



SURNA

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303.993.5271

Surna Commercial Chiller Operating & Maintenance Manual





Table of Contents

Warranty Information	4
Limited Warranty	4
Limitation of Liability	4
Warranty Disclaimer	4
Product Suitability	4
Service Under Warranty	5
Service NOT Under Warranty	5
Warnings	6
Safety Symbols	6
Surna Chiller Safety Guide	6
Parts List	8
Installation Instructions	9
Location	9
Electrical	9
Plumbing	9
Plumbing Tips	10
Operations Instructions	12
Temperature Settings	12
System Maintenance Instructions and Recommendations	12
System Specifications	14
Troubleshooting	18
Temperature Controller has no Power	18
Temperature controller is on, but the Chiller Won't Start	18
Fan Turns on and off, Even Though the Compressor is Running	19

Warranty Information

Thank you for choosing the Surna Chiller System. Because your chiller is built with leading technologies and the highest quality components, with proper care and maintenance, it will provide you with years of worry-free service. Please examine the unit upon arrival to be sure there is no damage as a result of shipping. If shipping damage has occurred, please note the damage on the receiving slip, and contact Surna immediately.

If you are missing parts or believe that you have a warranty issue, DO NOT return this item to the store of purchase. You must contact Surna at 303-993-5271 for troubleshooting and service instructions.

Limited Warranty

A 90-day all-inclusive warranty for: parts, labor, and shipping (including refrigerant). Choice of repair facility and technician is at the discretion of Surna.

A 1-year warranty on any defective part is also provided (including refrigerant). Choice of repair facility and technician is at the discretion of the chiller's owner, although Surna is happy to assist with locating a technician. If Surna chooses the technician, limited labor coverage may apply.

A 5-year warranty is provided for standard compressors (excluding refrigerant and labor). Choice of repair facility and technician is at the discretion of the chiller's owner, although Surna is happy to assist with locating a technician.

A 10-year warranty is provided for high efficiency compressors (excluding refrigerant and labor). Choice of repair facility and technician is at the discretion of the chiller's owner, although Surna is happy to assist with locating a technician.

Note: Extended warranty for parts, labor and shipping are available for purchase for a nominal fee. Contact Surna within 15 days of your chiller's arrival if you would like to purchase an extended warranty.

Limitation of Liability

To the extent allowable under applicable law, Surna's liability for consequential and incidental damages is expressly disclaimed. Surna's liability in all events is limited to and shall not exceed the cost of repair. Shipping damage is not covered under warranty. In the event that the item(s) arrive with shipping damage, Surna will assist with the repair or replacement of the damaged item ONLY if the damage is noted on the delivery receipt.

Warranty Disclaimer

Surna provides product information in this literature for the sole purpose of identification, and does not state or imply that the products are merchantable, or fit for a particular purpose, or that the products will conform to the descriptions.

Product Suitability

Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Surna attempts to ensure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, review the product applications, and all applicable national and local codes and be sure that the product, installation and use will comply with them.

Service Under Warranty

This product is warranted by Surna against defects due to fault in workmanship or materials.

If the product has been damaged under normal use, it will be entitled to warranty service of the type described and within the timeframes outlined. Damage caused by abnormal use, or after the timeframes outlined have expired, carry no such guarantee. Service under warranty is provided only upon presentation of reasonable evidence (purchase receipt) that the date of claim is within the warranty period.

Service NOT Under Warranty

The warranty is not valid if the defect is due to accidental damage, misuse, shipping damage, neglect, or in the case of alterations or repair carried out by unauthorized persons. Surna can, at its discretion, assist the consumer with shipping claims in the case of damage incurred during shipping, so long as the customer follows the instructions outlined above.

Warnings

Safety Symbols Used



CAUTION: Important information, consult product manual and read the provided instructions carefully.



WARNING: Potential electric shock hazard.



Protective Earth Connection



Action Prohibited

Surna Chiller Safety Guide



Please read the information in this document carefully prior to attempting the installation, operation and/or servicing of the Surna Chiller. This document contains all information required to install and operate the Surna Chiller commercial line of water-cooling devices. Failure to follow the directions provided herein may impair the safeties provided and could cause damage to the Surna Chiller equipment and or accessory equipment, damage to building facilities, and/or cause serious injury or death to the operator. Please adhere to all applicable safety guideline requirements in this document and all applicable electrical and mechanical jurisdictional codes.



Prior to providing power to the equipment, be sure to inspect the area for water spills, which may present a shock hazard to the user. Take extra care to mount accessory electrical equipment away from areas regularly exposed to water and be sure to provide secure wire and cable routing to protect personnel from shock hazards.



Only operate the equipment with an appropriately sized breaker in place and wire sizes with adequate current carrying capacity. Consult with an electrician before attempting electrical installation.



Using the Surna Chiller equipment in a manner not described in this manual may void its warranty.



Following unit installation and maintenance activities, the user shall observe the system operation to verify that normal operation has resumed prior to leaving the equipment to operate unattended.



Only use parts provided with, or specified for use with, the Surna Chiller equipment.



DO NOT operate the Surna Chiller at a temperature setting lower than 45°F (7°C) or risk freezing the evaporator, which is not covered under the product warranty.



DO NOT operate the Surna Chiller without an appropriate mixture of Propylene Glycol. For optimum performance, Surna recommends using a 50%/50% (glycol/water) mixture. The system requires a minimum of 30%/70% (glycol/water) mixture to operate safely. A 50%/50% (glycol/water) mixture is needed when outdoor temps fall below 20°F (-7°C).



DO NOT use the Surna Chiller indoors without proper ventilation. If the indoor temperatures are greater than 100°F (38°C), the room does not have adequate ventilation.



