DEL1157S Delfield Training Manual

R-290 Refrigerant Model 406 & 4048 Service Training

This Document is a comprehensive service oriented manual focused on the Delfield model 406 refrigerator and the Delfield model 4048 refrigerator

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Overview

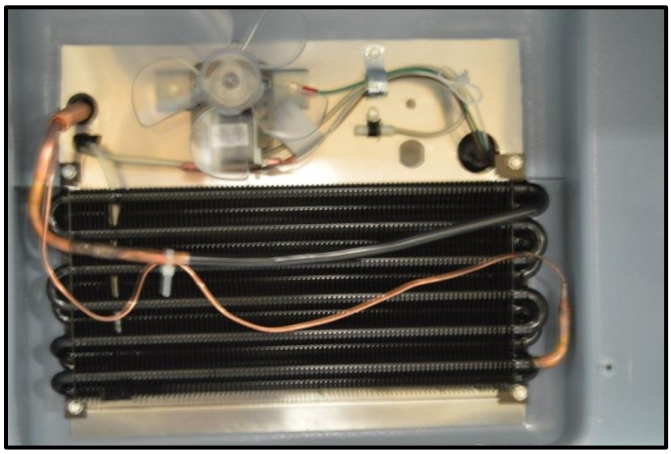
Delfield Under Counter Refrigeration Components Include:

- A self-contained R-290 (Propane) refrigerant system
- A Danfoss ETC solid state temperature control with on demand defrost
- Refrigeration metering device is a capillary tube

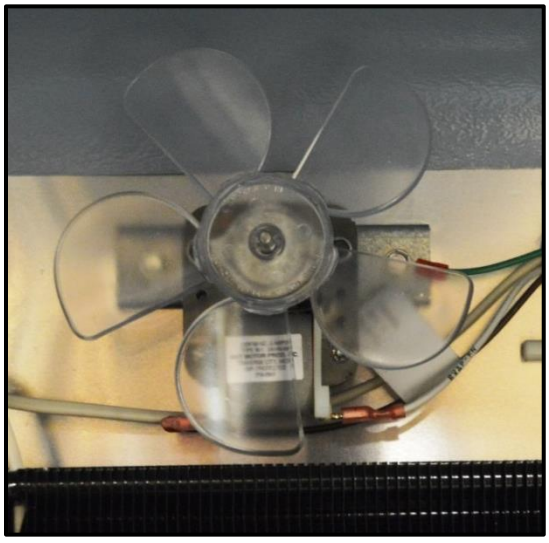




Overview

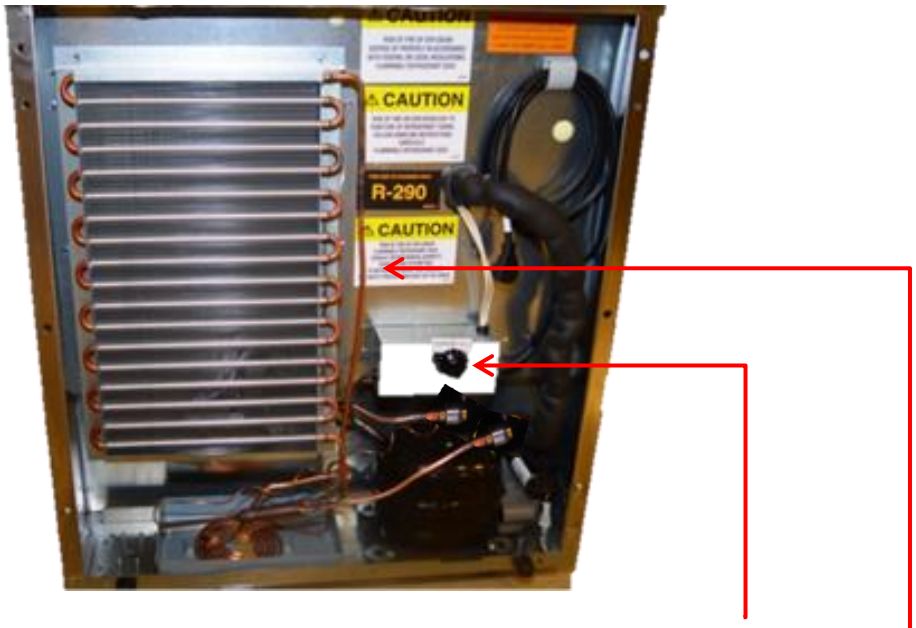


- Evaporator coil, capillary tube, and evaporator fan motor are accessed by removing the evaporator cover.

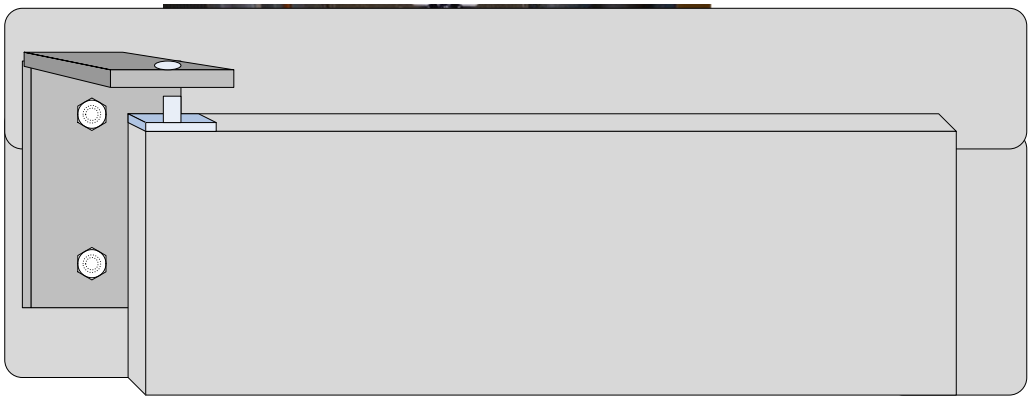


- An evaporator fan motor pulls air up through the evaporator coil and out through the fan guard.

Component Identification

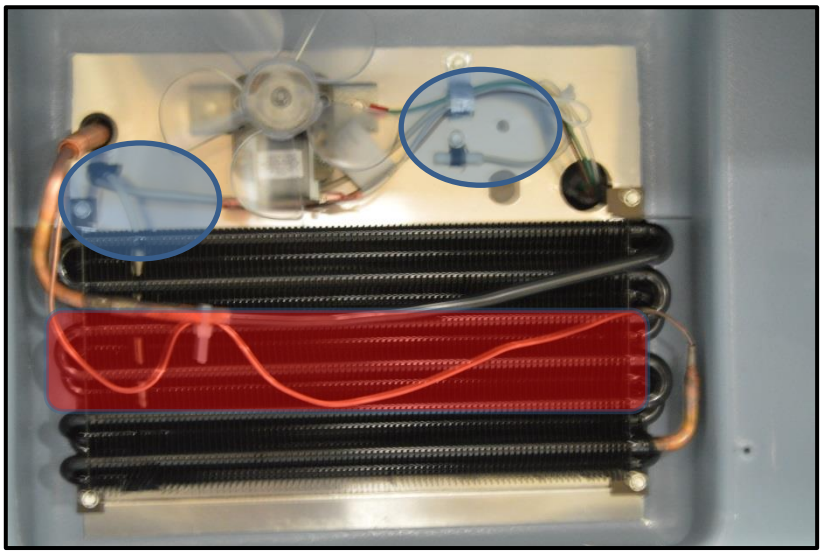


- The Danfoss ETC control is mounted to the control box mounted to the back of the unit.
- Labels describing the dangers of R-290 (Propane) are on the back of the unit.

