

R-290

SERVICE MANUAL

SWF MODELS

Continental[®]NR

Natural Refrigerant



*Principals and Best Practices
for servicing HC refrigeration equipment*

Continental[®]

Refrigerator

1-800-523-7138

Service Hours:

Monday to Friday, 8 am to 5 pm EST

After Hours:

service@continentalrefrigerator.com
or call 267-525-3300 to leave
message in general mailbox
www.continentalrefrigerator.com

SCAN this code
to download manual



TABLE OF CONTENTS

	Page
Overview and Disclaimer	4
Facts on Hydrocarbon R-290	5
Facts on Servicing Hydrocarbon R-290	6
R-290 Servicing, Tools and Labeling	7
R-290 Servicing	7
R-290 Tools	8
R-290 Labeling	10
Leak Checking System	11
Accessing Refrigeration System	12
Installing Service Piercing Valves	12
Recovering R-290	13
Venting R-290	14
System Evacuation	14
Charging the System	15
Removal and Sealing of Access Ports	16
Repair of Electrical Components	16
Flow Chart for R-290	18
Troubleshooting Guide for R-290	19
Refrigerant Circuit Diagrams	20
Pressure Temperature Chart HC-290	25

Overview and Disclaimer

PLEASE NOTE:

Not all content that is available in this Service Manual in English is available in every language.

WARNING statements in this Service Manual identify conditions or practices that could result in personal injury or loss of life.

IMPORTANT: This Service Manual covers the procedures to be used for servicing and repairs only to refrigeration equipment using R-290 (a hydrocarbon refrigerant) as a refrigerant and should be completely read before any attempt is made to service or repair any such equipment containing R-290 refrigerant. R-290 is highly flammable. Significant consequences may arise if a person servicing such equipment fails to properly address safety considerations, which may then result in fires, injury to persons, and/or damage to property. Though all statements and information contained herein are believed to be accurate and reliable as of the date of publication of this Service Manual, they are presented without guarantee or warranty of any kind, expressed or implied. Information provided herein does not relieve reader or user from their own responsibility of carrying out their own evaluation and analysis of the situation. The reader or user assumes all risks and liability for use of the information, actions and events obtained. Reader or user should not assume that all safety data, measures and guidance are indicated herein or that other measures may not be required, which do not compensate for individual guidance and instructions. The laws and guidelines of the locale where the equipment is located must be consulted and adhered to under all circumstances. The handling of flammable refrigerants and its associated systems and equipment is to be done by qualified and trained technicians only. The Material Safety Data Sheet (MSDS) for R-290 should also be reviewed before any attempt is made to service or repair any equipment containing R-290 refrigerant to make sure that the proper level of protection required while working with this refrigerant and servicing or repairing the equipment is worn. Continental Refrigerator does not control nor assume any responsibility for the work environment or the work activity of the reader or user of this Service Manual.

Mention of another company's trade names, commercial products, industry references, or technical resources does not constitute an endorsement or recommendation for use.

CONTINENTAL REFRIGERATOR DOES NOT ACCEPT ANY LIABILITY AND RESPONSIBILITY FOR ANY SPECIAL, PUNITIVE, INDIRECT OR CONSEQUENTIAL LOSS OR DAMAGES WHATSOEVER ARISING OUT OF OR IN CONNECTION WITH THE USE OF THIS SERVICE MANUAL OR RELIANCE PLACED ON IT, HOWEVER CAUSED, ON ANY THEORY OF LIABILITY, WHETHER IN AN ACTION FOR CONTRACT, STRICT LIABILITY, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE.

This edition of the Service Manual was published in April 2018.

© Continental Refrigerator, 2018

Facts on Hydrocarbon R-290



1. Hydrocarbon (HC) refrigerants have been in use from the late 1800's, and in conjunction with ammonia, were the most widely used refrigerants prior to the introduction of chlorinated fluorocarbon refrigerants in the 1930's.
2. R-290 is the name for refrigerant grade high purity odorless propane. It is **NOT** barbeque grill propane.
3. Most recently (about 10+ years) has been used in commercial refrigeration equipment outside the United States.
4. Propane has zero Ozone Depletion Potential, or ODP.
5. Propane's Global Warming Potential, or GWP, is < 3. For reference, R-134a has a GWP of 1430. R-404A has a GWP of 3922.
6. Great thermodynamic properties which leads to high efficiency and low operating costs to consumers.
7. R-290 offers lower operating temperatures than R-404A and reduces noise, as well as wear and tear on refrigeration components.
8. Low charges allowing smaller heat exchangers and piping.
9. Low toxicity to technicians/consumers.
10. You can vent propane to the atmosphere (**see pages 11 & 12 for more information**).
11. Most self-contained reach-in refrigerators & freezers are moving to R-290.
12. ASHRAE class A3, FLAMMABLE.

Facts on Servicing Hydrocarbon R-290



PROPANE IS FLAMMABLE. You MUST observe caution and proper safety practices when servicing equipment with R-290.

1. EPA has a limit of 150 grams (5.29 ounces) on the amount of R-290 charge for self-contained commercial systems.
2. EPA has exempted R-290 from Section 608, Venting Prohibition; however, due to safety concerns, it is recommended that R-290 be recovered with suitable equipment (**see page 11 & 12 “Recovering R-290”**).
3. Servicing refers to making repairs to the hermetically-sealed system and any parts of the electrical system.
4. Specialized training is not mandated, but is highly recommended (**see back cover “Training”**).
5. Repair on R-290 equipment should always be done in a well ventilated area.
6. Because R-290 is highly flammable, an electronic combustible gas leak detector is required when servicing R-290 systems (**see page 6 & 7 “R-290 Tools”**).
7. When opening any refrigeration system, the technician must replace with equivalent filter drier and only use OEM approved parts. **SAME SIZE COMPONENTS ARE CRITICAL.**
8. When diagnosing an R-290 system, **because there are no access fittings**, use temperatures/amps draw for evaluation of system performance (**see page 16 “Flow Chart for R-290”**).
9. Remember, before working on any R-290 equipment to:
MONITOR: make sure combustible gas meter is on and in proper position
VENTILATE: make sure there is adequate ventilation in the work area
ELIMINATE: make sure to eliminate any potential ignition source.

