Delfield

DEL1157S Webcast R-290 406 & 4048 Service Training

Duration: 1hrs.

MII-107
9/13

Manitowoc Parts & Service Communicator

Subject: Counterfeit and Imitation Components

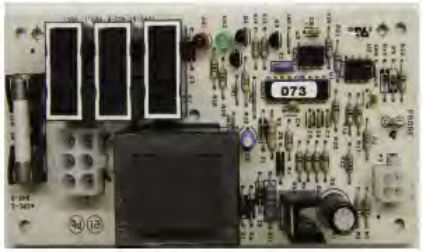
It has come to the attention of the Service Department that counterfeit/imitation parts are being used as replacement components. In the instance below the control board that failed was a replacement board in a Q270 ice machine. In this instance the control board can be identified as a non OEM part with a quick visual glance. The control board layout is not the same as the Manitowoc component and construction is inferior. The Manitowoc distributor quickly identified the part as a counterfeit and notified the Service Department.

In the event that a counterfeit, imitation or non-OEM part is used in Manitowoc equipment, it may:

- Void any manufacturer's warranty
- Cause equipment failure or malfunction
- Significantly reduce equipment life and performance
- Create operator safety risks
- Void agency certifications
- Nullify insurance coverage

Please report any instances of counterfeit parts you encounter and send the part to the service department. Call 1-800-545-5720 and ask for the service department to report the issue and schedule shipping.

Counterfeit Control Board



OEM Control Board

Manitowoc 2110 S. 26th St., P.O. Box 1720, Manitowoc, WI 54221-1720, Tel: 920-682-0161, www.manitowocice.com

Manitowoc

Counterfeit and Imitation Components

It has come to the attention of the Service Department that counterfeit/imitation parts are being used as replacement components.

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- Void any manufacturer's warranty
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- Nullify insurance coverage

Please report any instances:

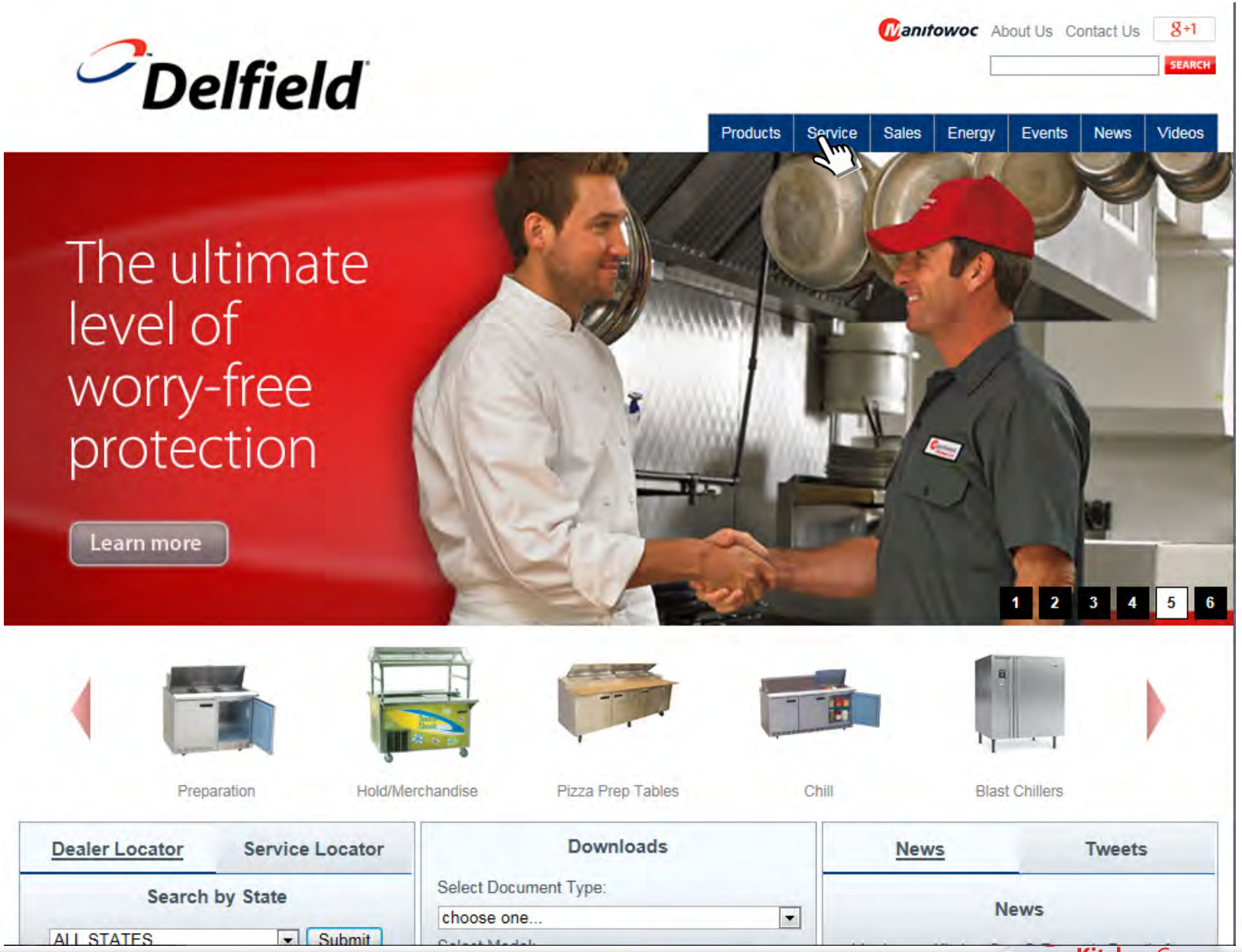
- *Toll Free: 844-724-CARE (2273)*
- *International: 727-359-0570*

Manitowoc KitchenCare

Manitowoc Food Service Policy / Procedures

Electronic Document Catalog

Electronic Document Catalog



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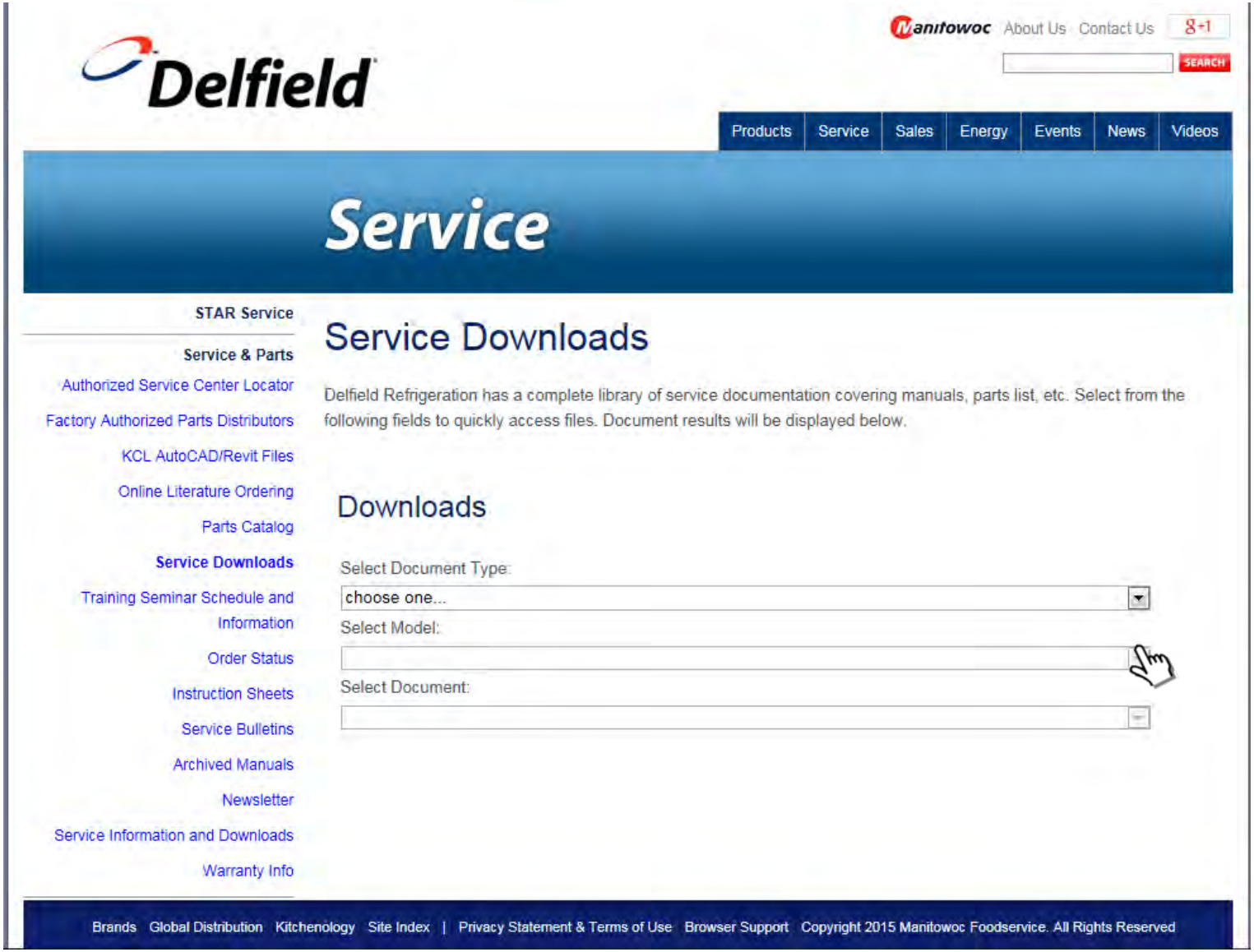
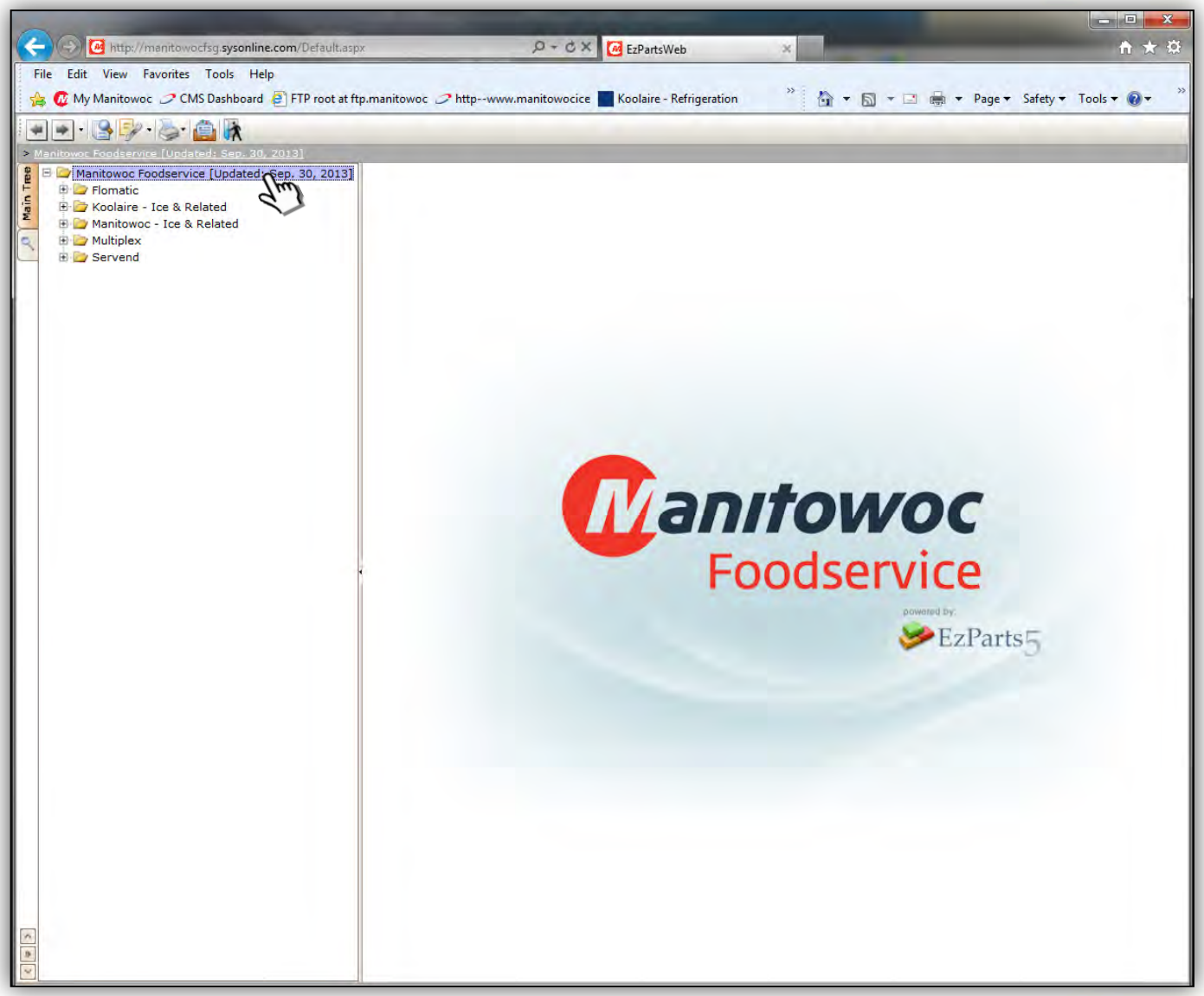


Manitowoc KitchenCare

Electronic Document Catalog



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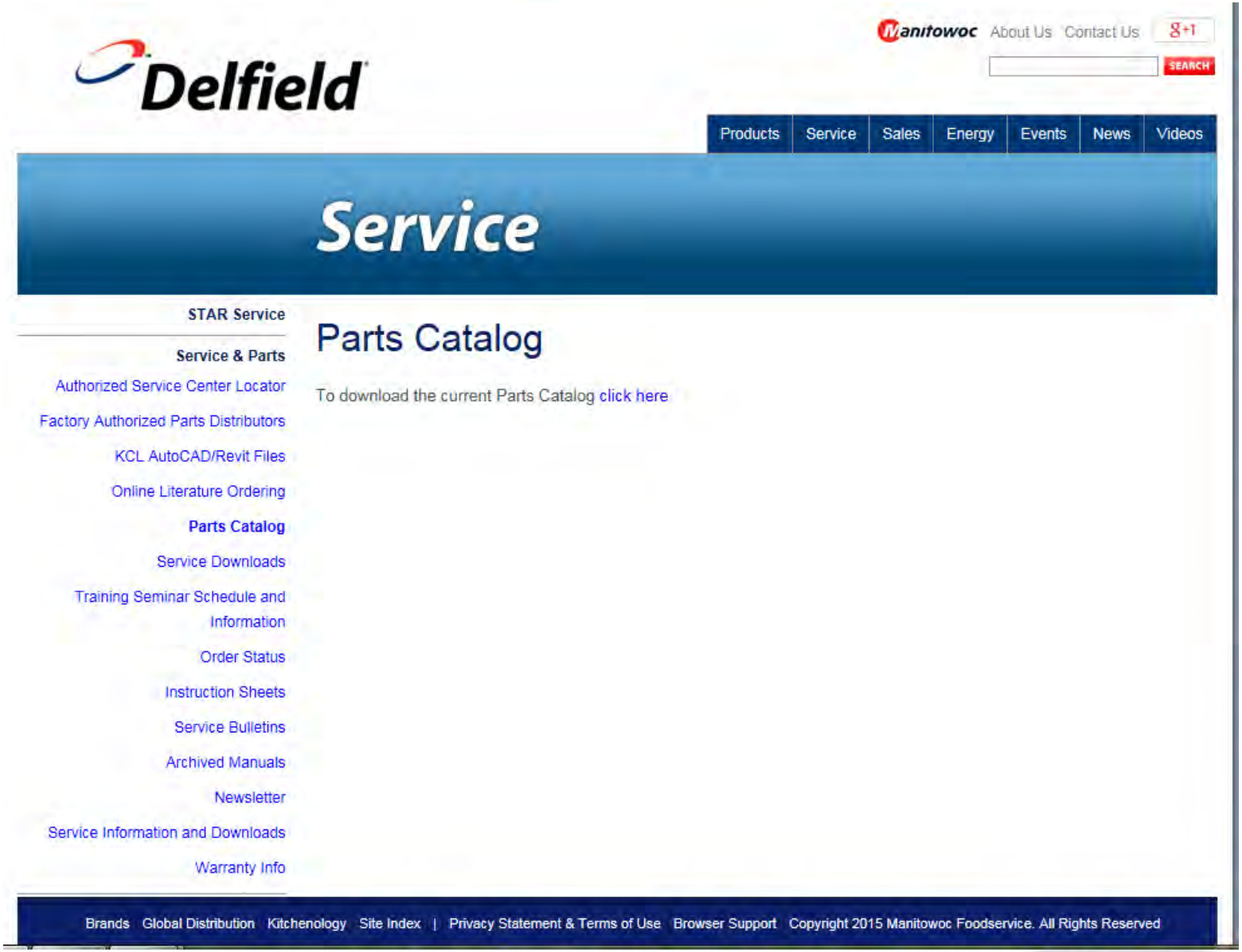


Manitowoc KitchenCare

Delfield

DEL1157S Webcast R-290 406 & 4048 Service Training

Duration: 1hrs.

