

READ AND SAVE THESE INSTRUCTIONS

DRI-STEEM

MODEL STS[®] and STS-DI[®]

STEAM-TO-STEAM HUMIDIFIERS

Installation Instructions
and
Maintenance Operations
Manual

For Toll-Free Customer Support,
Call 1-800-328-4447



UL LISTED



CUL LISTED

DRI STEEM[®]
HUMIDIFIER COMPANY



TABLE OF CONTENTS

TO THE PURCHASER AND THE INSTALLER

Thank you for purchasing DRI-STEEM STS® humidification equipment. We have designed and built this equipment to give you total satisfaction and many years of trouble-free service. Proper installation and operating practices will assure you of achieving that objective. We urge you to become familiar with the contents of this manual.

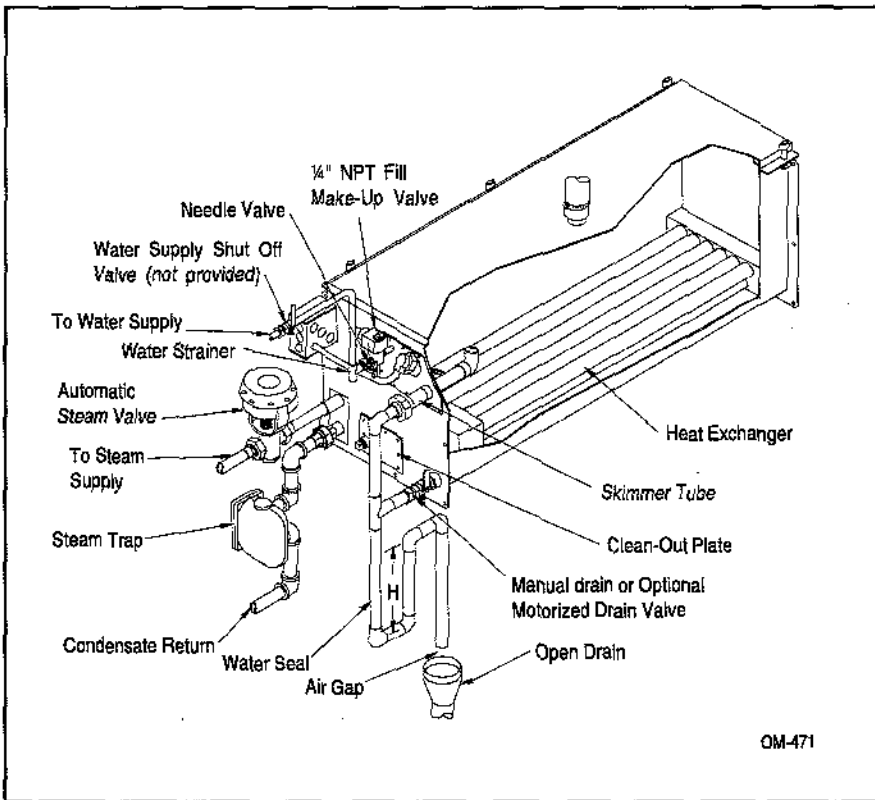
DRI-STEEM Humidifier Company

STS and STS-DI Humidifiers	3
Capacities and Dimensions	4
Installation	
• Selecting the Location	6
Mounting Methods	8
Steam Dispersion Installation	10
RAPID-SORB® Assembly and Installation	12
• Horizontal Duct Installation	12
• Vertical Duct Installation	13
Piping	14
Piping Diagrams: Steam, Water and Drain	17
Electrical	18
Start-Up and Operation	
• Drain/Flush Feature	19
• Test Cycling the Drain/Flush System	20
Recommended Maintenance	20
STS-DI Start-up and Recommended Maintenance	22
Trouble Shooting Guide	23
Replacement Parts	24
Two-Year Limited Warranty	28

STS® AND STS®-DI HUMIDIFIERS

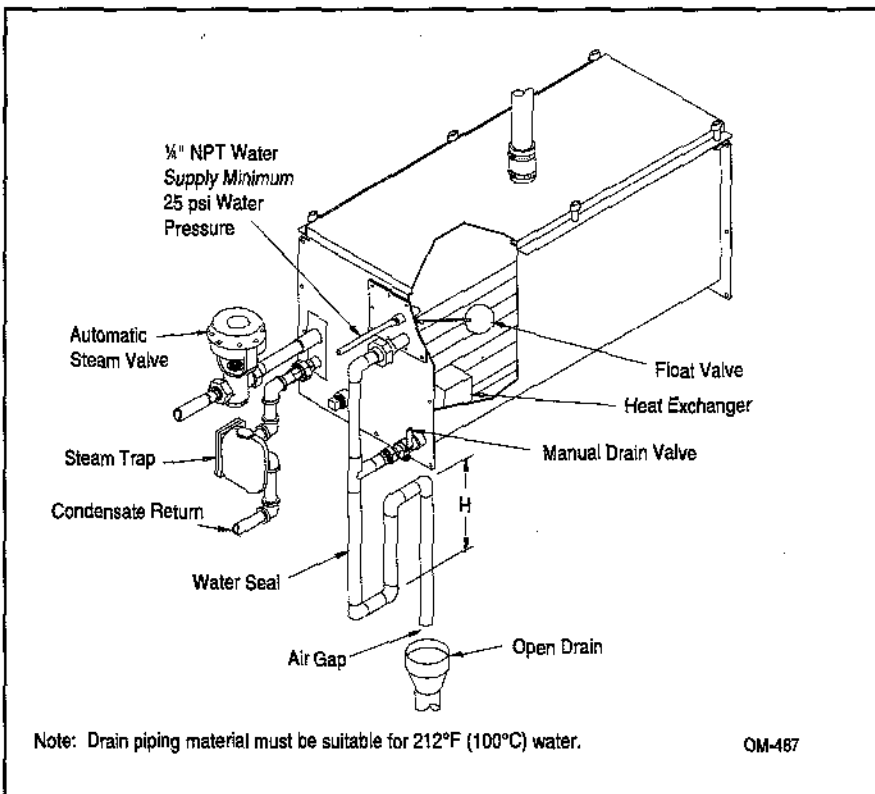
STS Humidifier (For use with softened or unsoftened water.)

This humidifier is designed for use with either softened or unsoftened water (preferably softened). The probe-type level control system requires water conductivity of 100 micromhos/cm (2 grains/gal) minimum to function, and therefore will not operate on water treated by reverse osmosis or deionization. However, STS humidifiers are available for use with these water types. The standard humidifier can be converted in the field to a STS-DI model. See below.



STS-DI Humidifier (For use with demineralized or reverse osmosis water.)

For use with deionized or reverse osmosis water. This unit produces chemical-free steam and reliable, accurate humidification control. It is *virtually maintenance-free, with no wasted water, heat, or downtime.*



CAPACITIES AND DIMENSIONS

Table 4-1: Capacities in Lbs/Hr with Copper Heat Exchangers

Model No.	Output Capacities Lbs/Hr (kg/hr) with Copper Heat Exchangers			
	*Steam Pressure - PSI (kPa)			
	5 (34)	10 (69)	13 (90)	15 (103)
STS-25C	20 (9)	70 (32)	100 (45)	120 (54)
STS-50C	50 (23)	150 (68)	200 (91)	240 (109)
STS-100C	100 (45)	300 (136)	400 (181)	480 (218)
STS-400C	300 (136)	580 (263)	720 (327)	790 (358)
STS-800C	650 (295)	1275 (578)	1500 (680)	1600 (726)

* At connection to STS[®] steam valve

Note: All DI/RO and Standard Units are available with either Copper or Stainless Steel Heat Exchangers.