DO NOT operate the Surna Chiller without adequate water flow. These chiller systems require 2.5 GPM (Gallons per Minute) per ton of cooling to prevent freezing of the evaporator.



DO NOT remove the grounded connection while power is being supplied to the Surna Chiller equipment. Doing so presents an electric shock hazard to users and service personnel.



Our chiller systems are approved for use with devices used in water chilled applications that allow for the use of propylene glycol and require a temperature of 45°F (7°C) or higher. Any such devices shall be used in accordance with the safety regulations in your local jurisdiction. Please contact Surna if you are unsure about how to properly incorporate our chillers within your system.

Surna Chiller Parts List

Below is a list of all parts provided with each Surna Chiller system.

1. Surna Chiller Product Manual
2. Chiller Unit
3. Strainer
4. Flow Meter



2. Chiller Unit



3. Brass Strainer



4. Flow Meter (front and side view)

Installation Instructions

Location

Only install the Surna Chiller equipment on a flat, level surface. Acceptable surfaces include concrete slabs, A/C pads, or pressure treated wood. Before attempting installation, be sure to verify that the mounting surface exhibits suitable load bearing capacity. Please consult the specification section of this document for the weight information for each chiller model. The unit shall be placed on a hard surface that extends a minimum of 6 inches from all sides of the chiller housing. This is to prevent dirt and debris from entering the condenser, which will affect cooling efficiency. **DO NOT** place the unit directly on the ground. Damage caused by debris striking the condenser is not covered under warranty. Roof mounting is acceptable so long as the roof joists are rated to support the chillers weight load. Consult your local building codes and guidelines before attempting roof mounting.

Following installation, verify that there is a minimum of 24 inches of clearance from obstruction on all sides and no obstructions above the unit to ensure proper airflow over the condenser.

Electrical

Contact an electrician if you are not familiar with the local codes and standards in your jurisdiction. Before attempting electrical installation, be sure to verify that appropriately sized circuit breakers are in place to handle the electrical load of your chiller. The ampacity is provided for each chiller unit in the Specifications section of this document along with recommendations for sizing your circuit breaker. The cross-sectional wire sizing to be used for the power connections is a product of the chiller unit's ampacity and the length of wire needed. Consult an electrician for more information on power wire sizing and connection.

Plumbing

IMPORTANT: You must use a mixture of Propylene Glycol and water in your reservoir. Your reservoir should contain 30% Propylene Glycol to 70% water (minimum), and contain up to 50% Propylene Glycol to 50% water (maximum). We recommend a 30%/70% mixture for optimum cooling efficiency. A 50%/50% mixture is necessary when outdoor temperatures fall below 20°F (-7°C). Failure to use an appropriate amount of Propylene Glycol may result in degradation of system performance and/or damage to the chiller unit which is not covered under warranty. **DO NOT** use standard car antifreeze in the Surna Chiller System (Ethylene Glycol).

Reservoir size is dependent on the type and amount of equipment being cooled. If your chiller is properly sized, a reservoir size of greater than 50 gallons per 10 Tons of cooling is rarely necessary, although larger reservoirs will result in longer cycle times.

Depending on the size of your unit, the plumbing connections will come in either 1" or 3/4" connections. Refer to the Specifications section in this document for information on your chiller's plumbing inlet/outlet connections. It is our recommendation that you use tubing that is sized 1/4" larger than the provided plumbing connections on your specific chiller unit (use an appropriate adapter for connection to the chiller). This is to ensure maximum water flow without restriction.

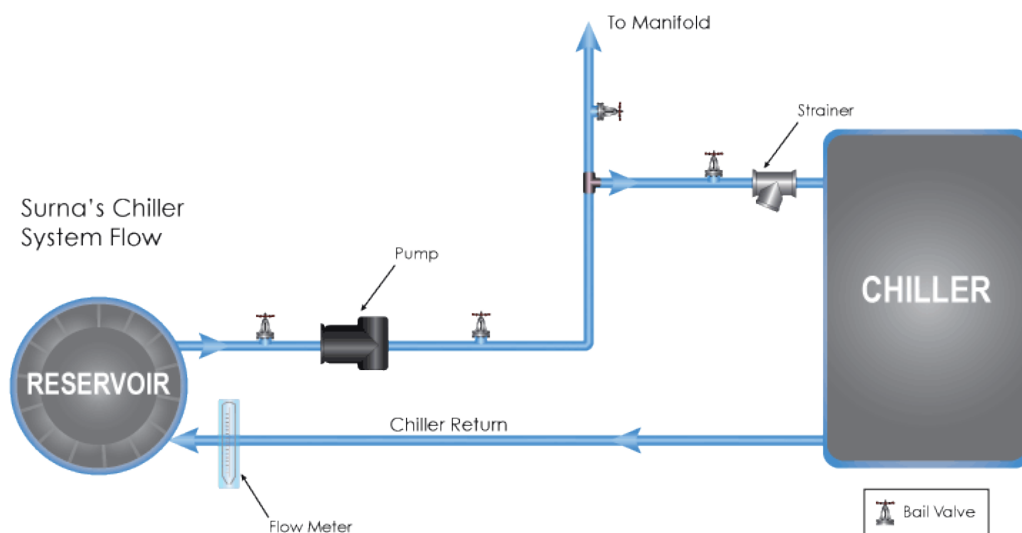
Be sure to install the water connections to the appropriately labeled "WATER IN" and "WATER OUT" ports on the chiller unit. This equipment will not function if these connections are reversed.