R-290 Servicing, Tools and Labeling

R-290 Tools

When replacing components, ignition-proof sealed electrical components are required. To avoid using unapproved parts, **only** OEM replacement parts are to be used on a R-290 system.



Wire nuts are **not** approved for R-290. All connectors must be UL approved for use with **Hydrocarbons**.



UL approved push and lock connectors **must** be used for wire connections. These connectors must have sufficient strength to hold the conductor/wire in place

Tool List (see next page for visual of tools)

Use the same basic refrigeration tools as R404-A & R-134a, AND:

1. Combustible gas leak detector (Inficon Gas Mate) or equal (required)
2. Tubing cutter
3. Vacuum gauge
4. Ball charging valves (3) (recommended)
5. Tap valves 1/4" (2) (required)
6. Pinch off tool (2) (recommended)
7. Propane warning placard
8. Approved fire extinguisher (Class B dry powder type)
9. 12" charging hose (low Loss design)
10. Gram scale
11. Digital thermometer
12. Venting hose
13. Recovery bag [available through Continental Refrigerator] (recommended)

R-290 Servicing, Tools and Labeling



12



1



2



11

13



3



10



Available through
Continental Refrigerator

Recommended

4

Any combination
but must use 3



Alternate

Core Removal Tool A32525N



9

5



Must use 2
of the same

8



7



6



Optional

Piercing Valve EZ-40288



R-290 Servicing, Tools and Labeling

R-290 Labeling

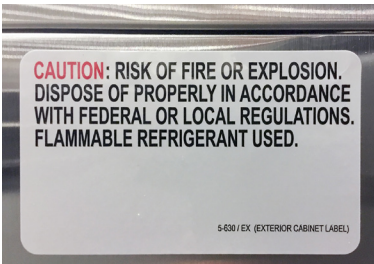
All equipment using compressors containing R-290 refrigerant are clearly labeled. You can locate identifying labels on equipment as follows:



Flammable refrigerant



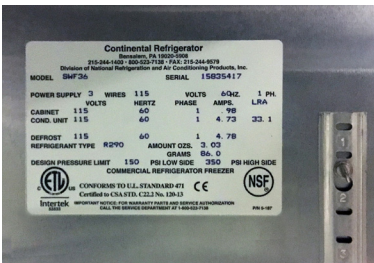
Exterior back wall



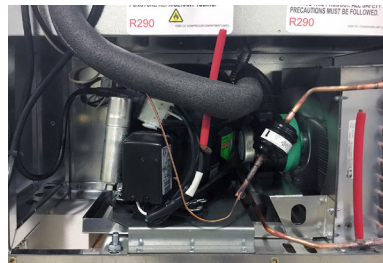
Cabinet side panel



Evaporator/fan cover



Data Tag



Red sleeves installed on process tubes

Caution: Replace red sleeves after servicing

Leak Checking System

WARNING: Do NOT use any leak test dyes when working on an R-290 refrigeration system.

A

Bubble test

B

Electronic combustible
gas detection

C

Nitrogen holding
pressure test

The following leak detection methods may be considered for **sealed system**: **A B**

The following leak detection methods may be considered for **accessed system**: **C**

For the most part, you would leak check a R-290 system the same way you would a R-134a or R-404A system with a couple of exceptions. You can still use a bubble solution or an electronic ultrasonic leak detector as well. We would also recommend using oxygen-free dry nitrogen with a trace gas not exceeding 150PSIG.

NOTE: You cannot use a halide leak detector on an R-290 system.

NOTE: your electronic leak detector must be designed specifically for combustible gas.

Accessing Refrigeration System

**REFER TO “FLOW CHART for R-290” (see page 16)
PRIOR TO ACCESSING THE SYSTEM.**

Installing Service Piercing Valves

Line tap valves can be used to access the refrigeration system. Line tap valves should be temporarily placed on the suction and liquid process tubes. Leaving valves on the system may void warranty.

IMPORTANT: Never leave piercing valves of any type on an R-290 refrigeration system.



Wear safety glasses and gloves (rubber coated are best).



Turn the gas combustible leak detector “ON”. On the detector we noted in the “**Tools**” section, a high pitched audible tone will change to a steady beeping sound. The LED will illuminate briefly. Refer to the manufacturer’s instructions for your detector you are using.



Post the warning placard in plain view for all to see on the front and rear of the refrigeration appliance. **Make sure the cabinet is disconnected from the power source.**



Remove the red sleeves on the suction and liquid line process tubes. Install the piercing valves following manufacturer’s instructions. Red sleeves **must** be replaced when done servicing.

Recovering R-290



According to the **Environmental Protection Agency's Significant New Alternative Policy**, R-290 can be vented to the atmosphere. (**USING APPROVED METHODS**)

NOTE: Recovery machines for use with hydrocarbon refrigerants are in limited production. Only an explosion proof recovery machine can be used to recover.