Agenda

- *Overview*
- *Component Identification*
- *Control Specifications*
- *Unit operation*
- *Service Tips*
- *R-290 Properties*
- *Avoiding ignition*
- *Service Procedures*
- *Trouble Shooting*
- *Cleaning and Maintenance*
- *Transporting R-290 Refrigerant*
- *Warranty information*
- *Parts*

DEL2157S R-290 Service Training

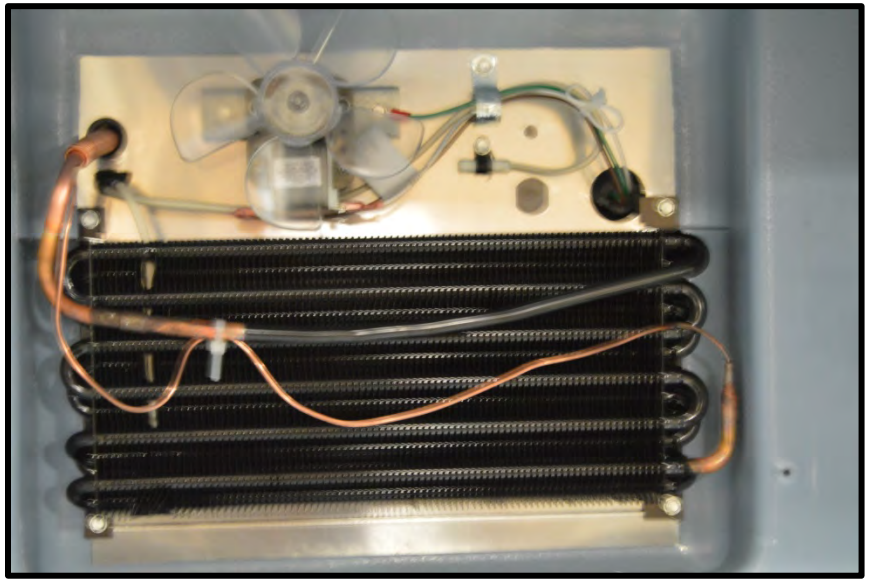
OVERVIEW

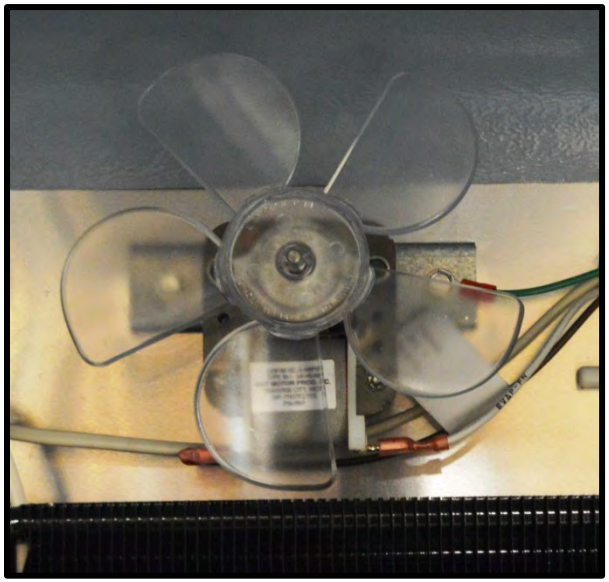
Overview

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

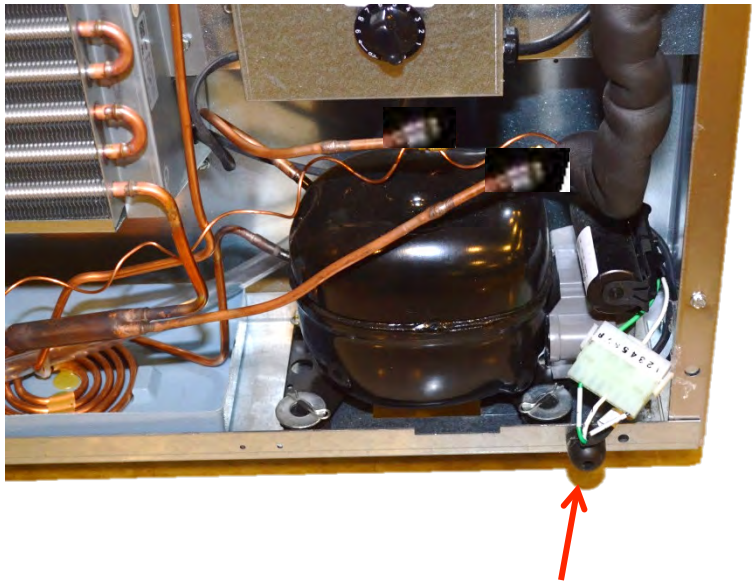




- *Evaporator coil, Capillary tube, and evaporator fan motor are accessed by removing the evaporator cover.*

- *A evaporator fan motor pulls air up through the evaporator coil and out through the fan guard*

Overview



- *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.*

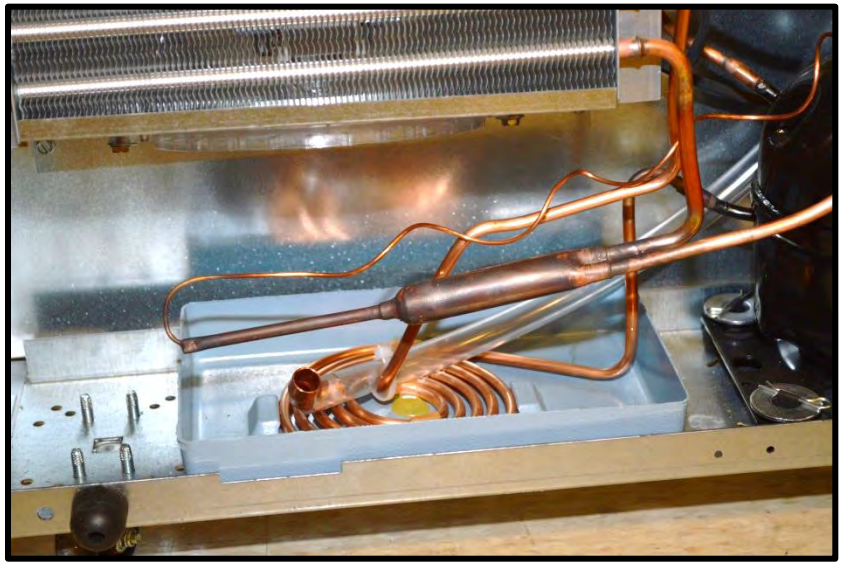
- *Delfield condensing unit is mounted so that air flow is from bottom up through the condenser coil. Rubber bumpers are installed to keep the unit 2” from the back wall.*

DEL2157S R-290 Service Training

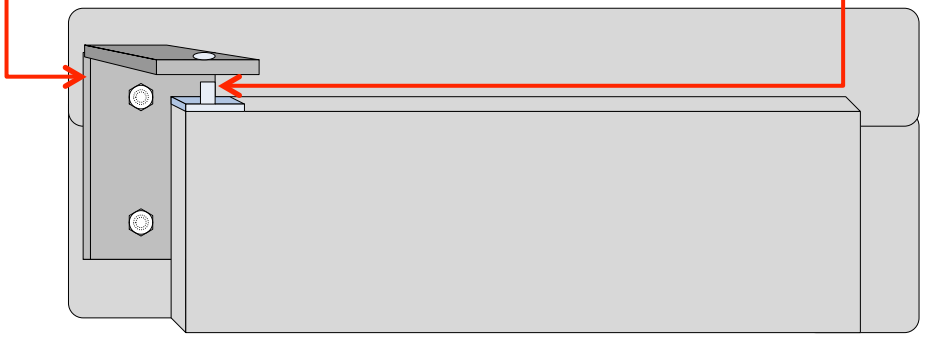
COMPONENT IDENTIFICATION

Component Identification

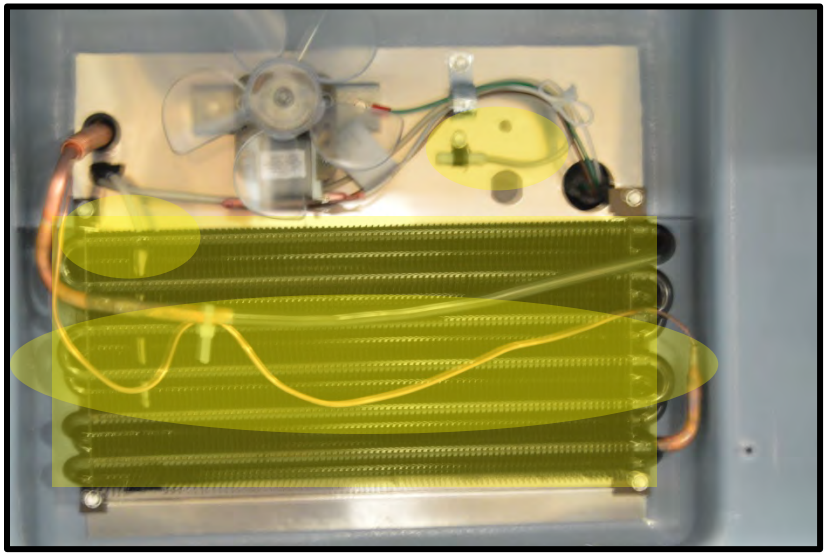
A hot gas condensate evaporator pan assembly is mounted on the back of the unit



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



Component Identification

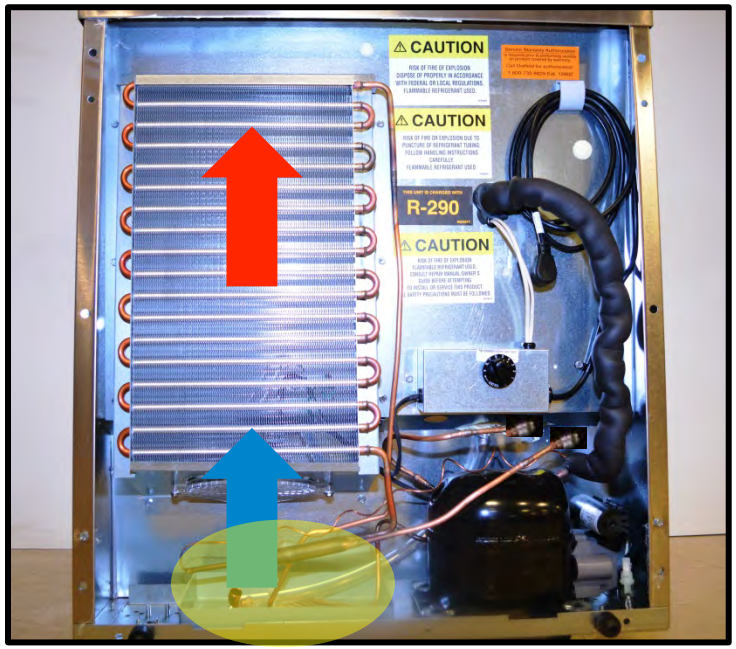


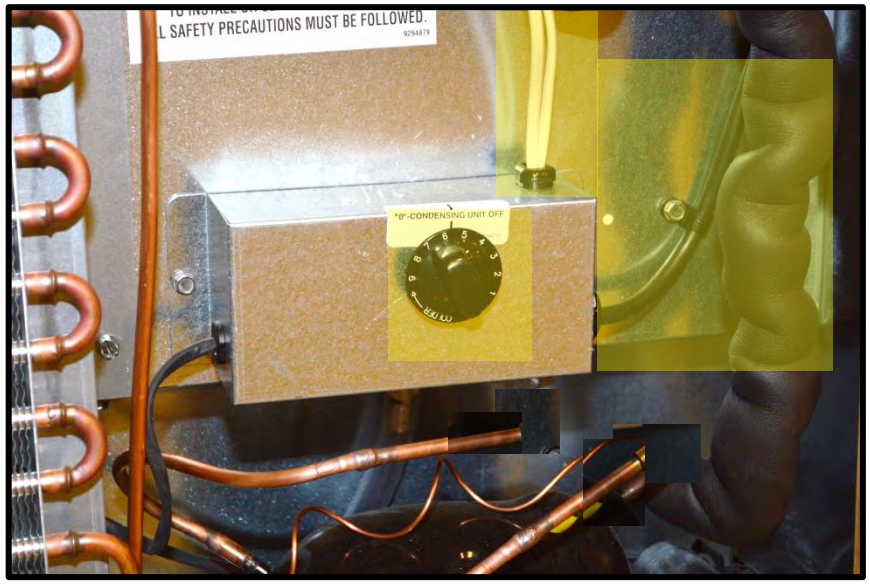
- Epoxy coated evaporator coil
- Capillary tube metering device
- Danfoss control thermistors

- Evaporator fan motor mounted behind evap. cover
- Air is pulled through the coil from the bottom and out through the fan

