

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer or equivalent, service agency, or the gas supplier

⚠ CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

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INSTALLATION INSTRUCTIONS

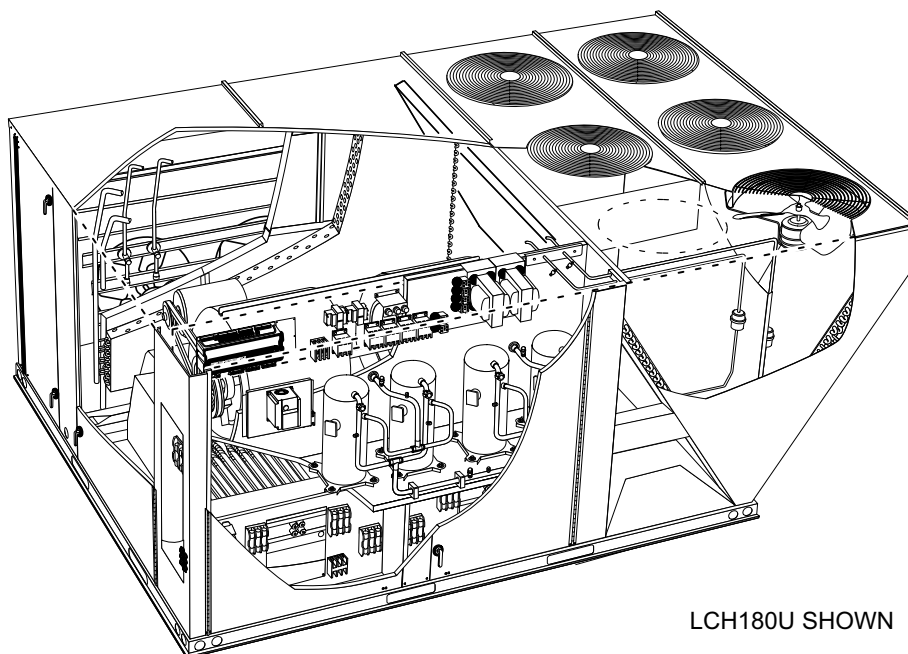
LGH/LCH156H	(13 Ton)
LGH/LCH180H	(15 Ton)
LGH/LCH180U	(15 Ton)
LGH/LCH210H	(17.5 Ton)
LGH/LCH240H	(20 Ton)
LGH/LCH240U	(20 Ton)
LGH/LCH300S	(25 Ton)

ROOFTOP PACKAGED UNITS

507124-07
2/2019
Supersedes 507124-06

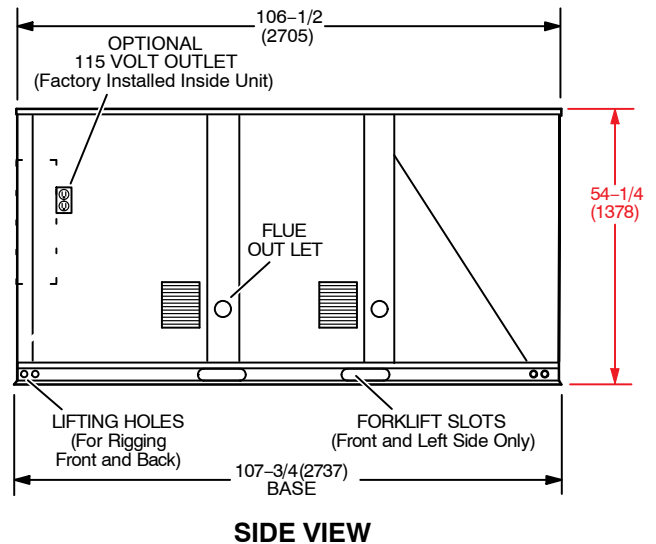
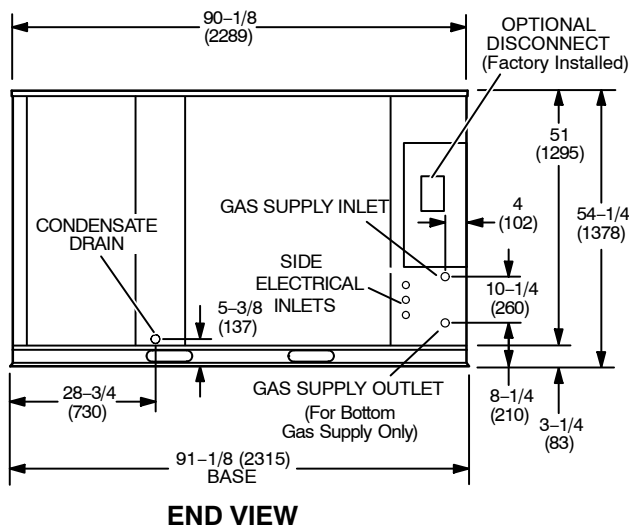
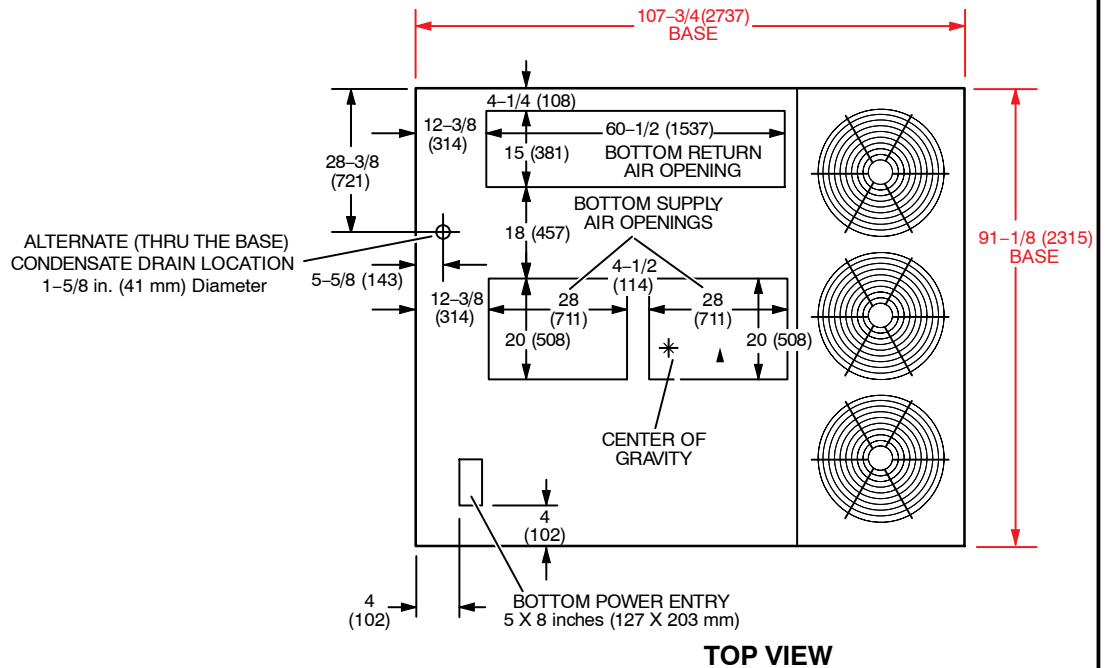
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RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

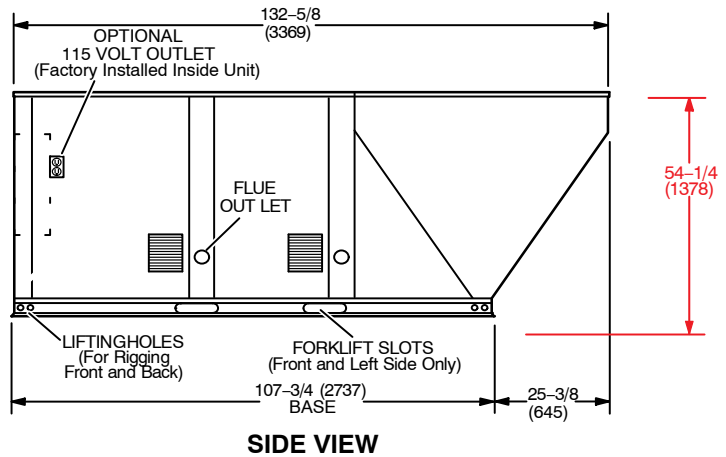
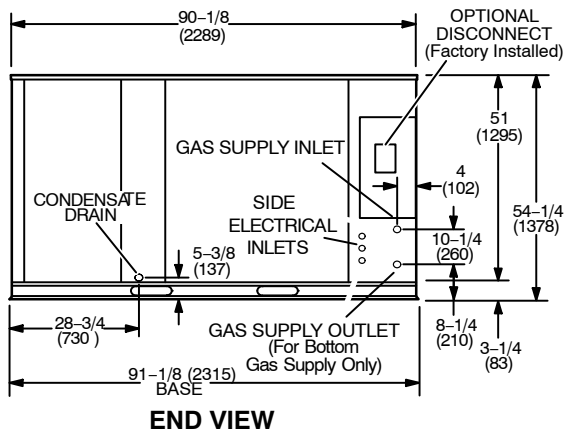
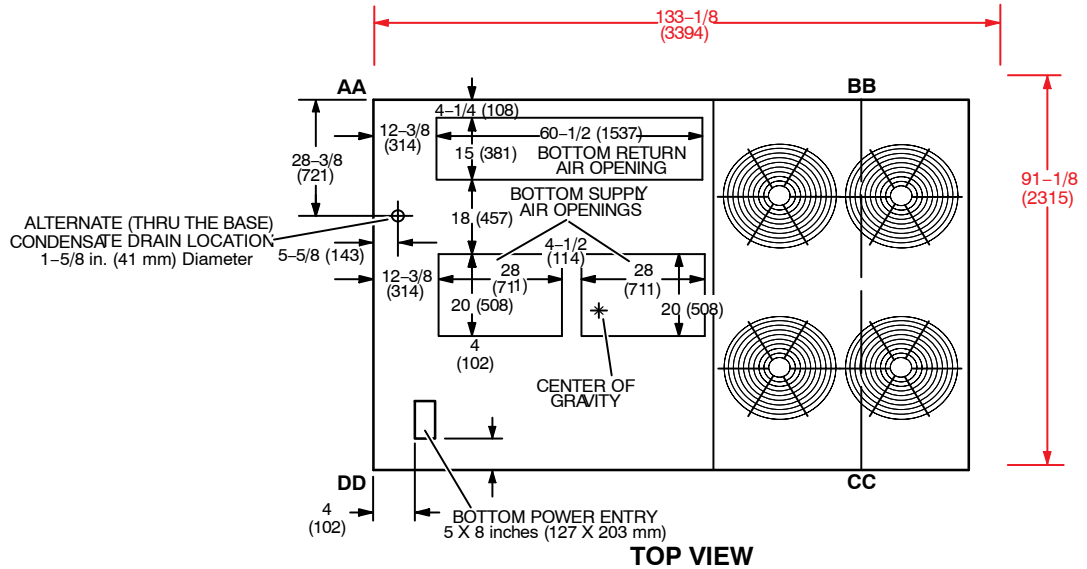


LCH180U SHOWN

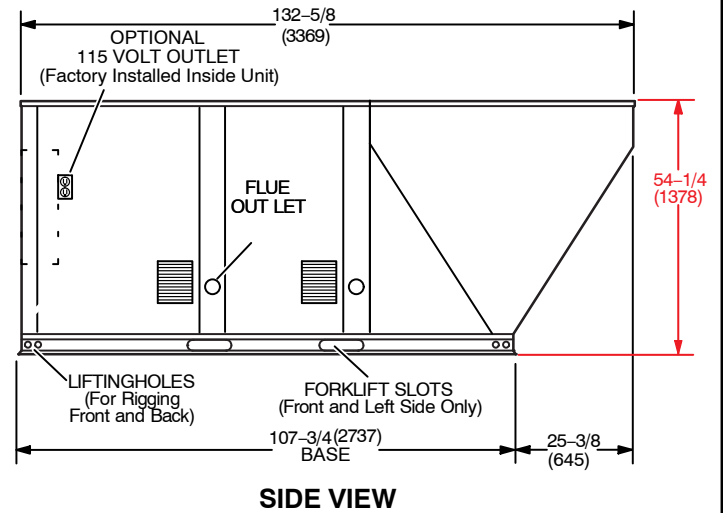
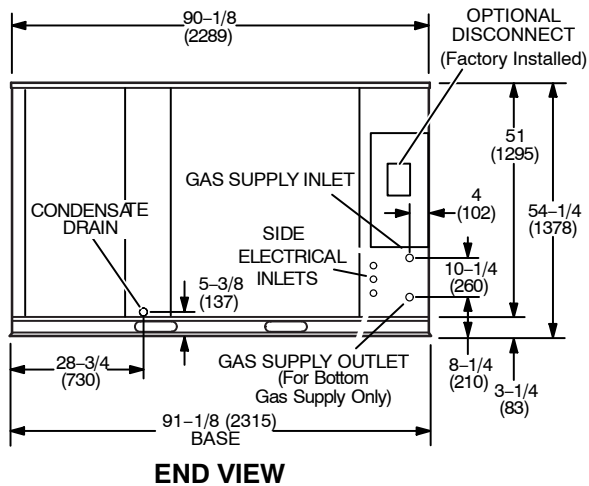
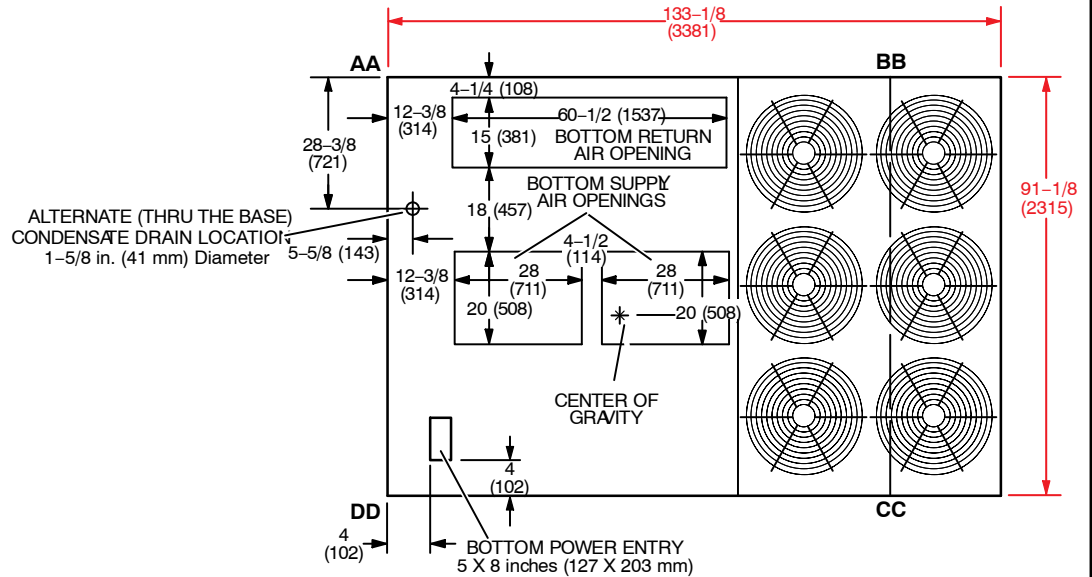
LGH/LCH156 Unit Dimensions - Inches (mm) - Gas Heat Section Shown



LGH/LCH180H Unit Dimensions - Inches (mm) - Gas Heat Section Shown

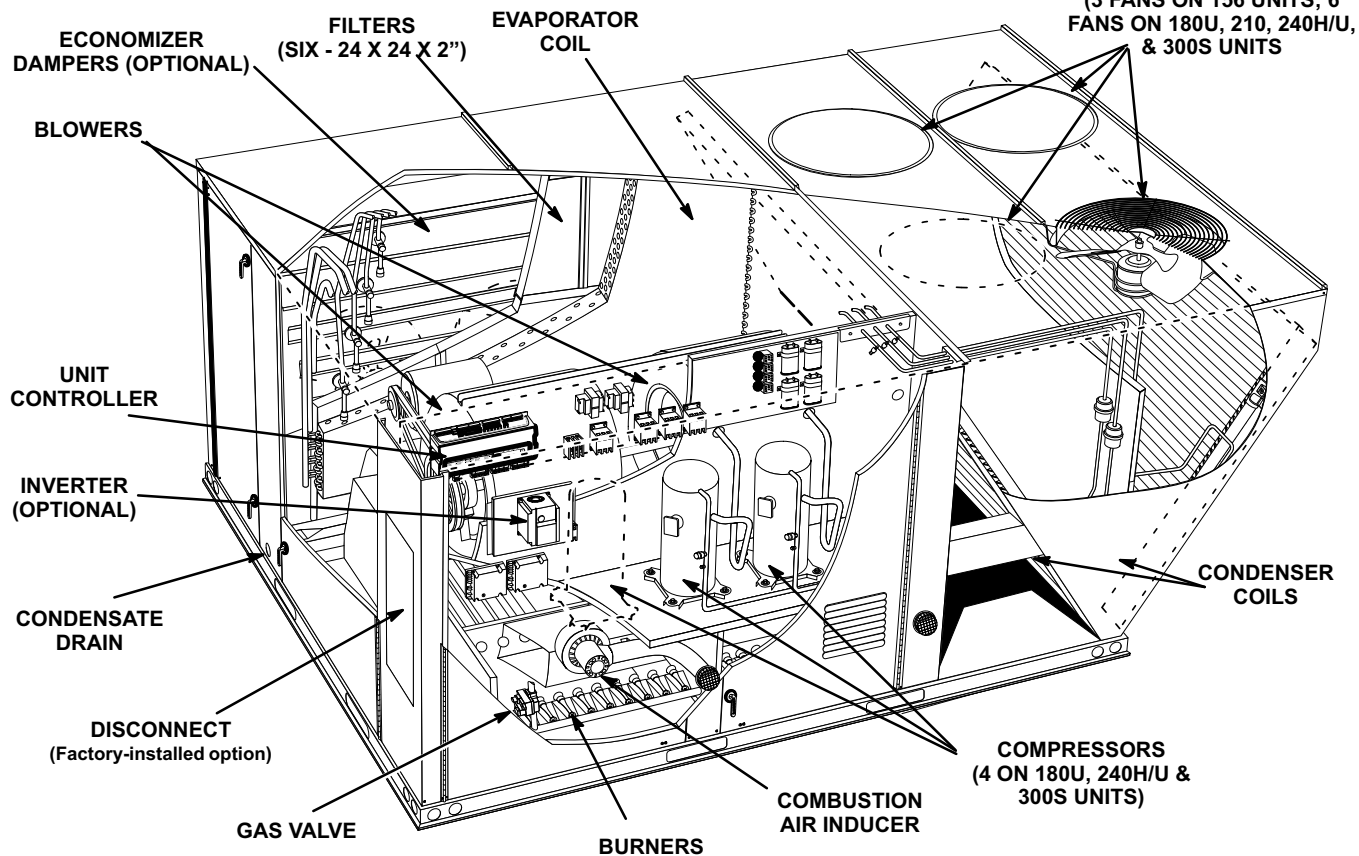


LGH/LCH180U, 210, 240H/U & 300S Unit Dimensions - Inches (mm) - Gas Heat Section Shown



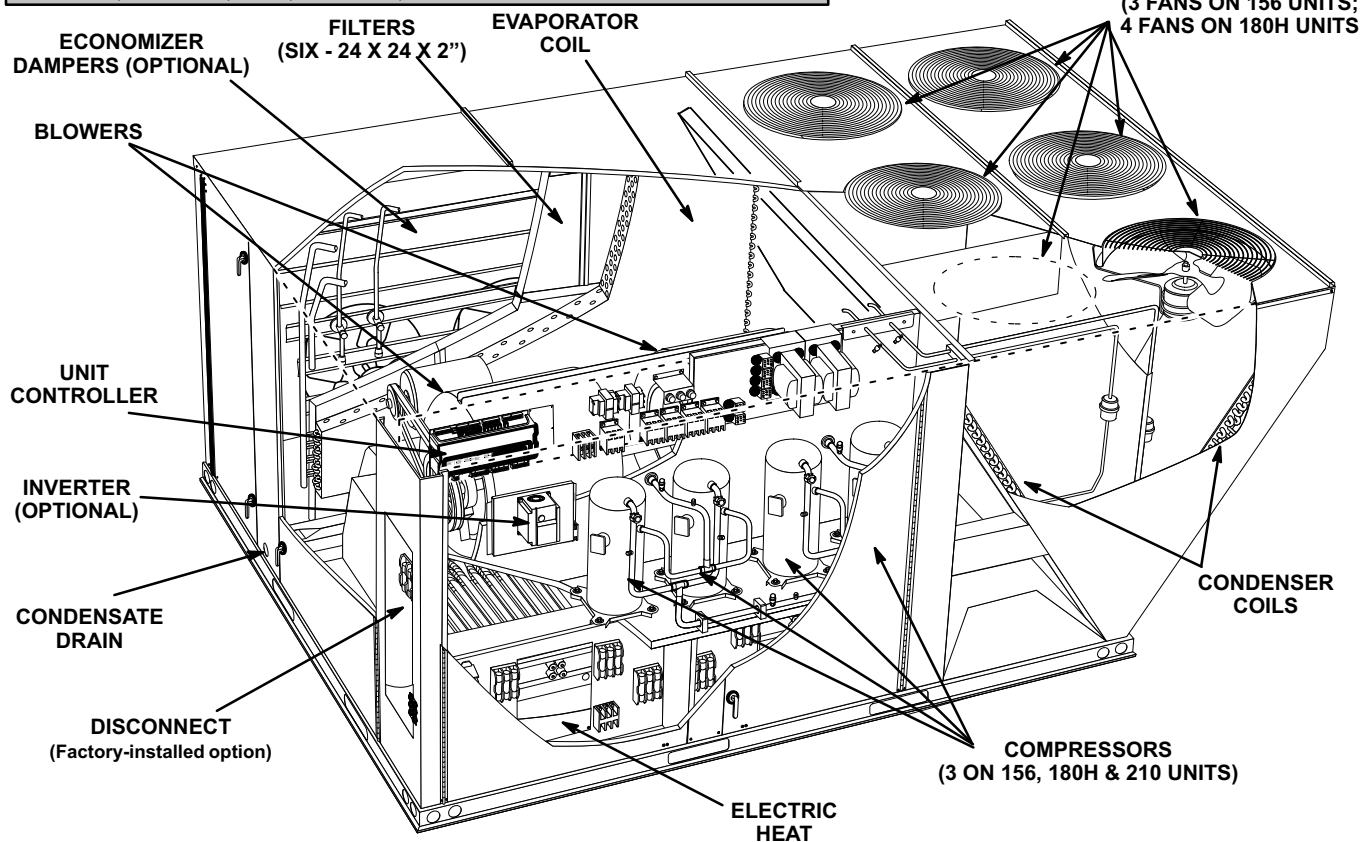
LGH156, 180H/U, 210, 240H/U, 300S PARTS ARRANGEMENT

180H Shown



LCH156, 180H/U, 210, 240H/U, 300S PARTS ARRANGEMENT

180U Shown



Shipping and Packing List

Package 1 of 1 contains:

1- Assembled unit

Check unit for shipping damage. Receiving party should contact last carrier immediately if shipping damage is found.

IMPORTANT - Hot gas reheat units require a specific field-provided and installed humidity sensor.

General

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

The LGH156H gas/electric packaged rooftop unit is available in 260,000 & 360,000 Btuh heating input. The LGH180H/U, 210H, 240H/U, & 300S gas/electric packaged rooftop units are available in 260,000, 360,000, or 480,000 Btuh heating inputs.

The LCH156H, 180H/U, 210H, 240H/U, & 300S cooling packaged rooftop unit is the same basic design as the LGH unit except for the heating section. Optional electric heat is factory- or field-installed in LCH units.

LGH and LCH156H, 180H, 210H, 240H, & 300S units have identical refrigerant circuits with respective 13, 15, 17-1/2, 20 and 25 ton cooling capacities. 156H, 180H and 210H units contain three compressors; 240H and 300S units contain four compressors.

LGH and LCH180U & 240U ultra high efficiency units have identical refrigerant circuits with respective 15 and 20 ton cooling capacities. Ultra high efficiency units contain four compressors; compressor 1 & 2 are tandem and compressor 3 & 4 are tandem.

Standard and high efficiency units come standard with a lightweight, all-aluminum condenser coil. Standard and high efficiency units are available with an optional, factory-installed fin/tube condenser coil. Ultra high efficiency units are equipped with fin/tube condenser coils.

Standard and high efficiency units are available with an optional hot gas reheat coil which provides a dehumidifying mode of operation. Refer to Reheat Operation section.

LGH/LCH180, 240H units are available with variable air volume, constant air volume, or multi-staged air volume.. LGH/LCH156, 210H, & 300S units are available in constant air volume or multi-staged air volume only. Refer to the 9th character of the model number to determine type of blower:

- B - Constant Air Volume
- V - Variable Air Volume
- M - Multi-Stage Air Volume

Units use R410A, an ozone-friendly HFC refrigerant. Refer to the Cooling Start-Up section for precautions when installing unit.

⚠ WARNING



Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off gas and electrical power to unit before performing any maintenance or servicing operations on the unit. Follow lighting instructions attached to unit when putting unit back into operation and after service or maintenance.

Requirements

See figure 1 for unit clearances.

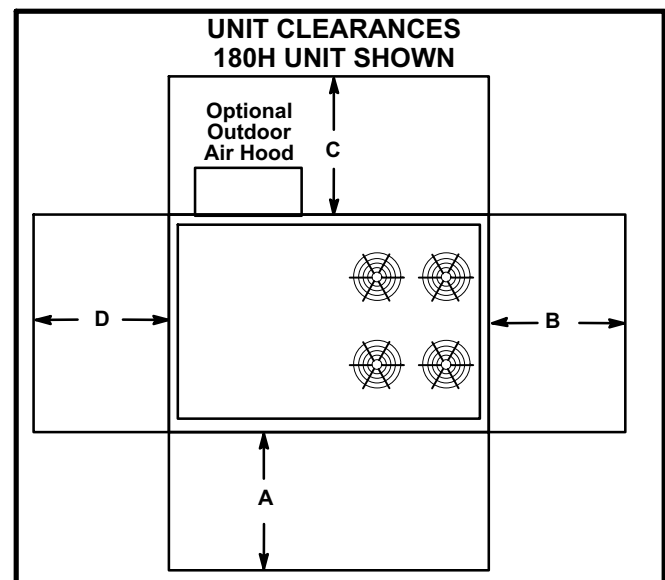


FIGURE 1

¹ Unit Clearance	A in.(mm)	B in.(mm)	C in.(mm)	D in.(mm)	Top Clearance
Service Clearance	60 (1524)	36 (914)	36 (914)	66 (1676)	Unob- structed
Clearance to Combustibles	36 (914)	1 (25)	1 (25)	1 (25)	Unob- structed
Minimum Operation Clearance	36 (914)	36 (914)	36 (914)	41 (1041)	Unob- structed

Note - Entire perimeter of unit base requires support when elevated above mounting surface.

¹ **Service Clearance** - Required for removal of serviceable parts.

Clearance to Combustibles - Required clearance to combustible material (gas units).

Minimum Operation Clearance - Required clearance for proper unit operation.

NOTICE

Roof Damage!

This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to swell. Bubbles in the rubber roofing material can cause leaks. Protect the roof surface to avoid exposure to refrigerant and oil during service and installation. Failure to follow this notice could result in damage to roof surface.

Use of this unit as a construction heater or air conditioner is not recommended during any phase of construction. Very low return air temperatures, harmful vapors and operation of the unit with clogged or misplaced filters will damage the unit.

If this unit has been used for heating or cooling of buildings or structures under construction, the following conditions must be met or the warranty will be void:

- The vent hood must be installed per these installation instructions.
- A room thermostat must control the unit. The use of fixed jumpers that will provide continuous heating or cooling is not allowed.
- A pre-filter must be installed at the entry to the return air duct.
- The return air duct must be provided and sealed to the unit.
- Return air temperature range between 55°F (13°C) and 80°F (27°C) must be maintained.
- Air filters must be replaced and pre-filters must be removed upon construction completion.
- The input rate and temperature rise must be set per the unit rating plate.
- The heat exchanger, components, duct system, air filters and evaporator coil must be thoroughly cleaned following final construction clean-up.
- The unit operating conditions (including airflow, cooling operation, ignition, input rate, temperature rise and venting) must be verified according to these installation instructions.

IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance.

Unit Support

In downflow discharge installations, install the unit on a non-combustible surface only. Unit may be installed on combustible surfaces when used in horizontal discharge applications or in downflow discharge applications when installed on an LARMF18/36 roof mounting frame.

NOTE - Securely fasten roof frame to roof per local codes.

CAUTION

To reduce the likelihood of supply / return air bypass and promote a proper seal with the RTU, duct work / duct drops / diffuser assemblies must be supported independently to the building structure.

A-Downflow Discharge Application

Roof Mounting with LARMF18/36

- 1- The LARMF roof mounting frame must be installed, flashed and sealed in accordance with the instructions provided with the frame.
- 2- The LARMF roof mounting frame should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3- Duct must be attached to the roof mounting frame and not to the unit; supply and return plenums must be installed before setting the unit.

Installer's Roof Mounting Frame

Many types of roof frames can be used to install the unit depending upon different roof structures. Items to keep in mind when using the building frame or supports are:

- 1- The base is fully enclosed and insulated, so an enclosed frame is not required.
- 2- The frames or supports must be constructed with non-combustible materials and should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3- Frame or supports must be high enough to prevent any form of moisture from entering unit. Recommended minimum frame height is 14" (356mm).
- 4- Duct must be attached to the roof mounting frame and not to the unit. Supply and return plenums must be installed before setting the unit.
- 5- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

NOTE-When installing a unit on a combustible surface for downflow discharge applications, an LARMF18/36 roof mounting frame is required.

B-Horizontal Discharge Applications

- 1- Units installed in horizontal airflow applications must use an LARMFH18/24 horizontal roof mounting frame. The supply air duct connects to the horizontal supply air opening on the LARMFH18/24. The return air duct connects to the unit horizontal return air opening. Refer to unit dimensions.
- 2- Specified installation clearances must be maintained when installing units. Refer to figure 1.
- 3- Top of support slab should be approximately 4" (102mm) above the finished grade and located so no run-off water from higher ground can collect around the unit.
- 4- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

Duct Connection

All exterior ducts, joints and openings in roof or building walls must be insulated and weather-proofed with flashing and sealing compounds in accordance with applicable codes. Any duct passing through an unconditioned space must be insulated.

⚠ CAUTION

In downflow applications, do not drill or punch holes in base of unit. Leaking in roof may occur if unit base is punctured.

Rigging Unit For Lifting

Rig unit for lifting by attaching four cables to holes in unit base rail. See figure 2.

- 1- Detach wooden base protection before rigging.
- 2- Connect rigging to the unit base using both holes in each corner.
- 3- All panels must be in place for rigging.
- 4- Place field-provided H-style pick in place just above top edge of unit. Frame must be of adequate strength and length. (H-style pick prevents damage to unit.)

RIGGING

Unit	*Weight	
	Lbs.	Kg.
LG 156, LC 156, LC 180H	2350	1066
LG 180H, LC180U, LG 210 LC 210, LC 240, LC 300	2855	1295
LG 180U, LG 240, LG 300	3000	1361

*Maximum weight with all available factory-installed accessories.

**LIFTING POINT SHOULD BE DIRECTLY
ABOVE CENTER OF GRAVITY**

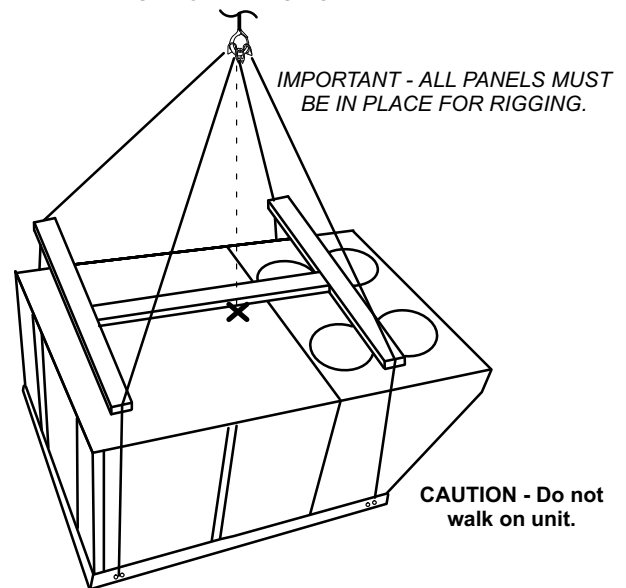


FIGURE 2

Condensate Drains

Remove cap and make drain connection to the 1" N.P.T. drain coupling provided on unit. A trap must be installed between drain connection and an open vent for proper condensate removal. See figure 3. It is sometimes acceptable to drain condensate onto the roof or grade; however, a tee should be fitted to the trap to direct condensate downward. The condensate line must be vented. Check local codes concerning condensate disposal. Refer to pages 2, 3 and 4 for condensate drain location.

Note - The drain pan is made with a glass reinforced engineered plastic capable of withstanding typical joint torque but can be damaged with excessive force. Tighten pipe nipple hand tight and turn an additional quarter turn.

CONDENSATE DRAIN CONNECTION

NOTE - Allow clearance to open doors when installing condensate piping.

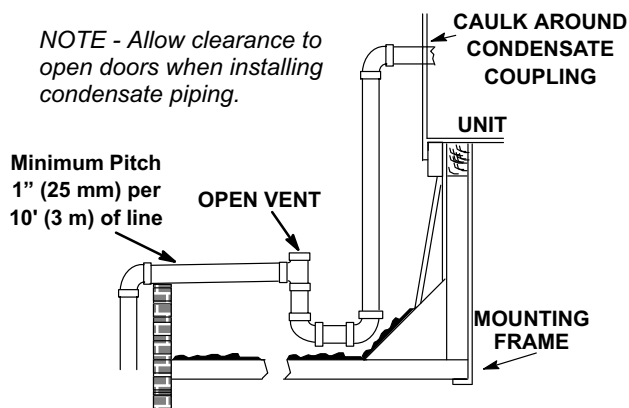


FIGURE 3

Connect Gas Piping

Before connecting piping, check with gas company or authorities having jurisdiction for local code requirements. When installing gas supply piping, length of run from gas meter must be considered in determining pipe size for 0.5" w.c. (.12kPa) maximum pressure drop. Do not use supply pipe smaller than unit gas connection. For natural gas units, operating pressure at the unit gas connection must be a minimum of 4.7" w.c. (1.17kPa) and a maximum of 10.5" (2.60kPa) w.c. For LP/propane gas units, operating pressure at the unit gas connection must be a minimum of 11" w.c. (2.74kPa) and a maximum of 13.5" w.c. (3.36kPa).

When making piping connections a drip leg should be installed on vertical pipe runs to serve as a trap for sediment or condensate. A 1/8" N.P.T. plugged tap is located on gas valve for test gauge connection. Refer to Heating Start-Up section for tap location. Install a ground joint union between the gas control manifold and the main manual shut-off valve. See figure 4 for gas supply piping entering outside the unit. See figure 5 for gas supply entering through bottom of unit.

Compounds used on threaded joints of gas piping shall be resistant to the action of liquified petroleum gases.

OUTSIDE OF UNIT GAS PIPING

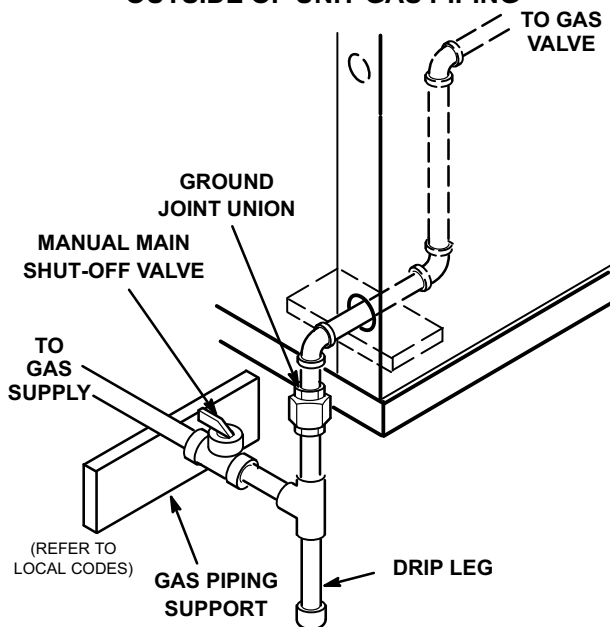


FIGURE 4

BOTTOM ENTRY GAS PIPING

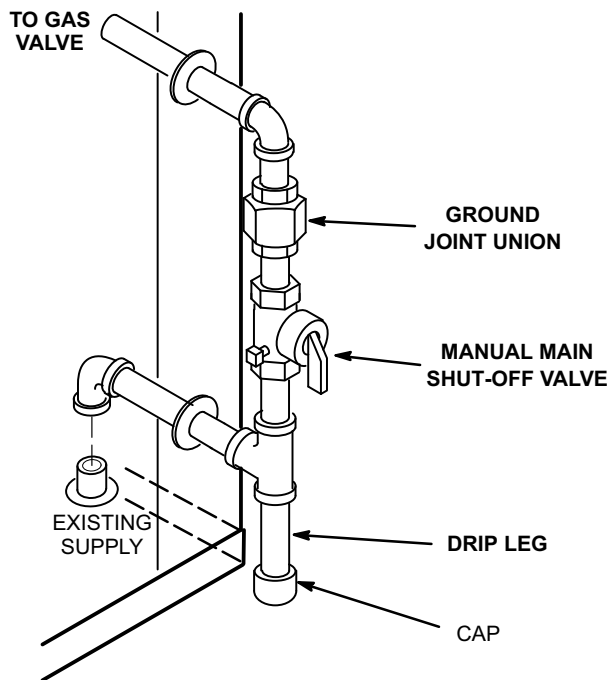


FIGURE 5

Pressure Test Gas Piping

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5 psig (3.48kPa). See figure 6.

NOTE-Codes may require that manual main shut-off valve and union (furnished by installer) be installed in gas line external to unit. Union must be of the ground joint type.

After all connections have been made, check all piping connections for gas leaks. Also check existing unit gas connections up to the gas valve; loosening may occur during installation. Use a leak detection solution or other preferred means. Do not use matches candles or other sources of ignition to check for gas leaks.

NOTE-In case emergency shut down is required, turn off the main manual shut-off valve and disconnect main power to unit. These devices should be properly labeled by the installer.

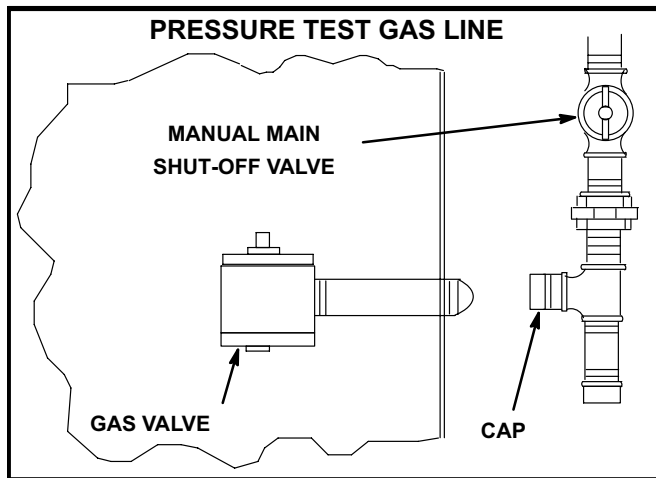


FIGURE 6

⚠ CAUTION

Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed. Do not use matches, candles, flame or othe sources of ignition to check for gas leaks.

⚠ WARNING



Danger of explosion. Can cause injury or product or property damage. Do not use matches, candles, flame or other sources of ignition to check for leaks.

High Altitude Derate

Locate the high altitude conversion sticker in the unit literature bag. Fill out the conversion sticker and affix next to the unit nameplate.

Refer to table 1 for high altitude adjustments.

**TABLE 1
HIGH ALTITUDE DERATE**

Altitude Ft.*	Gas Manifold Pressure
2000-4500	See Unit Nameplate
4500 And Above	Derate 2% / 1000 Ft. Above Sea Level

*Units installed at 0-2000 feet do not need to be modified.

NOTE - This is the only permissible derate for these units.

Electrical Connections

POWER SUPPLY

Route field wiring in conduit between bottom power entry and disconnect. See figure 7. This does not supersede local codes or authorities having jurisdiction.

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram.

Refer to unit nameplate for minimum circuit ampacity and maximum fuse size.

- 1- Units are factory-wired for 240/460/575 volt supply. For 208V supply, remove the insulated terminal cover from the 208V terminal on the control transformer. Move the wire from the transformer 240V terminal to the 208V terminal. Place the insulated terminal cover on the unused 240V terminal.
- 2- Route power through the bottom power entry area and connect to line side of unit disconnect, circuit breaker or terminal block. See unit wiring diagram.
- 3- *Units With Optional 120v GFCI Outlet -*
Route and connect separate 120v wiring to GFCI outlets which do not have factory-installed wiring. Route field wiring in conduit between bottom power entry and GFCI. See figure 7.
- 4- *Solar-Ready Units Only -*
All solar-ready units are equipped with an S48 disconnect along with F54 and F56 fuse blocks (located in the controls/compressor compartment). Connect solar panel array wiring to the top of F54 and F56 (one fuse block per solar array). Solar equipment must be specified for use with this unit.

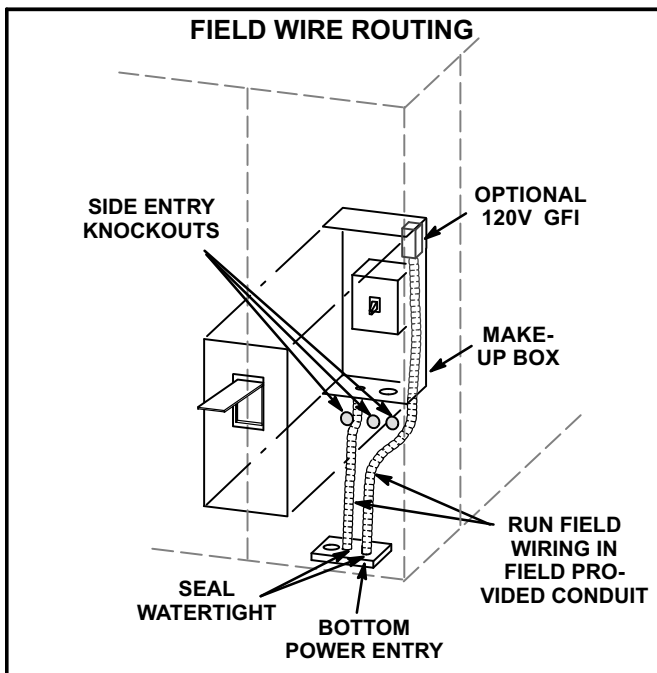


FIGURE 7

CONTROL WIRING

A-Thermostat Location

Room thermostat mounts vertically on a standard 2" X 4" handy box or on any non-conductive flat surface.

Locate thermostat approximately 5 feet (1524mm) above the floor in an area with good air circulation at average temperature. Avoid locating the room thermostat where it might be affected by:

- drafts or dead spots behind doors and in corners
- hot or cold air from ducts
- radiant heat from sun or appliances
- concealed pipes and chimneys

B-Wire Routing

Route thermostat cable or wires from subbase through knockout provided in unit. Use 18 AWG wire for all applications using remotely installed electro-mechanical and electronic thermostats.

On hot gas reheat units, route wires from RH sensor or remote switch through knockout provided in unit. For sensor installations, use 22AWG stranded, two twisted pairs, individually shielded, 100% aluminum shield with drain wire and Teflon jacket.

IMPORTANT - Unless field thermostat wires are rated for maximum unit voltage, they must be routed away from line voltage wiring.

C-Wire Connections

The Unit Controller will operate the unit from a thermostat or zone sensor based on the System Mode. The default System Mode is the thermostat mode. Refer to the Unit Controller Installation and Setup Guide to change the System Mode. Use the menu navigation arrows and select button; see SETTINGS > CONTROL.

1- Default Thermostat Mode -

The Unit Controller will operate two stages of heating and cooling based on thermostat demands. Install thermostat assembly in accordance with instructions provided with thermostat. See figure 8 for field wiring and refer to wiring diagrams on unit.

IMPORTANT-Terminal connections at the wall plate or subbase must be made securely. Loose control wire connections may result in intermittent operation.

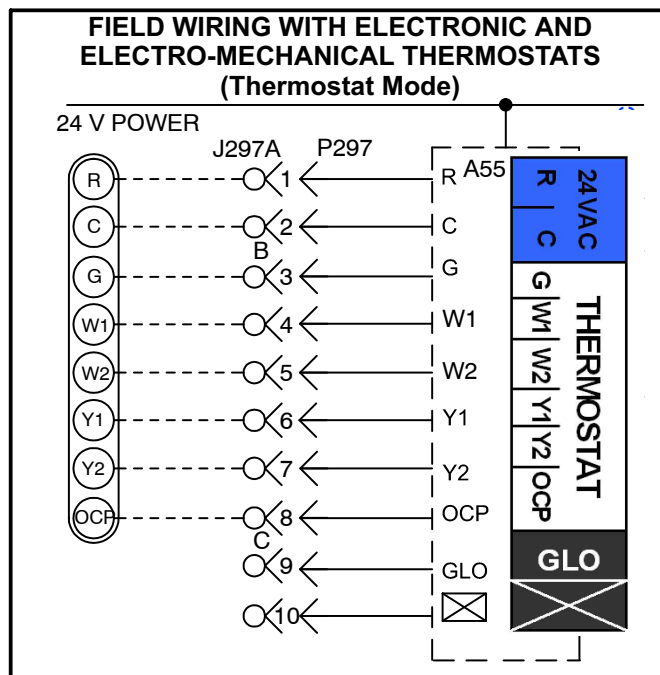


FIGURE 8

2- Zone Sensor Mode -

The Unit Controller will operate heating and cooling based on the Unit Controller internal setpoints and the temperature from the A2 zone sensor. An optional Network Control Panel (NCP) can also be used to provide setpoints. A thermostat or return air sensor can be used as a back-up mode. Make zone sensor wiring connections as shown in figure 9.