Table 4-2: Capacities in Lbs/Hr with Stainless Steel Heat Exchangers

Model No.	Output Capacities Lbs/Hr (kg/hr) with Stainless Steel Heat Exchangers			
	* Steam Pressure PSI (kPa)			
	5 (34)	10 (69)	13 (90)	15 (103)
STS-25S	10 (5)	25 (11)	30 (14)	35 (16)
STS-50S	30 (14)	55 (25)	75 (34)	80 (36)
STS-100S	60 (27)	110 (50)	140 (64)	150 (68)
STS-200S	150 (68)	290 (132)	360 (163)	390 (177)
**STS-400S	170 (77)	392 (178)	552 (250)	637 (289)
**STS-800S	212 (96)	825 (374)	1095 (497)	1223 (555)

* At connection to STS steam valve

** Without TEFLON[®] coating. Available in DI/RO only.

Table 4-3: Humidifier Weights

Model No.	Operating Weight Lbs. (kg)	Shipping Weight Lbs. (kg)
STS-25	175 (79)	95 (43)
STS-50	336 (152)	125 (57)
STS-100	350 (159)	139 (63)
STS-200	*850 (386)	245 (111)
STS-400	*950 (431)	320 (145)
STS-800	*1450 (658)	410 (186)

* Suspending from overhead construction is not recommended due to operating weight of unit.

Table 4-4: STS and STS DI/RO (Stainless Steel Heat Exchanger) Mechanical Specifications

Model No.	Dimensions - Inches (millimeters)									
	A	B	C	D	E	F	G	H	J	K
STS-25S	18.25 (465)	14.75 (375)	23.68 (600)	3.35 (85)	6.85 (175)	-	-	1.38 (35)	¾" NPT	¾" NPT
STS-50S	18.25 (465)	14.75 (375)	39.68 (1010)	3.35 (85)	6.85 (175)	-	-	1.38 (35)	¾" NPT	1" NPT
STS-100S	18.25 (465)	19.25 (490)	39.68 (1010)	3.35 (85)	6.85 (175)	-	-	1.38 (35)	¾" NPT	1" NPT
STS-200S/400S*	18.25 (465)	28.25 (720)	55.21 (1400)	3.35 (85)	6.59 (167)	-	-	1.38 (35)	¾" NPT	1½" NPT
STS-800S	28.57 (725)	28.25 (720)	55.21 (1400)	3.59 (90)	6.63 (168)	11.24 (285)	14.28 (360)	1.38 (35)	1½" NPT	1½" NPT

*STS-400S requires two STS-200S heat exchangers

Note: Above dimensions refer to drawings on page 5.

Table 4-5: STS and STS DI/RO (Copper Heat Exchanger) Mechanical Specifications

Model No.	Dimensions - Inches (millimeters)									
	A	B	C	D	E	F	G	H	J	K
STS-25C	18.25 (465)	14.75 (375)	23.68 (600)	3.59 (90)	6.63 (170)	-	-	1.38 (35)	¾" NPT	¾" NPT
STS-50C	18.25 (465)	14.75 (375)	39.68 (1010)	3.59 (90)	6.63 (170)	-	-	1.38 (35)	¾" NPT	1¼" NPT
STS-100C	18.25 (465)	19.25 (490)	39.68 (1010)	3.59 (90)	6.63 (170)	-	-	1.38 (35)	1¼" NPT	1¼" NPT
STS-400C	18.25 (465)	28.25 (720)	55.21 (1400)	3.59 (90)	6.63 (170)	-	-	1.38 (35)	1¼" NPT	1½" NPT
STS-800C	28.57 (725)	28.25 (720)	55.21 (1400)	3.59 (90)	6.63 (170)	11.24 (285)	14.28 (360)	1.38 (35)	1¼" NPT	1½" NPT

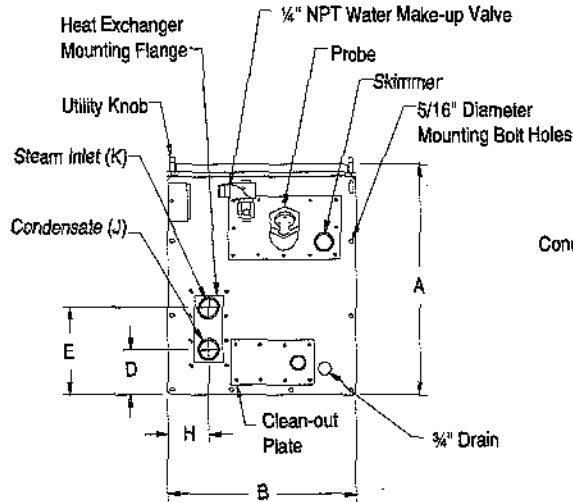
Note: Above dimensions refer to drawings on page 5.

Dimensions and specifications subject to change without notice.

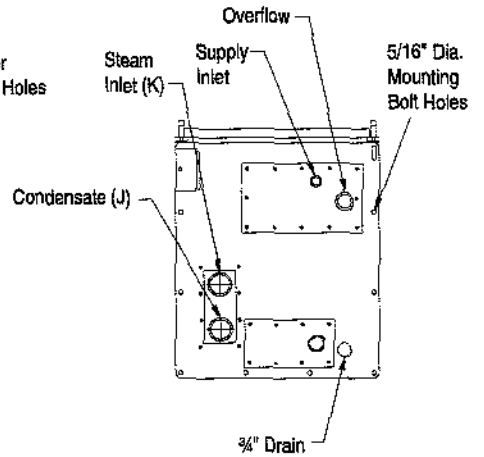
CAPACITIES AND DIMENSIONS

STS® and STS®- DI sizes 25, 50, 100, 200, and 400

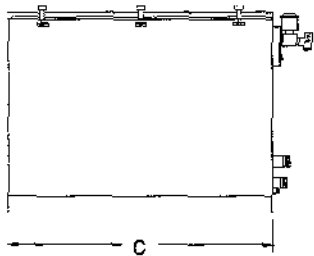
Front View Standard STS Unit



Front View DI Water Unit



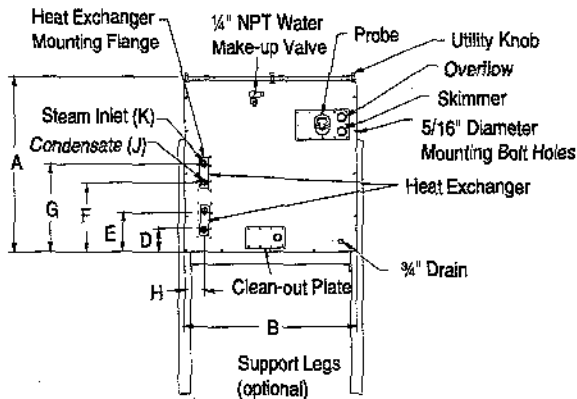
Side View



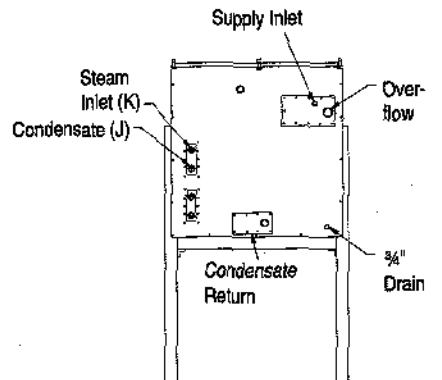
Note: For dimensions refer to tables 4-4 and 4-5 on page 4.

