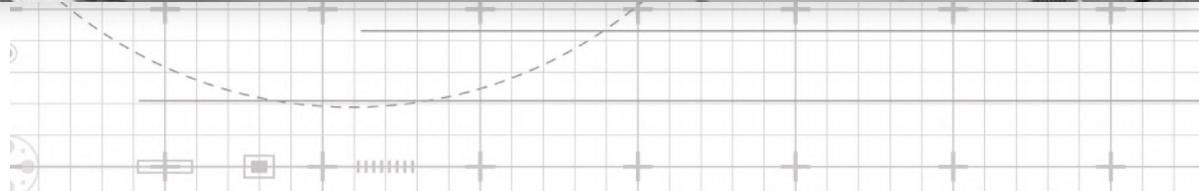
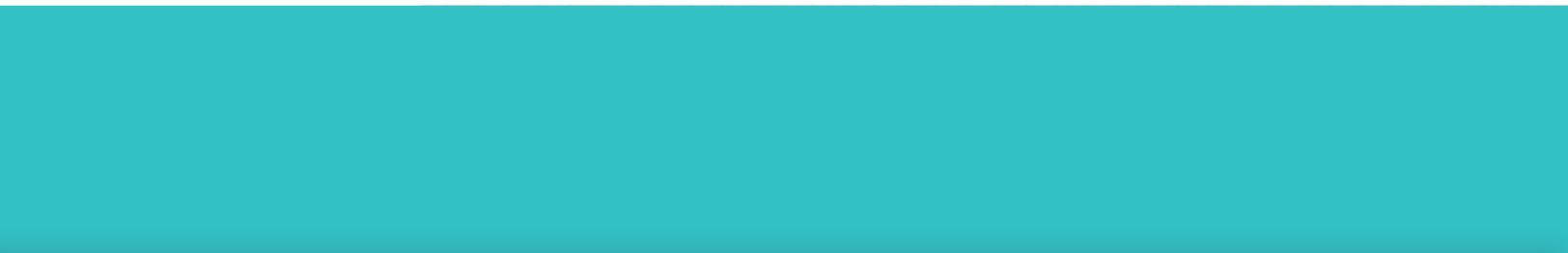


ISOSTREAM™ FAN COIL UNIT

OPERATING AND MAINTENANCE MANUAL





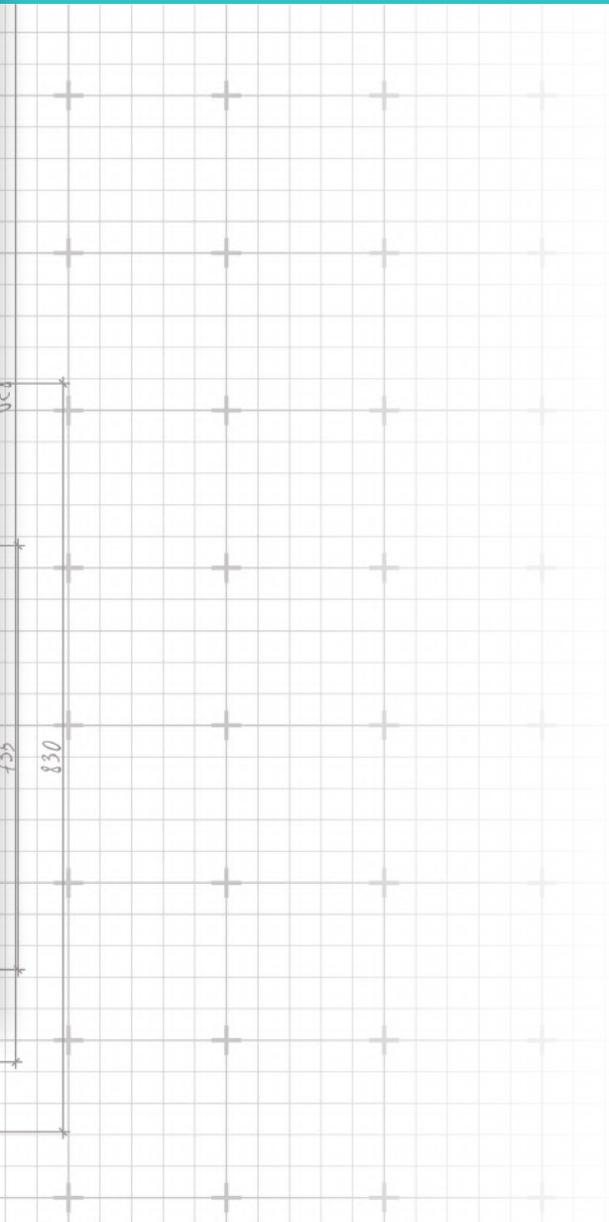
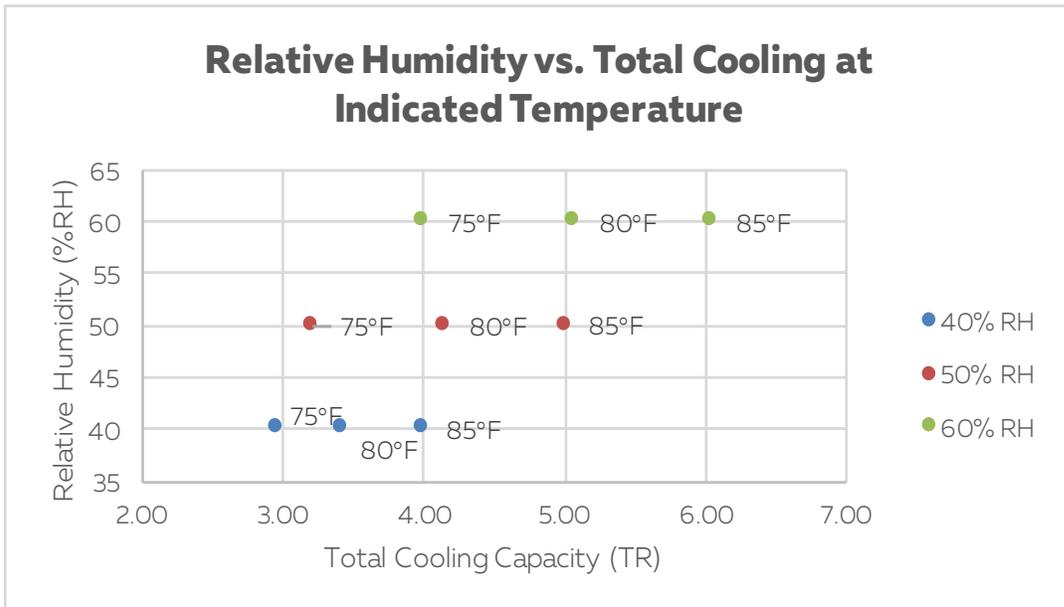


