COMMERCIAL/ RESIDENTIAL 2-10 TON CHILLER

OPERATING AND MAINTENANCE MANUAL

Models: 1-24-01, 1-36-01, 1-60-01, 1-84-01, 1-120-01, 1-120-02
August 2017

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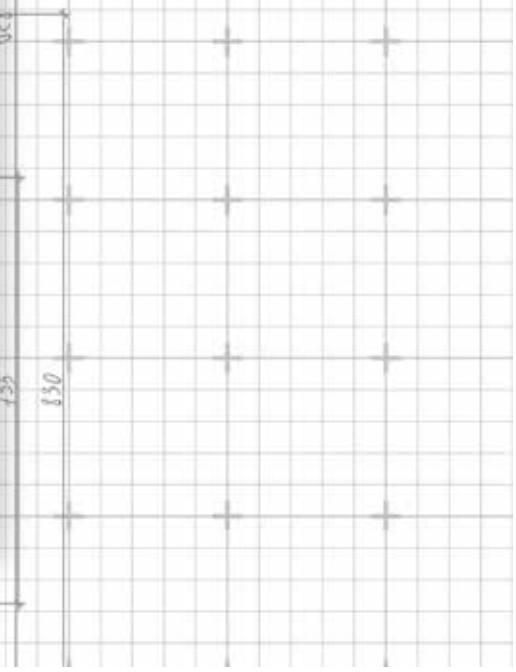

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SPECIFICATIONS

PHYSICAL	2 TON 1-24-14	3.5 TON 1-36-01	5T TON 1-60-01	7.5 TON 1-84-01	10 TON 1-120-01	10 TON 1-120-02
Length	32 in	35 in	38 in	45 in		
Width	28 in	30 in	35 in	40 in		
Height	28 in	28 in	41 in	39 in		
Weight	165 lbs	240 lbs	260 lbs	350 lbs	355 lbs	
ELECTRICAL						
Volts - Phase	208/230V Single Phase			208/230 V Three Phase		460/480V Three Phase
Compressor RLA	13.5A	14.1A	25.0A		30.1A	16.7A
Minimum Circuit Ampacity	17.6A	19.1A	32.8A	36.9A	43.2A	24.4A
Maximum Overcurrent Protection	30A		50A	60A	70A	40A
PERFORMANCE & MECHANICAL						
Nominal Cooling Capacity	24,000 BTU/hr	42,000 BTU/hr	60,000 BTU/hr	90,000 BTU/hr	120,000 BTU/hr	
Flow Rate	5 GPM	8.75 GPM	12.5 GPM	18.75 GPM	25 GPM	
Decibels	75	78	77	84		
Water Line In	3/4 in FNPT			1 in FNPT		
Water Line Out	3/4 in FNPT			1 in FNPT		
EER	11.0			11.2		

WARNINGS

DEFINITIONS

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

WARNING: Risk of death/serious injury if warning isn't heeded.

DANGER: Risk of death/serious injury if danger isn't avoided.

SAFETY SYMBOLS USED


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


WARNING: Potential electric shock hazard.


WARNING: High voltage


Protective Earth connection


Action prohibited

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.

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

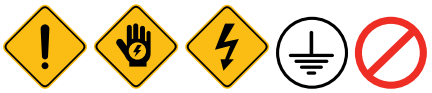
Only use parts provided with, or specified for use with, the Surna chiller equipment.

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. Surna recommends using a 50%/50% (glycol/water) mixture when outdoor temperatures fall below 20°F (-7°C). In all cases, maintain a minimum 30% propylene glycol by volume. Use only colored, USP food grade propylene glycol.

DO NOT use the Surna chiller indoors.

DO NOT operate the Surna chiller without adequate water flow. Process fluid must be supplied at 2.5 GPM per nominal cooling ton (i.e. 25 GPM for 10-ton chiller) to reduce the risk of freezing 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.

Chiller systems 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.

WARRANTY INFORMATION

Equipment manufactured by Surna ("Company"), the warranty shall exist for a period of twelve (12) months from initial start-up or eighteen (18) months from date of shipment, whichever period is shorter, against failure due to defects in material and/or manufacturing and warranted to the capacities and ratings set forth in Company's catalogs and bulletins ("Warranty").