Important Plumbing Tips

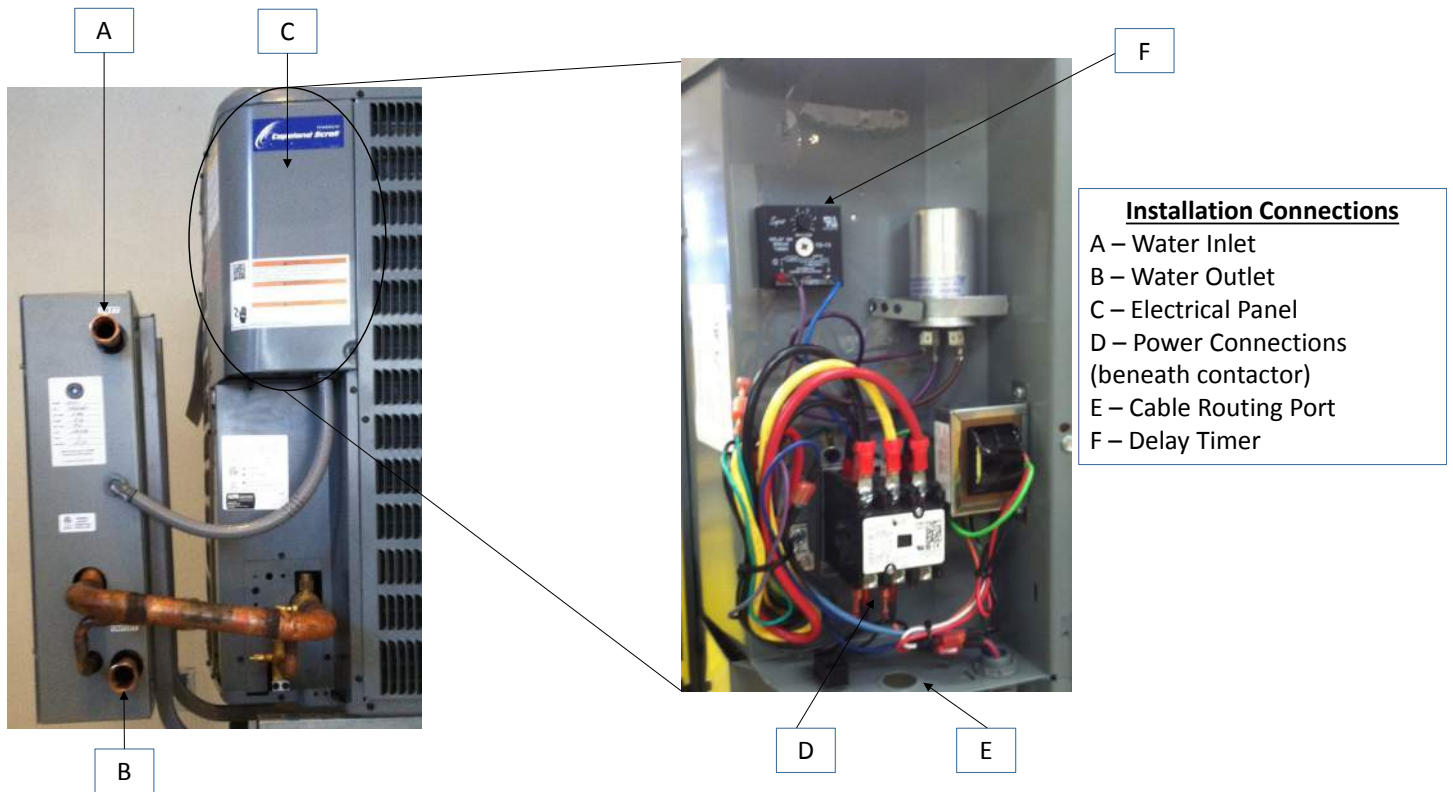
- ALWAYS use a backup wrench when installing water fittings. Failure to do so can cause damage to the copper lines, which is not covered under warranty.
- ALWAYS use the brass strainer that is provided with the unit. This strainer should be installed on the supply line water connection and is meant to prevent particles from entering the heat exchanger so as to maintain optimum water flow and efficiency.
- Periodically check the strainer to verify that the chiller is receiving the desired water flow. We recommend installing in-line water valves both before and after the strainer. This will allow you to inspect the strainer regularly without losing Glycol.
- If 90 degree bends are required in your layout, we recommend using long-turn 90's or flexible spa tubing to prevent restriction of water flow. Spa tubing can be glued with PVC glue or PVC fitting. In either case, we recommend using piping/tubing that is sized 1 size larger than the chiller water connections provided.
- Your chiller requires a flow rate of 2.5 GPM/ton (i.e. 5 GPM for a 2 ton chiller, 25 GPM for a 10 ton chiller, etc.). Failure to ensure adequate water flow through the chiller may result in system degradation, damage to the evaporator, and/or damage to the compressor.
- The chiller is provided with an appropriate flow meter for your system so that you can verify adequate flow through the chiller. Always install this meter INDOORS where it can be easily monitored. Maintaining proper flow rates through your chiller is critical to the efficiency of the unit and to prevent damaging the evaporator.
- The proper pump sizing will vary based on water line lengths, equipment being pumped to, lift rates, etc. Please contact Surna for more details on properly sizing your pump.