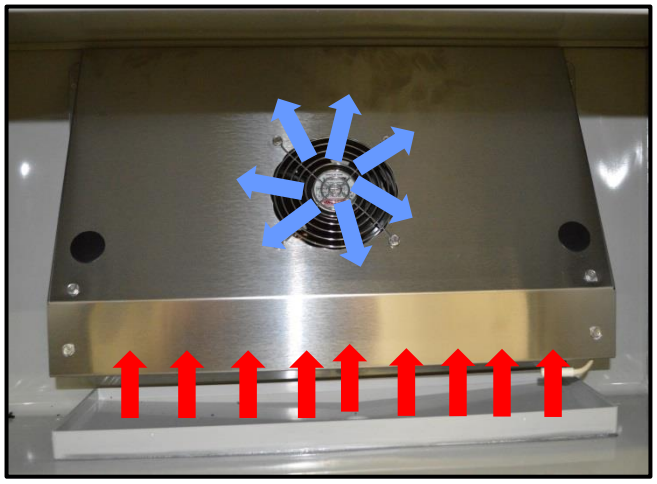


A hinge pin mounted in the door attaches to a mounting bracket screwed to the face of the door opening.

Component Identification



- Epoxy coated evaporator coil
- **Capillary tube metering device**
- Danfoss control thermistors

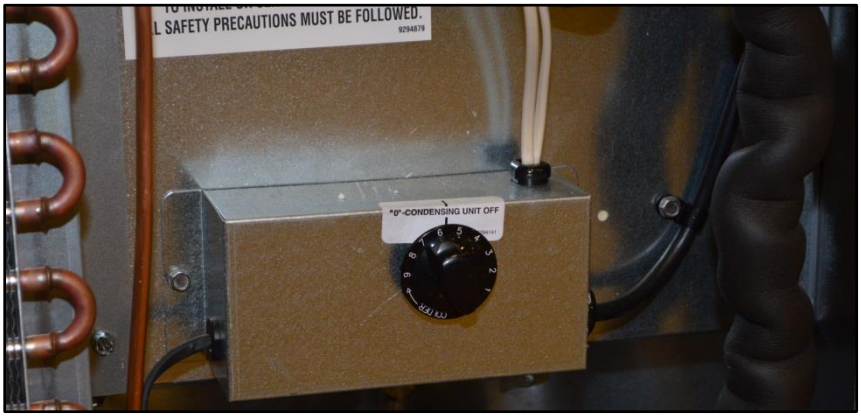


- The evaporator fan motor is mounted behind the evaporator cover
- Air is pulled through the coil from the bottom and out through the fan

Component Identification

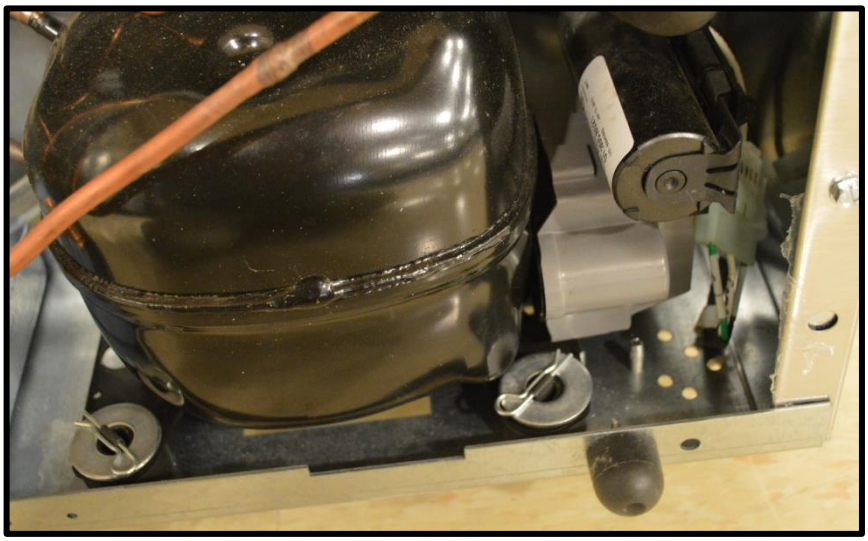


- The unit has a R=290 condensing unit
- The unit has a hot gas condensate evaporator
- Straight through airflow allows the unit to be flush against side walls



- The unit has a Danfoss temperature control
- Danfoss control thermistors sense coil and box temperatures
- Junction box on back of unit contains power cord and control

Component Identification



- Undercounter R-290 compressors have a spark proof cover over the electrical terminals and capacitor



- Under Counter units have a “Bullet” type push on gasket

Properties of R-290 (Propane)

- R-290 has been used in Europe for many years and has been accepted as a safe and efficient refirgerant with no ozone depletion properties
- R-290 is a alternative (not a drop in replacement) for most commonly used refrigerants
- R-290 is an effective refrigerant for low, medium, and high temperature applications
- It has zero ozone depletion and a negligible global warming potential
- Special care has to be taken with R-290 because of the flammability of propane
- R-290 units are equipped with a yellow warning label



Properties of R-290 (Propane)

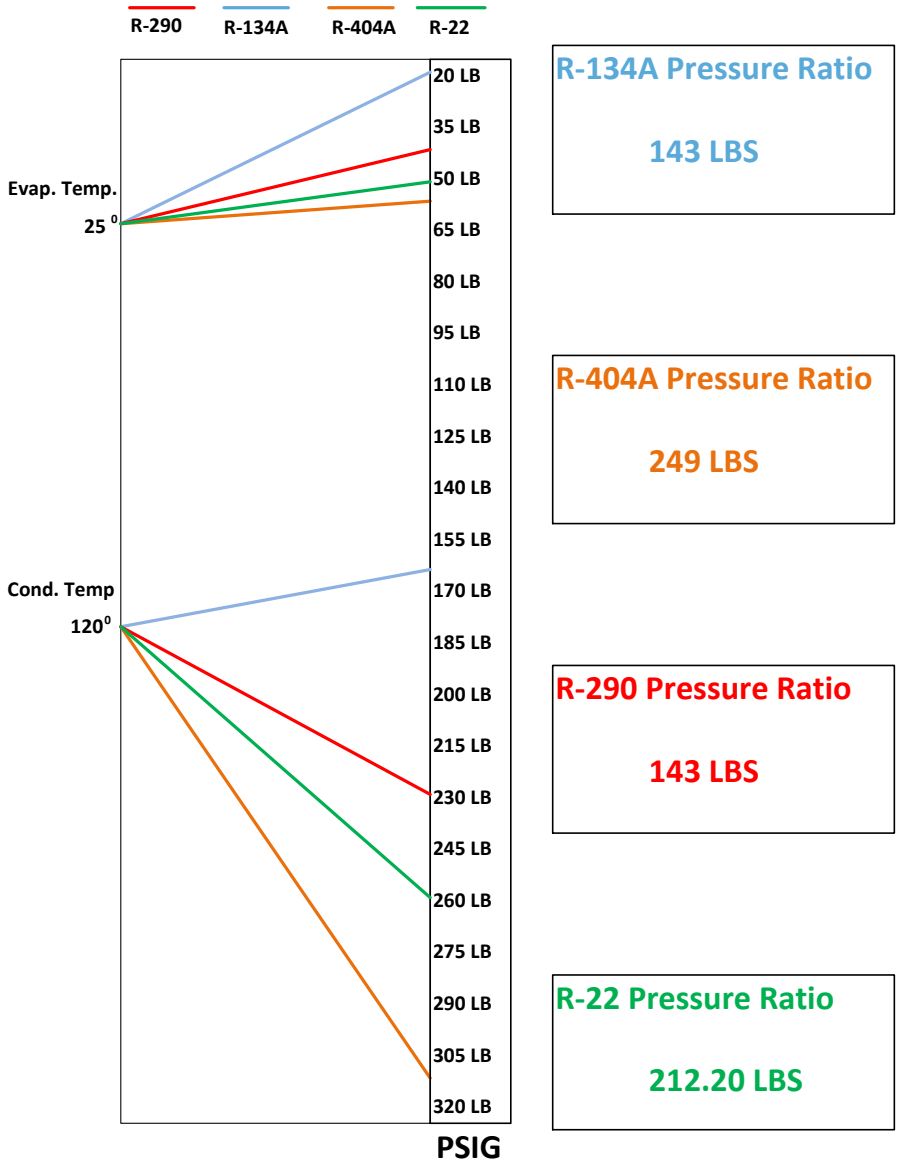
- The properties of R-290 differ from other refrigerants commonly used in small hermetic systems