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SPECIFICATIONS

| PHYSICAL | | IsoStream™ FCU 2-60-01 |
|--------------------------------|--|---------------------------|
| Length | | 44.06 inch |
| Width | | 24 inch |
| Height | | 15.25 inch |
| Weight | | 122 lbs |
| Water Inlet | | 3/4 in FNPS |
| Water Outlet | | 3/4 in FNPS |
| Condensation Drain | | 3/4 in NPS |
| ELECTRICAL | | |
| Volts - Phase | | 115V Single Phase |
| Minimum Circuit Ampacity | | 7.9 A |
| Maximum Overcurrent Protection | | 14 A |
| PERFORMANCE | | |
| Nominal Cooling Capacity | | 5 Tons |



TECHNICAL DESCRIPTION

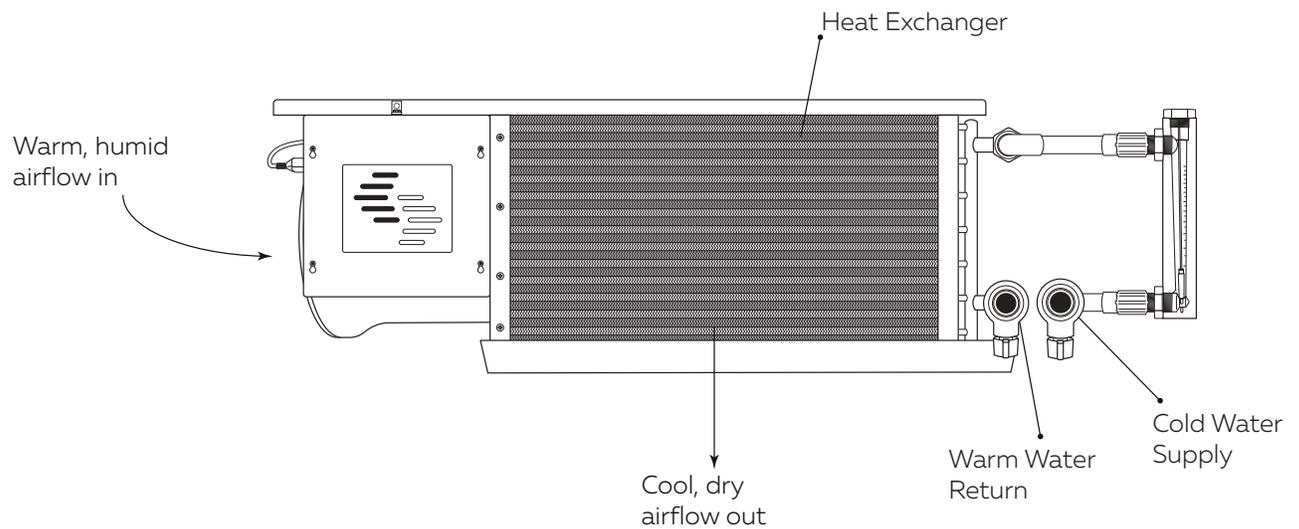


Figure 1 - IsoStream™ fan coil unit system overview

The Surna IsoStream™ fan coil unit (FCU) uses a chilled water system to remove heat and moisture from the environment. The water/glycol mixture flows from the supply plumbing through the heat exchanger/coil, where warm air is passed across the heat exchanger via the fan. As the fan pulls warm, humid air from the room and passes it across the copper heat exchanger, heat is transferred from

the incoming air to the water/glycol solution. The large temperature difference between the hot air and chilled water leads to condensation, reducing relative humidity. The water/glycol mix is circulated from the heat exchanger back into the return manifold and is pumped through the chillers to reject heat to the outside.

WARNINGS

DEFINITIONS

CAUTION: Risk of minor/moderate injury if precaution not taken.

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, read the provided instructions carefully.



WARNING: Potential electric shock hazard.



WARNING: High voltage



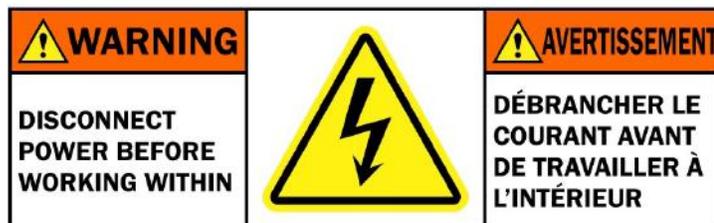
WARNING: Cut/Crush hazard



Protective earth connection



Action prohibited



FAN COIL SAFETY GUIDE



Read the information in this document carefully prior to attempting the installation, operation and/or servicing of the Surna IsoStream™ FCU. This document contains all information required to install and operate the fan coil unit. Failure to follow the directions provided could cause damage to the FCU and/or accessory equipment, damage to building facilities and/or cause serious injury or death to the operator. Adhere to all applicable safety guideline requirements in this document and all electrical and mechanical jurisdictional codes. Using the Surna IsoStream™ FCU in a manner not described in this manual may void unit warranty.