Note - Install sensor and make communication wiring connections as shown in literature provided with sensor.

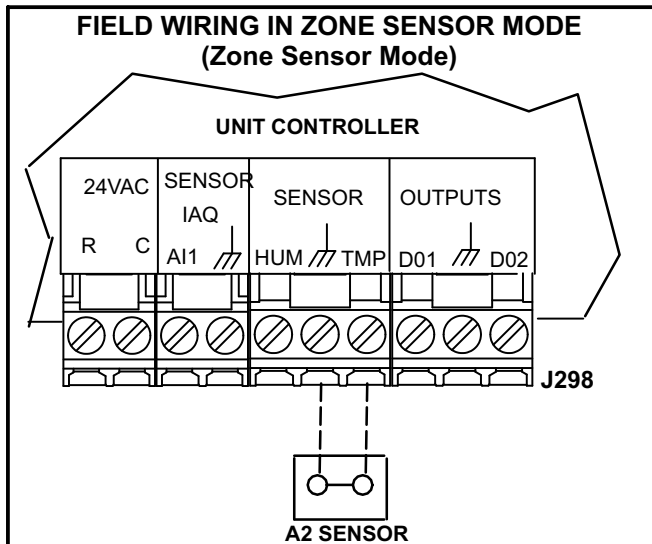


FIGURE 9

D-Hot Gas Reheat Units Only

- 1- Install humidity sensor in accordance with instructions provided with sensor. A DDC input may be used to initiate dehumidification instead of a sensor.
- 2- Make wiring connections as shown in figure 8 for Thermostat Mode and figure 9 for Zone Sensor Mode. In addition, connect either a humidity sensor or a dehumidification input. See figure 10 or 11 for humidity sensor wiring and figure 12 for dehumidification input wiring.

Humidity Sensor Cable Applications:

Wire runs of 50 feet (mm) or less:

Use two separate shielded cables containing 20AWG minimum, twisted pair conductors with overall shield. Belden type 8762 or 88760 (plenum) or equivalent. Connect both cable shield drain wires to TB1-7 as shown in figure 10.

Wire runs of 150 feet (mm) or less:

Use two separate shielded cables containing 18AWG minimum, twisted pair conductors with overall shield. Belden type 8760 or 88760 (plenum) or equivalent. Connect both cable shield drain wires to TB1-7 as shown in figure 10.

Wire runs over 150 feet (mm):

Use a local, isolated 24VAC transformer such as Lennox cat #18M13 (20VA minimum) to supply power to RH sensor as shown in figure 11. Use two shielded cables containing 20AWG minimum, twisted pair conductors with overall shield. Belden type 8762 or 88760 (plenum) or equivalent.

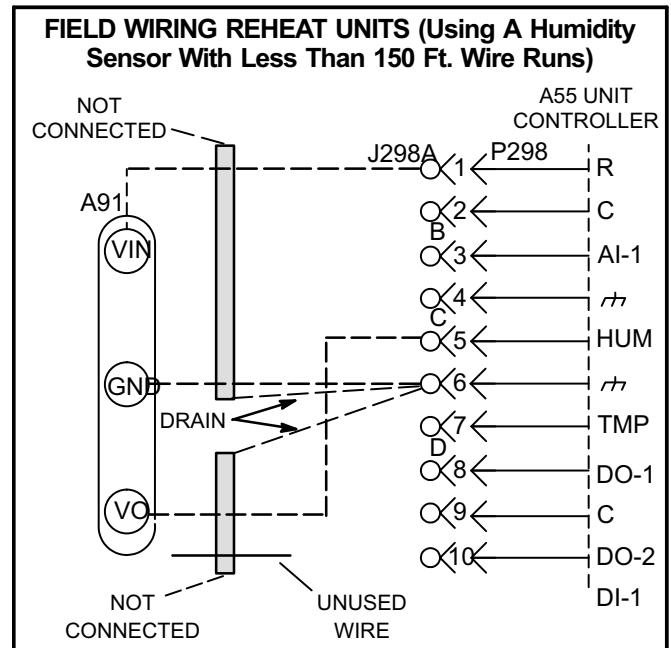


FIGURE 10

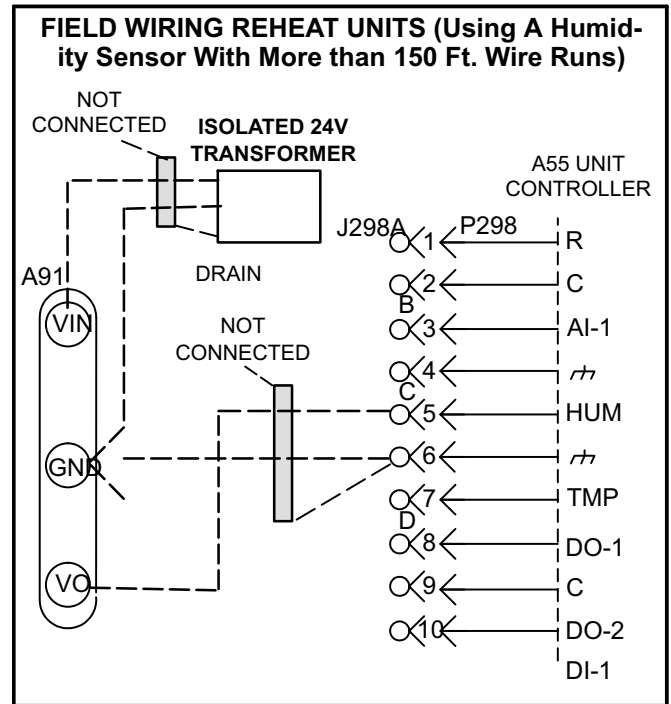
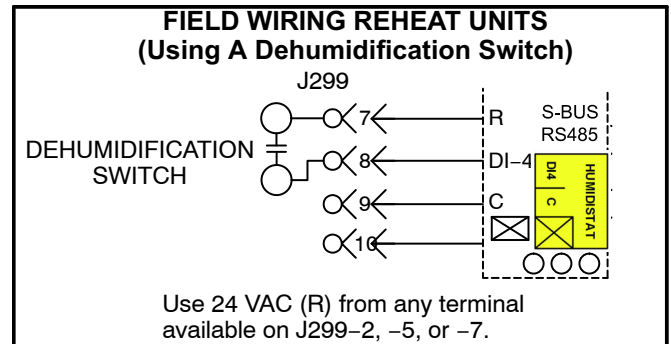


FIGURE 11



Use 24 VAC (R) from any terminal available on J299-2, -5, or -7.

FIGURE 12

Blower Operation and Adjustments

Supply Air Staged Units - The blower rotation will always be correct on units equipped with an inverter. Checking blower rotation is not a valid method of determining voltage phasing for incoming power.

Supply Air Staged Units and Units Equipped With Optional Voltage or Phase Detection - The Unit Controller checks the incoming power during start-up. If the voltage or phase is incorrect, the Unit Controller will display an alarm and the unit will not start.

⚠ IMPORTANT

Three Phase Scroll Compressor Voltage Phasing

Three phase scroll compressors must be phased sequentially to ensure correct compressor and blower* rotation and operation. Compressor and blower are wired in phase at the factory. Power wires are color-coded as follows: line 1-red, line 2-yellow, line 3-blue.

1-Observe suction and discharge pressures and blower* rotation on unit start-up.

2-Suction pressure must drop, discharge pressure must rise and blower* rotation must match rotation marking.

If pressure differential is not observed or blower* rotation is not correct:

3-Disconnect all remote electrical power supplies.

4-Reverse any two field-installed wires connected to the line side of S48 disconnect or TB13 terminal strip. Do not reverse wires at blower contactor.

5-Make sure the connections are tight.

Discharge and suction pressures should operate at their normal start-up ranges.

*Supply air inverter blower motors should rotate in the correct direction; verify scroll compressor rotation separately. Contact technical support if the blower is rotating incorrectly.

A-Blower Operation

Initiate blower only (G) demand at thermostat according to instructions provided with thermostat. Unit will cycle on thermostat demand. The following steps apply to applications using a typical electro-mechanical thermostat.

- 1- Blower operation is manually set at the thermostat subbase fan switch. With fan switch in **ON** position, blowers will operate continuously.
- 2- With fan switch in **AUTO** position, the blowers will cycle with demand. Blowers and entire unit will be off when system switch is in **OFF** position.

B-Blower Access

- 1- Disconnect jack/plug connector to blower motor. Also disconnect jack/plug connector heating limit switches on gas units.
- 2- Remove screws on either side of blower assembly sliding base. See figure 13.
- 3- Pull base toward outside of unit.

C-Determining Unit CFM

IMPORTANT - Multi-staged supply air units are factory-set to run the blower at full speed when there is a blower (G) demand without a heating or cooling demand. Refer to the field-provided, design specified CFM for all modes of operation. Use the following procedure to adjust motor pulley to deliver the highest CFM called for in the design spec. See Inverter Start-Up section to set blower CFM for all modes once the motor pulley is set.

Variable Air Volume Units - Refer to the Variable Air Volume Start-Up section.

- 1- The following measurements must be made with a dry indoor coil. Run blower (G demand) without a cooling demand. Measure the indoor blower shaft RPM. Air filters must be in place when measurements are taken.
 - 2- With all access panels in place, measure static pressure external to unit (from supply to return). Blower performance data is based on static pressure readings taken in locations shown in figure 14.
- Note - Static pressure readings can vary if not taken where shown.*
- 3- Referring to page 17, use static pressure and RPM readings to determine unit CFM. Use page 18 when installing units with any of the optional accessories listed.
 - 4- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 13. Do not exceed minimum and maximum number of pulley turns as shown in table 2.

**TABLE 2
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT**

Belt	Minimum Turns Open	Maximum Turns Open
A Section	No minimum	5
B Section	1*	6

*No minimum number of turns open when B belt is used on pulleys 6" O.D. or larger.

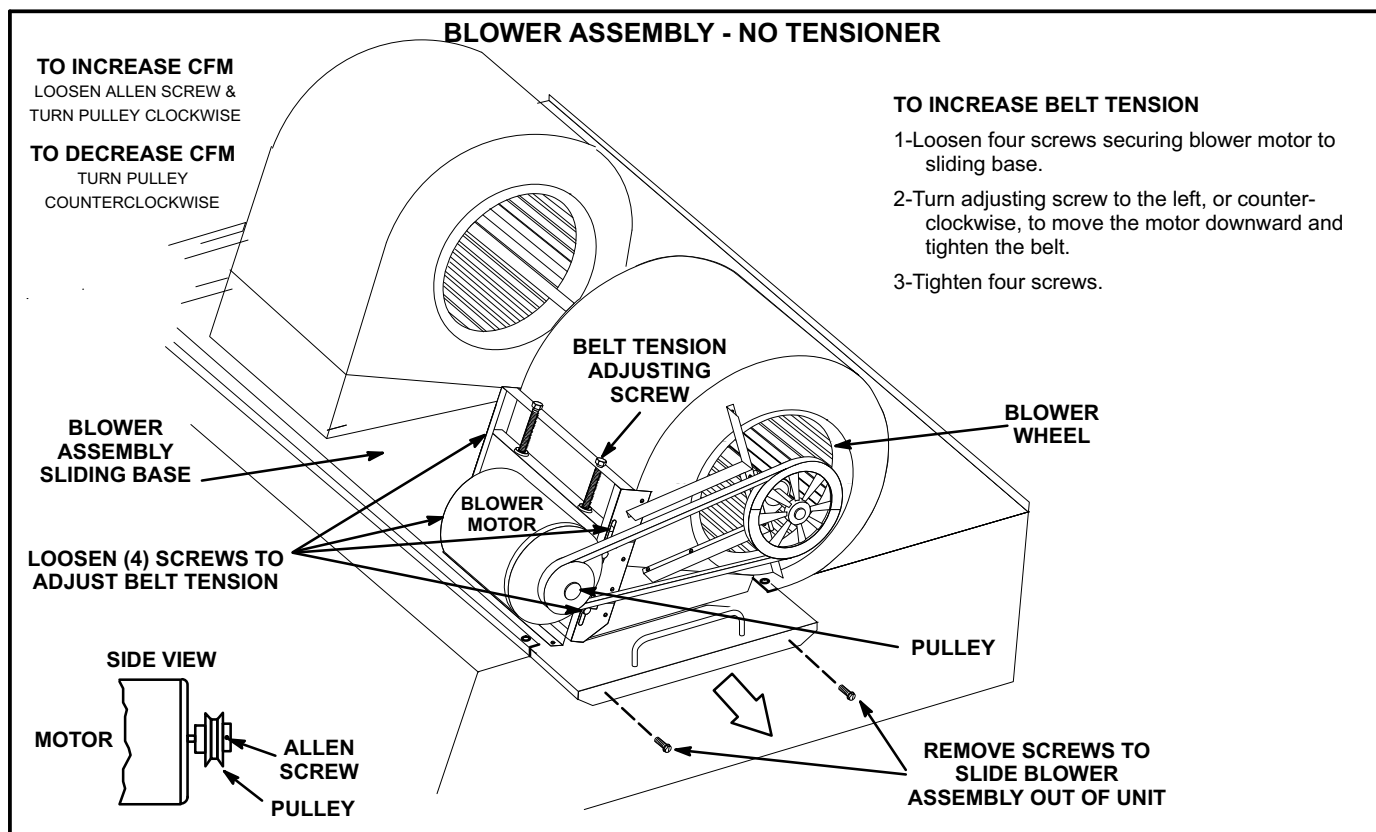


FIGURE 13

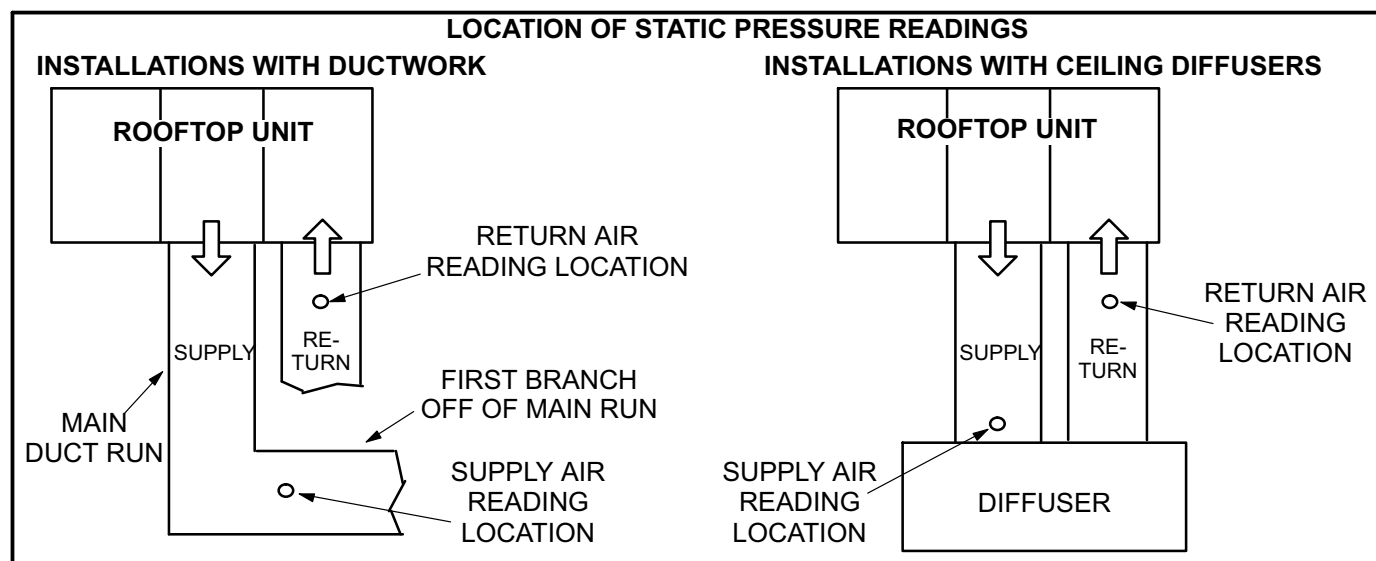


FIGURE 14

D-Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a 24-48 hour period of operation. This will allow belt to stretch and seat into pulley grooves. Make sure blower and motor pulley are aligned. See figure 15 for blowers not equipped with a tensioner and figure 16 for units equipped with an optional belt tensioner.

Blowers Without Belt Tensioner

- 1- Loosen four screws securing blower motor to sliding base. See figure 13.

2- To increase belt tension -

Turn belt tension adjusting screw to the left, or counterclockwise, to tighten the belt. This increases the distance between the blower motor and the blower housing.

To loosen belt tension -

Turn the adjusting screw to the right, or clockwise to loosen belt tension.

- 3- Tighten four screws securing blower motor to sliding base once adjustments have been made.

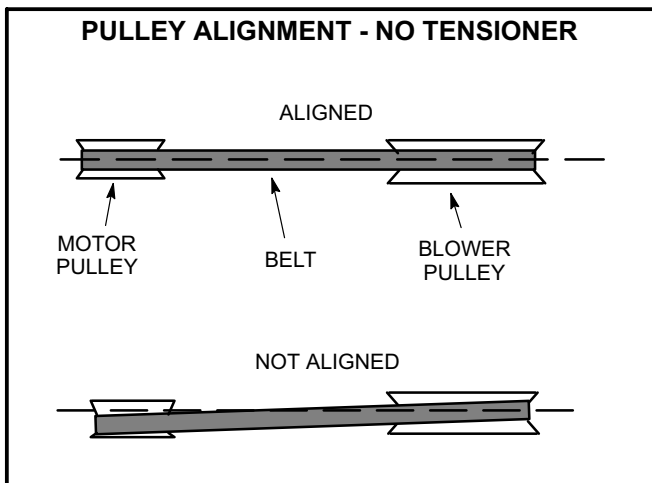


FIGURE 15

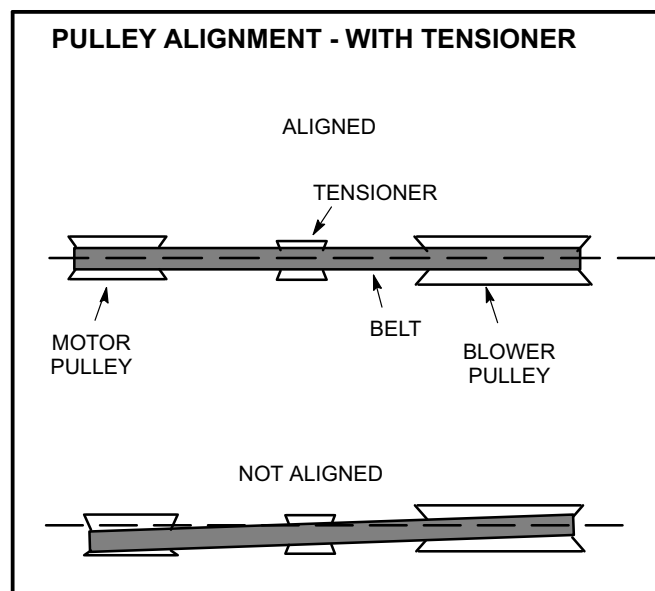


FIGURE 16

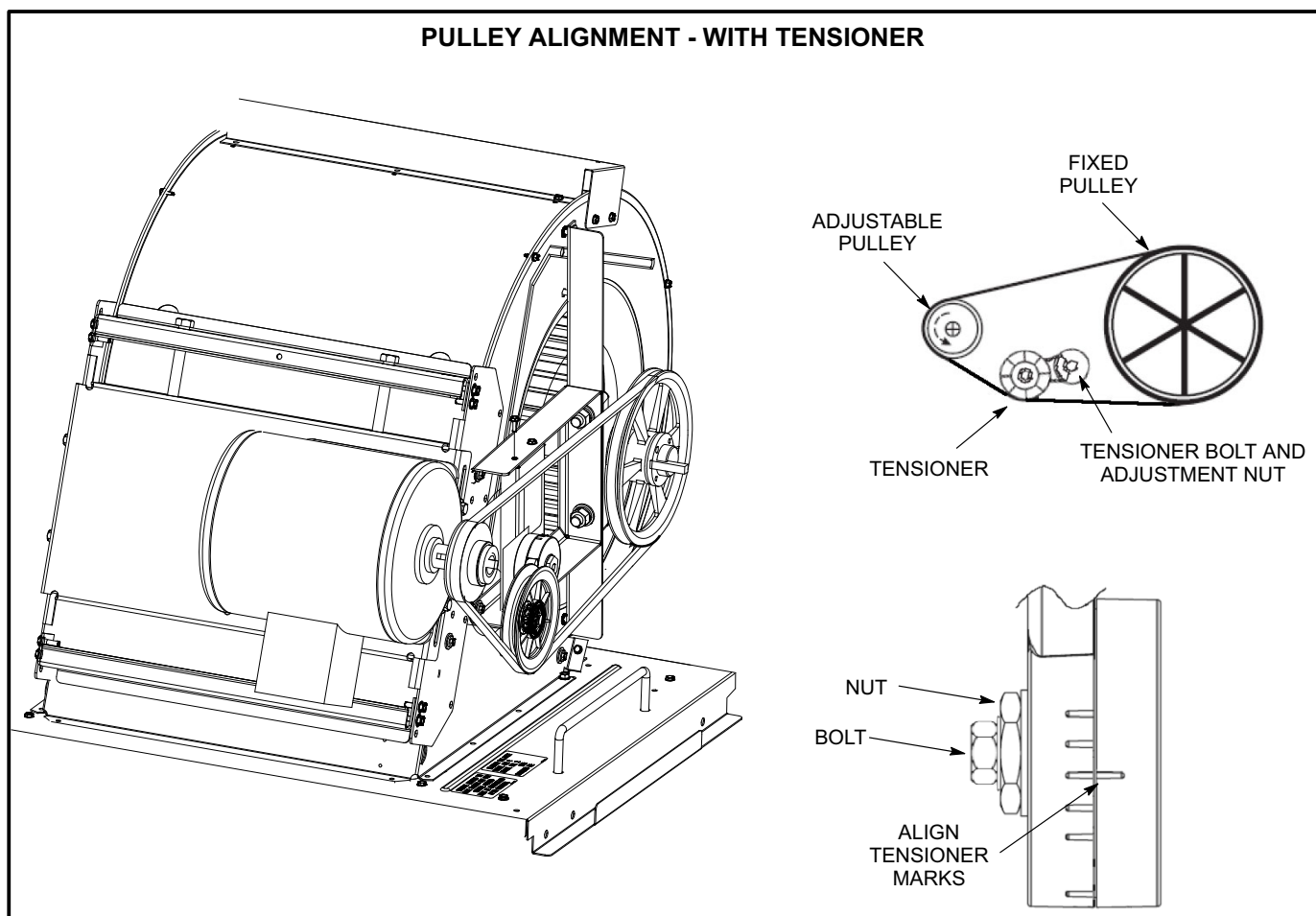


FIGURE 17

Blowers Equipped With Belt Tensioner

- 1- Loosen the bolt in the center of the tensioner. See figure 17.
- 2- Place belt over all three pulleys.
- 3- Using a 15/16" wrench, turn the tensioner nut until marks align as shown in figure 17.
- 4- Hold the tensioner with marks aligned and tighten the bolt to 23 ft.lbs. using the 9/16" wrench.

E-Check Belt Tension

Overtensioning belts shortens belt and bearing life. Check belt tension as follows:

- 1- Measure span length X. See figure 18.
- 2- Apply perpendicular force to center of span (X) with enough pressure to deflect belt 1/64" for every inch of span length or 1.5mm per 100mm of span length.

Example: Deflection distance of a 40" span would be 40/64" or 5/8".

Example: Deflection distance of a 400mm span would be 6mm.

- 3- Measure belt deflection force. For a used belt, the deflection force should be 5 lbs. (35kPa) . A new belt deflection force should be 7 lbs. (48kPa).

A force below these values indicates an undertensioned belt. A force above these values indicates an overtensioned belt.

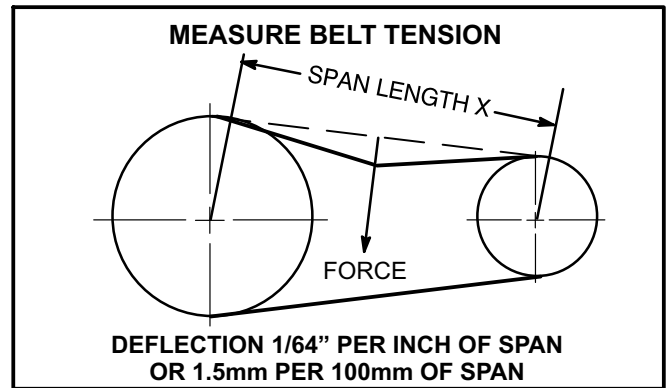


FIGURE 18

F-Field-Furnished Blower Drives

For field-furnished blower drives, use page 17 or 18 to determine BHP and RPM required. Reference table 3 to determine the manufacturer's model number.

BLOWER DATA

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL & AIR FILTERS IN PLACE
FOR ALL UNITS ADD:

- 1 - Wet indoor coil air resistance of selected unit.
- 2 - Any factory installed options air resistance (electric heat, economizer, etc.)
- 3 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.)

Then determine from blower table blower motor output and drive required.

See page 18 for wet coil and option/accessory air resistance data.

See page 18 for factory installed drive kit specifications.

MINIMUM AIR VOLUME REQUIRED FOR DIFFERENT GAS HEAT SIZES

Low (L), Standard (S) and Medium Heat (M) - 4500 cfm minimum

High Heat (H) - 5125 cfm minimum

Air Volume cfm	TOTAL STATIC PRESSURE - Inches Water Gauge (Pa)																									
	0.20		0.40		0.60		0.80		1.00		1.20		1.40		1.60		1.80		2.00		2.20		2.40		2.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2750	385	0.30	505	0.50	600	0.70	680	0.90	755	1.10	820	1.30	885	1.50	950	1.70	1015	1.90	1080	2.10	1145	2.30	1210	2.50	1275	2.70
3000	395	0.35	515	0.55	610	0.75	685	1.00	760	1.20	825	1.45	890	1.65	955	1.85	1020	2.05	1085	2.25	1150	2.45	1215	2.65	1280	2.85
3250	405	0.40	520	0.60	615	0.85	695	1.10	765	1.30	830	1.60	890	1.85	955	2.05	1020	2.30	1085	2.55	1150	2.75	1215	2.95	1280	3.15
3500	415	0.45	530	0.70	620	0.95	700	1.20	775	1.45	840	1.70	900	2.00	955	2.25	1005	2.50	1065	2.75	1125	2.95	1185	3.15	1245	3.35
3750	425	0.50	540	0.75	630	1.05	710	1.30	780	1.60	845	1.85	905	2.15	960	2.40	1010	2.65	1065	2.90	1120	3.10	1175	3.30	1230	3.50
4000	435	0.55	545	0.85	635	1.10	715	1.40	785	1.70	850	2.00	910	2.30	965	2.60	1020	2.90	1075	3.15	1130	3.35	1185	3.55	1240	3.75
4250	445	0.60	555	0.90	645	1.25	725	1.55	795	1.85	855	2.15	915	2.45	970	2.80	1025	3.10	1080	3.35	1135	3.55	1190	3.75	1245	3.95
4500	455	0.70	565	1.00	655	1.35	730	1.65	800	2.00	865	2.35	925	2.65	980	3.00	1030	3.30	1085	3.55	1140	3.75	1195	3.95	1250	4.15
4750	470	0.75	575	1.10	660	1.45	740	1.80	810	2.15	870	2.50	930	2.85	985	3.20	1040	3.55	1095	3.80	1150	4.05	1205	4.25	1255	4.45
5000	480	0.85	585	1.25	670	1.60	750	1.95	815	2.30	880	2.70	940	3.05	995	3.40	1045	3.80	1095	4.10	1150	4.30	1200	4.50	1250	4.70
5250	495	0.95	595	1.35	680	1.70	755	2.10	825	2.50	890	2.90	945	3.25	1000	3.65	1050	4.00	1100	4.40	1150	4.80	1200	5.20	1250	5.60
5500	505	1.05	605	1.45	690	1.85	765	2.25	835	2.65	895	3.05	955	3.45	1010	3.85	1060	4.25	1110	4.70	1155	5.10	1200	5.50	1240	5.90
5750	520	1.15	615	1.60	700	2.00	775	2.45	840	2.85	905	3.25	960	3.65	1015	4.10	1065	4.50	1115	4.95	1160	5.35	1205	5.80	1250	6.25
6000	530	1.30	630	1.75	710	2.15	785	2.60	850	3.05	910	3.45	970	3.90	1025	4.35	1075	4.80	1120	5.20	1170	5.65	1215	6.10	1255	6.55
6250	545	1.40	640	1.90	720	2.35	795	2.80	860	3.25	920	3.70	975	4.15	1030	4.60	1080	5.05	1130	5.50	1175	5.95	1220	6.45	1265	6.90
6500	560	1.55	650	2.05	730	2.50	805	3.00	870	3.45	930	3.95	985	4.40	1040	4.85	1090	5.35	1140	5.85	1185	6.30	1225	6.75	1270	7.25
6750	570	1.70	665	2.20	745	2.70	815	3.20	880	3.70	940	4.20	995	4.65	1045	5.10	1095	5.60	1145	6.10	1190	6.60	1235	7.10	1275	7.60
7000	585	1.85	675	2.35	755	2.90	825	3.40	890	3.95	950	4.45	1005	4.95	1055	5.40	1105	5.95	1155	6.45	1200	6.95	1240	7.45	1285	8.00
7250	600	2.00	690	2.60	765	3.10	835	3.65	900	4.15	955	4.65	1015	5.25	1065	5.75	1115	6.25	1160	6.75	1205	7.30	1250	7.85	1290	8.35
7500	615	2.20	700	2.75	775	3.30	845	3.85	910	4.45	965	4.95	1020	5.50	1075	6.05	1125	6.60	1170	7.15	1215	7.65	1260	8.25	1300	8.75
7750	630	2.40	715	3.00	790	3.55	855	4.10	920	4.70	975	5.25	1030	5.80	1080	6.35	1130	6.90	1180	7.50	1225	8.05	1265	8.60	1305	9.15
8000	640	2.55	725	3.20	800	3.80	865	4.35	930	4.95	985	5.50	1040	6.10	1090	6.70	1140	7.25	1185	7.85	1230	8.40	1275	9.00	1315	9.60
8250	655	2.80	740	3.40	810	4.00	880	4.65	940	5.25	995	5.85	1050	6.45	1100	7.05	1150	7.65	1195	8.25	1240	8.85	1280	9.40	1325	10.05
8500	670	3.00	750	3.65	825	4.30	890	4.90	950	5.55	1005	6.15	1060	6.80	1110	7.40	1160	8.05	1205	8.65	1250	9.25	1290	9.85	1330	10.45
8750	685	3.25	765	3.90	835	4.55	900	5.20	960	5.85	1015	6.45	1070	7.15	1120	7.75	1165	8.35	1215	9.05	1255	9.65	1300	10.30	1340	10.90
9000	700	3.50	780	4.20	850	4.85	910	5.50	970	6.15	1025	6.80	1080	7.50	1130	8.15	1175	8.75	1220	9.40	1265	10.10	1310	10.80	1350	11.40
9250	715	3.75	790	4.45	860	5.15	925	5.85	985	6.55	1040	7.20	1090	7.85	1140	8.55	1185	9.20	1230	9.85	1275	10.55	1315	11.20	---	---
9500	730	4.00	805	4.75	875	5.45	935	6.15	995	6.90	1050	7.60	1100	8.25	1150	8.95	1195	9.60	1240	10.30	1285	11.05	---	---	---	---
9750	745	4.30	820	5.05	885	5.75	950	6.55	1005	7.20	1060	7.95	1110	8.65	1160	9.40	1205	10.05	1250	10.80	1295	11.50	---	---	---	---
10,000	760	4.60	835	5.40	900	6.15	960	6.85	1015	7.60	1070	8.35	1120	9.05	1170	9.80	1215	10.50	1260	11.25	---	---	---	---	---	---
10,250	775	4.90	845	5.65	910	6.45	970	7.20	1030	8.00	1080	8.75	1135	9.55	1180	10.25	1225	11.00	---	---	---	---	---	---	---	---
10,500	790	5.20	860	6.00	925	6.85	985	7.65	1040	8.40	1095	9.20	1145	10.00	1190	10.70	1235	11.45	---	---	---	---	---	---	---	---
10,750	805	5.55	875	6.40	940	7.25	1000	8.05	1055	8.85	1105	9.65	1155	10.45	1200	11.20	---	---	---	---	---	---	---	---	---	---
11,000	820	5.90	890	6.80	950	7.60	1010	8.45	1065	9.30	1115	10.05	1165	10.90	---	---	---	---	---	---	---	---	---	---	---	---

BLOWER DATA

FACTORY INSTALLED BELT DRIVE KIT SPECIFICATIONS

Motor Efficiency	Nominal hp	Maximum hp	Drive Kit Number	RPM Range
Standard or High	2	2.30	1	535 - 725
Standard or High	2	2.30	2	710 - 965
Standard	3	3.45	1	535 - 725
Standard	3	3.45	2	710 - 965
High	3	3.45	3	685 - 856
High	3	3.45	4	850 - 1045
Standard	5	5.75	3	685 - 856
Standard	5	5.75	4	850 - 1045
Standard	5	5.75	5	945 - 1185
Standard	7.5	8.63	6	850 - 1045
Standard	7.5	8.63	7	945 - 1185
Standard	7.5	8.63	8	1045 - 1285
Standard	10	11.50	7	945 - 1185
Standard	10	11.50	10	1045 - 1285
Standard	10	11.50	11	1135 - 1365

NOTE - Using total air volume and system static pressure requirements determine from blower performance tables rpm and motor output required. Maximum usable output of motors furnished are shown. In Canada, nominal motor output is also maximum usable motor output. If motors of comparable output are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

NOTE - Units equipped with an inverter are limited to a motor service factor of 1.0.

FACTORY INSTALLED OPTIONS/FIELD INSTALLED ACCESSORY AIR RESISTANCE

Air Vol- ume CFM	Wet Indoor Coil		Cond- enser Reheat Coil	Gas Heat Exchanger			Electric Heat	Econo mizer	Filters		Horizontal Roof Curb	
	156H, 180H	180U, 240U, 210H, 240H, 300S		Low/ Standard Heat	Medium Heat	High Heat					156H thru 240H	300S
	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	in. w.g.	MERV 8	MERV 13	in. w.g.	in. w.g.
2750	.01	.02	.01	.02	.04	.05	---	---	.01	.03	.03	-
3000	.01	.02	.01	.03	.04	.05	---	---	.01	.03	.04	-
3250	.01	.03	.01	.03	.05	.06	---	---	.01	.04	.04	.01
3500	.01	.03	.02	.03	.05	.06	---	---	.01	.04	.05	.01
3750	.01	.03	.02	.04	.06	.07	---	---	.01	.04	.05	.01
4000	.02	.04	.02	.04	.06	.07	---	---	.04	.06	.06	.02
4250	.02	.04	.02	.04	.06	.08	---	---	.04	.06	.07	.02
4500	.02	.05	.02	.05	.07	.09	---	---	.04	.07	.07	.02
4750	.02	.05	.02	.05	.08	.10	---	---	.04	.07	.08	.03
5000	.02	.05	.02	.05	.09	.11	---	---	.05	.07	.08	.03
5250	.02	.06	.03	.06	.10	.12	---	---	.05	.07	.09	.04
5500	.02	.07	.03	.06	.10	.13	---	---	.05	.07	.10	.04
5750	.03	.07	.03	.06	.11	.14	---	---	.05	.08	.11	.05
6000	.03	.08	.03	.07	.12	.15	.01	---	.05	.08	.11	.06
6250	.03	.08	.03	.07	.12	.16	.01	.01	.05	.08	.12	.07
6500	.03	.09	.04	.08	.13	.17	.01	.02	.05	.08	.13	.08
6750	.04	.10	.04	.08	.14	.18	.01	.03	.05	.08	.14	.08
7000	.04	.10	.04	.09	.15	.19	.01	.04	.06	.08	.15	.09
7250	.04	.11	.04	.09	.16	.20	.01	.05	.06	.09	.16	.10
7500	.05	.12	.05	.10	.17	.21	.01	.06	.06	.09	.17	.11
8000	.05	.13	.05	.11	.19	.24	.02	.09	.06	.09	.19	.13
8500	.06	.15	.05	.12	.20	.26	.02	.11	.06	.09	.21	.15
9000	.07	.16	.06	.13	.23	.29	.04	.14	.07	.10	.24	.17
9500	.08	.18	.07	.14	.25	.32	.05	.16	.07	.10	.26	.19
10,000	.08	.20	.07	.16	.27	.35	.06	.19	.07	.11	.29	.21
10,500	.09	.22	.08	.17	.30	.38	.09	.22	.07	.11	.31	.24
11,000	.11	.24	.08	.18	.31	.40	.11	.25	.08	.11	.34	.27

**TABLE 3
MANUFACTURER'S NUMBERS**

Drive No.	H.P.	DRIVE COMPONENTS											
		RPM		ADJUSTABLE SHEAVE		FIXED SHEAVE		BELTS (STD.)		BELTS (WITH TENSION-ER)		SPLIT BUSHING	
		Min	Max	Supplier No.	OEM Part No.	Supplier No.	OEM Part No.	Supplier No.	OEM Part No.	Supplier No.	OEM Part No.	Supplier No.	OEM Part No.
1	2 & 3 Std.	535	725	1VP40x7/8	79J0301	BK95 x 1-7/16	80K1601	BX59	59A5001	BX60	100245-10	N/A	N/A
2	2 & 3 Std.	710	965	1VP40x7/8	79J0301	BK72 x 1-7/16	100244-13	BX55	63K0501	BX56	100245-11	N/A	N/A
3	3 High & 5	685	865	1VP50x1-1/8	P-8-1977	BK100 x 1-7/16	39L1301	BX61	93J9801	BX62	57A7701	N/A	N/A
4	3 High & 5	850	1045	1VP65x1-1/8	100239-03	BK110H	100788-06	BX65	100245-08	BX66	97J5901	H-1-7/16	49M6201
5	5	945	1185	1VP60x1-1/8	41C1301	BK90H x 1-7/16	100788-04	BX61	93J9801	BX62	57A7701	H-1-7/16	49M6201
6	7.5	850	1045	1VP65x1-3/8	78M7101	BK110H	100788-06	BX66	97J5901	BX67	100245-09	H-1-7/16	49M6201
7	7.5 & 10	945	1185	1VP60x1-3/8	78L5501	BK90H x 1-7/16	100788-04	BX62	57A7701	BX64	97J5801	H-1-7/16	49M6201
8	7.5	1045	1285	1VP65x1-3/8	78M7101	BK90H x 1-7/16	100788-04	BX64	97J5801	BX65	100245-08	H-1-7/16	49M6201
10	10	1045	1285	1VP65x1-3/8	78M7101	1B5V86	78M8301	5VX660	100245-20	5VX680	100245-35	B-1-7/16	100246-01
11	10	1135	1365	1VP65x1-3/8	78M7101	1B5V80	100240-05	5VX660	100245-20	5VX670	100245-21	B-1-7/16	100246-01

Cooling Start-Up

IMPORTANT- The crankcase heater must be energized for 24 hours before attempting to start compressor. Set thermostat so there is no demand to prevent compressors from cycling. Apply power to unit.

NOTE - These units must not be used as a "construction heater" at any time during any phase of construction. Very low return air temperatures, harmful vapors and misplacement of the filters will damage the unit and its efficiency. Additionally, a unit which will be subject to cold temperatures when not in operation must have a vapor barrier installed to seal the duct connections. Failure to protect the unit from moisture laden air or harmful vapors (generated from the construction process and temporary combustion heating equipment) will cause corrosive condensation within the unit. Failure to properly protect the unit in this situation will cause electrical and electronic component failure and could affect the unit warranty status.

A-Preliminary Checks

- 1- Make sure that unit is installed in accordance with the installation instructions and applicable codes.
- 2- Inspect all electrical wiring, both field- and factory-installed, for loose connections. Tighten as required.
- 3- Check to ensure that refrigerant lines do not rub against the cabinet or against other refrigerant lines.
- 4- Check voltage at disconnect switch. Voltage must be within range listed on nameplate. If not, consult power company and have voltage condition corrected before starting unit.
- 5- Make sure filters are in place before start-up.

B-Start-Up

Supply Air Staged Blower - Refer to the Multi-Staged Air Volume Start-Up section.

- 1- Initiate first and second stage cooling demands according to instructions provided with thermostat.
- 2- **156, 180H, 210, 240H, 300S -**
First-stage thermostat demand will energize compressors 1 and 2. Second-stage thermostat demand will energize compressors 3 and 4 (fourth compressor on 20 and 25 ton units only). On units with an economizer, when outdoor air is acceptable, a first-stage demand will energize the economizer; a second-stage demand will energize compressors 1 and 2.

180U & 240U -

First-stage thermostat demand will energize one of the following compressor combinations:

Compressor 1 (circuit 1) and Compressor 3 (circuit 2)
Compressor 1 (circuit 1) and Compressor 4 (circuit 2)
Compressor 2 (circuit 1) and Compressor 3 (circuit 2)
Compressor 2 (circuit 1) and Compressor 4 (circuit 2)

Second-stage thermostat demand will energize the remaining two compressors. On units with an economizer, when outdoor air is acceptable, a first-stage demand will energize the economizer; a second-stage demand will energize compressors in the same manner as a first-stage demand (no econo).

IMPORTANT

Run units equipped with tandem compressors in full load (all compressors running) for a minimum of thirty (30) minutes or until compressor sump superheat is above 20°F for each compressor. Check the oil level of each tandem compressor assembly using the sight glass installed in the oil equalization line near the base of the compressors. The oil level should be visible in the sight glass, preferably in the middle. If the oil level is not visible in the sight glass, refer to the section in the Unit Service Manual titled "Tandem Compressor Oil Level Test Procedure" to add oil to the system.

3- 156, 180H, & 210 -

Units contain three refrigerant circuits or systems. Evaporator and condenser coil refrigerant circuits 1 and 2 make up stage 1 cooling. Evaporator and condenser coil refrigerant circuit 3 makes up stage 2 cooling. See figure 19.

240H, 300S -

Units contain four refrigerant circuits or systems. Evaporator and condenser coil refrigerant circuits 1 and 2 make up stage 1 cooling. Evaporator and condenser refrigerant circuits 3 and 4 make up stage 2 cooling. See figure 20.

180U, 240U -

Units contain two refrigerant circuits or systems. Evaporator and condenser coil refrigerant circuits 1 makes up stage 1 cooling. Evaporator and condenser refrigerant circuit 2 makes up stage 2 cooling. See figure 21.

- 4- Each refrigerant circuit is separately charged with R410A refrigerant. See unit rating plate for correct amount of charge.
- 5- Refer to Cooling Operation and Adjustment section for proper method to check refrigerant charge.