Refrigerant	R-290	R-134A	R-404A	R-22
Name	Propane	**Tetraflouroeth**	Mixture R-125, R-134A, R-143	Isobutene
Boiling Point	-43.78	-15.7	-50.44	-41.44
Liquid Density	1.23 lbs.	3.02 lbs.	2.72 lbs.	3.0 lbs.

- The boiling point of R-290 is similar to that of R-404A. R-290 performs well in both medium and low temperature applications

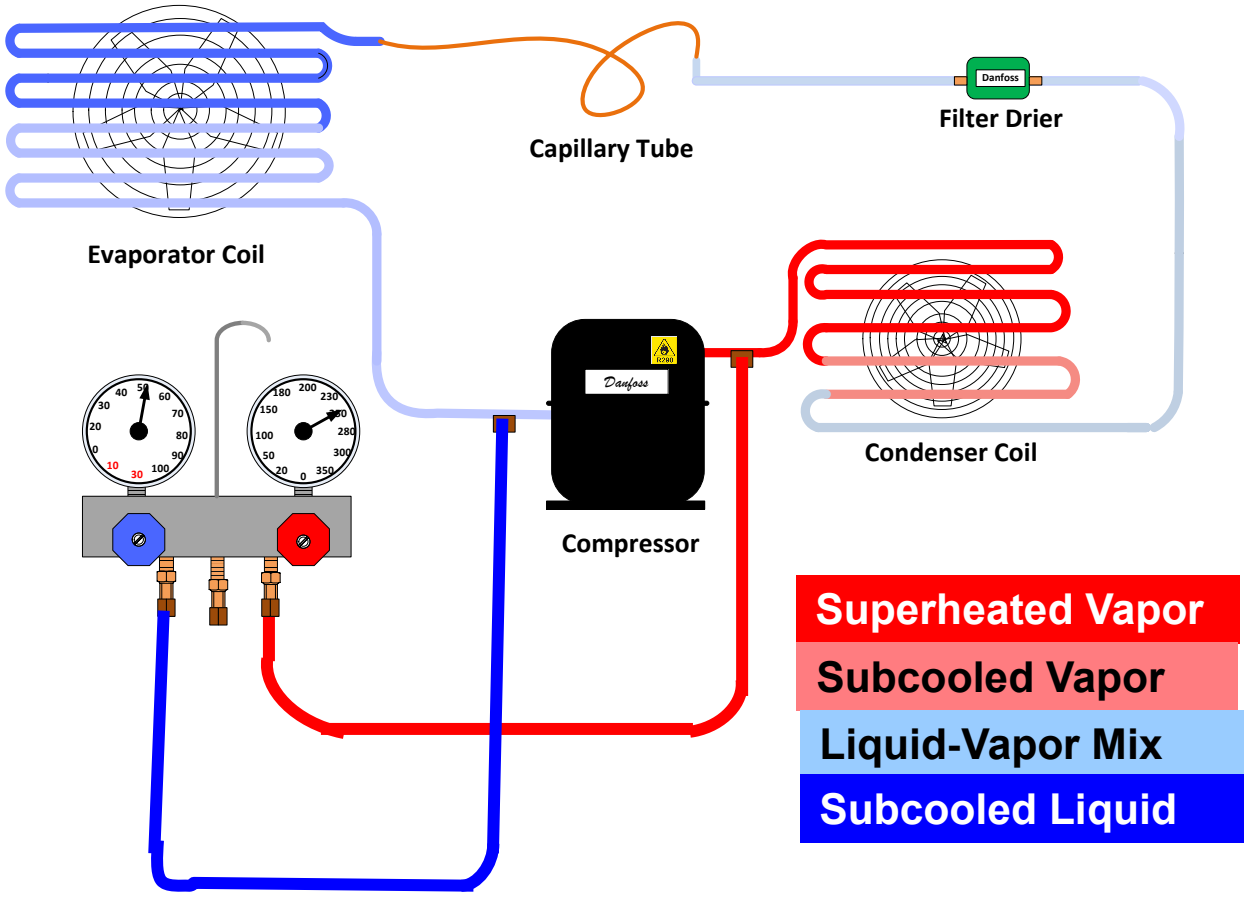
- The liquid density of R-290 requires system design similar to that of R-404A:
  a. Compressor sizing similar to R-404A
  b. Evaporator design similar to R-404A
  c. Pipe sizing similar to R-404A

Properties of R-290 (Propane)



- **Pressure Ratio Comparison**
- Based on 35 degree refrigerator temperature
- 10 degree evaporator TD90 degree ambient / 120 degree condenser temperature
- **<u>The lower the pressure ratio the better the efficiency</u>**

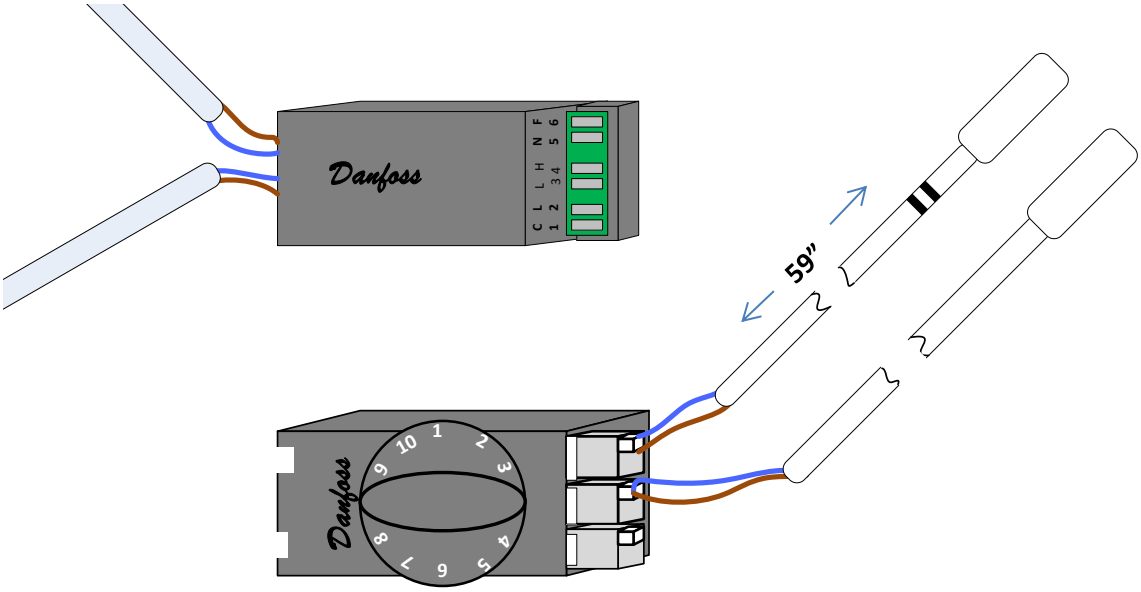
Properties of R-290 (Propane)