Equipment, material, and/or parts that are not manufactured by Company are not warranted by Company and carry such warranties as may be extended by the respective manufacturer.

Exclusions from this Warranty include damage or failure arising from: wear and tear; corrosion, erosion, deterioration; modifications made by others to the Equipment; repairs or alterations by a party other than Company that adversely affect the stability or reliability of the Equipment; vandalism; neglect; accident; adverse weather or environmental conditions; abuse or improper use; improper installation; commissioning by a party other than Company; unusual physical, electrical or mechanical stress; lack of proper startup or maintenance as recommended by Company; operation with any accessory, equipment or part not specifically approved by Company; and/or refrigerant not recommended or supplied by Company.

Company shall not be obligated to pay for the cost of lost refrigerant or lost product or any other direct, indirect, or consequential damages. Company's obligations and liabilities under this Warranty are limited to furnishing replacement equipment or parts, at its option, FCA (Incoterms 2000) factory or warehouse (f.o.b. factory or warehouse for US domestic purposes) at Company-designated shipping point, freight allowed to Company's warranty agent's stock location, for all non-conforming Company manufactured Equipment which have been returned by Customer to Company.

Returns must have prior written approval by Company and are subject to restocking and replacement charges where applicable.

No warranty liability whatsoever shall attach to Company until Customer's complete order has been paid for in full and Company's liability under this Warranty shall be limited to the purchase price of the Equipment shown to be defective.

Additional warranty and service protection is available on an extra-cost basis and must be in writing and agreed to by an authorized signatory of the Company.

The warranty excludes: (a) labor, transportation and related costs incurred by the Dealer or Customer; (b) re-installation costs of repaired equipment; (c) re-installation costs of replacement equipment; (d) removal costs of equipment; (e) consequential damages of any kind; and, (f) reimbursement for loss caused by interruption of service.

EQUIPMENT MANUFACTURED BY COMPANY THAT INCLUDES A REQUIRED START-UP AND SOLD IN NORTH AMERICA WILL NOT BE WARRANTED BY COMPANY UNLESS COMPANY OR ITS AUTHORIZED AGENT PERFORMS THE EQUIPMENT STARTUP.

COMPANY MAKES NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, REGARDING PREVENTION OF MOLD/MOULD, FUNGUS, BACTERIA, MICROBIAL GROWTH, OR ANY OTHER CONTAMINATES.

EXCEPT FOR COMPANY'S WARRANTY EXPRESSLY SET FORTH HEREIN, COMPANY DOES NOT MAKE, AND HEREBY EXPRESSLY DISCLAIMS, ANY WARRANTIES, EXPRESS OR IMPLIED CONCERNING ITS PRODUCTS, EQUIPMENT OR SERVICES, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF DESIGN, MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, OR OTHERS THAT ARE ALLEGED TO ARISE FROM COURSE OF DEALING OR TRADE.

CHILLER ORDER

Below is a list of all parts provided with each Surna Chiller. The following are included with the order (quantities are dependent on individual order).

1. Surna commercial/residential chiller (2-10 tons)
2. Surna commercial/residential product manual
3. Brass wye strainer
4. Flowmeter: 2-20 GPM rotameter style

INSTALLATION INSTRUCTIONS

LOCATION

Provide rigid, non-warping mounting pads or a concrete foundation of sufficient strength and mass to support the total weight (including completed piping and full operating charges of refrigerant, oil, and water). Once in place, the unit must be level within ¼ inch (0.64 cm) over its length and width. Consult your local building codes and guidelines before attempting roof mounting.

Following installation, verify there is a minimum of 24 inches (60.96 cm) of clearance from obstruction on all sides and 7 feet (2.13 m) of clearance above the unit to ensure proper airflow over the condenser.

ELECTRICAL

All wiring must comply with local codes and the latest version of the National Electric Code (NEC). Electrical work should only be performed by licensed, qualified contractors. Ensure all conductors and circuit breakers are appropriately sized. Reference the **specifications** section in this document for electrical details.

PLUMBING

IMPORTANT: Chillers are designed to run on a mixture of propylene glycol and water. Maintain a minimum 30% propylene glycol by volume. A 50%/50% mixture is necessary when outdoor temperatures fall below 10°F (-12°C). Running the chiller with insufficient quantities of glycol can lead to damage, which is not covered by warranty. DO NOT use ethylene glycol in the Surna chiller system.