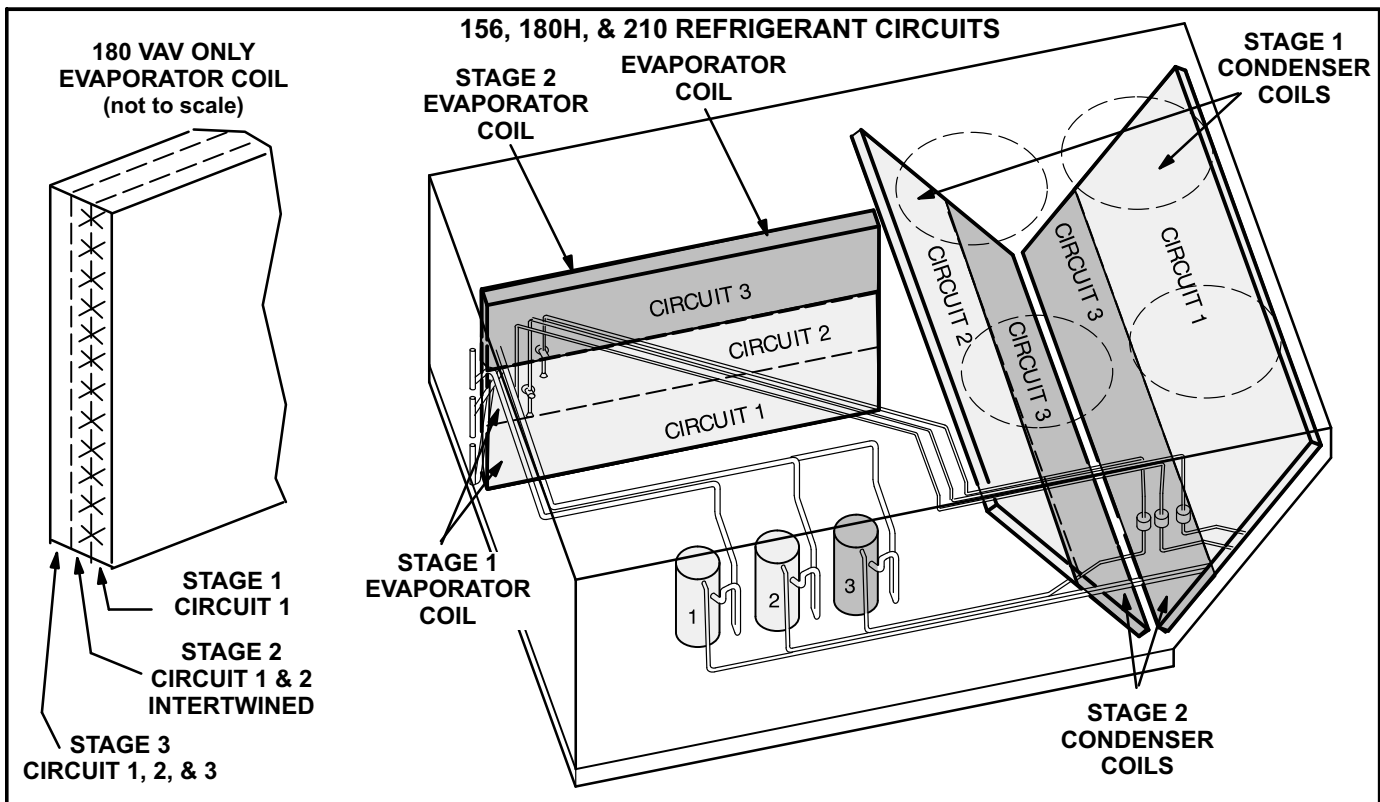


FIGURE 19

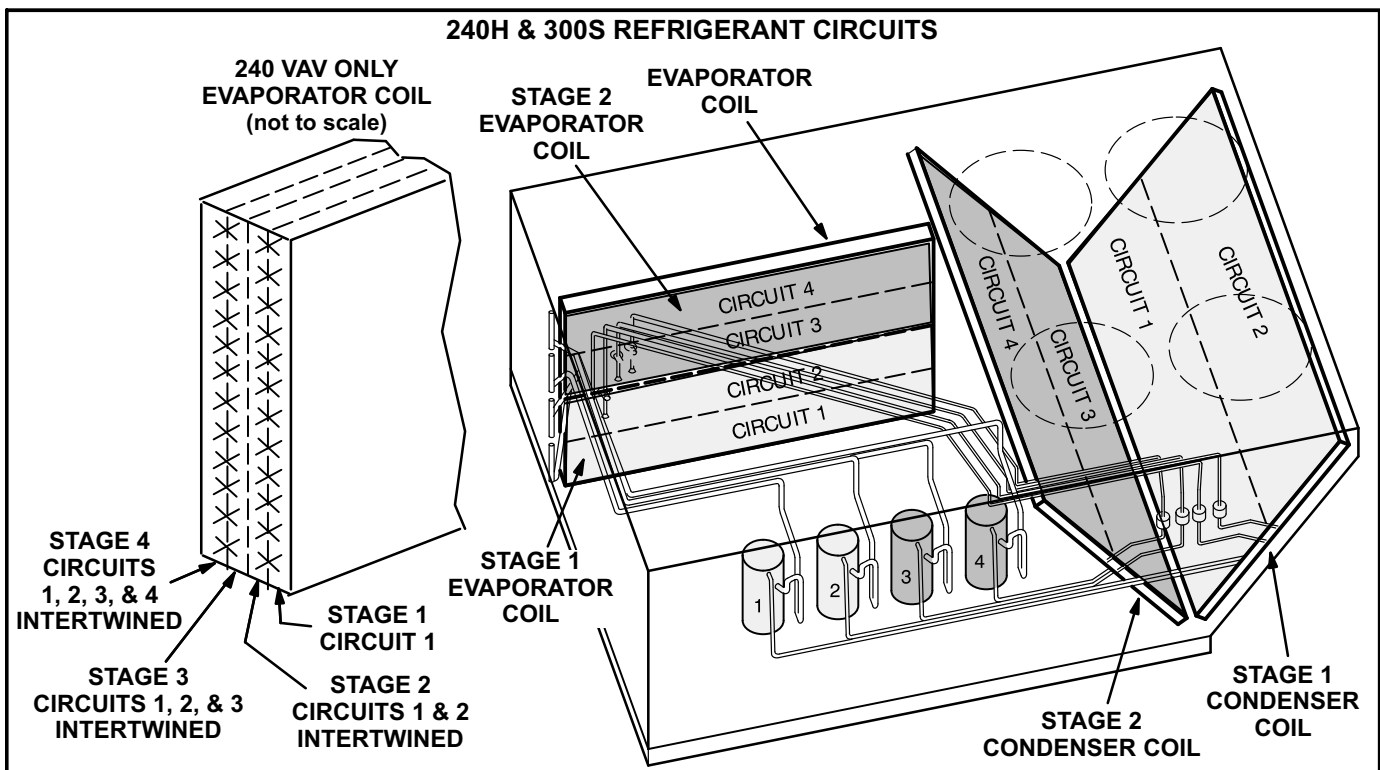


FIGURE 20

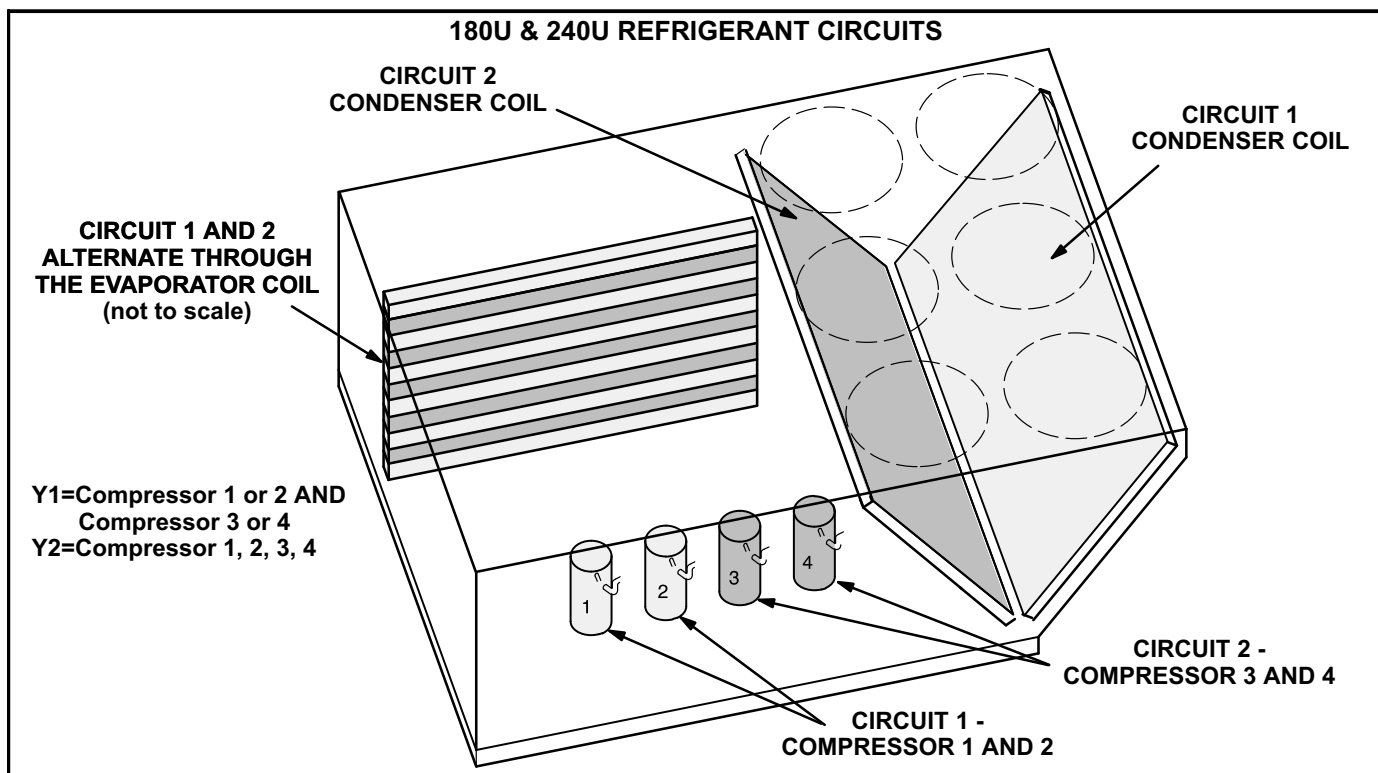


FIGURE 21

C-R410A Refrigerant

Units charged with R410A refrigerant operate at much higher pressures than R22. The expansion valve and liquid line drier provided with the unit are approved for use with R410A. Do not replace them with components designed for use with R22.

R410A refrigerant is stored in a pink cylinder.

! IMPORTANT

Mineral oils are not compatible with R410A. If oil must be added, it must be a polyol ester oil.

Manifold gauge sets used with systems charged with R410A refrigerant must be capable of handling the higher system operating pressures. The gauges should be rated for use with pressures of 0-800 on the high side and a low side of 30" vacuum to 250 psi with dampened speed to 500 psi. Gauge hoses must be rated for use at up to 800 psi of pressure with a 4000 psi burst rating.

D-Refrigerant Charge and Check - All-Aluminum Coils

WARNING-Do not exceed nameplate charge under any condition.

This unit is factory charged and should require no further adjustment. If the system requires additional refrigerant, reclaim the charge, evacuate the system, and add required nameplate charge.

NOTE - System charging is not recommended below 60°F (15°C). In temperatures below 60°F (15°C), the charge **must** be weighed into the system.

If weighing facilities are not available, or to check the charge, use the following procedure:

IMPORTANT - Charge unit in standard cooling mode.

- 1- Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.
- 2- Check each system separately with all stages operating. Compare the normal operating pressures (see tables 4 - 14) to the pressures obtained from the gauges. Check unit components if there are significant differences.
- 3- Measure the outdoor ambient temperature and the suction pressure. Refer to the appropriate circuit charging curve on Page 29 through Page 48 to determine a target liquid temperature.

Note - Pressures are listed for sea level applications.

- 4- Use the same thermometer to accurately measure the liquid temperature (in the outdoor section).
 - If measured liquid temperature is higher than the target liquid temperature, add refrigerant to the system.
 - If measured liquid temperature is lower than the target liquid temperature, recover some refrigerant from the system.

- 5- Add or remove charge in increments. Allow the system to stabilize each time refrigerant is added or removed.

6- Continue the process until measured liquid temperature agrees with the target liquid temperature. Do not go below the target liquid temperature when adjusting charge. Note that suction pressure can change as charge is adjusted.

7- Example LGH/LCH180H Circuit 1: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 96.5°F. For a measured liquid temperature of 106°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

TABLE 4
LGH/LCH156H NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	110	241	112	279	115	321	117	367	119	419	122	472
	118	245	121	282	124	324	127	370	129	420	131	474
	137	255	140	292	142	333	145	378	148	431	152	484
	154	266	160	304	163	346	163	392	171	441	174	496
Circuit 2	111	249	112	287	113	328	116	374	118	423	121	474
	119	253	120	291	122	332	124	378	127	428	129	481
	137	263	139	301	142	342	145	387	146	438	149	490
	153	276	158	313	162	356	164	402	167	451	171	505
Circuit 3	115	256	116	294	118	335	120	381	122	429	124	480
	123	261	125	299	128	340	130	386	132	436	133	488
	140	273	143	311	146	353	149	398	152	449	154	502
	157	284	162	324	166	367	169	413	171	462	174	515

TABLE 5
LGH/LCH156H REHEAT NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	113	238	113	278	113	342	115	380	117	450	119	540
	121	242	124	279	123	324	124	375	125	438	127	521
	138	250	141	287	144	328	146	372	145	428	147	492
	156	261	160	298	164	338	167	383	170	432	171	488
Circuit 2	111	244	112	284	114	329	116	384	119	451	121	537
	120	246	121	286	122	331	124	383	127	445	130	518
	138	254	140	290	142	335	143	384	145	439	148	504
	157	264	161	300	164	342	166	390	168	442	170	499
Circuit 3	114	249	115	291	116	340	117	397	120	465	121	552
	123	252	124	294	125	342	126	396	128	459	131	538
	142	261	144	300	145	345	146	397	108	454	150	521
	161	272	165	311	168	355	170	404	172	458	175	516

TABLE 6
LGH/LCH180H CAV/STAGED NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	104	235	106	275	105	326	106	389	110	466	113	552
	114	238	118	275	115	319	117	378	119	447	122	527
	130	245	134	281	136	320	136	365	138	424	141	483
	146	253	153	289	157	330	159	374	162	421	165	478
Circuit 2	100	241	103	281	104	327	105	379	109	442	112	513
	111	244	112	282	113	327	115	379	116	445	119	507
	128	249	132	286	131	331	132	377	135	434	139	488
	144	257	151	295	154	336	158	382	158	439	161	498
Circuit 3	106	241	110	278	110	326	111	380	114	447	117	536
	118	242	115	282	120	326	120	380	123	437	126	512
	134	250	138	287	140	328	139	378	142	431	145	491
	151	260	157	298	160	340	163	385	165	435	167	494

TABLE 7
LGH/LCH180H CAV/STAGED REHEAT NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	103	242	106	277	109	319	110	374	112	444	-	-
	112	243	114	279	117	325	119	368	120	437	122	514
	130	249	133	286	136	326	137	374	139	425	142	489
	143	275	149	306	155	334	158	378	158	417	166	485
Circuit 2	107	249	109	284	110	330	111	374	113	430	-	-
	115	252	116	288	119	334	120	378	121	430	122	492
	131	260	134	297	136	337	138	380	140	436	143	488
	143	287	148	317	156	346	160	391	157	428	167	500
Circuit 3	111	246	112	285	112	342	114	403	116	489	-	-
	119	247	120	288	122	337	123	389	124	471	129	551
	138	254	140	292	142	336	143	383	143	450	147	517
	154	265	159	302	163	341	165	389	168	441	171	505

TABLE 8
LGH/LCH180H VAV NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	102	234	104	273	106	311	108	358	111	411	114	471
	110	235	112	276	114	314	116	360	119	410	122	470
	123	242	127	283	130	320	132	367	135	418	138	476
	135	251	141	290	145	333	149	380	152	431	155	486
Circuit 2	103	236	105	273	107	315	109	363	111	417	113	472
	110	239	113	276	115	317	117	362	120	415	122	475
	123	246	127	283	132	324	135	370	138	421	141	477
	134	253	141	290	146	332	152	377	156	429	160	481
Circuit 3	115	243	117	280	119	321	121	369	124	419	126	477
	123	246	126	282	128	324	130	368	133	419	135	477
	136	256	141	293	145	334	152	384	152	430	155	485
	150	272	155	304	161	345	166	391	171	439	175	490

TABLE 9
LGH/LCH210H NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	110	228	113	262	114	302	116	349	118	402	119	466
	119	231	121	266	123	305	125	352	127	405	128	466
	136	238	139	271	141	312	143	358	146	409	149	464
	152	246	157	277	161	319	165	363	169	414	171	472
Circuit 2	112	232	111	267	113	312	115	358	116	414	119	479
	121	235	123	272	125	311	127	357	126	415	129	476
	137	242	141	278	144	317	146	365	149	415	151	471
	153	253	159	289	164	333	168	374	171	425	174	478
Circuit 3	105	241	106	284	108	327	110	375	112	429	115	489
	112	244	115	282	118	323	121	369	121	428	123	487
	130	251	132	289	135	332	138	378	141	428	145	484
	146	261	151	297	156	339	159	386	163	437	165	495

TABLE 10
LGH/LCH210H REHEAT NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	109	234	111	270	114	311	115	357	118	410	121	472
	119	237	120	274	122	314	125	360	127	412	130	472
	137	246	140	281	143	321	146	365	146	417	150	473
	152	260	158	292	162	330	166	373	170	421	173	476
Circuit 2	113	240	115	276	114	320	115	369	117	420	122	478
	122	244	123	281	125	321	125	369	127	423	130	481
	139	254	143	291	146	330	148	374	150	424	152	480
	154	267	160	302	165	341	169	384	172	431	176	486
Circuit 3	111	239	113	277	116	319	115	371	117	427	121	488
	119	243	121	281	123	326	125	374	127	430	130	489
	135	252	139	291	143	332	145	379	148	432	150	490
	149	265	155	303	160	344	164	390	168	438	173	496

TABLE 11
LGH/LCH240H CAV/STAGED NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	107	249	109	286	111	331	113	391	116	450	118	513
	115	251	118	285	120	332	122	383	125	443	128	513
	134	255	136	291	139	334	141	383	143	441	146	506
	156	269	160	305	164	352	163	393	166	451	168	508
Circuit 2	105	236	106	277	109	320	112	373	114	445	116	538
	114	239	116	275	117	323	119	372	122	438	125	530
	131	245	134	279	136	322	138	372	140	427	144	489
	153	257	157	291	161	337	161	377	164	433	167	486
Circuit 3	110	247	112	286	114	330	115	386	117	444	119	507
	119	251	121	289	122	334	123	384	126	442	128	512
	136	259	139	298	141	341	144	389	145	445	147	506
	157	276	162	314	166	358	166	399	168	457	170	511
Circuit 4	104	240	106	276	108	319	110	372	111	435	115	492
	113	244	114	280	117	320	117	371	120	432	123	497
	128	251	131	289	133	331	136	376	139	430	142	486
	149	264	154	301	157	345	157	387	161	442	165	493

TABLE 12
LGH/LCH240H CAV/STAGED REHEAT NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	111	252	112	288	112	334	114	386	116	441	118	502
	119	256	121	294	122	337	123	387	125	440	127	499
	136	266	140	303	142	345	145	391	147	446	148	499
	140	268	155	314	160	356	164	402	168	451	172	505
Circuit 2	108	246	109	282	110	326	112	379	114	438	116	512
	116	248	118	286	119	330	120	379	122	426	125	501
	133	257	137	294	138	335	140	382	142	440	145	494
	138	259	152	303	158	345	161	390	165	437	168	492
Circuit 3	115	248	117	285	118	327	121	375	124	426	127	479
	121	252	125	290	128	332	129	378	131	429	135	484
	135	260	140	299	144	341	148	388	152	442	153	493
	141	262	154	308	160	353	164	399	169	450	173	504
Circuit 4	112	243	114	278	115	319	118	365	116	425	120	479
	118	246	122	283	125	324	126	369	127	418	129	479
	133	254	137	291	141	332	145	377	148	430	150	481
	138	257	151	301	157	344	161	389	166	437	170	491

TABLE 13
LGH/LCH240H VAV NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	98	238	101	276	102	318	105	367	108	413	110	467
	107	240	109	278	111	321	113	368	116	418	119	474
	124	248	127	284	129	325	132	372	134	422	137	478
	143	255	145	293	148	333	152	380	154	428	157	482
Circuit 2	101	230	103	267	105	309	108	360	110	407	113	462
	109	232	111	268	113	311	116	358	118	411	121	467
	125	239	129	274	132	315	135	362	137	413	140	471
	141	245	145	283	150	323	154	371	158	419	161	474
Circuit 3	113	249	115	287	117	329	119	381	121	432	123	488
	122	252	124	290	126	333	127	381	129	434	131	492
	139	263	142	299	145	341	147	388	149	441	152	498
	159	275	159	313	164	353	167	402	169	451	172	508
Circuit 4	117	242	119	281	120	324	122	377	124	428	127	486
	125	246	127	285	129	329	131	377	133	430	135	490
	139	256	145	293	148	335	151	389	153	436	156	495
	158	268	161	308	166	348	171	396	174	446	177	504

TABLE 14
LGH/LCH300S NORMAL OPERATING PRESSURES - ALUMINUM COIL

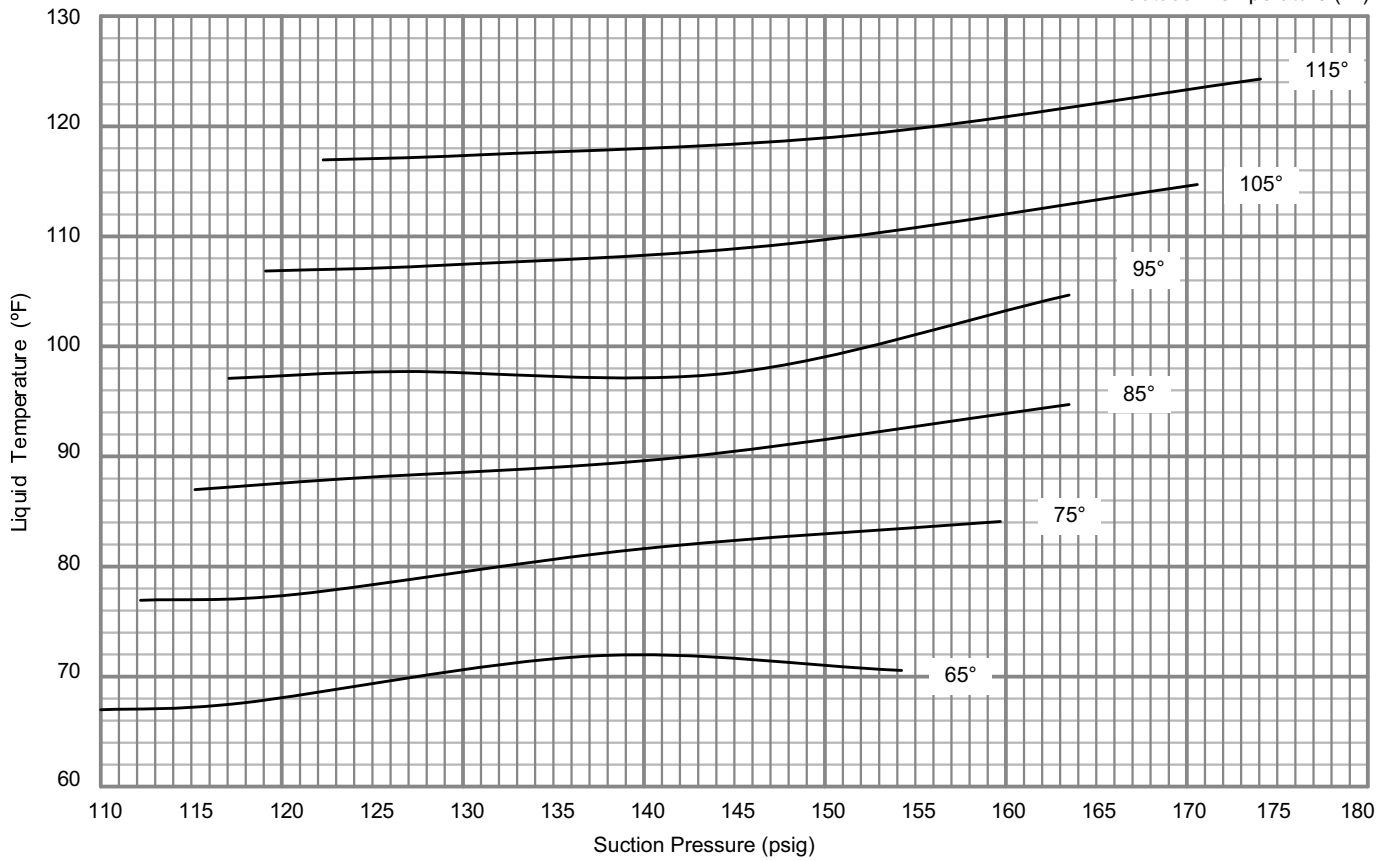
Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	105	248	109	283	109	330	110	381	112	432	114	486
	114	250	117	291	117	338	119	384	121	432	123	487
	127	253	134	300	137	343	140	388	141	444	144	501
	142	265	149	308	154	349	159	399	163	449	167	503
Circuit 2	103	236	105	272	107	318	108	373	109	428	111	484
	112	238	114	278	116	325	116	374	118	425	120	482
	127	246	131	285	135	327	137	377	140	433	142	491
	141	254	146	294	150	332	156	385	160	437	164	495
Circuit 3	104	258	105	302	107	345	109	399	111	456	114	519
	112	263	114	308	115	354	117	403	120	463	123	524
	131	297	133	320	136	367	138	410	140	465	142	526
	147	313	147	334	152	381	156	423	160	476	165	537
Circuit 4	100	246	103	289	104	329	105	381	107	437	110	500
	109	253	110	293	112	337	114	383	116	443	119	505
	126	281	127	303	131	349	133	391	136	443	139	499
	141	296	143	321	149	370	152	410	157	462	161	521

TABLE 15
LGH/LCH300S REHEAT NORMAL OPERATING PRESSURES - ALUMINUM COIL

Normal Operating Pressures												
	Outdoor Coil Entering Air Temperature											
	65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
Circuit 1	108	259	110	299	112	353	113	396	114	452	117	510
	118	263	119	303	120	348	123	396	125	450	128	510
	133	275	137	314	139	357	142	407	144	460	148	516
	149	288	154	326	159	370	162	416	166	468	171	527
Circuit 2	106	253	107	293	109	348	111	389	113	445	115	509
	116	257	118	296	119	340	120	391	122	445	125	506
	133	267	136	307	139	349	142	398	142	452	145	512
	148	280	153	318	158	360	161	407	164	460	168	521
Circuit 3	110	258	109	304	110	363	111	405	113	463	116	535
	119	263	122	304	123	350	122	405	124	463	126	526
	135	274	139	316	142	360	145	410	148	463	151	520
	149	288	155	329	159	375	163	422	168	475	172	536
Circuit 4	105	251	107	290	107	347	109	390	110	449	113	511
	114	256	117	294	119	338	119	388	121	446	123	509
	128	268	133	308	136	349	139	397	142	449	144	510
	141	282	147	320	152	363	156	408	160	462	165	521

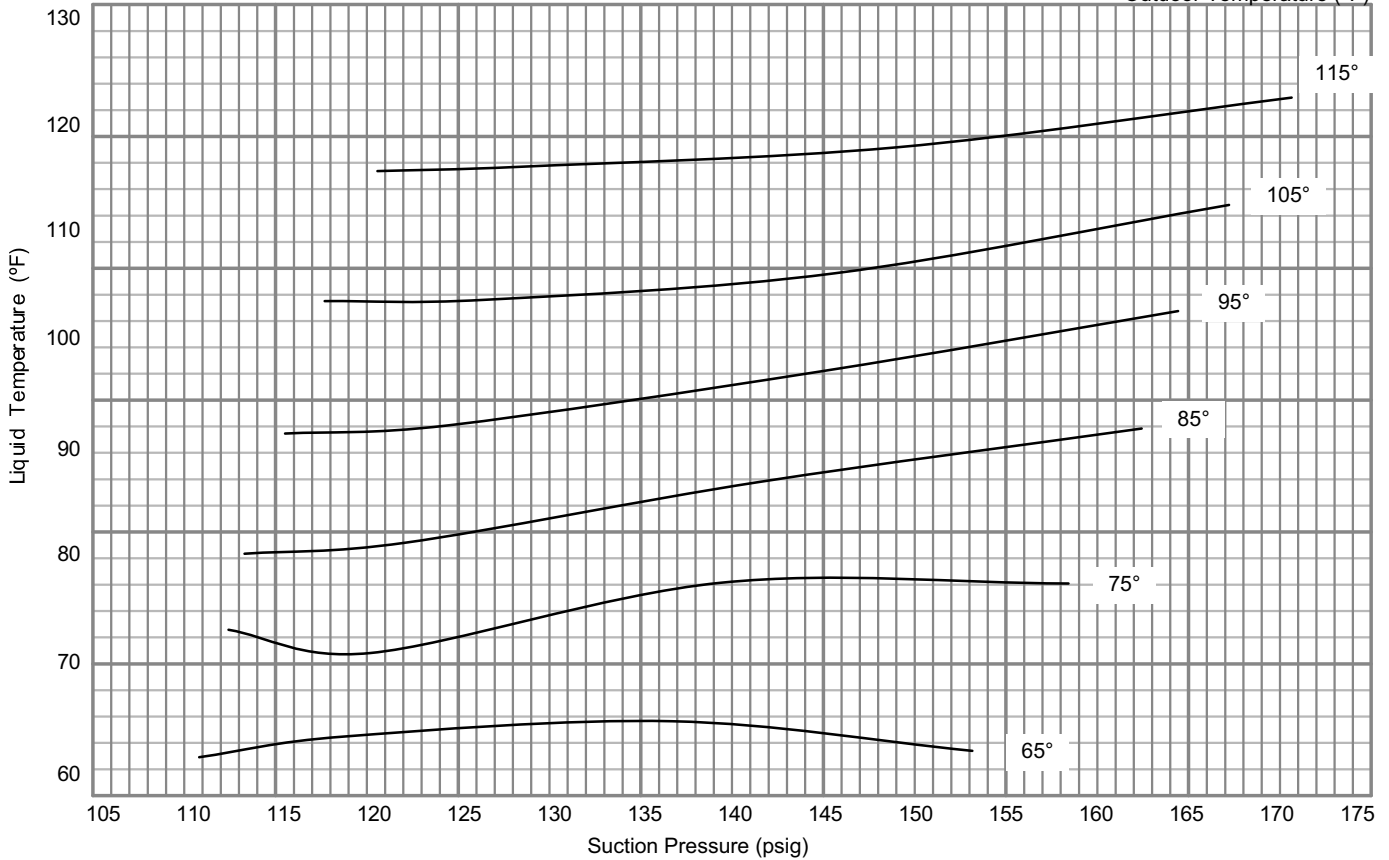
LGH/LCH156 CHARGING CURVE CIRCUIT 1

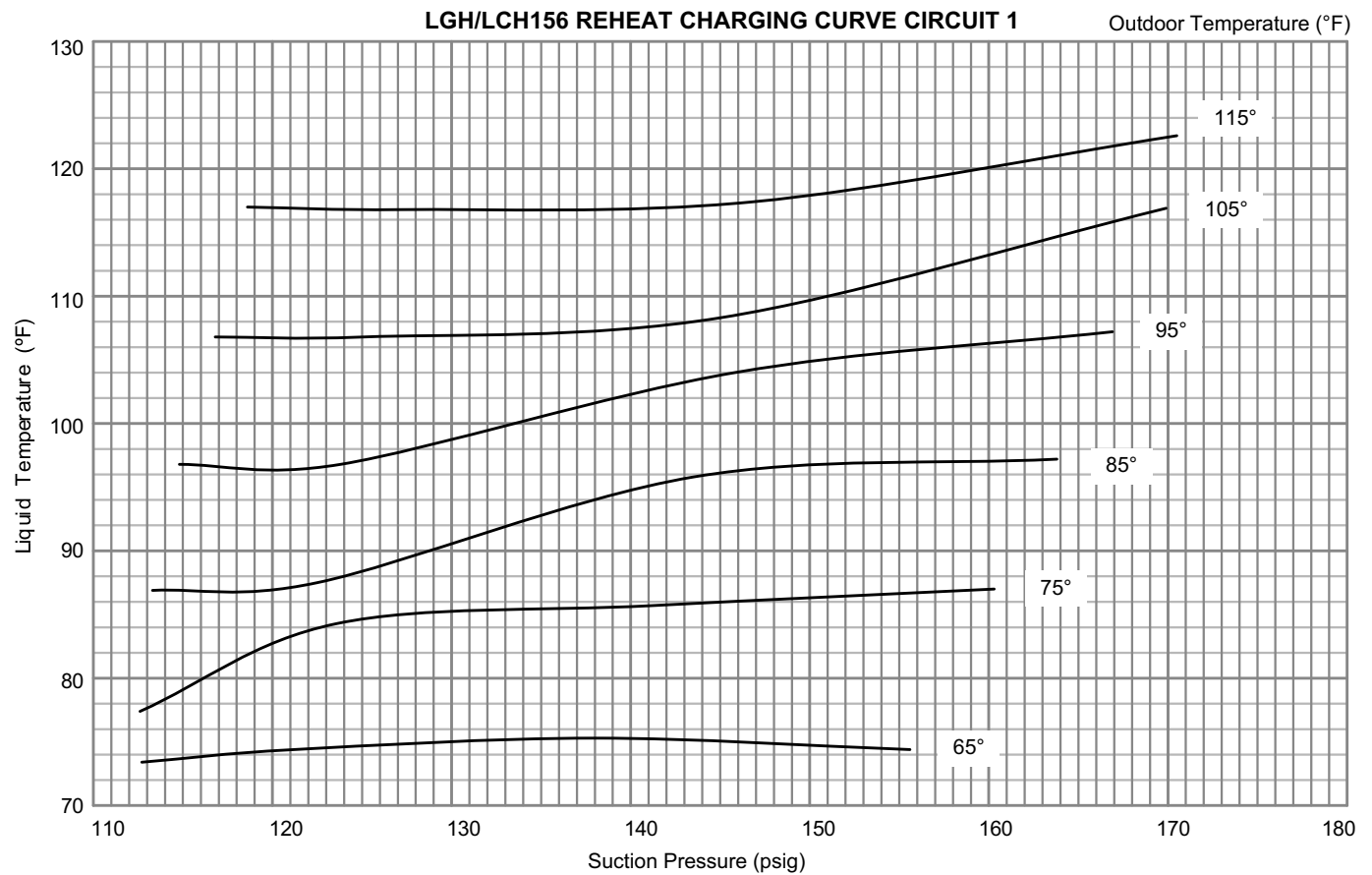
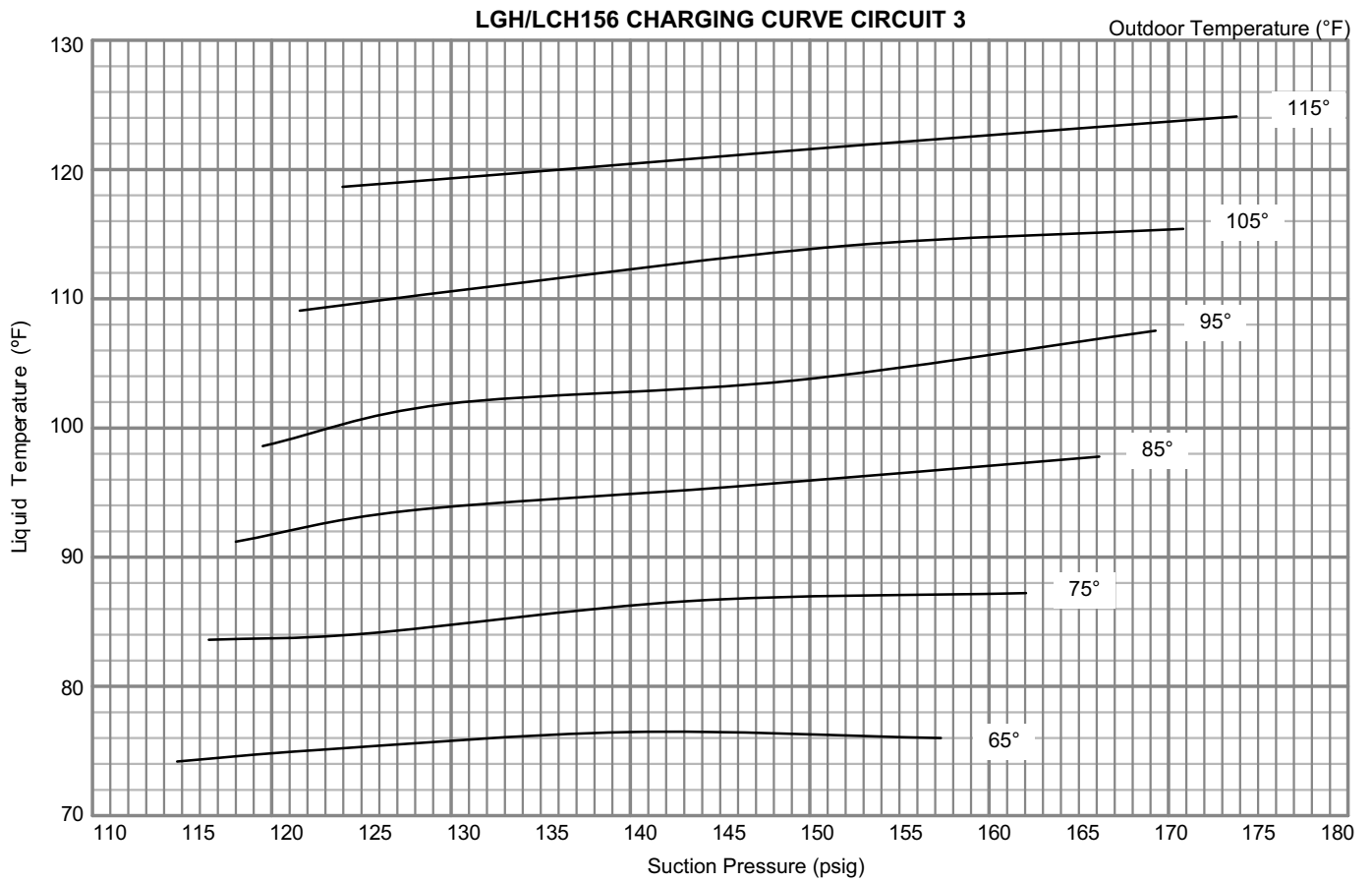
Outdoor Temperature (°F)

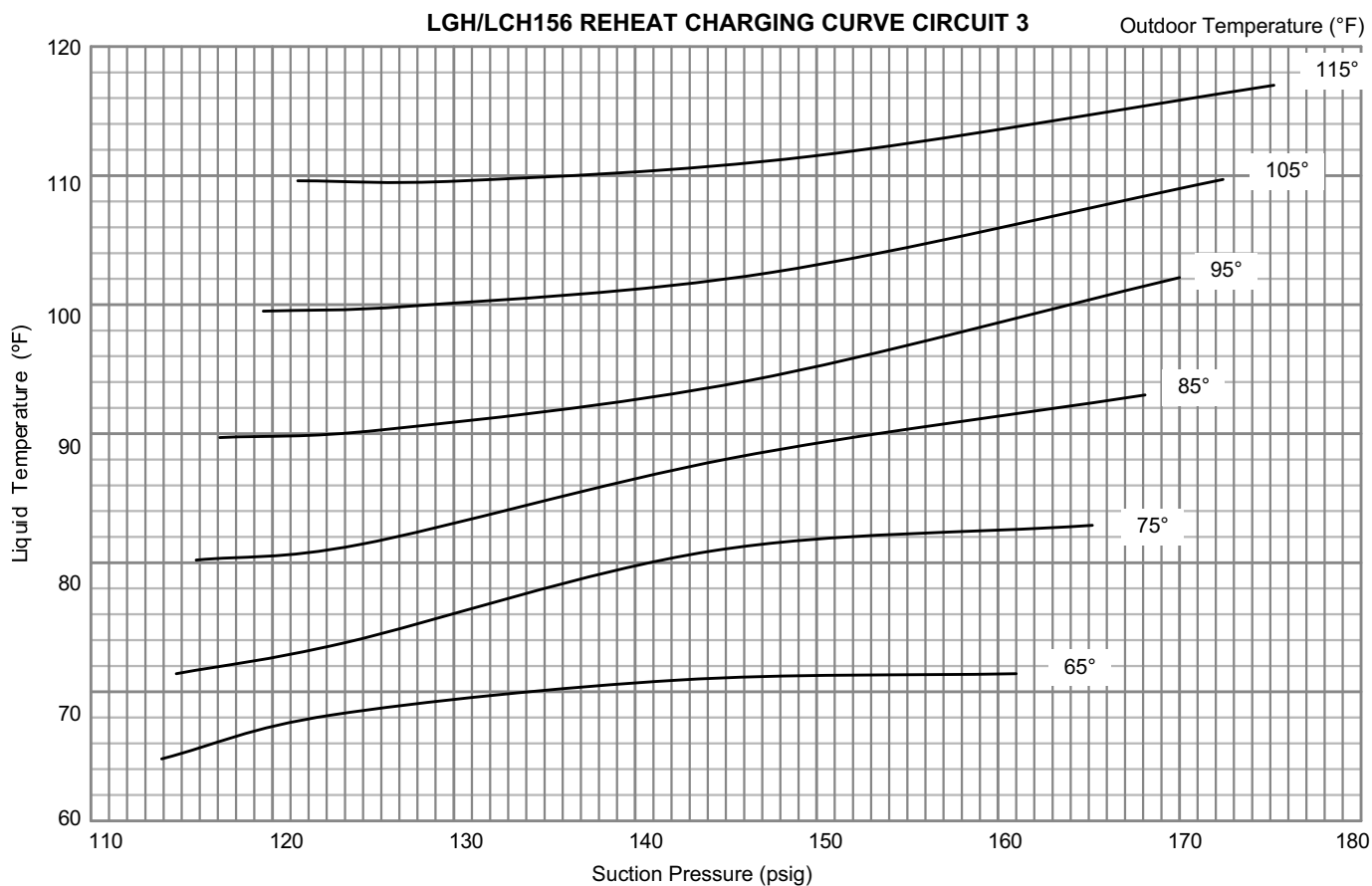
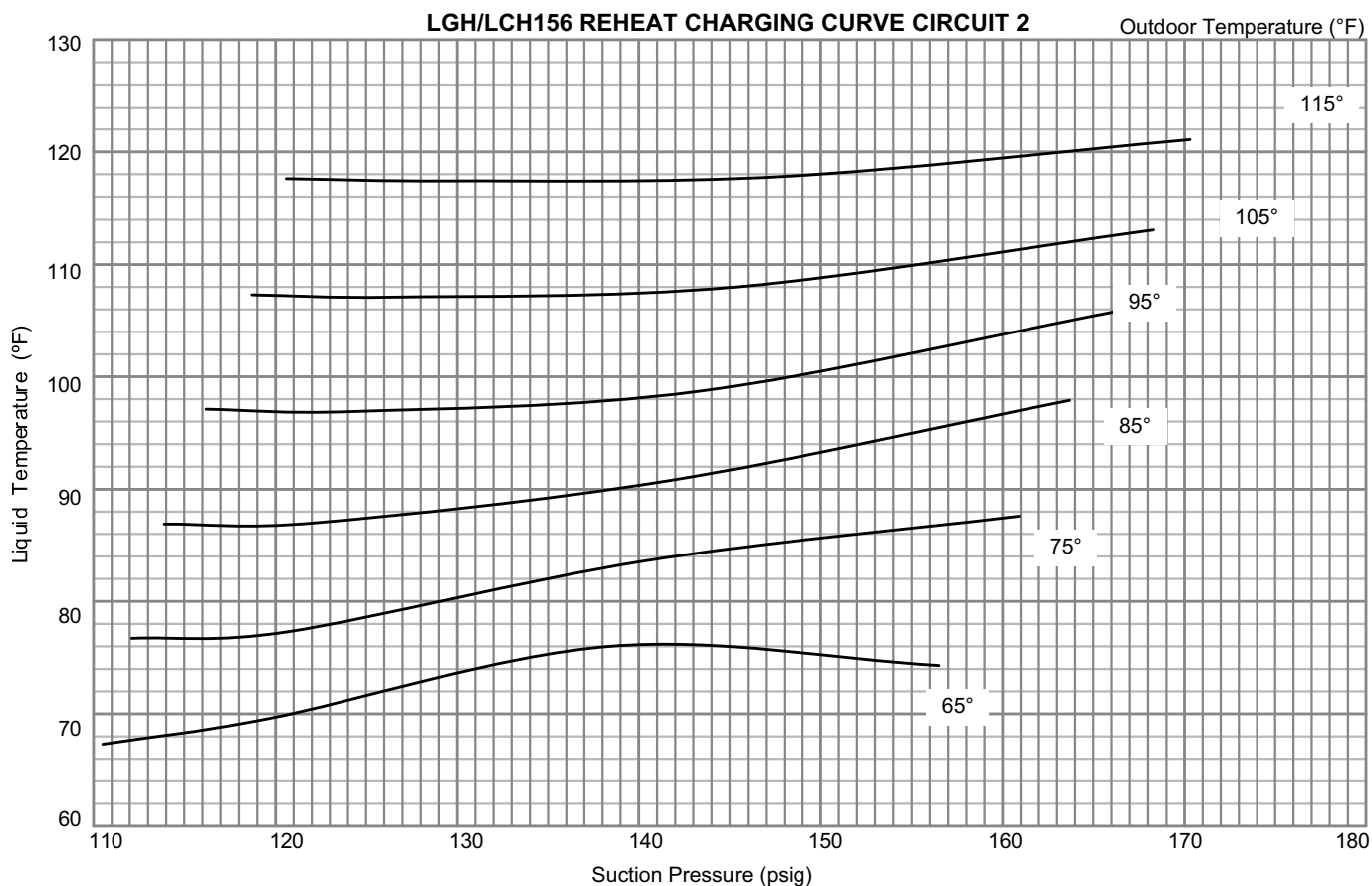