Prior to providing power to the equipment, 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. Provide secure wire and cable routing to protect personnel from shock hazards.



Only operate the equipment with an appropriately sized switch or circuit breaker in place. Only operate equipment with adequate wire sizes and current carrying capacity. Consult with a licensed electrician and the **specifications** section of this manual before attempting electrical installation. The switch or circuit breaker shall be accessible without the use of a tool, shall be easily accessible to users, shall be clearly marked with "ON" and "OFF" positions, and shall disconnect all current carrying conductors simultaneously.



DO NOT use an extension cord or plug adapters. These actions may result in a fire hazard or electric shock.



DO NOT operate this unit with damaged power wires. If the power wires are damaged they must be replaced by the manufacturer or a qualified/licensed service technician.



DO NOT plug other equipment into the socket outlet on the chassis exterior. This connection is meant for the fan module only.



This unit must be connected to a protective earthing system prior to operation. DO NOT remove the grounded connection while power is being supplied to the FCU. Doing so presents an electric shock hazard to users and service personnel.



To reduce the risk of injury to persons, mount the FCU with moving parts at least 7 feet (2.1 meters) above the floor.



DO NOT use this unit as a bench or table.



This device is intended for indoor use only and should be protected from rain and flooding.



This equipment is not meant for connection to a ducting system.



Only use Surna supplied or recommended equipment with the IsoStream™ FCU.



A minimum clearance of 36 inches (91.5 cm) shall be provided around the intake and 72 inches (182.8 cm) on the exhaust sides of the FCU to ensure proper air flow and servicing. After installation, service and maintenance personnel shall be able to access the power supply, coil connections, and condensate drain.



Prior to installation, care must be taken to ensure the structural integrity of the supporting members when mounting FCU's. Verify the load bearing capacity of any mounting surface is rated for the load of the fan coil unit.



DO NOT use ethylene glycol with this system. Only propylene glycol is to be used.

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.

FAN COIL ORDER

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

1. Surna IsoStream™ FCU
2. Surna IsoStream™ FCU product manual
3. Flowmeter
4. 15 ft of thermostat wire
5. Thermostat (only on models without Surna parallel module)

INTENDED APPLICATION

The Surna IsoStream™ FCU is a critical component of the chilled water cooling system. This FCU helps maintain stable air temperatures throughout the growing environment and helps control humidity in the facility.

Surna's climate control system circulates water, not air, eliminating the need for ducting. Instead, Surna's FCU's recirculate air already in the garden. The Surna IsoStream™ FCU is easy to install and maintain, and will provide years of trouble-free operation.

INSTALLATION INSTRUCTIONS

MECHANICAL

Mounting details are shown in **figures 2-5**.

This FCU is designed for installation with a tilt (up to 5 degrees or ½ inch/foot) sloping towards the condensate drain outlet connections.

The unit must be securely supported in compliance with local codes. Generally, 14G unistrut is used to suspend and support the unit. Using 3/8 inch (0.95 cm) stainless steel bolts and washers, hang the FCU from the mounting slots provided on the top of the unit, taking care to engage all threads of the nut and tightening until the fan coil is secure.

Equivalent support methods are acceptable, provided structural members have sufficient load bearing capacity to support the fan coil's weight (including piping), and shall have a mounting point span no longer than 38 inches (96.5 cm) with direct supporting members installed parallel to the direction of air flow through the fan. Unistrut supports should be mounted to the ceiling or support structure using a minimum size of 3/8 inch (0.95 cm) all-thread and appropriate spring nuts and washers per Unistrut OEM installation procedures.

When installing, service clearances must be provided to maximize performance (proper airflow is critical), and allow servicing of the unit. Ensure that a minimum of 72 inches (182.8 cm) of clearance is provided on exhaust sides of unit, and a minimum of 36 inches (91.5 cm) of clearance on the intake side of the unit. Allow adequate space to facilitate servicing of the electrical box, coil connections, and condensate drain.

NOTE: Be sure that the FCU is not exhausting into a Surna dehumidifier.

ELECTRICAL



WARNING: Turn off the breaker until all electrical connections are made.

All wiring shall comply with local and national codes. A knockout is provided in the cabinet for the routing of field wiring.

High and low voltage terminal blocks are provided in the unit's electrical panel. The high voltage terminal block should be connected to your incoming 115V power wires. The low voltage block is connected to a fan relay to allow the unit to be controlled remotely via 24V signal.

The fan is connected to the power supply through a socket outlet on the chassis exterior. Do not remove this plug when in operation or try to operate other equipment from this connection.

WIRING



WARNING: This unit must be connected to a protective grounding system.

Before attempting system installation, verify that the electrical system and wiring are adequate for supplying the required ampacity to the FCU at 115 VAC. Refer to the **specifications** section of this document for the FCU ampacity information. Field wiring terminals are provided for power and control connections. Always employ the services of a qualified electrician prior to installing and operating the equipment. Making improper electrical wiring connections could cause damage to the equipment or servicing personnel. When installing the power wiring, verify that the line conductor is connected to the terminal marked "L", and the neutral conductor is connected to the terminal marked "N".

For units manufactured prior to October 2016: These FCU's are controlled via a thermostat included with the unit. For use with an alternate thermostat or control device, remove the pre-installed thermostat and isolate the unit from the power by switching off the breaker. Remove the cover of the electrical box using a screwdriver. Once open, disconnect the thermostat leads from the low voltage terminal block. Using the same routing as the factory installed thermostat, wire the new control device into the terminal blocks "COM" and "SW1" terminals.

For units manufactured after October 2016: These units are controlled via Surna's parallel module, installed within the electrical box. The Surna parallel module allows multiple FCU's to be controlled by a single thermostat. Use the connections on the low voltage terminal block (TB2 per **figure 2B**).

