

Refrigeration Basics: Dual Evaporators & Deep Evacuation

Participant Guide
IH-02309-10

Rev. 2



Legal

Trademarks

Trademarks mentioned in this document are owned by their respective companies and corporations.

© All rights reserved. © 2016 Sears Brands, LLC This course contains proprietary training content and cannot be duplicated without express permission from Sears Brands, LLC. For internal use only.

Contents

Dual Evaporators & Deep Evacuation.....	5
<i>Introduction.....</i>	<i>5</i>
<i>Course Objectives.....</i>	<i>5</i>
<i>Evaporators.....</i>	<i>5</i>
Multiple Evaporators.....	5
Four Evaporators with Valve.....	7
4-way Valve - Samsung 4-door.....	8
3-Way Valve.....	9
Multi-port Valve Stepper Motor.....	10
3-Way Valve Service.....	11
<i>Sealed System Service Procedure: Deep Evacuation.....</i>	<i>12</i>
Deep Evacuation Steps.....	12
Sealed System Job Codes.....	14
<i>Course Summary.....</i>	<i>15</i>

Dual Evaporators & Deep Evacuation

Introduction

In this course, you will learn about dual evaporators and the procedure to perform deep evacuation.

Course Objectives

Upon completing this course, you should be able to:

- Identify the evaporator(s) that may be found on some refrigerator models.
- Understand different designs of dual evaporator products.
- Describe how the 3-way valve operates.
- Describe a deep evacuation procedure.
- Compare sealed system job codes.

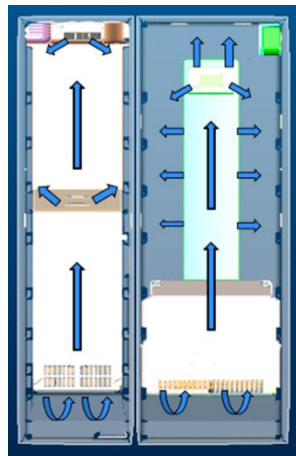
Evaporators

Multiple Evaporators

More than one evaporator may be found on some refrigerator models.

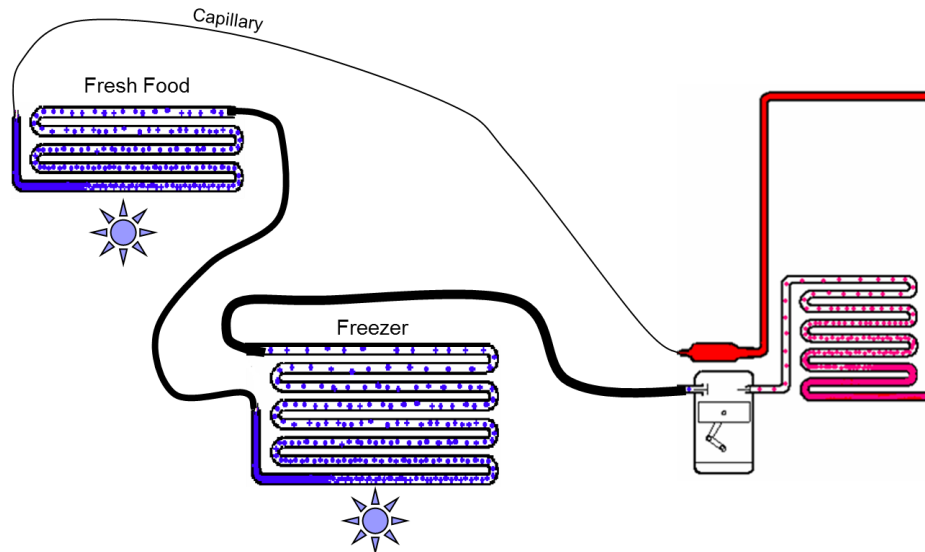
Benefits include:

- Efficiency
- Stable temperatures in separate compartments
- Higher humidity in fresh food compartment for longer life of fresh foods
- No transfer of odors from one compartment to the other