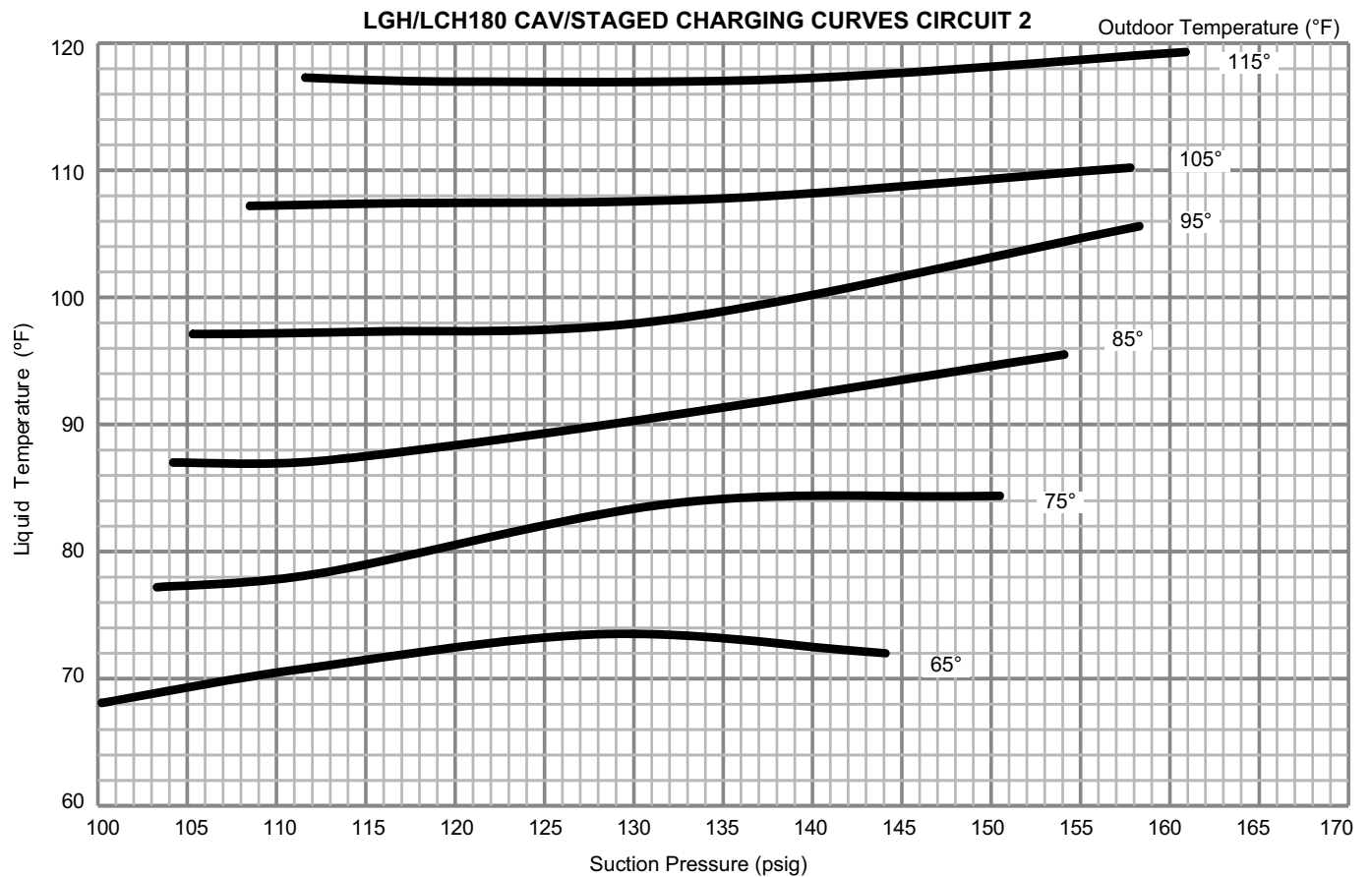
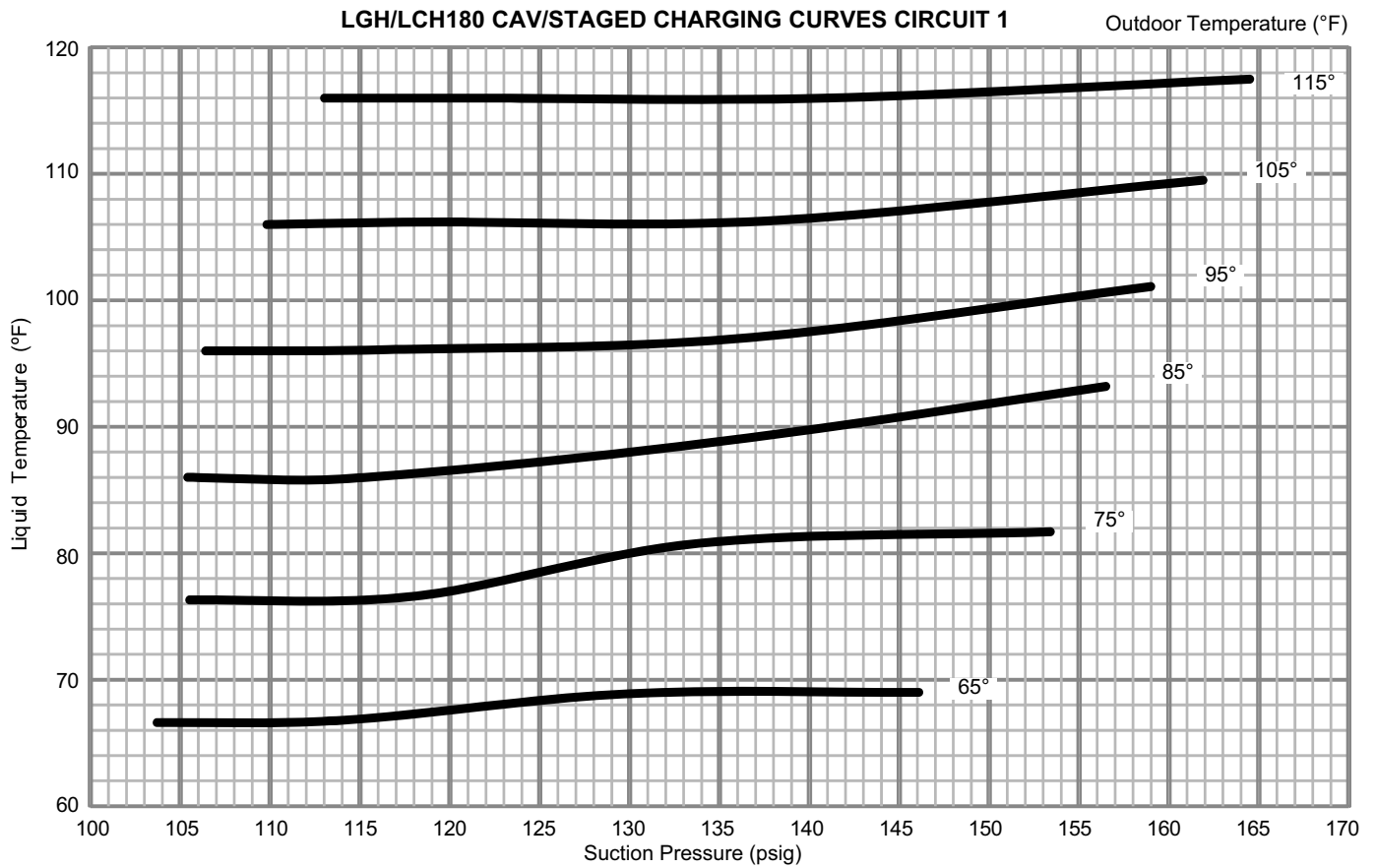
LGH/LCH156 CHARGING CURVE CIRCUIT 2

Outdoor Temperature (°F)

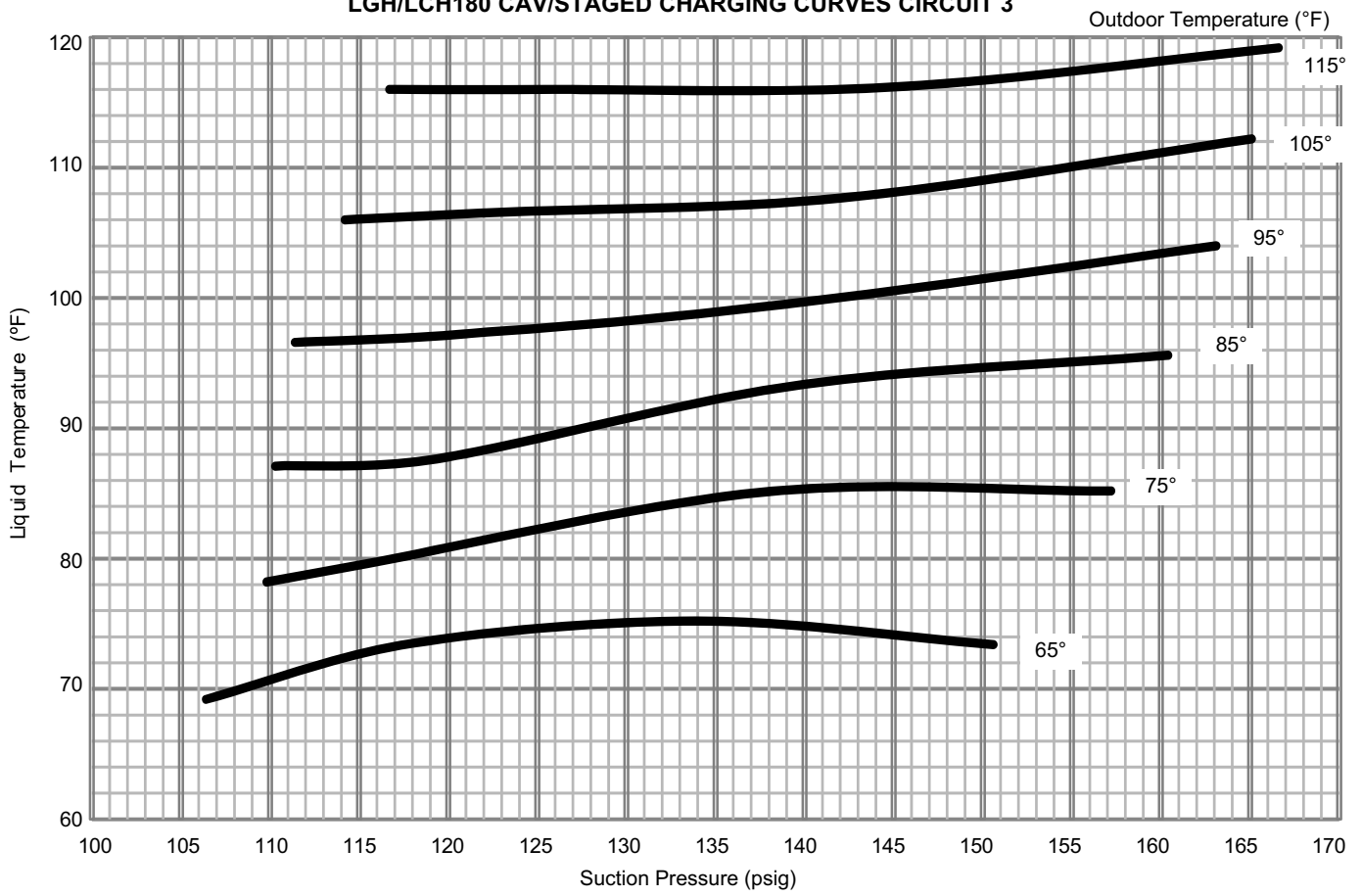


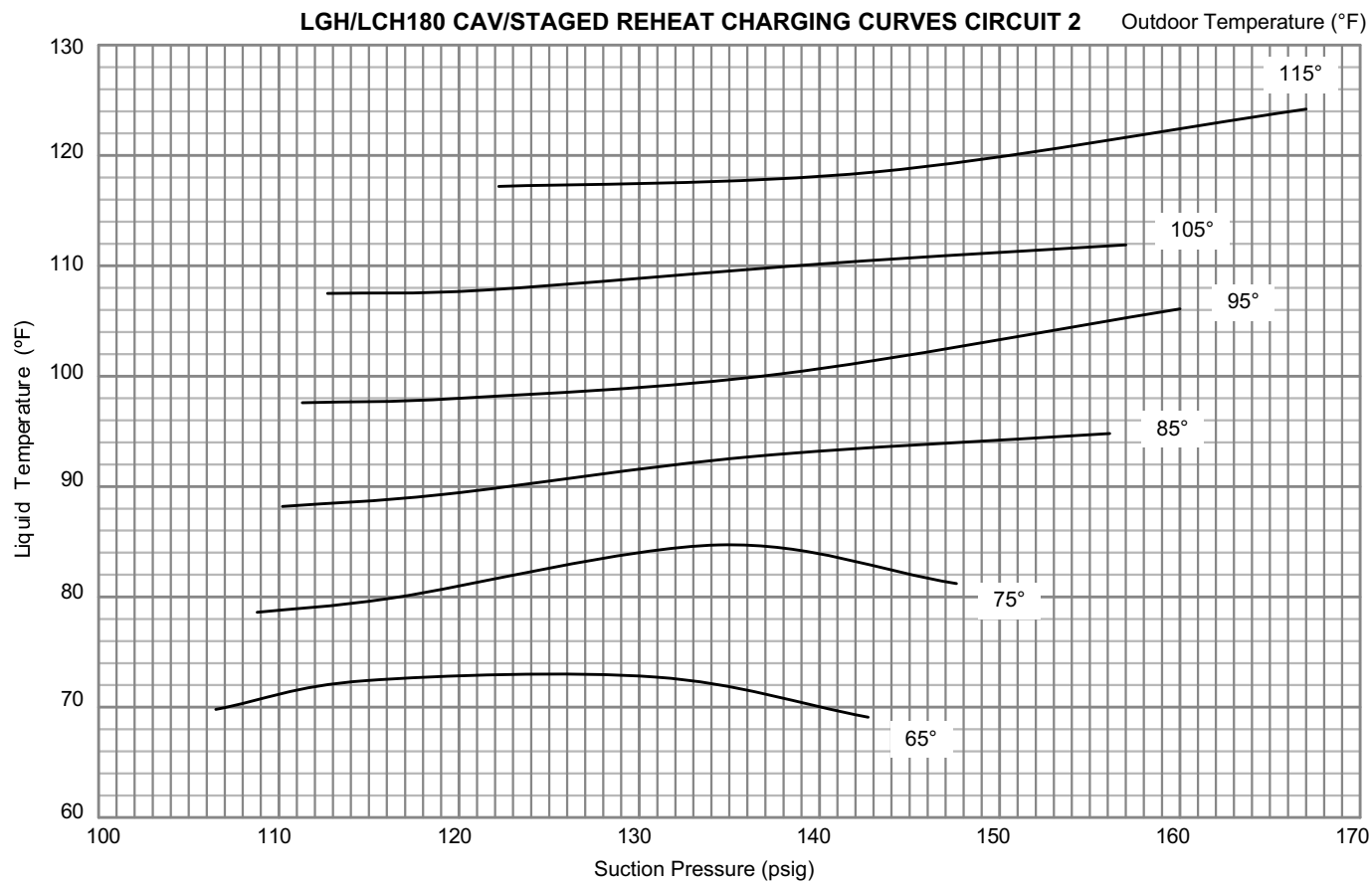
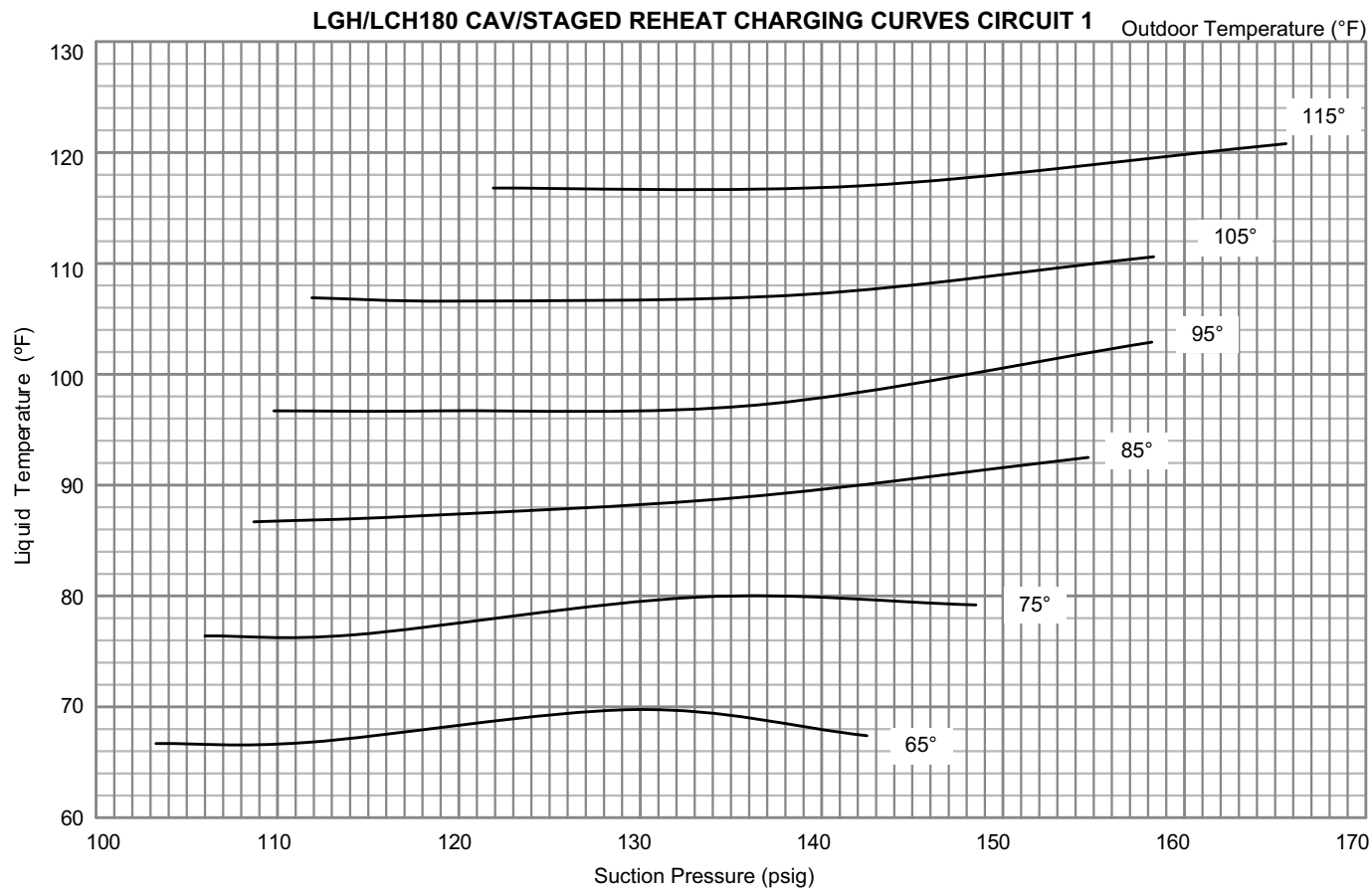






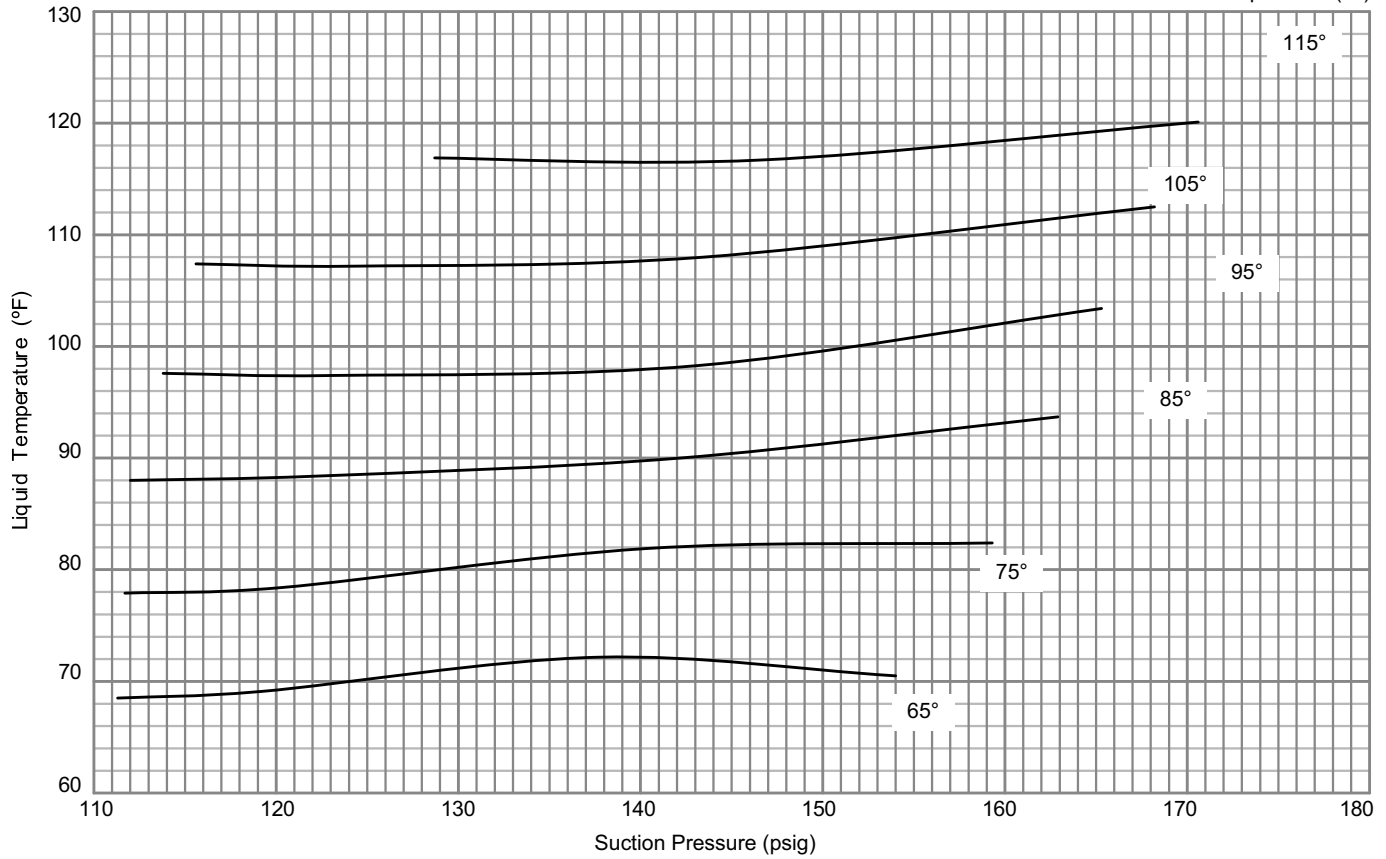
LGH/LCH180 CAV/STAGED CHARGING CURVES CIRCUIT 3





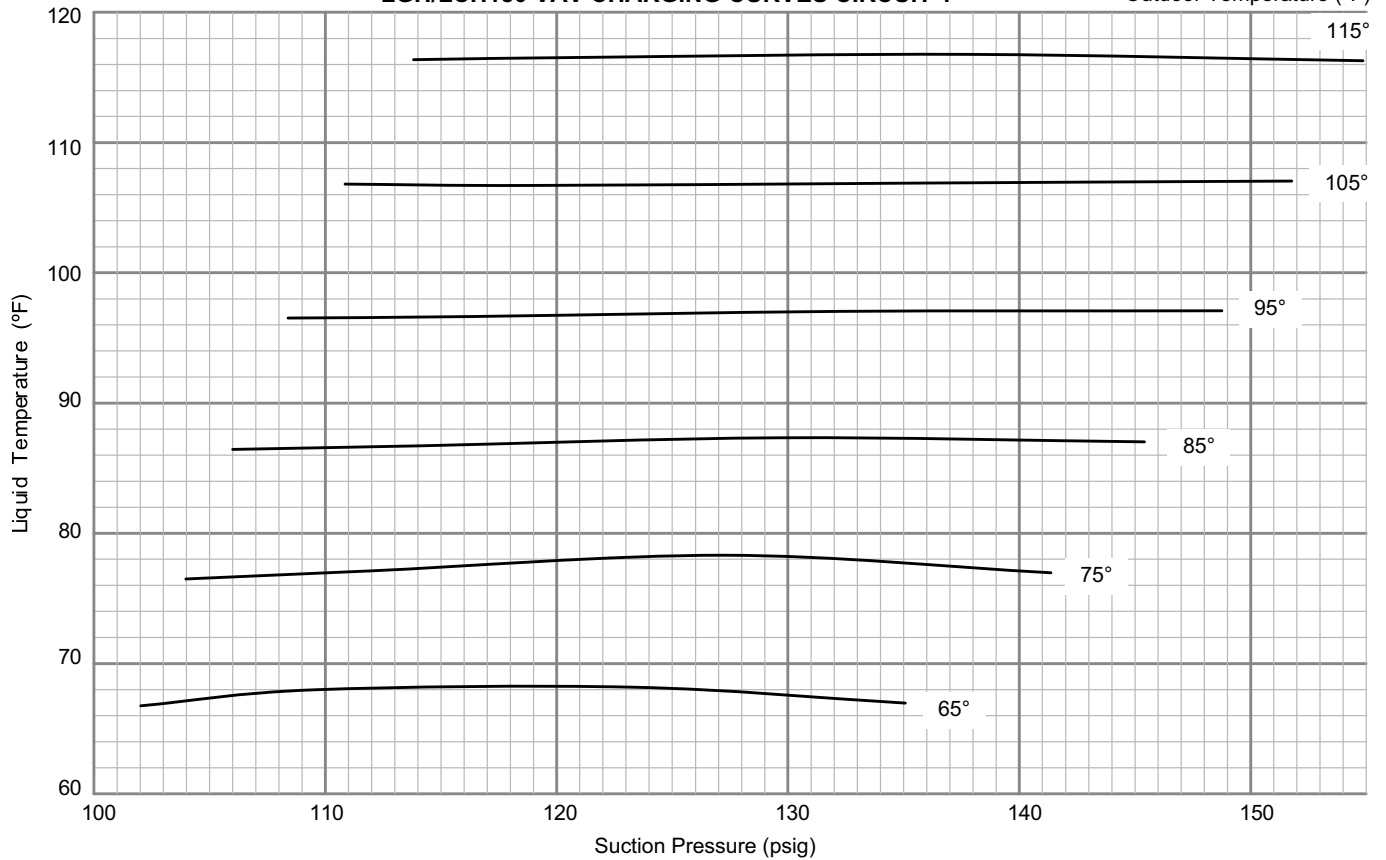
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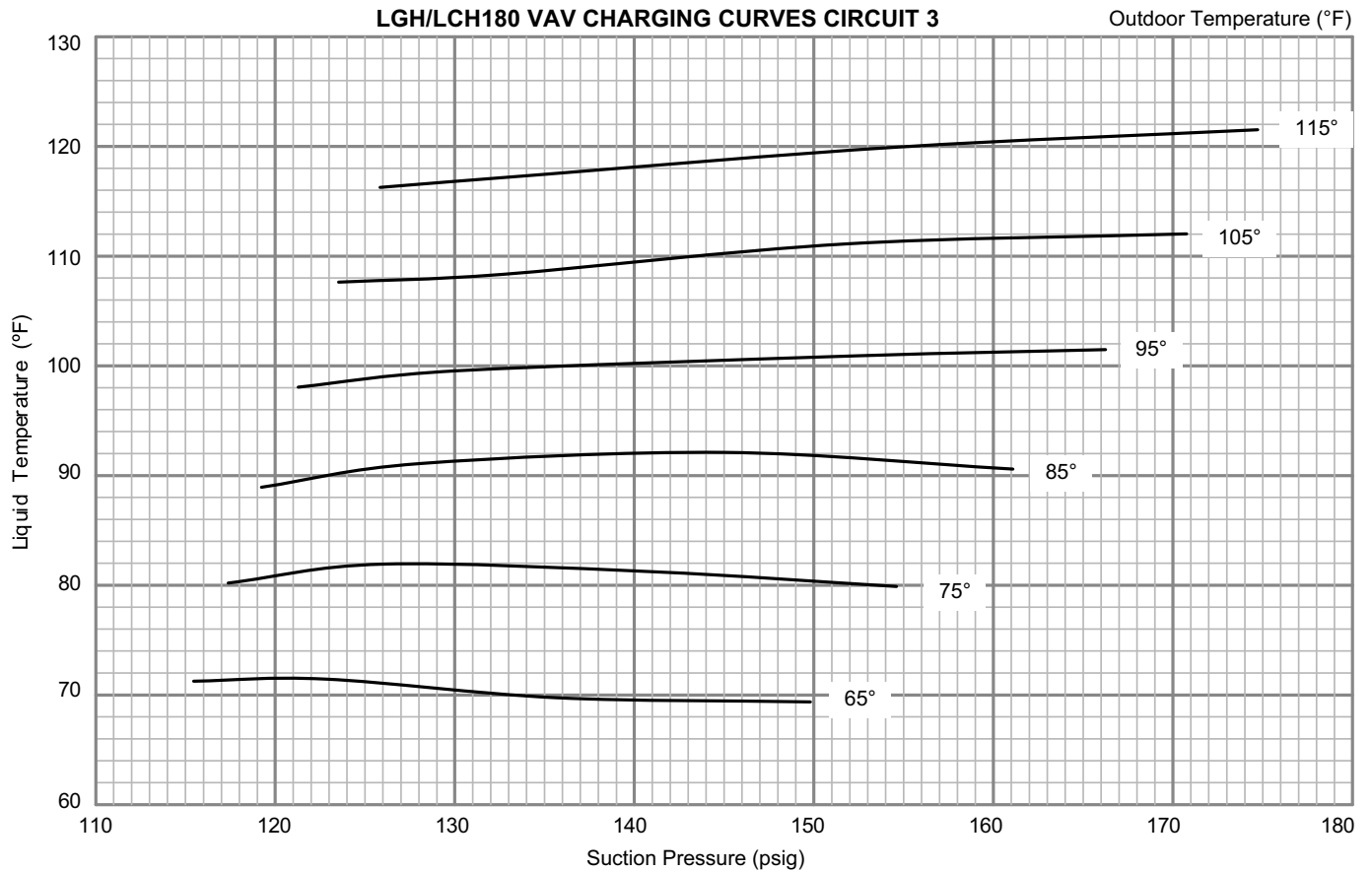
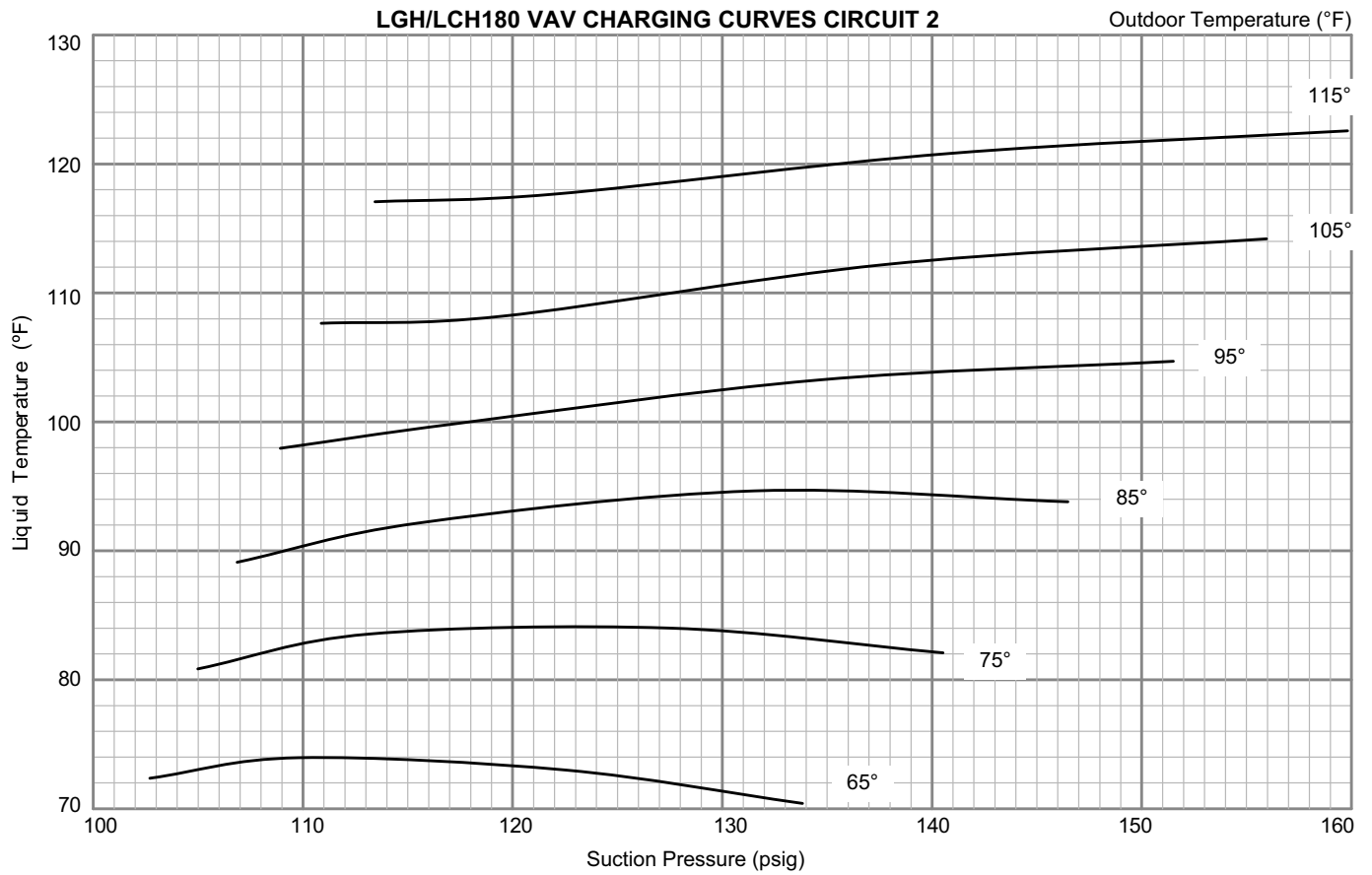
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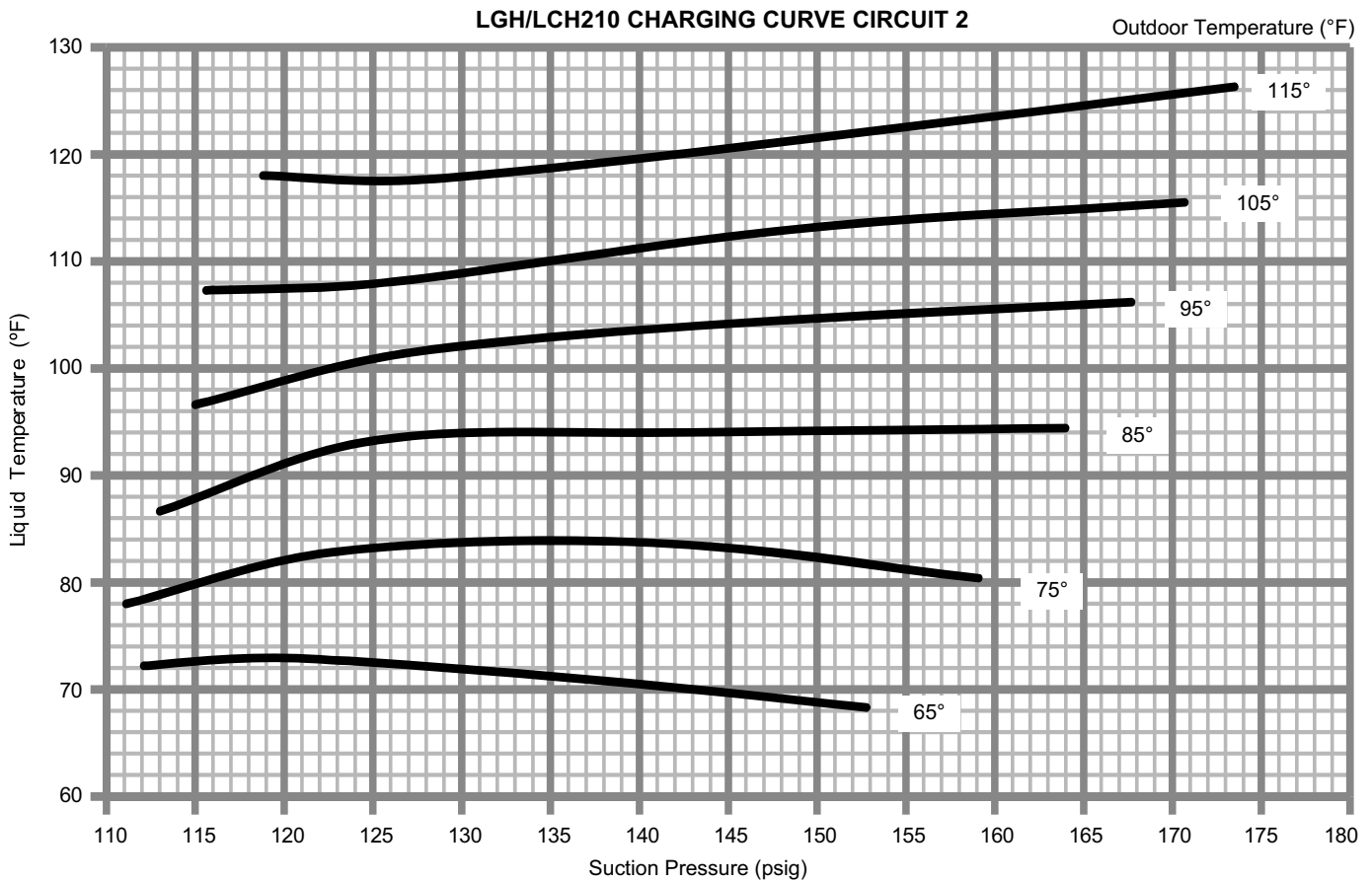
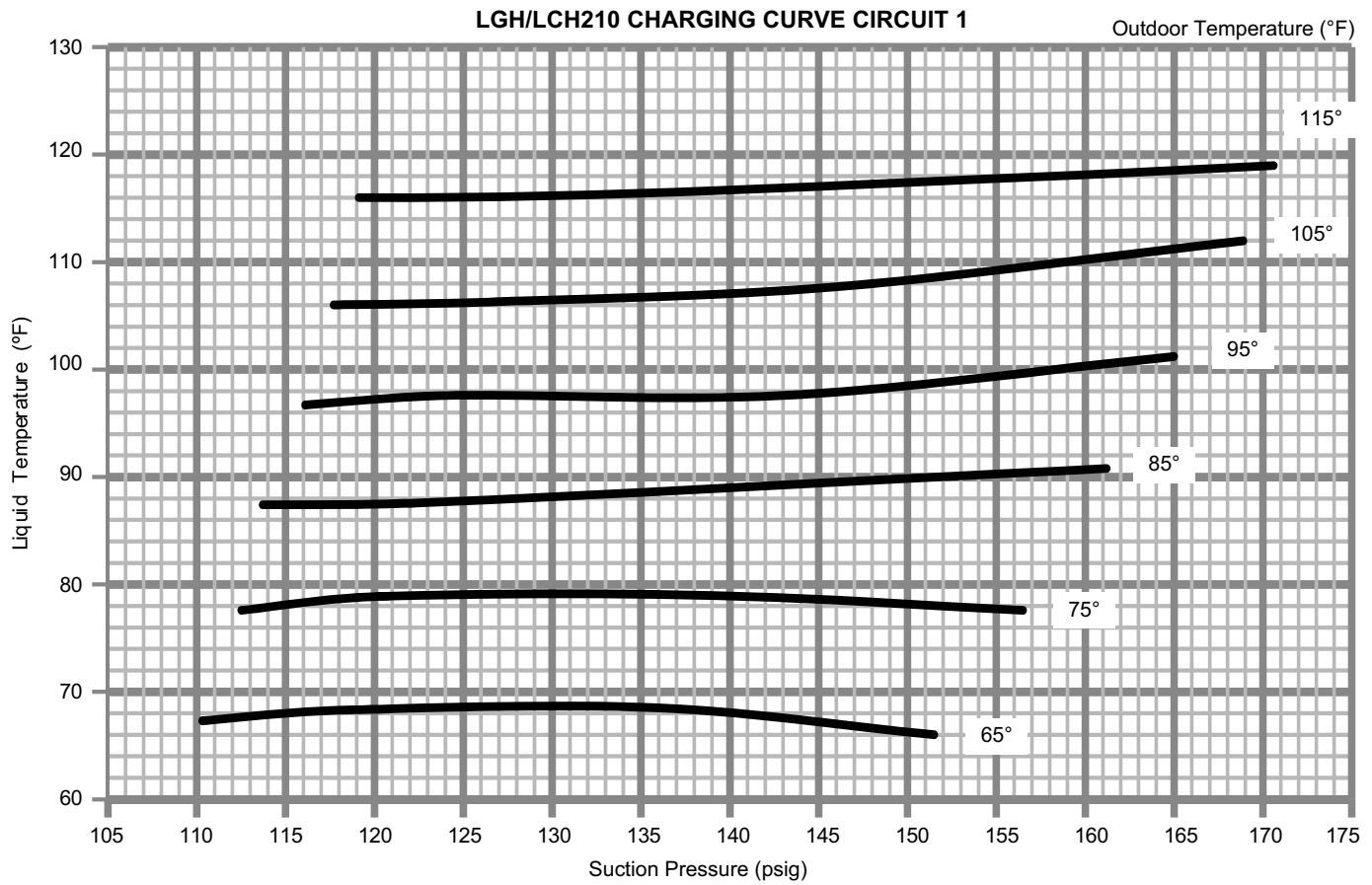


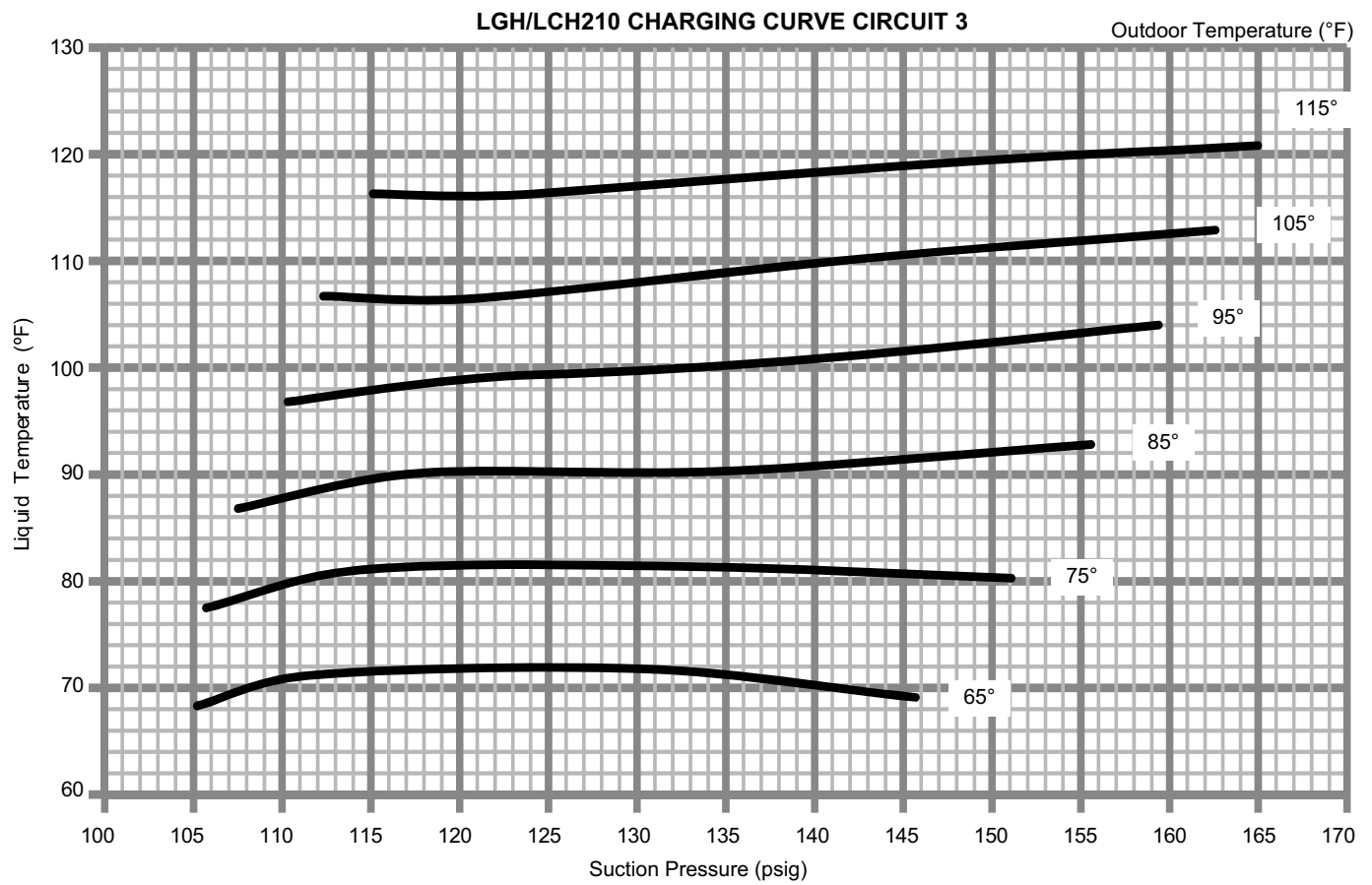
LGH/LCH180 VAV CHARGING CURVES CIRCUIT 1