Recovering R-290 Without the Use of a Recovery Machine

1. Evacuate an empty recovery cylinder into a vacuum.
2. Using an accurate refrigerant scale, zero out the refrigerant scale and weigh the empty recovery cylinder prior to adding refrigerant gauges or hoses. Note this weight.
3. Securely connect the evacuated cylinder to the refrigeration system using refrigerant gauges and hoses.
4. Open both refrigerant gauges to allow refrigerant to flow through the gauges to the recovery cylinder. You **must** evacuate from both sides.
5. Once the pressures have equalized, valve off the refrigerant gauges and the recovery cylinder securely.
6. Carefully remove the refrigerant hose from the recovery cylinder.
7. Zero out the refrigerant scale and weigh the recovery cylinder. Note this weight.
8. Subtract the empty tank weight recorded from the cylinder now containing the refrigerant. This will be the amount recovered.

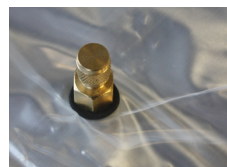
NOTE: You can check Data Tag to verify any leak.

9. A recovery cylinder containing R-290 can be vented outdoors. See "**Venting R-290**" for instructions on venting R-290.
10. After venting the refrigerant, purge the recovery cylinder with nitrogen at a flow rate of 5PSIG through the liquid port of the recovery cylinder for 2 minutes outdoors, 10 feet away perimeter from any structures or ignition sources.
11. Repeat steps 1-9 until the recovery cylinder and the system equalize into a vacuum.

NOTE: Trace amounts of R-290 will remain trapped in the POE oil of the compressor.

If Using a Continental Refrigerator Recovery Bag

1. Locate the access fitting provided on the recovery bag.
2. Connect yellow hose on your gauge set to the access fitting on the recovery bag.
3. Open both gauges and wait until both gauges read "0".
4. Remove hose from recovery bag.



Access fitting
on recovery bag

Venting R-290

1. Do **NOT** vent hydrocarbon refrigerants inside a building under any circumstance (SAFETY RISK).
2. Venting hydrocarbon refrigerants to a public area or where people are unaware of the procedure is not permitted.
3. When venting R-290 **YOU MUST** make everyone in the immediate area aware that you are venting a flammable gas to the atmosphere.
4. Ensure there are no ignition sources within a 10 ft. perimeter of the area you are venting R-290. **Be aware that a cell phone, E-cigarettes or similar electronic devices could be a source an ignition.**
5. Ensure that all local legislation/regulations addressing safety of hazardous or flammable substances are satisfied.
6. Ensure you are not venting R-290 into a low lying area. R-290 is heavier than air and can accumulate in floor drains, grease traps, piping troughs, etc.
7. After venting, purge with Nitrogen through the system for a minimum of 10 seconds.

NOTE: Technician **must use tube cutter** instead of torch when removing refrigeration system components.

System **Evacuation** (After Repairs Have Been Made)

NOTE: Prior to sealing up the system make sure you have a sufficient amount of service access tubing remaining for service in the future.

1. Remove the crimped tubing and piercing/saddle valve from the process tube.
2. Extend the process tube a minimum of 12”.
3. Crimp and braze the process tube extension.
4. Install piercing/saddle valve just before last crimp.

After the system has been sealed and leak checked, it is necessary to evacuate it in order to remove air, moisture, and unwanted residual refrigerant.

1. It is necessary to purge the system with nitrogen. This is necessary to prevent flammable mixtures from occurring.
2. When connecting the hoses between the system, gauge manifolds, and vacuum pump, ensure that the connections are secure and there are no potential ignition sources nearby.

System Evacuation (cont'd...)

3. Ensure that the pump discharge is in an area free of potential ignition sources.
4. Ensure that a micron gauge is used since conventional manifold gauges may not provide a proper reading.
5. The system should be evacuated to the desired pressure (typically 250 microns or less) and then left to stand for 15 minutes to ensure that the entire refrigerant charge has been removed from the oil and any residual moisture has been evaporated from the system.
6. Ensure that the vacuum pump is of good quality and of appropriate capacity for the system, and the oil level is correct.

Charging the System

IMPORTANT: Dial-a-charge cylinders, with a sight glass, should not be used to charge systems with flammable refrigerant.

The same charging procedures are used with R-290 refrigerants as with any other type of refrigerant, except certain considerations are important:

1. **Evacuate the system following the “System Evacuation” section in this manual.**
2. **Charge the System.**

DO NOT OVERCHARGE A SYSTEM USING R-290.

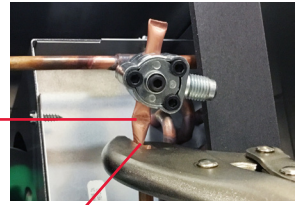
You must weigh in the exact charge.

- Prior to charging, ensure the system has been leak checked.
- Hoses or lines must be as short as possible to minimize the amount of refrigerant contained in them.
- Evacuate the hoses and manifold prior to charging to avoid contamination of the refrigerant.
- Upon completion of charging, a further leak check must be carried out prior to leaving the site.
- After charging, carefully disconnect the hoses, attempting to minimize the release of refrigerant.
- After charging, all access ports/points must be removed following the “**Remove Access Ports**” section on the next page.

Removal and Sealing of Access Ports

IMPORTANT: Do NOT leave piercing valves on this system.

1. Pinch line off just before the temporary access port two times using a crimper tool. Keep crimping tool in place **as shown in photo**.
2. Verify that there are no leaks.
3. Remove the piercing valve/temporary access port.
4. Snap off at **“crimp 1”** and check for leaks.
5. Braze open end shut while crimping tool is in place.
6. Leak check the system, with crimping tool removed, following the methods in the **“Leak Checking System”** section (see page 9).



crimp 2 - w/crimping tool

Repair of Electrical Components

WARNING: The electrical power to the machine **must** be disconnected. A combustible gas leak detector **must be on at all times**.