Depending on the size of your unit, the chilled water plumbing connections will be either ¾ inch (1.9 cm) or 1 inch (2.54 cm). Refer to the **specifications** section in this document for further details. When transitioning to PVC, larger pipe must be used. Contact Surna with questions on pipe sizing.

Be sure to install the water connections to the appropriately labeled "WATER IN" and "WATER OUT" ports on the chiller unit. The chiller 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. The strainer must be installed on the supply line water connection to prevent particles from entering and damaging the heat exchanger. Clean the strainer regularly to maintain optimum water flow.

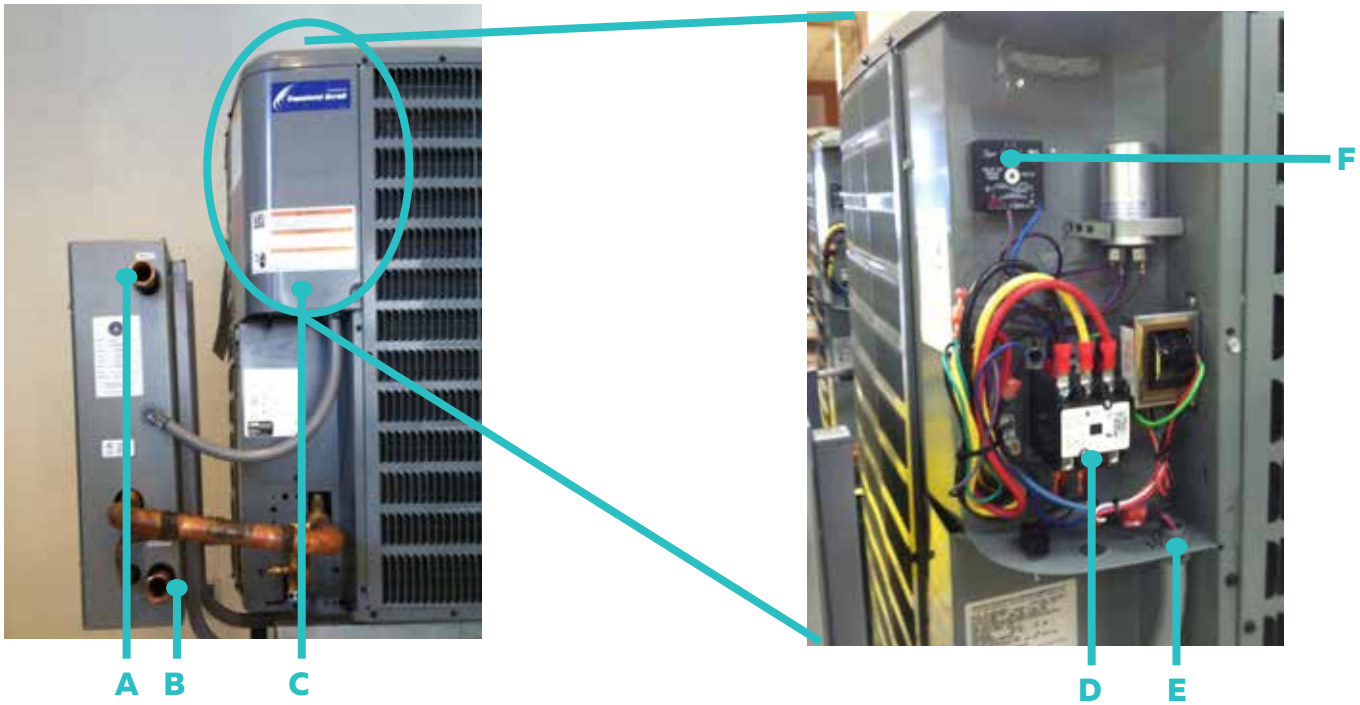
Periodically check the strainer to verify that the chiller is receiving the desired water flow. A decrease in flowrate could indicate a clogged filter. Isolate the flow to the chiller before opening the wye strainer to inspect or service.

Monitor chiller flowrate using a properly sized rotameter or vortex (turbine – type) flowmeter. Chiller flow should be within 25-75% of device full scale range.

Process fluid must be supplied to the chiller at a rate of 2.5 GPM per nominal cooling ton. Improper flow can lead to permanent equipment damage and/or reduced cooling performance.