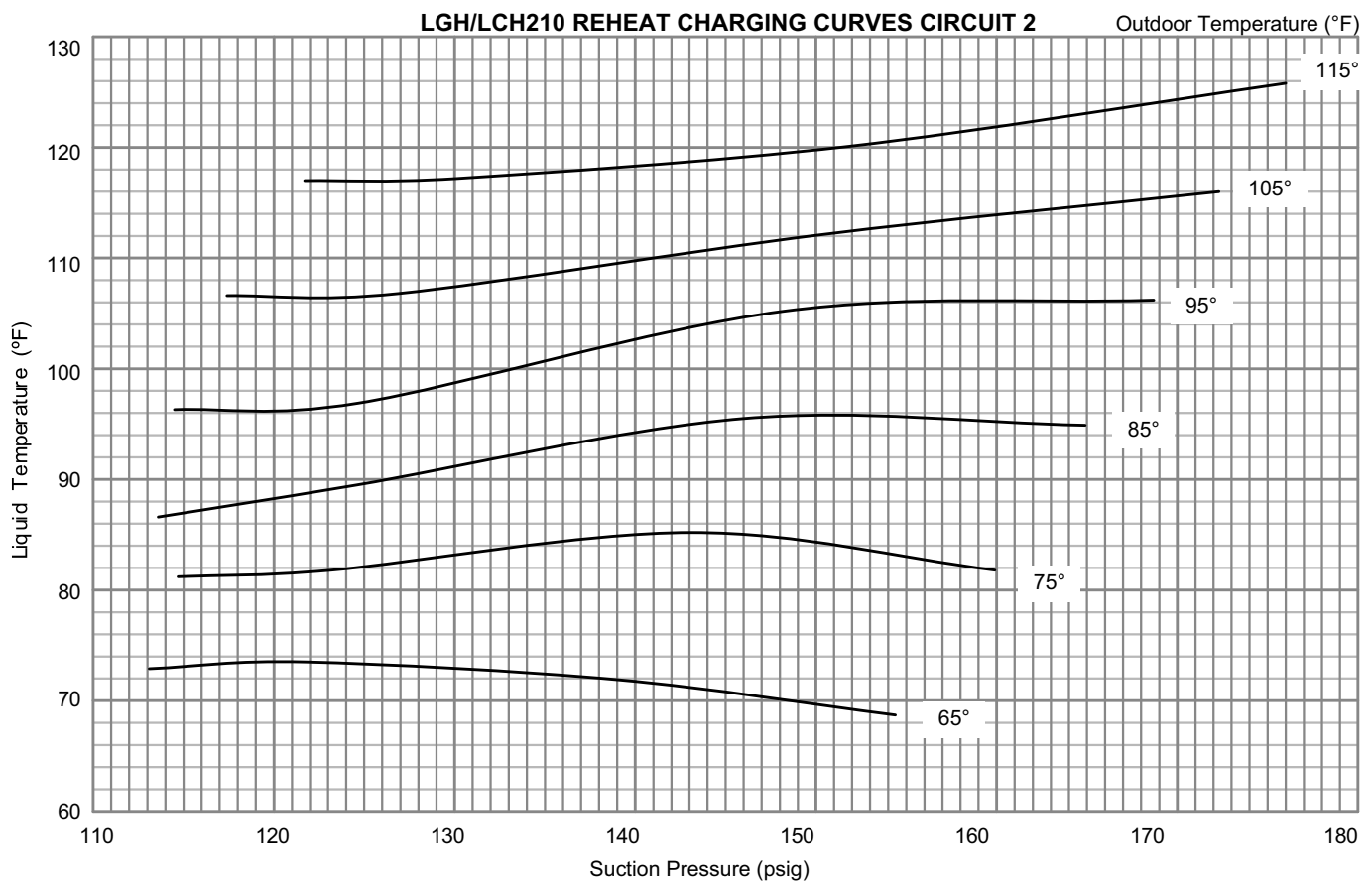
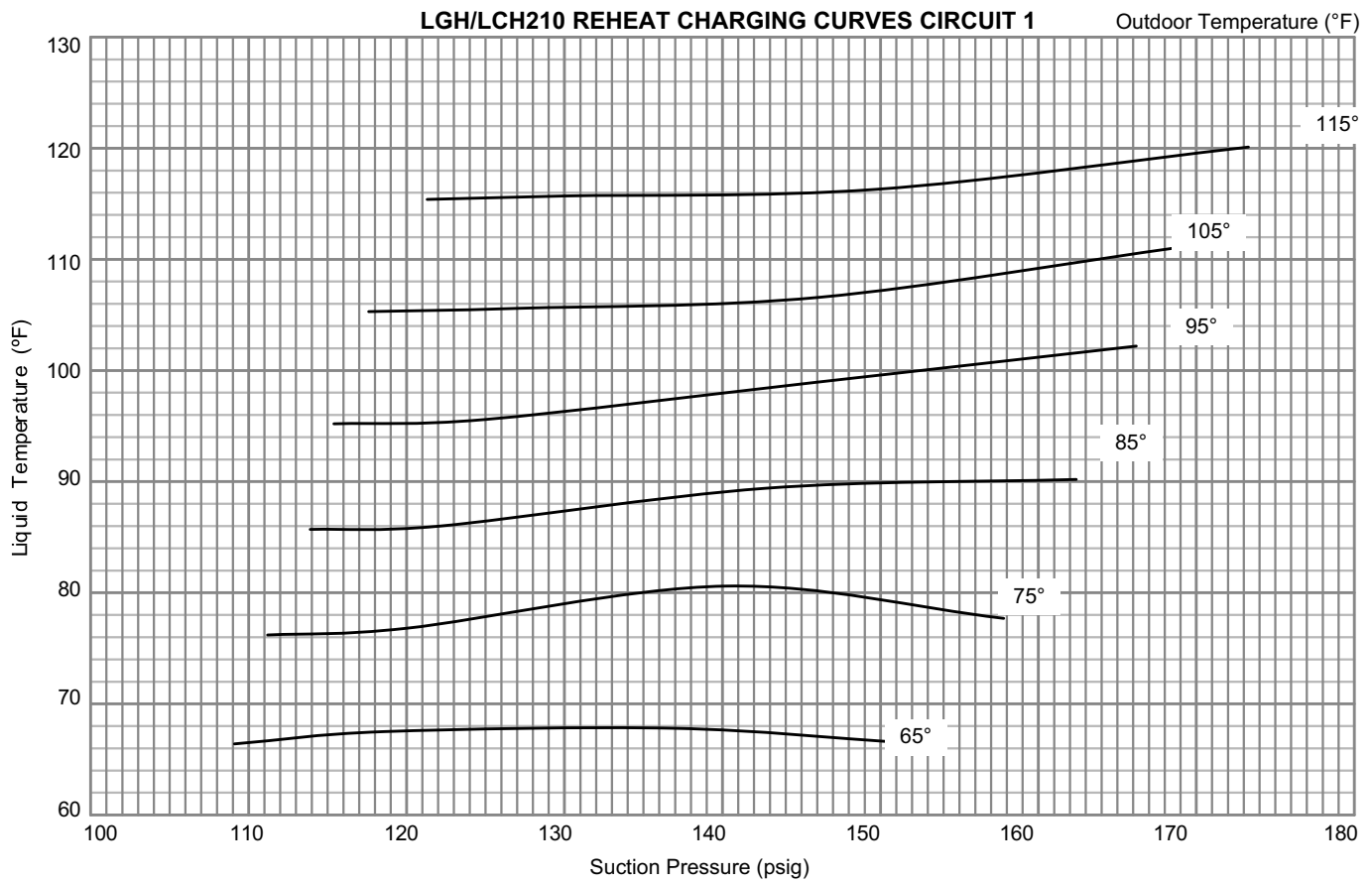
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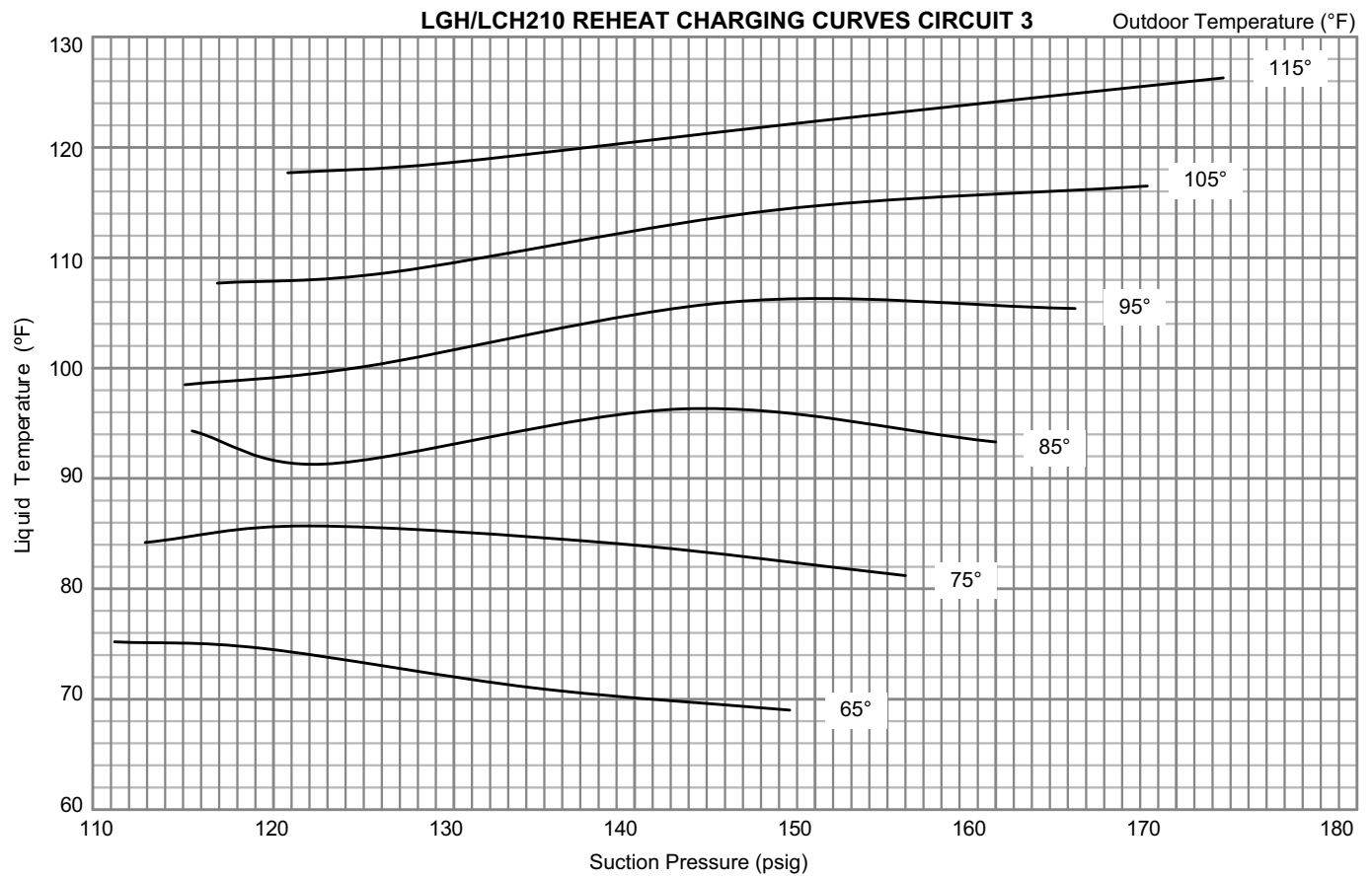




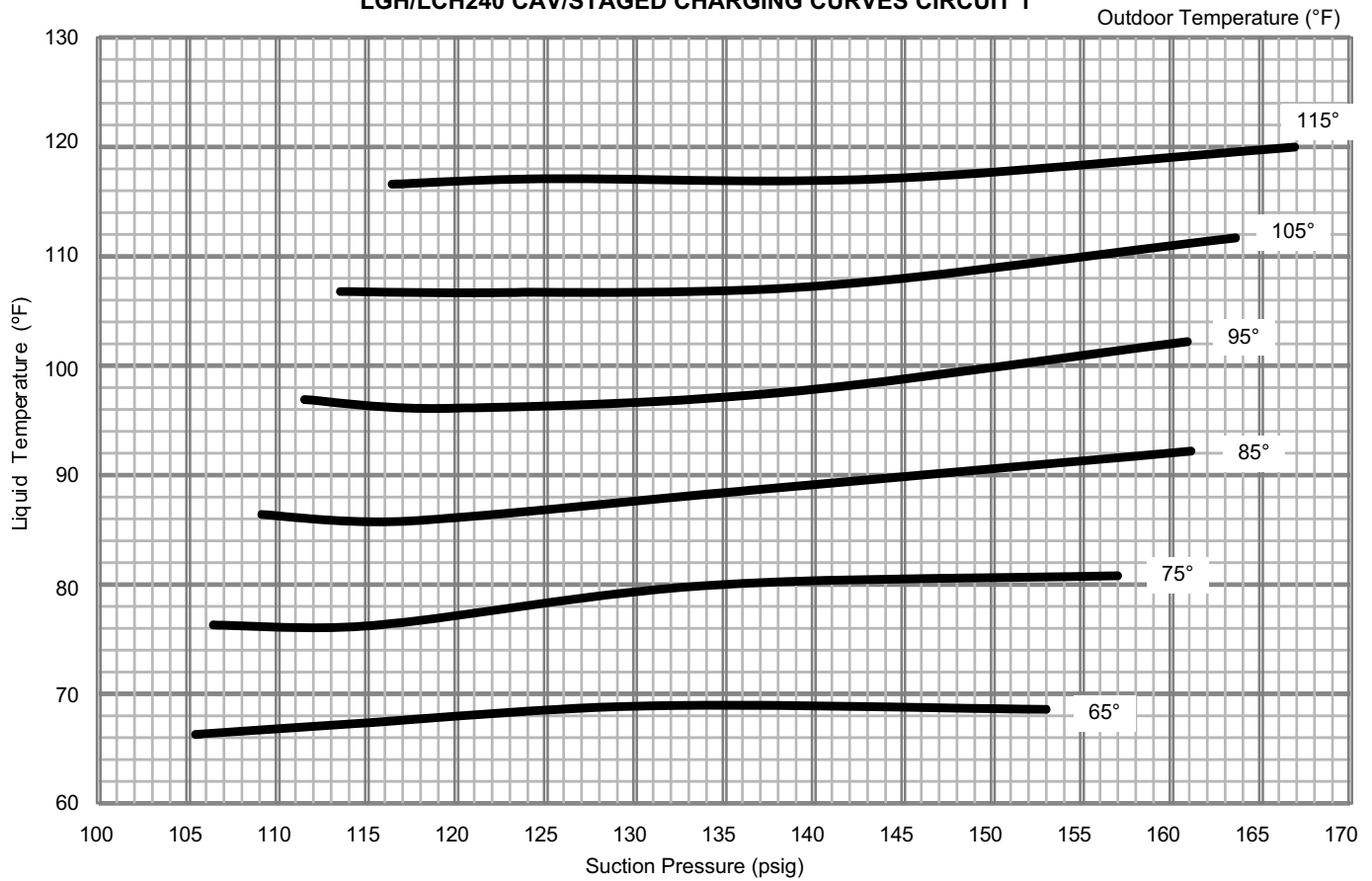




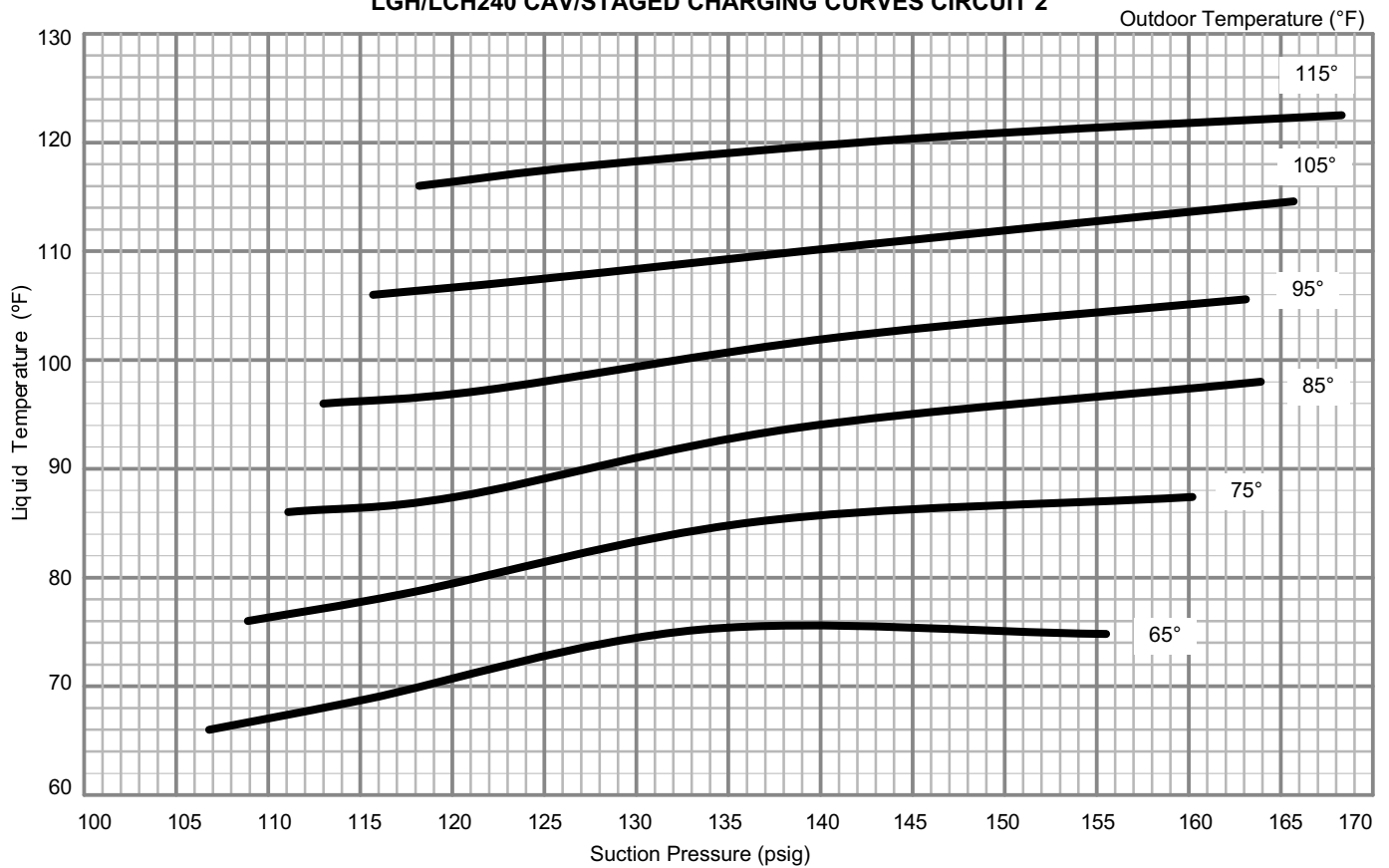




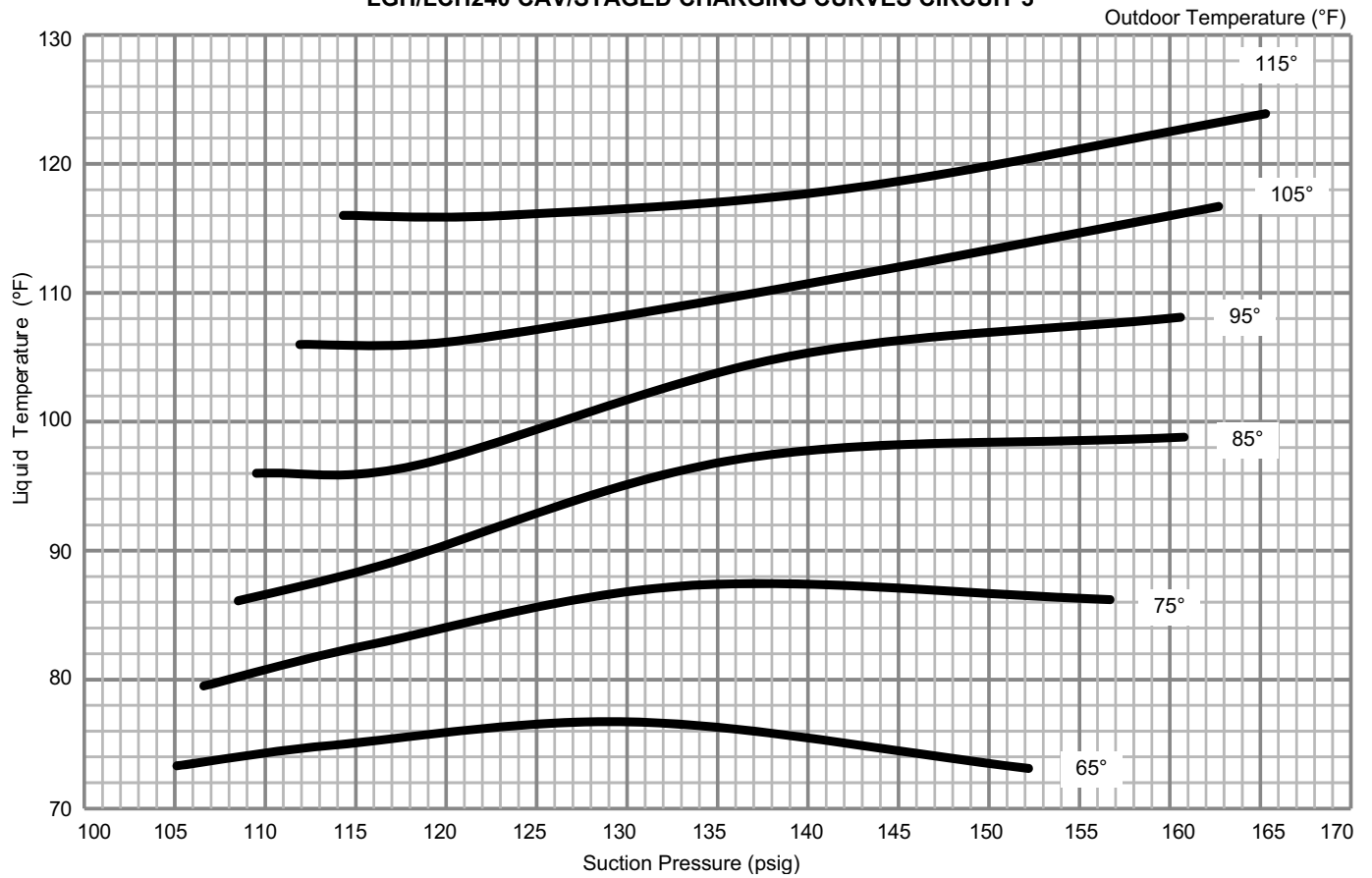
LGH/LCH240 CAV/STAGED CHARGING CURVES CIRCUIT 1



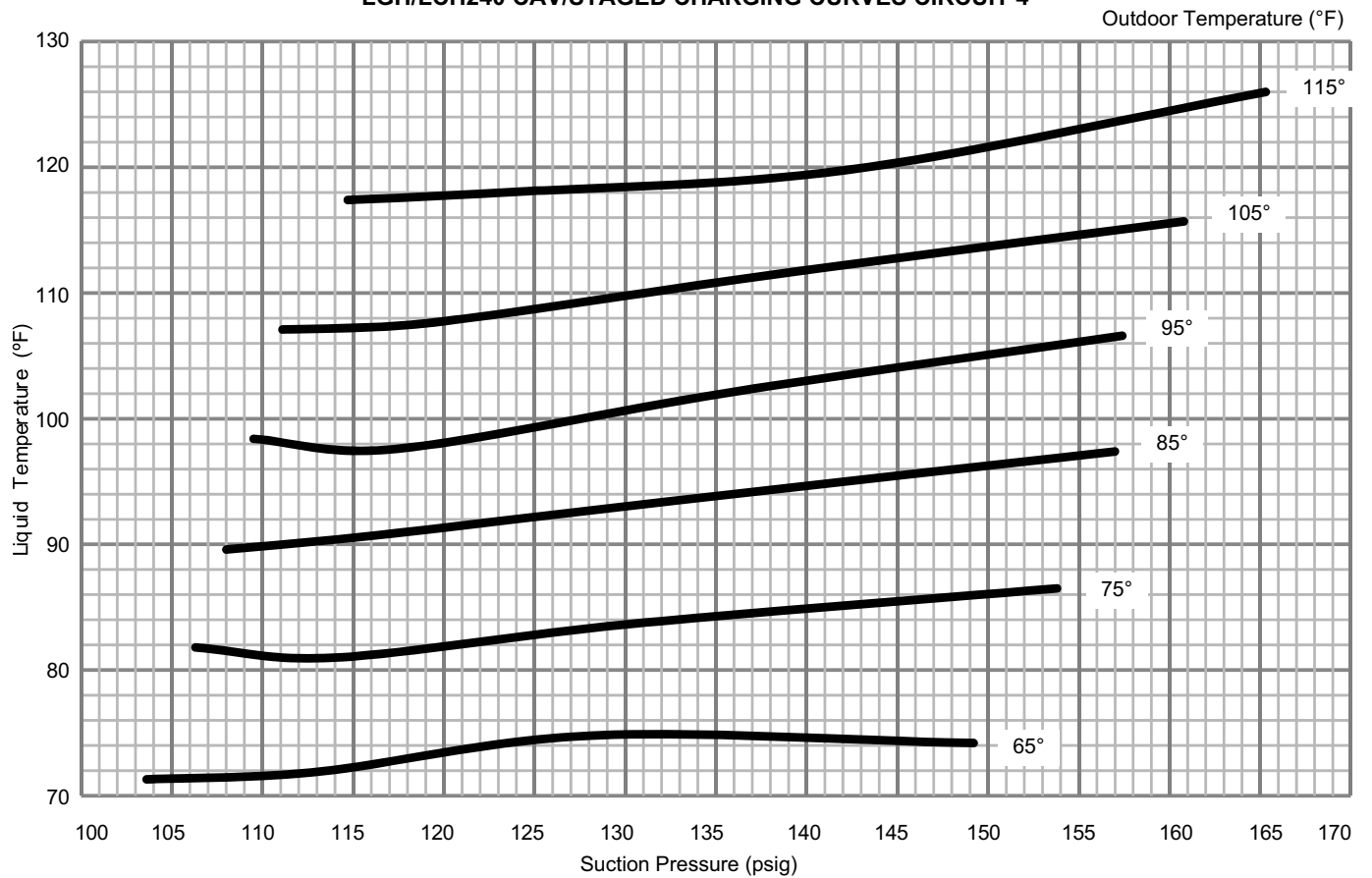
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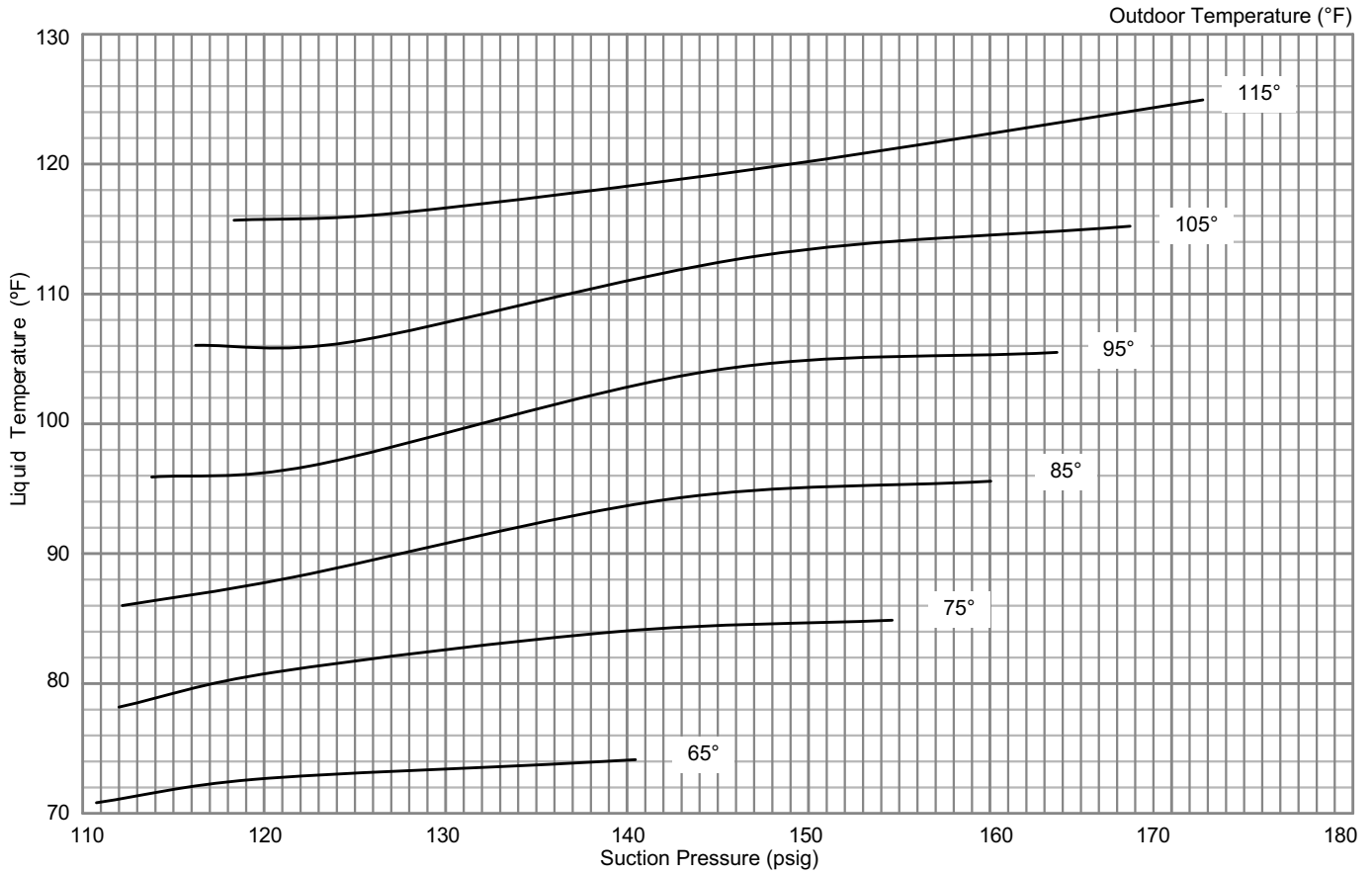
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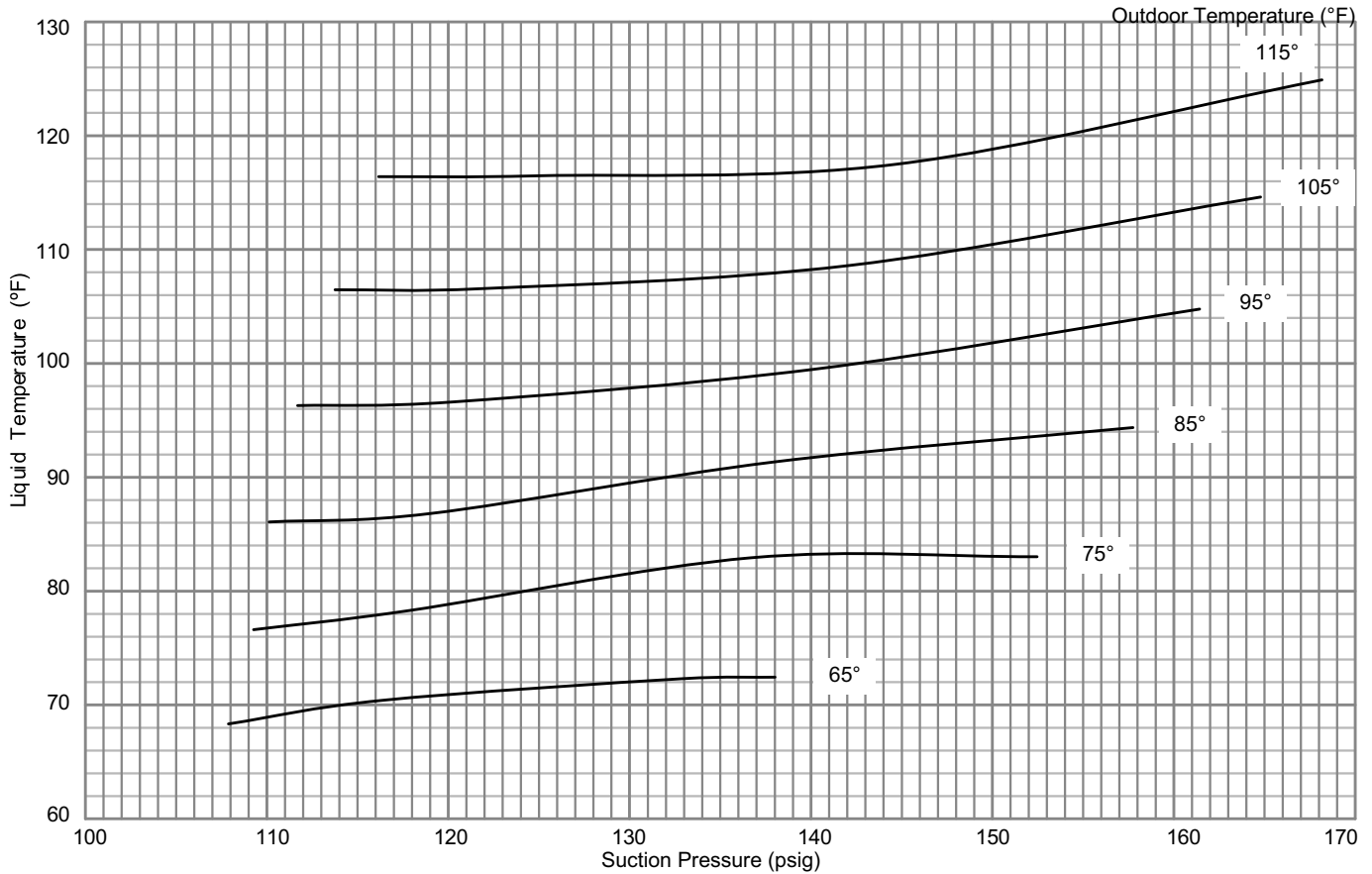
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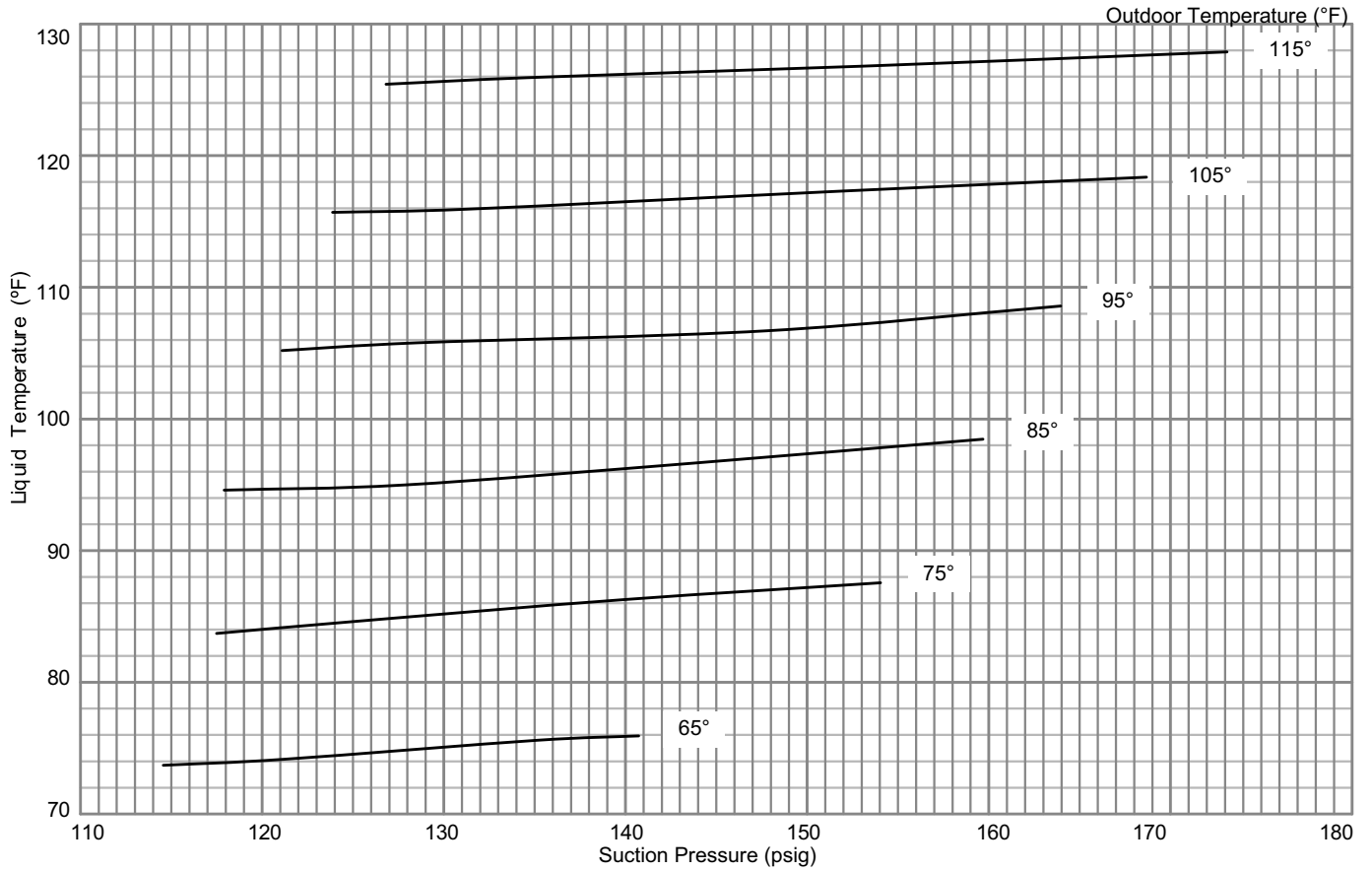
LGH/LCH240 CAV/STAGED REHEAT CHARGING CURVES CIRCUIT 1