PLUMBING



The FCU's have dedicated water inlet (CWS) and outlet connections (CWR). When plumbing CWS/CWR piping, verify these connections are not reversed, or the unit will not operate properly. The upper water connection on the fan coil is the "IN" connection and the lower water connection is the "OUT" water connection for proper direction of flow. The unit will operate at a lower efficiency if these connections are reversed. Refer to the **specifications** section of this document for water connection sizes and types. After plumbing be sure to properly insulate all water lines in accordance with local and national building codes to prevent condensation from forming on the pipes.

The recommended water flow rate to be supplied to each FCU is 2.5 gallons per minute (GPM), per ton of fan coil capacity. The IsoStream™ FCU will operate most efficiently when supplied with 12-14 GPM. Flow rates too high or too low will cause significant decreases in performance.

Prior to commissioning, the system must be flushed and checked for leaks. New systems are typically coated with oil, grease or a protective film during fabrication, storage or construction. Dirt, solder flux and welding and pipe scale can also cause problems. Therefore, a thorough cleaning of new systems is recommended. A solution of 1-2% trisodium phosphate can be used with water for flushing the system. Other commercially available cleaning products may also work. During the flush out, check the water circuit(s) for leaks. Do not power the chiller/s on at this time.

1. Run your flush through the plumbing for a minimum of several hours and up to 24 hours, check/clean Y-strainers every few hours during this period to remove any debris from the system.
2. Drain the flush from the system, clean all Y-strainers, correct leaks and retest the plumbing as necessary.
3. Once all Y-strainers are clean and all leaks are corrected, drain the system and fill with the proper glycol/water mix.
4. Turn on the system and top off the reservoir as needed in an open loop system, or purge air from a closed loop system and add glycol/water mix as needed to complete fill.

NOTE: Do not add glycol or start circulating chilled water until steps #1 and #2 above have been completed.

IMPORTANT PLUMBING TIPS



1. Pipe diameters and length will vary depending on number and size of system components. If in doubt on the proper size of pipe, stop and contact Surna engineering prior to continuing.
2. Install isolation valves at the main supply/return manifold and on each fan coil unit. This allows individual fan coils to be isolated from the cooling loop for maintenance or service, and aids in adjustment of flow rates.
3. Use long radius elbows whenever possible to reduce piping restrictions.
4. Insulate all chilled water supply and return lines to minimize condensation on pipe outer diameters. Insulate condensate plumbing a minimum of 72 inches (182.8 cm) from each unit, or as needed if experiencing condensation.
5. All condensation lines require a $\frac{1}{4}$ inch (0.64 cm) drop per linear foot slope to ensure proper drainage.
6. Inhibited propylene glycol must be utilized at a minimum of 30% glycol to reduce the freezing point and act as a system lubricant/anti-corrosive. When advised by Surna, a 50/50 ratio solution should be used. DO NOT use ethylene glycol (automobile antifreeze).

WIRING DIAGRAM

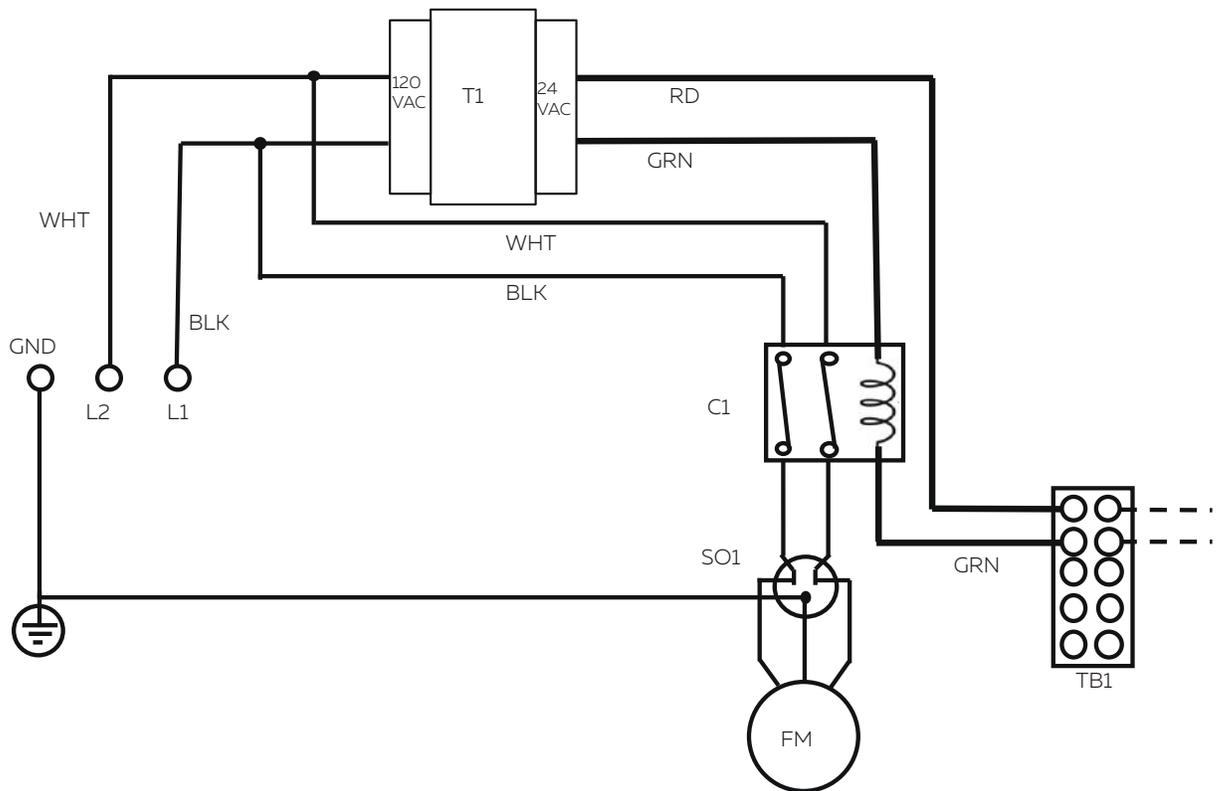


Figure 2A - Wiring diagram for units manufactured before October 2016

These FCU's are controlled via a thermostat included with the unit. For use with an alternate thermostat or control device, remove the pre-installed thermostat and isolate the unit from the power by switching off the breaker. Remove the cover of the electrical box using a screwdriver. Once open, disconnect the thermostat leads from the low voltage terminal block. Using the same routing as the factory installed thermostat, wire the new control device into the terminal blocks "COM" and "SW1" terminals.