STS and STS-DI 800

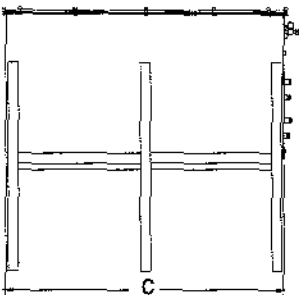
Front View Standard STS Unit



Front View DI Water Unit



Side View



Note: For dimensions refer to tables 4-4 and 4-5 on page 4.

INSTALLATION

Selecting the Location

When selecting the location, first consideration should be given to rapid, thorough absorption of the steam. The warmest air will most readily absorb steam. The most active part of the air stream will provide the best mixing of the steam and air. Avoid dead spots such as the inside curve of an elbow or an area immediately downstream of a baffle plate. Since the "fog" will travel some distance before "disappearing" and will saturate objects it touches while visible, you should avoid discharging the steam nearer than your calculated absorption distance* upstream of fans, filters, dampers, etc. unless the air temperature is warmer than 90°F. If so, a shorter distance may be permissible. If in doubt, consult factory.

When the remote mounting method with the vapor hose kit is used, condensate will drain into the duct unless the dispersion tube is positioned correctly and the tube and vapor hose are pitched properly. Preferably, the condensate should drain back to the humidifier in the vapor hose. When job conditions prevent this, an alternate method is used. Waterlogged low points in the hose will cause "gurgling" and in severe conditions periodically "slugs" of condensate may be discharged into the duct. (See page 10 for alternate methods.)

* When adequate distance is not available, you should use a rapid absorption tube bank. Contact your local DRI-STEEM representative at 1-800-328-4447.

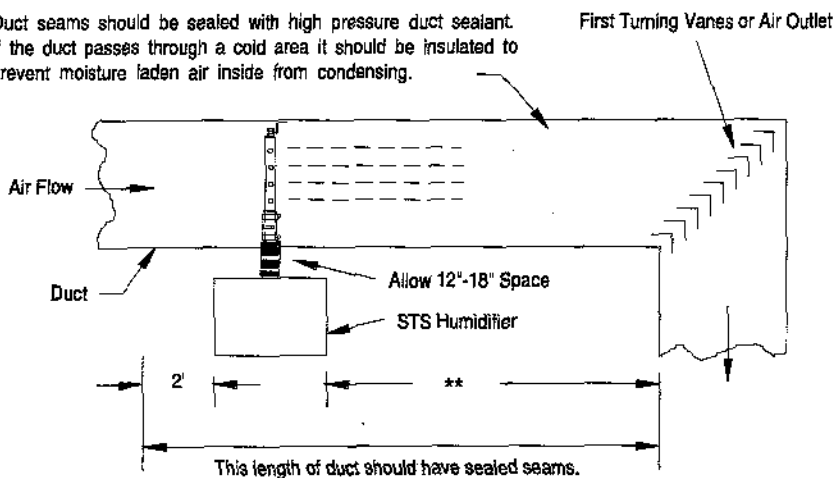
The location selected must also provide for electrical service, cold water for make-up and sanitary waste for drain.

Simply Stated:

- A. It is very important that the dispersion tube be located where the water vapor being discharged will be carried off with the airstream and will not cause condensation or dripping from the duct.
- B. In general, the STS® humidifier is best placed where the air can most readily absorb the moisture being added without causing condensation at or after the unit. This will normally be after the heating coil or where the air temperature is highest.
- C. Do not place the unit too close to the intake of a high efficiency filter. The filter may remove the visible moisture and become waterlogged.*
- D. Do not place unit where water vapor will impinge on a metal surface.
- E. Do not place the unit too close to a split in the duct. The unit may put more moisture in one branch than the other.

Figure 6-1: Vapor Absorption Distance

Duct seams should be sealed with high pressure duct sealant. If the duct passes through a cold area it should be insulated to prevent moisture laden air inside from condensing.



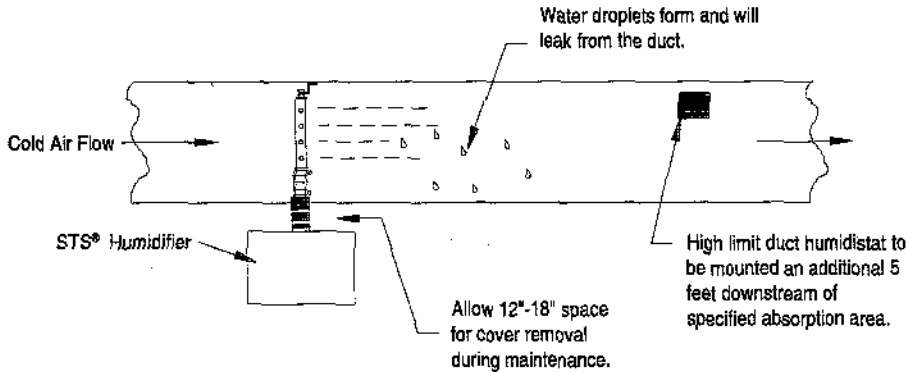
A distance of air travel is required for the steam to "disappear" or go into the gaseous state.

While visible, the steam may collect on internal devices, such as turning vanes, resulting in dripping.

**A distance of 5 to 8 feet is recommended, depending on temperature. (When duct air is cooler than 80°F, up to 12 feet should be allowed.)

INSTALLATION

Figure 7-1: Installation in Cool Air Stream



When a humidifier discharges into a duct that will carry cool air (under 70°F) periodically, the dew point temperature should be determined.

If the psychrometric chart reveals that saturation may occur, protection should be provided. A high limit humidistat or a thermostat, set to cut off the humidifier at a safe temperature, can be used for this purpose.

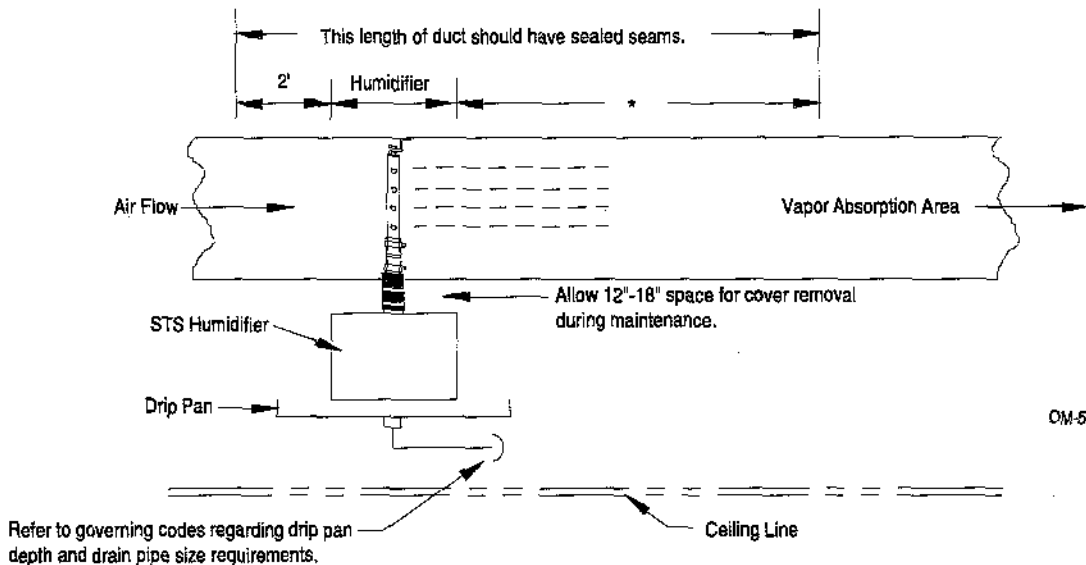
OM-58

Water piping and humidifiers should not be installed above expensive apparatus or equipment. A broken water pipe, leaking valve gland, condensation or other water leaks may occur causing serious damage and costly repairs to the equipment below.