The R-290 refrigeration cycle is identical to the cycle of fluorinated refrigerants

Operation pressures will be similar to those of R-22

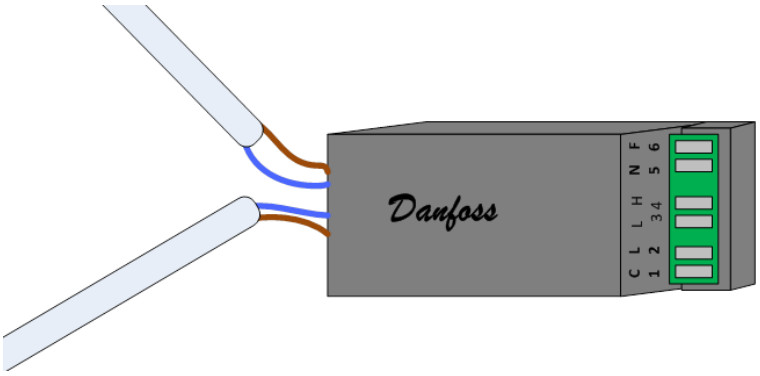
Control Specifications



The Danfoss Solid State temperature control includes:

1. Control
2. Thermistors (no stripe = air sensing ---- two stripe = coil sensing)

Control Specifications



Terminal	C	L	L	H	N	F
	1	2	3	4	5	6

C1 = component being controlled

L2 = Line Voltage

L3 = Line Voltage (second terminal)

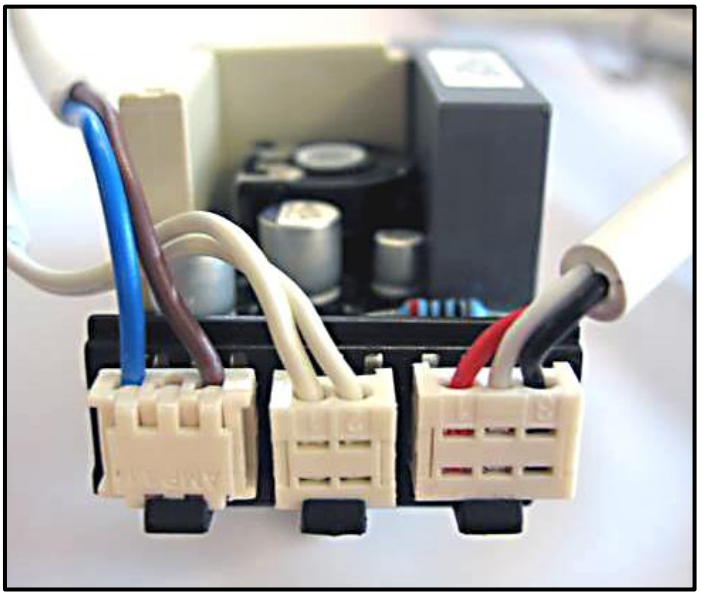
H4 = Defrost Heater

N5 = Neutral

F6 = Fans

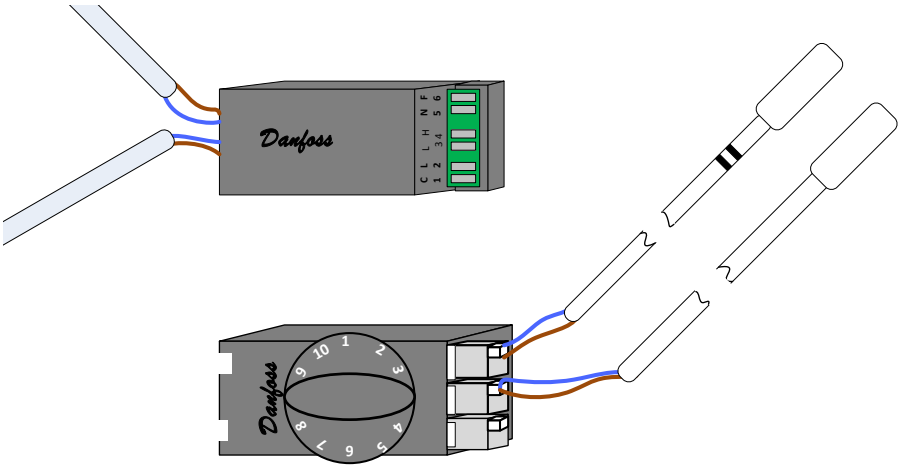
Control Specification

Thermistor connector ends will connect to only one spot on the control



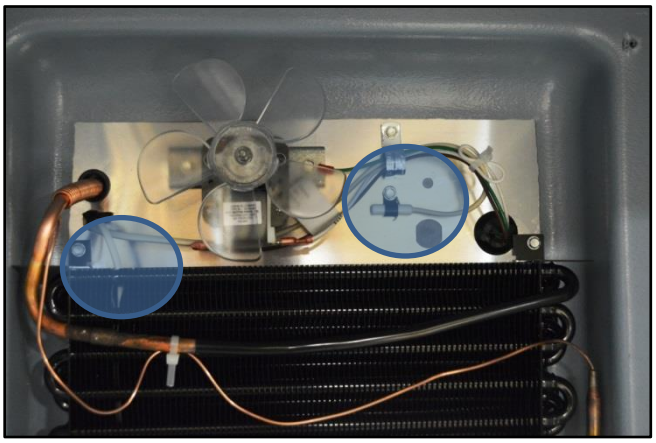
Connection #	Connection Description	Thermistor function
1.1 1.2 1.3	Display Cable	Powers LED display
2.1 2.2	Two Stripe Thermistor	Coil Sensing for Defrost
3.1 3.2 3.3	No Stripe Thermistor	Air sensing thermistor

Control Specifications



- The two striped thermistor is installed on the inlet of the evaporator and controls defrost

- No stripe thermistor is installed in the inlet air to the evaporator and cycles the condensing unit (controls the box

