# Remote Air Cooled Fluid Coolers



Installation, Operation & Maintenance Manual





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#### 1.0 INTRODUCTION

#### 1.1 General

The Water/Glycol Fluid cooler (Drycooler) covered by this manual is designed and manufactured by Stulz Air Technology Systems, Inc. (SATS). Recognized as a world leader, SATS provides precision cooling systems with the highest quality craftsmanship using the finest materials available in the industry. The unit will provide years of trouble free service if installed and maintained in accordance with this manual. Damage to the unit from improper installation, operation or maintenance is not covered by the manufacturer's warranty.

This manual contains information for installation, operation, maintenance, troubleshooting and repair. STUDY the instructions contained in this manual. They must be followed to avoid difficulties. Spare parts are available from SATS to insure continuous operation. Using substitute parts or bypassing electrical or refrigeration components in order to continue operation is not recommended and will VOID THE WARRANTY. Due to technological advancements, components are subject to change without notice.

SATS Drycoolers are designed to reject heat from water/glycol based cooling equipment. Any use beyond this is deemed to be not intended. SATS is not liable for any damage resulting from improper use. The unit is designed to be installed outdoors unless otherwise noted on the equipment nameplate.

#### 1.2 Product Description

SATS Drycoolers are designed to be the most efficient and reliable fluid coolers in the industry. The unit is an air cooled, heat rejection unit with a vertical air discharge pattern.

The unit is self contained in a light weight, corrosion resistant galvanized steel cabinet designed for mounting to a horizontal surface. The cabinet houses the coil(s) and fan assembly(s). The electrical controls are in an integrally mounted, weather proof enclosure which is isolated from the rest of the equipment. There are several cabinet sizes based on the capacity of the unit. Refer to the installation drawing supplied with your unit for the layout and dimensions of your cabinet.

The total heat rejection in BTU/Hr will depend on the unit size which can range up to 2,000,000 BTU/Hr. Refer to the unit nameplate to identify the model number of your unit. The system will consist of a single circuit or dual circuit coil. The coil is a closedloop water/glycol heat exchanger in which fluid is continuously circulated by a pump. The drycooler rejects heat from a condenser in a water/glycol cooled air conditioner.

Drycoolers use On/Off control or fan cycling control to maintain the leaving coolant temperature. See the unit nameplate for the type of control used for your unit.

#### <u>NOTE</u>

SATS drycoolers are strictly for non-residential applications.

Operation of the drycooler is controlled by a 24 VAC input signal from a system controller provided with the pump package or, it can be configured for independent, stand-alone operation.

#### 1.2.1 Capabilities and Features

- Galvanized steel cabinet construction.
- Aluminum fin, copper tube coil construction.
- Adjustable mounting legs.
- Direct driven propeller fan(s) with permanently lubricated motors.
- Unit mounted, weather resistant electrical enclosure with lockable service disconnect switch.

#### 1.2.2 Application Ranges

SATS drycoolers are designed for operation within the following ranges:

Maximum Outdoor Temperature Range:

Standard	95º F		
Optional	105º F		
Storage Conditions:	-30⁰F	to	105º F.

Operating Voltage:

VAC Input per unit nameplate +/- 10%.

#### <u>NOTE</u>

Damage or malfunction to the unit due to storage or operation outside of these ranges will VOID THE WARRANTY.

#### 1.2.3 Safety Features

The drycooler is provided with a factory mounted, service disconnect switch as standard. The service disconnect switch electrically isolates the unit during routine maintenance. The handle of the switch may be locked in the "Off" position to prevent unauthorized operation. Finger guard grilles are provided on each fan to protect the operator from injury and to keep large tools or other objects from falling into the fan.



#### 1.3 Product Warranty- SATS offers a two year standard limited warranty as stated below.

imes imeSTULZ AIR TECHNOLOGY SYSTEMS, INC. 12 MONTH PRECISION A/C LIMITED WARRANTY / 24 MONTHS PRECISION A/C UPGRADED LIMITED WARRANTY The 12 month Precision A/C Limited Warranty applies when the Product Support Network Factory Start-Up is not purchased at the time of order entry. The 24 Month Precision A/C Upgraded Limited Warranty applies only if Factory Start-Up was purchased at the time of Order Entry and Start-Up has been validated by Product Support. The 12 Month Precision A/C Limited Warranty provided by Stulz Air Technology Systems, Inc. (SATS) warrants your purchase to be free from defects in material and workmanship. SATS' obligation under this warranty is to repair or replace, at its option, any part or parts which are determined by SATS to be defective for a period of 12 months from the date of shipment when an accurately completed Factory Start-Up Form has been submitted to SATS, within 180 days from shipment. Parts repaired or replaced under this warranty are shipped FOB Factory, and warranted for the balance of the original warranty period or for 90 days from the date of installation, whichever is greater. If the Factory Start-Up form is not returned to SATS within 180 days from the date of equipment shipment, the equipment warranty will be terminated on the 181st day from shipment. This limited warranty does not include labor, freon, or any other expense required to replace the defective component and bring the unit back to a working status. The 24 Month Precision A/C, Upgraded Limited, Warranty provided by Stulz Air Technology Systems, Inc. (SATS) warrants your purchase to be free from defects in material and workmanship for 24 months. SATS obligation under this warranty is to repair or replace, at its option, any part or parts which are determined by SATS to be defective for a period of 24 months from the date of start-up. Parts repaired or replaced under this warranty are shipped FOB factory ground, and warranted for the balance of the original warranty period or for 90 days from the date of installation, whichever is greater. If the factory is not allowed to start the equipment within 180 days from the date of shipment, the warranty will commence on the 181st day from equipment shipment. This limited warranty does not include labor, freon, or any other expense required to replace the defective component and bring the unit back to a working status. Stulz Air Technology System's warranty does not cover failures caused by improper installation, abuse, misuse, alteration, misapplication, improper or lack of maintenance, negligence, accident, normal deterioration (including wear and tear), or the use of improper parts or improper repair. X Purchaser's remedies are limited to replacement or repair of non-conforming materials in accordance with the written warranty. This warranty does not include costs for transportation, travel expenses, costs for removal or reinstallation of equipment or labor for repairs or replacements made in the field. X If any sample was shown to the buyer, such sample was merely to illustrate the general type and quality of the product, and not to represent that the equipment would necessarily conform to the sample. This is the only warranty given by the seller, and such warranty is only given to buyer for commercial or industrial purposes. The warranty is not enforceable until the invoice(s) is paid in full. THIS FOREGOING SHALL CONSTITUTE SATS' ENTIRE LIABILITY AND YOUR EXCLUSIVE REMEDY. IN NO EVENT SHALL SATS BE LIABLE FOR ANY DEFECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES, INCLUDING LOST PROFITS (EVEN IF ADVISED OF THE POSSIBILITY THEREOF) ARISING IN ANY WAY OUT OF THE INSTALLATION, USE OR MAINTENANCE OF THE EQUIPMENT. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. This warranty supersedes all other previously printed warranties dated prior to this document. WARF-1001 Rev. B: 9/20/10