Component Identification

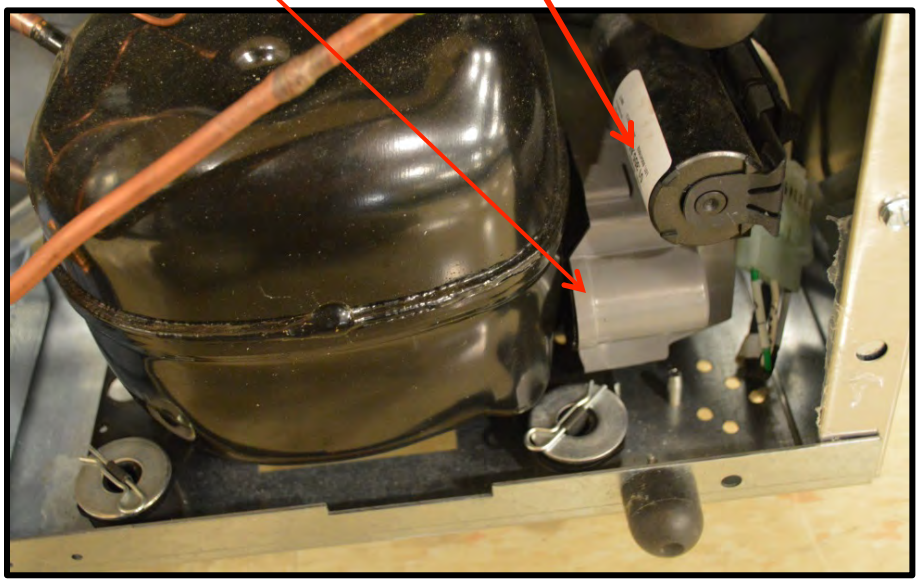
- R-290 condensing unit
- Hot gas condensate evaporator
- Straight through airflow allows unit to be flush against side walls
- Danfoss temperature control
- Danfoss control thermistors
- Power cord connects in junction box





Component Identification

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



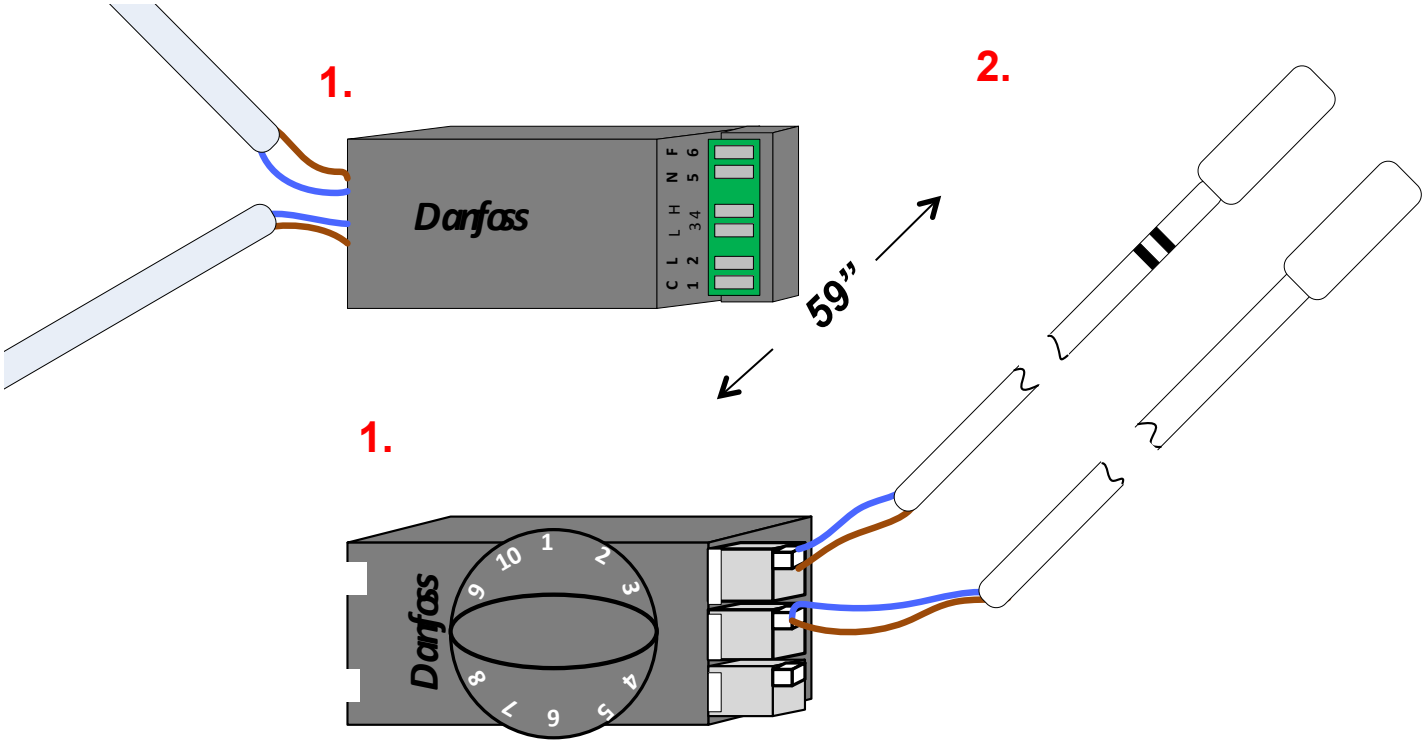
Under Counter units have a "Bullet" type push on gasket

DEL2157S R-290 Service Training

CONTROL SPECIFICATIONS

Control Specifications

Control Information



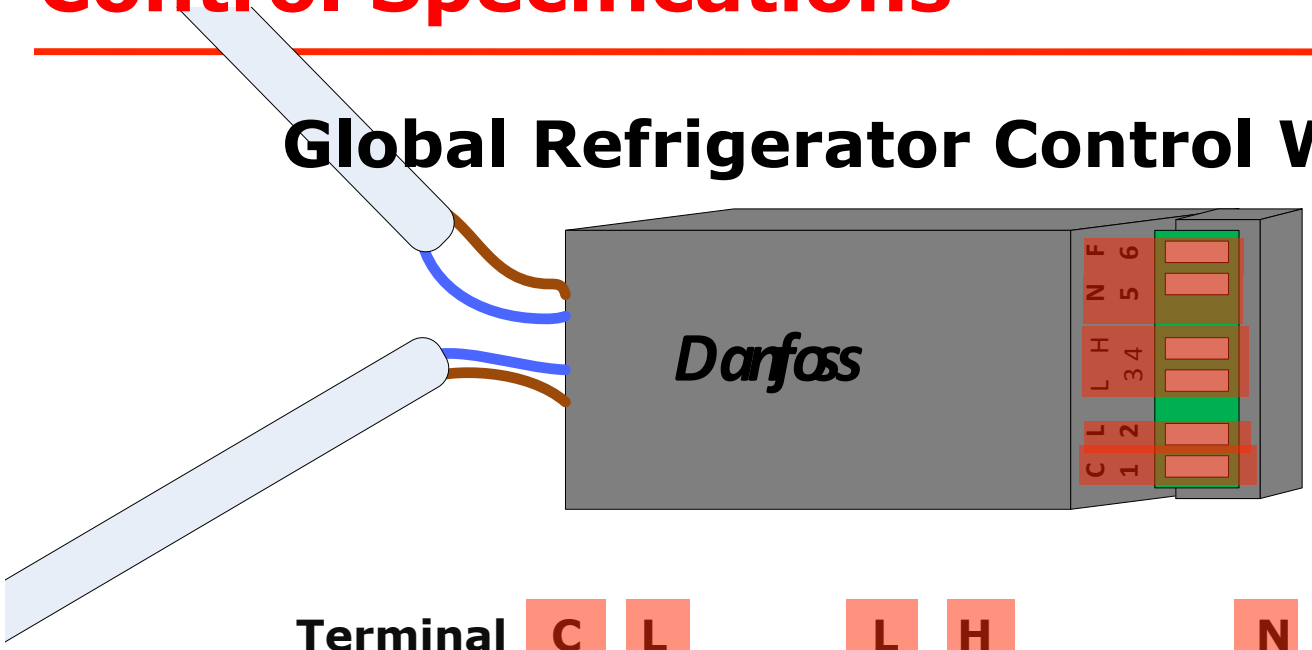
The Danfoss Solid State temperature control includes:

1. Control

2. Thermistors (no stripe / air sensing --- two stripe / coil sensing)

Control Specifications

Global Refrigerator Control Wiring



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

C / 1 = component being controlled

L / 2 = Line Voltage

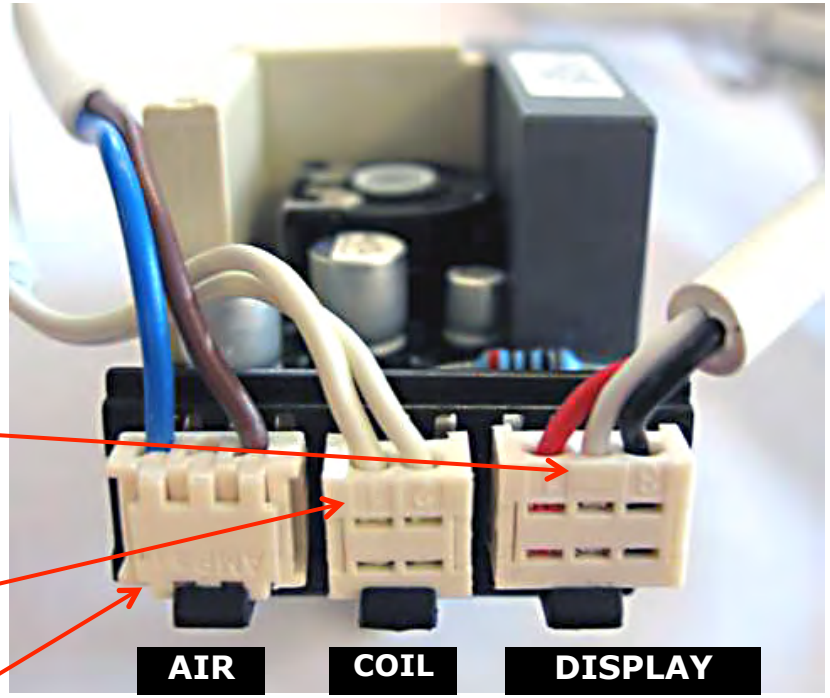
L / 3 = Line Voltage (second terminal)

H / 4 Defrost Heater N / 5 = Neutral F / 6 = Fans

Control Specifications

Control Thermistor Connections

Connection Label	*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 Cycles Condensing Unit



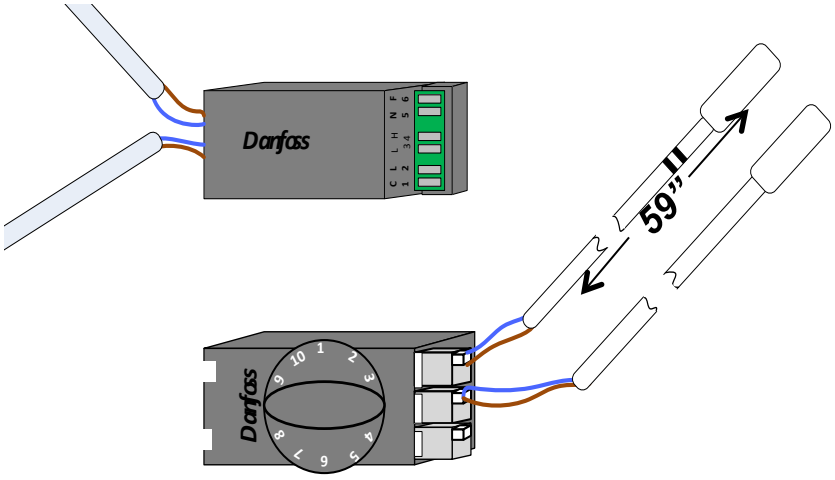
Thermistor connector ends will connect to only one spot on the control

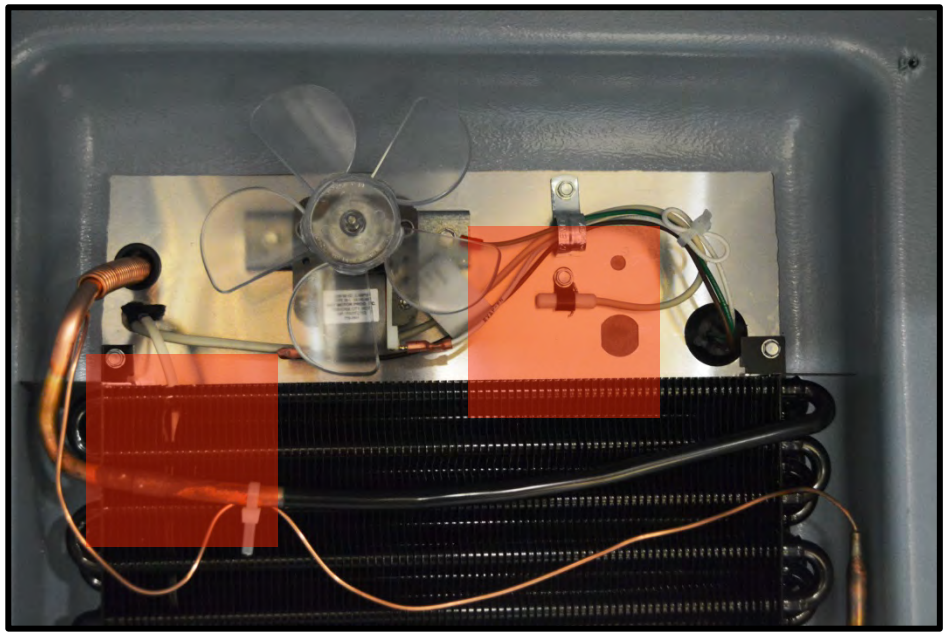
Control Specifications

Thermistor Installation

- Two stripe thermistor is installed on the inlet of the evaporator and controls defrost

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





DEL2157S R-290 Service Training

UNIT OPERATION

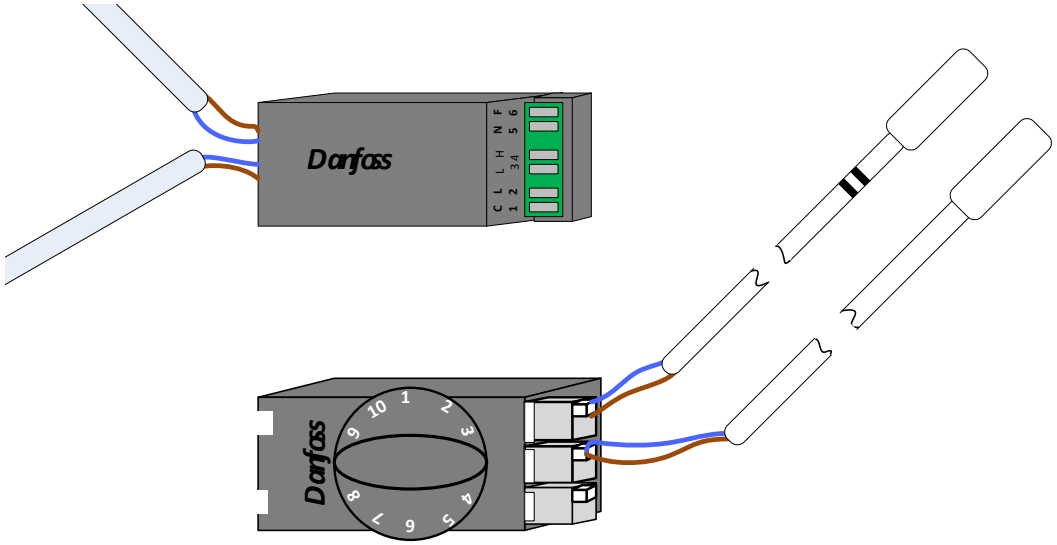
Unit Operation

- **At unit start up 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 complete**
- **During the condensing unit off cycle the evaporator fans cycle on and off every 3 minutes**

DEL2157S R-290 Service Training

SERVICE TIPS

Service Tips



When servicing the unit reduce the off time "initialing" of the control by:

1. ***Turn the control to the off position***
2. ***Unplug the unit***
3. ***Service the unit***
4. ***Re-apply power to the unit***
5. ***Turn the control back to the desired setting***

Service Tips

- Thermistor resistance is **16330 ohms at 32 degrees F**
  - 15000 to 17000 ohms at 32 degrees F is acceptable.
  - The control must be mounted on the ***outside*** of the unit.
  - The control must be mounted in a clean and dry environment.