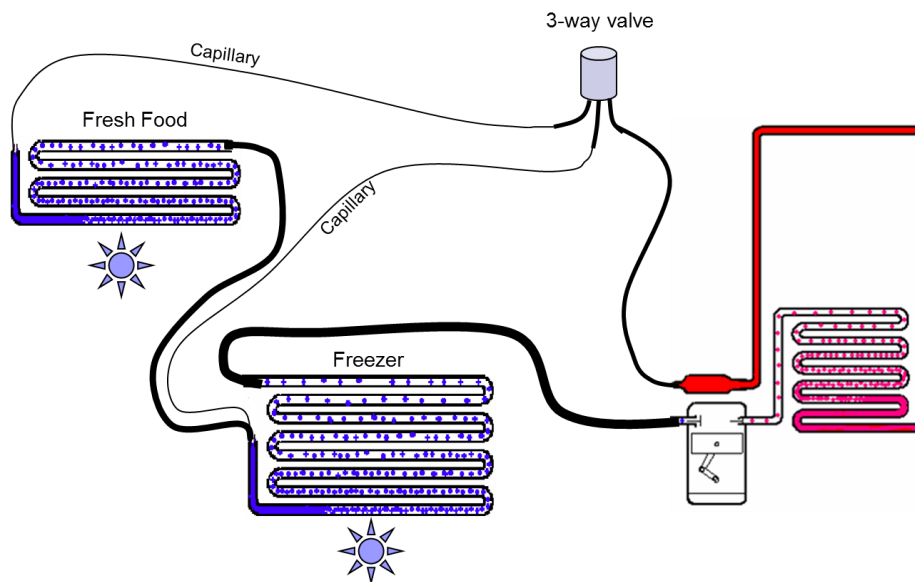


Whirlpool Corporation

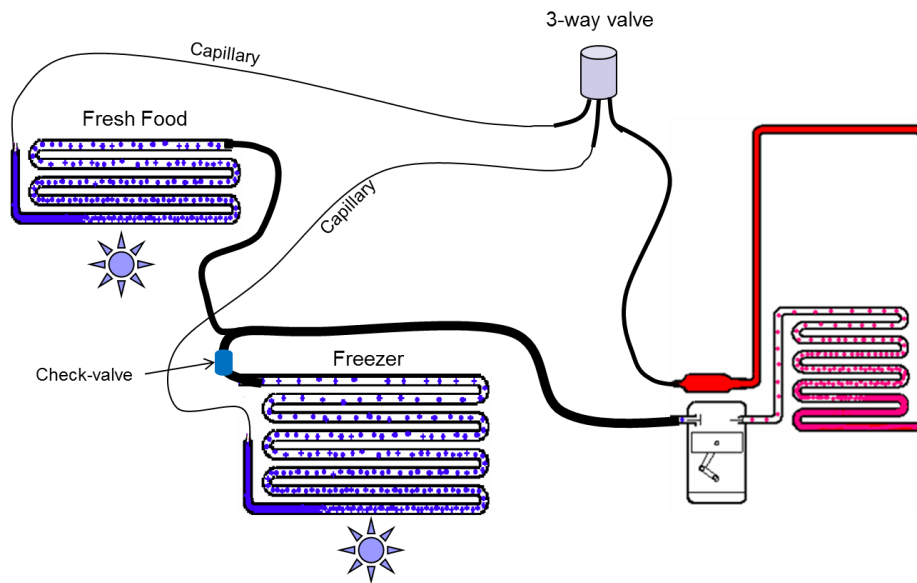
The following illustrations and descriptions show a variety of dual evaporator designs.



Above, refrigerant is routed through both evaporators (in series). The air is moved over the evaporator into each separate compartment. If the individual compartment temperature is reached, that compartment fan is turned off while the compressor and other compartment's fan continue to operate.