Where this type of installation cannot be avoided install a drip tray constructed of galvanized sheet under the humidifier, valve, etc. to catch any possible water drip.

It is advisable to terminate the drain above an open floor drain. The overflow from the STS should be piped separately to a floor drain rather than the drip pan.

Figure 7-2: Installation Above Valuable Equipment



OM-58

* The distance steam will travel within a given airstream is predictable and can be determined using the STS catalog. If this has already been done, the travel distance should be specified; if not, consult the STS catalog or contact your DRI-STEEM representative or the DRI-STEEM factory.

MOUNTING METHODS

Mounting Notes

1. For the electrode probe water level control and the skimmer system to properly operate, the humidifier must be mounted level in both directions.

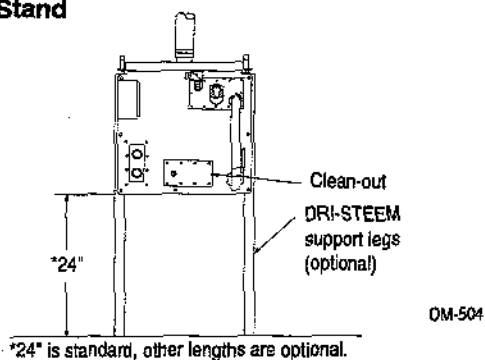
2. Access (12" to 18" minimum) for periodic removal of the top cover is recommended. In most cases, scale that forms on the heat exchanger continuously flakes off as it

forms and the loose scale settles to the bottom. A clean-out tray on the floor of the evaporator may be removed periodically through the front clean-out opening.

3. Due to the size and weight of the STS® 200, 400 and 800 units, the trapeze hanger and wall brackets are not recommended.

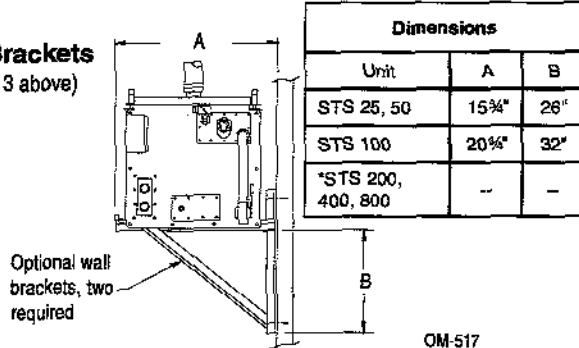
Figure 8-1: Mounting Support Methods

Floor Stand



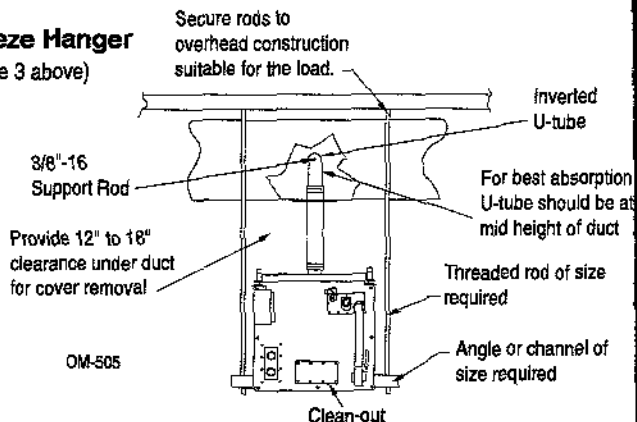
Wall Brackets

(see note 3 above)



Trapeze Hanger

(see note 3 above)



Cradle

Models STS 200, STS 400C and 800C require cradle.

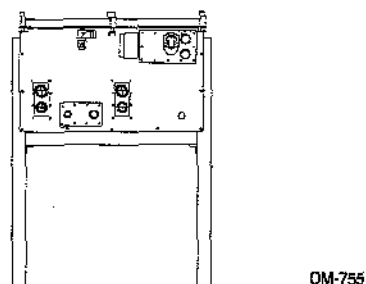
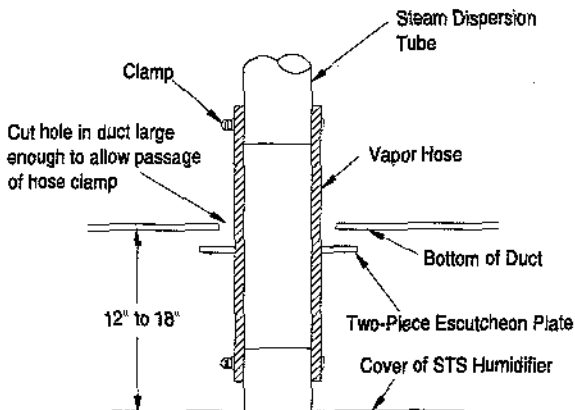
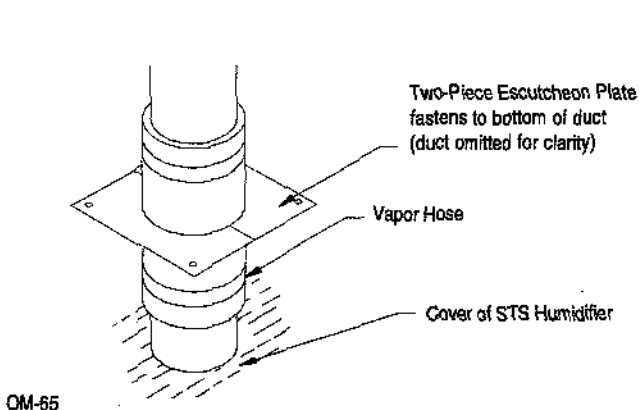


Figure 8-2: Mounting Unit on Underside of Duct

Mounting humidifier 12" to 18" below duct recommended to facilitate cover removal.