#### 1.4 Safety

#### 1.4.1 General

Stulz Air Technology Systems, Inc. uses **NOTES** along with **CAUTION** and **WARNING** symbols throughout this manual to draw your attention to important operational and safety information.

A bold text **NOTE** marks a short message in the information to alert you to an important detail.

A bold text **CAUTION** safety alert appears with information that is important for protecting your equipment and performance. Be especially careful to read and follow all cautions that apply to your application.

A bold text **WARNING** safety alert appears with information that is important for protecting you from harm and the equipment from damage. Pay very close attention to all warnings that apply to your application.

A safety alert symbol <u>N</u> accompanies a general **WARNING** or **CAUTION** safety statement.

A safety alert symbol accompanies an electrical shock hazard **WARNING** or **CAUTION** safety statement.

#### 1.4.2 Safety Summary

The following statements are general guidelines followed by warnings and cautions applicable throughout the manual.

Prior to performing any installation, operation, maintenance or troubleshooting procedure read and understand all instructions, recommendations and guidelines contained within this manual.



All maintenance and/or repairs must be performed by qualified personnel who are experienced with this type of equipment.



Never lift any component in excess of 35 pounds without help. If a lifting device is used to move a unit, ensure it is capable of supporting the unit.



Do not allow the unit to swing while suspended from a lifting device. Failure to observe this warning may result in injury to personnel and damage to the equipment.



Do not allow anyone under the equipment suspended from a lifting sling.



This unit employs high voltage equipment with rotating components. Exercise extreme care to avoid accidents and ensure proper operation.



When working on electrical equipment, remove all jewelry, watches, rings, etc. Keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.



Always disconnect the main power supply to the equipment at the main power disconnect switch before beginning work on the equipment. A lock-out tag-out procedure should be followed to ensure that power is not inadvertently reconnected.



All personnel working on or near equipment should be familiar with hazards associated with electrical maintenance. Safety placards/stickers have been placed on the unit to call attention to all personal and equipment damage hazard areas.



Ensure the unit is properly phased. Improper phasing can cause severe damage to the compressor.



#### 1.5 General Design

The remote outdoor, air cooled drycooler is housed in a galvanized steel frame type cabinet and is rated for outdoor use. Figure 1 depicts a typical layout of a drycooler and identifies the major components.

#### 1.5.1 Coil

The coil is a copper tube, aluminum finned coil with hot dip galvanized end plates. The capacity of the fluid cooler indicated by the unit model number, is based on the rated capacity of the coil. In the case of dual circuit units, the model number is based on the combined capacity of both coil circuits.

#### 1.5.2 Fan Assembly

For outdoor applications the drycooler is equipped with high efficiency propeller type fan(s). The quantity of fans varies depending upon the capacity of the unit. The fan(s) utilize corrosion resistant, multi-blade impellers designed for high aerodynamic efficiency which results in lower power consumption, lower noise levels and longer life. Each fan utilizes a direct driven motor with maintenance free bearings. The fan motors are internally protected from overload.

#### 1.5.3 Electric Box

The electrical components are protected in a weather resistant enclosure located at the header end of the unit. The electric box houses the aquastat(s), motor contactor(s) and terminal positions for main power and control wiring. The electric box has a removable front access panel which is safety interlocked with the service disconnect switch, preventing the panel from being removed when the switch is in the "On" position. The switch must be turned "Off" to gain access to the electrical components.



Figure 1- Typical Layout



#### 2.0 INSTALLATION

#### 2.1 Receiving the Equipment

Your system has been tested and inspected prior to shipment. To ensure that your equipment has been received in excellent condition, make a visual inspection of the equipment immediately upon delivery. Carefully remove the shipping container and all protective packaging. Open the electric box and thoroughly inspect the unit for any signs of transitincurred damage. If there is shipping damage, it must be noted on the freight carrier's delivery forms **BEFORE** signing for the equipment. Any freight claims **MUST** be done through the freight carrier. SATS ships all equipment FOB factory. SATS is not liable for any equipment damage while in transit. SATS can assist in the claim filing process with the freight carrier. Should any damage be present, notify the SATS Product Support Group prior to attempting any repairs. Refer to section five of this manual for instructions.

Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies to appropriate authority.

A Data Package has been sent with your unit. It contains this manual, system drawings, applicable MSDS's and other applicable instructions based on the configuration and options of your unit. The data package has been placed in your unit in a clear plastic envelope. These documents need to be kept with the unit for future reference.

The unit should always be stored in a dry location prior to installation.

#### 2.2 Site Preparation

SATS remote air cooled drycoolers are designed with easy service access in mind. Install the drycooler in a secure location where the unit cannot be tampered with and the main power disconnect switch cannot be inadvertently turned off. Allow access to the unit for routine operation, servicing and for necessary maintenance. The components on drycoolers are accessed through the top by removing the fan assembly. The electric box is accessed at the header end of the unit. Locate the unit where the fan(s) are not likely to draw dirt and debris into the coil fins. Refer to the installation drawing provided with your unit for the dimensions.

#### <u>NOTE</u>

Working clearance requirements need to be established prior to mounting the unit. Refer to local and national electrical codes.

#### 2.3 Rigging

Remote drycoolers are shipped on a skid to facilitate moving prior to installation. The unit may be left on the skid until it has been moved to its final location. The unit must be kept level and in a vertical position. Use an appropriate lifting device that has the capacity to safely handle the weight of the equipment. A weight table is provided on the installation drawing provided with your unit. Move the unit with a suitable device such as a forklift or attach an overhead lifting sling.

The unit may be lifted with an overhead sling attached to the top of the mounting support legs as shown in Figure 2. If using an overhead lifting device, utilize spreader bars that exceed the cabinet width so as to avoid crushing the sides of the unit. Never use the coil headers or return bends for moving the drycooler.



Figure 2- Rigging



Take care not to damage the exposed coil fins on the underside of the cabinet when moving the unit.



#### 2.3.1 Extending the Legs

The two piece telescoping legs are shipped in a recessed position. The legs may be extended while the unit is on the ground or after it's hoisted above the mounting location. Raise the unit high enough to take the weight off the legs. Remove the bolts that hold the legs in together. Hoist the unit 18" above the mounting surface allowing the legs to extend down to their normal mounting height. Align the new set of mounting holes and reinstall the bolts in the holes, then tighten them securely.

#### 2.4 Mounting/Placement

Outdoor, air cooled drycoolers are designed for mounting to a flat surface. Drycoolers must not be located in the vicinity of steam, hot air or fume exhausts. Avoid overhead obstructions. Ensure the unit is not located above or near noise sensitive areas. If possible, make use of terrain features such as trees and buildings to provide a shaded location. This will minimize the solar load on the unit. Avoid ground level sites that are accessible to the public.

## 

The unit must be kept level to operate properly.

Ensure the mounting location is capable of supporting the weight of the equipment including the fluid it contains. Refer to Table 2 for the noncharged system weight and the corresponding water/glycol fluid weight. When installing the unit on a roof, ensure the weight is adequately distributed to the load bearing points. For ground mounted units,



Figure 3- Ground Mounting

install a concrete slab as shown in Figure 3. The slab should extend below the frost line and be at least 2 inches higher than the surrounding grade. The slab should extend at least 2" beyond the outer profile of the drycooler on all sides.

Insert vibration isolators between the unit and the base to reduce the vibration transmitted to the mounting surface. Secure the unit with fasteners (field supplied by others) to prevent the system from moving during operation.

The clearance around the unit to the nearest wall or obstruction should be at least 1 times (1x) the unit's width to ensure adequate airflow to the coil(s) (see Figure 4). Space multiple units at least 2 times (2x) the unit's width when placing them side by side. Ensure hot exhaust air is not directed toward the air inlet of an adjacent unit. When placing units end to end, allow at least 4 feet of space between units. Avoid areas where heavy snow will accumulate at air inlet and outlet openings.



Figure 4- Side Clearance

If the unit(s) are surrounded by three walls or, if they are located in a pit, space them at least 2 times (2x) the unit's width from the nearest walls (see Figure 5). The top of the unit must be equal to the height of the walls or the pit. A stack may be used, if necessary, to extend the air discharge. The height of the extension must not exceed 10 feet.



Figure 5- Walled Areas or Pits



#### 2.5 Piping Connections

Split indoor systems require field installed piping between the condenser and the drycooler. Figure 6 depicts a typical piping diagram for a system using a single circuit pump.

Dual circuit drycoolers will require 2 sets of inlet and outlet connections. Refer to the diagram provided with your unit for piping details specific to your unit.

The piping system should provide maximum leak prevention. Weld or sweat joints should be used where possible or tightly drawn teflon tape threaded pipe joints should be made if needed. Consideration should be given to the fact that water/glycol solutions are more susceptible to leaking than water. The system should not employ a pressure reducing valve because a slight leak would lead to dilution of the water/glycol solution. When refilling water/glycol systems, the refill solution must be premixed so as to maintain the proper water-to-glycol ratio. All copper piping should be installed with high temperature soldered joints. Clear all pipe connections of debris and prepare the connections for soldering. Use only "L" or "K" grade refrigerant copper tubing. Be careful not to allow solder/piping debris to get inside the lines.