Protect yourself from hazards of working on the electrical components by following some basic guidelines **before** you begin the repair. Prior to starting your repair work on an electrical component, use your combustible gas detector to see if flammable gas is present. Only when the area is clear of any flammable gas should you start the repair.

WARNING: The tools you use **can be** a source of arcs, sparks, etc.

- **Do not** use components that produce sparks, discharge, etc.
- Components that could produce a potential ignition source need to be positioned in an area, distant and unreachable, from any potential refrigerant leak.
- OEM components are designed for use with flammable refrigerants.
- **Do not** replace faulty components that are intended not to spark with components that do. **ONLY use OEM components**.
- **Do not** modify components that are intended not to spark in such a way that they will spark.

Repair of Electrical Components (cont'd...)

Per ANSI/UL 471, Ed: 10th, SB6.2.4, component parts shall be replaced with like components. **ALWAYS use OEM components.**

Remember, you may not be the first person that has worked on this system.

- Check all components for unauthorized/non-OEM replacement parts.
- Look beyond your repair for any wear, stresses, that could become an ignition source. Are terminal connections tight and in a UL approved push and lock connector?
- Check all protective conductors' connections each time you access a system or repair is made.
- Finally, check the plug, cabling and wiring for any damage.



Wire nuts are **not** approved for R-290. All connectors must be UL approved for use with **Hydrocarbons**.

UL approved push and lock connectors **must** be used for wire connections. These connectors must have sufficient strength to hold the conductor/wire in place

Flow Chart for R-290

Before starting work on a R-290 system your combustible gas leak detector must be turned ON and located close to the floor before any work begins.

ACCESSING REFRIGERATION CIRCUIT		NOTES
1	Disconnect electrical supply to appliance.	If possible, ground the appliance to avoid static electric spark.
2	Access condenser/compressor and install 2 piercing valves.	You need to vent both the high and low side of the system in case you have a blocked cap tube and/or drier.
3	Connect your refrigeration gauge equipped with 12" hoses to the 2 piercing valves.	
4	Connect the yellow hose of your gauge set to Continental Refrigerator's recovery bag or a venting tube, if a safe venting location is available.	See page 11 "If Using a Continental Refrigerator Recovery Bag"
5	Once the charge is removed, hook up your Nitrogen tank.	
6	Purge Nitrogen through the system for a min. of 10 seconds.	If using the recovery bag, be sure to take it to a safe location and vent.
7	Always cut the compressor or other components out with a tubing cutter.	
8	If compressor or other components must be unbrazed, purge Nitrogen through the system at 1 to 2 psi.	
9	Purge Nitrogen through system while brazing in all new components at 1 to 2 psi.	
INSTALLING NEW COMPONENTS		NOTES
1	Remove old compressor, drier and any other defective component.	If servicing of the equipment requires the removal of the compressor, solder the suction and discharged tubes <u>now</u> to prevent a spill.
2	Install new OEM components.	Remember if installing a compressor a new drier is required.
3	Prior to brazing, make certain the 2 service tubing access lines that remain are a minimum of 12" long for future service. If necessary, remove the 2 tap piercing valves and install longer copper with brazed pinched off ends. Reinstall tap valves.	Access tubing lines may need to be braced to prevent bending over.
4	Purge Nitrogen again at 1 to 2 psi while brazing. Wrap drier with wet rag when brazing.	
5	Fill the system with Nitrogen to 150 psi and check for leaks.	
6	Release Nitrogen and pull a vacuum on the system to 250 microns or less. Turn off the vacuum and monitor the system to see if it holds the vacuum.	
7	If vacuum holds, you are now ready to charge system.	Remember to use <u>only</u> labeled R-290 refrigerant. DO NOT USE BBQ PROPANE.
8	Purge charging hoses and ready your gauge set and hoses so they will not move during the charging process.	
9	Check the manufacturer's label for the required charge.	
10	Use your ball valves installed on your hose to meter in the charge.	Because the charge is small, take your time and be precise.
11	Charge (preferred method of charging is to charge liquid into liquid line)	
12	Install new starting components if compressor has changes. Check electrical connections and install all terminal covers.	OEM compressor start components are designed for use with HC refrigerants. Do not replace with non-OEM parts.
13	Start the system and check operation. Do a final check for leaks.	

Troubleshooting Guide for R-290

Before starting work on a R-290 system your combustible gas leak detector must be turned ON and located close to the floor before any work begins.

System is equipped with an electronic control. Begin by reviewing the “Operations Manual easy Electronic Control” for the sequence of operation and troubleshooting. Is the problem solved?

SCAN this code to download manuals

If not resolved, check the maintenance of the coils. Check the “Installation and Operations Manual” for more information. Are the coils clean and obstructed? Is the problem resolved?



If not resolved, refer to the “Troubleshooting Guide” in the “Installation and Operations Manual” for more information. Is the problem resolved?

Because the system has no service access ports, refer to the “Refrigerant Circuit Diagrams” on pages 18-22 for the line temperatures and amp draw (charts are based on ambient temperatures in room 80°-100°). Check the compressor for temperature, vibration, noise and locked rotor.

After **ALL** of the above have been completed, or following the diagnosis of a failed component of the closed system, it is time to access the closed system. **Be sure the power to the unit is turned OFF.**

If your diagnosis calls for the removal of a component of the refrigeration circuit or repair of a leak. **Remove the charge from the system.**

NOTE: A torch may **NOT** be used to undo any copper fittings. Fittings must be cut out using a tubing cutter.