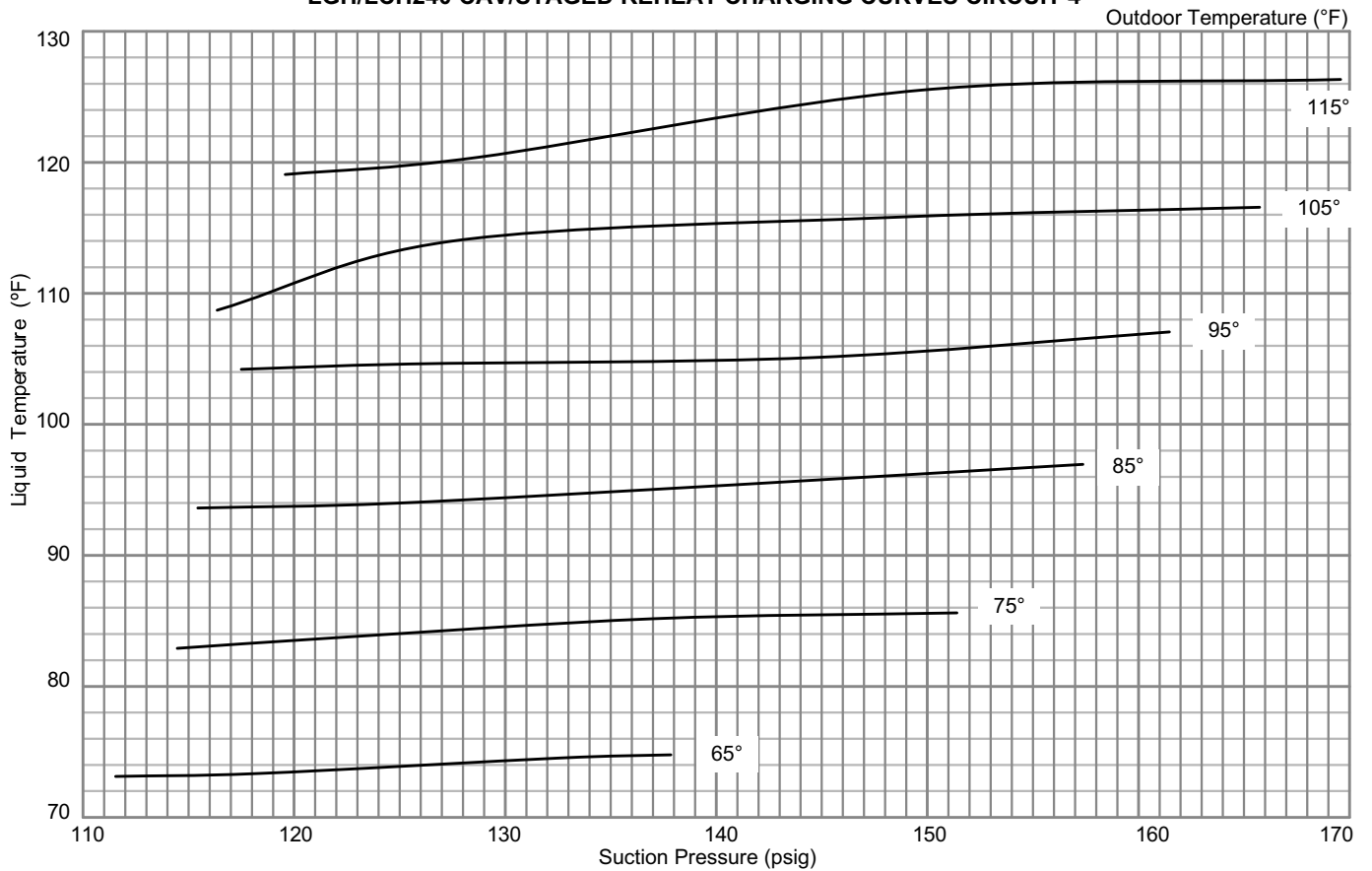
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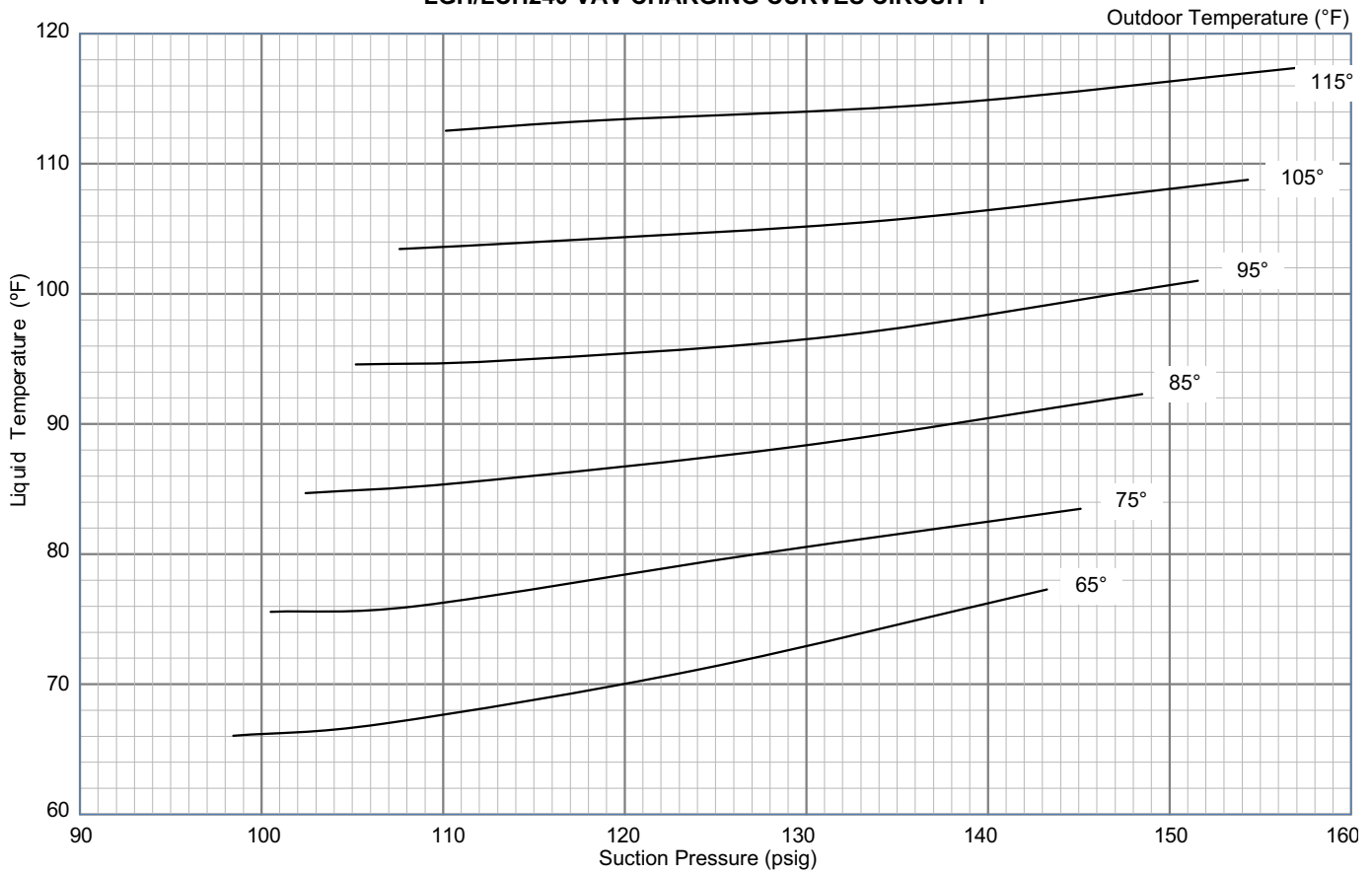
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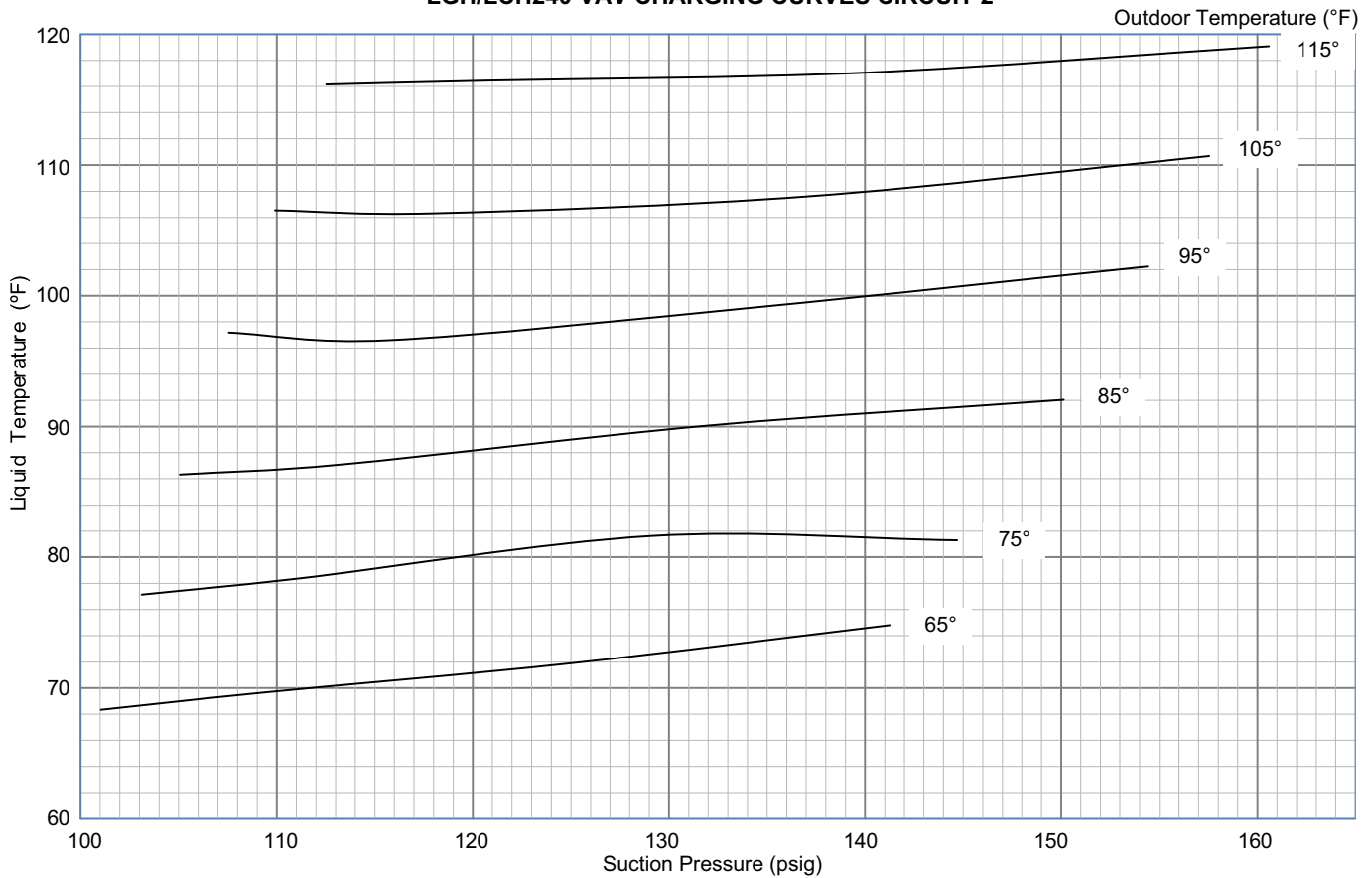
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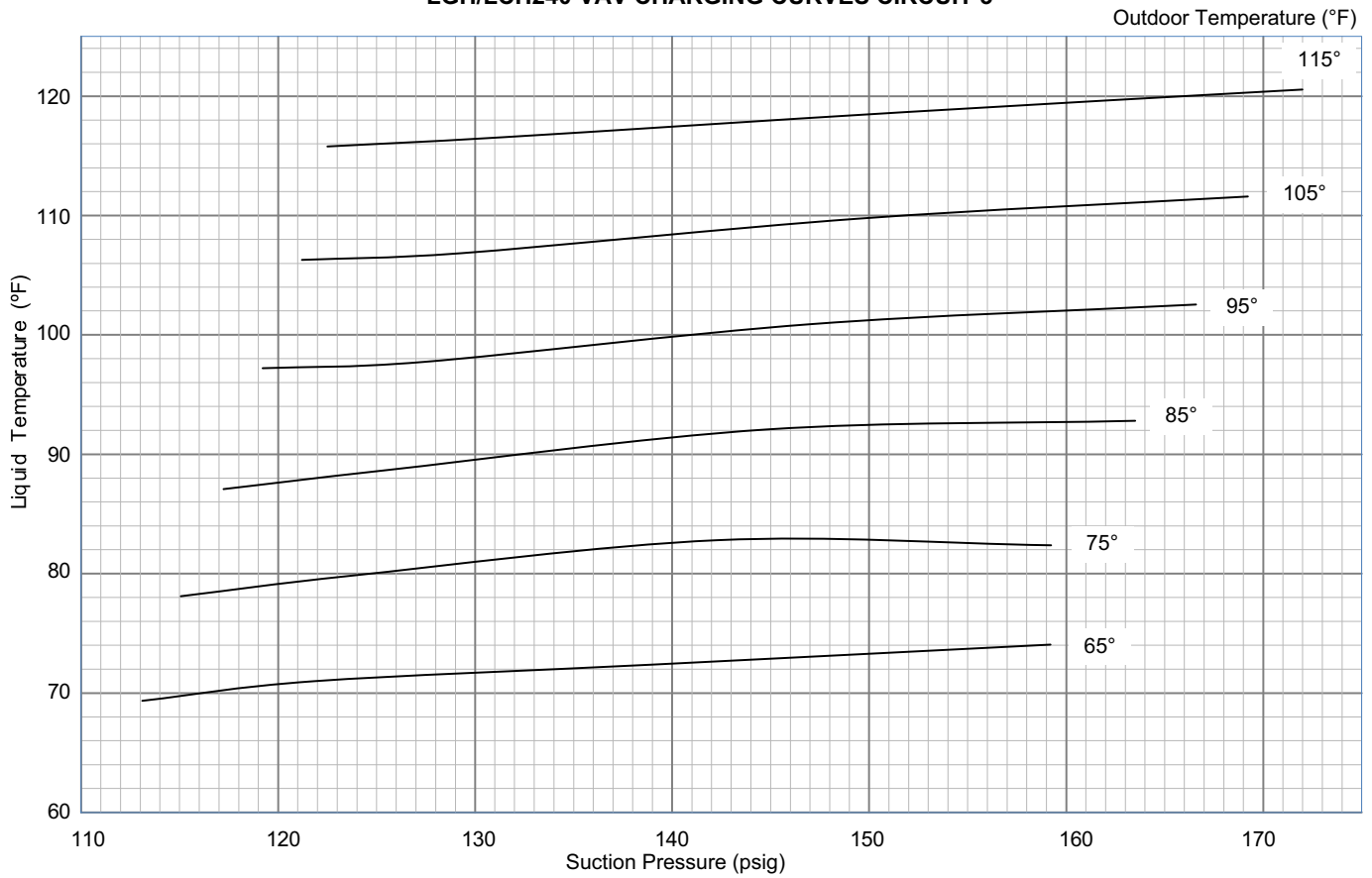
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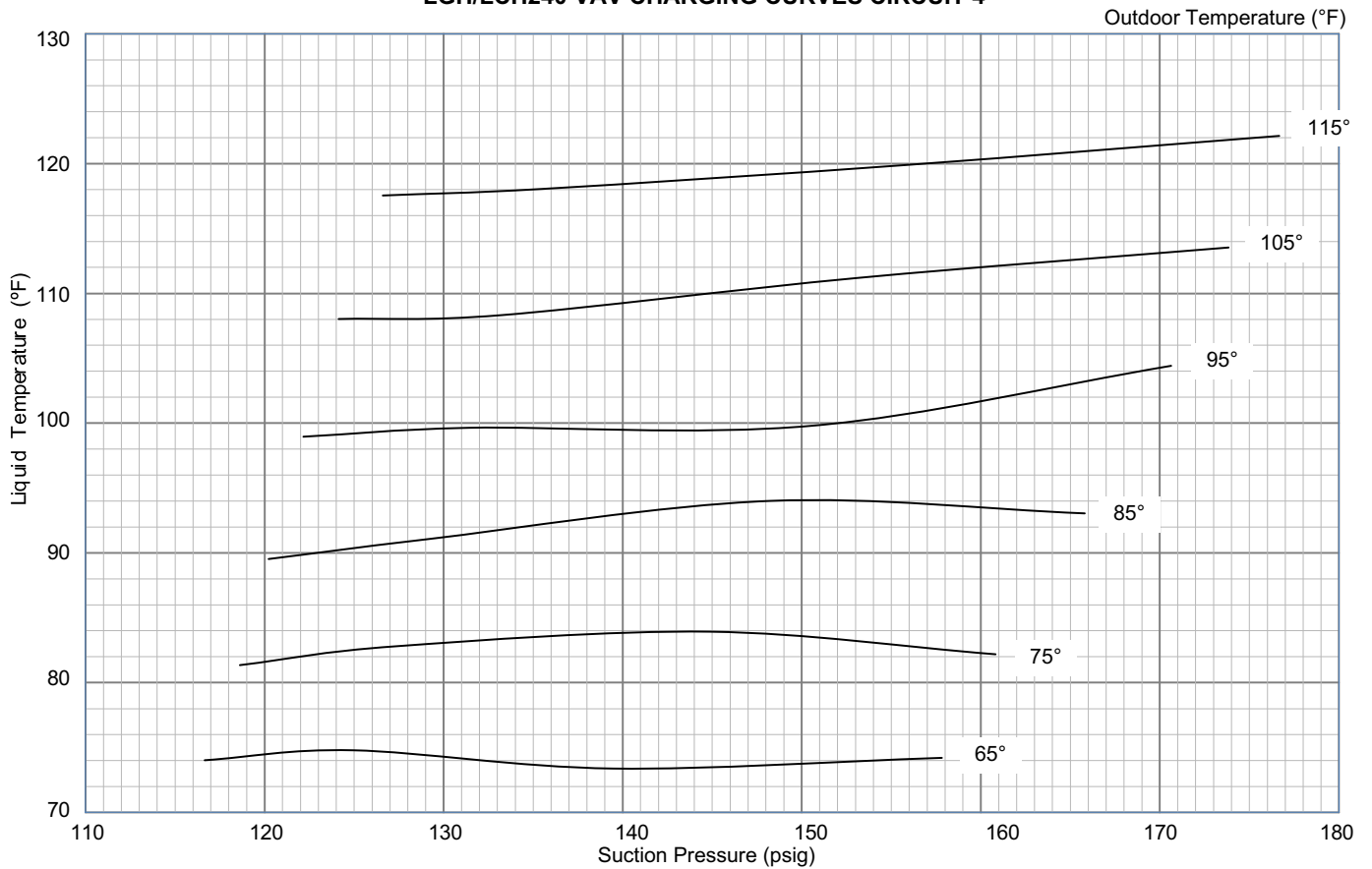
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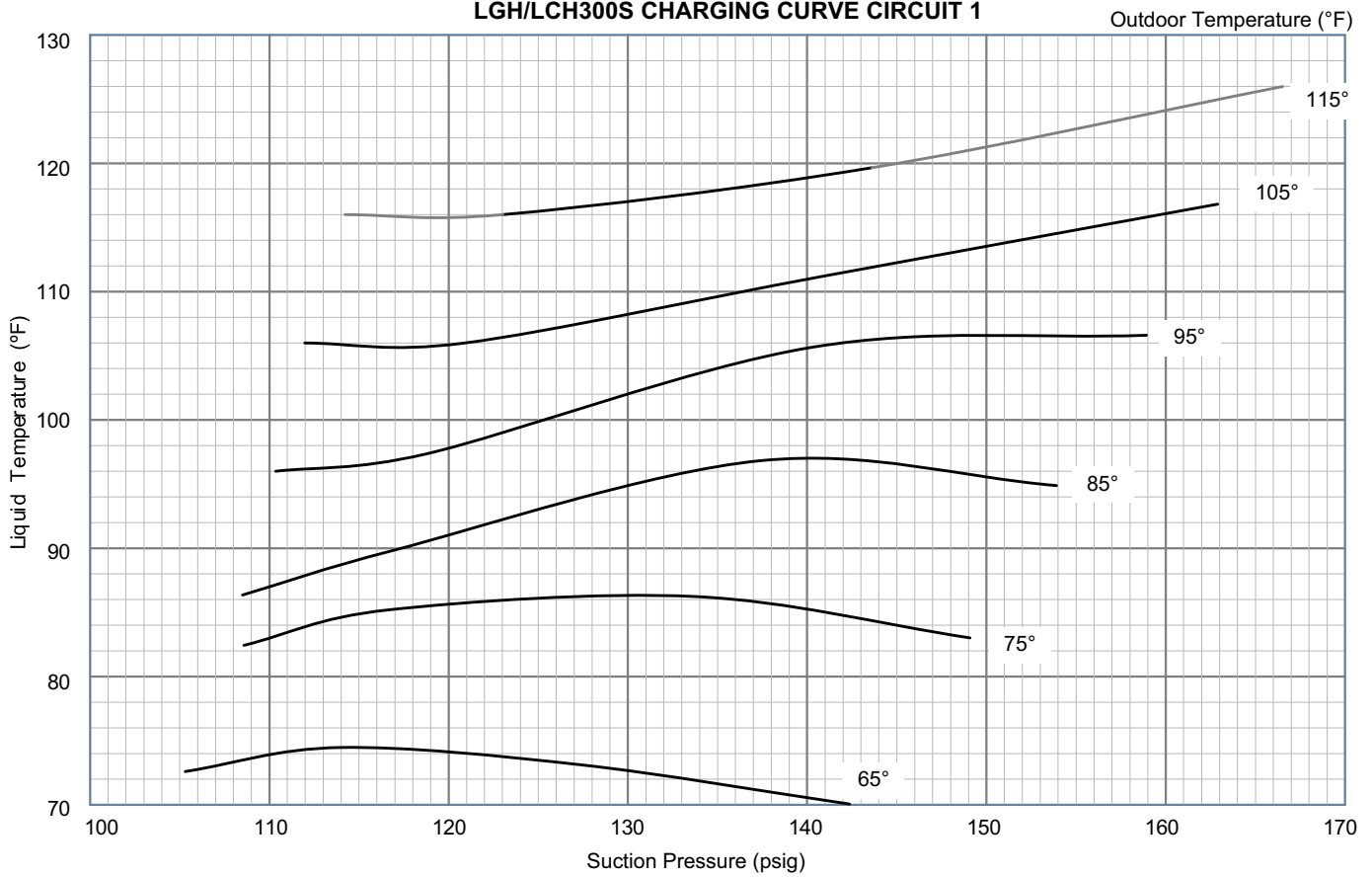
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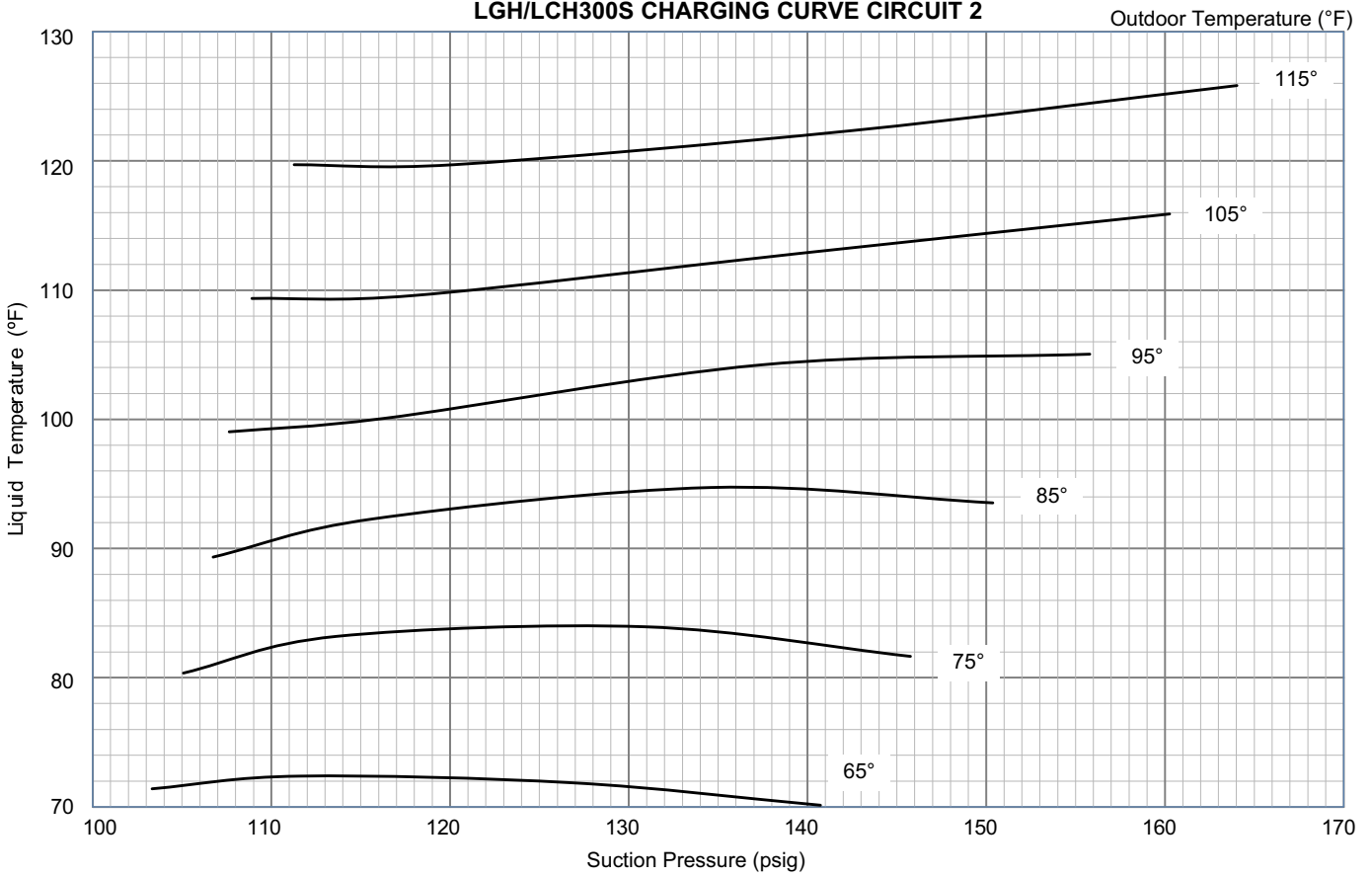
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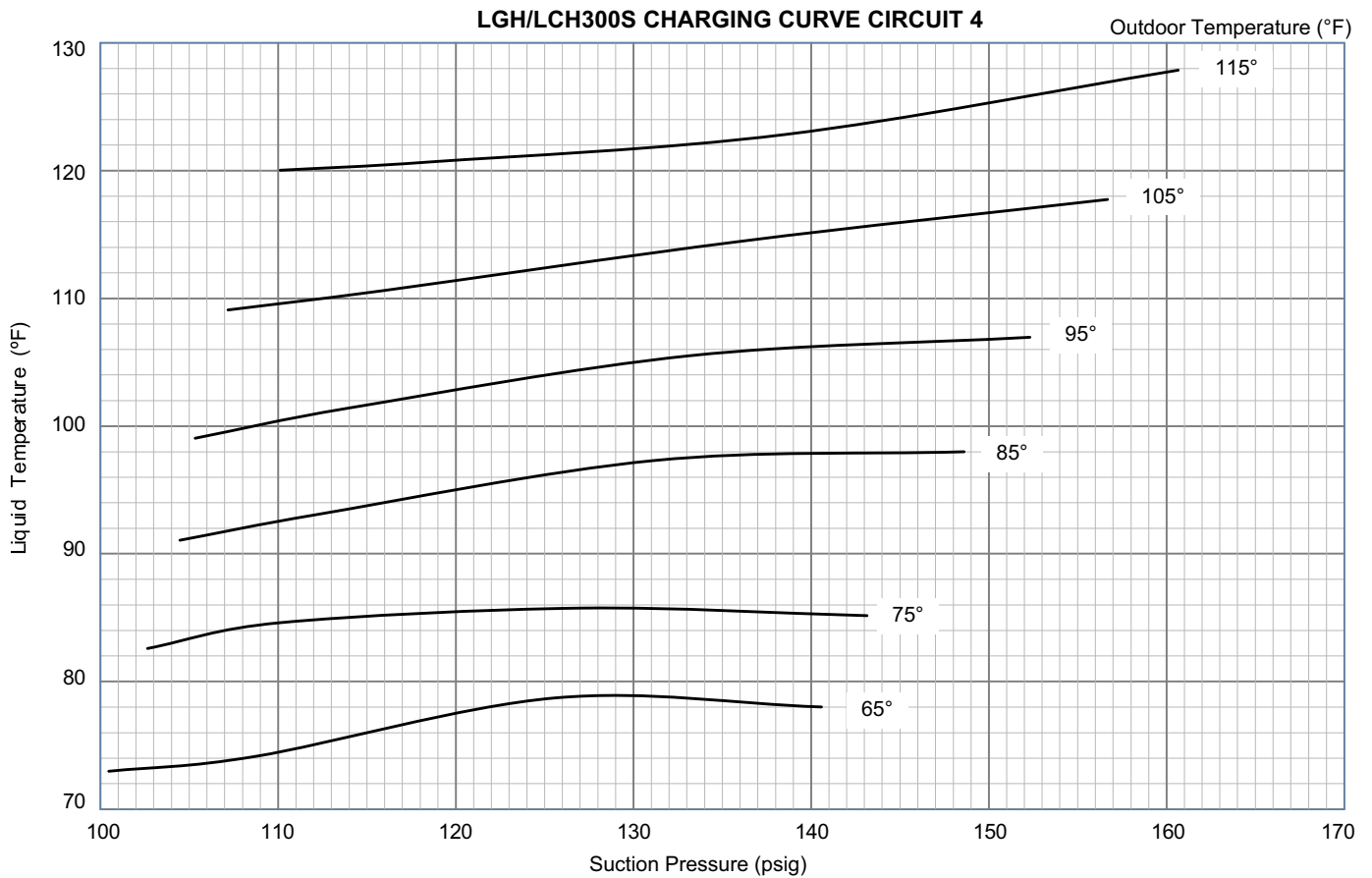
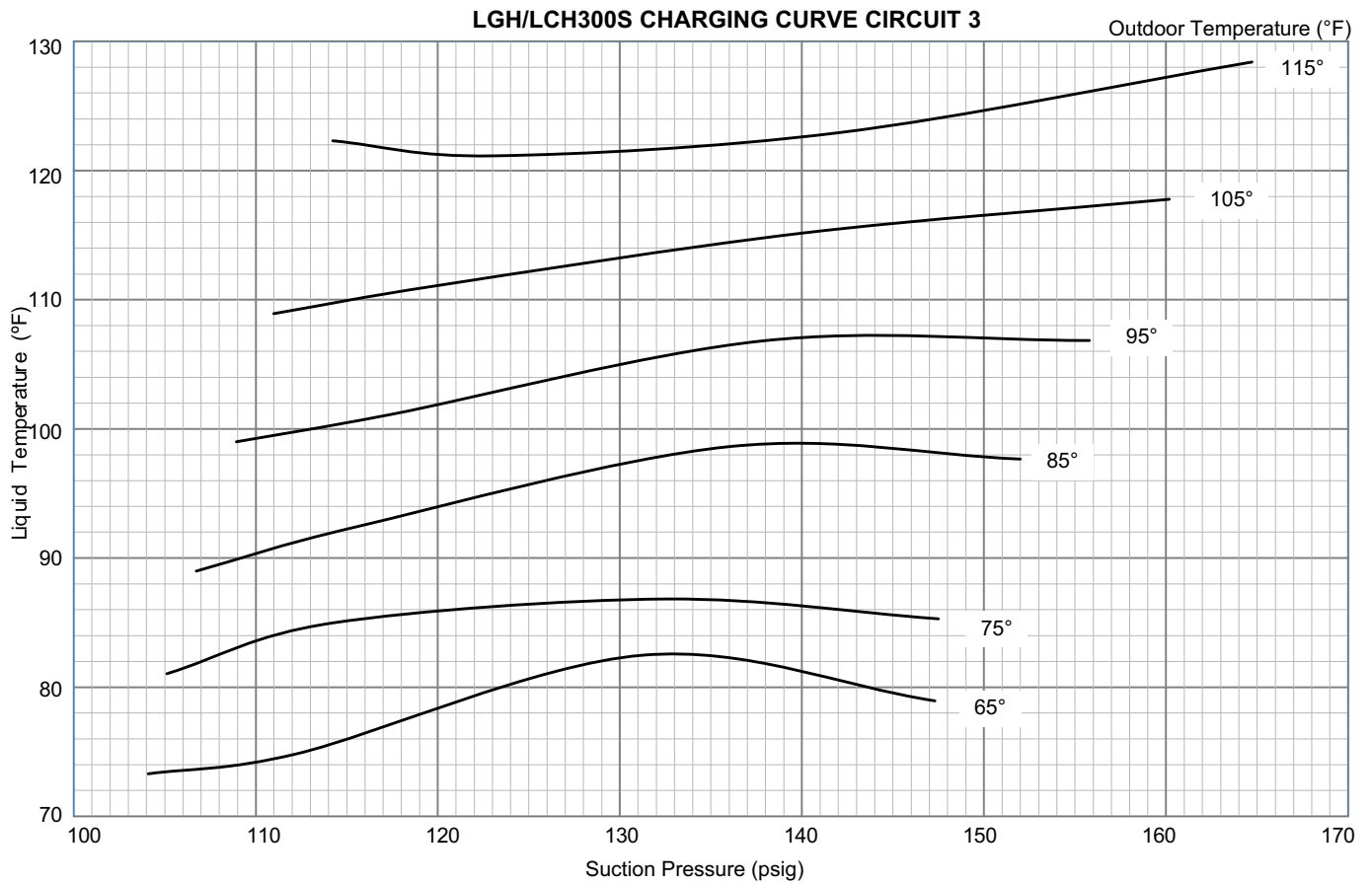


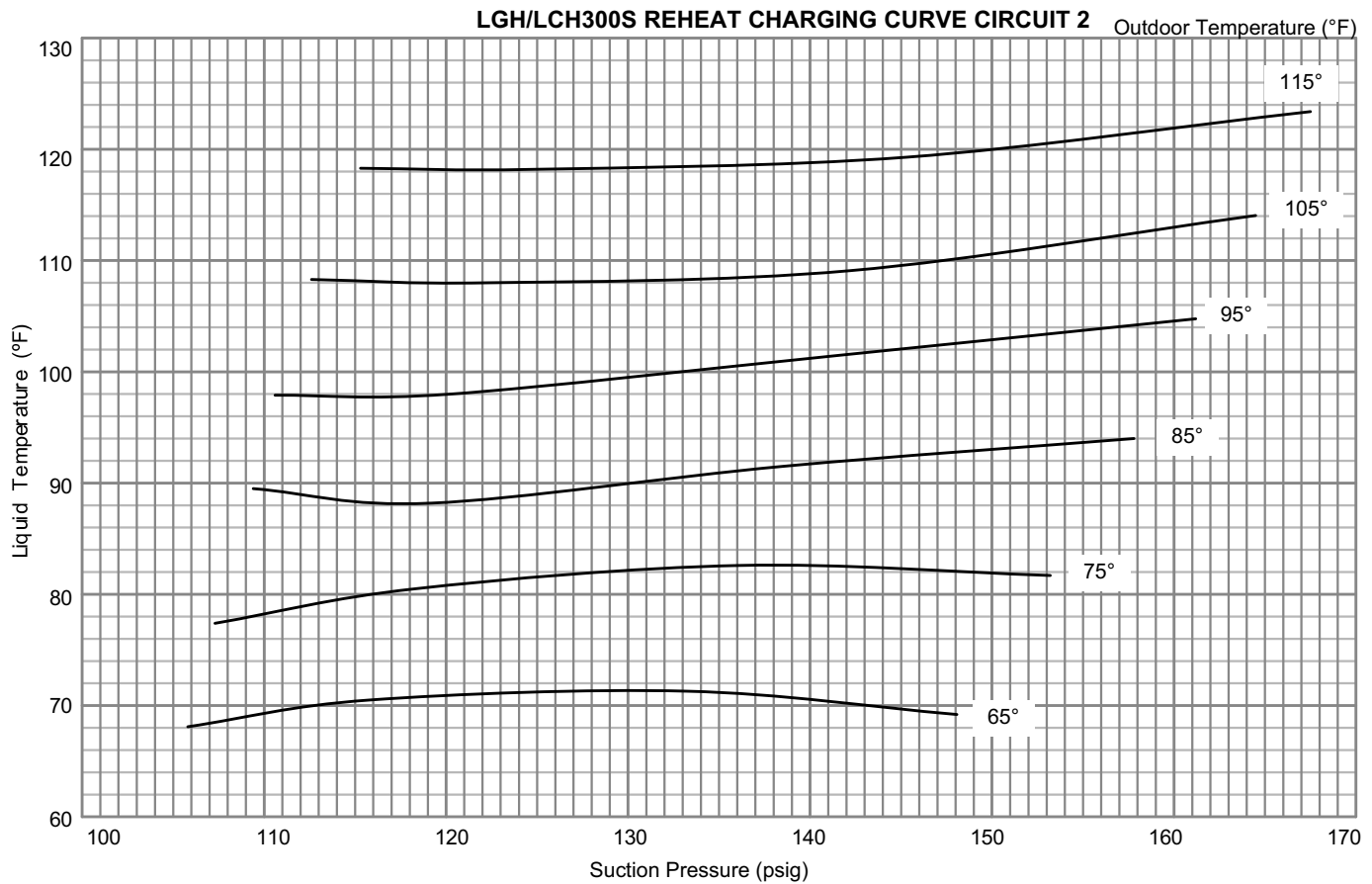
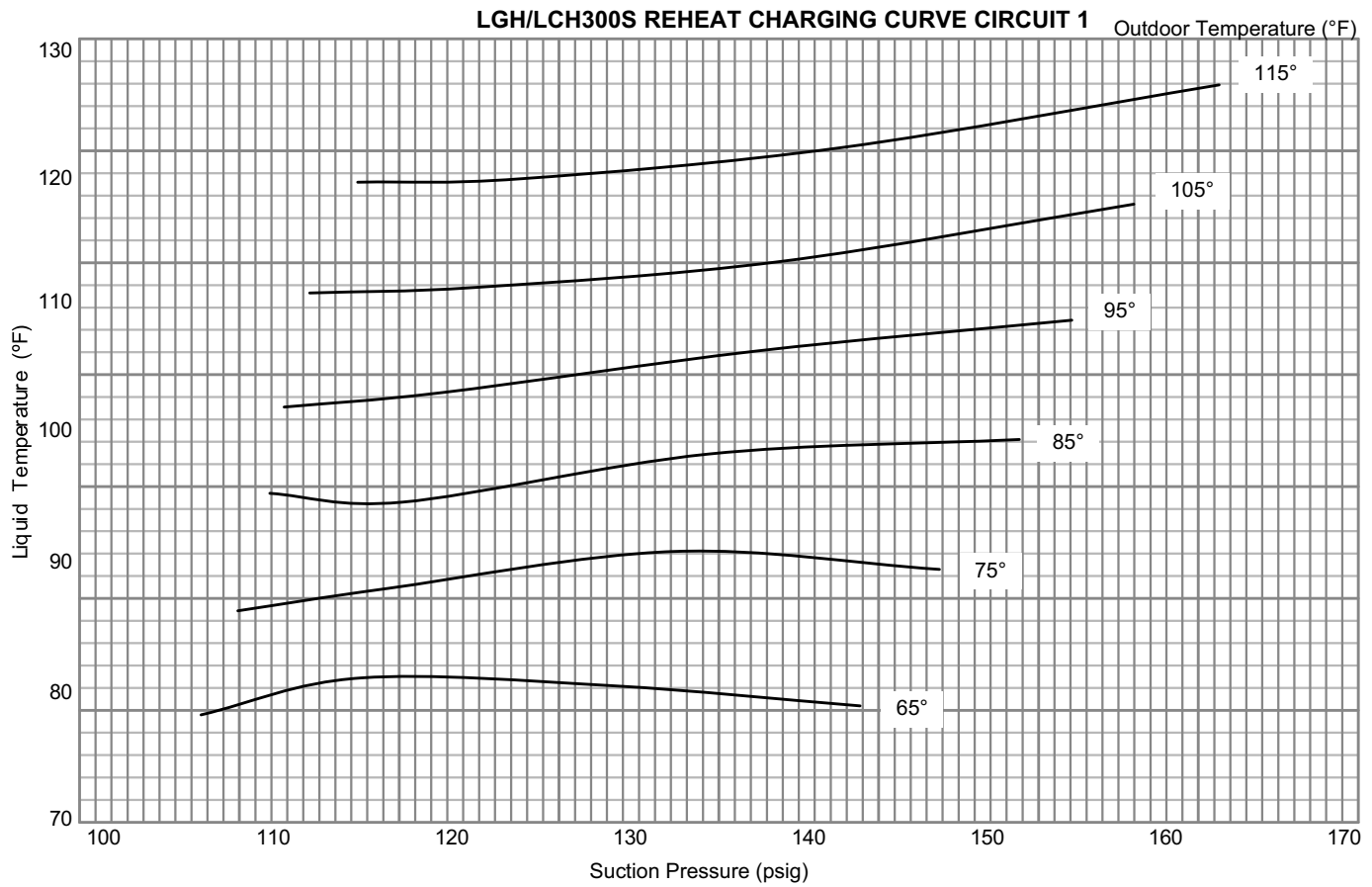
LGH/LCH300S CHARGING CURVE CIRCUIT 1

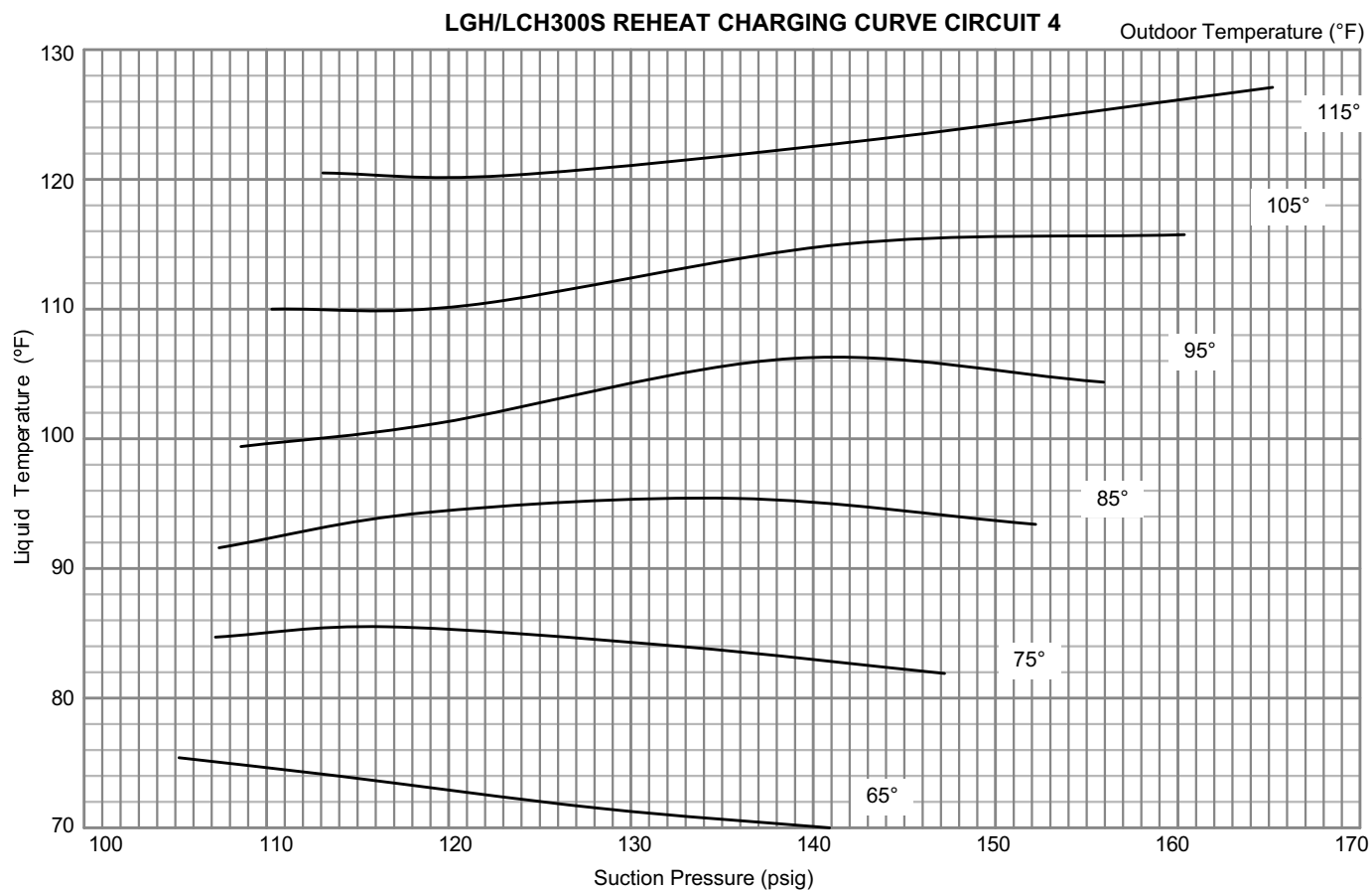
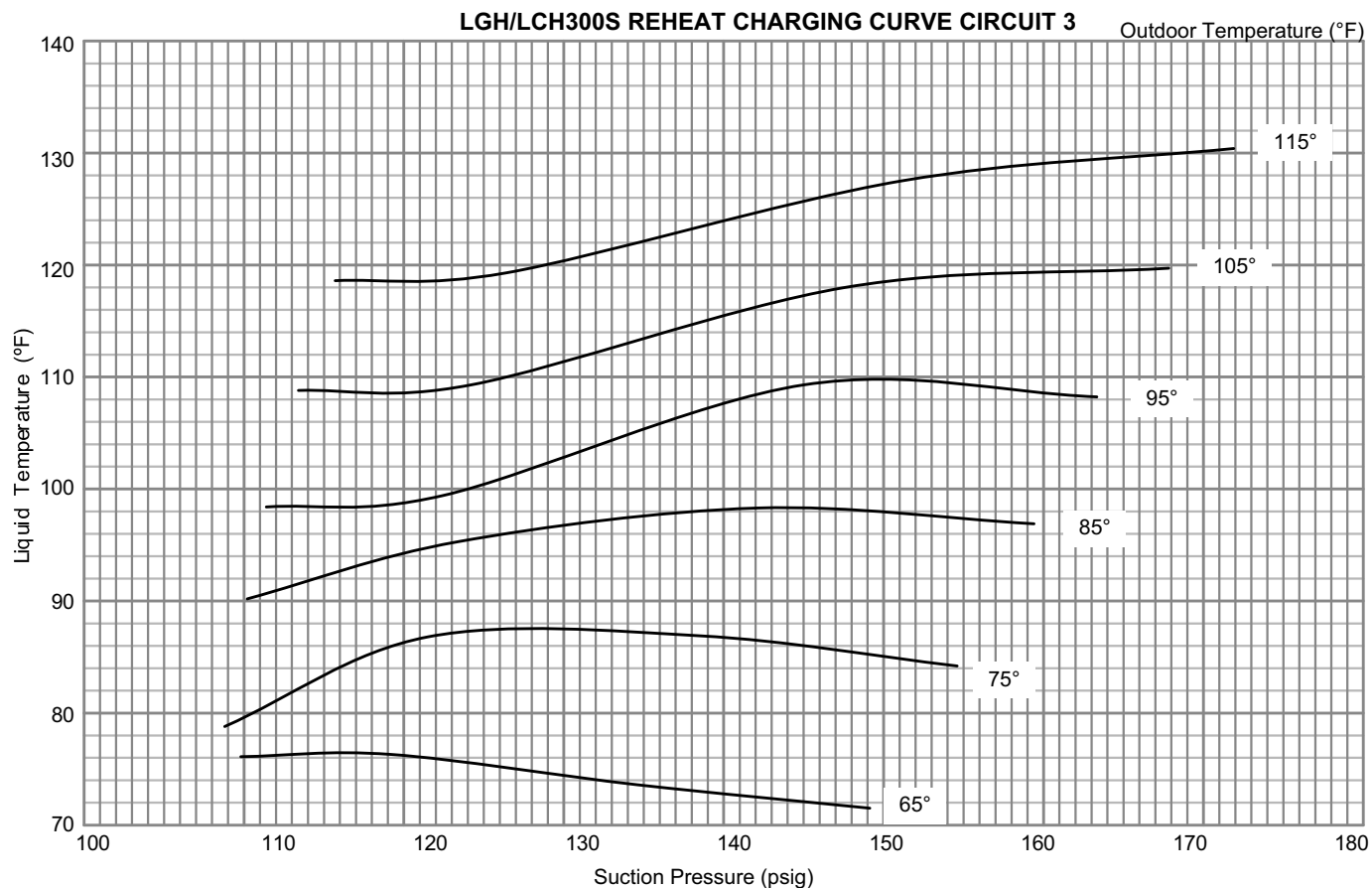


LGH/LCH300S CHARGING CURVE CIRCUIT 2









E-Refrigerant Charge and Check - Fin/Tube Coil

WARNING-Do not exceed nameplate charge under any condition. This unit is factory charged and should require no further adjustment. If the system requires additional refrigerant, reclaim the charge, evacuate the system and add required nameplate charge.

NOTE - System charging is not recommended below 60°F (15°C). In temperatures below 60°F (15°C), the charge **must** be weighed into the system.

If weighing facilities are not available, or to check the charge, use the following procedure:

IMPORTANT - Charge unit in normal cooling mode.

- 1- Attach gauge manifolds and operate unit in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.
- 2- Check each system separately with all stages operating.
- 3- Use a thermometer to accurately measure the outdoor ambient temperature.
- 4- Apply the outdoor temperature to tables 16 through 27 to determine normal operating pressures. Pressures are listed for sea level applications at 80°F dry bulb and 67°F wet bulb return air.
- 5- Compare the normal operating pressures to the pressures obtained from the gauges. Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system. **Correct any system problems before proceeding.**
- 6- If discharge pressure is high, remove refrigerant from the system. If discharge pressure is low, add refrigerant to the system.
 - Add or remove charge in increments.
 - Allow the system to stabilize each time refrigerant is added or removed.
- 7- Use the following approach method along with the normal operating pressures to confirm readings.

TABLE 16
LG/LC Series 156H Std.

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2		Circuit 3	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	255	136	263	136	273	140
75°F	292	139	301	139	311	144
85°F	333	141	342	141	353	146
95°F	378	144	387	143	398	148
105°F	431	148	438	145	449	150
115°F	484	150	490	146	502	152

TABLE 17
LG/LC Series 156H Reheat

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2		Circuit 3	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	265	134	273	135	273	140
75°F	302	138	311	138	311	144
85°F	343	140	352	140	353	146
95°F	388	143	397	142	398	148
105°F	441	147	448	144	449	150
115°F	494	149	500	145	502	152

TABLE 18
LG/LC Series 180H Std.

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2		Circuit 3	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F*	248	137	257	135	259	137
75°F	285	139	294	137	296	137
85°F	328	143	336	139	338	140
95°F	374	146	383	141	385	144
105°F	425	148	433	144	435	147
115°F	479	151	488	147	488	151

TABLE 19
LG/LC Series 180H Reheat

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2		Circuit 3	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F*	258	136	267	133	259	137
75°F	295	138	304	135	296	137
85°F	338	142	346	137	338	140
95°F	384	145	393	139	385	144
105°F	435	147	443	142	435	147
115°F	488	150	498	145	488	151

TABLE 20
LG/LC Series 180U

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	246	135	256	136
75°F	282	138	293	139
85°F	324	140	336	142
95°F	368	142	387	145
105°F	407	145	421	147
115°F	461	148	475	151

TABLE 21
LG/LC Series 210H Std.

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2		Circuit 3	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F*	246	138	252	142	264	138
75°F	284	142	294	145	306	140
85°F	326	145	335	147	348	142
95°F	373	148	380	149	393	144
105°F	422	150	430	151	441	145
115°F	472	153	482	154	492	148

TABLE 22
LG/LC Series 210H Reheat

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2		Circuit 3	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F*	258	136	264	141	264	138
75°F	296	140	306	144	306	140
85°F	338	143	347	146	348	142
95°F	385	146	392	148	393	144
105°F	434	148	442	150	441	145
115°F	484	151	494	153	492	148

TABLE 23
LG/LC Series 240H Std.

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2		Circuit 3		Circuit 4	
	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g
65°F*	255	137	246	132	260	141	252	135
75°F	291	140	284	137	298	144	290	137
85°F	332	142	325	140	340	146	331	139
95°F	378	145	371	142	385	148	377	141
105°F	428	148	421	145	436	150	428	143
115°F	481	151	473	148	488	153	479	145

TABLE 24
LG/LC Series 240H Reheat

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2		Circuit 3		Circuit 4	
	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g
65°F*	270	13	261	130	260	141	252	135
75°F	306	137	299	135	298	144	290	137
85°F	347	140	340	137	340	146	331	139
95°F	393	143	386	140	385	148	377	141
105°F	443	145	436	143	436	150	428	143
115°F	496	148	488	145	488	153	479	145

TABLE 25
LG/LC Series 240U

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2	
	Dis. ±10 psig	Suc. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	251	127	262	128
75°F	290	132	303	133
85°F	331	135	347	136
95°F	376	137	394	139
105°F	426	141	443	142
115°F	479	144	495	145

TABLE 26
LG/LC Series 300S Std.

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2		Circuit 3		Circuit 4	
	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g
65°F	272	129	273	128	280	129	277	127
75°F	311	132	303	131	321	131	317	129
85°F	357	134	349	133	367	133	363	130
95°F	403	137	397	137	418	135	406	134
105°F	451	139	453	140	475	138	471	136
115°F	502	142	506	142	532	144	529	140

TABLE 27
LG/LC Series 300S Reheat

Outdoor Coil En- tering Air Temp	Circuit 1		Circuit 2		Circuit 3		Circuit 4	
	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g	Dis. ±10 psi g	Suc. ±5 psi g
65°F	285	128	284	128	280	129	277	127
75°F	324	132	315	130	321	131	317	129
85°F	368	134	358	132	367	133	363	130
95°F	418	136	406	136	418	136	406	135
105°F	466	138	462	138	475	138	471	136
115°F	517	141	515	141	532	144	529	140

F-Charge Verification - Approach Method - AHRI Testing (Fin/Tube Coil)

- Using the same thermometer, compare liquid temperature to outdoor ambient temperature.
Approach Temperature = Liquid temperature (at condenser outlet) minus ambient temperature.
- Approach temperature should match values in table 28. An approach temperature greater than value shown indicates an undercharge. An approach temperature less than value shown indicates an overcharge.
- The approach method is not valid for grossly over or undercharged systems. Use tables 16 through 27 as a guide for typical operating pressures.

TABLE 28
APPROACH TEMPERATURES - FIN/TUBE COIL

L Series Unit	Liquid Temp. Minus Ambient Temp.			
	1st Stage	2nd Stage	3rd Stage	4th Stage
156H Std.	9°F + 1 (5.0°C ±0.5)	9°F + 1 (5.0°C ±0.5)	11°F + 1 (6.1°C ±0.5)	NA
156H Reheat	6°F + 1 (3.3°C ±0.5)	6°F + 1 (3.3°C ±0.5)	11°F + 1 (6.1°C ±0.5)	NA
180H Std.	6°F + 1 (3.3°C ±0.5)	6°F + 1 (3.3°C ±0.5)	6°F + 1 (3.3°C ±0.5)	NA
180H Reheat	4°F + 1 (2.2°C ±0.5)	4°F + 1 (2.2°C ±0.5)	6°F + 1 (3.3°C ±0.5)	NA
180U	5°F + 1 (2.8°C ±0.5)	6.5°F + 1 (3.6°C ±0.5)	NA	NA
210H Std.	6°F + 1 (3.3°C ±0.5)	6°F + 1 (3.3°C ±0.5)	7°F + 1 (3.9°C ±0.5)	NA
210H Reheat	4°F + 1 (2.2°C ±0.5)	4°F + 1 (2.2°C ±0.5)	7°F + 1 (3.9°C ±0.5)	NA
240H Std.	6°F + 1 (3.3°C ±0.5)	6°F + 1 (3.3°C ±0.5)	7°F + 1 (3.9°C ±0.5)	7°F + 1 (3.9°C ±0.5)
240H Reheat	4°F + 1 (2.2°C ±0.5)	4°F + 1 (2.2°C ±0.5)	8°F + 1 (4.4°C ±0.5)	8°F + 1 (4.4°C ±0.5)
240U	4°F + 1 (2.2°C ±0.5)	6.5°F + 1 (3.6°C ±0.5)	NA	NA
300S Std.	5°F + 1 (2.8°C ±0.5)	5°F + 1 (2.8°C ±0.5)	8°F + 1 (4.4°C ±0.5)	8°F + 1 (4.4°C ±0.5)
300S Reheat	3°F + 1 (1.7°C ±0.5)	3°F + 1 (1.7°C ±0.5)	8°F + 1 (4.4°C ±0.5)	8°F + 1 (4.4°C ±0.5)

G-Compressor Controls

See unit wiring diagram to determine which controls are used on each unit.