Keep piping as straight as possible. Avoid unnecessary bends and minimize additional fittings if possible. To avoid placing a strain on drycooler or pump connections, do not bow pipe when making connections. Allow for pipe expansion from warm fluids.

Use standard practices for piping supports, cleaning, leak testing and filling the system. When city make-up water is used, follow local codes ensuring that provisions for disconnecting the water supply is provided. The piping should be isolated from the building by the use of vibration isolating supports. To prevent pipe damage when sealing openings in walls and to reduce vibration transmission, use a soft flexible material to pack around the piping.



Figure 6- Typical Piping - Single Circuit Pump



#### 2.5.1 Pipe Sizing

The following general guidelines may be used to assist in determining the size of the piping between the indoor condenser and the drycooler.

Refer to the installation drawing provided with the drycooler for tables showing the inlet/outlet pipe connections for the system you are installing. Things to consider when sizing piping are the total system flow and the equivalent length of pipe needed between the indoor condenser and the remote drycooler. If the pressure drop is too high, the power consumption of the pump increases and the capacity decreases. An excessive amount of water/glycol solution will be used if the diameter of the piping is too large.

#### <u>NOTE</u>

The size of the equipment pipe connections does not indicate the size of the piping to be used. In cases where the pipe size doesn't match the size of the connection, a reducing fitting must be used to transition between the connection and the pipe. Table 1 shows pressure drops for various pipe sizes at flow rates commonly used with a typical drycooler. These pipe sizes are not necessarily always correct for the run from the indoor condenser to the dry cooler. Proper pipe size will depend on available pump head. This can be determined by subtracting the indoor unit's pressure drop and the drycooler pressure drop from the total available pump head at design flow. Allow some safety factor for pipe fittings added to the system and for eventual fouling of the system. After piping is completed, all joints should be tested for leaks.

The piping requires no insulation except when the fluid temperature will be below ambient dew-point temperatures. Economizing or free cooling applications may require insulation due to the lower operating fluid temperature during the winter operating periods of the year. Vents are required at all high points in the piping to bleed air when filling the system. If drycoolers are at high points, vent valves should be installed at each drycooler. It is recommended that gate valves be installed on both sides of the pump

FLOW GPM	PIPE SIZE STEEL	TYPE "L" OD COPPER	Schedule 40 Steel Head FT / 100 FT Equiv. Length	Copper Tube Head Head FT / 100 FT Equiv. Length
15 20 25	1 1 -	1.125 1.125 1.125	17.6 30.2	15.0 23.1 34.6
25	1.25	1.375	11.5	12.6
30	1.25	1.375	16.3	17.4
35	1.25	1.375	21.8	23.0
40	1.5	1.625	13.0	12.9
45	1.5	1.625	16.5	15.7
60	-	1.625	-	26.3
60	2	2.125	7.9	7.0
80	2	2.125	13.7	12.0
100	2.5	2.625	8.5	6.1
150	2.5	2.625	18.6	12.9
200	3	3.125	10.7	9.1
300	3.5	3.625	11.1	9.2
300	4	4.125	5.9	4.9
350	4	4.125	7.9	6.5
400	4	4.125	10.2	8.2

Table 1 - Pressure Loss (in Feet of Water Column) by Pipe Size



to prevent loss of fluid in the event the pump should require repair or replacement. Shut-off valves are also recommended at the drycooler in case the unit is to be moved or requires maintenance involving the coolant system.

#### 2.5.2 Glycol Charge

The recommended water/glycol solution ratio is 20% to 50% ethylene glycol or propylene glycol to water as required to provide freeze protection at the designed minimum outdoor temperature. SATS recommends Dowtherm SR1 manufactured by Dow Chemical Co. Use only ethylene or propylene glycol with inhibitors for corrosion protection. Regardless of the strength of the mixture, you MUST premix the glycol and water prior to adding it to the system. The chemical reaction between the two will release oxygen, which is extremely undesirable in a close-loop system.

The holding volume of drycoolers varies by model number. Table 2 shows the water/glycol fluid volume and weights of the SATS drycoolers.

#### 2.5.3 Glycol Sludge Prevention

Glycol systems may be subject to sludge formation in coils, due to one or more of the following causes:

1. Reaction of the corrosion inhibitor with galvanized piping (zinc).

2. Reaction of the glycol with chromate type water additives.

3. Reaction of the glycol with pipe dope, cutting oils, solder flux, and other system dirt. Glycol manufacturers offer a specially inhibited glycol (formulated for snow melting systems) which does not react with zinc. This glycol is also suitable for heat transfer systems.

Glycol manufacturers also provide inhibitor check services on a regular basis. Consequently, good glycol system design requires the following precautions:

1. No galvanized piping is to be used.

2. System piping must be thoroughly cleaned and flushed with a heated tri-sodium phosphate solution before filling with the water/glycol mixture.

