

HVAC Refrigerant Recovery and Evacuation Procedure

1.0 Maintenance Objective & Frequency

The objective of this procedure is to safely recover refrigerant from an HVAC system and perform a deep vacuum evacuation to remove moisture and non-condensable gases. Proper evacuation prevents acid formation, compressor slugging, and premature bearing failure. This procedure must be performed whenever the refrigerant circuit is opened for repair, component replacement, or scheduled maintenance. Frequency is as-needed based on system service events.

2.0 Lockout/Tagout (LOTO) & Safety

- **Electrical Isolation:** Disconnect all power to the HVAC unit at the disconnect switch and apply a personal lock and tag.
- **Refrigerant Safety:** Verify refrigerant type via nameplate. Wear safety glasses and chemical-resistant gloves. Work in a well-ventilated area or use a refrigerant monitor.
- **Pressurized System:** Ensure system pressure is at or below 0 psig before opening any lines. Use a manifold gauge set to verify.
- **Mandatory PPE:** Safety glasses, cut-resistant gloves, steel-toed boots, and long sleeves.

3.0 Required Tools, Parts & Lubricants

- Refrigerant recovery machine (e.g., Robinair 34788 or equivalent)
- Manifold gauge set with hoses (low side, high side, and center service port)
- Recovery cylinder (DOT approved, correct refrigerant type)
- Vacuum pump (minimum 6 CFM, capable of 500 microns)
- Electronic micron gauge (range 0-5000 microns)
- Vacuum-rated hoses (3/8 inch diameter recommended)
- Refrigerant scale (capacity 50 kg, resolution 10 g)
- Adjustable wrench (10 inch)
- Teflon tape or Nylog gasket sealant
- Service valve core removal tool (if required)
- Leak detection solution (electronic leak detector or soap bubbles)

4.0 Step-by-Step Maintenance Procedure

1. Confirm the system is electrically isolated and locked out. Verify zero voltage at the unit disconnect using a multimeter.
2. Identify the refrigerant type from the unit nameplate. Ensure the recovery cylinder is rated for that refrigerant and is not overfilled (maximum 80% fill by volume).
3. Connect the manifold gauge set: low side hose to the suction service valve, high side hose to the discharge service valve, and center hose to the recovery machine inlet.

4. Connect the recovery machine outlet hose to the recovery cylinder liquid port. Purge the hoses of air by briefly opening the recovery machine purge valve or using the manifold gauge to vent a small amount of refrigerant into the recovery cylinder.
5. Open both manifold gauge valves fully. Start the recovery machine and begin recovering refrigerant. Monitor the refrigerant scale to track the amount recovered. Continue until the system pressure drops to 0 psig and the recovery machine shuts off automatically or the pressure holds steady at 0 psig for 2 minutes.
6. Close the recovery cylinder valve and the manifold gauge valves. Disconnect the recovery machine. Replace the recovery machine inlet filter if the machine indicates a restriction.
7. Connect the vacuum pump to the center port of the manifold gauge set using a vacuum-rated hose. Connect the micron gauge to the system at a point as far from the vacuum pump as possible (e.g., at the service valve or a Schrader port).
8. Open both manifold gauge valves fully. Start the vacuum pump and allow it to run until the micron gauge reads 500 microns or lower. If the system is large or wet, perform a triple evacuation: pull vacuum to 1000 microns, break vacuum with dry nitrogen to 5 psig, then repeat the vacuum pull to 500 microns twice more.
9. Once the target vacuum is achieved, close the manifold gauge valves and turn off the vacuum pump. Observe the micron gauge for 10 minutes. A rise to 1000 microns or less is acceptable. A rapid rise above 1000 microns indicates a leak or residual moisture; locate and repair the leak, then repeat the evacuation.
10. Disconnect the vacuum pump and micron gauge. Close the service valves if equipped. The system is now ready for charging with the correct refrigerant type and quantity as per the nameplate.

5.0 Verification & Return to Service

1. Reconnect power to the unit and remove the lockout/tagout. Verify all electrical connections are secure.
2. Charge the system with the specified refrigerant type and weight per the nameplate. Use a refrigerant scale to measure the charge accurately.
3. Start the system and allow it to run for 15 minutes. Check suction pressure, discharge pressure, superheat, and subcooling against the manufacturer's specifications.
4. Perform a final leak check on all service valves and connections using an electronic leak detector or soap bubble solution. No bubbles or alarm indicates a tight system.
5. Record the recovered refrigerant weight, vacuum level achieved, final charge weight, and all operating pressures in the maintenance log. Sign off on the PM work order in ServiceGrid.

Regulatory Disclaimer: This document is a generic maintenance template provided for educational and informational purposes only. It does not constitute professional engineering or reliability advice. The end-user assumes all liability for validating all step sequences, torque specs, and LOTO protocols against specific machinery OEM manuals before deployment to a live production floor.