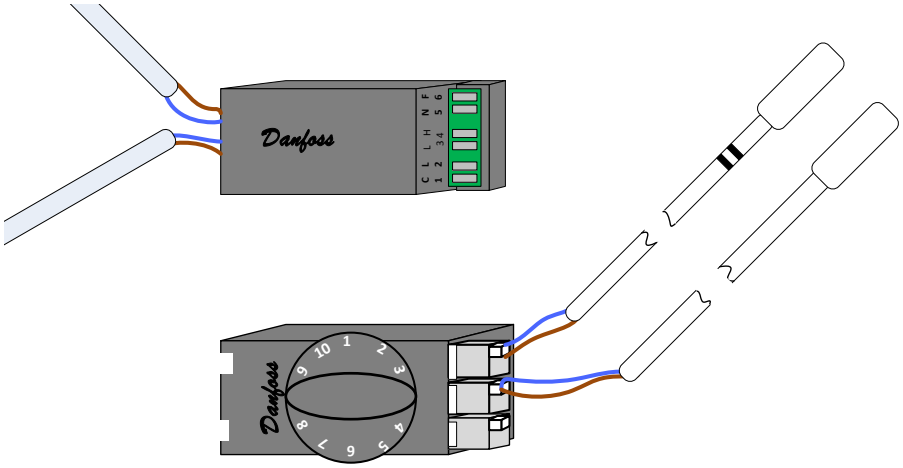


Unit Operation

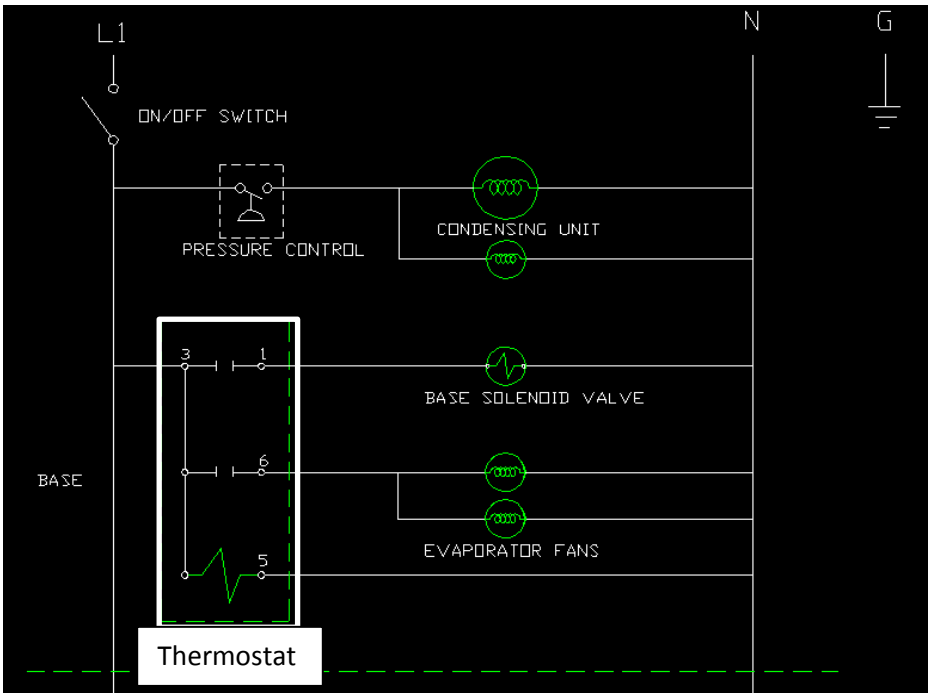
- When power is applied to the unit the control will “initial” the parameters into the control

- This process could take up to 30 minutes to complete

- The unit will not operate until this process is compete



Refrigerator Operation



- Evaporator fans will cycle on every 3 minutes during off cycle / **fans run continually during cooling cycle**

- **The refrigerator wil initiate a defrost** cycle when the following are satisfied

(a) At least 60 minutes of accumulated compressor tun time

and

(b) The coil temperature is -4 degrees F.

- 120 second drip time and 5 second fan delay after defrost cycle

Service Tips

- Thermistor resistance is 16330 ohms at 32 degrees F.

    a. 15000 to 17000 ohms at 32 degrees is acceptable
    b. The control must be mounted on the outside of the unit
    c. The control must be mounted in a clean and dry environment

- **Keep the control mounted in the box provided with cover installed and all screws in place**

- **Always remember to re-seal openings in the cabinet when replacing the thermistors.** Warm air infiltration willaffect the box temperature thermistor and cause the condensing unit to run constantly.

- The control knob has a “stop” at the coldest and the warmest setting.

- The control stem is made of plastic and will break if knob is forced past stop or pushed into the control.

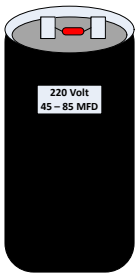


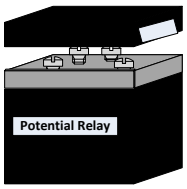


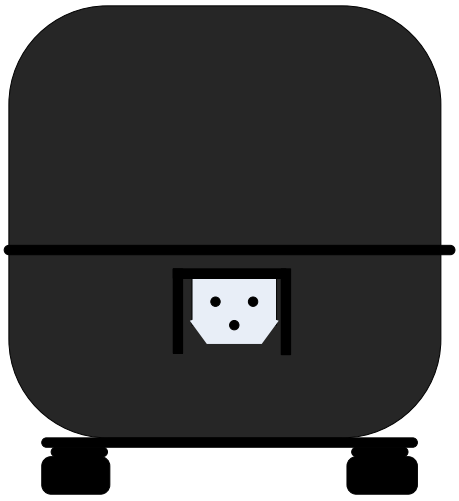
Avoiding Ignition

Before Repairing the Electrical System:

- Make sure the capacitors are discharged
- Never work on “live” electrical components and wiring
- Make sure the unit is grounded and the ground does not break
- Ensure that the casings on electrical components are not cracked or broken when charging or recovering refrigerant
- Replace components with factory specified components. Other components could result in ignition of refrigerant in the ambient from a leak







Avoiding Ignition

General Safety Precautions When Working With R-290

- **Technicians must be instructed on the correct service procedures with R-290**

- Working within confined spaces should be avoided

- No flammable materials are stored in the work area – **a 35/ft. radius free of any ignition sources should be maintained**

- Fire extinguishing equipment is available within the immediate area

- The work area is properly ventilated before working on the equipment

- Gas detectors should be present and operating to warn workers of concentrations of flammable refrigerants

- Only refrigerant handling and other service equipment designed for use with flammable refrigerants should be used when working on R-290 systems

Avoiding Ignition

Sources of Ignition and Avoiding Ignition

Sparks

- Electrical terminals including capacitor terminals must be tightened and secured against loosening. Wires must be insulated to prevent shorting and sparking. Electrical motors must be brushless.

Open Flames

- R-290 equipment should be positioned at a safe distance from open flames
- R-290 equipment should be positioned so that there are always air gaps around all sides of the equipment
- R-290 equipment should be installed in a well ventilated space

90% Air / 10% Propane Mixture Is Required For Ignition



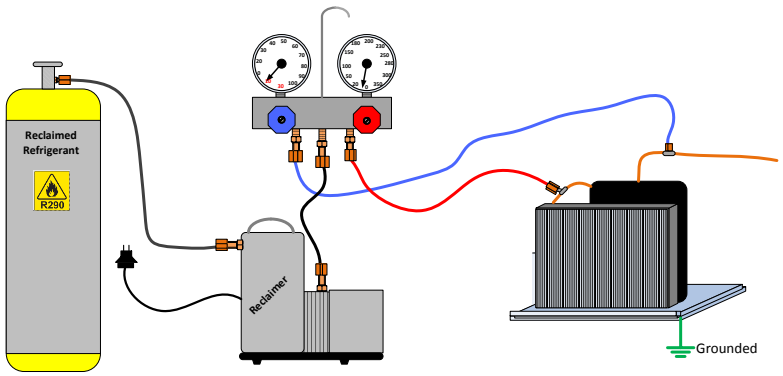
Service Procedures



- Always use gas detection equipment when working on R-290 systems
- Set the alarm to 15% of the LFL (Lower Flammability Level)

- Make sure all ignition sources are removed from the work area
- Flames, sparks, and static electricity can ignite leaking refrigerant

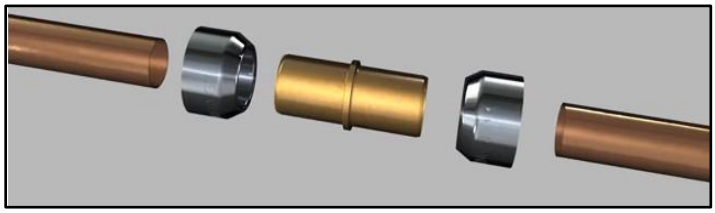
- **Always reclaim and purge system (twice) before using torch on system**