    Keep control mounted in box provided with cover installed and all screws in place.

Service Tips

- **Always remember to re-seal openings in cabinet when replacing thermistors*. Warm air infiltration will affect 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 can break if knob is***

    forced past stop or pushed into the control.

DEL2157S R-290 Service Training

PROPERTIES OF R-290 PROPANE

Properties of R-290 (Propane)

R-290 has been used in Europe for many years and has been accepted as a safe and efficient refrigerant with no ozone depletion properties

- R-290 is a alternative (not 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 neglectible global warming potential
- Special care has to be taken with R-290 because of the flammability of propane
- R-290 (propane) units are equipped with a yellow warning label

Properties of R-290 (Propane)

Delfield

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

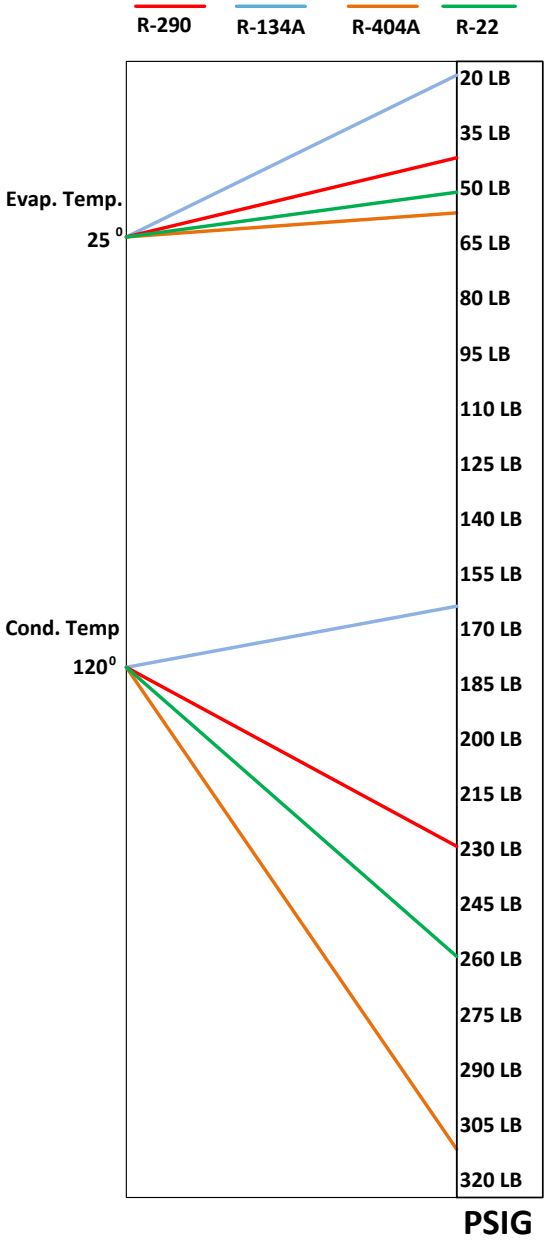
Refrigerant	R-290	R-134A	R-404A	R-22
Name	Propane	**Tetraflouroeth**	Mixture R-125, R-134A, R-143	Isobutene
Boiling Point	-43.78	-15.7	-50.44	-41.44
Liquid Density	1.23 lbs.	3.02 lbs.	2.72 lbs.	3.0 lbs.

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

The liquid density of R-290 requires system design similar to that of R-404A :

- ***Compressor sizing similar to R-404A***
- ***Evaporator design similar to R-404A***
- ***Pipe sizing similar to R-404A***

Properties of R-290



R-134A Pressure Ratio

143 LBS

R-404A Pressure Ratio

249 LBS

R-290 Pressure Ratio

143 LBS

R-22 Pressure Ratio

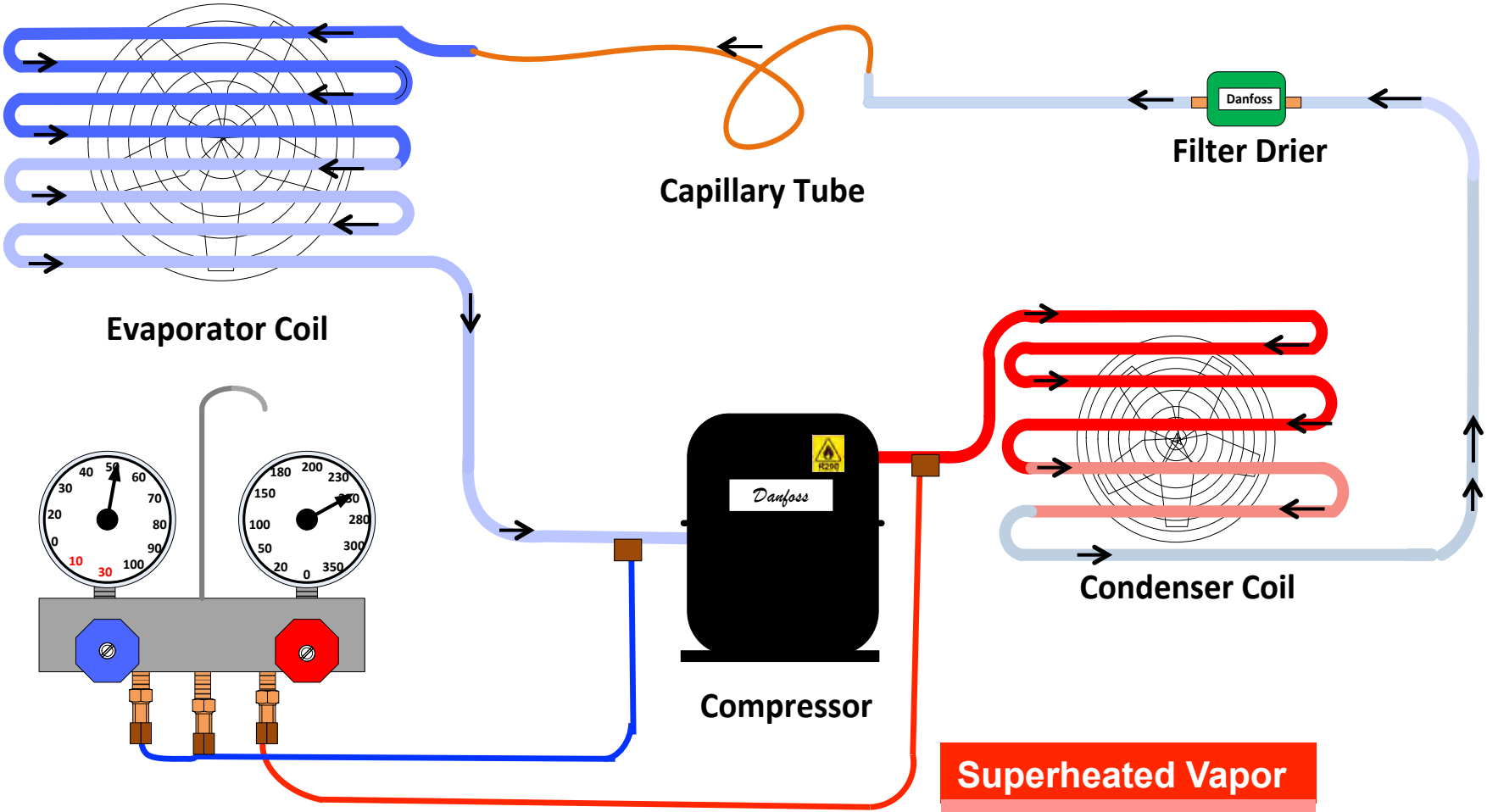
212.20 LBS

Pressure Ratio Comparison

- Based on 35 Degree Refrigerator Temperature
- 10 degree evaporator TD
- 90 degree ambient / 120 degree condenser temperature

The lower the Pressure Ratio the better the efficiency

Properties of R-290 (Propane)



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

Operating pressures will be similar to those of R-22

Superheated Vapor

Subcooled Vapor

Liquid-Vapor Mix

Subcooled Liquid

Review

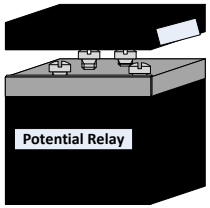
- *R-290 is propane and very combustible*
- *R-290 has 0 ozone depletion properties*
- *R-290 equipment design is similar to R-404A*
- *R-290 is a efficient refrigerant for medium and low temperature applications*

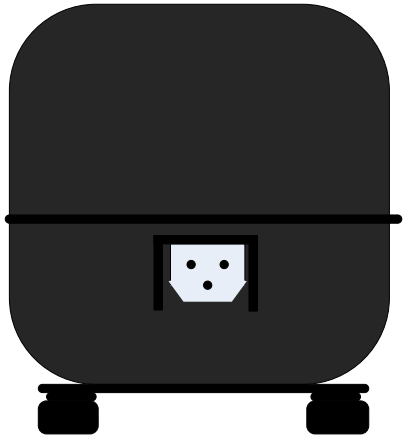
DEL2157S R-290 Service Training

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
- No ignition sources are present anywhere in the work area
- 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

Delfield

Sources of Ignition & 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 is always good air gaps around all sides of the equipment

R-290 equipment should be installed in a well ventilated space

Hot Surfaces

R-290 equipment should be installed where leaked refrigerant will not be exposed to any surfaces exceeding 600 degrees F (auto-ignition temperature).

90% air / 10% propane mixture is required for ignition

DEL2157S R-290 Service Training

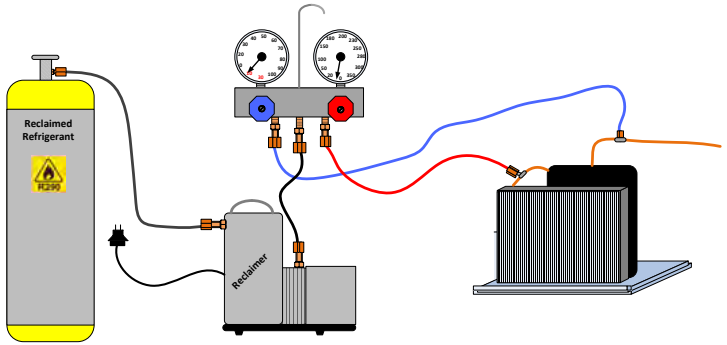
SERVICE PROCEDURES

Service Procedures

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

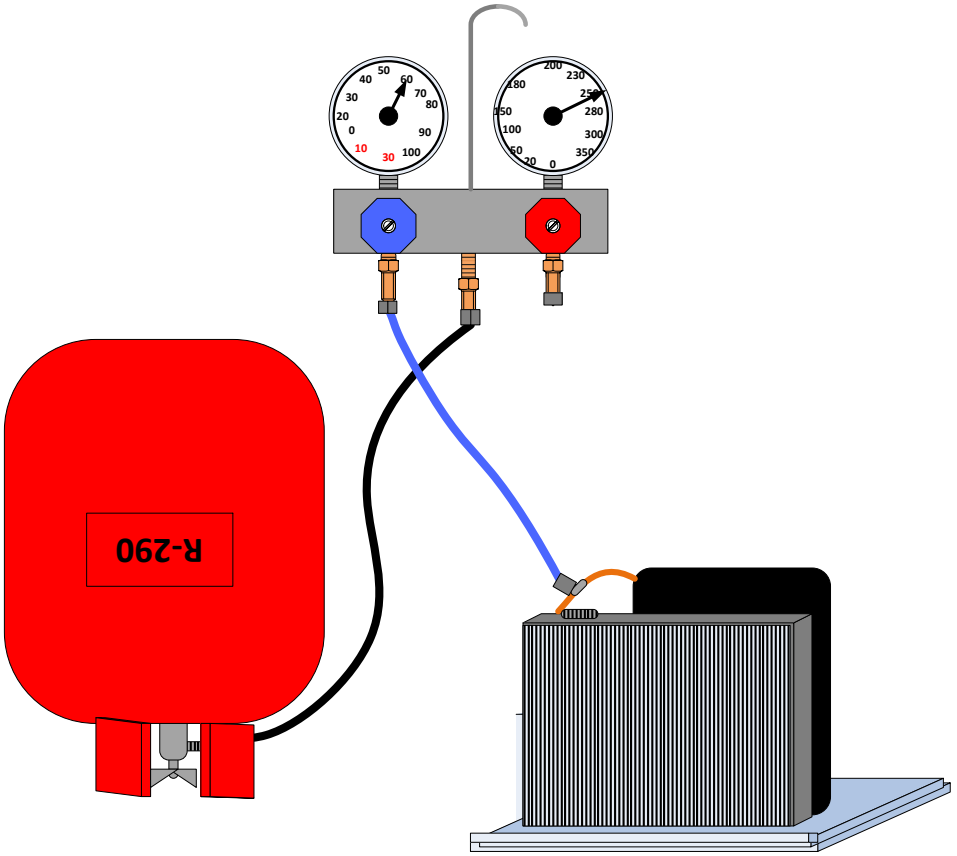
- Make sure all ignition sources are removed from the work area
- Maintain a 35’ area work area free of any ignition source
- Flames, sparks, and static electricity can ignite leaking refrigerant
- Always reclaim and purge system (twice) before using torch on system
- Always run the unit a minimum of 5 minutes before reclaiming refrigerant
- Follow evacuation (500 microns minimum) & purging procedures