Flow Diagram

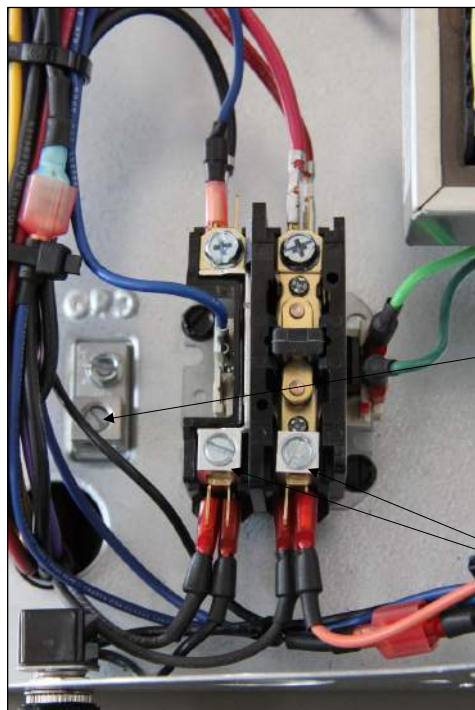
Single pump layout. Consult Surna if your layout requires multiple pumps or chillers.



Installation Connections



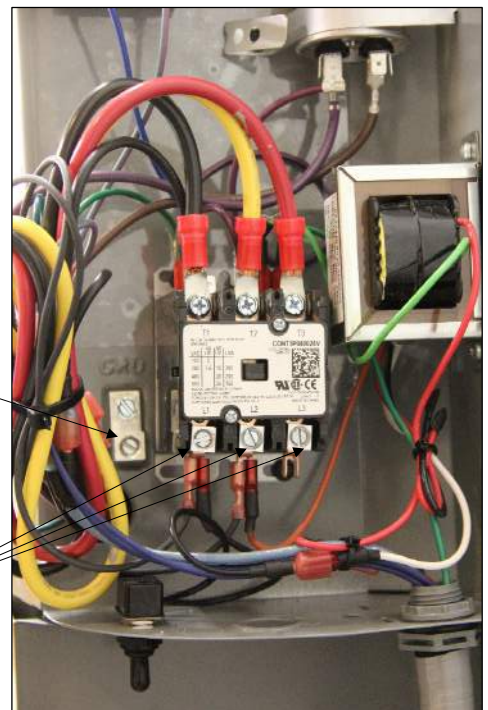
2, 3.5 & 5-Ton Power



Grounding

Power Connectors

7.5 & 10-Ton Power



NOTE: If the compressor makes an unusual noise after applying 3-Phase power (7.5 and 10-ton units), you have installed the power wiring backwards. Shut the unit off immediately, shut the electric supply off at the breaker, and reverse any 2 of the 3 line conductor wires.

Operation Instructions

Temperature Settings

After you have made all of the appropriate electrical and plumbing connections per the instructions provided above, you may power on the chiller unit and set your desired temperature using the following procedure:

- Turn the chiller on using the switch on the temperature controller.
- Press "Set" once: Choose Celsius or Fahrenheit using up or down arrows.
- Press "Set" twice: Using the up and down arrows, set your desired chiller temperature set point (NEVER set this below 45°F / 7°C)
- Press "Set" three times: This is your temperature differential and should NEVER be changed from the factory preset of 3 degrees. Reducing this will cause rapid cycling of the chiller's compressor, which will shorten the life-span of the unit. Increasing this number could lead to temperature spikes.
- Press "Set" four times: This should always read "C1" per the factory preset. If this menu reads anything other than "C1," the chiller will not function.
- All other settings should never be changed from the factory presets.
- When using the chiller unit with water-cooled air handlers: Start the chiller temperature at 55°F (13°C) and adjust up or down based on cooling and dehumidification needs. NEVER set this temperature below 45°F (7°C).
- When using your chiller with other water-cooled devices, such as Ice Boxes or Cool Coils: Start the chiller temperature at 65°F (18°C) and adjust up or down based on cooling needs. NEVER set this temperature below 45°F (7°C).

System Maintenance Instructions and Recommendations

- ALWAYS maintain a clean condensing coil for maximum efficiency. Chiller units located indoors will need to be cleaned often due to dust build-up. Units located outdoors are often washed by rainfall.
- ALWAYS maintain 24" of clearance on all sides of the unit and an unobstructed clearance on the top of the unit. Make sure the unit has plenty of fresh air available for heat exchange. We recommend outdoor use.
- DO NOT use the chiller indoors without proper ventilation. If temperatures in the room reach 100°F (38°C), the room is not properly ventilated.
- If using the chiller in an environment with freezing ambient temperatures, a compressor heater is needed to prevent the compressor from freezing. Damage caused due to failure to use a compressor heater is not covered under warranty. The compressor heater can be installed at the factory, or be purchased aftermarket and be installed on-site by a qualified technician.
- ALWAYS provide a minimum of 2.5 GPM (Gallons per Minute) per ton of chiller capacity to prevent freezing of the evaporator and to achieve optimum system performance.
- ALWAYS install the strainer/filter provided with the equipment to prevent debris from clogging the heat exchanger.
- We strongly recommend a 50%/50% (glycol/water) mixture to operate your chiller system under optimum conditions. At a minimum, a 30%/70% (glycol/water) mixture must be used for chiller operation. Not using the prescribed

