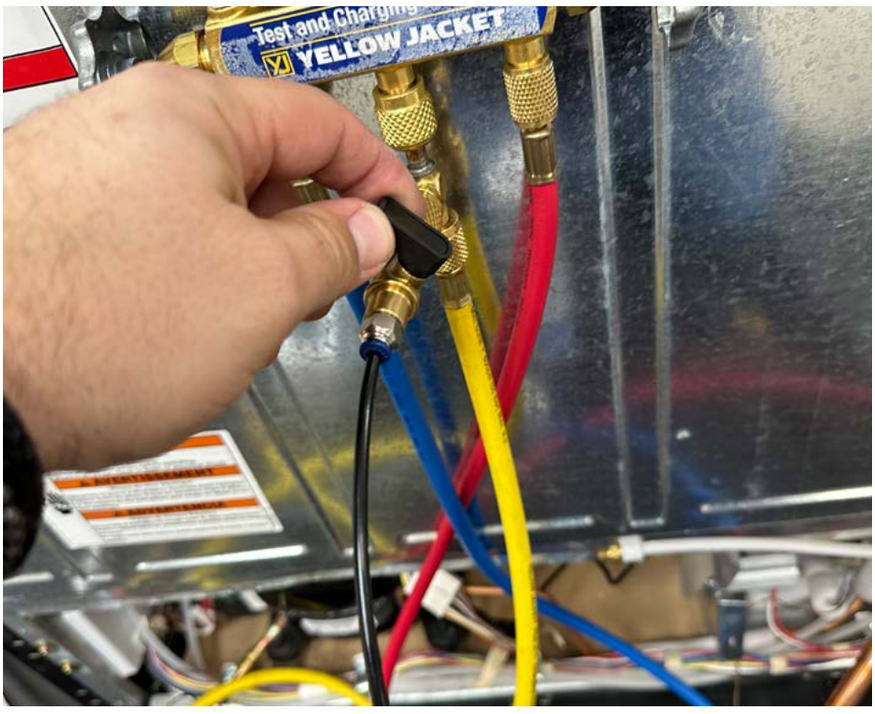


8. Zero out the scale.

NOTE: Wait until the scale display remains constant (stabilizes).

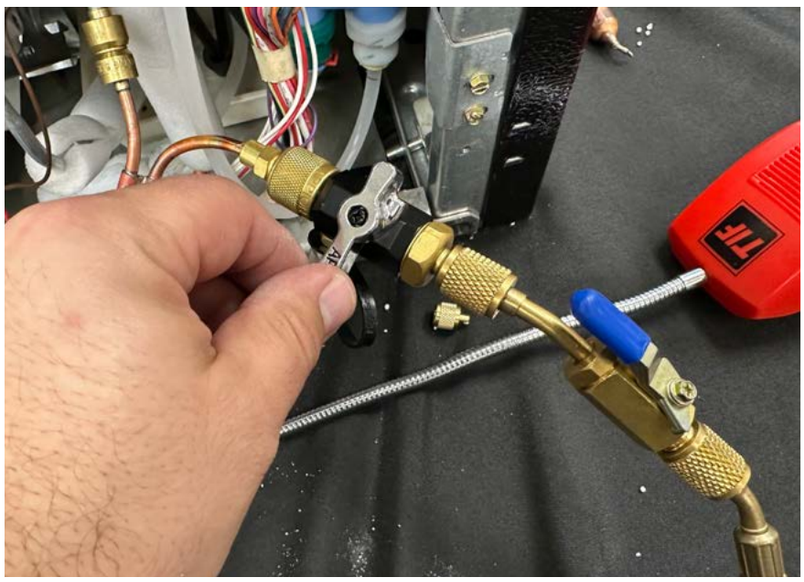


9. Start metering the amount of R600a needed for the refrigerator by slowly opening the ball valve on the refrigerant line.