Follow evacuation / purging procedures

Lokring Fitting / Alternative to Soldering

Lokring's are safe, effective, and easy to install



Lokring tools must be used to install fittings



Step 1: Thoroughly clean area and cut with tubing cutter

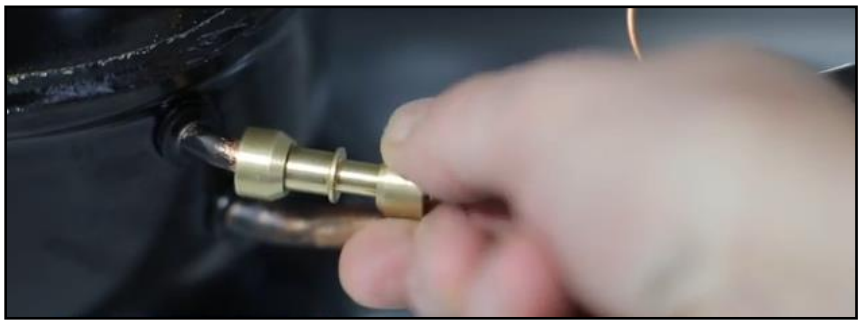


Step 2: Apply sealing fluid to both sides of tubing and slide on fittings

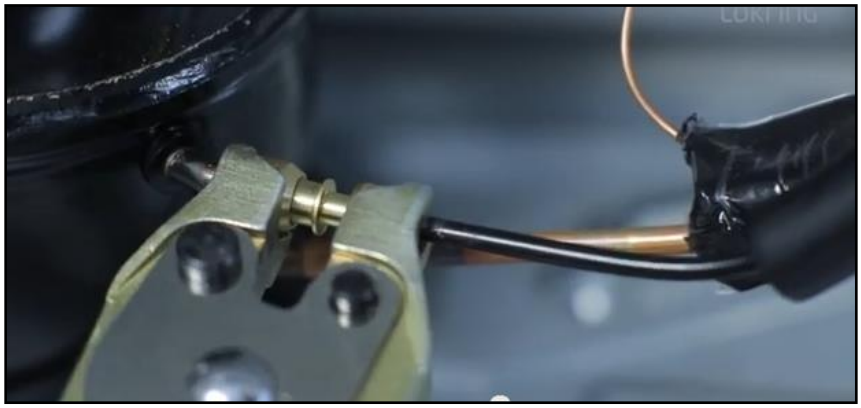


Lokring Fitting / Alternative to Soldering

Step 3: Push the connector onto the tubing



Step 4: Using the Lokring tool crimp the connectors together



Finished Connection



Service Procedures



Lokring fittings should be used to seal refrigeration lines on R-290 systems.

Tool parts numbers and quantities of Lokring parts necessary to service R-290 systems are as follows:

Quantity	Part Number	Description	Notes
1	L13003829	Hand tool w/double hinge handles	
2	L20000200	Assembly Jaw-Hand Tool MB8	
1	L14000878	Lok Prep 15ml	Good for 1 yr.
12	L13000766	Brass end caps .25	Use 2 per cap

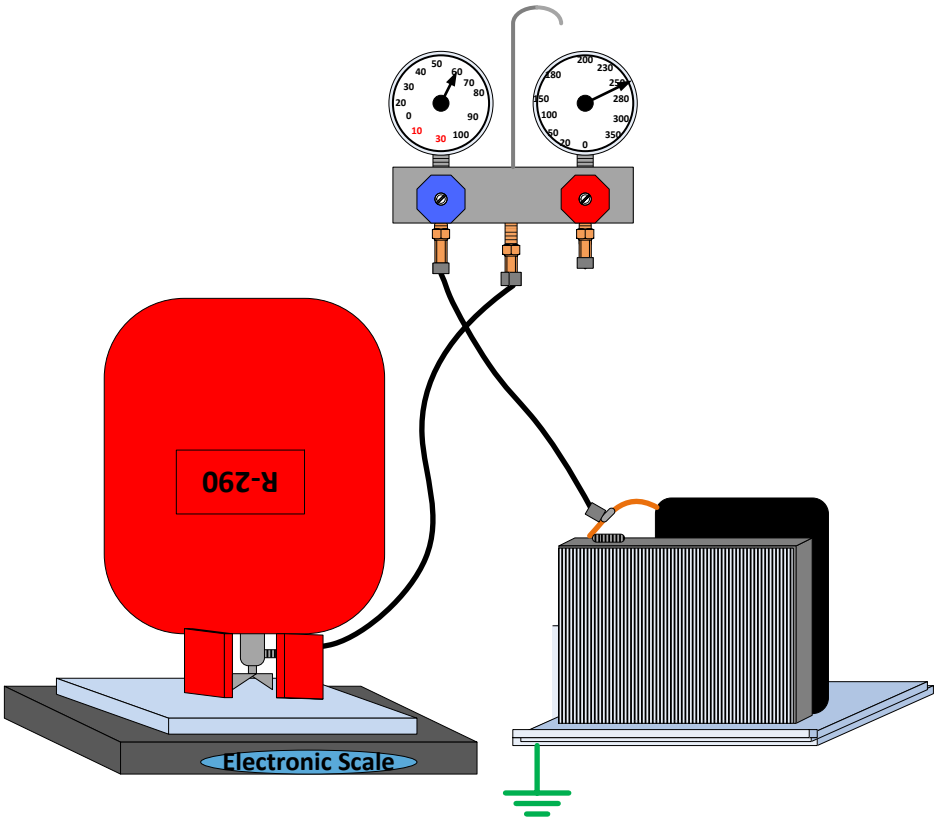
Phone numbers to order parts: PA.800-304-0153 and FL. 877-861-0955

*To purchase from other vendors reference # WX5X1 for Lokring tool

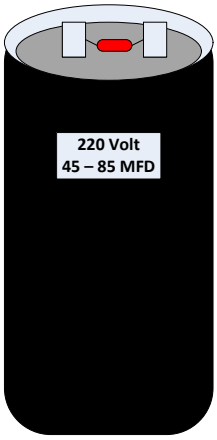
Service Procedures

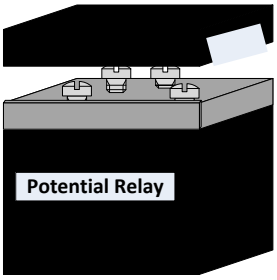
- Charging with R-290
- Charging with R-290 is similar to charging systems with hydrocarbons
- Like all blend refrigerants. R-290 systems must be charged with liquid to maintain correct composition of the blend
- **Be sure that the unit is grounded before charging**
- It is very important to take care NOT to overfill the system

Hydrocarbon charge sizes are typically 40% to 50% less than that of fluorocarbons