3. No chromate inhibitor treatment must be used.

4. The glycol manufacturer should provide inhibitor check service and supply additional inhibitor as required.

		*Fluid Data				
Drycooler Model	Unit Weight Dry (lbs)	*Fluid Weight (lbs)	*Operating Charge (gallons)			
SINGLE ROW FAN CONFIGURATIONS						
FSS-103A	144	10.5	1.26			
FSS-104A	160	15.8	1.90			
FSS-201A	234	20.3	2.44			
FSS-202A	259	30.5	3.66			
FSS-203A	283	40.6	4.88			
FSS-204A	410	40.7	4.89			
FSS-205A	418	40.7	4.89			
FSS-206A	436	61.0	7.00			
FSS-207A	455	61.0	7.33			
FSS-208A	495	61.0	7.33			
FSS-209A	520	61.0	7.33			
FSS-210A	550	81.4	9.77			
FSS-211A	600	101.7	12.21			
FSS-301A	800	90.4	10.85			
FSS-302A	900	120.6	14.47			
FSS-303A	1000	150.7	18.09			
FSS-401A	1050	119.8	14.38			
FSS-402A	1100	159.7	19.17			
FSS-403A	1150	199.7	23.97			
FSS-404A	1200	199.7	23.97			
FSS-501A	1370	198.9	23.88			
FSS-502A	1430	248.6	29.85			
FSS-503A	1490	248.6	29.85			
FSS-601A	1370	238.1	28.58			
FSS-602A	1750	297.6	35.72			
FSS-603A	1830	297.6	35.72			
DU	AL ROW FAN C	ONFIGURATIC	DNS			
FDS-401B	1080	122.1	14.66			
FDS-402B	1140	162.8	19.54			
FDS-403B	1190	203.5	24.43			
FDS-404B	1240	203.5	24.43			
FDS-601B	1640	180.8	21.71			
FDS-602B	1840	241.1	28.95			
FDS-603B	2050	301.4	36.18			
FDS-801B	2150	239.6	28.76			
FDS-802B	2250	319.4	38.35			
FDS-803B	2350	399.3	47.94			
FDS-804B	2460	399.3	47.94			
FDS-1001B	2800	397.8	47.75			
FDS-1002B	2950	497.2	59.69			
FDS-1003B	3075	497.2	59.69			
FDS-1201	3400	476.1	57.16			
FDS-1202B	3620	595.1	71.44			
FDS-12035B	3750	595.1	71.44			

\*Based on 40% ethylene glycol solution by volume

## Table 2 - Drycooler Weights and Water/Glycol Charge Capacity



#### 2.6 Utility Connections

#### 2.6.1 Main Power and Control Wiring

Systems equipped with a remote drycooler require field power and control wiring (see Figure 7). The drycooler is provided with main power and control terminal positions for connection of the field wiring (supplied by others). It is important to identify the options that were purchased with the unit in order to confirm which field connections are required. Refer to the electrical drawing supplied with the unit to determine the total number of interconnecting conductors required for your system.

Verify that the main power supply coincides with the voltage, phase and frequency information specified on the system nameplate. The supply voltage measured at the unit must be within ±10% of the voltage specified on the nameplate. The nameplate also provides the full load amps (FLA), the current that the unit will draw under full design load, the minimum circuit ampacity (MCA) for wire sizing, and the maximum fuse or HACR (Heating, Air Conditioning, Refrigeration) breaker size (MAX FUSE/CKT BKR) for circuit protection. The unit's nameplate is located inside the electrical box.

Proper over-current protection should be provided for the fan motors. See the typical wiring diagrams shown in Figure 8 for details on fuses, disconnect switches, etc. All standard motors have internal inherent over-



Figure 7- Field Wiring

load protectors. All drycoolers are furnished with either single-phase or three-phase fan motors which are identified by the unit nameplate. Electrical leads from each motor terminate at the unit electric box.

Pilot hole openings for the conduit are located in the bottom of the electric box. A label stating "MAIN POWER INPUT" is in close proximity. The main power wires are terminated at the line side of the service disconnect switch located within the electric box. A separate equipment ground lug is provided within the electrical box for termination of the earth ground wire.

The installer must also wire control conductors to the terminal board within the electric box. The number of control conductors needed varies depending on the type of control method being used with your equipment. Refer to the electrical drawing supplied with your unit to determine the correct quantity of control conductors needed and for the proper wire terminations.

## WARNING

**High voltage is used in the operation of this equipment.** Verify power is turned off before making connections to the equipment.

### 

If a power transformer is supplied with the equipment, it is sized and selected based upon the expected load for the system. Do not con-

nect any additional loads to the system power transformer. To prevent overloading do not connect additional loads to the factory supplied transformer.

#### <u>NOTE</u>

All wiring must conform to local and national electrical code requirements. Use of copper conductors only is required. Wiring terminations may become loose during transit of the equipment; therefore, it is required to verify that all wiring terminations are secure.

### 

Improper wire connections will result in the reverse rotation of the fan. To correct this problem, exchange any two of the incoming main power wires at the main power distribution block. DO NOT rewire the unit's individual components.





#### Figure 8- Typical Drycooler Wiring Diagrams



#### 3.0 START-UP

For new installations, ensure the unit is ready to operate by going through the Checklist for Completed Installation, located in Appendix A, prior to start-up.

#### <u>NOTE</u>

A Warranty Registration and Start-Up Checklist is provided with the unit data package. It should be completed during start-up and sent to SATS. This checklist should be used as a guideline for items that need to be confirmed during start-up.

### 

Start-up must be performed by an authorized journeyman, refrigeration mechanic or an air conditioning technician.

#### 3.1 Pre-start

Check for correct fan rotation. This can be done by quickly jogging the fan contactor. Be sure the fans run freely. The same check is recommended for the fluid pumps.

#### 3.2 Filling and Purging the System

The system should be pressure tested before adding the water/glycol solution. The system can be tested with air or water, however if the ambient temperature is at or below freezing the use of air is recommended. Test pressure should not exceed 60 PSIG.