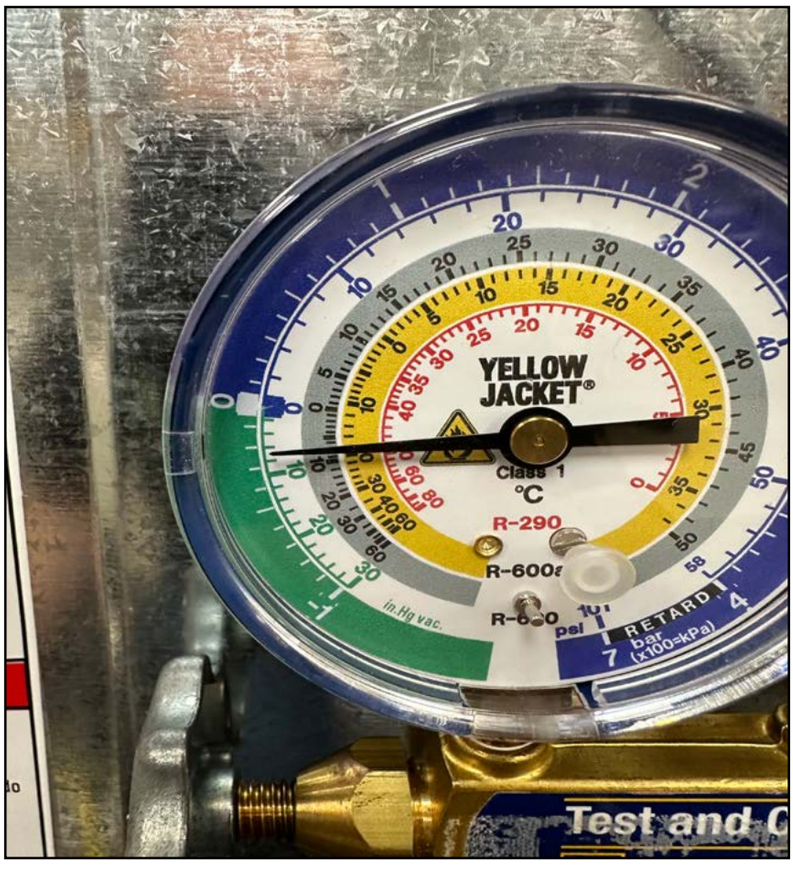
10. Once the scale reads the amount of R600a needed, close the ball valve on the refrigerant charging line.

11. Close the ball valve on the Schrader valve removal tool on the high side.



12. Plug in the refrigerator and wait for the compressor to turn on.

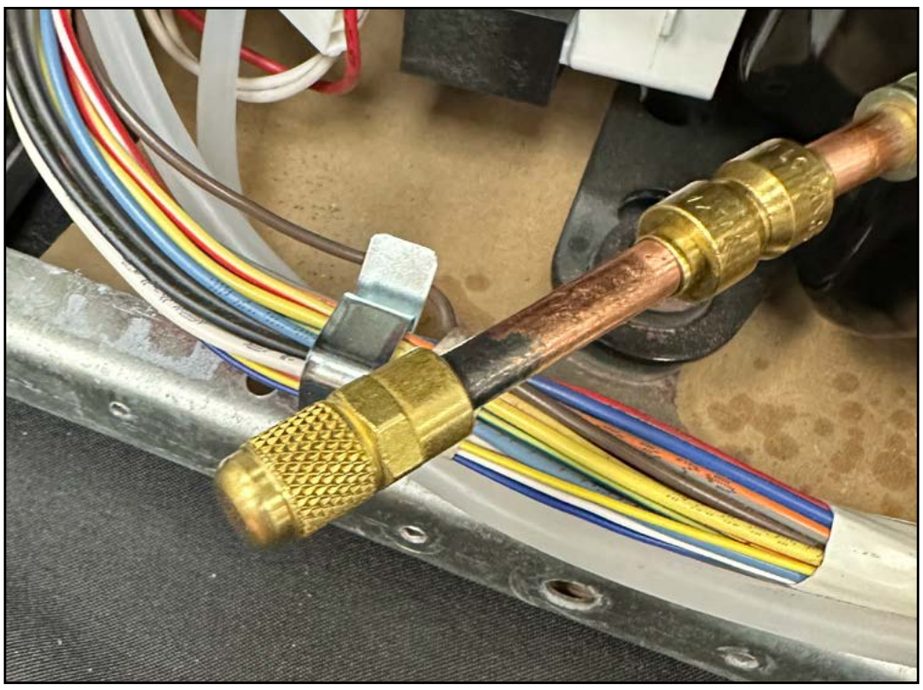
13. Once the compressor is on, watch the pressure on the low side of the manifold. Once it is in a vacuum, negative pressure, then close the ball valve on the Schrader valve removal tool on the low side. This process ensures that max amount of R600a is evacuated from the charging hoses into the sealed system.



14. Now the charging hoses and manifold can be removed from the refrigerator.

    14.1. If the manifold is needed to monitor pressures in the system for troubleshooting, follow steps 11 through 13 before removing the hoses to ensure no R600a is left in the hoses.

15. At this point, unplug the refrigerator.
16. After waiting at least 1 minutes (this allows the system pressures to equalize and there will be a positive pressure on both sides), follow the manufacturer's instructions of the Schrader valve removal tools to replace the Schrader valves.
17. Disconnect the Schrader valve removal tools.
18. Secure the Schrader valve cap on both the high and low sides to complete the charging procedure.



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FOR LITERATURE ORDERS (CUSTOMER EXPERIENCE CENTER):

PHONE: 1-800-253-1301

FOR TECHNICAL INFORMATION AND SERVICE POINTERS:

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