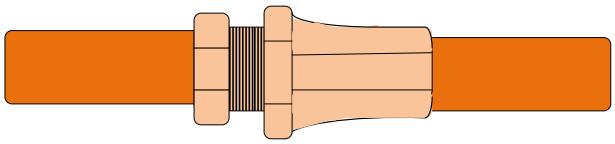


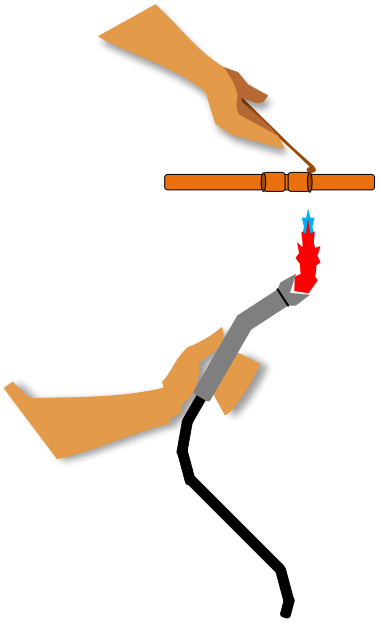
Service Procedures





- Always use factory approved components that are designed to prevent sparking

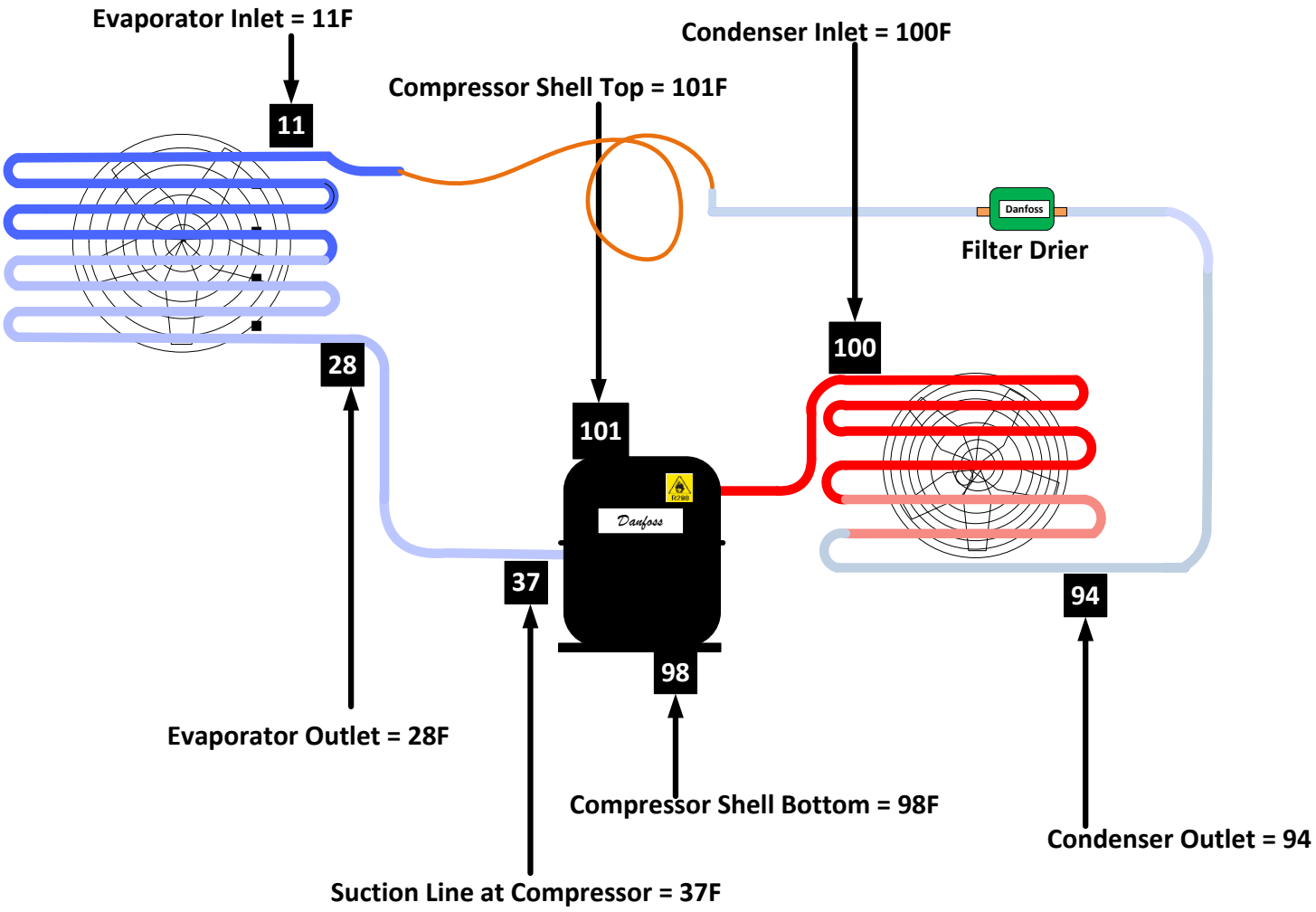




- Avoid flare or other mechanical fittings – braze fittings whenever possible

Trouble Shooting

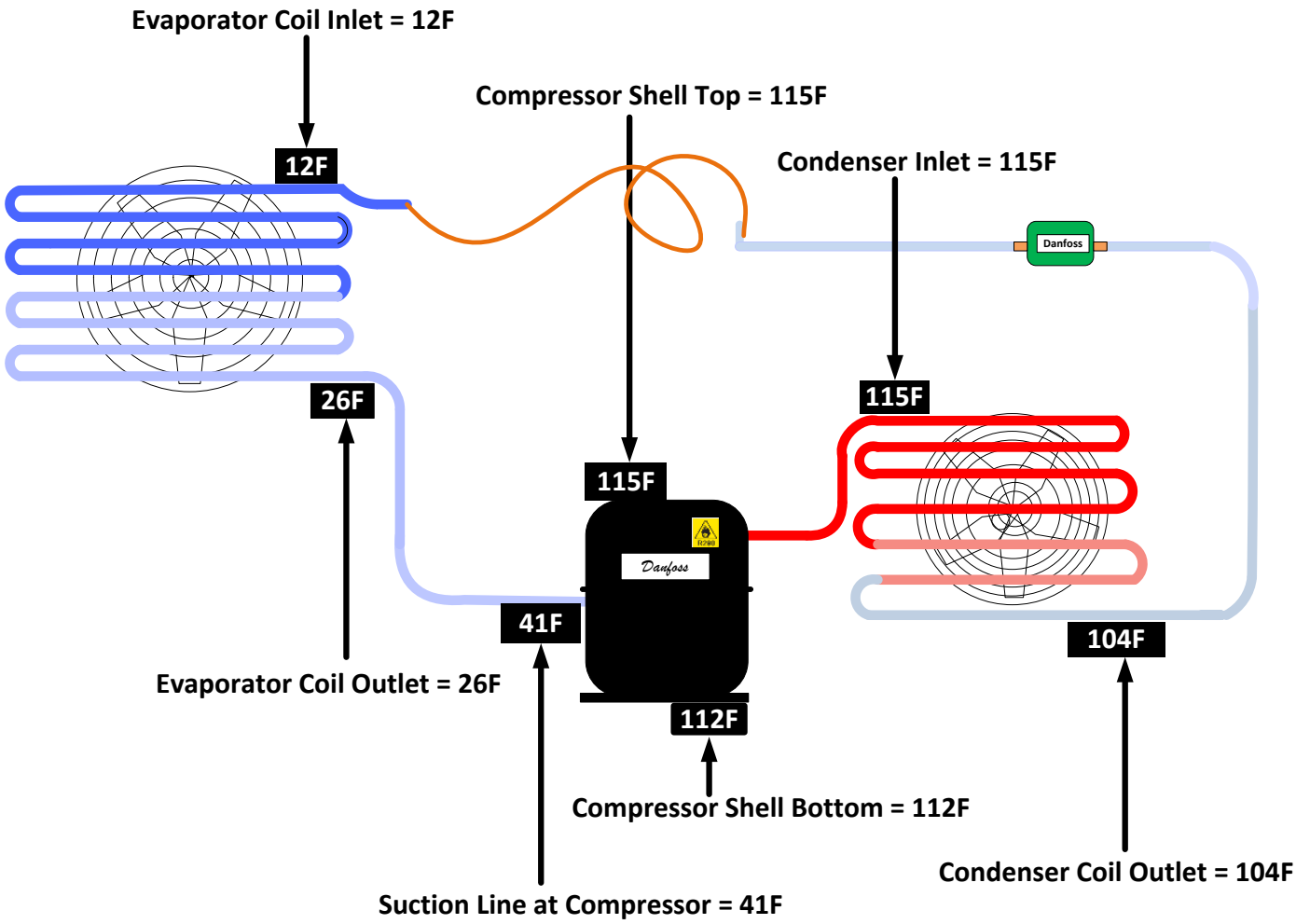
75 F Ambient / 32 Degree Box Temperature