- High Pressure Switch (S4, S7, S28, S96)**
The compressor circuit is protected by a high pressure switch which opens at 640 psig ± 10 psig (4413 kPa ± 70 kPa) and automatically resets at 475 psig ± 20 psig (3275 kPa ± 138 kPa).
- Low Pressure Switch (S87, S88, S97, S98)**
The compressor circuit is protected by a low pressure switch. Switch opens at 40 psig ± 5 psig (276 ± 34 kPa) and automatically resets at 90 psig ± 5 psig (621 kPa ± 34 kPa).
- Crankcase Heater (HR1, HR2, HR5, HR11)**
Units have compressors which contain a belly band compressor oil heater which must be on 24 hours before running compressors. Energize by setting thermostat so that there is no cooling demand, to prevent compressor from cycling, and apply power to unit.
- Low Ambient Pr. Sw. (S11, S84, S85, S94)**
Switch maintains adequate discharge pressure by de-energizing condenser fan when liquid pressure falls below 240 psig ± 10 (1655 kPa ± 69). Switch closes to energize condenser fan when pressure rises to 450 psig ± 10 (3103 kPa ± 69).

156

All three condenser fans are energized on a Y1 cooling demand and continue to operate when Y2 demand is initiated. See figure 22.

Condenser fans 2 and 3 are de-energized when outdoor temperature drops below 55°F (13°C). S11, S84 and S85 pressure switches (in refrigerant circuits 1, 2 and 3 respectively) are wired to the Unit Controller.

Condenser fan 1 is cycled by S11, S84 and S85 pressure switches when outdoor temperature drops below 55°F (13°C).

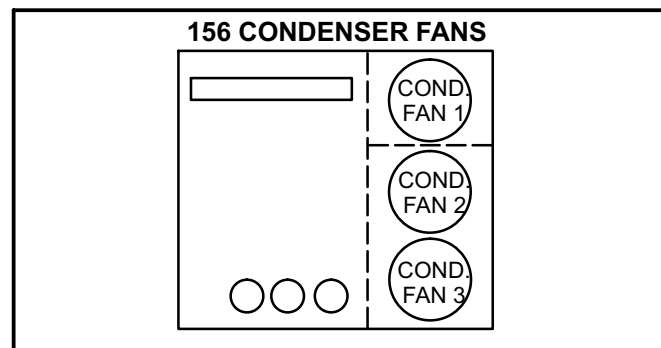


FIGURE 22

180H

All four condenser fans are energized on a Y1 cooling demand and continue to operate when Y2 demand is initiated. See figure 23.

Condenser fans 2 and 4 are de-energized when outdoor temperature drops below 55°F (13°C). S11, S84, S85 pressure switches (in refrigerant circuits 1, 2 and 3 respectively) are wired to unit controller.

Condenser fan 1 is cycled by S11 and S85 pressure switches when outdoor temperature drops below 55°F (13°C).

Condenser fan 3 is cycled by S84 and S85 pressure switches when outdoor temperature drops below 55°F (13°C).

210

All six condenser fans are energized on a Y1 cooling demand and continue to operate when Y2 demand is initiated. See figure 24.

Condenser fans 1, 2, 5 and 6 are energized after a 2-second delay.

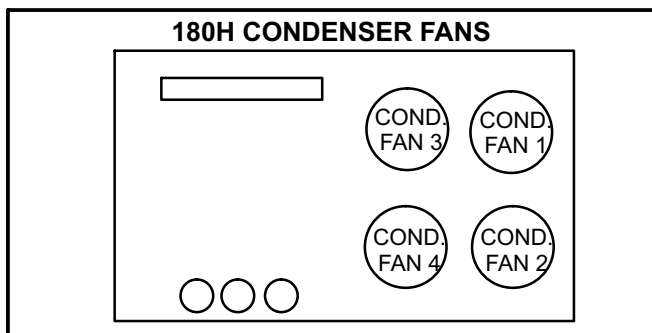


FIGURE 23

Condenser fans 2 and 5 are de-energized when outdoor temperature drops below 55°F (13°C).

Condenser fans 1 and 6 are de-energized when outdoor air temperature is below 40°F (4°C).

Condenser fan 3 is cycled by S11 and S85 pressure switches (refrigerant circuits 1 and 3 respectively) when outdoor temperature drops below 55°F (13°C).

Condenser fan 4 is cycled by S84 and S85 pressure switch (refrigerant circuits 2 and 3 respectively) when outdoor temperature drops below 55°F (13°C).

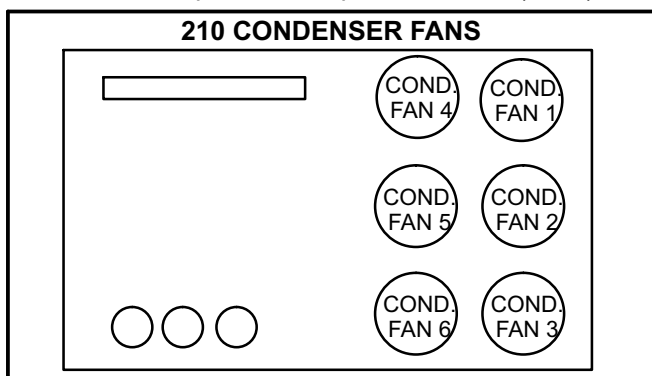


FIGURE 24

240H & 300S

Condenser fans 1, 2 and 3 are energized on a Y1 cooling demand; condenser fans 4, 5 and 6 are energized on a Y2 cooling demand. Condenser fans 1, 2, 5 and 6 are energized after a 2-second delay. See figure 25.

Condenser fans 2 and 5 are de-energized when outdoor temperature drops below 55°F (13°C).

Condenser fans 1 and 6 are de-energized when outdoor air temperature is below 40°F (4°C).

Condenser fan 3 is cycled by S11 and S84 pressure switches (refrigerant circuits 1 and 2 respectively) when outdoor temperature drops below 55°F (13°C).

Condenser fan 4 is cycled by S85 and S94 pressure switches (refrigerant circuits 3 and 4 respectively) when outdoor temperature drops below 55°F (13°C).

180U, 240U

All six condenser fans are energized on a Y1 cooling demand and continue to operate when a Y2 demand is initiated. See figure 25.

Condenser fans 1, 2, 5 and 6 are de-energized when outdoor temperature drops below 55°F (13°C).

Condenser fan 3 is cycled by S11 pressure switch (refrigerant circuit 1) when outdoor temperature drops below 55°F (13°C).

Condenser fan 4 is cycled by S85 pressure switch (refrigerant circuit 2) when outdoor temperature drops below 55°F (13°C).

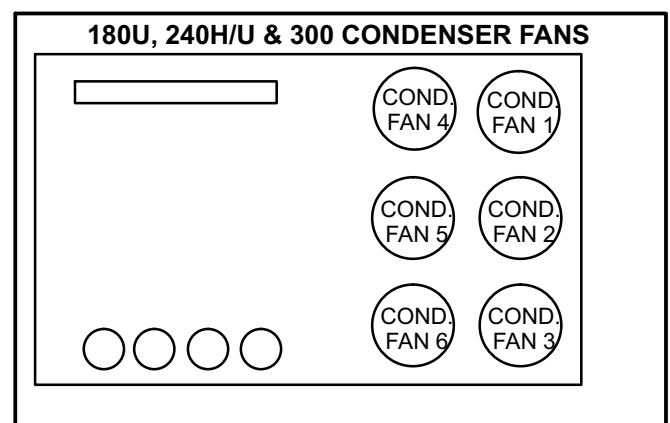


FIGURE 25

5- Freezestats (S49, S50, S53, S95)

Switches de-energize compressors when evaporator coil temperature falls below 29°F (-2°C) to prevent evaporator freeze-up. Switches reset when evaporator coil temperature reaches 58°F (15°C).

6- Thermal Protector (S5, S8, S31, S180)

156H, 180H, 210H, 240H, 300S -

Each compressor is protected by an internal thermal protector switch.

180U, 240U -

Each compressor is protected by an internal temperature switch and a discharge line thermostat switch. The N.C. discharge line switch opens at $240^{\circ}\text{F} \pm 9$ ($116^{\circ}\text{C} \pm 13$) and automatically resets at $190^{\circ}\text{F} \pm 13$ ($88^{\circ}\text{C} \pm 7$).

Gas Heat Start-Up (Gas Units)

FOR YOUR SAFETY READ BEFORE LIGHTING

BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, do not try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

This unit is equipped with an automatic spark ignition system. There is no pilot. In case of a safety shutdown, move thermostat switch to **OFF** and return the thermostat switch to **HEAT** to reset ignition control.

⚠ WARNING



Electric shock hazard. Can cause injury or death. Do not use this unit if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system and any gas control which has been under water.

⚠ WARNING



Danger of explosion. Can cause injury or product or property damage. If overheating occurs or if gas supply fails to shut off, shut off the manual gas valve to the appliance before shutting off electrical supply.

⚠ WARNING



Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

⚠ WARNING

SMOKE POTENTIAL

The heat exchanger in this unit could be a source of smoke on initial firing. Take precautions with respect to building occupants and property. Vent initial supply air outside when possible.

⚠ WARNING



Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.

A-Placing Unit In Operation

WARNING



Danger of explosion and fire. Can cause injury or product or property damage. You must follow these instructions exactly.

Gas Valve Operation for Honeywell VR8205Q / VR8305Q and White Rodgers 36H54 (figure 26 and 27)

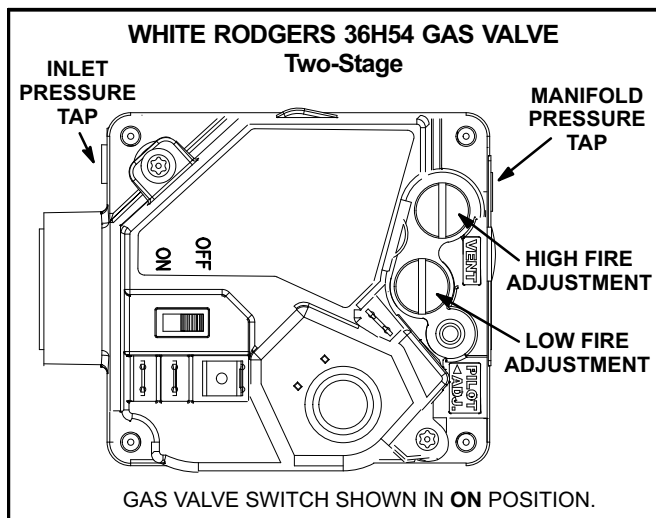


FIGURE 26

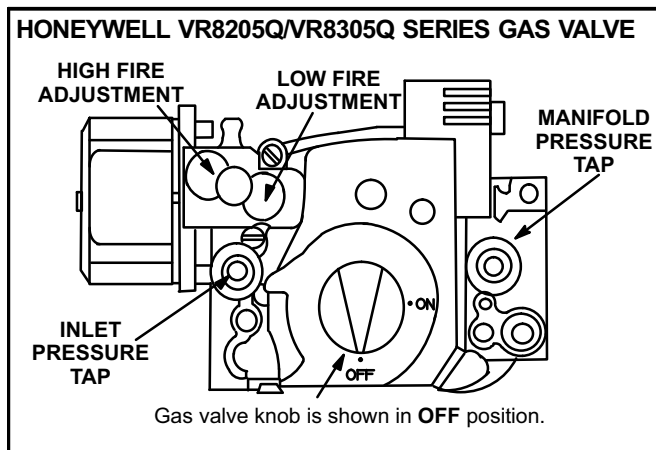





FIGURE 27

- 1- Set thermostat to lowest setting.
- 2- Turn off all electrical power to appliance.
- 3- This appliance is equipped with an ignition device which automatically lights the burner. Do **not** try to light the burner by hand.

- 4- Open or remove the heat section access panel.
- 5- Turn gas valve switch to **OFF**. See figure 26. On Honeywell VR8305Q gas valves, turn the knob on the gas valve clockwise  to "**OFF**". Do not force. See figure 27.
- 6- Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas, go to the next step.
- 7- Turn gas valve switch to **ON**. See figure 26. On Honeywell VR8305Q gas valves, turn the knob on the gas valve counterclockwise  to "**ON**". Do not force. See figure 27.
- 8- Close or replace the heat section access panel.
- 9- Turn on all electrical power to appliance.
- 10- Set thermostat to desired setting.
- 11- The ignition sequence will start.
- 12- If the appliance does not light the first time (gas line not fully purged), it will attempt up to two more ignitions before locking out.
- 13- If lockout occurs, repeat steps 1 through 10.
- 14- If the appliance will not operate, follow the instructions "Turning Off Gas to Appliance" and call your service technician or gas supplier.

Turning Off Gas to Unit

- 1- If using an electromechanical thermostat, set to the lowest setting.
- 2- Before performing any service, turn off all electrical power to the appliance.
- 3- Open or remove the heat section access panel.
- 4- Turn gas valve switch to **OFF**. On Honeywell VR8305Q gas valves, turn the knob on the gas valve clockwise  to "**OFF**". Do not force.
- 5- Close or replace the heat section access panel.

WARNING



Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.

Heating Operation and Adjustments

(Gas Units)

A-Heating Sequence of Operation

- 1- On a heating demand the combustion air inducer starts immediately.
- 2- Combustion air pressure switch proves inducer operation. After a 30-second pre-purge, power is allowed to ignition control. Switch is factory set and requires no adjustment.
- 3- Spark ignitor energizes and gas valve solenoid opens.
- 4- Spark ignites gas, ignition sensor proves the flame and combustion continues.
- 5- If flame is not detected after first ignition trial, ignition control will repeat steps 3 and 4 two more times before locking out the gas valve.
- 6- For troubleshooting purposes, an ignition attempt after lock out may be re-established manually. Move thermostat to "OFF" and return thermostat switch to "HEAT" position.

B-Limit Controls

Limit controls are factory-set and are not adjustable. Two limits are located on the drip shield in the blower compartment. See figure 28.

C-Heating Adjustment

Main burners are factory-set and do not require adjustment.

The following manifold pressures are listed on the gas valve.

Natural Gas Units - Low Fire - 1.6" w.c. (not adjustable)

Natural Gas Units - High Fire - 3.7" w.c.

LP Gas Units - Low Fire - 5.5" w.c. (not adjustable)

LP Gas Units - High Fire - 10.5" w.c.

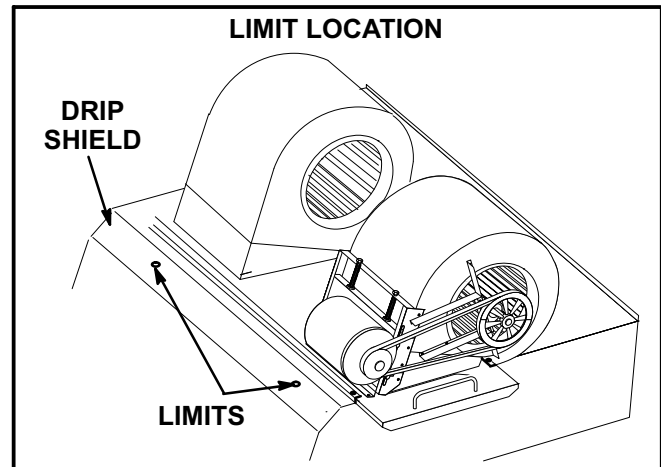


FIGURE 28

Electric Heat Start-Up (LCH Units)

Factory- or Field-Installed Option

Electric heat will stage on and cycle with thermostat demand. Number of stages of electric heat will vary depending on electric heat assembly. See electric heat wiring diagram on unit for sequence of operation.

Variable Air Volume Start-Up

Units may contain an optional supply air blower equipped with a variable frequency drive A96 (VFD) which varies supply air CFM.

The supply air VFD (A96) is located near the compressors. See figure 30.

A-Start-Up

- 1- A pressure transducer (A30) is shipped in a box in the blower compartment. Install the transducer according to manufacturer's instructions.

Note - Make sure the transducer is installed in the main duct at least 2/3 of the distance away from the unit.

- 2- Two twisted pairs of shielded cable must be used to connect the pressure transducer. See figure 29. J/P300 connector is hanging in the control box.
- 3- Open all zone dampers and/or boxes.
- 4- Locate the A55 Unit Controller. Refer to figure 30.
- 5- Use the Unit Controller to calibrate the blower CFM. Select the **SETUP->TEST & BALANCE->BLOWER** menu to start the blower. The Unit Controller will display the percent of blower speed. Adjust blower speed percentage to meet design airflow specifications. Allow blower speed to stabilize.

- 6- Press SAVE to display the current static pressure. If the static pressure meets the design specification, press SAVE again to set the setpoint. If the static pressure does not meet the design specification, adjust the pressure and press SAVE to set the setpoint.

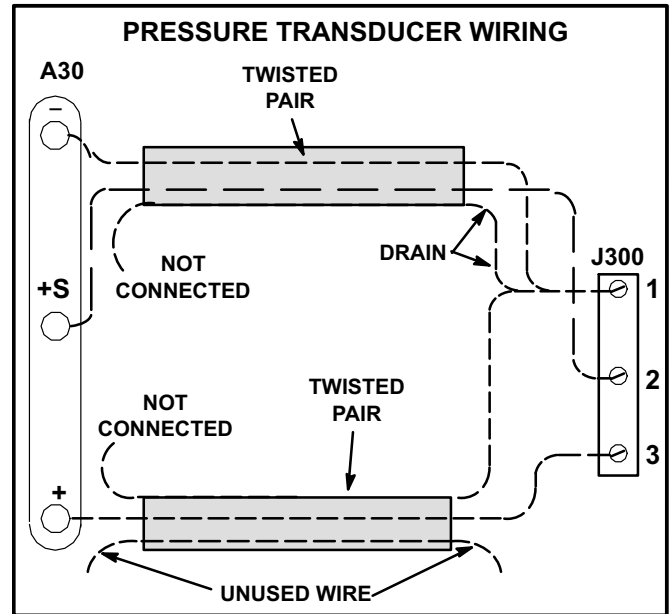


FIGURE 29

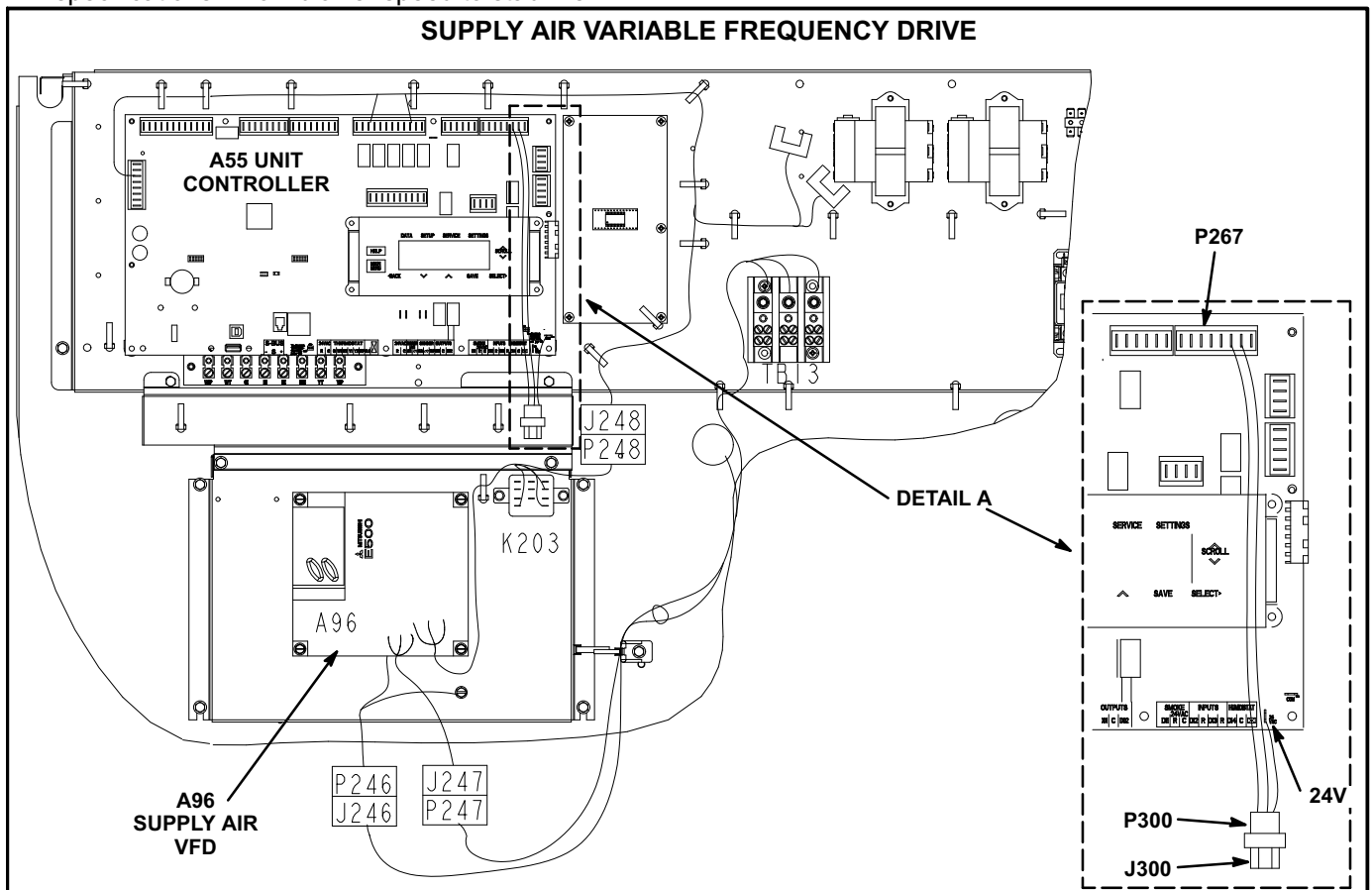


FIGURE 30

7- Record new setpoints in table 29.

Note - The Unit Controller will lock-out the unit for 5 minutes if static pressure exceeds 2.0" w.c. for 20 seconds. The Unit Controller will permanently shut down the unit after three occurrences. See Unit Controller parameters 110, 42, and 43 to adjust default values.

8- If the desired CFM cannot be met with current pulley setup, refer to the *Blower Operation and Adjustments* section to adjust CFM.

B-Unit Operation

Use the Unit Controller to check unit mechanical operation. See the *Service - Test* section of the Unit Controller manual.

**TABLE 29
RECORD ADJUSTED SETPOINTS**

Parameter	Setpoint Description	Setpoint "w.c."	Display Setting
386	Smoke		
387	Ventilation		
388	Heating		
389	Cooling		

C-Supply Air VFD Bypass (Optional)

IMPORTANT - All dampers must be open to prevent damage to duct work and dampers.

- 1- Turn off all power to unit.
- 2- Locate J/P247 and J/P248 connectors near the VFD. See figure 31.
- 3- Disconnect P247 from J247 and connect J249 to P247. See figure 32.
- 4- Disconnect J248 from P248 and connect connect P248 jumper plug to J248. P248 jumper plug is attached to the J248 wire harness near the J248 jack connector. See figure 33.
- 5- Locate VFD control relay K203 on the lower control panel next to terminal strip TB24. See figure 31.
- 6- Locate wires labeled K203-A and K203-B in area shown in figure 31. Disconnect insulated terminals.
- 7- Locate wires labeled K3-A and K3-B coming from K3 blower relay. Connect to K203-A to K3-A and K203-B to K3-B.
- 8- Restore power to unit. Blower will operate in constant air volume (CAV) mode.
- 9- Check the indoor blower motor nameplate for full load amperage (FLA) value. Measure the amp readings from the indoor blower motor operating in bypass mode. If measured amps are higher than nameplate FLA value, decrease the CFM by opening (turning counterclockwise) the motor pulley. See figure 13. Do not exceed minimum and maximum number of pulley turns as shown in table 2.

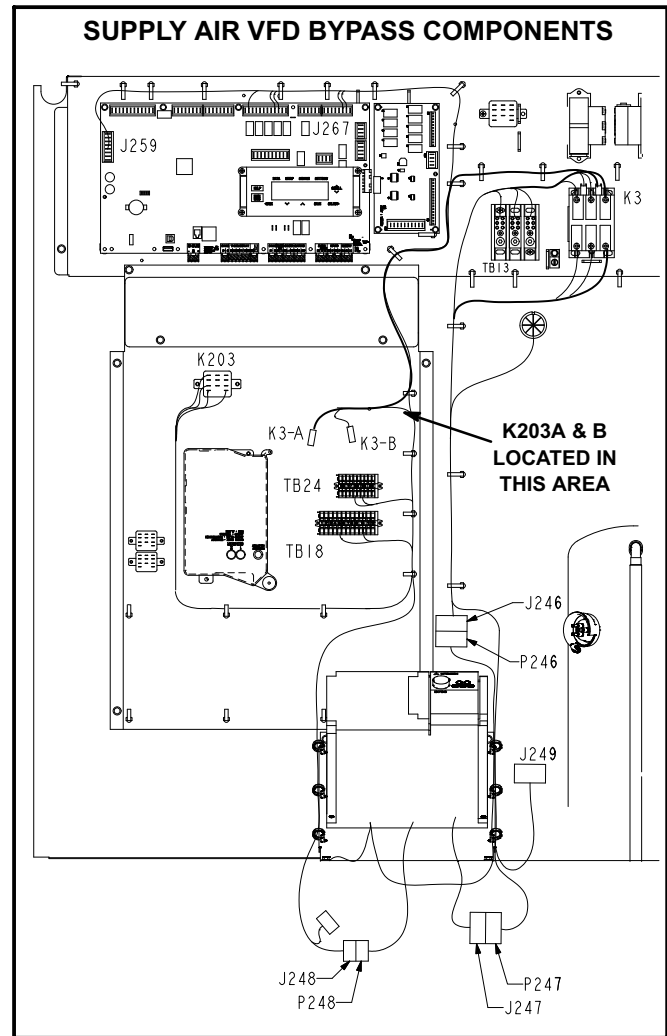


FIGURE 31

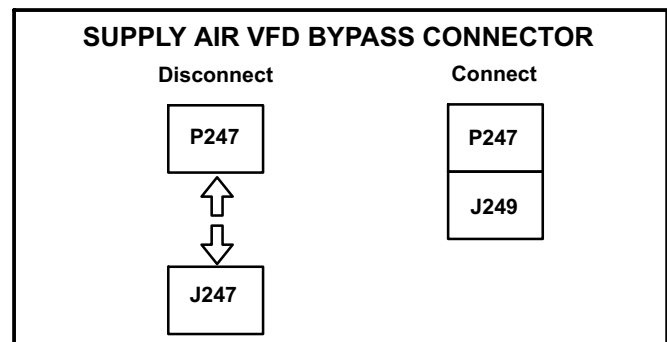


FIGURE 32

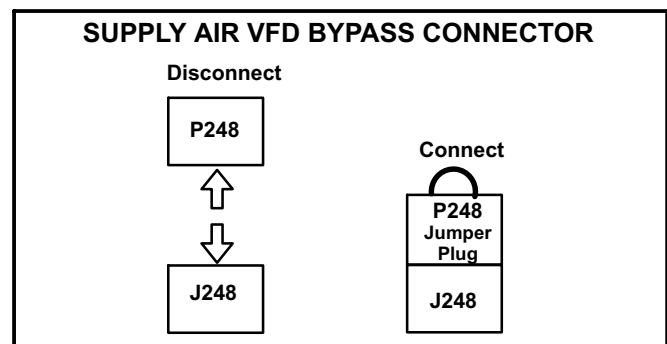


FIGURE 33

Multi-Staged Air Volume Start-Up

A-Design Specifications

Use table 30 to fill in field-provided, design specified blower CFM for appropriate unit.

If only high and low cooling design specifications are provided, set the medium cooling CFM at the high or low cooling design spec or any CFM between.

B-Set Maximum CFM

Use table 30 to determine highest blower CFM for appropriate unit. Adjust the blower pulley to deliver that amount of CFM with only the blower operating. See *Determining Unit CFM* in the Blower Operation and Adjustment section.

TABLE 30
Blower CFM Design Specifications

Unit	T'Stat or Zone Control Stages	Blower Speed	Design Specified CFM
156, 180, 210	2	Htg.	
		Clg. High	
		Clg. Low	
		Ventilation	
156, 180, 210	3 or 4	Htg.	
		Clg. High	
		Clg. Med.	
		Clg. Low	
		Ventilation	
180U, 240U	1	Htg.	
		Clg. High	
		Clg. Low	
		Ventilation	
180U, 240, 300	2	Htg.	
		Clg. High	
		Clg. Low	
		Ventilation	
180U, 240, 300	3	Htg.	
		Clg. High	
		Clg. Med.	
		Clg. Low	
		Ventilation	
180U, 240, 300	4	Htg.	
		Clg. High	
		Clg. Med. High	
		Clg. Med. Low	
		Clg. Low	
		Ventilation	

*Available blower speeds vary by unit and thermostat stages.

C-Set Blower Speeds

- 1- Use the following menu to enter the blower design specified CFM into the Unit Controller. Make sure blower CFM is within limitations shown in table 31. Refer to the Unit Controller manual provided with unit.
SETUP > TEST & BALANCE > BLOWER >
- 2- Enter the following design specifications as shown in table 30.

Blower / Heat CFM
 Cooling High CFM¹
 Cooling Low CFM¹
 Vent CFM

- 3- Adjust the blower RPM to deliver the target CFM based on the measured static pressure using the blower table.
- 4- Measure the static pressure again and apply the static pressure and RPM to the blower tables to determine adjusted CFM.
- 5- Repeat adjustments until design CFM is reached.

¹The Unit Controller will prompt when more cooling stages are available depending on the number of compressors and the control mode.

D-Set Damper Minimum Position

To maintain required minimum ventilation air volumes when the unit is in the occupied mode, two minimum damper positions must be set. The Unit Controller will open the dampers to “Min OCP Blwr Low” when blower CFM is BELOW a “midpoint” CFM. The Unit Controller will open the damper to “Min OCP Blwr High” when blower CFM is at or ABOVE the “midpoint” CFM.

The Unit Controller will calculate the “midpoint” CFM.

Set Minimum Position 1

Use the following menu in the Unit Controller to set “Min OCP Blwr Low” for the blower CFM below the “midpoint” CFM. When navigating into this menu, the Unit Controller will bring on the corresponding blower speed and allow damper position adjustment.

SETTINGS > RTU OPTIONS > EDIT PARAMETER >
ENTER DATA ID - 9 > MIN DAMPER LOW BLOWER =
X.X%

Measure the intake air CFM. If the CFM is lower than the design specified CFM for ventilation air, use the Unit Controller to increase the damper percent open. If the CFM is higher than specified, decrease the damper percent open.

Note - Intake air CFM can also be determined using the outdoor air temperature, return air temperature and mixed air temperature. Refer to the economizer or outdoor air damper installation instructions.

Set Minimum Position 2

Use the same menu in the Unit Controller to set “Min OCP Blwr High” for the blower CFM above the “midpoint” CFM. When navigating into this menu, the Unit Controller will bring on the corresponding blower speed and allow damper position adjustment.

SETTINGS > RTU OPTIONS > DAMPER > MIN
DAMPER POSITION BLOWR ON HIGH = X.X%

Measure the intake air CFM. If the CFM is lower than the design specified CFM for ventilation air, use the Unit Controller to increase the damper percent open. If the CFM is higher than specified, decrease the damper percent open.

Note - Intake air CFM can also be determined using the outdoor air temperature, return air temperature and mixed air temperature. Refer to the economizer or outdoor air damper installation instructions.

E-Inverter Bypass Option

The supply air inverter is factory-set to by-pass the inverter manually. To by-pass the inverter and operate the blower in the constant air volume mode, use the following Unit Controller menu and set to “engaged”:

SETTINGS > RTU OPTIONS > BLOWER > VFD
BYPASS

To configure the unit to by-pass the inverter automatically, use the following Unit Controller menu.

SETUP > INSTALL

Press SAVE until the menu reads:

CONFIGURATION ID 1

Change the 6th character position to A for automatic bypass option.

Press SAVE

Caution - Units not equipped with an inverter will have the 6th character set to N, indicating the inverter is not bypassed. The blower motor could be damaged and/or result in product or property damage if the setting is changed to automatic or manual.

**TABLE 31
MINIMUM AND MAXIMUM CFM -
156, 180H, 210, 240H, 300S**

Gas Heat Minimum CFM		
Unit	Gas Heat Size	Airflow CFM
LGH156-300S	Low, Std. Med.	4500
LGH180-300S	High	5125
Electric Heat Minimum CFM		
Unit	Heat Size (kW)	Airflow CFM
LCH156	All	5200
LCH180-300S	All	6000
Cooling Minimum CFM - 220 CFM/ton		
Unit	Blower Speed	Airflow CFM
LGH/LCH156	Low, Med. Low, Med., Med. High	2860
LGH/LCH180	Low, Med. Low, Med., Med. High	3300
LGH/LCH210	Low, Med. Low, Med., Med. High	3850
LGH/LCH240	Low, Med. Low, Med., Med. High	4400
LGH/LCH300S	Low, Med. Low, Med., Med. High	5500
Cooling Minimum CFM - 280 CFM/ton		
Unit	Blower Speed	Airflow CFM
LGH/LCH156	High	3640
LGH/LCH180	High	4200
LGH/LCH210	High	4900
LGH/LCH240	High	5600
LGH/LCH300S	High	7000
Smoke and Ventilation Minimum CFM - 150 CFM/ton		
Unit	Not Applicable	Airflow CFM
LGH/LCH156	NA	1950
LGH/LCH180	NA	2250
LGH/LCH210	NA	2625
LGH/LCH240	NA	3000
LGH/LCH300S	NA	3750
Heating and Cooling Maximum CFM - 480 CFM/ton		
Unit	Blower Speed	Airflow CFM
LGH/LCH156	High	6240
LGH/LCH180	High	7200
LGH/LCH210	High	8400
LGH/LCH240	High	9600
LGH/LCH300S	High	12000

**TABLE 32
MINIMUM AND MAXIMUM CFM - 180U, 240U**

Gas Heat Minimum CFM		
Unit	Gas Heat Size	Airflow CFM
LGH180U/240U	Low, Std., Med.	4500
LGH180U//240U	High	5125
Electric Heat Minimum CFM		
Unit	Heat Size (kW)	Airflow CFM
LCH180U/240U	All	6000
Cooling 1 Minimum CFM - 130 CFM/ton		
Unit	Blower Speed	Airflow CFM
LGH/LCH180U	Low	1950
LGH/LCH240U	Low	2600
Cooling 2 Minimum CFM - 160 CFM/ton		
Unit	Blower Speed	Airflow CFM
LGH/LCH180U	Med. Low	2400
LGH/LCH240U	Med. Low	3200
Cooling 3 Minimum CFM - 190 CFM/ton		
Unit	Blower Speed	Airflow CFM
LGH/LCH180U	High	2850
LGH/LCH240U	High	3800
Cooling 4 Minimum CFM - 220 CFM/ton		
Unit	Blower Speed	Airflow CFM
LGH/LCH180U	High	3300
LGH/LCH240U	High	4400
Smoke and Ventilation Minimum CFM - 150 CFM/ton		
Unit	Not Applicable	Airflow CFM
LGH/LCH180U		2250
LGH/LCH240U		3000
Heating and Cooling Maximum CFM - 480 CFM/ton		
Unit	Blower Speed	Airflow CFM
LGH/LCH180U	High	7200
LGH/LCH240U	High	9600

Multi-Staged Air Volume Operation

This is a summary of cooling operation. Refer to the sequence of operation provided in the Engineering Handbook or Service Manual for more detail.

Note - During a dehumidification demand the blower operates at the highest speed. Free cooling is locked-out during reheat operation. Refer to reheat start-up and operation section for details.

A-Two-Stage T'Stat; 3- and 4-Compressor Units

1-Economizer With Outdoor Air Suitable

Y1 Demand -

- Compressors Off
- Blower Cooling Low
- Dampers modulate

Y2 Demand -

- Compressors Off
- Blower Cooling High
- Dampers Modulate

156, 180H, 210, 240H, 300S - If dampers are at maximum open for three minutes, compressor 1 and 2 are energized and blower stays on cooling high.

180U, 240U - If dampers are at maximum open for three minutes, two compressors (one from each circuit) are energized and blower stays on cooling high.

2-No Economizer or Outdoor Air Not Suitable

Y1 Demand -

- First-stage Compressors On
- Blower Cooling Low
- Dampers Minimum Position

Y2 Demand -

- All Compressors On
- Blower Cooling High
- Dampers Minimum Position

B-Three-Stage T'Stat, 3 and 4 Compressor Units AND Zone Sensor (4 Clg. Stages), 3-Compressor Units

1-Economizer With Outdoor Air Suitable

Three-Compressor Units:

Y1 Demand -

- Compressors Off
- Blower Cooling Low
- Dampers Modulate

Y2 Demand -

- Compressors Off
- Blower Cooling High
- Dampers Modulate

Note - If dampers are at maximum open for three minutes, compressor 1 is energized and blower stays on cooling high.

Y3 Demand -

- Compressors 1 and 2 On
- Blower Cooling High
- Dampers Maximum Open

Y4 Demand -

- All Compressors On
- Blower Cooling High
- Dampers Maximum Open

Four-Compressor Units:

Y1 Demand -

- Compressors Off
- Blower Cooling Low
- Dampers modulate

Y2 Demand -

- Compressors Off
- Blower Cooling High
- Dampers Modulate

156, 180H, 210, 240H, 300S - If dampers are at maximum open for three minutes, compressors 1 and 2 are energized and blower stays on cooling high.

180U, 240U - If dampers are at maximum open for three minutes, two compressors (one from each circuit) are energized and blower stays on cooling high.

Y3 Demand -

- Compressors 1, 2 and 3 On
(180U & 240U, any three compressors are on)
- Blower Cooling High
- Dampers Maximum Open

2-No Economizer or Outdoor Air Not Suitable

Three-Compressor Units:

Y1 Demand -

- Compressor 1 On
- Blower Cooling Low

Y2 Demand -

- Compressors 1 and 2 On
- Blower Cooling Medium

Y3 or Y4 Demand -

- All Compressors On
- Blower Cooling High

Four-Compressor Units:

Y1 Demand -

Compressors 1 and 2 On
180U, 240U - Two Compressors On
(one from each circuit)
Blower Cooling Low

Y2 Demand -

Compressors 1, 2 and 3 On
180U & 240U, any three compressors are On
Blower Cooling Medium

Y3 Demand -

All Compressors On
Blower Cooling High

C-Zone Sensor (4 Clg. Stages), 4-Compressor Units

1-Economizer With Outdoor Air Suitable

Y1 Demand -

Compressors Off
Blower Cooling Low
Dampers modulate

Y2 Demand -

Compressors Off
Blower Cooling High
Dampers Modulate

156, 180H, 210, 240H, 300S - If dampers are at maximum open for three minutes, compressor 1 is energized and blower stays on cooling high.

180U, 240U - If dampers are at maximum open for three minutes, two compressors (one from each circuit) are energized and blower stays on cooling high.

Y3 Demand -

Compressors 1 and 2 On
180U, 240U - Two Compressors On
(one from each circuit)
Blower Cooling High
Dampers Maximum Open

Y4 Demand -

All Compressors On
Blower Cooling High
Dampers Maximum Open

2-No Economizer or Outdoor Air Not Suitable

Y1 Demand -

Compressor 1 On
180U, 240U - Two Compressors On
(one from each circuit)
Blower Cooling Low

Y2 Demand -

Compressors 1 and 2 On
180U, 240U - Two Compressors On
(one from each circuit)
Blower Cooling Medium Low

Y3 Demand -

Compressors 1, 2 and 3 On
180U & 240U, any three compressors are On
Blower Cooling Medium High

Y4 Demand -

All Compressors On
Blower Cooling High

Hot Gas Reheat Start-Up And Operation

General

Hot gas reheat units provide a dehumidifying mode of operation. These units contain a reheat coil adjacent to and downstream of the evaporator coil. Reheat coil solenoid valves, L14 and L30, route hot discharge gas from the compressor to the reheat coil. Return air pulled across the evaporator coil is cooled and dehumidified; the reheat coil adds heat to supply air.

See figure 34 for 156, 180H and 210 reheat refrigerant routing, figure 35 for 156, 180H and 210 normal cooling refrigerant routing, figure 36 for 240H and 300S reheat refrigerant routing and figure 37 for 240H and 300S normal cooling refrigerant routing.

L14 and L30 Reheat Coil Solenoid Valves

When Unit Controller (P298-5 or J299-8) indicates room conditions require dehumidification, L14 and L30 reheat valves are energized (Unit Controller P269-3 or P269-4) and refrigerant is routed to the reheat coil.

Reheat Setpoint

Reheat is factory-set to energize when indoor relative humidity rises above 60% (default). The reheat setpoint can be adjusted by changing Unit Controller *Settings - Control* menu. A setting of 100% will operate reheat from an energy management system digital output. The reheat setpoint can also be adjusted using an optional Network Control Panel (NCP).

Reheat will terminate when the indoor relative humidity falls 3% (57% default) or the digital output de-energizes. The reheat deadband can be adjusted at *Settings - Control* menu.

A91 Humidity Sensor

Relative humidity should correspond to the sensor (A91) output voltage listed in table 33. For example: if indoor air relative humidity is 80% \pm 3%, the humidity sensor output should read 8.00VDC.

Check the sensor output annually for accuracy. Keep the air intake openings on the sensor clean and free of obstructions and debris.

Check-Out

Test hot gas reheat operation using the following procedure.

- 1- Make sure reheat is wired as shown in wiring section.
- 2- Make sure unit is in local thermostat mode.
- 3- Select Unit Controller *Service - Test*.

TABLE 33

Relative Humidity (%RH \pm 3%)	Sensor Output (VDC)
20	2.00
30	3.00
40	4.00
50	5.00
60	6.00
70	7.00
80	8.00
90	9.00

The blower, compressor 1 and compressor 2 (reheat) should be operating. L14 and L30 LED's on the Unit Controller should also be ON, indicating the reheat valves are energized. Reheat mode will appear on the Unit Controller display.

- 4- Deselect Unit Controller *Service - Test*.

Compressor 1 and 2 (reheat) should de-energize, L14 and L30 LED's should go OFF, blower should still be energized.

Default Reheat Operation

Reheat will operate as shown in table 34 once three conditions are met:

- 1- Blower must be operating.
- 2- System must be in occupied mode.
- 3- System must NOT be operating in heating mode.

IMPORTANT - Free cooling does not operate during reheat.

For other reheat control options, refer to the Unit Controller manual.

Additional Cooling Stages

Units are shipped from the factory to provide two stages of cooling.

Three stages of cooling is available in zone sensor mode. Three stages of cooling is also available by installing a transfer relay and a three-stage thermostat. Refer to the Main Control Operation section in the Unit Controller manual when using the transfer relay.

Four stages of cooling is available in zone sensor mode on units with four compressors (240, 300S).

Compressors are not de-energized when unit operation changes from cooling to reheat or from reheat to cooling. Instead, L14 and L30 reheat valves are energized (reheat) or de-energized (cooling).

NOTE - Another thermostat staging option is available which allows both compressors to be energized during free cooling. See Unit Controller manual for details.