Passive recovery



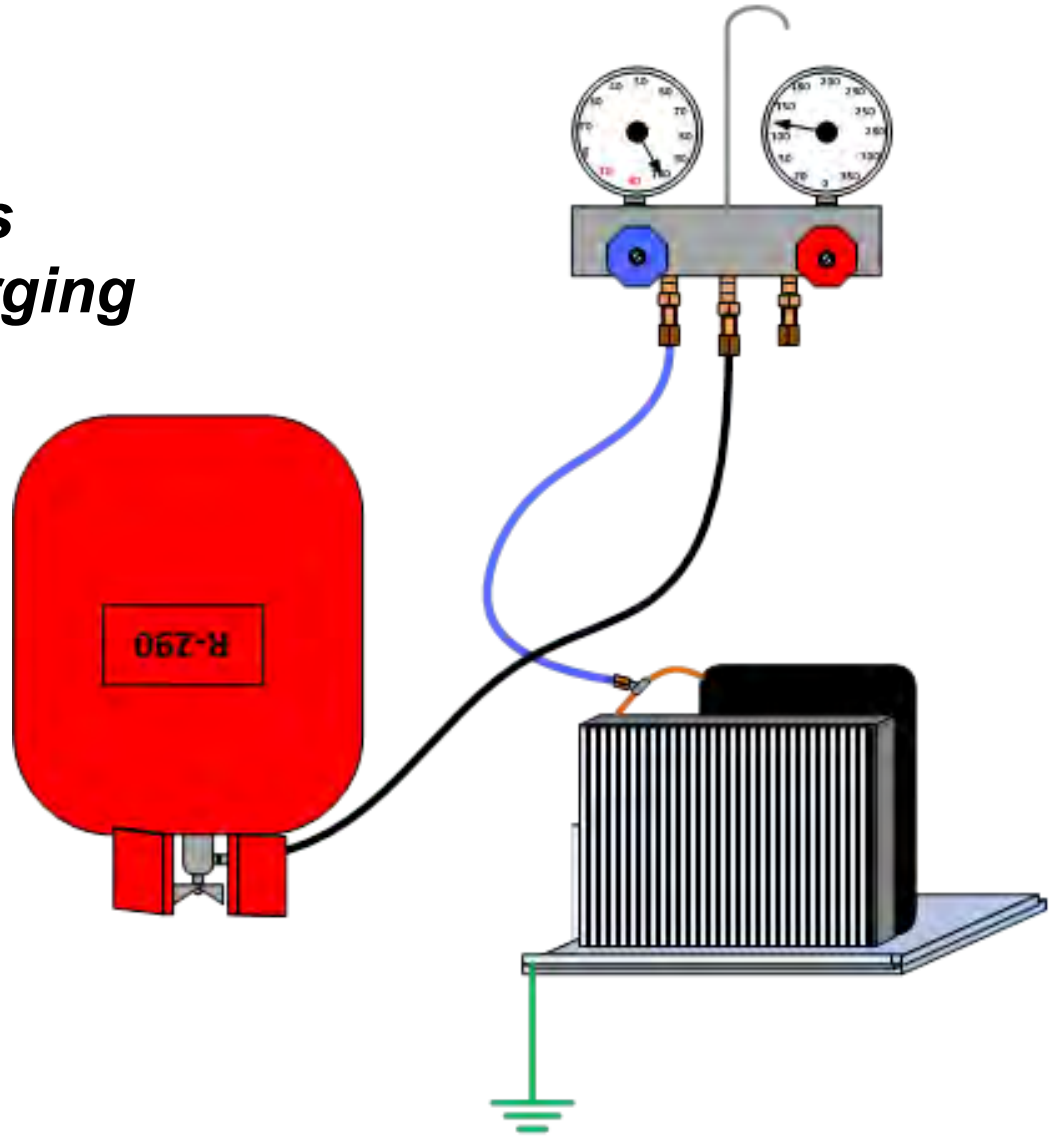
Charging with R-290

- 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



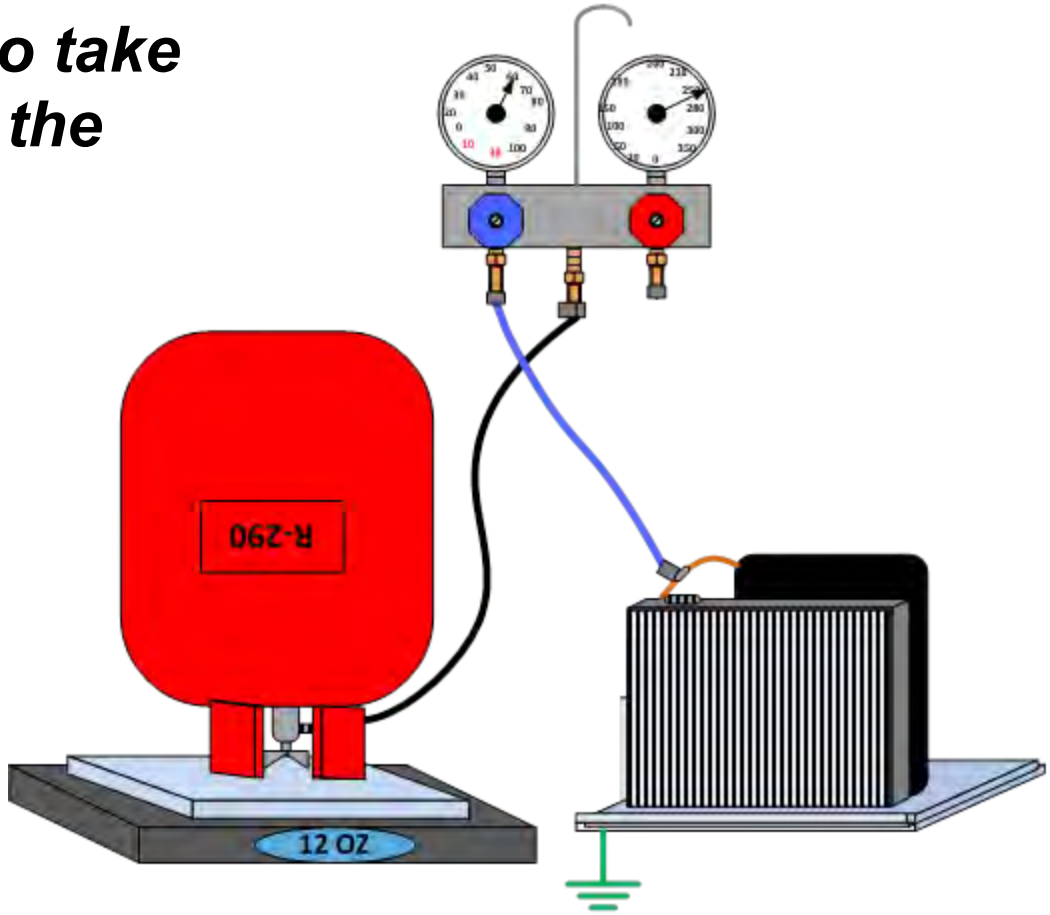
R-290 Service Procedures

- ***Be sure that the unit is grounded before charging***



R-290 Service Procedures

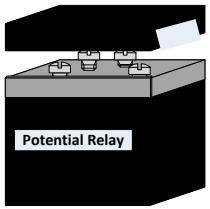
- *It is very important to take care NOT to overfill the system*



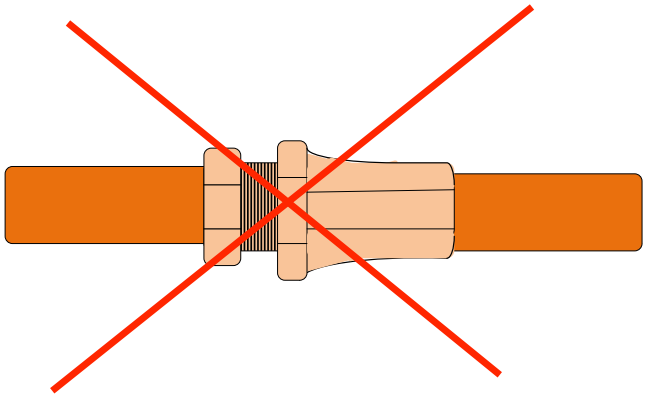
Hydrocarbon charge sizes are typically 40% to 50% less than that of fluorocarbons

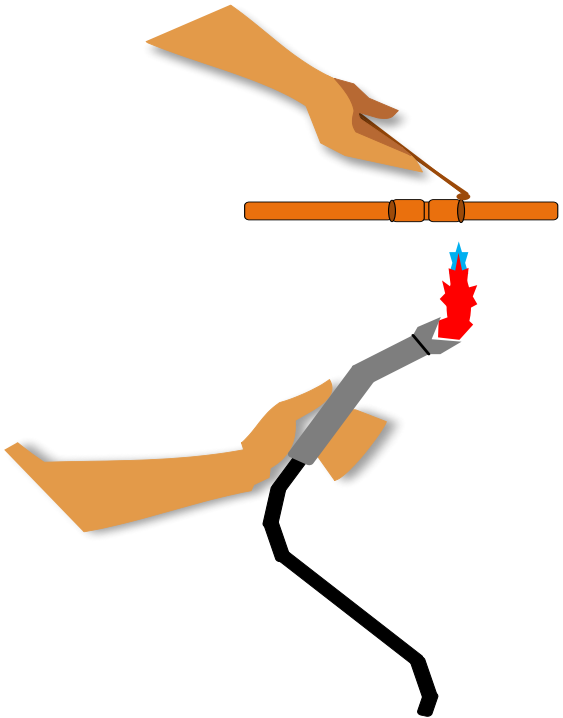
Service Procedures

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



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

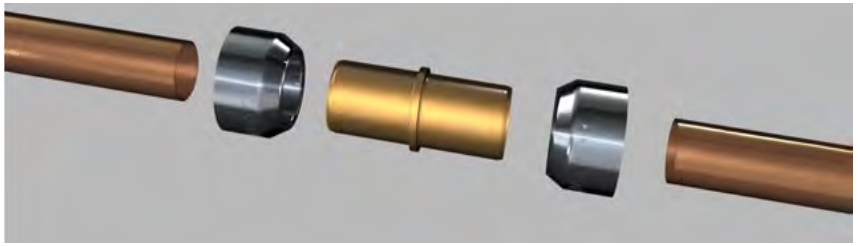




Lokring fitting / Alternative to Soldering

Delfield

Lokrings are safe, effective, and easy to install



Lokring tools must be used to install fittings

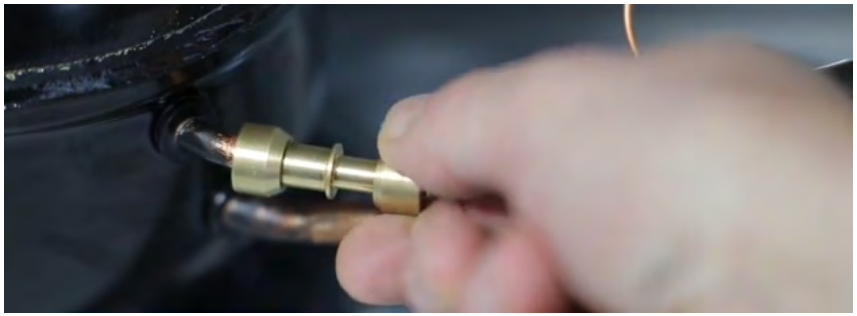
Step 1: thoroughly clean area and cut with tubing cutter

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

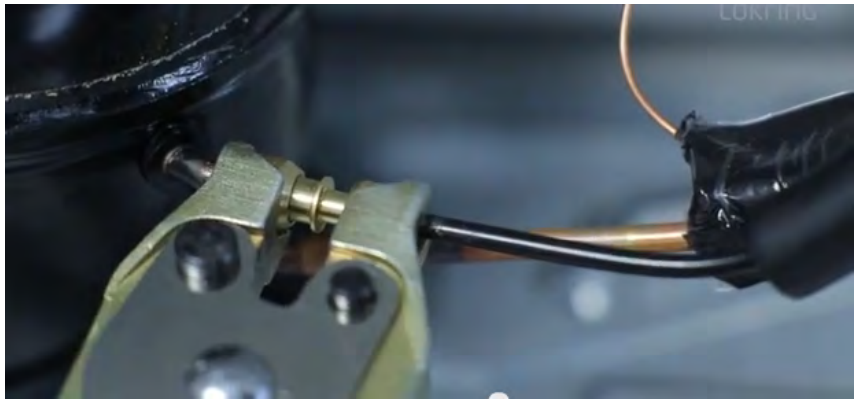
Lokring fitting / Alternative to Soldering

Delfield

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 part 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***

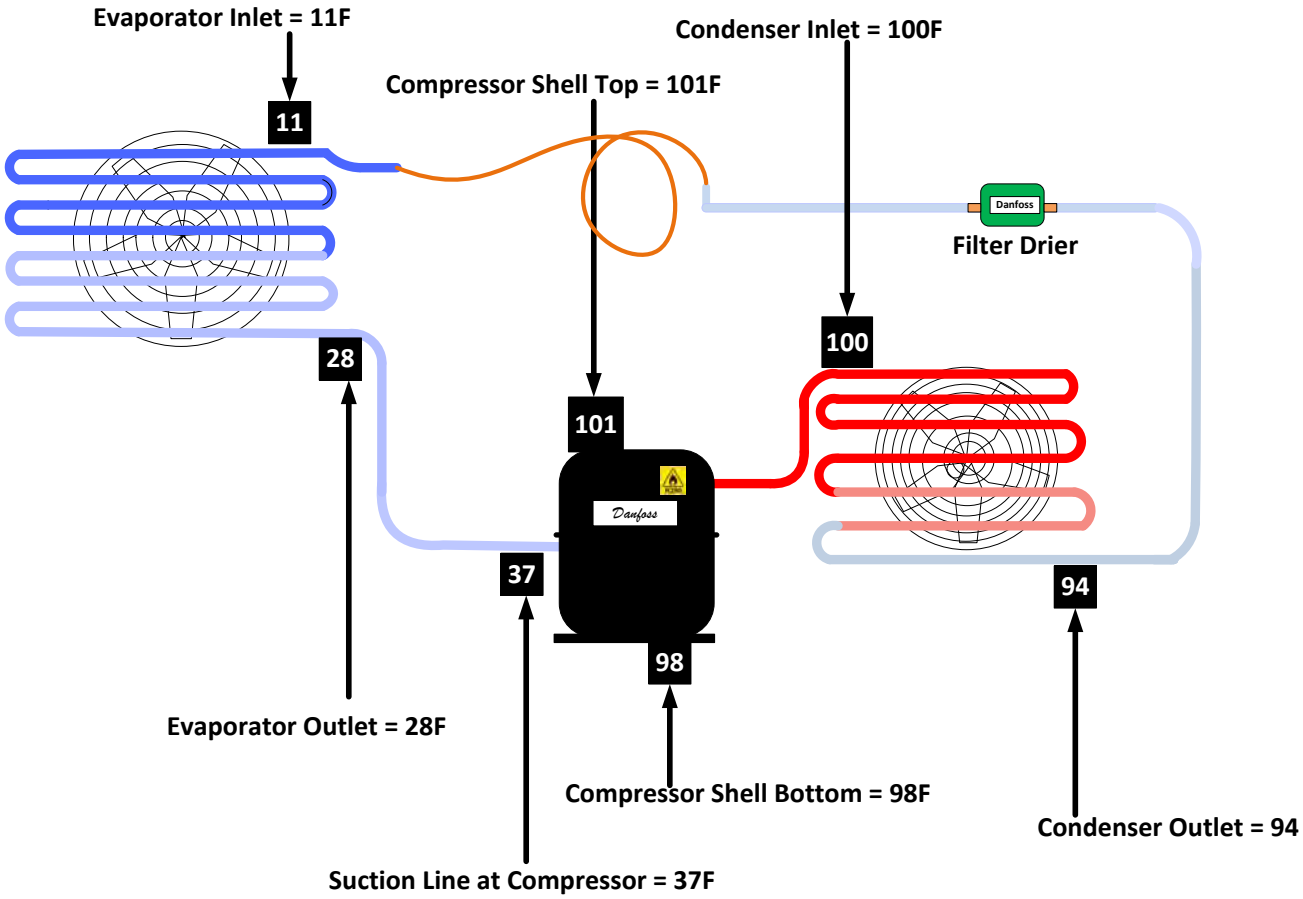
Review

- *It's advisable to use portable gas detectors when working on R-290 units*
- *Before soldering on a R-290 system technicians should evacuated and purged with nitrogen twice*
- *Maximum allowable non-condensable in a R-290 system is 1%*
- *Evacuate the unit to a minimum of 500 microns before charging*
- *Bubble leak test or Gas Detection leak testing are the two preferred methods*
- *R-290 should be charged in the liquid state*
- *R-290 charges are typically 40% to 50% that of fluorocarbon refrigerants*
- *R-290 operating pressures compare to that of R-404A*