Evap. Inlet	Evap. Outlet	Suction Line	Comp. Top	Comp. Bottom	Cond. Inlet	Cond. Outlet
11F	28F	37F	101F	98F	100F	94F

Trouble Shooting

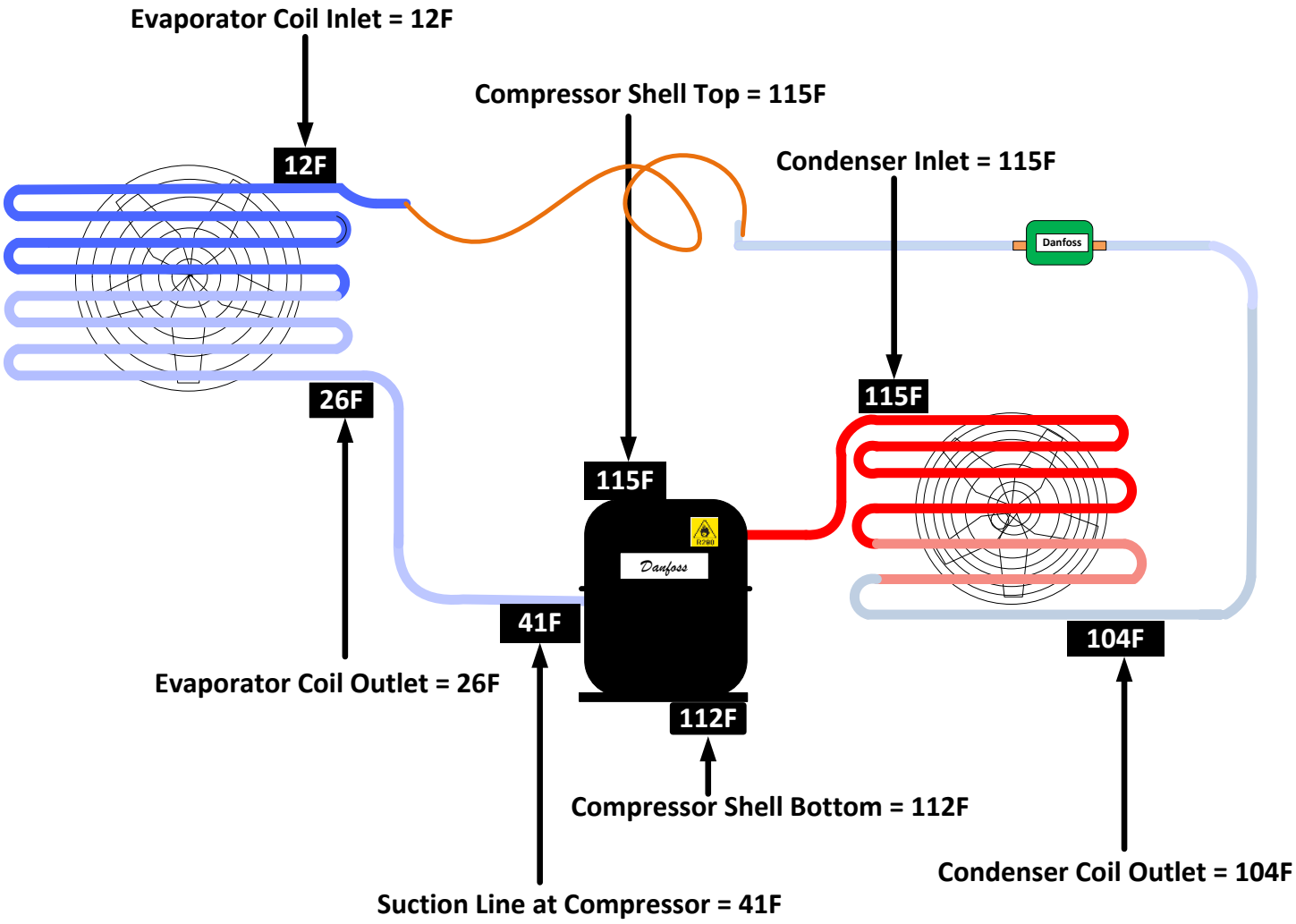
86 F Ambient / 32 Degree Box Temperature



Evap. Inlet	Evap. Outlet	Suction Line	Comp. Top	Comp. Bottom	Cond. Inlet	Cond. Outlet
14F	28F	45F	132F	129F	131F	117F

Trouble Shooting

100 F Ambient / 32 F Box Temperatures



Evap. Inlet	Evap. Outlet	Suction Line	Comp. Top	Comp. Bottom	Cond. Inlet	Cond. Outlet
12F	26F	41F	115F	112F	115F	104F

Cleaning and Maintenance

Interior and Exterior

Both interior and exterior can be cleaned using soap and warm water. If this is insufficient an ammonia / water mixture can be used or even a non-abrasive liquid cleaner.

Stainless Steel Care and Cleaning

Routine cleaning can be done with soap and water

Any cleaning solution used needs to be alkaline based or non-chloride

Use only soft cloth or plastic scouring pads

When cleaning stainless steel, always work with the grain of the stainless steel

There are also stainless steel cleaners which will restore and preserve the finish





Cleaning and Maintenance

Maintenance Guidelines

- Keep the condenser coil clean
- Clean the cndenser coil as oftem as needed or at least every three months. Blow the dust and dirt out of the coil. Protect all the electrical components including the condenser fan from liquid cleaners. Clean the condensre fan blade.
- Do not bend the condenser fins or the tubing

- Clean the evaporator coil

- Use the same methods listed above to clean the evaporator coil

- Clean the condensate drain as often as needed or at least every three months

- Clean and grease the roller bearings on drawer units using a food grade grease

Transporting R-290 Refrigerant

For information on the safe and lawful means and methods of transporting R-290 refrigerant refer to the Environmental Protection Agency (EPA) guide at this location:

http://www.epatest.com/608/manual/Manual.htm

This is a free manual containing useful information on R-290 Safe Service, Tips, and Techniques including the Department of Transportation (DOT) rules and regulations.

Warranty Information



Delfield refrigerators and Freezers are covered with a “One Year Parts and Labor Warranty”

For Warranty Information call KitchenCare Customer Service at:
844-724-CARE (2273) or on-Line at **WWW.mtwkitchencare.com**

406P and 4048P Critical Parts List

Part #	Description	Suggested stock (< 5 units)	Suggested Stock (> 5 units)
219 4810 kt-S	CTRL,REF,DANFOSS. 115V WITH PROBES	1	2
352 7140	COMPRESSOR 115V, EMBRACO	*AVAILABLE OVERNIGHT	*AVAILABLE OVERNIGHT
180-CJL-0032-S	CAPILLARY TUBE, 406/4048	1	2
351 6172-S	EVAP. FAN BLADE	1	2
216 2691-S	EVAP. FAN MOTOR	1	2
351 6172-S	COND. FAN BLADE	1	2
216 2691-S	COND. FAN MOTOR	1	2

*Compressors are available to be shipped overnight when needed, overnight shipping covered under the Delfield warranty

*Part list current as of 1/6/16

Thank You for Attending This Training

DEL2157A Delfield 406 Refrigerator and 4048 Refrigerator, R-290 Refrigerant Service Training