WIRING DIAGRAM

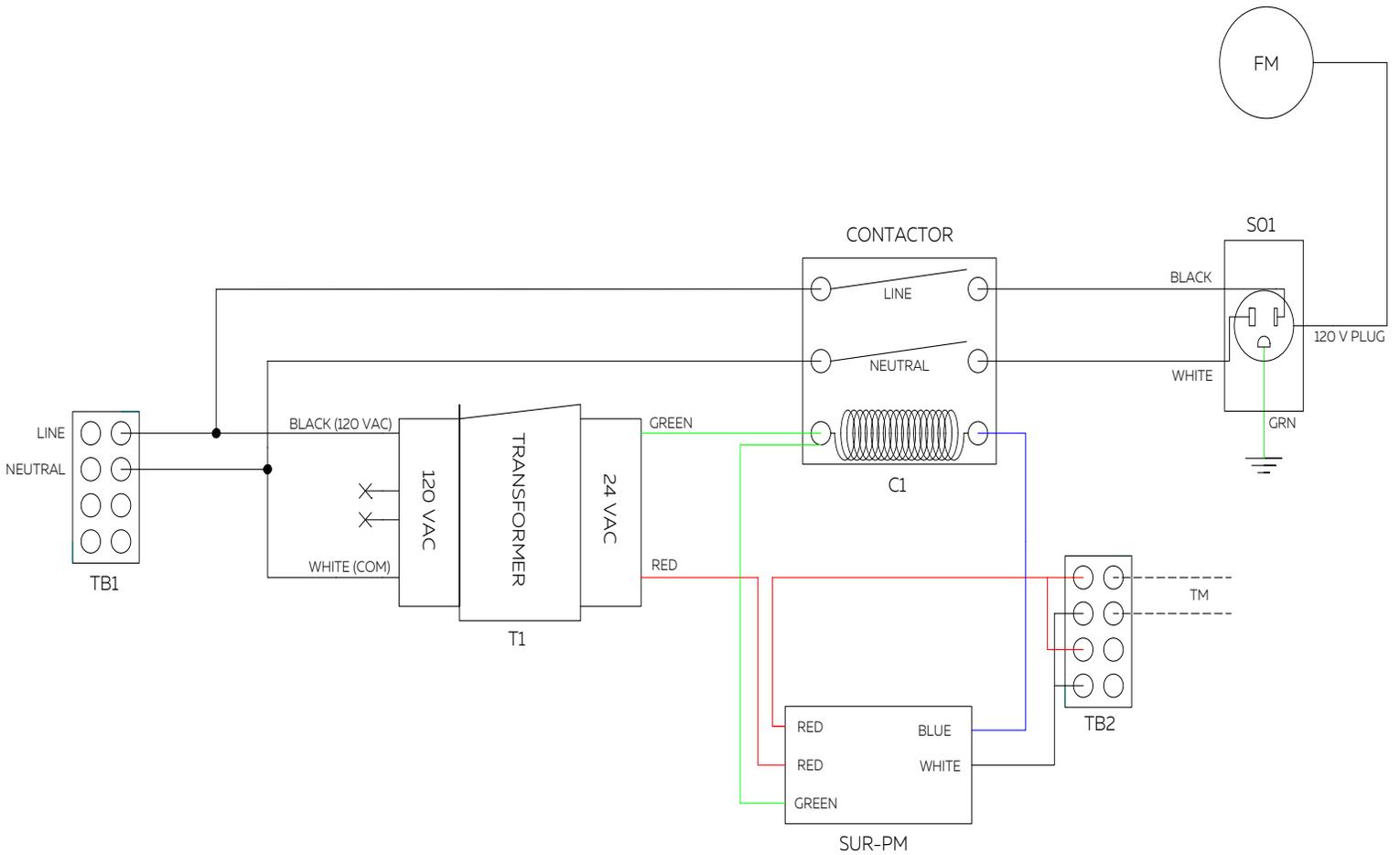
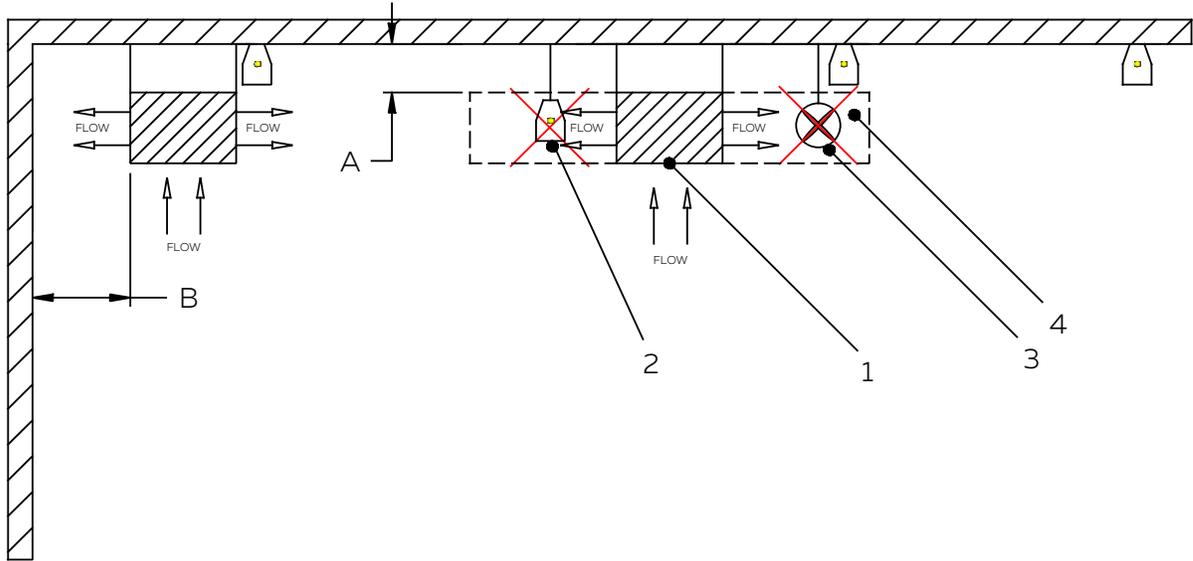