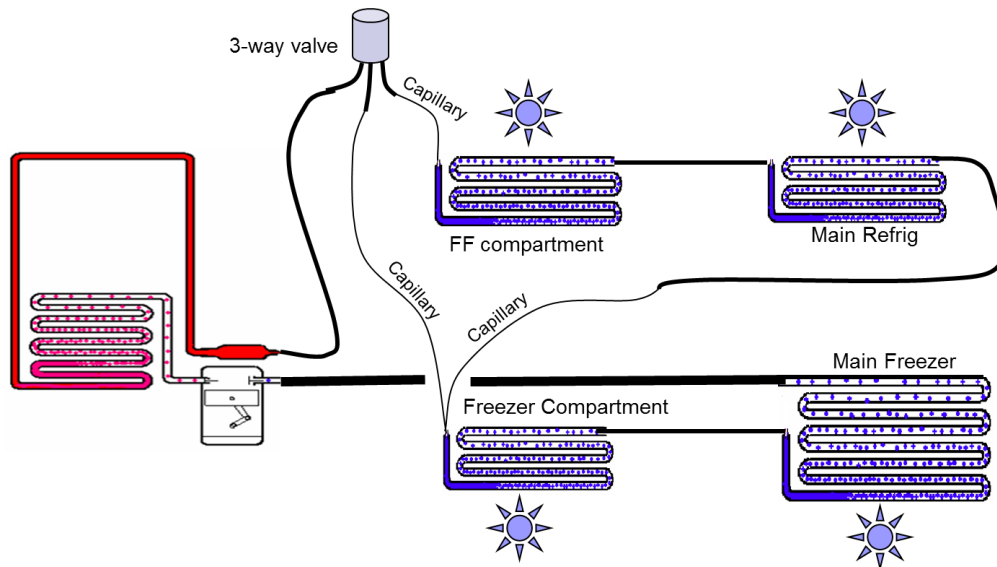
In this design, refrigerant is routed either through both evaporators (in series) just as it is in the previous design, or through the freezer evaporator only. The 3-way valve in this example is capable of opening only to one port or the other. If the valve will not move for whatever reason, the symptom may be that the fresh food is too warm or too cold, depending on which position the valve was in last.



In this design, refrigerant is routed through either evaporator or both evaporators (in parallel). The 3-way valve in this example is capable of opening to either one port only or to both ports. A check valve is added to keep refrigerant from going into the freezer evaporator during fresh-food-only operation, as well as to prevent the freezer evaporator pressure/temperature from rising. One manufacturer's design also allows the 3-way valve to close completely for a pump-down mode. Another manufacturer's design will allow refrigerant to flow in only one evaporator at a time.

Four Evaporators with Valve

In this limited edition Samsung 4-door from several years ago, four evaporators are isolated in each compartment and temperature is maintained by controlling airflow across the evaporator to each compartment.

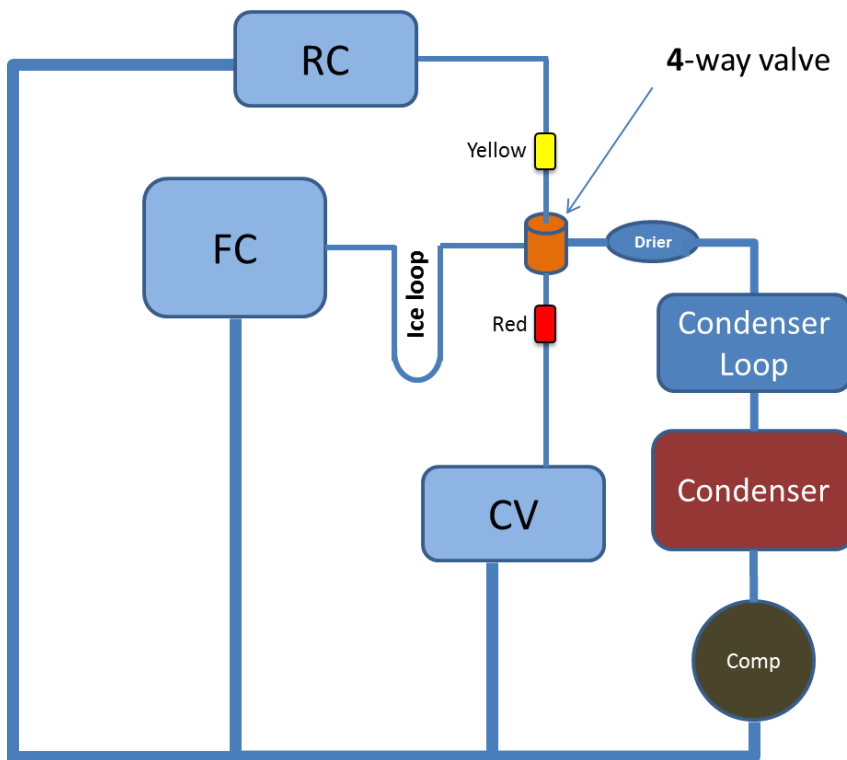


4-way Valve - Samsung 4-door

2013-2015 versions of the Samsung 4-door have 2 separate sealed systems; one with a 3-way valve and one without. The 2013 production of the dual sealed system design has one R134a system and one R600a system. **DO NOT ACCESS a R-600a SYSTEM!**

Both sealed systems of the 2014-2015 production use R134a.