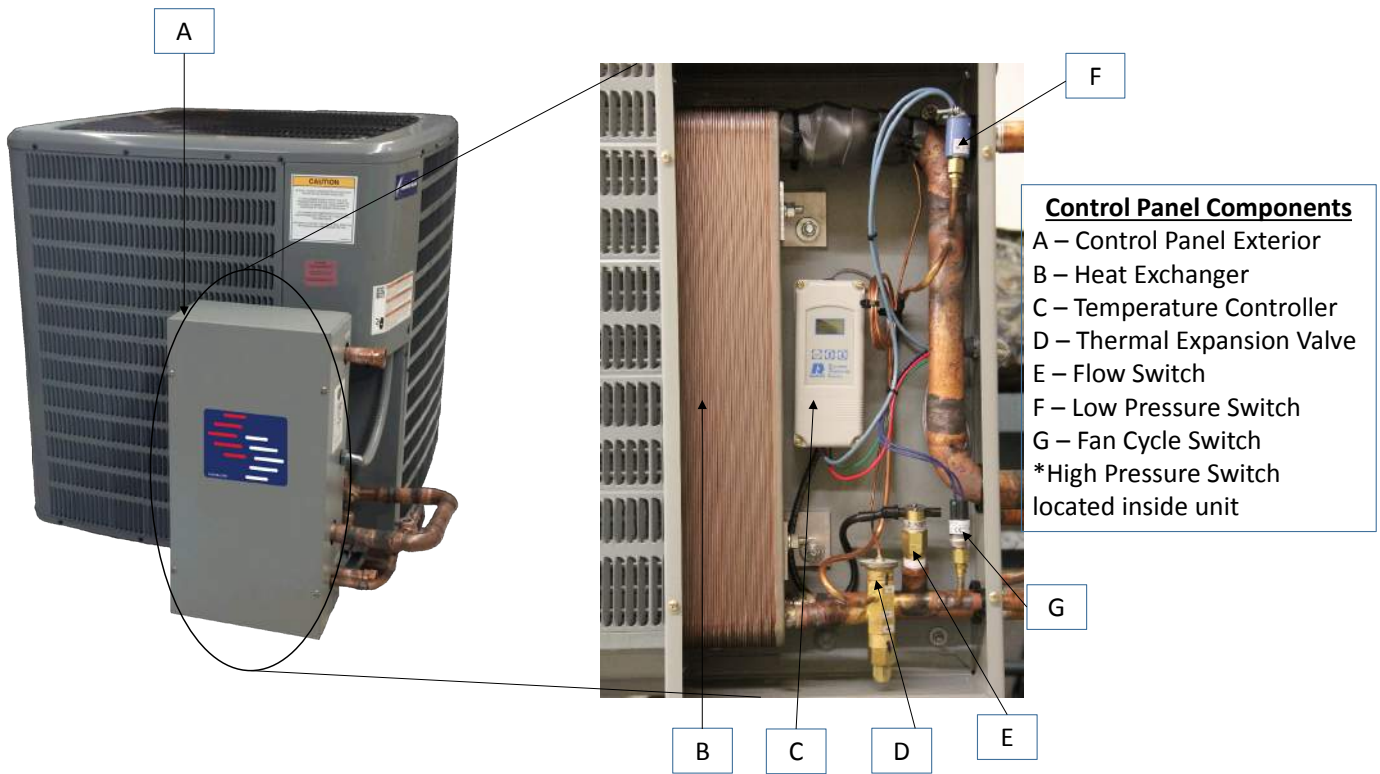
glycol/water mixture may cause system inefficiencies or damage to the evaporator, which is not covered under warranty.

- NEVER set the chiller below 45°F (7°C) or risk freezing the evaporator, which is not covered under warranty.
- Only use properly sized breakers and wiring with an appropriate ampacity or damage to the compressor could occur. The further the unit is away from the breaker box, the larger the wire gauge must be to carry sufficient amperage when the compressor starts. Damage caused by improper wiring is not covered under warranty. Please consult with a qualified electrician for more information on proper breaker and wire sizing if you are not sure.
- Chillers must be installed on concrete or an A/C condenser pad. Failure to do so can cause the condenser to become dirty sooner from splashing dirt and debris when it rains. This will also cause premature rusting of the chiller base where it contacts the ground.
- Proper voltage must always be maintained. Consult the System Specification section of this document for more information.