#### 3.2.1 Roof Mounted Drycooler

To fill the system pour the <u>premixed</u> water and glycol into the expansion tank (see Figure 6). Fill the system until the expansion tank is half full, then purge the air from ALL vents. Operate the system for a minute, then purge ALL vents again and add glycol as required. Repeat the purging of all vents after the first hour of operation and again after several hours of operation.

#### 3.2.2 Ground Mounted Drycooler

The drycooler may be the lowest point in the system; consequently the <u>premixed</u> water and glycol will have to be pumped into the system (see Figure 9). Close the shut off valve(s) installed in the piping run on the leaving side of the primary pump.

Connect a pump with an outlet hose to the hose bib farthest away from the primary pump outlet. Connect a return hose to the hose bib closest to the primary



Figure 9- Ground Mounted Drycooler Filling Diagram



pump. Open the two hose bib valves and begin pumping the glycol mixture into the system at FULL PRESSURE. For the return hose you should partially close the hose bib valve so you get only a small flow of fluid or air. This is necessary in order to build a head of fluid which will force the air from the system. Once all the air is out you will have a steady flow of fluid only. At this point you should close off the two hose bibs and open the shut off valve.

Once the system is completely full of fluid, start the fluid circulating pump. To assure proper fluid flow, adjust the shut-off valve for the required GPM by checking the pump curve and observing gauge pressure, or by using an in-line flow meter.

#### 3.3 Operation

- 1. Replace all equipment access panels removed prior to performing start-up checks.
- 2. Apply power to the drycooler at the main power disconnect switch.

#### 3.4 Drycooler Control

#### 3.4.1 On/Off Control

When the A/C unit begins to operate, the water/glycol solution leaving the indoor condenser rises. The GPS pump package turns on and coolant flows from the pump. Control power is applied to the interface terminals in the pump package electric box labeled "Remote Drycooler". This control signal enables the drycooler to operate. A drycooler fan cycling switch (Aquastat) monitors the leaving water/glycol fluid temperature and turns on the drycooler fan(s) as required to maintain allowable condensing temperatures. This is a differential control switch with SPST contacts and an automatic reset. The switch activates the drycooler fan contactor(s), turning on the fan(s) to maintain the temperature of the water/glycol leaving the drycooler to 110° F to control the indoor condenser's condensing temperature.

Factory setting: Contacts close on a temperature rise to 110° F and open at 60° F. Setpoint range is 110 to 135° F. Differential is non-adjustable and set at 50° F.

#### 3.4.2 Fan Cycling

On larger units with multiple fans, each fan may be controlled with its own aquastat. Fans are staged to operate sequentially as the water/glycol temperature rises. The primary fan, farthest from the header, turns on 1<sup>st</sup> as described above. If temperature continues to rise, adjacent fan(s) are set to turn on sequentially in 5° F increments with the fan located closest to the header turning on last. Conversely, as water/glycol temperature drops, the fans cut out sequentially in reverse order. See Section 3.4.2.1 for the fan cycling temperature control settings.

Dual row drycoolers operate with an aquastat wired in parallel to each pair of fans. If the aquastats sense a rise in temperature, the fans will turn on as pairs in the manner described above with each aquastat set to sequentially turn on adjacent pairs of fans in 5° F increments as the temperature rises.

#### 3.4.2.1 Fan Cycling Temperature Control Settings

1st I	Fan(s)	2nd	Fan(s)	3rd	Fan(s)	4th	Fan(s)	5th I	Fan(s)	6th I	Fan(s)
Cut-In	Cut-Out										
95° F	90° F	100° F	95° F	105° F	100° F	110° F	105° F	115° F	110° F	120° F	115° F



#### 3.5 Start-Up/Commissioning

#### 3.5.1 Operation

For new installations, ensure the unit is ready to operate by going through the Checklist for Completed Installation, located in Appendix A, prior to start-up.

#### <u>NOTE</u>

A Warranty Registration and Start-Up Checklist is provided with the unit data package. It should be completed during start-up and sent to SATS. This checklist should be used as a guideline for items that need to be confirmed during start-up.

### 

Start-up must be performed by an authorized journeyman, refrigeration mechanic or an air conditioning technician.

#### 3.5.2 Step-by-Step Startup Instructions

- 1. Replace all equipment removed prior to performing start-up checks.
- 2. Turn the main power disconnect switch to the "On" position.



#### 4.0 MAINTENANCE/REPAIRS

#### 4.1 Periodic General Maintenance

Systematic, periodic general maintenance of the drycooler is recommended for optimum system performance. General maintenance should include, but is not limited to the following: tightening electrical connections, cleaning the interior of the unit, inspecting the unit's components visually and inspection/ cleaning the coil(s).

Use copies of the Periodic General Maintenance Checklist in this manual (see Appendix A) to record periodic general maintenance inspections. For assistance, contact the SATS Product Support Group. Ensure adherence to all safety statements while performing any type of maintenance.

## 

All maintenance and/or repairs must be performed by a journeyman, refrigeration mechanic or an air conditioning technician.

## 

Turn off power to the unit at the main power disconnect switch unless you are performing tests that require power. To prevent personal injury, stay clear of rotating components because automatic controls may start them unexpectedly. With power and controls energized, the unit could begin operating automatically at any time.

Hazardous voltage will still be present even when the unit is not operating. To isolate the unit for maintenance, always turn off power at the main power disconnect switch prior to performing any service or repairs.

This unit employs high voltage equipment with rotating components. Exercise extreme care to avoid accidents and ensure proper operation.