Locate and remove the red plastic line covers from the high and low side of the system. Install the 2 tap piercing valves as high up on tubes as possible. Connect refrigeration manifold gauge set to high and low side using 12” hoses, as specified. Check for pressure. If pressure exists, **prepare to remove refrigerant.**

Connect the venting hose to the gauge set and route venting hose to a safe and proper location outside of the building. If using a Continental Refrigerator recovery bag, connect it to your gauge set. Open both gauges and wait until both gauges read “0”.

Remove venting hose and/or recovery bag.

NOTE: At this point it is good practice to vent the system for 10 seconds with nitrogen before you start your work to remove any residual refrigerant.

NOTE: If using the recovery bag, be sure to take it to a safe location and vent.

Clean copper tubing where cut is to be made.

IMPORTANT: Clean copper in the area where cut is to be made. Also clean copper on compressor and any other components with the plug securely in place (keeps system clean).

NOTE: If removing the compressor, cut copper as close to the compressor as possible.

Replace the defective components. If changing the compressor, you must also change the drier and replace both with the OEM replacements.

Prior to brazing, make certain the 2 service tubing access lines that remain are a minimum of 12” long for future service. If necessary, remove the 2 tap piercing valves and install longer copper, with brazed pinched off ends. Reinstall tap valves.

NOTE: Purge the system using nitrogen 10 seconds prior to, and during, brazing. You are now ready to braze.

Leak test all joints prior to charging (see page 9).

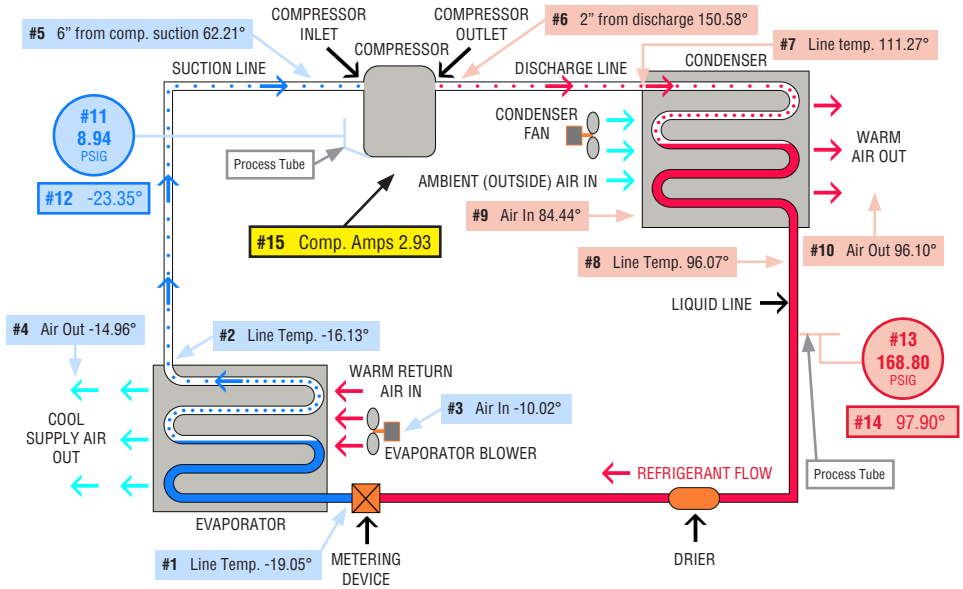
Charge system (see page 13).

Check system while running. If okay, remove the 2 tap piercing valves by using 2 pinch off tools. Make 2 pinch offs below the tap piercing valves in opposite directions, a minimum of a ½” apart. While the pinch off tool is still connected to the lower pinch, snap off the tubing at the upper pinch. Braze closed with pinch off tool still in place. It may be necessary to brace tools. Leak check, remove pinch off tools, and replace red covers on access lines. **Unit is now ready to be closed.**

IMPORTANT: Be sure to remove access fittings from the system or warranty will be void.

Refrigerant Circuit Diagram for SWF27 with R-290

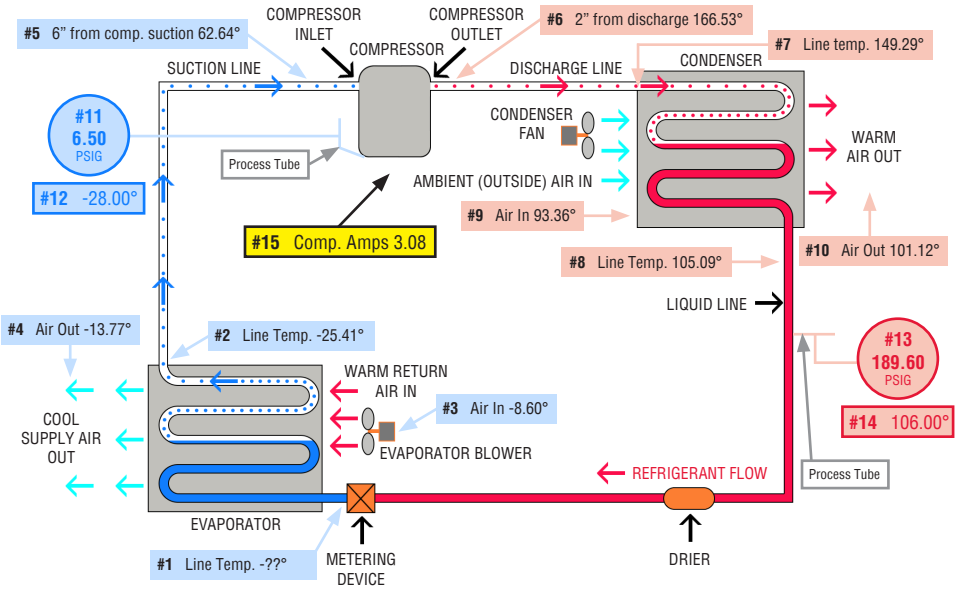
80 degrees environment shown (refer to chart below for other degrees)