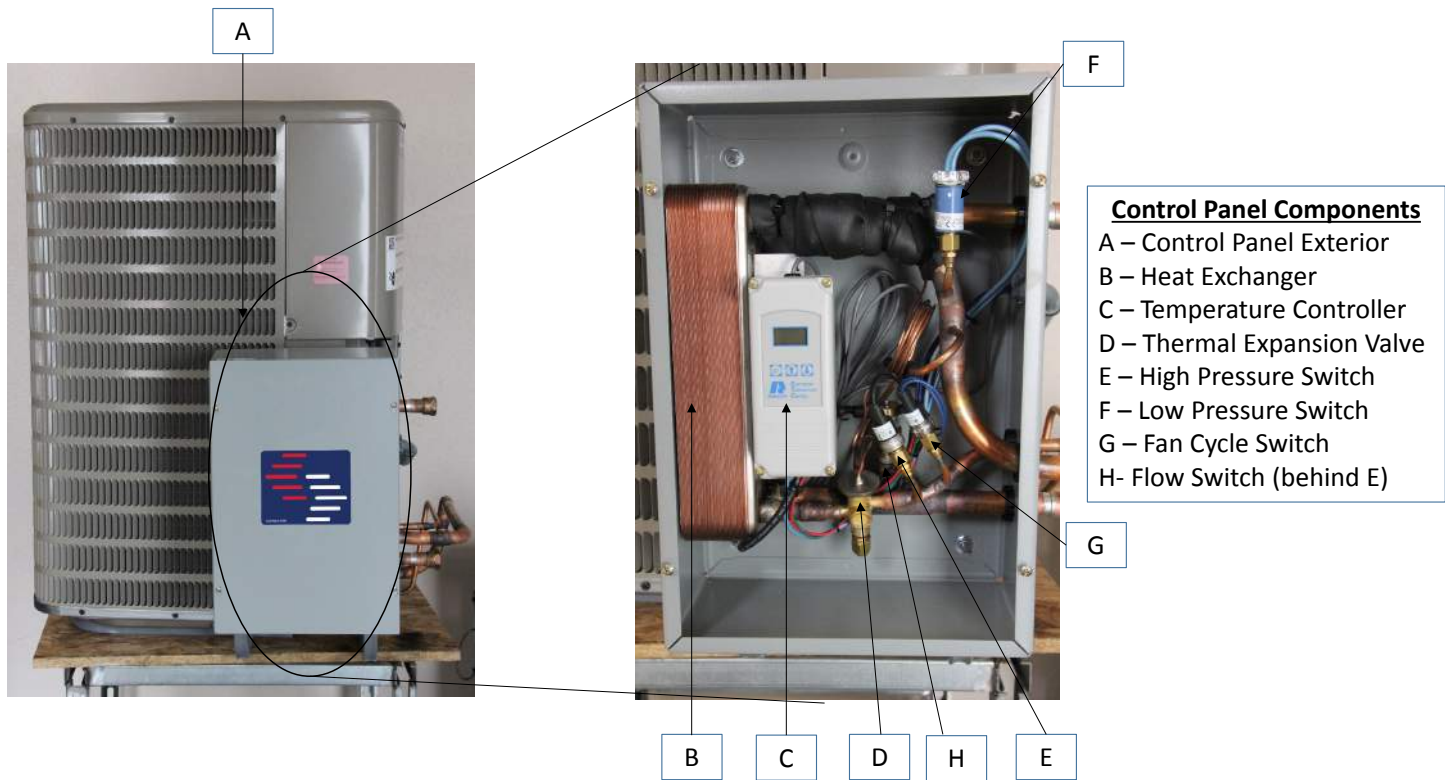
System Specifications

Surna Commercial Chiller System Specifications					
Model Number	24-1	42-1	60-1	90-3	120-3
Description	2-Ton Chiller	3.5-Ton Chiller	5-Ton Chiller	7.5-Ton Chiller	10-Ton Chiller
Dimensions					
Length (inches)	32	35	38	45	45
Width (inches)	28	30	35	40	40
Height (inches)	28	28	41	39	39
Weight (lbs)	165	240	260	350	355
Operating Characteristics					
Nominal Cooling Capacity (BTU/hr)	24,000	42,000	60,000	90,000	120,000
EER	11.0	11.0	11.0	11.2	11.2
Decibels	75	78	77	84	84
Compressor					
Number of Compressors	1	1	1	1	1
RLA	13.5	14.1	25.0	25	30.1
LRA	58.3	77.0	134	164	225
Phase	1	1	1	3	3
Condenser Fan Motor					
Number of Fans	1	1	1	1	1
Horsepower	1/8	1/4	1/4	1	1
FLA	0.7	1.1	1.5	5.6	5.6
Phase	1	1	1	1	1
Cooling System					
Water Line In	3/4" FNPT	3/4" FNPT	3/4" FNPT	1" FNPT	1" FNPT
Water Line Out	3/4" FNPT	3/4" FNPT	3/4" FNPT	1" FNPT	1" FNPT
Flow Rate (GPM)	5	8.75	12.5	18.75	25
Approved Liquids	Water/Propylene Glycol	Water/Propylene Glycol	Water/Propylene Glycol	Water/Propylene Glycol	Water/Propylene Glycol
Refrigerant Type	R410A	R410A	R410A	R410A	R410A
Refrigerant Charge	As Labeled	As Labeled	As Labeled	As Labeled	As Labeled
Electrical Data					
AC Volts	208/230	208/230	208/230	208/230	208/230
Hz	60	60	60	60	60
Minimum Circuit Ampacity (A)	17.6	19.1	32.8	36.9	43.2
Maximum Overcurrent (A)	30	30	50	60	70