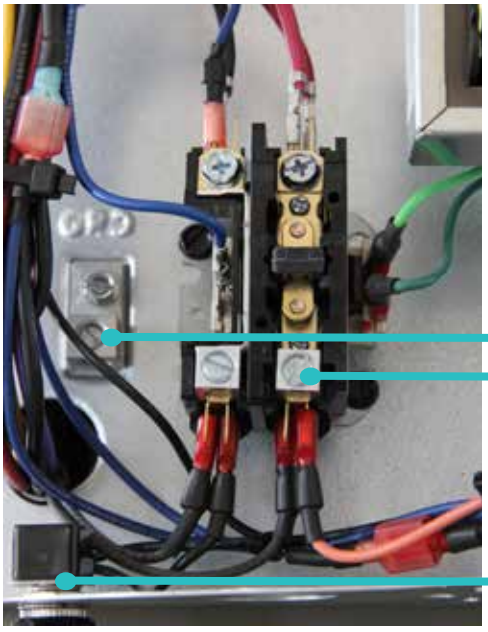
The proper pump sizing depends on many factors and is critical to system operation and reliability. Please contact Surna for more details on properly sizing your pump.

INSTALLATION CONNECTIONS

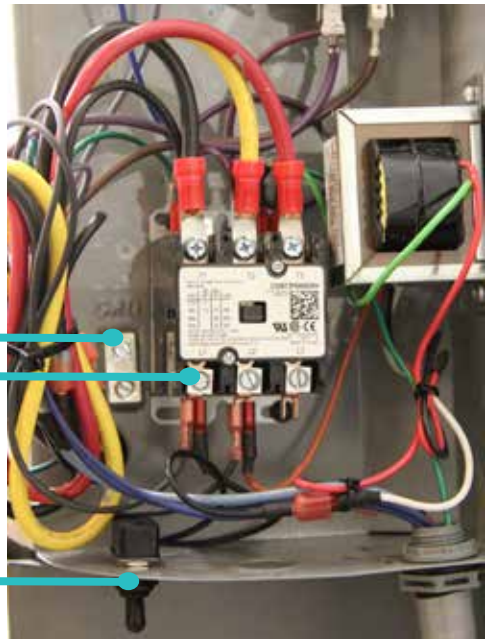


A - Water Inlet	B - Water Outlet	C - Electrical Panel	D - Power Connections
E - Cable Routing Port	F- Delay Timer	G - Grounding	H - Power Connection (On/Off Switch)