Figure 2B - Wiring diagram for units manufactured after October 2016

These units are controlled via Surna's parallel module which are installed within the electrical box. The Surna parallel module allows multiple fan coils to be controlled by a single thermostat. Use the connections on the low voltage terminal block.

REQUIRED UNIT CLEARANCES

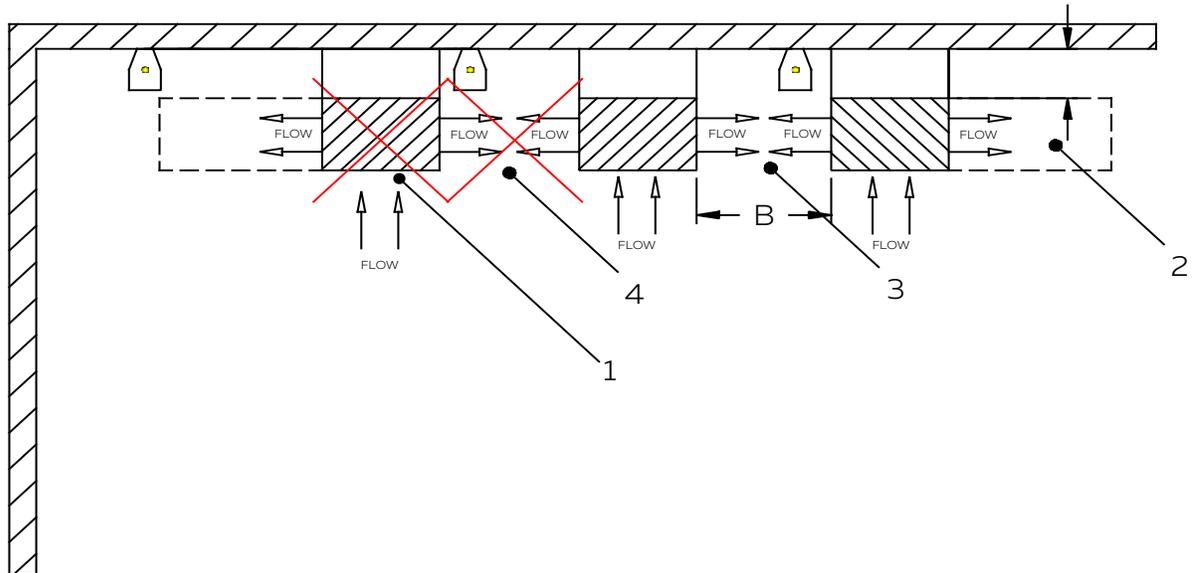


| | |
|---|---|
| A | Minimum 12 inches (30.5 cm) of clearance above and below |
| B | Minimum 72 inches (182. cm) of clearance from any wall or structure in front of discharge |

| | |
|---|---|
| 1 | Surna IsoStream™ FCU |
| 2 | Do not block intake or discharge |
| 3 | Do not direct any air into intake or discharge via fans or vents |
| 4 | No conditioned air discharge or circulating fans within minimum 36 inches (91.5 cm) (recommended 72 inches (182.8 cm)) from intake or minimum 72 inches (182.8 cm) from discharge of unit |