#### 4.1.1 General

Maintenance access to the drycooler coil is through the hinged` fan assembly panel on top of the unit. Examine the areas around the air inlet and outlet grills, fans, motors and coils. Use a vacuum cleaner with a soft bristle brush to clean dirt from components.

Clean the coil of all debris that will inhibit airflow. This can be done with a vacuum cleaner, soft brush and compressed air, or with a commercial coil cleaner. Check for bent or damaged coil fins and repair as necessary. On outdoor units do not permit snow to accumulate on or around the unit in the winter.

- Check all piping for vibration isolation and support as necessary.
- Check all piping for signs of leaks.
- Examine all wiring for signs of chafing, loose connections or other obvious damage. (Quarterly)
- Examine brackets, motor mounts and hardware for loose or missing parts or other damage. (Quarterly)
- Clean accumulations of dust and dirt from all interior and exterior surfaces. (Quarterly)

#### <u>NOTE</u>

Fan motors have permanently sealed bearings, therefore, no lubrication is required.



#### 4.2 Troubleshooting

Turn off all power to the unit before conducting any troubleshooting procedures, unless the procedure specifically requires the system to operate. For trouble shooting purposes, the system may be operated with the electric box open by using a pair of channel lock pliers to turn the shaft of the main power disconnect switch to the "On" position. When the switch is turned on, high voltage will be present inside the box. Exercise caution to prevent injury. Keep hands, clothing and tools clear of the electrical terminals and rotating components. Ensure that your footing is stable at all times.

## 

This equipment should be serviced and repaired by a journeyman or a qualified refrigeration technician only.

SYMPTOM	PROBABLE CAUSE	RECOMMENDATION
Unit Fails to Start	a. Incorrect phasing or voltage.	Correct phase or voltage input.
	b. Power failure.	Check power source, power input and fuses. Check control wiring and connections.
	c. Overload protection tripped.	Check for cause of overload and repair.
Control is Erratic	Wiring improperly connected or broken.	Check wiring against schematic diagram.
Indoor Condenser Head Pressure too High	a. Low drycooler airflow. (Indicated by excessive warm air leaving the drycooler fan).	Open air passages. Clean coil. Check drycooler fan(s).
	b. Drycooler fan(s) not operating.	1. Check main voltage power source to unit.
		2. Check fan motor, contactor and fan cycling switch.
		3. Check temperature switches and motor. Replace as needed.
	c. Condenser pressure regulating valve setting too high.	Adjust to obtain correct pressure.
	d. Air in the system.	Purge air with additional water/glycol solution.
Erratic Fan Operation	Dirty or blocked drycooler coil.	Clean coil or remove blockage.
	Loose Fan Blade.	Align and tighten fan blade.



#### 4.3 Field Service

It may be necessary to perform repairs on the system. If field repairs are necessary, the following procedures apply:

#### <u>NOTE</u>

Do not attempt to make repairs without the proper tools.

#### 4.3.1 Leak Detection and Repair

Visually inspect the pipe inlet/outlet fittings and observe the area around the drycooler and the base for signs of leaking coolant.

#### <u>NOTE</u>

Repairs must be performed by a qualified technician.

If a leak is located in the piping, isolate that section of piping using appropriate shut-off valves. Ensure the indoor systems are disabled prior to isolating the drycooler. It may be necessary to drain some of the coolant. When repairs are complete, pressure check the system, checking for leaks prior to refilling the system with water/glycol. After 24 hours observe the piping system for leaks.

#### 4.3.2 General Common Repairs

If a failure has occurred, determine whether it is an electrical or a mechanical failure. An electrical failure may be indicated by a distinct pungent odor once the electric box has been opened. A mechanical failure may be indicated by abnormal or excessive noise from the fans or motors.

All electrical connections should be checked to ensure that they are tight and properly made. Check all fuses, switches, contactors and wiring. The contactor should be examined and replaced if the contacts are worn or pitted.



#### 5.0 PRODUCT SUPPORT GROUP

SATS provides its customers with a Product Support Group (PSG) which not only provides technical support and parts but the following additional services, as requested: performance evaluations, start-up assistance and training.

#### 5.1 Technical Support

The SATS Product Support Group (PSG) is dedicated to the prompt reply and solution to any problem encountered with a unit. Should a problem develop that cannot be resolved using this manual, you may contact PSG at (240) 529-1399 Monday through Friday from 8:00 a.m. to 5:00 p.m. EST. If a problem occurs after business hours, dial the page number (301) 414-4514 and follow the steps below:

- 1. Wait for the dial tone.
- 2. Dial your telephone number (including area code).
- 3. Press the pound (#) key.
- 4. Wait for a busy signal.
- 5. Hang up the telephone.

One of our service technicians will return your call. When calling to obtain support, it is vital to have the following information readily available, (information is found on unit's nameplate):

- Unit Model Number (F()S-XXX-X)
- SATS Item Number (123456)
- Unit Serial Number (1234567)
- Description of Problem

#### 5.2 Obtaining Warranty Parts

Warranty inquires are to be made through the Product Support Group (PSG) at (240) 529-1399 Monday through Friday from 8:00 a.m. to 5:00 p.m. EST. A service technician at SATS will troubleshoot the system over the telephone with a field service technician to determine the defect of the part. If it is determined that the part may be defective a replacement part will be sent UPS ground. If the customer requests that warranty part(s) be sent by any other method than UPS ground the customer is responsible for the shipping charges. If you do not have established credit with SATS you must provide a freight carrier account number. A written (or faxed) purchase order is required on warranty parts and must be received prior to 12:00 p.m. for same day shipment. The purchase order must contain the following items:

- Purchase Order Number
- Date of Order
- SATS Stated Part Price (obtained from PSG)
- Customer Billing Address
- Shipping Address
- Customer's Telephone and Fax Numbers
- Contact Name
- Unit Model No., Serial No. & SATS Item No.