	SWF27 R-290 Secop SP/Diff -7.0/5.0	70° No A/S Heaters	70° With A/S Heaters	80°	90°	100°	100° Dirty Condenser
1	Evap In	-20.75	-21.35	-19.05	-18.34	-17.09	-17.09
2	Evap Out	-14.71	-15.00	-16.13	-15.39	-14.60	-14.45
3	Evap Air In	-10.31	-9.07	-10.02	-9.73	-9.30	-8.37
4	Evap Air Out	-15.59	-16.00	-14.96	-14.70	-14.00	-14.11
5	6" Suction	55.53	57.81	62.21	69.22	77.68	78.27
6	2" Discharge	137.04	140.34	150.58	166.09	178.78	183.72
7	Cond In	99.61	100.90	111.27	122.71	133.02	135.93
8	Cond Out	86.80	87.54	96.07	104.99	113.85	115.63
9	Cond Air In	75.40	74.88	84.44	93.80	102.98	102.14
10	Cond Air Out	86.45	87.61	96.10	105.77	115.28	121.01
11	Suction Pressure	7.92	7.60	8.94	8.20	10.33	10.31
12	Saturated Suction Temp	-25.35	-25.98	-23.35	-22.24	-20.73	-20.76
13	Liquid Pressure	148.31	150.91	168.80	191.11	214.25	219.33
14	Liquid Saturated Temp	89.00	90.17	97.90	106.79	115.30	117.08
15	UUT Amps I1	2.84	3.06	2.93	3.12	3.16	3.15

Refrigerant Circuit Diagram for SWF32 with R-290

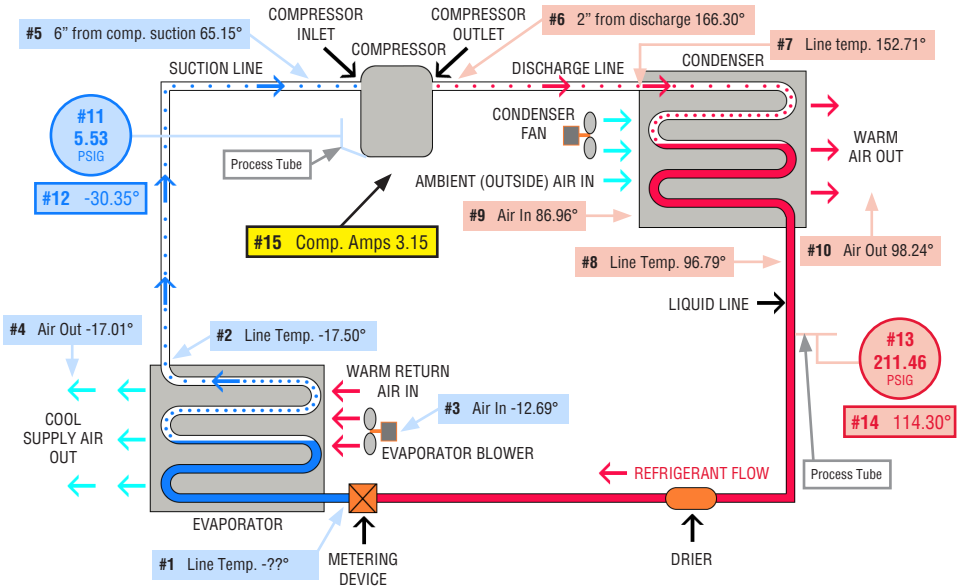
80 degrees environment shown (refer to chart below for other degrees)



	SWF32_R-290 Secop SP/Diff -7.0/5.0	70° No A/S Heaters	70° With A/S Heaters	80°	90°	100°	100° Dirty Condenser
1	Evap In	?	?	?	?	?	?
2	Evap Out	-25.49	-26.04	-25.41	-23.61	-21.98	-21.88
3	Evap Air In	-8.81	-8.46	-8.60	-8.06	-7.74	-7.68
4	Evap Air Out	-14.14	-14.30	-13.77	-23.42	-12.53	-12.46
5	6" Suction	56.80	59.20	62.64	67.55	73.63	74.51
6	2" Discharge	153.41	163.09	166.53	184.61	198.97	202.15
7	Cond In	137.43	145.02	149.29	165.62	178.93	182.29
8	Cond Out	97.53	99.84	105.09	114.36	122.71	123.28
9	Cond Air In	85.04	87.63	93.36	103.60	112.88	106.48
10	Cond Air Out	92.84	95.63	101.12	111.15	120.26	121.99
11	Suction Pressure	5.76	6.01	6.50	7.54	8.66	8.84
12	Saturated Suction Temp	-30.00	-29.00	-28.00	-26.00	-24.00	-23.90
13	Liquid Pressure	170.68	176.23	189.60	213.96	238.43	239.88
14	Liquid Saturated Temp	99.00	100.50	106.00	115.00	123.50	124.00
15	UUT Amps I1	3.04	3.28	3.08	3.37	3.33	3.43