Figure 3 - Proper clearances for the Surna IsoStream™ FCU

PROPER UNIT AIRFLOW

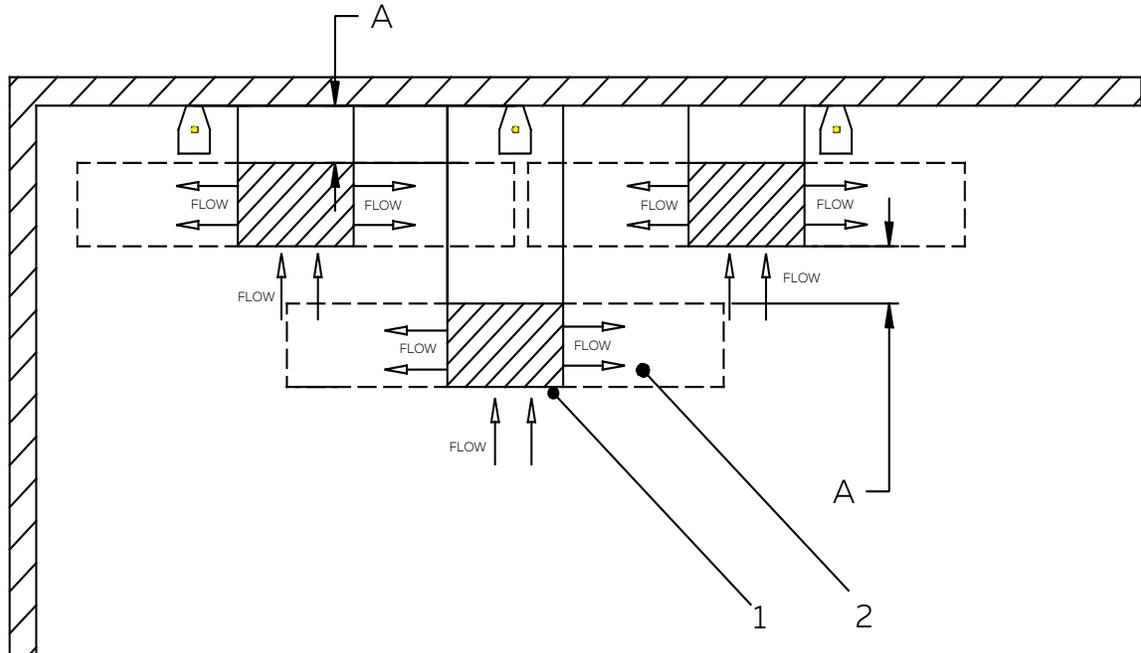


| | |
|---|---|
| A | Minimum 12 inches (30.5 cm) of clearance above and below |
| B | Minimum 36 inches (91.5 cm) (recommended 72 inches (182.8 cm)) of clearance between two units with adjacent intakes |

| | |
|---|--|
| 1 | Surna IsoStream™ FCU |
| 2 | No conditioned air discharge or circulating fans within minimum 36 inches (91.5 cm) (recommended 72 inches (182.8 cm)) from intake or minimum 72 inches from discharge of unit |
| 3 | Units may disregard "3" if intakes are opposing and have a clearance minimum of 36 inches (91.5 cm) (recommended 72 inches (182.8 cm)) |
| 4 | DO NOT exhaust into unit's intake or exhaust |

Figure 4 - Proper positioning of the Surna IsoStream™ FCU with regard to airflow

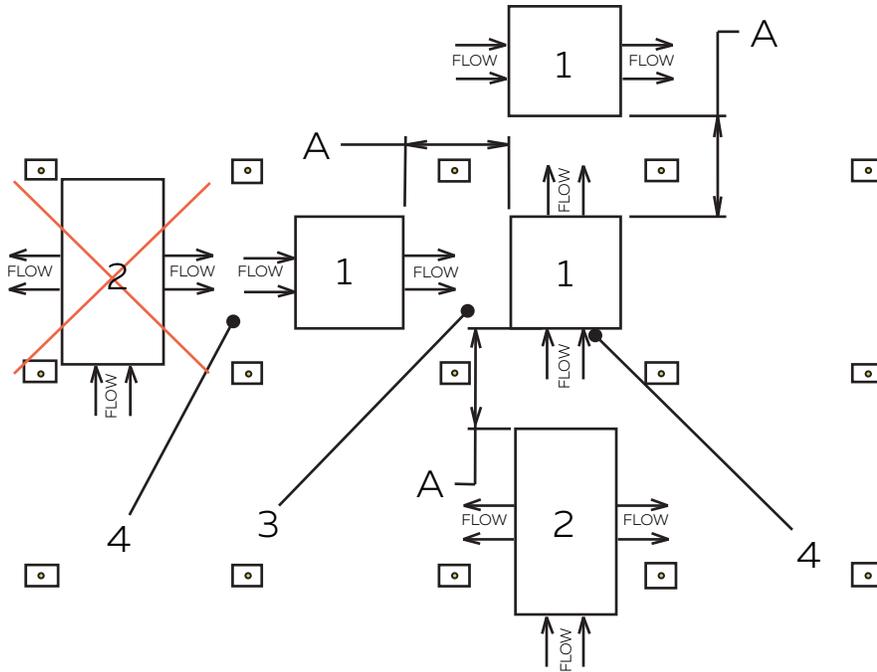
REQUIRED UNIT OFFSETS



| | |
|---|---|
| A | Minimum 12 inches (31.5 cm) of clearance above and below |
| 1 | Surna dehumidifier |
| 2 | No conditioned air discharge or circulating fans within minimum 36 inches (91.5 cm) (recommended 72 inches (182.8 cm)) from intake or minimum 72 inches (182.8 cm) from discharge of unit |

Figure 5 - Correct operational offsets for the Surna IsoStream™ FCU if linear space is limited in the room to provide proper unit and airflow clearances between units

BIRD'S EYE UNIT CLEARANCES



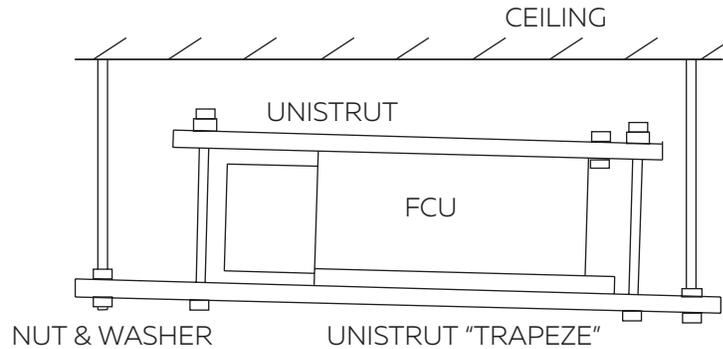
| | |
|---|---|
| A | Minimum 12 inches (31.5 cm) of clearance above and below |
| B | Minimum 36 inches (91.5 cm) (recommended 72 inches (182.8 cm)) of clearance between two units with adjacent intakes |

| | |
|---|---|
| 1 | Surna IsoStream™ FCU |
| 2 | No conditioned air discharge or circulating fans within minimum 36 inches (91.5 cm) (recommended 72 inches (182.8 cm)) from intake or minimum 72 inches (182.8 cm) from discharge of unit |
| 3 | Units may disregard "3" if intakes are opposing and have a clearance minimum of 36 inches (91.5 cm) (recommended 72 inches (182.8 cm)) |
| 4 | DO NOT exhaust into unit's intake or exhaust |