2- to 5-Ton Units



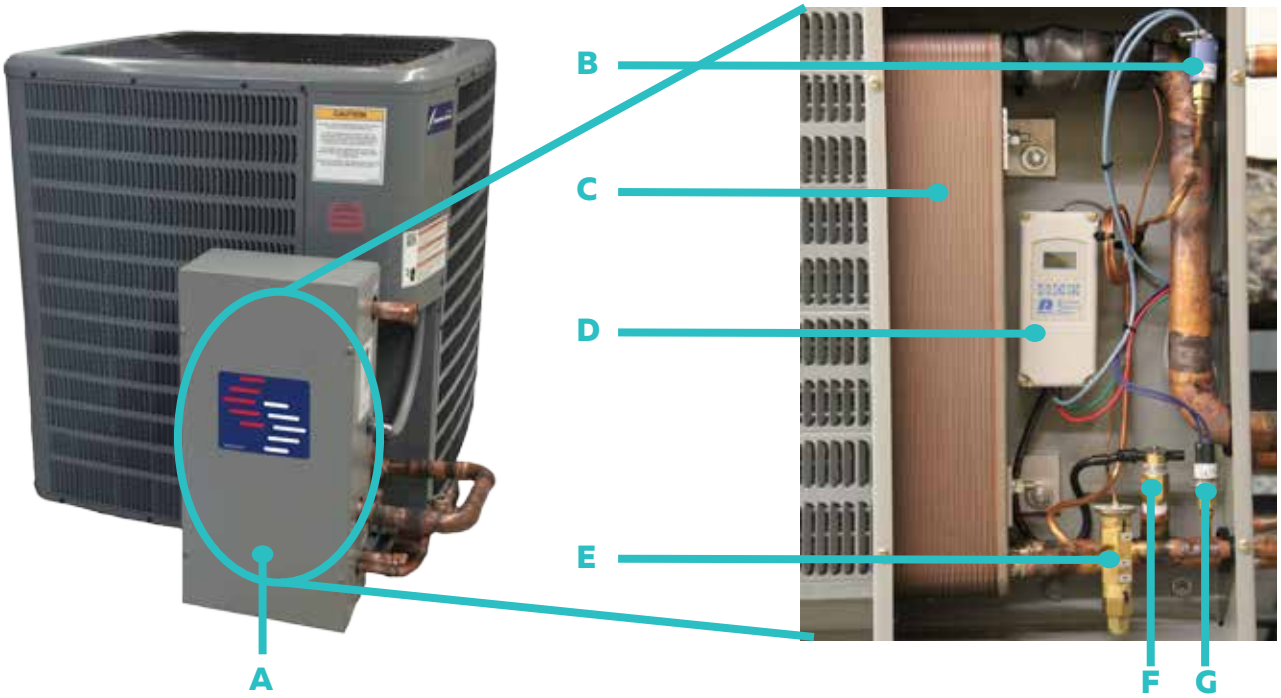
7.5- & 10-Ton Units



NOTE: If the compressor makes an unusual noise after applying 3-Phase power (10-ton 480V), the power wiring has been installed backwards. Shut the unit off immediately, shut the electric supply off at the breaker, and reverse any 2 of the 3 line conductor wires.