Refrigerant Circuit Diagram for SWF36 with R-290

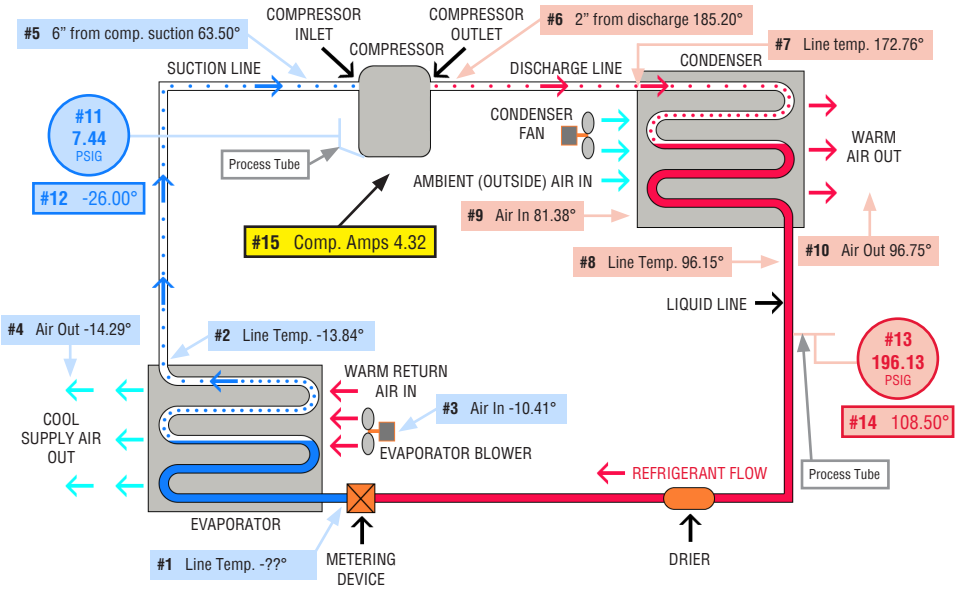
80 degrees environment shown (refer to chart below for other degrees)



	SWF36 R-290 Secop SP/Diff -7.0/5.0	70° No A/S Heaters	70° With A/S Heaters	80°	90°	100°	100° Dirty Condenser
1	Evap In	?	?	?	?	?	?
2	Evap Out	-17.46	-18.05	-17.50	-18.24	-24.72	-24.19
3	Evap Air In	-12.57	-12.27	-12.69	-14.38	-13.70	-13.35
4	Evap Air Out	-17.52	-17.80	-17.01	-16.57	-16.20	-16.26
5	6" Suction	58.89	59.03	65.15	72.83	72.99	73.48
6	2" Discharge	154.51	158.91	166.30	184.40	196.84	199.73
7	Cond In	141.09	144.56	152.71	170.03	182.77	185.68
8	Cond Out	88.64	87.89	96.79	107.20	115.58	116.36
9	Cond Air In	79.87	77.16	86.96	96.19	104.58	102.91
10	Cond Air Out	89.95	89.46	98.24	108.89	117.08	120.03
11	Suction Pressure	4.34	4.48	5.53	7.03	8.90	9.16
12	Saturated Suction Temp	-32.95	-32.78	-30.35	-27.45	-23.41	-22.95
13	Liquid Pressure	193.15	191.25	211.46	236.49	256.83	257.94
14	Liquid Saturated Temp	107.54	106.84	114.30	122.90	129.42	129.76
15	UUT Amps I1	3.09	3.41	3.15	3.54	3.65	3.65

Refrigerant Circuit Diagram for SWF48 with R-290

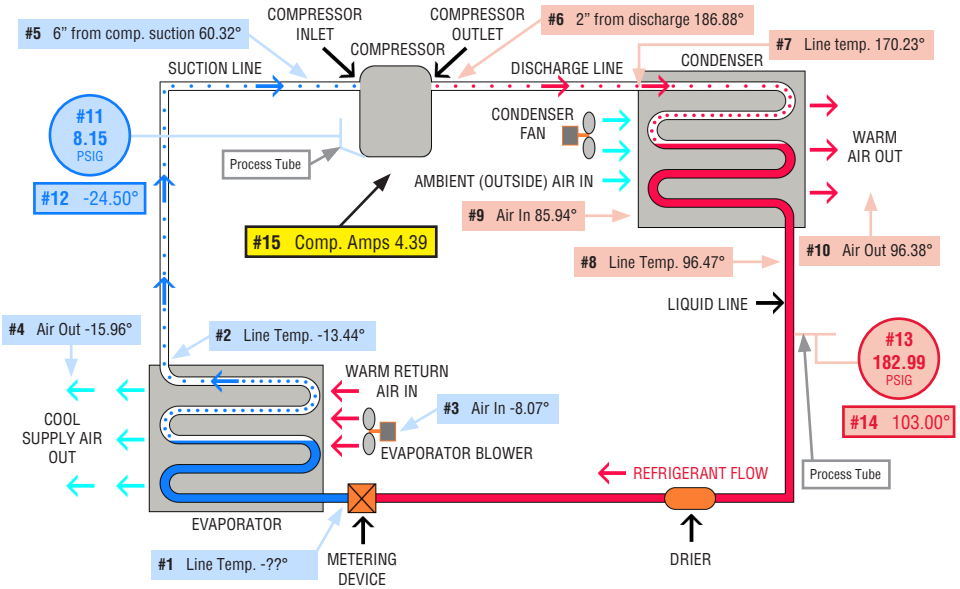
80 degrees environment shown (refer to chart below for other degrees)