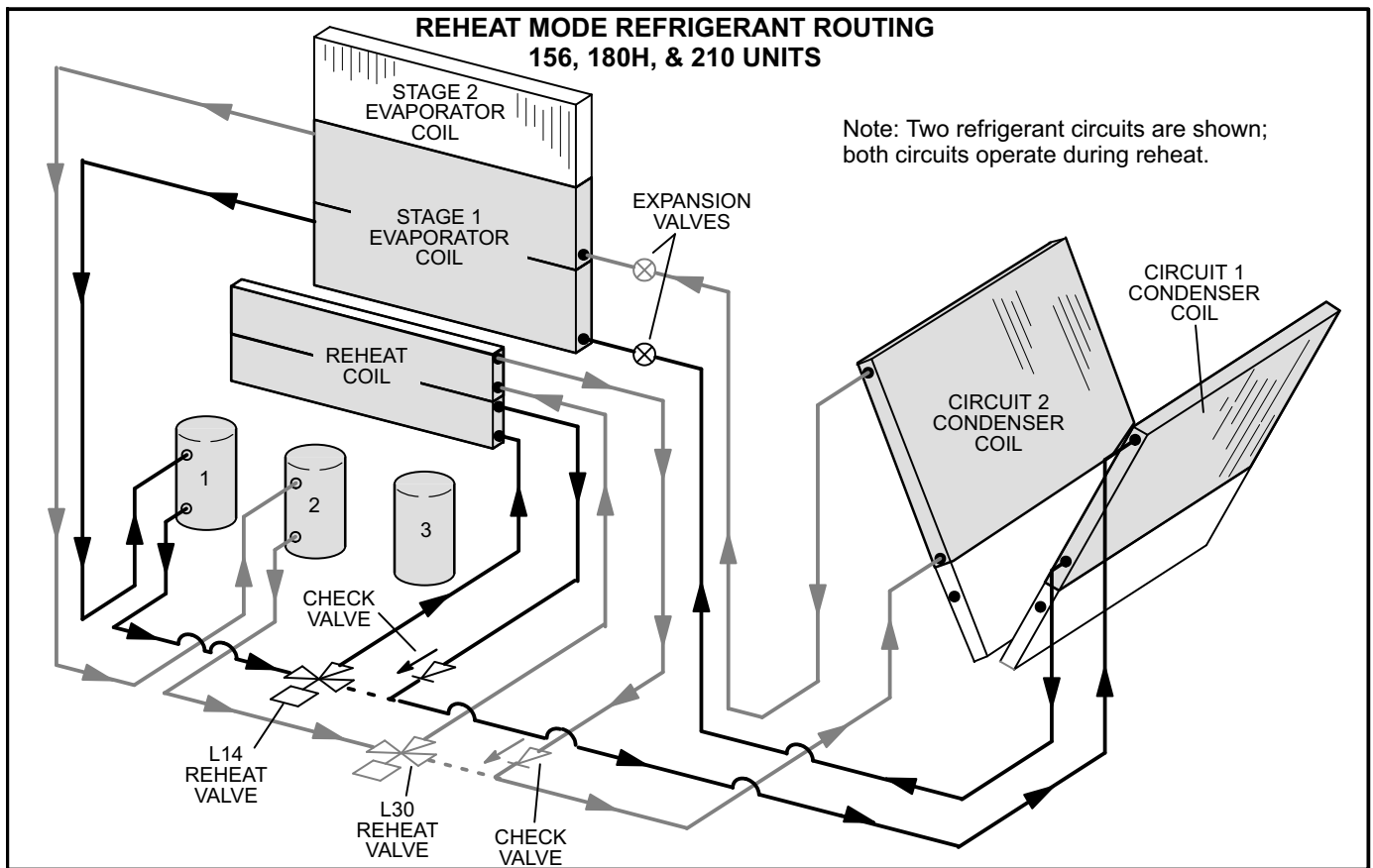


FIGURE 34

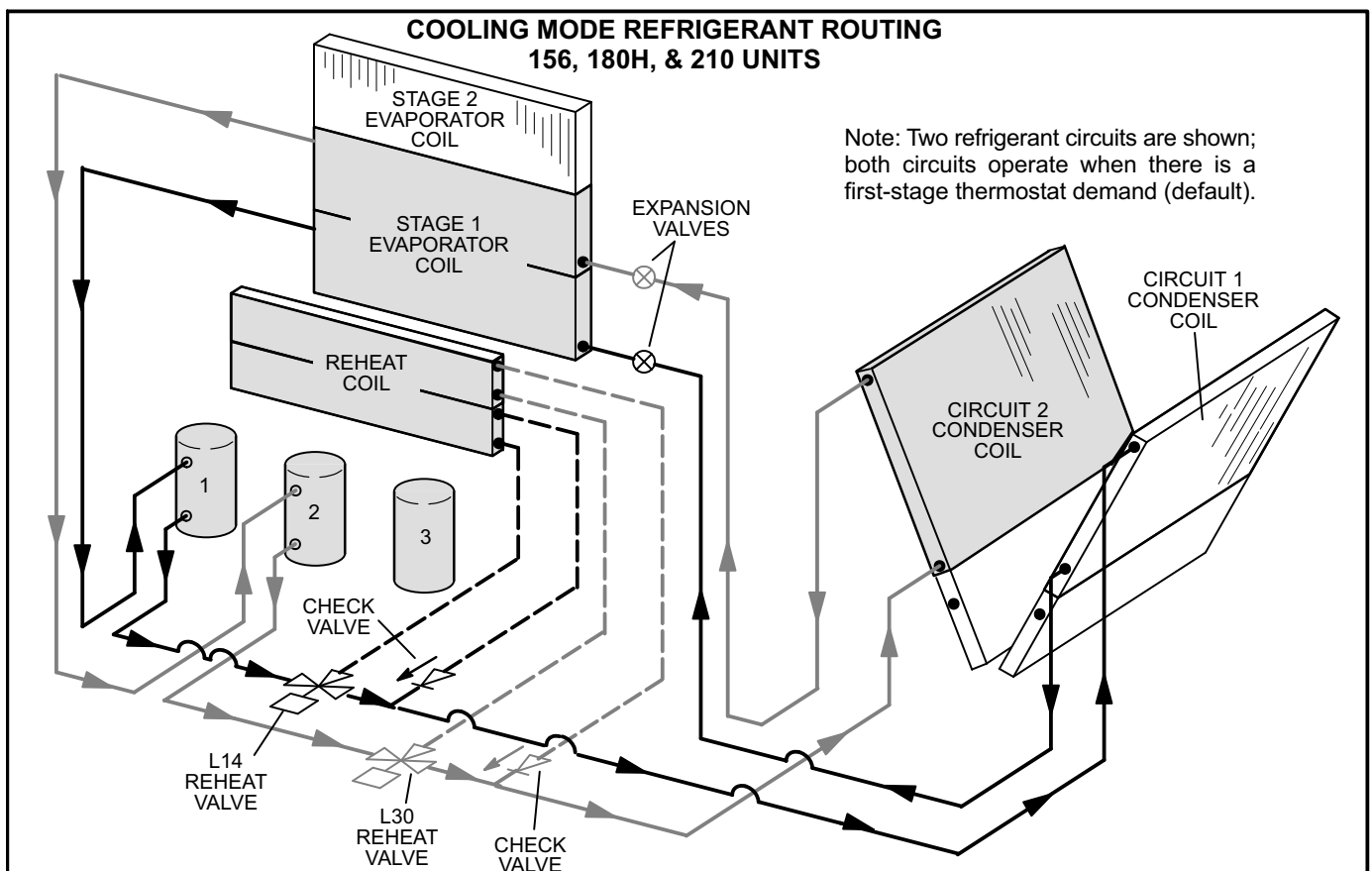


FIGURE 35

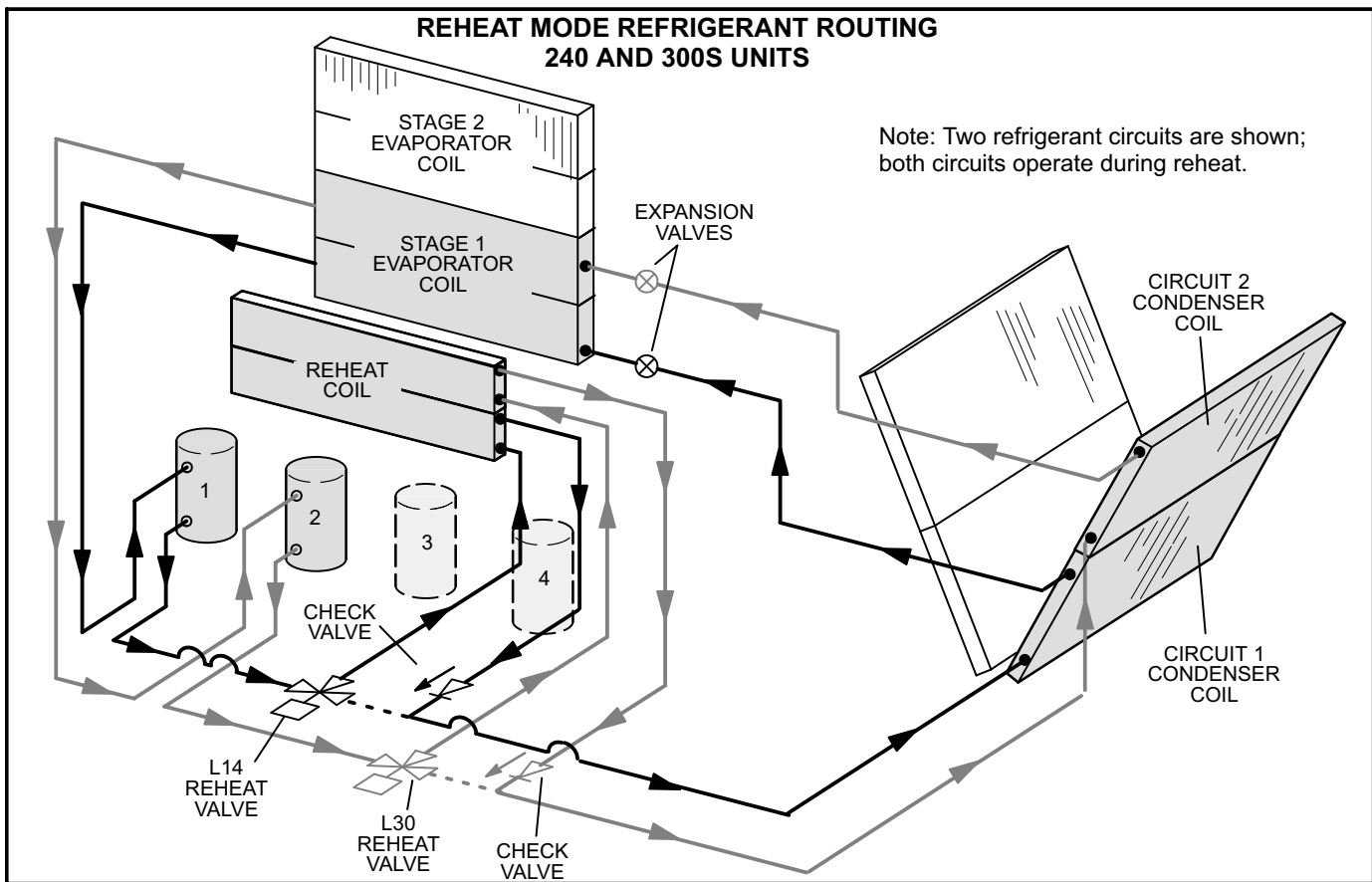


FIGURE 36

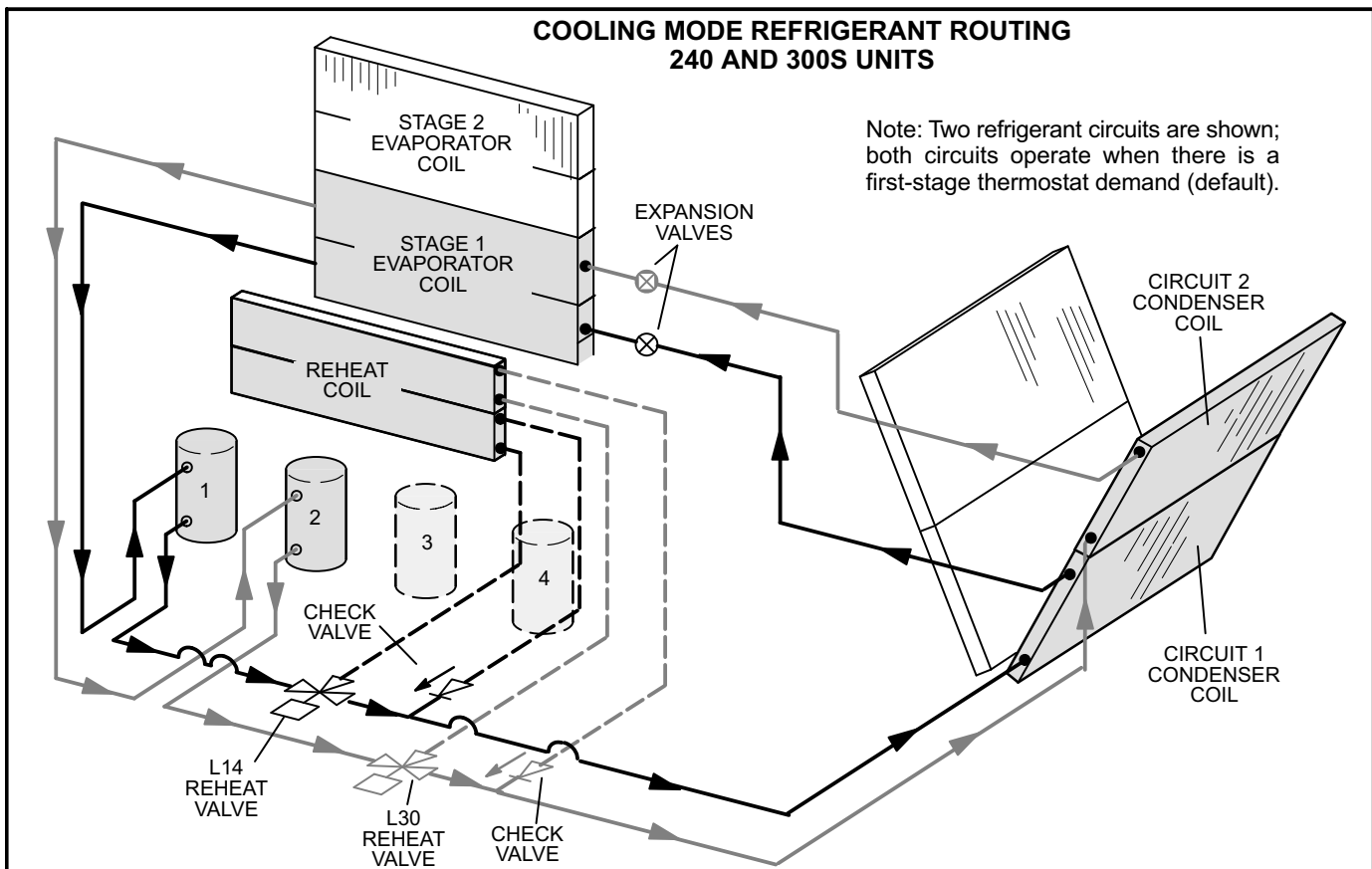


FIGURE 37

**TABLE 34
REHEAT OPERATION**

Two-Stage Thermostat - Default		
T'stat and Humidity Demands	Operation	
	156, 180H, 210 (3-Compressors)	240H, 300S (4-Compressors)
Reheat Only	Compressor 1 & 2 Reheat	Compressor 1 & 2 Reheat
Reheat & Y1	Compressor 1 & 2 Reheat and Compressor 3 Cooling ¹	Compressor 1 & 2 Reheat and Compressor 3 & 4 Cooling ¹
Reheat & Y1 & Y2	Compressor 1, 2, & 3 Cooling ³	Compressor 1, 2, 3 & 4 Cooling ³
Three-Stage Thermostat (Transfer relay required)		
T'stat and Humidity Demands	Operation	
	156, 180H, 210 (3-Compressors)	240H, 300S (4-Compressors)
Reheat Only	Compressor 1 & 2 Reheat	Compressor 1 & 2 Reheat
Reheat & Y1	Compressor 1 & 2 Reheat and Compressor 3 Cooling ¹	Compressor 1 & 2 Reheat and Compressor 3 Cooling ¹
Reheat Y1 & Y2	Compressor 1, & 2, Cooling ²	Compressor 1 & 2 Reheat and Compressor 3, & 4 Cooling ³
Reheat Y1 & Y2 & Y3	Compressor 1, 2, & 3 Cooling ³	Compressor 1, 2, 3, & 4 Cooling ⁴
Four-Stage Zone Sensor Mode		
Cooling* and Humidity** Demands	Operation	
	156, 180H, 210 (3-Compressors)	240H, 300S (4-Compressors)
Reheat Only	Compressor 1 & 2 Reheat	Compressor 1 & 2 Reheat
Reheat & Y1	Compressor 1 & 2 Reheat and Compressor 3 Cooling ¹	Compressor 1 & 2 Reheat and Compressor 3 Cooling ¹
Reheat & Y1 & Y2	Compressor 1, & 2, Cooling ²	Compressor 1 & 2 Reheat and Compressor 3 & 4 Cooling ²
Reheat & Y1 & Y2 & Y3	Compressor 1, 2, & 3 Cooling ³	Compressor 1, 2, & 3 Cooling ³
Reheat & Y1 & Y2 & Y3 & Y4	Compressor 1, 2, & 3 Cooling ⁴	Compressor 1, 2, 3, & 4 Cooling ⁵

*Cooling stage is initiated when zone temperature is higher than the cooling setpoint plus the appropriate stage differential.

**Reheat demand is initiated when relative humidity is higher than relative humidity setpoint.

¹If there is no reheat demand and outdoor air is suitable, free cooling will operate.

²If there is no reheat demand and outdoor air is suitable, free cooling and compressor 1 will operate.

³If there is no reheat demand and outdoor air is suitable, free cooling and compressor 1 and 2 will operate.

⁴If there is no reheat demand and outdoor air is suitable, free cooling, compressor 1, 2 and 3 will operate.

⁵If there is no reheat demand and outdoor air is suitable, free cooling, compressor 1, 2, 3 and 4 will operate.

The following conditions must be met before reheat will be energized:
(factory-default; see Unit Controller manual for other options)

- | | |
|-------------------------------------|--|
| 1- Blower must be operating. | 3- System must NOT be operating in heating mode. |
| 2- System must be in occupied mode. | |

Service

The unit should be inspected once a year by a qualified service technician.

A-Filters

Units are equipped with six 24 X 24 X 2" filters. Filters should be checked monthly and replaced when necessary with filters of like kind and size. Take note of air flow direction marking on filter frame when reinstalling filters. See figure 38.

NOTE-Filters must be U.L.C. certified or equivalent for use in Canada.

B-Lubrication

All motors are lubricated at the factory. No further lubrication is required.

Blower shaft bearings are prelubricated. For extended bearing life, relubricate at least once every two years with a lithium base grease, such as Alvania 3 (Shell Oil), Chevron BRB2 (Standard Oil) or Regal AFB2 (Texas Oil). Use a hand grease gun for relubrication. Add only enough grease to purge through the bearings so that a bead of grease appears at the seal lip contacts.

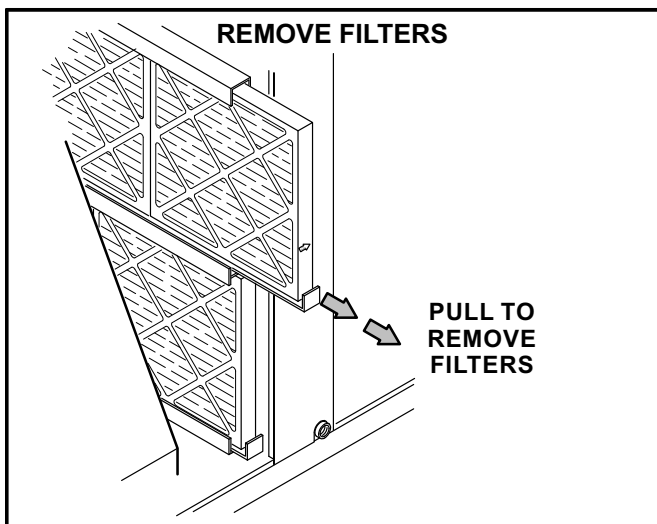


FIGURE 38

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

C-Burners (Gas Units)

Periodically examine burner flames for proper appearance during the heating season. Before each heating season examine the burners for any deposits or blockage which may have occurred.

Clean burners as follows:

- 1- Turn off both electrical power and gas supply to unit.
- 2- Open burner compartment access panel.
- 3- Remove screws securing burner assembly to burner support and remove assembly. See figure 39. Clean as necessary.
- 4- Locate the ignitor under the left burners. Check ignitor spark gap with appropriately sized twist drills or feeler gauges. See figure 40.
- 5- Check the alignment of the ignitor and the sensor as shown in figure 41 and table 35.
- 6- Replace burners and screws securing burner.
- 7- Replace access panel.
- 8- Restore electrical power and gas supply. Follow lighting instructions attached to unit and use inspection port in access panel to check flame.

⚠ WARNING



Danger of explosion. Can cause injury or death. Do not overtighten main burner mounting screws. Snug tighten only.

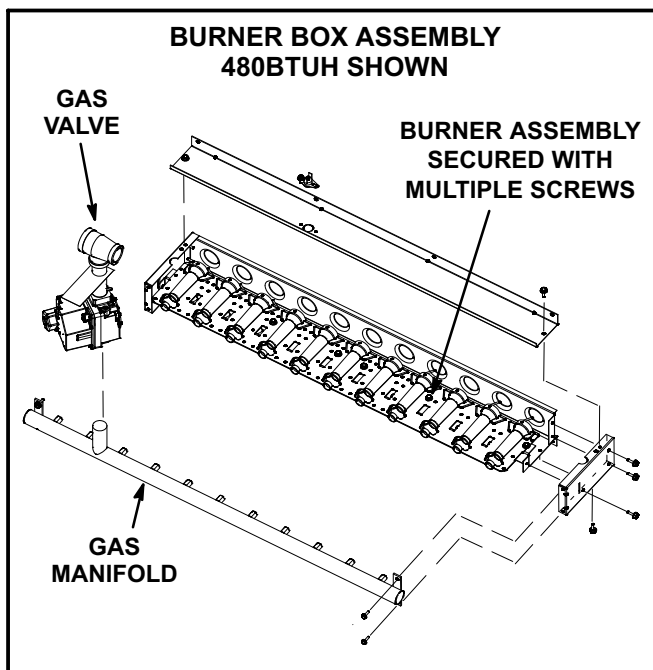


FIGURE 39

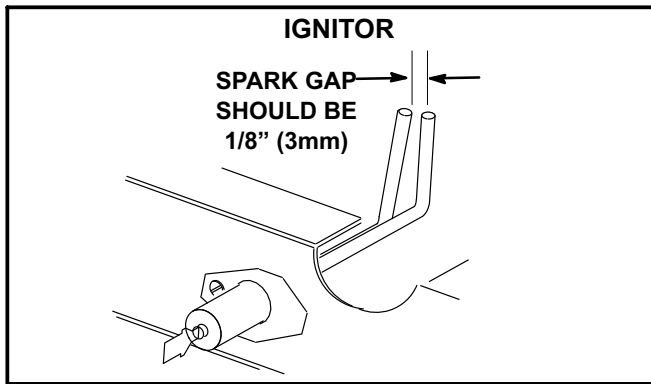


FIGURE 40

TABLE 35

Dimension	Unit Btuh Input	Length - in. (mm)	
		Ignitor	Sensor
A	260K	7-3/4 (197)	11 (279)
B	360K	5 (127)	5-1/2 (140)
C	480K	2-1/4 (57)	2-3/4 (70)

D-Combustion Air Inducer (Gas Units)

A combustion air proving switch checks combustion air inducer operation before allowing power to the gas controller. Gas controller will not operate if inducer is obstructed.

Under normal operating conditions, the combustion air inducer wheel should be checked and cleaned prior to the heating season. However, it should be examined periodically during the heating season to establish an ideal cleaning schedule. With power supply disconnected, the condition of the inducer wheel can be determined by looking through the vent opening.

Clean combustion air inducer as follows:

- 1- Shut off power supply and gas to unit.
- 2- Disconnect pressure switch air tubing from combustion air inducer port.
- 3- Remove and retain screws securing combustion air inducer to flue box. Remove and retain two screws from bracket supporting vent connector. See figure 42.
- 4- Clean inducer wheel blades with a small brush and wipe off any dust from housing. Clean accumulated dust from front of flue box cover.
- 5- Return combustion air inducer motor and vent connector to original location and secure with retained screws. It is recommended that the combustion air inducer gasket be replaced during reassembly.
- 6- Clean combustion air inlet louvers on heat access panel using a small brush.

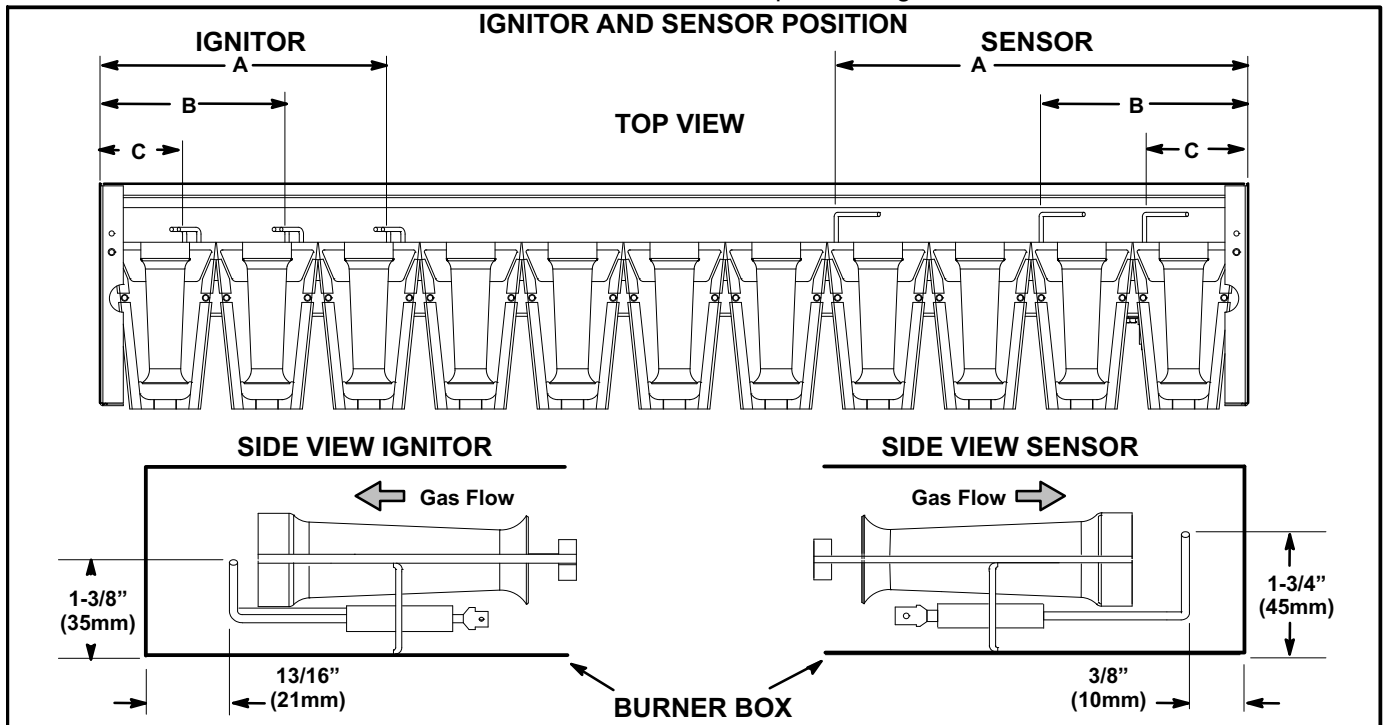


FIGURE 41

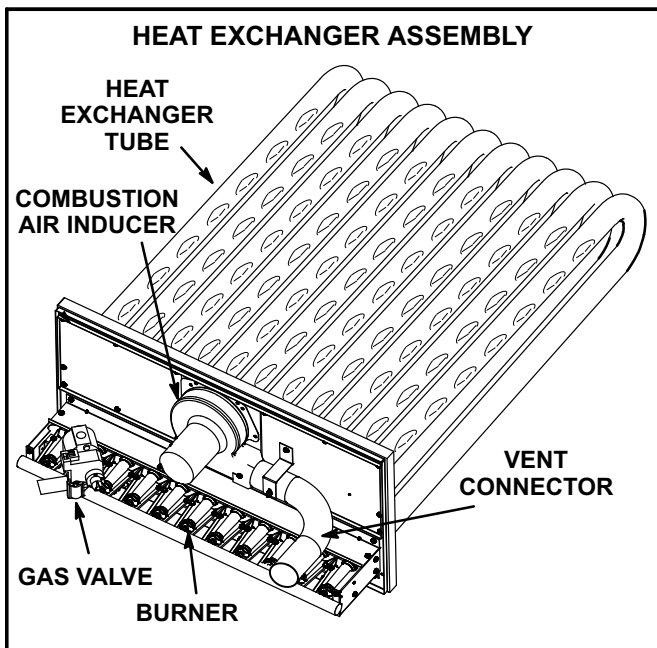


FIGURE 42

E-Flue Passageway and Flue Box (Gas Units)

- 1- Remove combustion air inducer assembly as described in section D.
- 2- Remove flue box cover. Clean with a wire brush as required.
- 3- Clean tubes with a wire brush.
- 4- Reassemble the unit. The flue box cover gasket and combustion air inducer gasket should also be replaced during reassembly.

F-Evaporator Coil

Inspect and clean coil at beginning of each cooling season. Clean using mild detergent or commercial coil cleaner. Flush coil and condensate drain with water taking care not to get insulation, filters and return air ducts wet.

G-Supply Air Blower Wheel

Annually inspect supply air blower wheel for accumulated dirt or dust. Turn off power before attempting to remove access panel or to clean blower wheel.

H-Condenser Coil

All-Aluminum Coil -

Clean condenser coil annually with water and inspect monthly during the cooling season.

Clean the coil by spraying the coil steadily and uniformly from top to bottom. Do not exceed 900 psi or a 45° angle; nozzle must be at least 12 inches from the coil face. Take care not to fracture the braze between the fins and refrigerant tubes. Reduce pressure and work cautiously to prevent damage.

Conventional Fin/Tube Condenser -

Clean condenser coil annually with detergent or commercial coil cleaner and inspect monthly during the cooling season. Access panels are provided on front and back of condenser section.

Factory Unit Controller Settings

Use the Unit Controller to adjust parameters; menu paths are shown in each table. Refer to the Unit Controller manual provided with each unit.

Tables 36 through 45 show factory settings (in degrees, % of fan CFM, etc.). Record adjusted settings on the label located inside the compressor access panel.

When field installing optional kits and accessories, the Unit Controller must be configured to identify the option before it will function. Refer to figures 43 and 44 to determine whether the Unit Controller configuration I.D. must change. To configure the option, use MAIN MENU > SETUP > INSTALL menu path. Press SAVE until CONFIGURATION ID 1 or 2 appears depending on the option installed. Change the appropriate character in the configuration I.D. For example, when an economizer is installed using a single enthalpy sensor, change configuration I.D. 1, the second character, to "S".

TABLE 36 - 580730

Units With BACnet Module Settings
Use menu SETUP > NETWORK INTEGRATION. Set "BACNET" and network address.
BACNET MAC ADDRESS:

TABLE 37 - 580731

Units With Automated Logic DDC (Target) Settings			
Parameter	Factory Setting	Field Setting	Description
Use SETTINGS > RTU OPTIONS > EDIT PARAMETERS			
91	120		Compressor minimum run time.
111	3		Thermostat with three cooling stages.
118	400		Damper "start open" CO ₂ setpoint for DCV.
119	2000		Damper "full open" CO ₂ setpoint for DCV.
139	74		Backup occupied cooling setpoint.
153	60		Time delay between heating and cooling mode.

TABLE 38 - 580732

Units With Room Sensor, CPC/LSE Gateway Settings			
Use menu SETUP > NETWORK INTEGRATION. Set "L CONNECTION" and network address.			
LCONN ADDRESS:			

TABLE 39 - 580734

Units With Hot Gas Reheat			
Use SETTINGS > RTU OPTIONS > EDIT PARAMETERS			
Parameter	Factory Setting	Field Setting	Description
105	6		Hot Gas Reheat Option 6: Reheat is only possible if blower is energized during occupied periods. Controlled by RH sensor (A91) connected to input A55_P298_5 and set point set at parameter 106 (default 60%).

TABLE 40 - 580733

Units With BACnet Module (Kohl's) Settings			
Use menu SETUP > NETWORK INTEGRATION. Set "BACNET" and network address.			
BACNET MAC ADDRESS:			
Parameter	Factory Setting	Setting	Description
Use SETTINGS > RTU OPTIONS > EDIT PARAMETERS			
137	65		Sets the backup occupied heating setpoint to 65F.

TABLE 41 - 580745

LGH/LCH 156H/180H/210H (3-Compressor) MSAV					
Para-meter	Factory Setting			Field Setting	Description
	156	180	210		
Note: Any changes to Smoke CFM setting must be adjusted before the other CFM settings. Use SETTINGS > RTU OPTIONS > EDIT PARAMETERS					
12	5200 CFM	6000 CFM	7000 CFM	CFM	Blower CFM during smoke detection.
SETUP > TEST & BALANCE (can also use SETTINGS > RTU OPTIONS > BLOWER > SPEEDS)					
	5200 CFM	6000 CFM	7000 CFM	CFM	Blower CFM during heating.
	4675 CFM	5400 CFM	6300 CFM	CFM	Blower CFM during compressor 3 operation.
	3375 CFM	3900 CFM	4550 CFM	CFM	Blower CFM during compressor 2 operation.
	3375 CFM	3900 CFM	4550 CFM	CFM	Blower CFM during compressor 1 operation.
	5200 CFM	6000 CFM	7000 CFM	CFM	Blower CFM during ventilation.
SETUP > TEST & BALANCE (can also use SETTINGS > RTU OPTIONS > DAMPER)					
	0%	0%	0%	%	Damper min. position during LOW blower operation.
	0%	0%	0%	%	Damper min. position during HIGH blower operation.
	50%	50%	50%	%	Min. damper % for stage 1 power exhaust operation.
SETTINGS > RTU OPTIONS > EDIT PARAMETERS					
29	101%	101%	101%	%Open	Damper minimum position during G blower operation. (Setting parameter 29 to “101” disables parameter 29 and passes control to parameter 9 or 132)
219	70%	70%	70%	%	Min. damper % for stage 2 power exhaust operation.
216	10%	10%	10%	%	Deadband % for stage 1 power exhaust operation.
220	10%	10%	10%	%	Deadband % for stage 2 power exhaust operation.
224	100	100	100	Sec	Stage 1 power exhaust off-delay in seconds.
30	70%	70%	70%	%Speed	Minimum blower speed % for stage 2 power exhaust operation.

TABLE 42 - 580746

LGH/LCH 240H/300S (4-Compressor) MSAV				
Parameter	Factory Setting		Field Setting	Description
	240S	300S		
Note: Any changes to Smoke CFM setting must be adjusted before the other CFM settings. Use SETTINGS > RTU OPTIONS > EDIT PARAMETERS				
12	8000 CFM	10000 CFM	CFM	Blower CFM during smoke detection.
SETUP > TEST & BALANCE (can also use SETTINGS > RTU OPTIONS > BLOWER > SPEEDS)				
	8000 CFM	10000 CFM	CFM	Blower CFM during heating.
	7200 CFM	9000 CFM	CFM	Blower CFM during compressor 4 operation.
	5200 CFM	6500 CFM	CFM	Blower CFM during compressor 3 operation. This parameter is inactive for thermostats with 2-stage cooling.
	5200 CFM	6500 CFM	CFM	Blower CFM during compressor 2 operation.
	5200 CFM	6500 CFM	CFM	Blower CFM during compressor 1 operation. This parameter is inactive for thermostats with 2-stage or 3-stage cooling.
	8000 CFM	10000 CFM	CFM	Blower CFM during ventilation.
SETUP > TEST & BALANCE (can also use SETTINGS > RTU OPTIONS > DAMPER)				
	0%	0%	%	Damper min. position during LOW blower operation.
	0%	0%	%	Damper min. position during HIGH blower operation.
	50%	50%	%	Min. damper % for stage 1 power exhaust operation.
SETTINGS > RTU OPTIONS > EDIT PARAMETERS				
29	101%	101%	%Open	Damper minimum position during G blower operation. (Setting parameter 29 to "101" disables parameter 29 and passes control to parameter 9 or 132)
219	70%	70%	%	Min. damper % for stage 2 power exhaust operation.
216	10%	10%	%	Deadband % for stage 1 power exhaust operation.
220	10%	10%	%	Deadband % for stage 2 power exhaust operation.
224	100	100	Sec	Stage 1 power exhaust off-delay in seconds.
30	70%	70%	%Speed	Minimum blower speed % for stage 2 power exhaust operation.

TABLE 43 - 580852

LGH/LCH 156-600 - VAV - Test and Balance Settings			
Para-meter	Factory Setting	Field Setting	Description
Use SETTINGS > RTU OPTIONS > EDIT PARAMETERS			
386	1	W.C.	Supply static pressure setpoint during smoke operation.
SETUP > TEST & BALANCE > (can also use SETTINGS > RTU OPTIONS > BLOWER > SPEEDS)			
	1	W.C.	Supply static pressure setpoint
SETUP > TEST & BALANCE (can also use SETTINGS > RTU OPTIONS > DAMPER) (Optional)			
	0%	%	Damper min. position during blower operation.
	50%	%	Min. damper % for stage 1 power exhaust operation.
	75%	%	Min. damper % for stage 2 power exhaust operation.
	0.05	W.C.	Pressure setpoint for stage 1 power exhaust operation.
	0.10	W.C.	Pressure setpoint for stage 2 power exhaust operation.
29	101%	%Open	Damper minimum position during G blower operation. (Setting parameter 29 to "101" disables parameter 29 and passes control to parameter 9 or 132)

TABLE 44 - 580749

LGH/LCH 180U/240U (4-Compressor) MSAV				
Para meter	Factory Setting		Field Setting	Description
	180U	240U		
Note: Any changes to Smoke CFM setting must be adjusted before the other CFM settings. Use SETTINGS > RTU OPTIONS > EDIT PARAMETERS				
12	6000 CFM	8000 CFM	CFM	Blower CFM during smoke detection.
SETUP > TEST & BALANCE (can also use SETTINGS > RTU OPTIONS > BLOWER > SPEEDS)				
	6000 CFM	8000 CFM	CFM	Blower CFM during heating.
	5400 CFM	7200 CFM	CFM	Blower CFM during compressor 4 operation.
	3900 CFM	5200 CFM	CFM	Blower CFM during compressor 3 operation. This parameter is inactive for thermostats with 2-stage cooling.
	3900 CFM	5200 CFM	CFM	Blower CFM during compressor 2 operation.
	3900 CFM	5200 CFM	CFM	Blower CFM during compressor 1 operation. This parameter is inactive for thermostats with 2-stage or 3-stage cooling.
	6000 CFM	8000 CFM	CFM	Blower CFM during ventilation.
SETUP > TEST & BALANCE (can also use SETTINGS > RTU OPTIONS > DAMPER)				
	0%	0%	%	Damper min. position during LOW blower operation.
	0%	0%	%	Damper min. position during HIGH blower operation.
	50%	50%	%	Min. damper % for stage 1 power exhaust operation.
SETTINGS > RTU OPTIONS > EDIT PARAMETERS				
29	101%	101%	%Open	Damper minimum position during G blower operation. (Setting parameter 29 to "101" disables parameter 29 and passes control to parameter 9 or 132)
219	70%	70%	%	Min. damper % for stage 2 power exhaust operation.
216	10%	10%	%	Deadband % for stage 1 power exhaust operation.
220	10%	10%	%	Deadband % for stage 2 power exhaust operation.
224	100	100	Sec	Stage 1 power exhaust off-delay in seconds.
30	70%	70%	%Speed	Minimum blower speed % for stage 2 power exhaust operation.

TABLE 45 - 580735

Units with BACnet Module (Target) Settings			
Use menu SETUP > NETWORK INTEGRATION. Set "BACNET" and network address.			
BACNET MAC ADDRESS:			
Parameter	Factory Setting	Setting	Description
Use SETTINGS > RTU OPTIONS > EDIT PARAMETERS			
91	120		Sets the compressor minimum run time to 2 minutes.
106	99		Set reheat SP from connected sensor to 99% to basically disable. Reheat will be controlled over by BAS. Only applies to units with the reheat option.
111	3		Thermostat with three cooling stages.
117	0		DCV max. open damper. 0=controlled by network.
153	60		Time delay between heating and cooling mode.

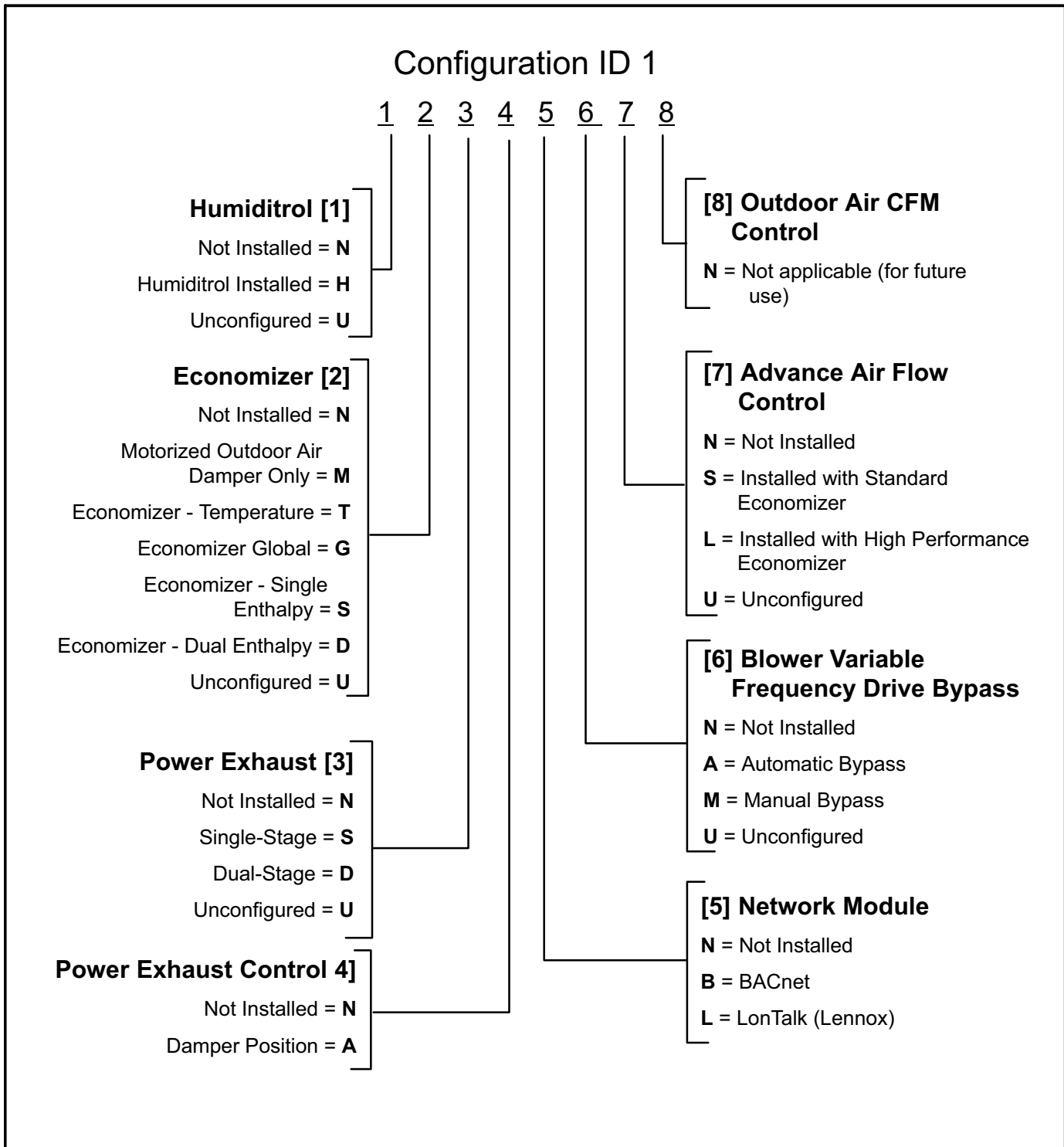


FIGURE 43

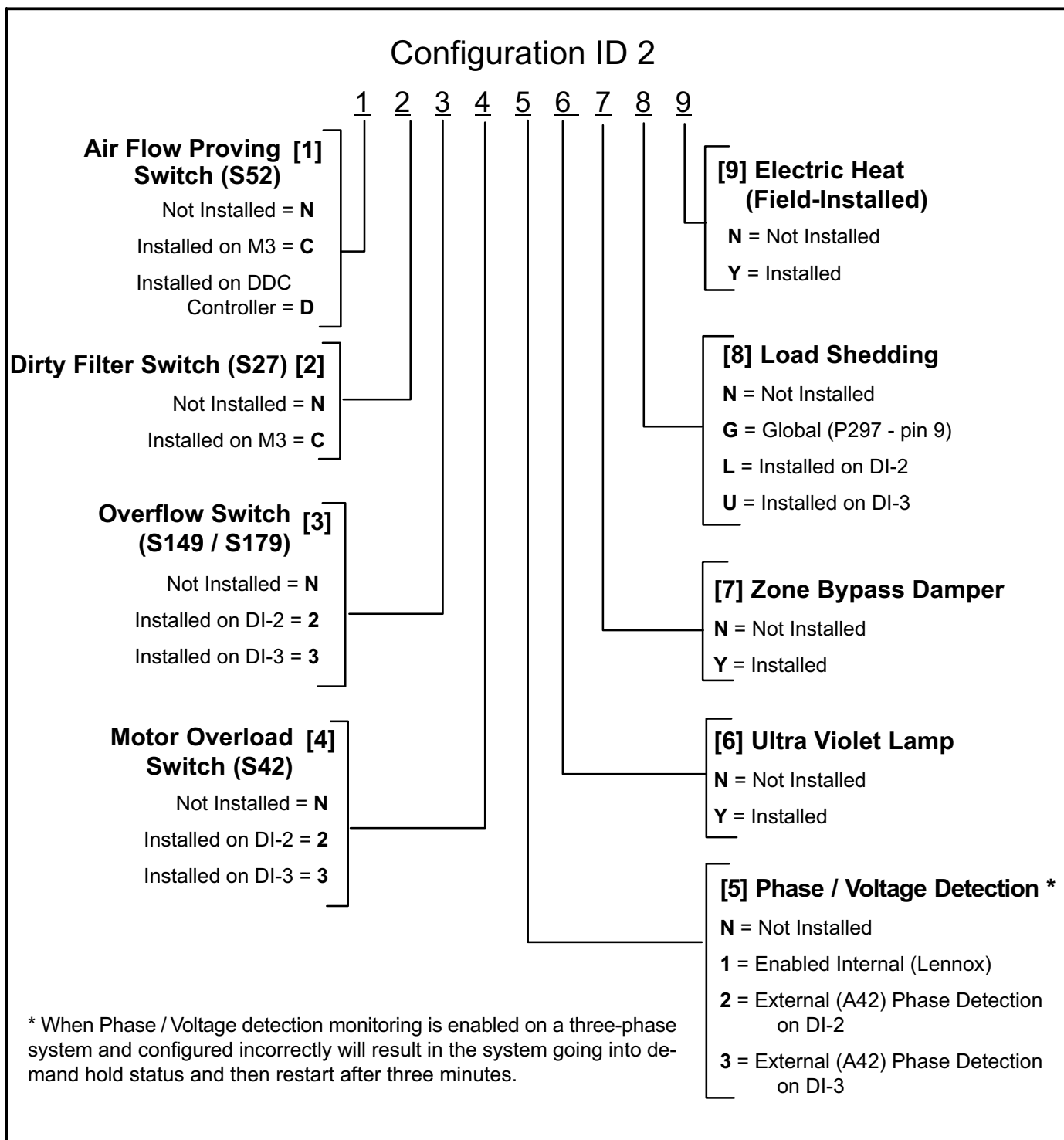


FIGURE 44