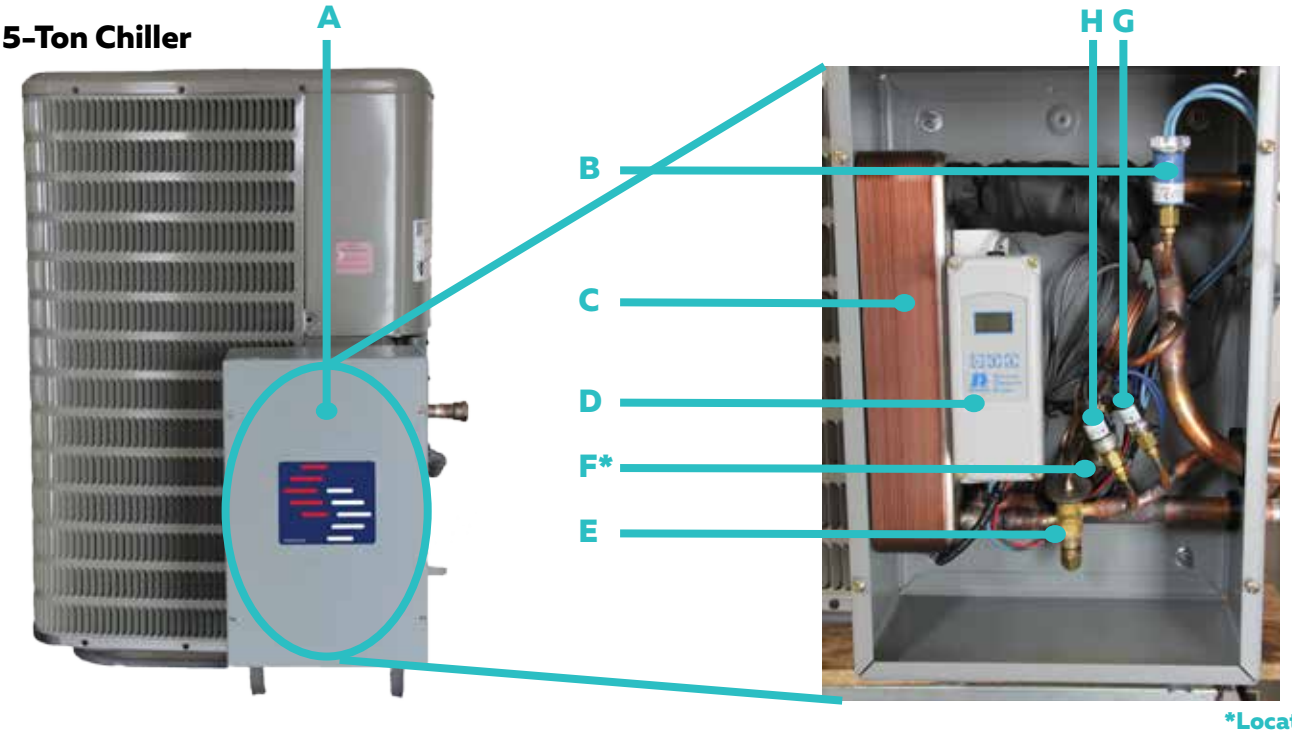
CONTROL PANEL CONNECTIONS

10-Ton Chiller



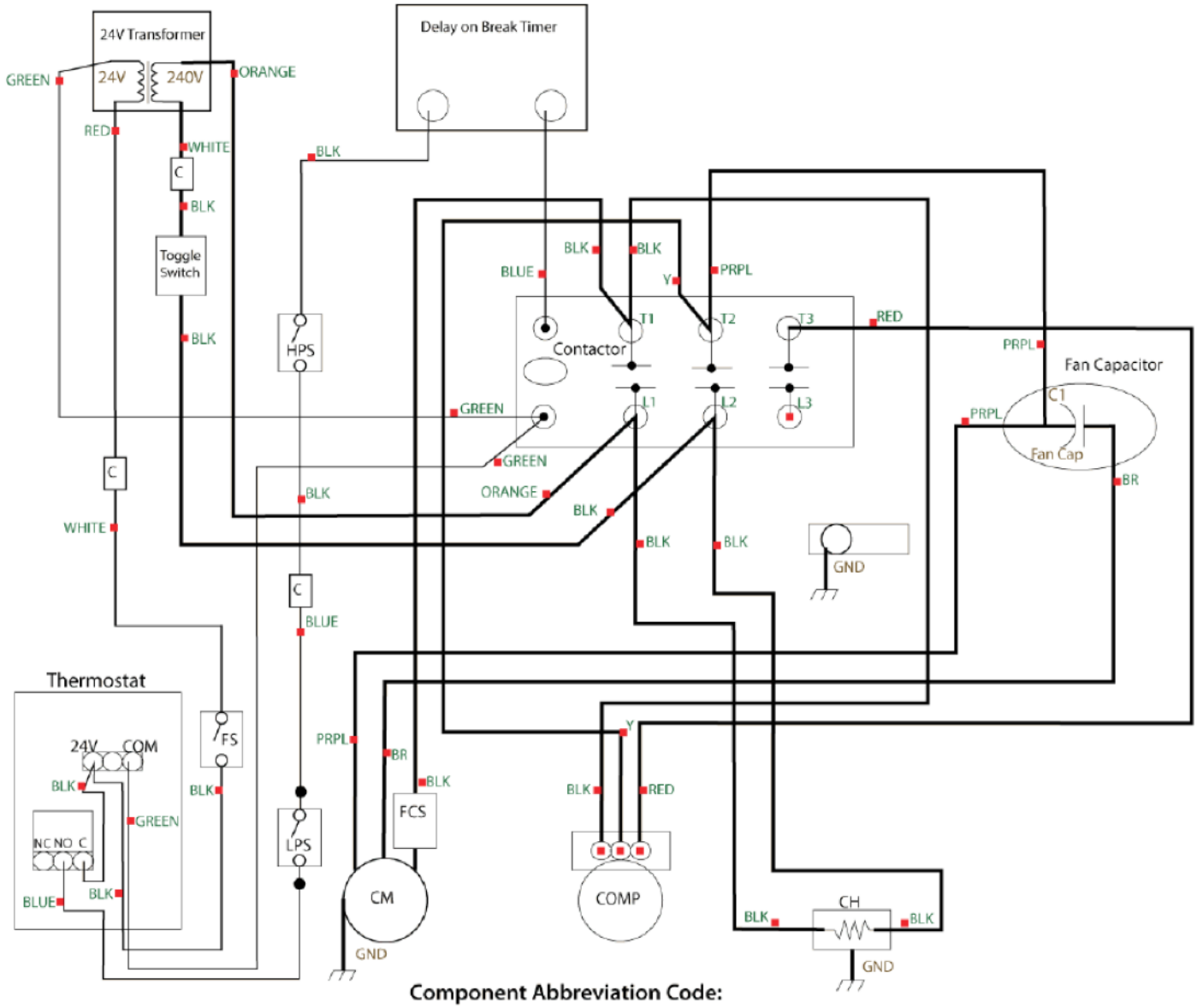
A - Control Panel Exterior	B- Low Pressure Switch	C - Heat Exchanger	D - Temperature Controller
E - Thermal Expansion Valve	F - Flow Switch	G - Fan Cycle Switch	H - High Pressure Switch