The 2016 design of Samsung's 4-door refrigerator has a single sealed system using a 4-way valve to route refrigerant to either the refrigerator compartment, freezer compartment (which includes the icemaker loop), or the convertible compartment.



Refrigerant may be forced to each of the 3 circuits individually by using the forced mode.

In forced mode:

FF – Compressor run and valve position based on compartment sensor (needs)

FF r - Compressor run and valve open to RC (Yellow)

FF F - Compressor run and valve open to RC (no color)

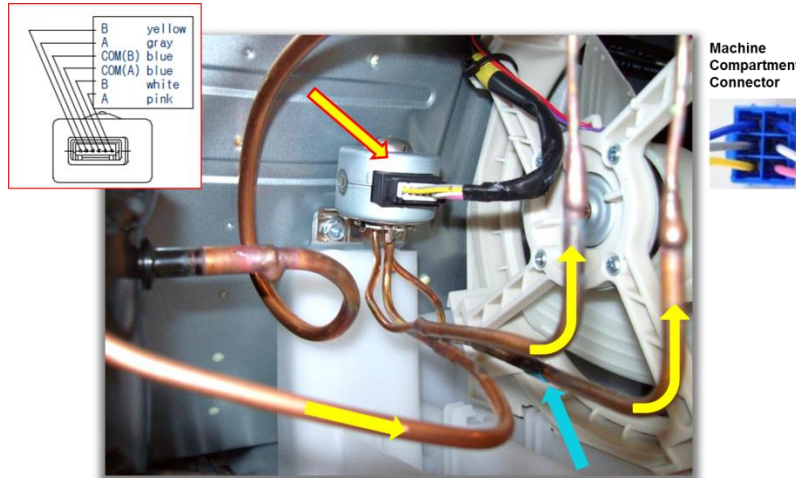
FF C - Compressor run and valve open to Convertible zone (Red)

F d: - Compressor off, defrost

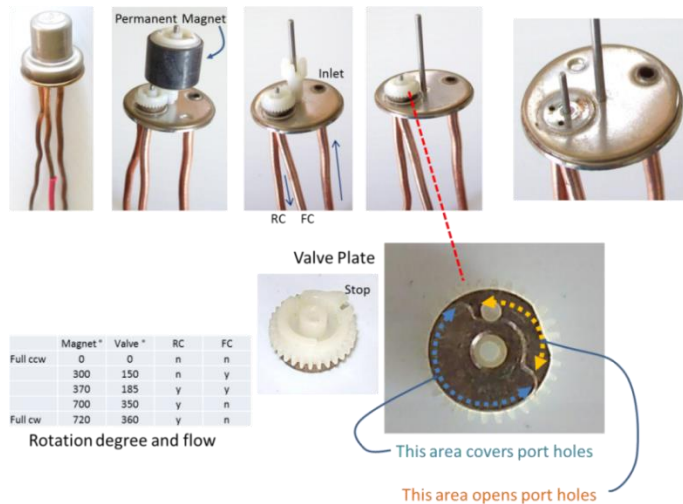
3-Way Valve

Below is an example of an LG manufactured source 795 Kenmore.

The inlet to the 3-way valve is from the filter-drier and there are two outlets for the evaporators. On this particular model, the fresh food evaporator port is identified with a small blue sleeve on the tube.



The valve is driven by a stepper motor. This particular one has six wires, but others have only five. The harness connector at the cabinet is the preferred disconnect point as the pins located right on the stepper motor are very small and easily bent. The machine compartment connector on this model is located near the fill valve on the right side when facing the rear of the cabinet.



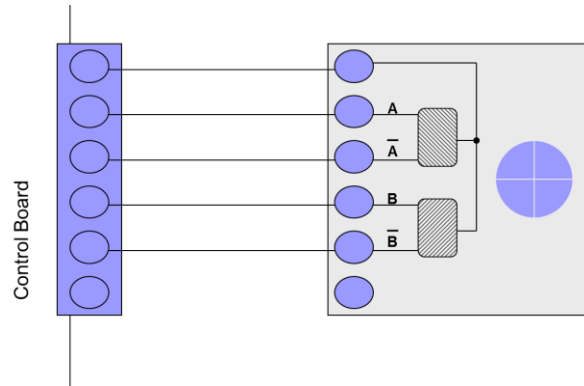
Samsung

In the above photo of an early Samsung 3-way valve, we see the permanent magnet that is attached to a gear driven valve plate that either covers or uncovers the port holes. The permanent magnet and attached gear is the armature of the stepper motor and are sealed inside the valve body.