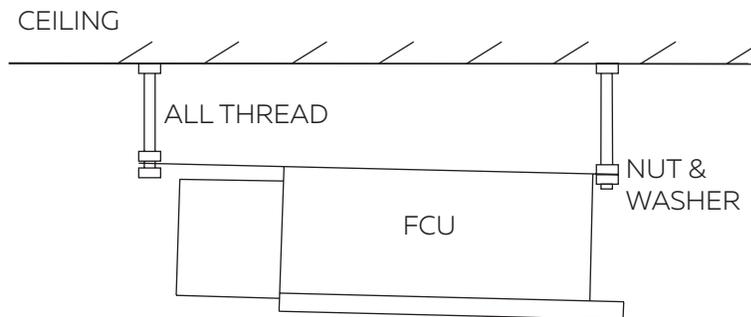
Figure 6 - Bird's eye view of proper installation of the Surna IsoStream™ FCU with recommended clearances

MOUNTING DETAIL

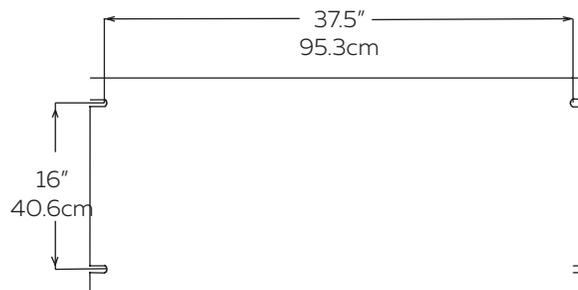
OPTION 1 - TRAPEZE



OPTION 2 - DIRECTLY MOUNTED



MOUNTING HOLE DIMENSIONS



NOTES:

1. Hang FCU at an angle with 1/4 inch (0.64cm) per foot of slope for proper drainage of condensate.
2. Dwyer Flowmeter recommended as standard, other options exist for balancing. Pressure independent balancing valves or ultrasonic flowmeters are acceptable. Each FCU must be able to be isolated for service using isolation valves. Isolation valve may be used for throttling flow.

Figure 7 - Mounting detail for the IsoStream FCU

OPERATION INSTRUCTIONS

To start operation, flip the breaker that supplies power to the unit to the "ON" position, set the thermostat to "COOL" and set the temperature to the desired setting for the space. This applies to the basic thermostat that is supplied by Surna.

CONTACT US

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

ROUTINE MAINTENANCE

This product is designed to provide many years of dependable, trouble free use when properly maintained. Proper maintenance will consist of routine heat exchanger coil cleanings, bi-annual check-ups that include (but are not limited to) heat exchanger and electrical component inspections by a qualified service technician. Failure to provide periodic check-ups and cleaning can result in excessive operating cost and/or equipment failure.

The Surna Isostream™ FCU is filterless, so it is recommended to clean the coils once per six months, or more frequently if any decrease of airflow or performance occurs.



WARNING: Before performing any maintenance or servicing, verify unit is disconnected from power source. **DO NOT** attempt maintenance or repairs unless you are properly trained to do so.

CLEANING THE COIL

1. Remove power from the unit
2. Remove light accumulations of dirt and other material using compressed air as follows:
 - a. Direct compressed air across the coil in the opposite direction of normal airflow, from the cleaner to the dirtier side. If using high pressure air, direct it either at a 90° angle or directly through the fins. This will prevent damage to the fins.
 - b. Maintain consistent airflow across the coil for a minimum of 2 minutes.

WARNING: Avoid blowing dust, dirt and debris into the system or into your garden. Wear eye protection to keep the material out of your eyes. If necessary, use a shop vacuum cleaner to collect material as it is dislodged.

3. Use a mild detergent and warm water to clean the coils as follows:
 - a. Mix warm water and a simple detergent (that is non-corrosive to aluminum or copper), such as Cal-Green or Evap-Green, in a spray bottle, hand sprayer or garden sprayer.
 - b. Apply the water and detergent solution to the evaporator coils.
 - c. Let the solution soak in and loosen debris for 5-10 mins. Reapply as needed.
 - d. Wash the coils clean, being careful to direct runoff into the fan coil condensate drain pan.

NOTE: If the coils are heavily soiled or are dirty enough to seriously affect fan coil function, remove the fan completely to gain access to the inner walls of the heat exchanger.

TROUBLESHOOTING

Prior to calling Surna technical support, follow these troubleshooting steps.

To avoid voiding the warranty, please contact Surna via email at support@surna.com or via phone at 303.993.5271 before having a technician perform work.

UNIT WILL NOT TURN ON

1. Verify thermostat has power (change out batteries if necessary).
2. Verify that thermostat is set to "Cool" and "Auto" with a setpoint below current room temperature, or set to "Cool" and "On".
3. Ensure breaker has not tripped.
4. Verify the unit is supplied with proper power of 115V.
5. Remove power from unit, and check for loose wires, burned/charred wires or components.
6. Verify incoming power wires are wired to terminal block (TB1), and not wired directly to contactor.

UNIT IS NOT DRAINING CONDENSATE PROPERLY

1. Ensure unit has been mounted with adequate tilt (1/4" drop per linear foot or approximately 5 degrees) for proper condensate draining.
2. Check condensate plumbing for any clogs, kinks, or breaks and ensure proper slope of condensate lines to drain or reclamation system.

UNIT NOT PRODUCING ENOUGH COOLING

1. Verify proper flow rate of 12.5 GPM (gallons per minute).
2. Measure incoming and outgoing water temperature. (Should have approximately a 10 degree differential.)
3. Check that the coil is clean. If not, clean the coil. (See **routine maintenance** section.)
4. Verify proper minimum clearance is provided around the unit. (Recommended minimum of 72" of clearance be provided on exhaust sides of unit, and a minimum of 36" of clearance on the intake side of the unit).
5. Check fan operation by plugging fan directly into an extension cord with 115V power.



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