5-Ton Chiller



*Located behind H

2- TO 7.5-TON WIRING DIAGRAM



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 Swtich

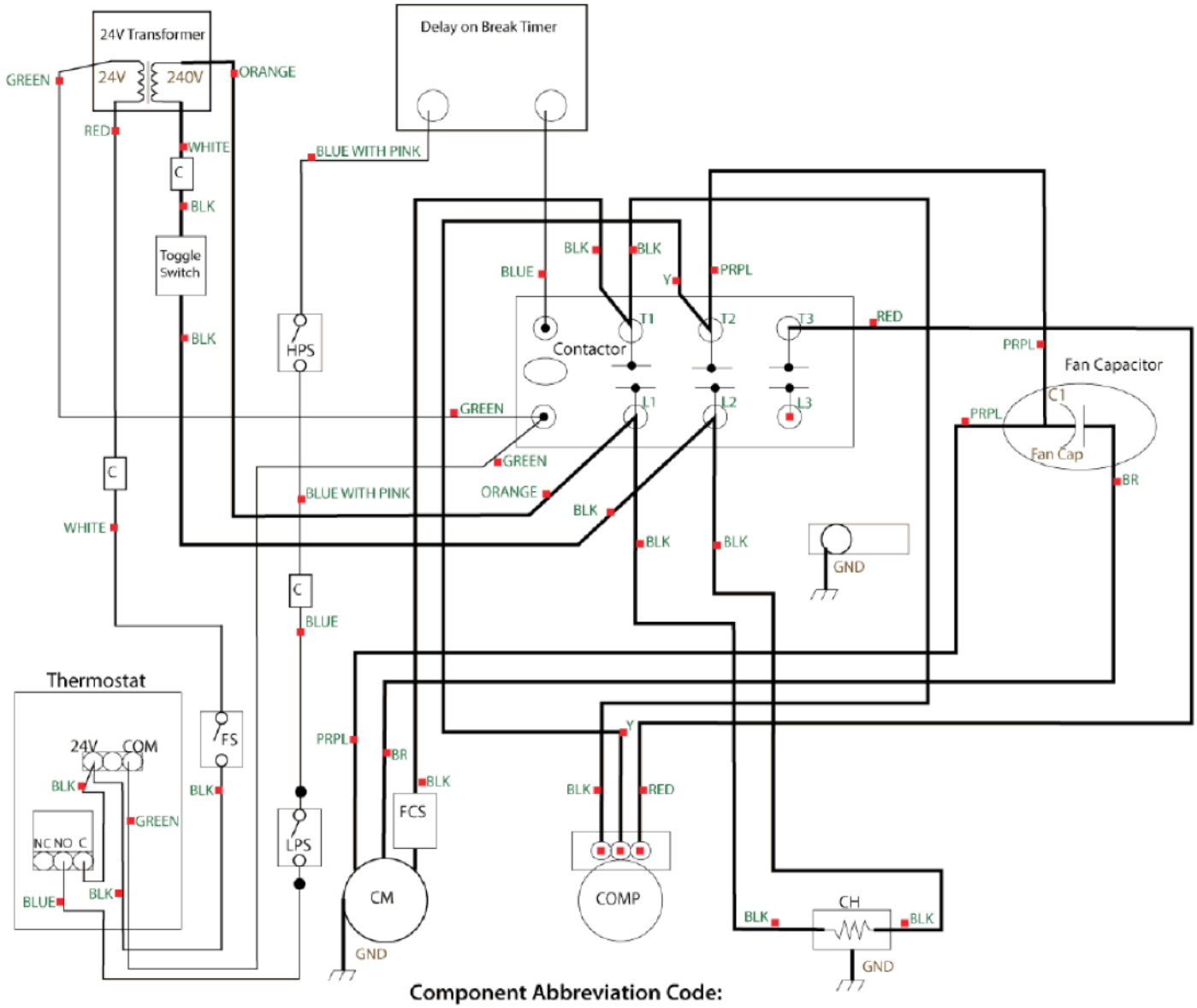
Color Code:

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

Wiring Code:

Low Voltage
High Voltage

10-TON WIRING DIAGRAM



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Wiring Code:

—— Low Voltage
▬▬ High Voltage

OPERATION INSTRUCTIONS

TEMPERATURE SETTINGS

After chiller electrical and plumbing connections are completed, power on the chiller unit and set desired temperature as follows:

1. Turn the chiller on using the power switch- see H on **installation connections** diagram.

2. Press "Set" once: Choose Celsius or Fahrenheit using up or down arrows.

3. Press "Set" twice: Using the up and down arrows, set chiller exiting water temperature. Recommended set point is 55°F (12°C).

4. Press "Set" three times: This is the temperature differential. It is factory preset at 3 degrees and should not be changed without consulting Surna.

5. Press "Set" four times: This is the mode; it is factory preset to "C1" and will not function in any other mode.

All other settings should never be changed from the factory presets.

CONTACT US

Contact Surna via email at support@surna.com or via phone at 303.993.5271.

ROUTINE MAINTENANCE

SYSTEM INSTRUCTIONS AND RECOMMENDATIONS

No.	Equipment	Task Description for Chillers	Frequency*
1	Chiller	Check wye strainer for particulates and/or debris. Clean as needed to ensure proper operation.	Q1, SA, Q3, A
2	Chiller	Verify chiller flow rate to achieve optimal energy efficiency. Advise on adjustments or repairs to restore proper flow ensuring proper operation.	Q1, SA, Q3, A
3	Chiller	Perform chemical testing of system water. Advise on treatment to ensure proper water chemistry and freeze protection.	Q1, SA, Q3,A
4	Chiller	Check for evidence of improper operation. Advise on replacement components as needed to ensure proper operation.	Q1, SA, Q3, A
5	Chiller	Visually inspect fan blades and shroud for any signs of damage or excessive wear. Advise on adjustments or repairs to ensure proper operation.	Q1, SA, Q3, A
6	Chiller	Visually inspect condenser coil for buildup of particulates and/or debris. Clean coil as needed to restore optimal energy efficiency. Advise on repairs to ensure proper operation.	SA, A
7	Chiller	Check system temperatures. If outside of recommended operating levels, find cause. Advise on necessary adjustments and/or repairs to ensure proper operation and optimal energy efficiency.	SA, A
8	Chiller	Check control box for dirt, debris, loose connections, and signs of damage. Clean, tighten as needed, advise on repairs to ensure proper operation.	A

*Legend**	
Q1	First Quarter
SA	Semi-Annually
Q3	Third Quarter
A	Annually

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 detect a problem, 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.

TEMPERATURE CONTROLLER HAS NO POWER

1. Ensure 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. Visually check for any loose wires.

THE FOLLOWING STEPS SHOULD BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY

5. Check flow for proper voltage at the unit with an electric volt-meter.
6. Remove the front cover of the temperature sensor and check voltage. If 24 VAC is presen and all wires are installed and tight, the controller may need to be replaced. If no voltage is present, see step 7.
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 step 8.
8. Check connections of the flow sensor (the flow sensor is installed in the water line) to verify there is 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 CHILLER 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 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).
3. Check to make sure the controller is set to C1.

THE FOLLOWING STEPS SHOULD BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY

4. Check voltage at contactor (spade terminals on each side) which should be 24VAC while the temperature controller is calling for cooling. Check for a loose wire on the controller. If none are found, check for power at the relay inside the controller. If relay inside the controller has power, unit may have tripped a 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 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.
5. 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.
6. If there is voltage across the contactor when the temperature controller is calling for cooling and the compressor, fan (or both) are not coming on, the capacitor may be malfunctioning and should be replaced. Check voltage across the capacitor to verify. Bulging capacitors are an indication of a problem.
7. If both the compressor and fan are not engaging, then the problem may be an easily replaceable 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 may be a problem with one of those components and they may need to be replaced. The fan motor is easily replaceable 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.
8. If the refrigerant charge of the unit is in question, recover and weigh the charge. The amount of refrigerant required in the system is written on the product label. Pressures are an unreliable indicator of proper charge.

FAN TURNS ON & OFF EVEN THOUGH COMPRESSOR IS NOT RUNNING

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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