The customer is responsible for the shipping cost incurred for returning the defective part(s) back to SATS. Return of defective part(s) must be within 30 days at which time an evaluation of the part(s) is conducted and if the part is found to have a manufacturing defect a credit will be issued.

When returning defective part(s) complete the Return Material Authorization Tag and the address label received with the replacement part.

See SATS Standard Warranty located in section one of this manual.

#### 5.3 Obtaining Spare/Replacement Parts

Spare and replacement parts requests are to be made through the Product Support Group (PSG) by fax (301) 620-1396, telephone (240) 529-1399 or E-mail (parts@stulz-ats.com). Quotes are given for specified listed parts for a specific unit.

SATS accepts Visa and MasterCard. SATS may extend credit to its customers; a credit application must be prepared and approved (this process could take one week).

A 25% minimum restocking charge will be applied on returned stocked parts that were sold as spare/replacement parts. If the returned part is not a stocked item, a 50% restocking charge may be applied. Additionally a Return Material Authorization Number is required when returning parts. To receive credit for returned repair/replacement parts, the parts must be returned to SATS within 30 days of the purchase date. Spare part sales over 30 days old will be considered final and the parts will remain the sole property of the ordering party.

NOTES



Frederick, Maryland USA 21704

Telephone: (301) 620-2033 Facsimile: (301) 620-1396

## **APPENDIX A - FORMS**

#### **Remote Air Cooled Fluid Cooler**

Stulz Air Technology Systems Inc. Frederick, Maryland USA 21704 Telephone: (301) 620-2033 Facsimile: (301) 620-1396

#### **Checklist for Completed Installation**

1	Proper clearances for service access have been maintained around equipment.	8	Customer supplied main power circuit breaker (HACR type) or fuses have proper ratings for equipment installed.	
2	Equipment is level and mounting fasteners are tight.	9	Control wiring connections completed to fluid cooler.	
<b>3</b>	Piping completed to cooling equipment.	10	All wiring connections are tight.	
4	All field installed piping leak tested.	11	Foreign materials have been removed from	
5	Water/Glycol charge added (Premixed).		(shipping materials, construction materials, tools, etc.).	
6	Incoming line voltage matches equipment nominal nameplated rating ± tolerances.	12	Inspect all piping connections for leaks during initial operation.	
7	Main power wiring connections to the equipment, including earth ground, have been			

properly installed.



Telephone: (301) 620-2033 Facsimile: (301) 620-1396

#### Remote Air Cooled Fluid Cooler Periodic General Maintenance Checks and Services Checklist

Date: Model Number Item Number:	Pre	pared By: ial Numbe	er:							
Monthly										
	Area Around Fluid Cooler Unit Clean and Clear of Obstructions									
Semi-Annually										
	Check Water/Glycol Charge Level Check % Water/Glycol Fluid Solution Ensure Piping is Secured Tighten Electrical Connections		Ensure Motor Mounts are Secured Clean Unit as Necessary Check Coil(s), Clean as Needed							
Annually										
	Inspect Piping System for Leaks and Corrosion Conduct a Complete Check of All Services Liste Above and Clean Unit's Interior	d								
Notes:										

\*\*\* If factory assistance is required for any reason, provide the model number, serial number, and SATS item number found on the unit nameplate. This will speed the process and ensure accuracy of information. \*\*\*

Signature:\_\_\_\_\_

#### Fluid Cooler Installation, Operation & Maintenance Manual

## Appendix B - Glossary

#### Definition of Terms and Acronyms

SATS -	Stulz Air Technology Systems, Inc.	kW -	Kilowatt
BMS -	Building Management System	MAX CKT BKR -	Maximum Circuit Breaker
BTU/Hr -	British Thermal Units Per Hour	MAX FUSE -	Maximum Fuse
DRY COOLER -	Fluid Cooler	MCA -	Minimum Circuit Ampacity
ESD -	Electrostatic Discharge	MSDS -	Material Safety Data Sheet
°F-	Degrees Fahrenheit	NEC -	National Electric Code
FLA -	Full Load Amps	PSI -	Pounds Per Square Inch
FOB -	Freight on Board	PSIG -	Pounds Per Square Inch Gauge
GPM -	Gallons per Minute	RLA -	Run Load Amps
HACR -	Heating, Air Conditioning, Refrigeration	R-Value -	Thermal Resistance
HP -	Horse Power	V -	Volt
Hz -	Hertz	VAC -	Volt, Alternating Current
KVA -	Kilo Volt Amps		



# Globally close to you

Stulz-ATS, located in Frederick, MD USA, is part of The STULZ Group with headquarters in Hamburg, Germany and production facilities world wide. Our network of manufacturer's representatives and sales partners span the globe, providing innovative solutions to your unique environmental control needs.

# www.stulz-ats.com



Stulz Air Technology Systems, Inc. 1572 Tilco Drive, Frederick, Maryland 21704 Phone: (301) 620-2033, Fax: (301) 662-5487 Email: info@stulz-ats.com

#### www.stulz-ats.com



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ORU0031A Remote Fluid Cooler Installation, Operation & Maintenance 10/10- Specifications are subject to change witout notice.