DEL2157S R-290 Service Training

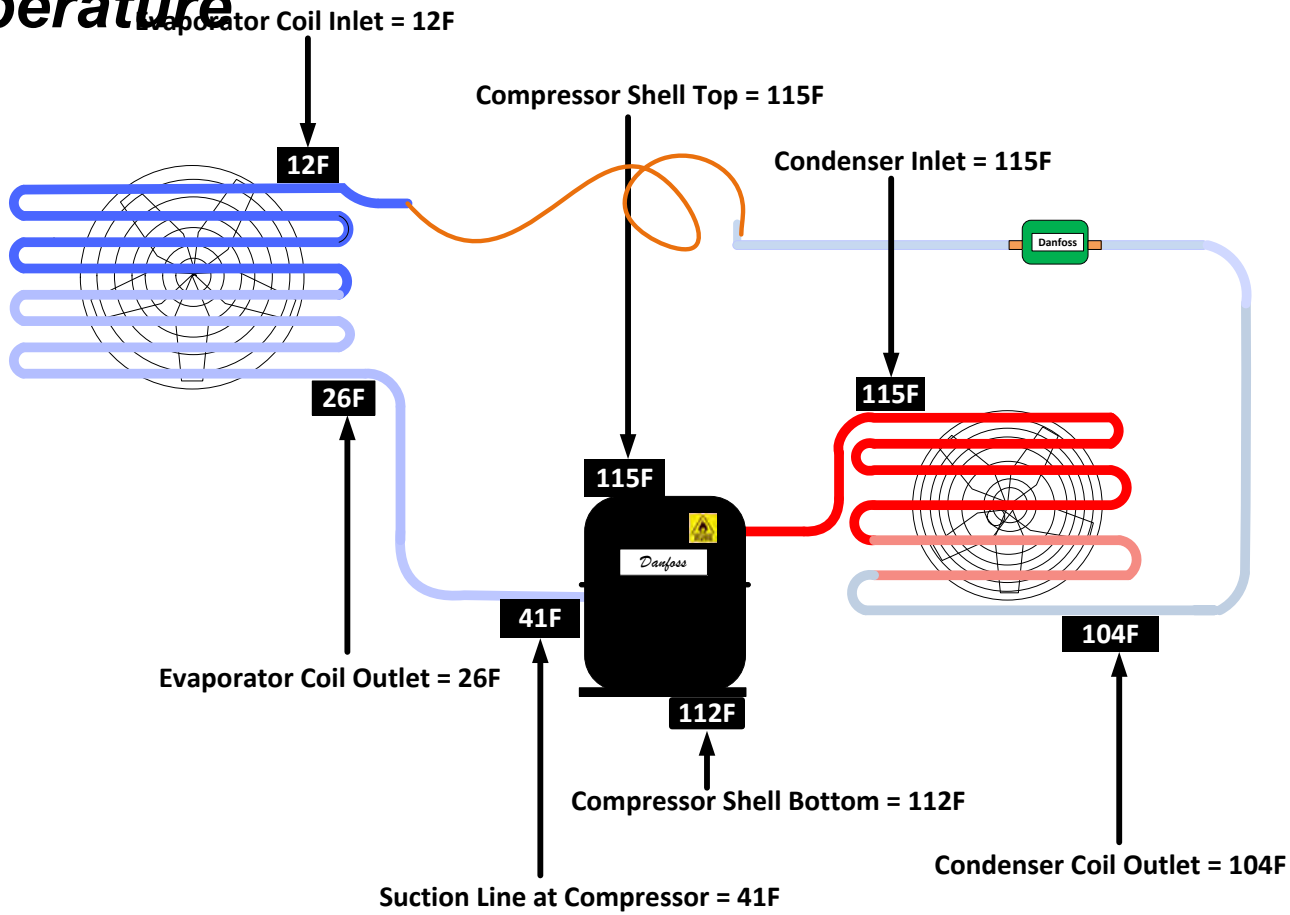
TROUBLE SHOOTING

75 F Ambient / 32 Degree Box Temperature



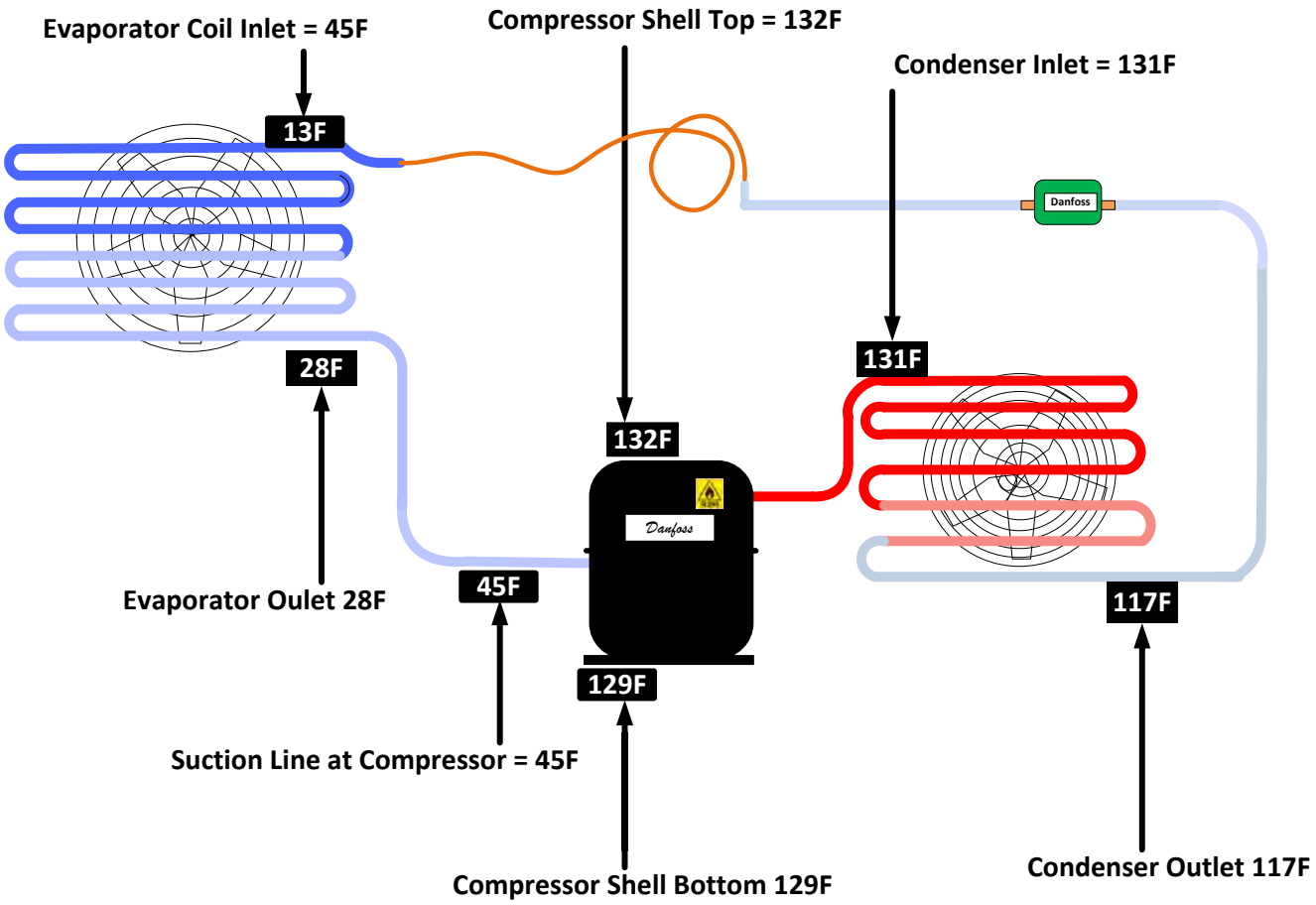
Evap. Inlet	Evap. Outlet	Suction Line	Comp. Top	Comp. Bottom	Cond. Inlet	Cond. Outlet
11F	28F	37F	101F	98F	100F	94F

86 F Ambient / 32 Degree Box Temperature



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

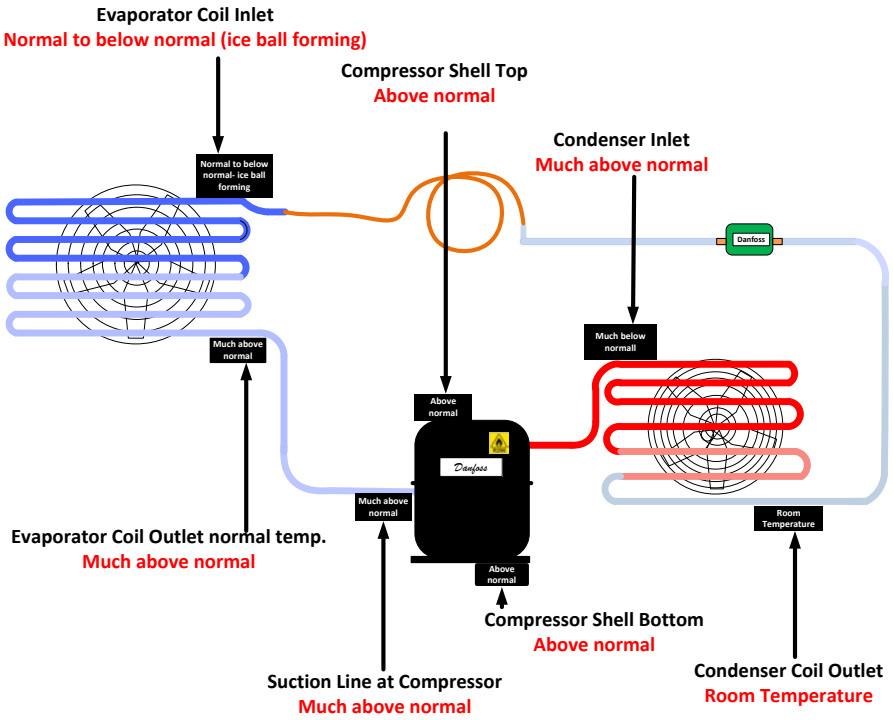
100 F Ambient / 32 F Box Temperature



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

Trouble Shooting Scenario's (1)

System Temperatures

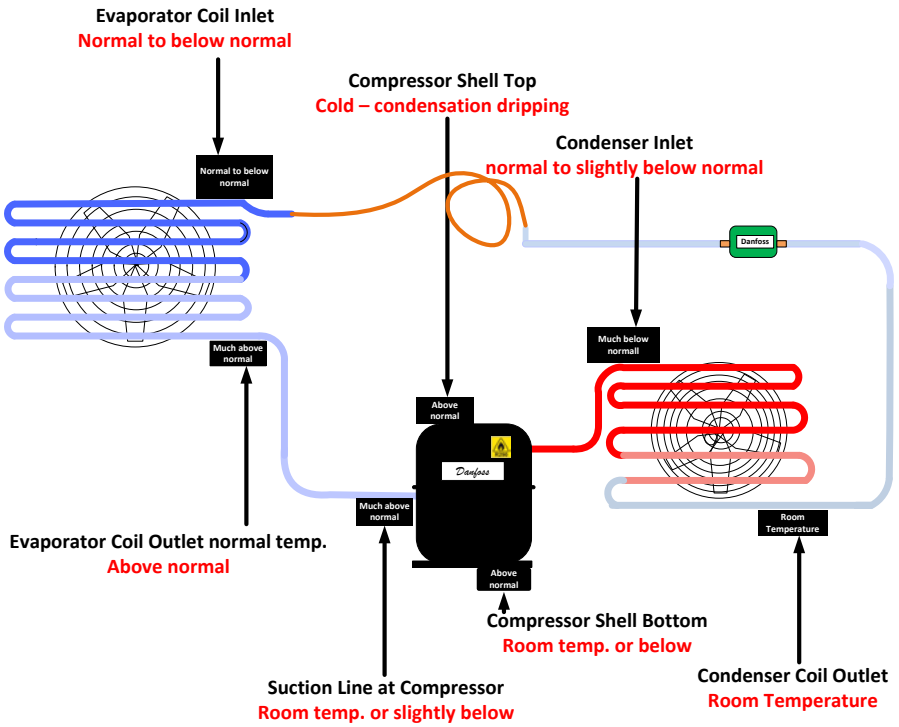


Most Probable issue?