MOUNTING METHODS

Figures 9-1 and 9-2: Mounting Units Away from Duct(s) Using Vapor Hose

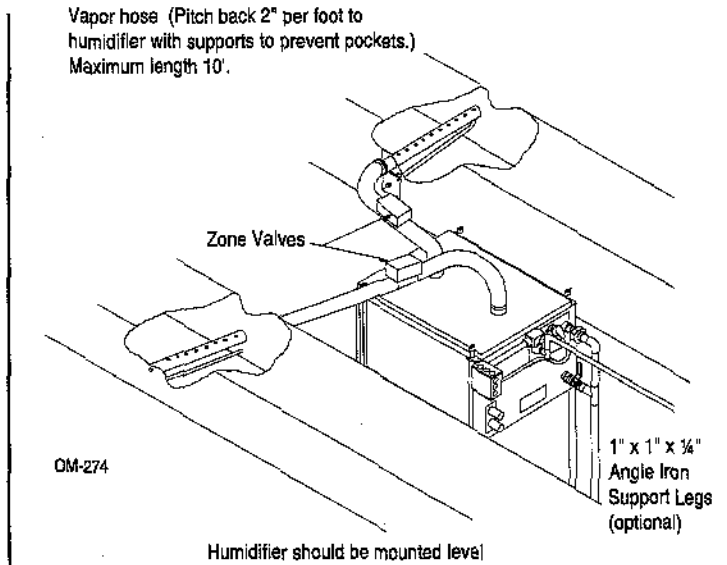
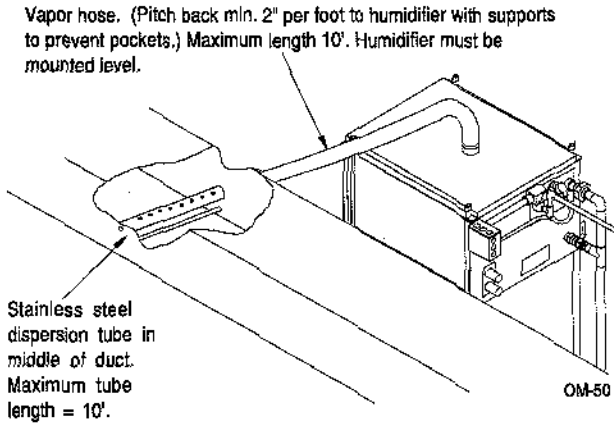
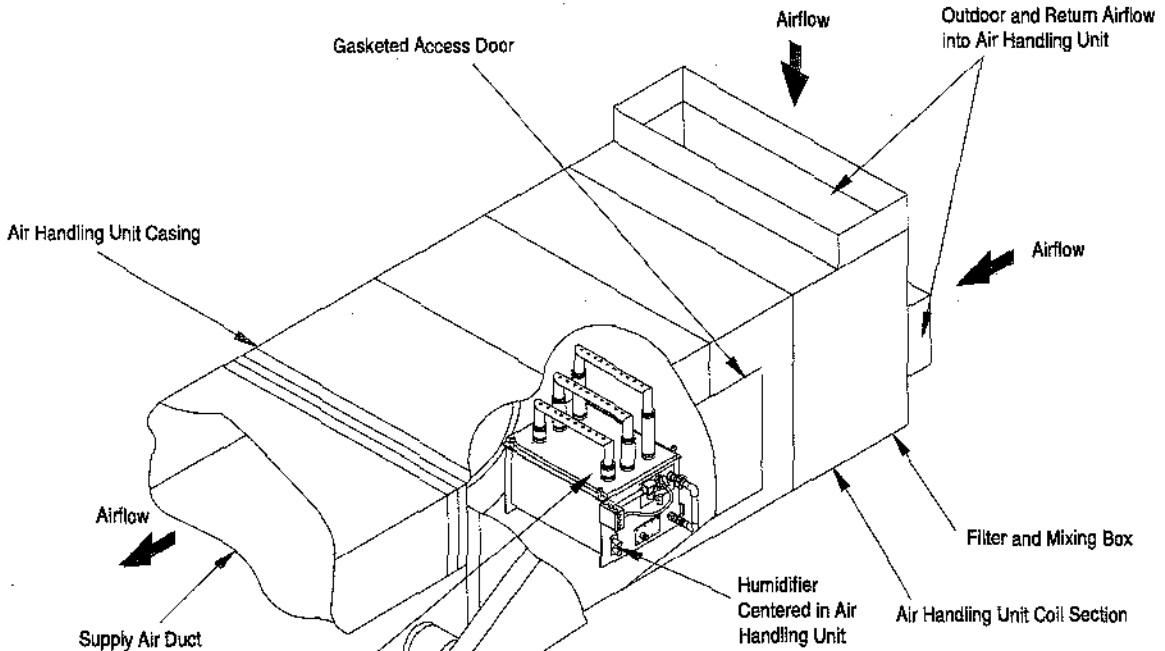


Figure 9-3: Mounting In Air Handling Unit



Set unit level. Locate unit so that steam dispersion assembly is in the most active part of the air stream.

OM-276

STEAM DISPERSION INSTALLATION

STS Dispersion Tube Installation with Condensate Drain (over 28 pph per dispersion tube)

Vapor Hose

- Vapor hose should be supported to prevent sags or low spots and to maintain a minimum pitch of 2" per foot back to the humidifier.
- When mounting the humidifier above the level of dispersion tube, see page 15.

Failure to follow the above recommendation may result in excessive back pressures being imposed on the humidifier. This in turn may lead to dispersion tube(s) spitting, lost water seals or leaking gaskets.

When distance between humidifier and the dispersion tube(s) exceeds 10 feet, consult factory for special recommendations.

Vapor Rigid Piping (when used)

- Vapor piping should have a minimum I.D. of 1.5 inches.
- A minimum pitch of 2" per foot back to the humidifier should be maintained.
- 90° elbows are not recommended, use two 45° elbows one foot apart instead.
- Thin wall tubing will heat up faster and cause less start up loss than heavywall pipe.
- Insulating the rigid piping will reduce the loss in output caused by condensation.

Tube Mounting

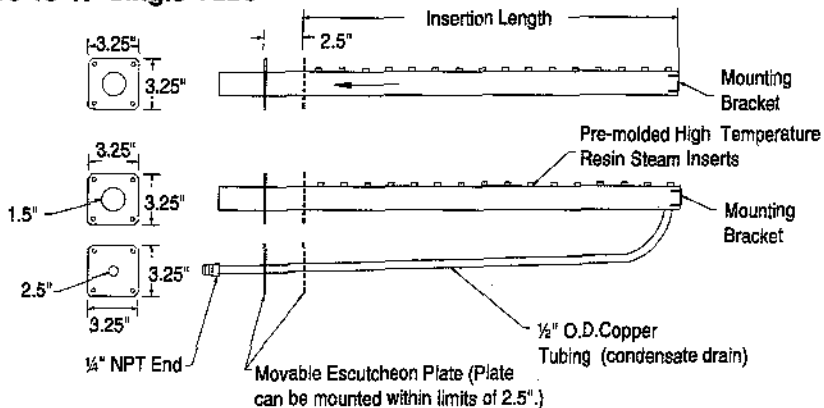
- Mount dispersion tube dead level.
- Best vapor absorption occurs when dispersion tube discharges against the air flow.

**Return line drain tube must be suitable for 212° F (100°C) water.

Minimum Condensate Drain Line Sizing

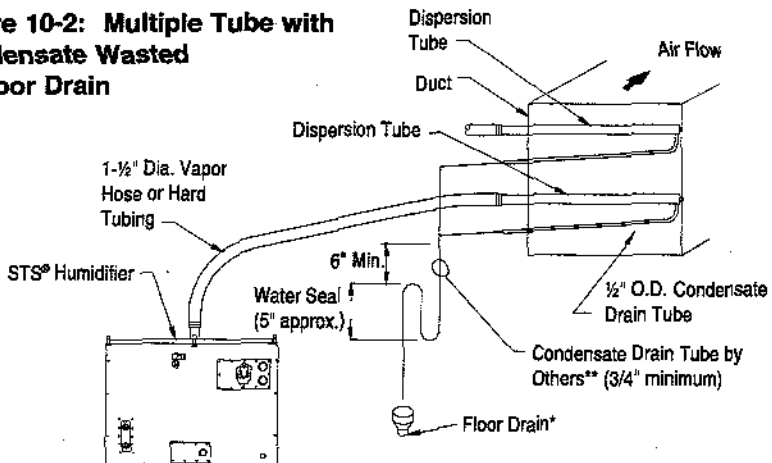
- One or two tubes: 3/4" I.D.
- Three or more tubes - 1" I.D.