When the refrigerator is first powered up, the control board drives the valve to the home position, and then from there it depends on programming and the needs of the individual compartments.

Multi-port Valve Stepper Motor

Most often, the valve that is used to divert the refrigerant from one path to the next is driven by a stepper motor that is similar to that of the stepper motor used on the air-damper or dispenser door.



Sections of the low-voltage coils are energized by the control board in sequence, allowing the rotor to be “stepped” to a pre-determined position. The position the 3-way valve is driven to is determined by the control board programming and temperature sensor feedback.

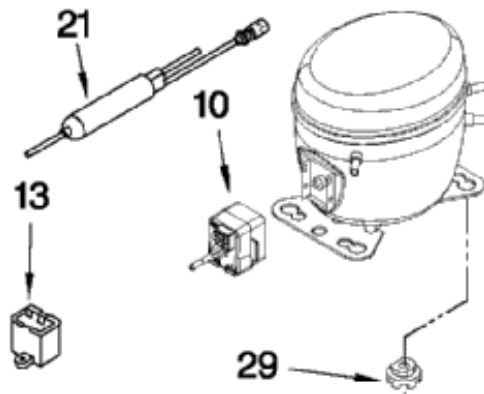
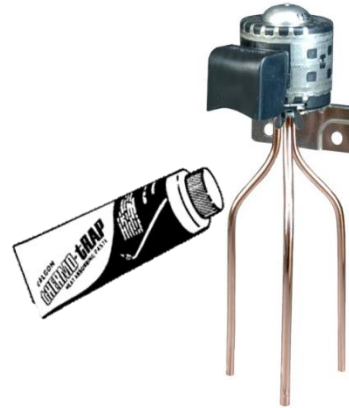
The control board provides a constant 12 volts DC to two windings that are each center tapped effectively giving it four windings.

3-Way Valve Service

In some cases, the stepper motor winding coil can be replaced separately without accessing the sealed system. Be sure the coil is completely seated onto the valve for proper operation.

If the valve requires replacement, use thermal paste to prevent internal damage when brazing.

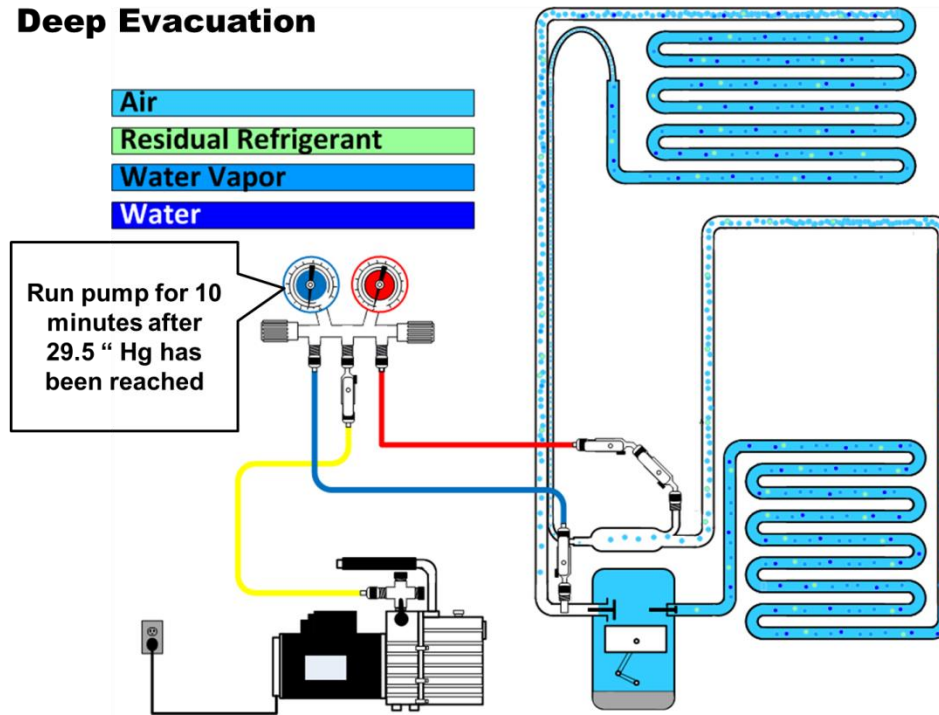
The filter-drier on dual evaporator refrigerators should be ordered also when any other sealed system component as it is different than the standard single-evaporator model filter-drier.