- Dirty condenser coil
- Expansion valve not feeding enough
- Low on Refrigerant
- Overcharged
- Bad Compressor (weak valves)

Trouble Shooting Scenario's (2)

System Temperatures



Most Probable Issue

- Dirty condenser coil
- Expansion valve not feeding enough
- Low on Refrigerant
- Overcharged
- Bad Compressor (weak valves)

DEL2157S R-290 Service Training

CLEANING & MAINTENANCE

Maintenance

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 nonabrasive 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 clothes 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

Maintenance Guidelines

- **Keep the condenser coil clean**

  - Clean the condenser coil as often 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 condenser 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: WWW.epatest.com/608/Manual.htm

Click on hyperlink to view manual

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

DEL2157S R-290 Service Training

WARRANTY INFORMATION

Warranty Information

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 & 4048P Critical Parts

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 as of 1/6/16***

Review

- Be sure to ground the unit before servicing refrigeration system
- Operate the condensing unit for a minimum of 5 minutes before evacuating to allow oil and refrigerant to separate
- Propane detectors should always be used when servicing R-290 equipment
- Reclaim and purge system twice before servicing unit
- Always cut components and fittings out of system – never use a torch to remove components
- Never leave any type of access fittings on R-290 system – always permanently seal the system

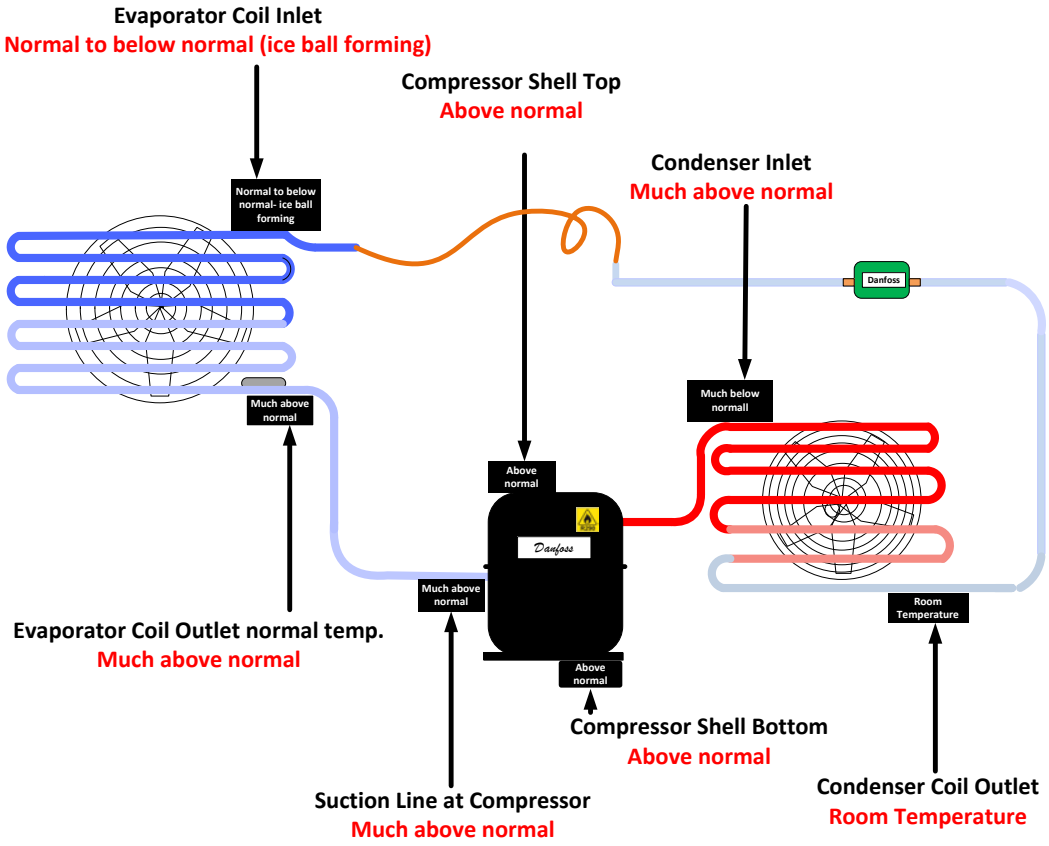
Thank You for Attending

DEL2157S Refrigerator

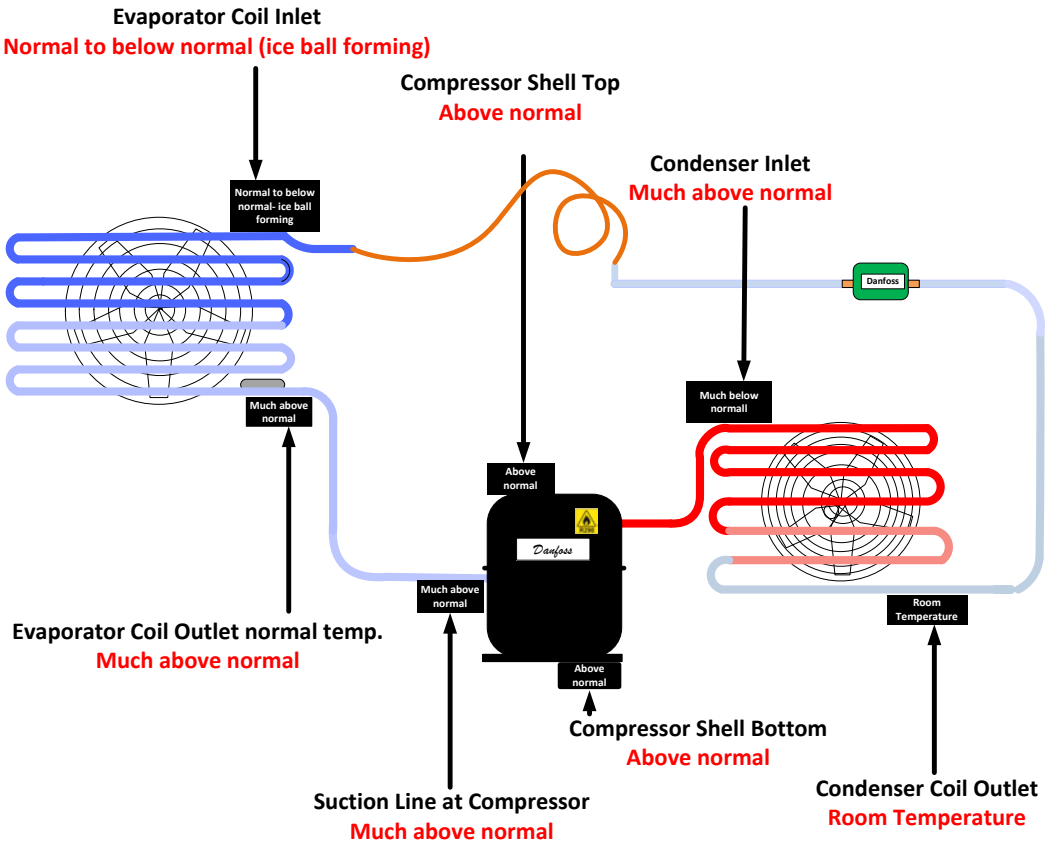
R-290 Service Training

Manitowoc KitchenCare™

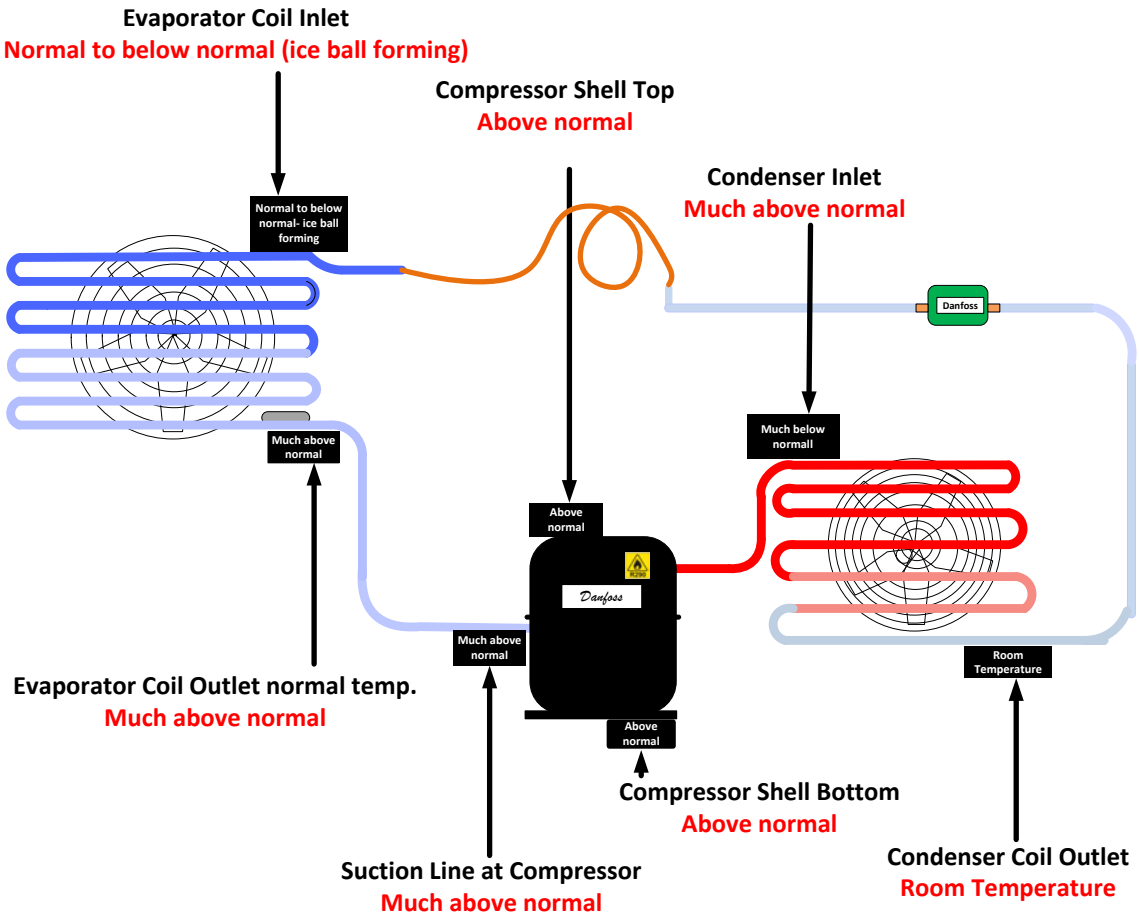
Dirty Condenser Coil – *wrong answer, the condenser coil temperature would be much higher, not normal - evaporator coil temperature would be higher than normal not lower at inlet; no ice ball would be forming at evaporator coil inlet.*



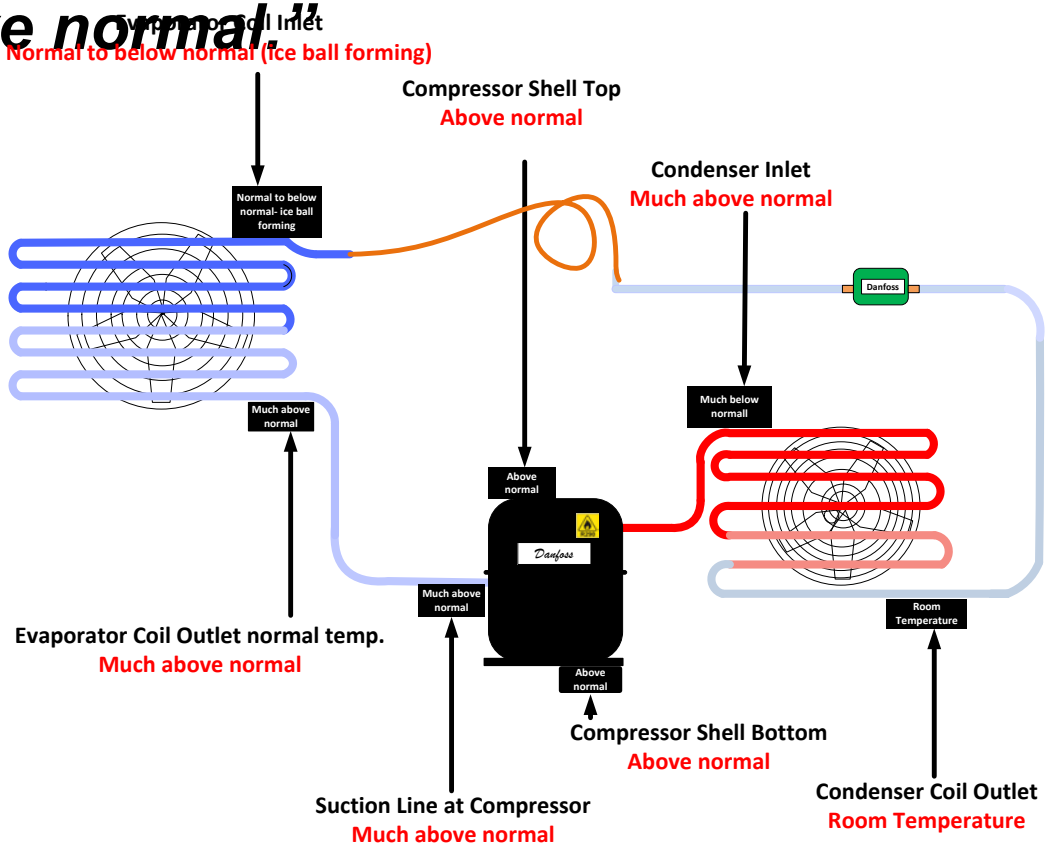
Capillary tube not feeding enough refrigerant – *not likely, the ice ball would be forming on the capillary outlet, not after the evaporator inlet - the condenser inlet would be slightly above normal not much above normal.*