Figure 10-1: Single Tube



OM-351

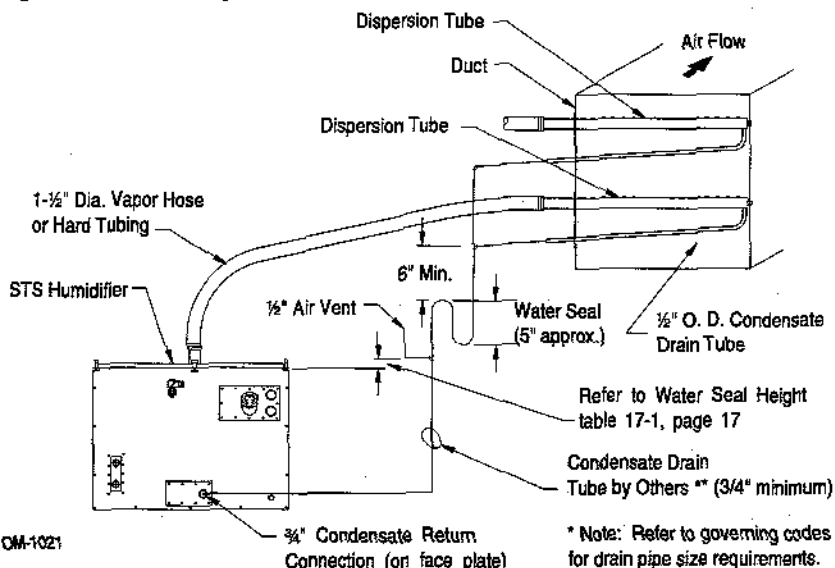
Figure 10-2: Multiple Tube with Condensate Wasted to Floor Drain



OM-1020

* Note: Refer to governing codes for drain pipe size requirements.

Figure 10-3: Multiple Tube with Condensate Return to Humidifier



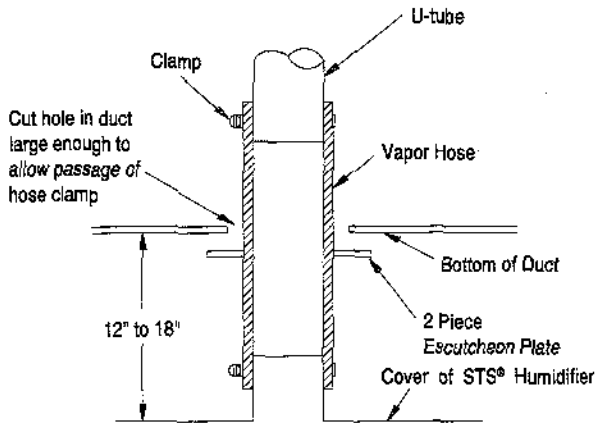
OM-1021

* Note: Refer to governing codes for drain pipe size requirements.

STEAM DISPERSION INSTALLATION

U-Tube Installation

Figure 11-1: Detail of Connection to U-Tube



OM-66

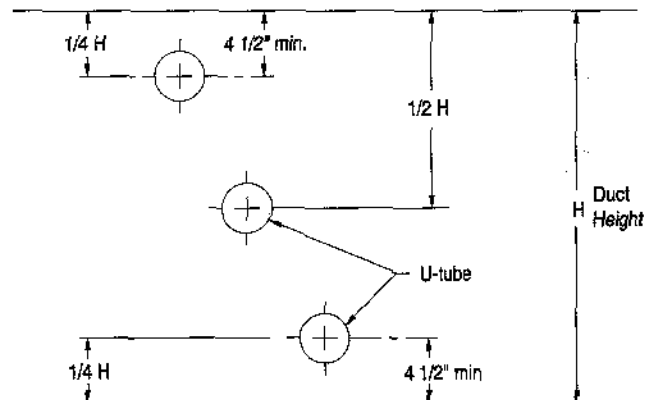
Note: Local regulations may not permit combustibles (steam hose) inside of duct. When necessary U-tubes can be specified to have extended legs of length necessary to reach below floor of duct.

Table 11-1: U-tube Spacing for Improved Absorption

Duct Height	Number of U-Tubes
Up to 12"	1
13" to 24"	2
25" to 36"	3

Figure 11-2: U-tube Spacing for Tall Ducts

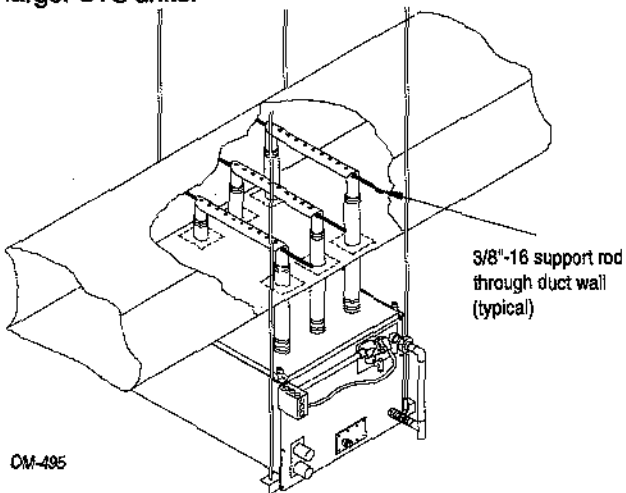
Improves absorption in 'tall' air streams.



OM-512

Figure 11-3: Multiple Inverted U-tubes

Provides extra steam dispersion capacity needed for larger STS units.



OM-495

RAPID-SORB® ASSEMBLY AND INSTALLATION

Horizontal Duct Installation

1. Unpack Shipment and verify receipt of all RAPID-SORB components with packing list. Report any shortages at once to the DRI-STEEM factory.
2. Provide necessary access around and into duct work.
3. Locate 1" x 1½" stainless steel channel inside duct centered between duct side walls. Hang channel from top of duct with the two mounting holes provided.
4. Locate dispersion tubes and slide hose cuffs over end of each tube, include a pair of hose clamps.
5. Note direction of air flow within duct then arrange each dispersion tube so steam will blow perpendicular to the air flow. Use the hex bolts provided to attach tubes to overhead 1" x 1½" channel. Do not secure. On units with the header mounted outside the duct, punch-out necessary clearance holes in base of duct to slide dispersion tubes up from bottom (see figure 12-2).

6. For a Header Inside the Duct (See figure 12-1.): Punch or cut out necessary clearance holes for RAPID-SORB header. Slide header into the duct, position header and slide the dispersion tube hose cuffs or slip couplings over the header dispersion tube nipples.

Position the header so vertical dispersion tubes are perpendicular to duct and pitch the header toward condensate drain. Secure header to the mounting bracket. Use escutcheon plates to secure header where it enters the duct.

Check that the dispersion tubes release steam perpendicular to the air flow. Secure tubes to the overhead channel. Secure the channel to the duct, and secure hose cuffs or slip couplings over tube and header tube nipples.

For a Header Outside the Duct (see figure 12-2.): Position header under dispersion tubes, then slide hose cuffs or slip couplings over header dispersion tube nipples.

Position the header so dispersion tubes are perpendicular to duct and pitch the header to condensate drain. Secure dispersion tubes in place with the tube escutcheon plates provided.

Check the position of the tubes for steam release perpendicular to the air flow. Secure tubes to the overhead channel, and secure channel to the duct. With header pitched to condensate drain, slip hose cuffs or slip couplings over tube nipples and secure.

7. Connect a condensate drain to header, provide the water trap as shown and run to open drain, sized per governing codes.