	SWF48_R-290 Secop SP/Diff -7.0/5.0	70° No A/S Heaters	70° With A/S Heaters	80°	90°	100°	100° Dirty Condenser
1	Evap In	?	?	?	?	?	?
2	Evap Out	-12.53	-13.12	-13.84	-13.80	-15.41	-18.99
3	Evap Air In	-10.07	-10.39	-10.41	-10.68	-10.46	-9.38
4	Evap Air Out	-14.38	-14.43	-14.29	-14.10	-13.68	-13.45
5	6" Suction	56.75	57.74	63.50	70.65	77.46	78.45
6	2" Discharge	168.85	175.69	185.20	204.09	219.58	225.79
7	Cond In	156.22	162.72	172.76	191.02	206.20	211.23
8	Cond Out	86.01	87.08	96.15	105.81	114.97	118.08
9	Cond Air In	71.62	71.18	81.38	91.32	100.44	99.29
10	Cond Air Out	86.12	87.56	96.75	107.60	117.29	121.31
11	Suction Pressure	5.61	5.94	7.44	8.74	9.89	10.29
12	Saturated Suction Temp	-30.00	-29.50	-26.00	-24.00	-22.00	-20.00
13	Liquid Pressure	173.01	174.36	196.13	219.48	243.22	251.57
14	Liquid Saturated Temp	99.75	100.50	108.50	118.00	126.00	127.50
15	UUT Amps I1	4.15	4.57	4.32	4.88	5.01	5.06

Refrigerant Circuit Diagram for SWF60 with R-290

80 degrees environment shown (refer to chart below for other degrees)



	SWF60_R-290 Secop SP/Diff -7.0/5.0	70° No A/S Heaters	70° With A/S Heaters	80°	90°	100°	100° Dirty Condenser
1	Evap In	?	?	?	?	?	?
2	Evap Out	-13.20	-13.55	-13.44	-18.43	-18.57	-18.28
3	Evap Air In	-8.18	-8.03	-8.07	-7.92	-7.61	-7.62
4	Evap Air Out	-16.59	-16.62	-15.96	-15.80	-15.03	-14.80
5	6" Suction	53.95	54.11	60.32	66.19	70.37	72.10
6	2" Discharge	170.97	176.28	186.88	205.59	220.32	225.06
7	Cond In	154.67	159.07	170.23	187.68	201.75	206.70
8	Cond Out	86.39	86.80	96.47	106.71	116.07	118.89
9	Cond Air In	76.82	72.95	85.94	95.85	104.91	100.36
10	Cond Air Out	86.24	86.65	96.38	106.75	116.13	119.77
11	Suction Pressure	6.93	7.13	8.15	8.90	9.74	10.17
12	Saturated Suction Temp	-27.75	-26.50	-24.50	-24.00	-22.00	-21.00
13	Liquid Pressure	161.28	161.78	182.99	206.33	230.10	237.67
14	Liquid Saturated Temp	95.00	95.00	103.00	112.50	121.00	123.00
15	UUT Amps I1	4.24	4.70	4.39	4.93	5.06	5.09

Pressure Temperature Chart HC-290

PRESSURE psig (°Hg)	TEMPERATURE Degrees F	PRESSURE psig (°Hg)	TEMPERATURE Degrees F	PRESSURE psig (°Hg)	TEMPERATURE Degrees F
-22	-92.57	37	15.76	145	87.51
-20	-85.05	38	16.82	150	89.78
-18	-78.72	39	17.86	155	92.01
-16	-73.23	40	18.88	160	94.19
-14	-68.36	41	19.89	165	96.32
-12	-63.96	42	20.88	170	98.41
-10	-59.95	43	21.87	175	100.5
-8	-56.26	44	22.84	180	102.5
-6	-52.82	45	23.8	185	104.4
-4	-49.61	46	24.74	190	106.4
-2	-46.59	47	25.68	195	108.3
0	-43.74	48	26.6	200	110.2
1	-41.04	49	27.51	205	112
2	-38.46	50	28.42	210	113.8
3	-36.01	51	29.31	215	115.6
4	-33.66	52	30.19	220	117.3
5	-31.4	53	31.06	225	119.1
6	-29.23	54	31.92	230	120.8
7	-27.14	55	32.77	235	122.4
8	-25.13	56	33.62	240	124.1
9	-23.18	57	34.45	245	125.7
10	-21.29	58	35.28	250	127.3
11	-19.46	59	36.1	255	128.9
12	-17.69	60	36.91	260	130.4
13	-15.96	61	37.71	265	132
14	-14.28	62	38.5	270	133.5
15	-12.65	63	39.29	275	135
16	-11.06	64	40.07	280	136.5
17	-9.5	65	40.84	285	137.9
18	-7.99	66	41.6	290	139.4
19	-6.5	67	42.36	295	140.8
20	-5.06	68	43.11	300	142.2
21	-3.64	69	43.86	305	143.6
22	-2.25	70	44.59	310	145
23	-0.89	75	48.19	315	146.3
24	0.44	80	51.63	320	147.7
25	1.75	85	54.95	325	149
26	3.03	90	58.13	330	150.3
27	4.29	95	61.23	335	151.6
28	5.52	100	64.21	340	152.9
29	6.74	105	67.1	345	154.2
30	7.93	110	69.9	350	155.4
31	9.1	115	72.62	355	156.7
32	10.26	120	75.27	360	157.9
33	11.39	125	77.84	365	159.1
34	12.51	130	80.35	370	160.3
35	13.61	135	82.79	375	161.5
36	14.7	140	85.18	380	162.7

Notes:

Training



Refrigeration Service Engineering Society (RSES)
Hydrocarbon Refrigerants Course and Test - Third Edition

Details

The United States Environmental Protection Agency (EPA) has recently made changes to the hydrocarbon rules under its Significant New Alternatives Program (SNAP).

In response to these changes, RSES offers an online course through their Web site at www.rses.org. Full eLearning course on working safely with Hydrocarbon refrigerants and includes a study guide, online review and test. There is a charge for this course.

Continental[®]
Refrigerator

A Division of National Refrigeration & Air Conditioning Products, Inc.
539 Dunksferry Road • Bensalem, PA 19020-5908
P 215-244-1400 • 1-800-523-7138 • F 215-244-9579
www.continentalrefrigerator.com