Sealed System Service Procedure: Deep Evacuation

Deep evacuation, as opposed to the sweep method, is required when performing sealed system repair on dual-evaporator refrigerators. Certain models should have the **3-way valve** placed in a particular position prior to servicing the sealed system.

Deep Evacuation



Micron Gauge
(Analog)

Each District should have a **micron gauge** in order to periodically **test your deep evacuation pump** for efficiency.

Deep Evacuation Steps

Deep evacuation using a vacuum pump is necessary on units having a multiple path for refrigerant flow in the sealed system. This is due to the sweep method limitations requiring a single path.

For deep evacuation, the following procedure should be used when performing a sealed system repair on a refrigerator with a dual evaporator or a sealed system that has multiple paths.

In your Tech Assit app, search for and watch the "[Deep Evacuation Clip](#)" video.

Step	Procedure
1.	Place the system (3-way valve) in the recommended recovery mode or position per manufacturer's instructions, if applicable.
2.	Using recovery equipment, recover refrigerant per EPA and Sears' standards.
3.	Perform required sealed system repair, leak test, and recover leak-test refrigerant charge.
4.	Before pulling a vacuum, make sure that a new drier has been installed and access ports are available on both the high and low side.
5.	<p>Hook-up hand valves and hoses to the manifold gauge, access ports, and vacuum pump.</p> <p>(Refer to the previous image when servicing refrigerators and freezers. For today, you will use one brazing project from each team to simulate a refrigerator sealed system. Use both brazed-on saddle valves as High-side and Low-side access ports.)</p> <p>For this activity at CTS, begin with step 5 and continue through step 12.</p>
6.	Check the vacuum pump and equipment by running the pump before opening the hand valves. Make sure the pump pulls down to 29.5" Hg or below. Turn the pump off and see if the gauge remains at 29.5" or below. If it does, proceed to the next step. If not, check hoses, valves, and hand valves. If ok, check pump and replace oil as needed. Follow manufacturer's recommendations for maintenance of pump.
7.	If the position of the 3-way valve or access to the multiple paths has changed, follow manufacturer's instructions to allow refrigerant flow through all evaporators or multiple paths as in step 1.
8.	Open all valves and operate vacuum pump until a minimum of 29.5 inches of vacuum is obtained, then operate the pump for an additional 10 minutes.
9.	Isolate the vacuum pump, turn it off, and wait for 10 minutes.
10.	If after 10 minutes the 29.5" of vacuum is maintained, then proceed with critical charge and step #13.
11.	If there is a steady loss of vacuum , then a leak in the system is indicated. Find and repair the leak.
12.	If the reading rises slightly and stabilizes , this indicates moisture in the system. Pull an additional vacuum by returning to step #8.
13.	After critical charge is weighed in on the high-side, wait a couple of minutes before disconnecting the low-side hand valve from the system port to ensure a positive system pressure. This

Step	Procedure
	eliminates the possibility of air being pulled into the system while disconnecting the hose.
14.	Cap both ports and check for leaks.
15.	Continue with standard sealed system service procedures concerning equipment and refrigerant allocation.

Sealed System Job Codes

Sweep (SC)

Compressor/Replace/SC
 RestrictedDrier/Rep/SC
 ContaminatedSystem/Rep/SC
 DyeDrier/inst/SweepCharge
 Condenser/Replace/SC
 Evaporator MinorRepair/SC
 Evaporator MajorRepair/SC

Deep Evacuation (DE)

Compressor/Replace/DE
 RestrictedDrier/Rep/DE
 ContaminatedSystem/Rep/DE
 DyeDrier/inst/DeepEvac
 Condenser/Replace/DE
 Evaporator MinorRepair/DE
 Evaporator MajorRepair/DE

When selecting a sealed system job code, any job code with SC is a sweep charge procedure.

Any job code that has DE in the description is a Deep Evacuation procedure.

You must use the applicable job code for the type of procedure you are using on each service order and appliance.

Course Summary

Now that you have completed this course, you should be able to:

- Explain the operation of dual/multiple evaporators.
- Understand stepper valve operation.
- Describe a sealed system deep evacuation.
- Compare sealed system job codes.