8. Attach the header swivel hose connector to main header using the hose cuff and clamps provided, do not secure.

9. Route the necessary number of vapor hoses or pipes from the humidifier tank, position connector to accept the hoses or pipes and secure.

Note: Refer to page 10 for vapor hose information on routing and for alternate vapor hose installation methods.

Figure 12-1: RAPID-SORB Unit Header Inside Duct

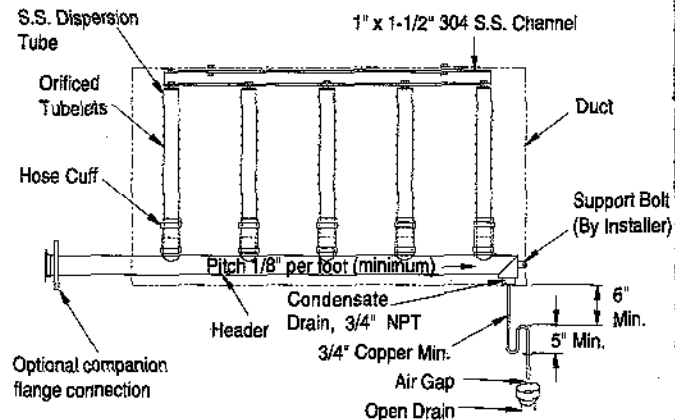
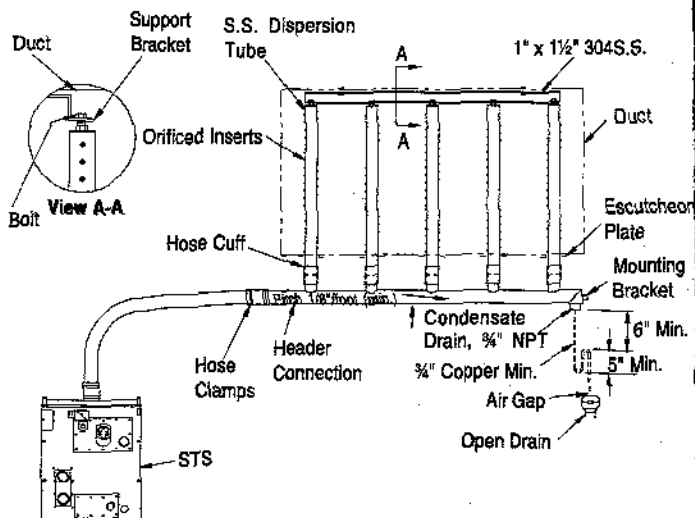


Figure 12-2: RAPID-SORB Unit Header Under Duct



RAPID-SORB® ASSEMBLY AND INSTALLATION

Vertical Duct Installation

Install the RAPID-SORB® with dispersion tubes and header pitched to condensate drain as shown in figures 13-1, 13-2, and 13-3.

Figure 13-1: Plan View

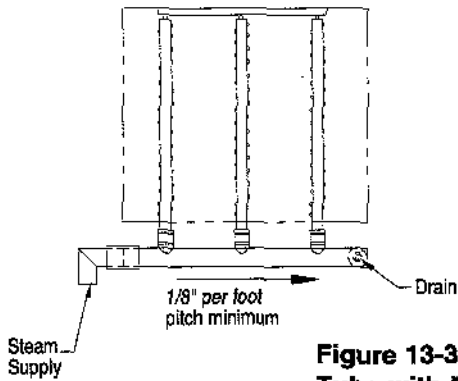


Figure 13-2: Elevation View Tube without Drain

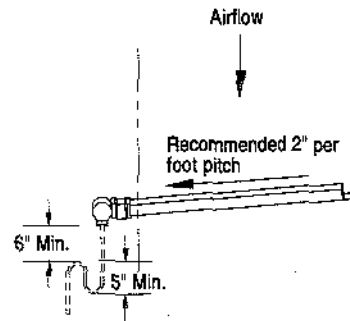
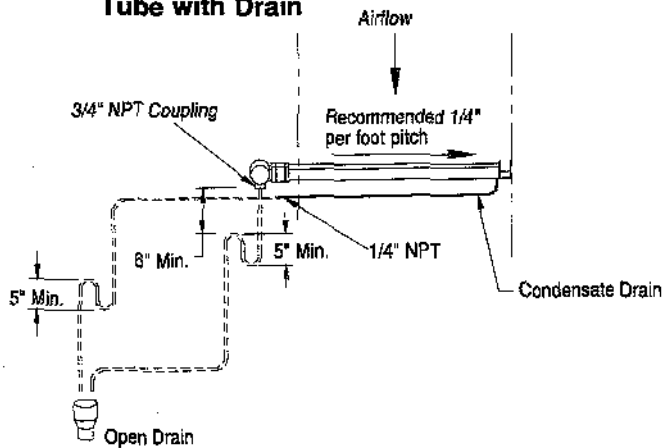


Figure 13-3: Elevation View Tube with Drain



---- Dashed line indicates field piping.

PIPING

Steam Supply

The heat exchanger in the STS® standard humidifier is designed for a maximum steam pressure of 15 psi. The steam valve, trap and strainer are shipped loose for field installation.

Make-up Water Piping

Either cold or hot water can be used for make-up. If the water pressure is above 60 psi and/or water hammer would be objectionable, a pressure reducing valve or shock arrester should be installed. Even though the STS has an inner 1" air gap, some local codes may require a vacuum breaker in the water supply pipe. STS-DI minimum 25 psi.

Make-up Water Considerations

When non-metallic water piping is used, it must be rated to withstand 212°F or greater temperature. If not, the final 3 feet connected to the humidifier should be metallic and should not be insulated.

The STS Humidifier works with all water types. The STS can be arranged for the use of unsoftened, softened, and demineralized make-up water. The decision of which one should be used is usually based on:

- 1) Budget
- 2) The mineral content of the untreated water supply
- 3) The expected diligence of the maintenance program
- 4) Level of accuracy of humidity control that is required

Preferably this humidifier should be supplied with softened water. The probe type level control system requires water conductivity of 100 micromhos/cm (2 gr/gal) minimum to function and will not operate with water treated by reverse osmosis or deionizing process. Specially designed STS DI humidifiers are available for use with these water types.

Softened Water

There are two major advantages derived from using softened water instead of unsoftened water (assuming the untreated supply water hardness is over 10 grains per gallon): maintenance and accuracy of control.

Maintenance

The skimmer, in conjunction with softened water, is an unbeatable combination for eliminating scale formation in the evaporating chamber. Several seasons of operation with no need for cleaning is normal, even with water having up to 30 grains of dissolved minerals per gallon prior to being softened.