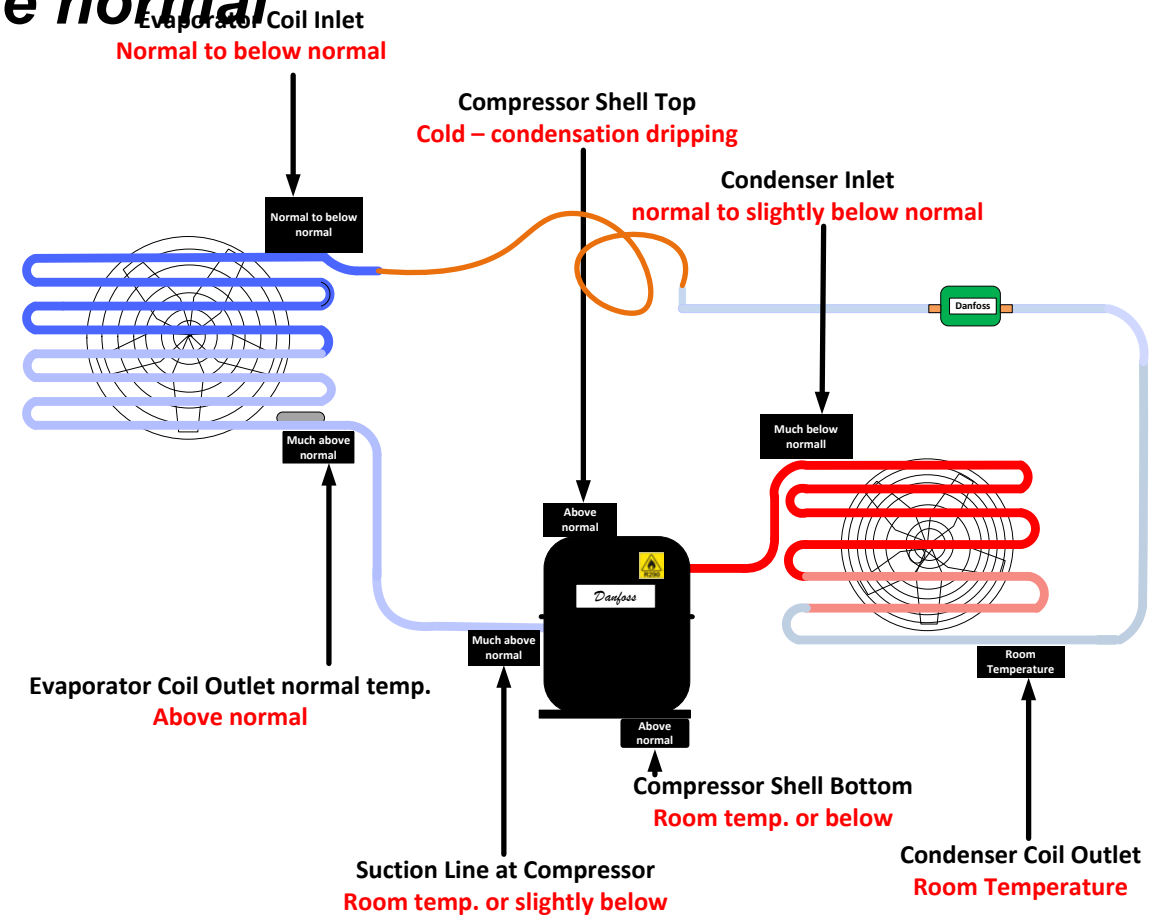
Low on refrigerant – *correct!*



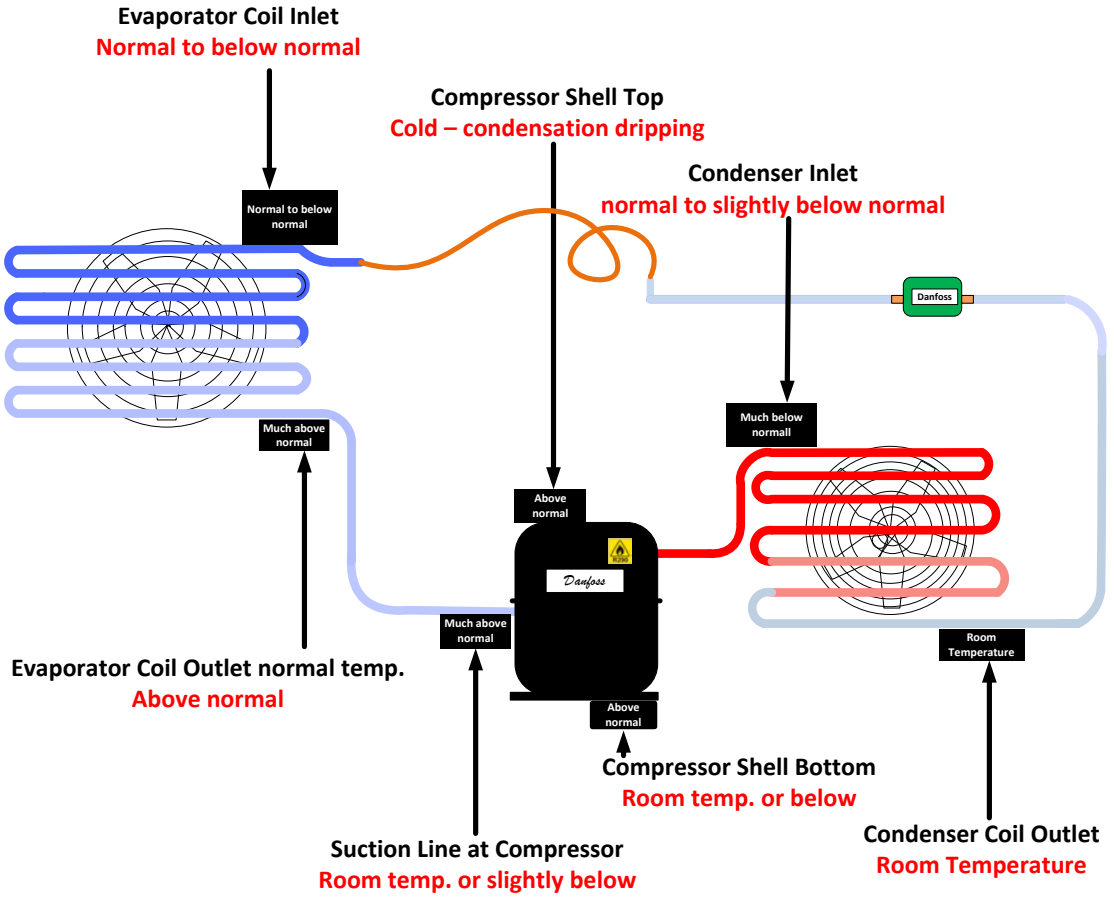
Overcharged with R-290 - ***wrong answer, inlet and outlet of condenser would be high, not low – no ice would be forming on inlet of evaporator – the evaporator temperatures would be normal to slightly above normal not "much above normal."***



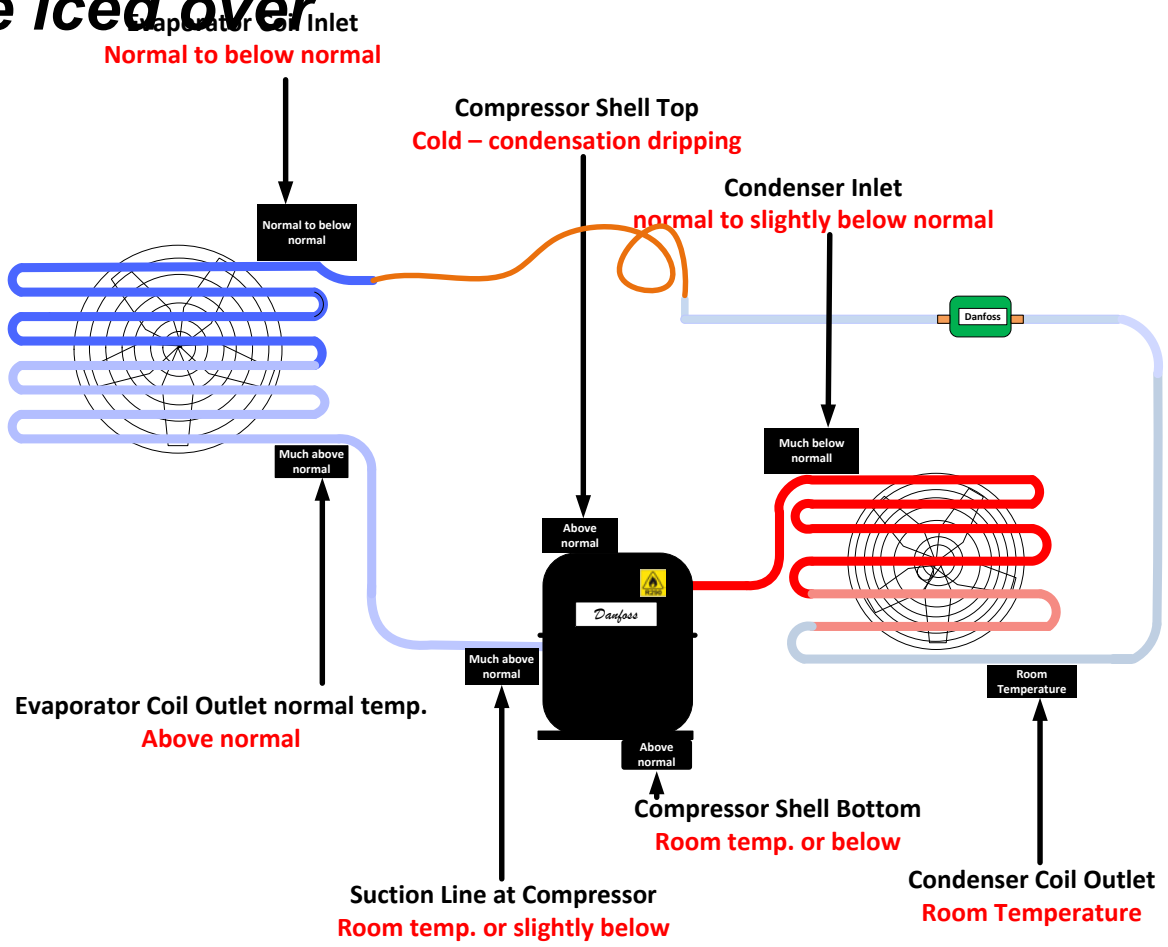
Dirty Condenser Coil *Wrong answer – compressor would be hot – condenser would be hot – evaporator coil would be above normal*



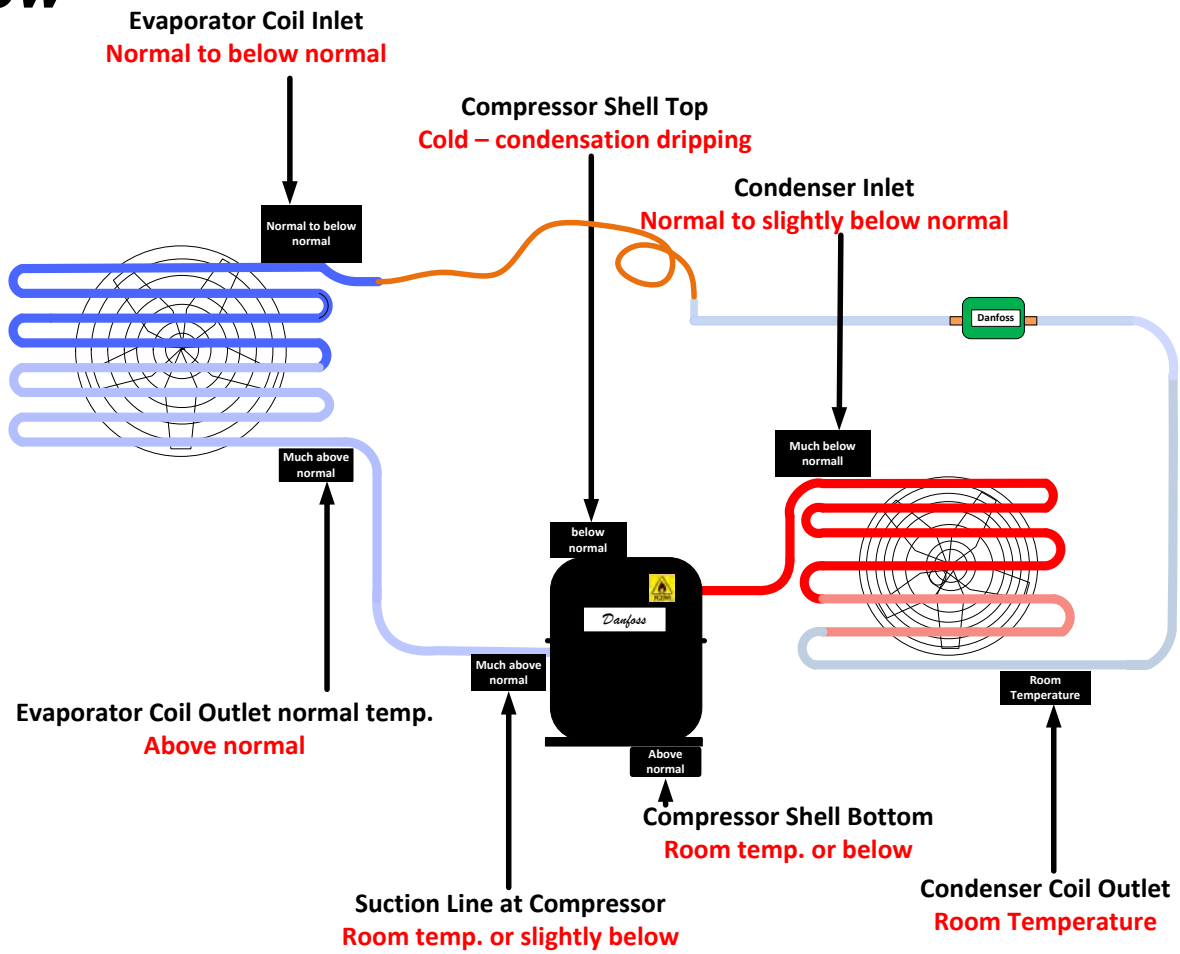
Capillary Tube Not Feeding Enough - *Wrong answer, the compressor would be hot not cold – the evaporator inlet would be above normal*



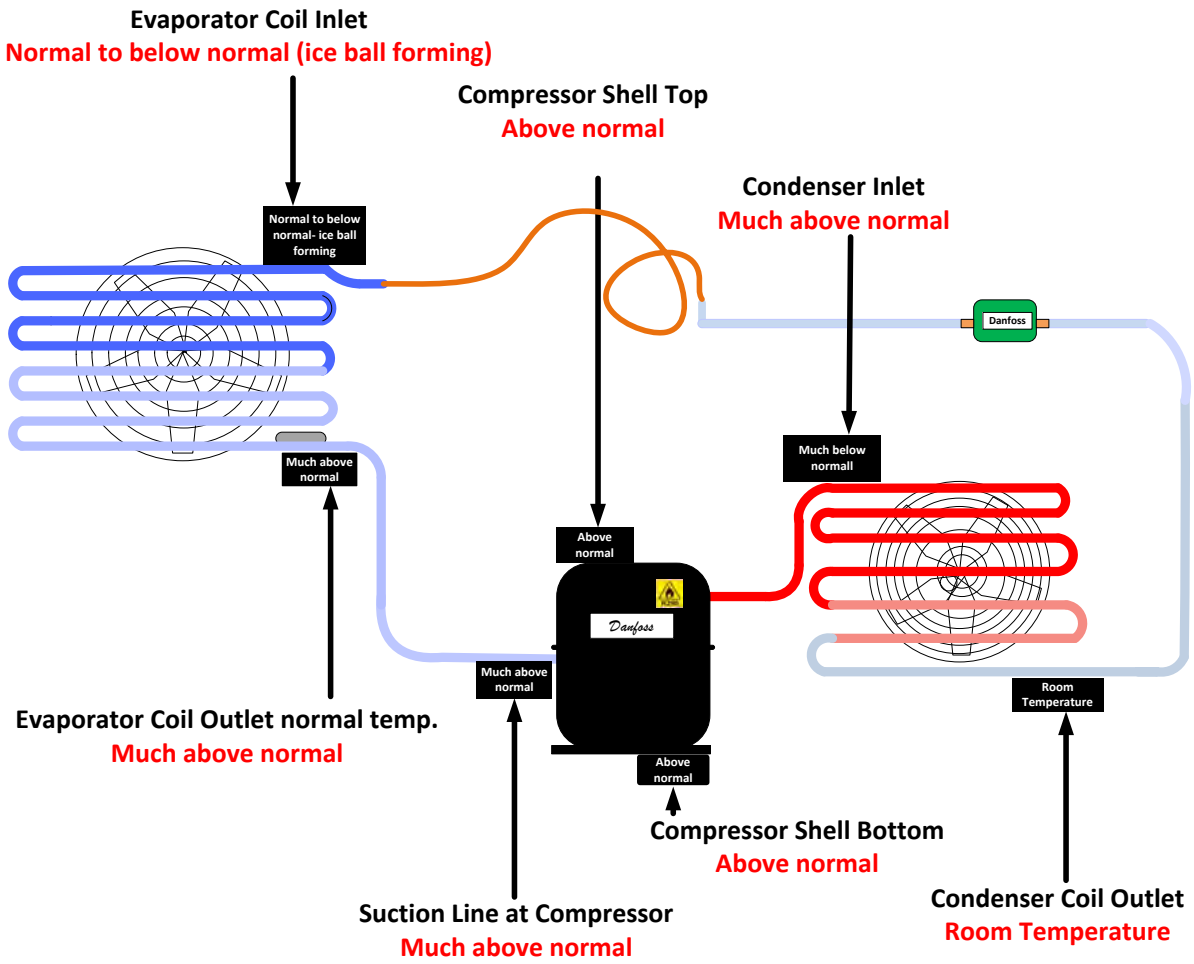
Low On Refrigerant – *wrong answer, the compressor shell would be hot not cold, the outlet of the capillary tube would be iced over*



Overcharged – *not likely, the compressor would be hot, not cold – the condenser inlet and outlet would be above normal not below*



Bad Compressor valves – *not likely, the compressor shell top would be normal to below normal temperature.*



Bad Compressor Valves – *Correct!*