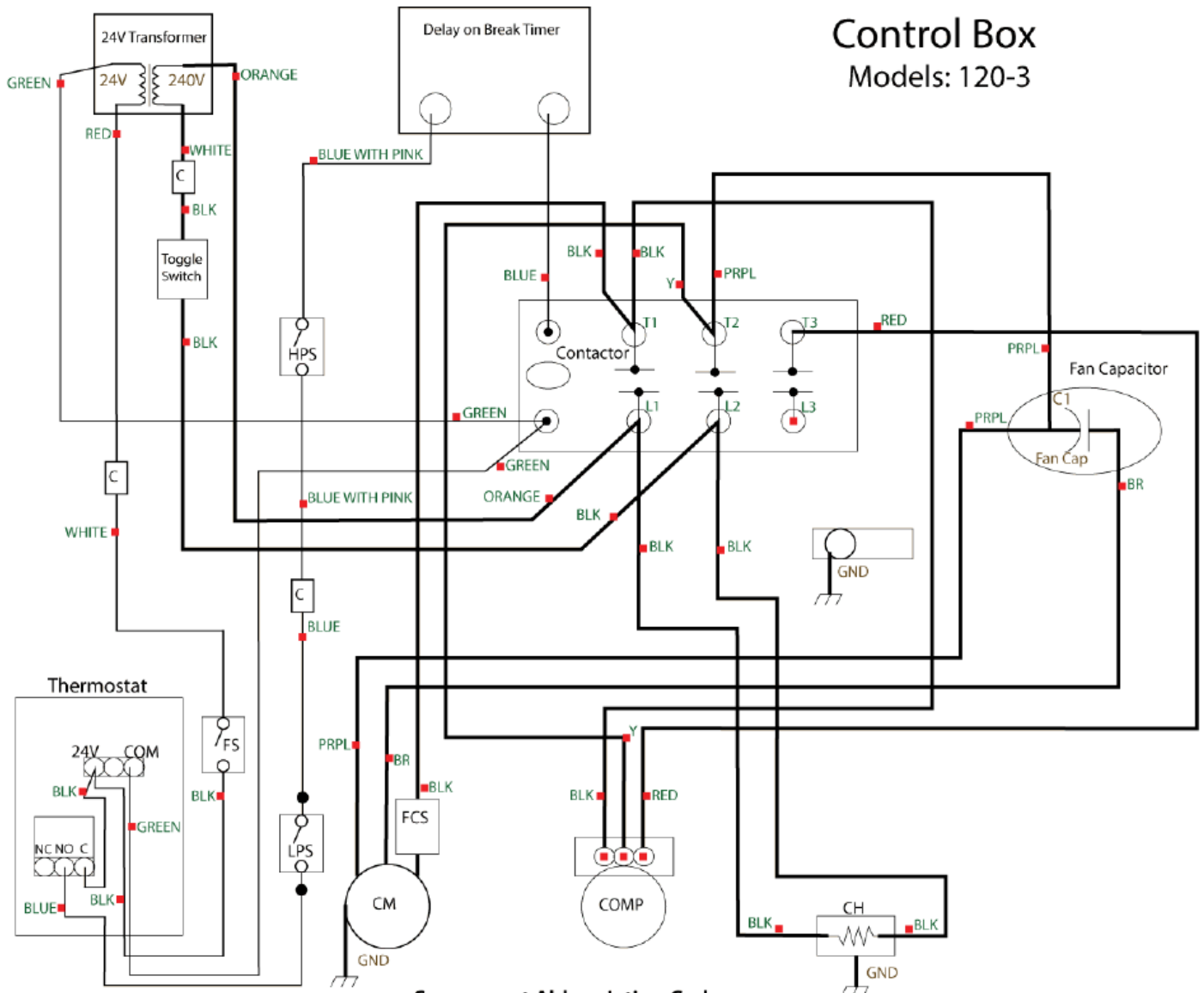
10-Ton Chiller Chiller Control Panel Connections



5-Ton Chiller Control Panel Connections



10-ton Chiller Wiring Diagram



Control Box
Models: 120-3

Component Abbreviation Code:

- C ----- Connector
- CH ----- Crankcase Heater
- CM ----- Outdoor Fan Motor
- COMP - Compressor
- FCS ----- Fan Cycle Pressure Switch
- FS ----- Flow Switch
- HPS ----- High Pressure Switch

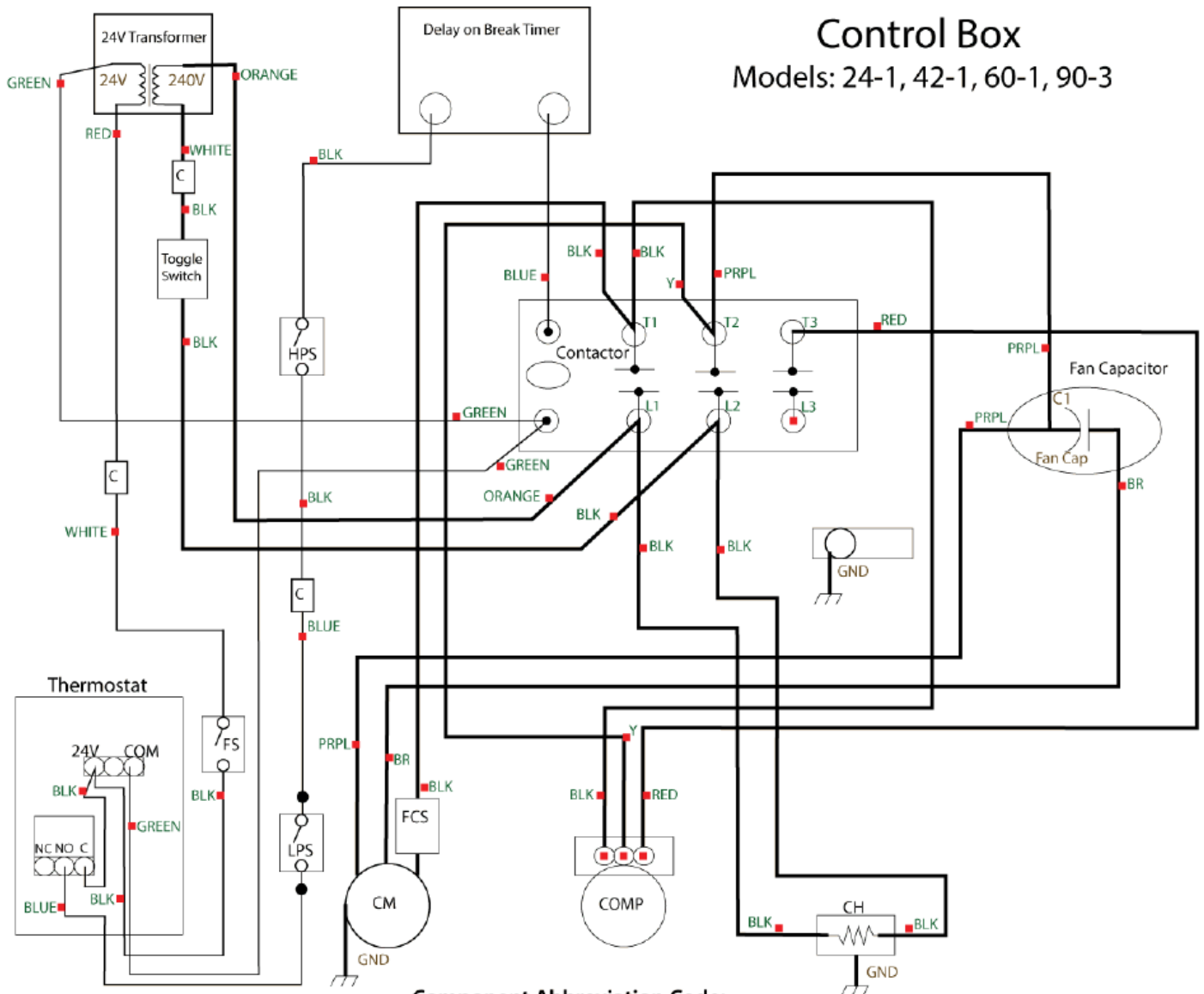
Color Code:

- BLK --- Black
- BR --- Brown
- Y ----- Yellow
- PRPL -- Purple

Wiring Code:

- Low Voltage
- High Voltage

2-7.5 ton Chiller Wiring Diagram



Control Box
Models: 24-1, 42-1, 60-1, 90-3

Component Abbreviation Code:

- C ----- Connector
- CH ----- Crankcase Heater
- CM ----- Outdoor Fan Motor
- COMP - Compressor
- FCS ----- Fan Cycle Pressure Switch
- FS ----- Flow Switch
- HPS ----- High Pressure Switch

Color Code:

- BLK --- Black
- BR --- Brown
- Y ----- Yellow
- PRPL -- Purple

Wiring Code:

- Low Voltage
- High Voltage

Troubleshooting

This unit is equipped with safety sensors that may include high and low pressure sensors for the refrigeration circuit and also a flow switch to help prevent freezing if there is a pump failure or other loss of flow. If any of these sensors are not satisfied, they will not allow the chiller to function.

Some of the troubleshooting steps listed below can be performed by the end user, and some of these steps must be performed by a licensed HVAC technician. Retain this guide should your chiller ever require servicing in the future.

Temperature controller has no power

1. Check and make sure switch is in the on position.
2. Check breaker for proper function.
3. Check flow meter for adequate water flow (2.5 GPM per ton). Insufficient flow will cause loss of power.
4. **QUALIFIED SERVICE PERSONNEL ONLY:** Check flow for proper voltage at the unit with an electric volt-meter.
5. Visually check for any loose wires.
6. **QUALIFIED SERVICE PERSONNEL ONLY:** Remove the front cover of the temperature sensor and check voltage. If 24 VAC is present, and all wires are installed and tight, then most likely the controller will need to be replaced. If no voltage is present, see the next step.
7. The controller is wired so that it will not come on if there is not sufficient water flow to the unit. If there is no voltage at the controller, check the flow and verify that the chiller is receiving at least 2.5 GPM for each ton of cooling required. If there is sufficient flow, see the next step.
8. Check connections of the flow sensor (the flow sensor is installed in the water line) to make

sure you are getting 24VAC across the sensor while sufficient water is flowing. If there is no voltage across the sensor leads with a proper flow-rate, then the sensor needs to be replaced.

9. Check the direction of flow in the water circuit. If water is flowing backwards, the flow switch will not allow power to the temperature controller, and the unit will not function properly.

Temperature controller is on, but the unit will not start

1. The unit has a 5-minute delay on start-up before beginning normal operation. Before troubleshooting, ensure that 5 minutes have passed.
2. Check the temperature set-points of the controller to verify that the desired settings are still in place. The factory differential temperature should be 3 degrees, and shouldn't be changed. For example, with the factory set differential temperature setting of 3 degrees, and a desired temperature setting of 45°F (8°C), the unit will not start until the water reaches 48°F (9°C).
4. Check to make sure the controller is set to C1.
5. **QUALIFIED SERVICE PERSONNEL ONLY:** Check voltage at contactor (spade terminals on each side), which should be 24VAC while the temperature controller is calling for cooling, then check for a loose wire on the controller. If none are found, check for power at the relay inside the controller. If you have power there the other cause would be a tripped high/low pressure sensor, in which case an HVAC technician will need to service your unit. He/she should check the refrigeration pressures with a gauge set to verify that there is not a problem with system pressures. If no problems are found with pressure, then the high/low pressure sensor may need to be replaced.
6. **QUALIFIED SERVICE PERSONNEL ONLY:** Check the voltage across the ENDS of the main contactor with a meter. This should be 240VAC

on each side when the temperature controller is calling for cooling. If there is not 240VAC on each side, the contactor is malfunctioning and needs to be replaced.

7. **QUALIFIED SERVICE PERSONNEL ONLY:** If there is voltage across the contactor when the temperature controller is calling for cooling and the compressor, fan, or both are not coming, the capacitor could be malfunctioning and needs to be replaced. Check voltage across the capacitor to verify. Bulging capacitors are an indication of a problem.

8. If both the compressor and fan are not engaging, then the problem is almost certainly an easily replaced bolt on component, and not with the fan or compressor themselves. If one of the two components is not running after these troubleshooting steps have been attempted, there could be a problem with one of those components and they may need to be replaced. The fan motor is simple to replace and can be done by the end user after all power has been disconnected from the unit. If compressor replacement is required, a licensed refrigeration technician must complete the associated repairs.

9. **QUALIFIED SERVICE PERSONNEL ONLY:** If the refrigerant charge of the unit is in question, the best avenue for checking this is to recover and weigh the charge. The amount of refrigerant in the system is written on the product label. Pressures are an unreliable indicator of proper charge.

Fan turns on & off even though the compressor is running

1. The unit is equipped with a fan cycle switch, in which case the fan will come on only when absolutely needed. The cycling of the fan is most common in cooler weather.



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