Accuracy of Control

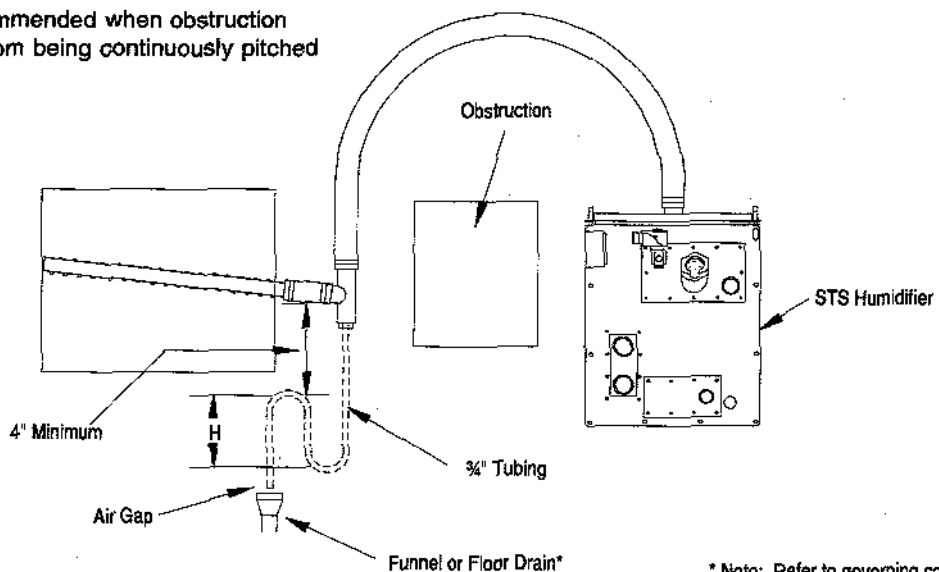
Reducing the higher skimmer quantity and eliminating the drain/flush cycle (both of which are accomplished by the use of softened water) improves controllability.

Softened Water Reduces Water Usage

The fewer number of make-ups per unit of time and the lesser the amount of water per make-up, the more "on time" or actual humidifying time will occur thus improving control accuracy. This is especially true when modulating control of the steam input to the humidifier is used.

Figure 14-1:

This piping method is recommended when obstruction prevents dispersion tube from being continuously pitched back to the humidifier.



OM-702

* Note: Refer to governing codes for drain pipe size requirements.

PIPING

Unsoftened Water

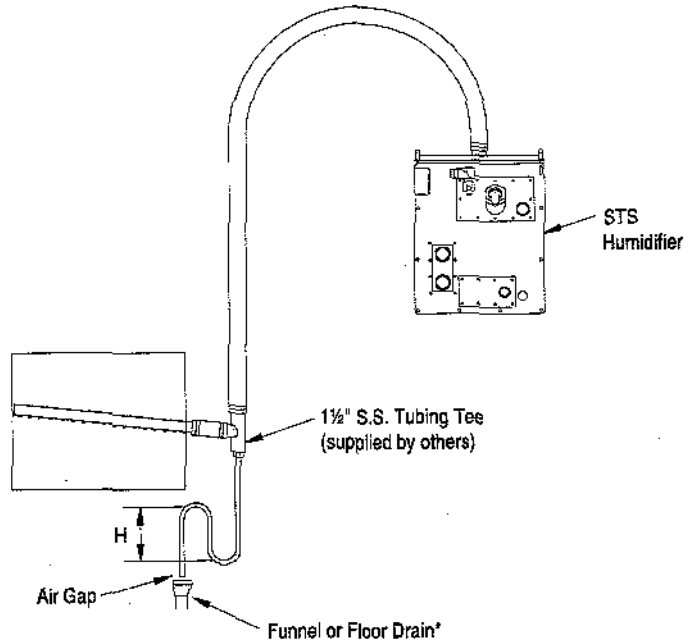
For water less than 10 grains per gallon hardness the skimmer system alone, without softening, usually provides a full season or more of humidification without a need for cleaning the evaporator.

For water hardness above 10 grains per gallon and where softened water is not available the optional timer operated drain/flush feature is available. When this option is furnished the humidifier control module contains an integral adjustable timer which accumulates the "on" or actual humidifying time of the unit. When this accumulated time reaches the amount previously pre-set in the control module, the drain/flush cycle is activated.

Drain Piping

A drain line should be extended from the skimmer/drain connection to a sanitary waste. A water seal should be provided in the drain line of sufficient height to contain the pressure developed within the humidifier. Without this, steam will be forced through the drain line which would be objectionable. The depth of the water seal must be sufficient to overcome the static pressure of the air handling system plus the pressure developed by the humidifier itself. (Refer to table 17-1 on page 17.)

Figure 15-1: This piping method is recommended when humidifier must be mounted higher than the duct.



OM-703

* Note: Refer to governing codes for drain pipe size requirements.

PIPING

Figure 16-1 - Piping of STS® from an overhead steam supply main with condensate returned to a vented gravity flow return system. Note the steam trap installed at the bottom of the branch rise feeding the steam valve of the STS. Failure to install this trap will cause water hammer, which could damage the STS heat exchanger.

Figure 16-2 - Depicts the same supply configuration, however the condensate return main is above the STS and the condensate must be "lifted". Lifts in excess of six inches per PSI steam inlet pressure should not be attempted. Check valves down stream of both steam traps are necessary to avoid hammer and associated problems.

In both instances, Figure 16-1 and 16-2, vacuum breakers are necessary to ensure condensate can drain from the heat exchanger when the steam valve closes.

Figure 16-1

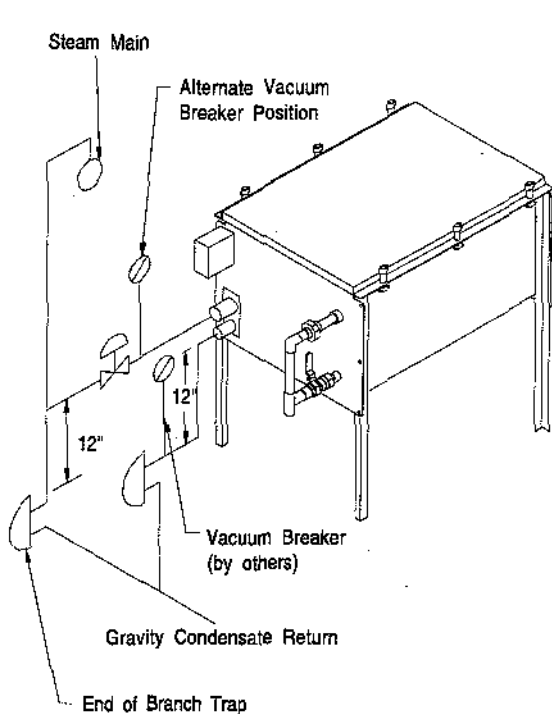
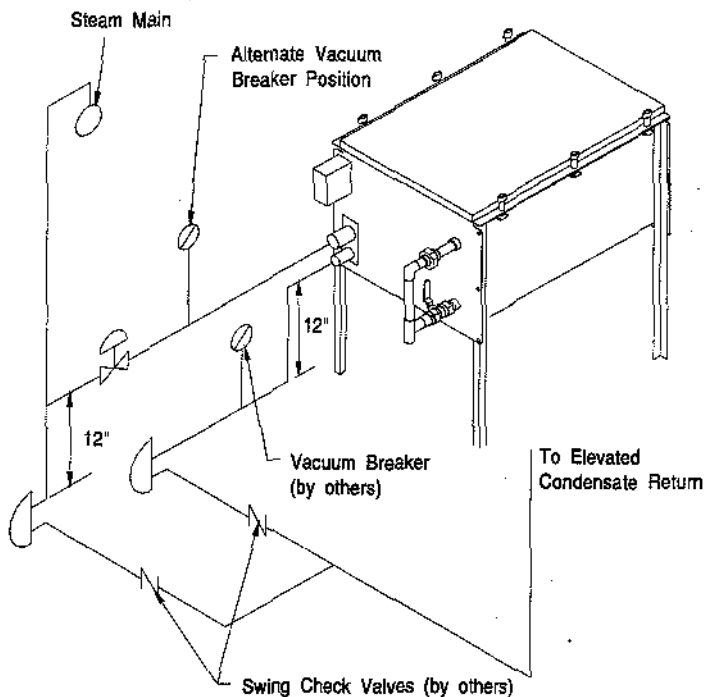
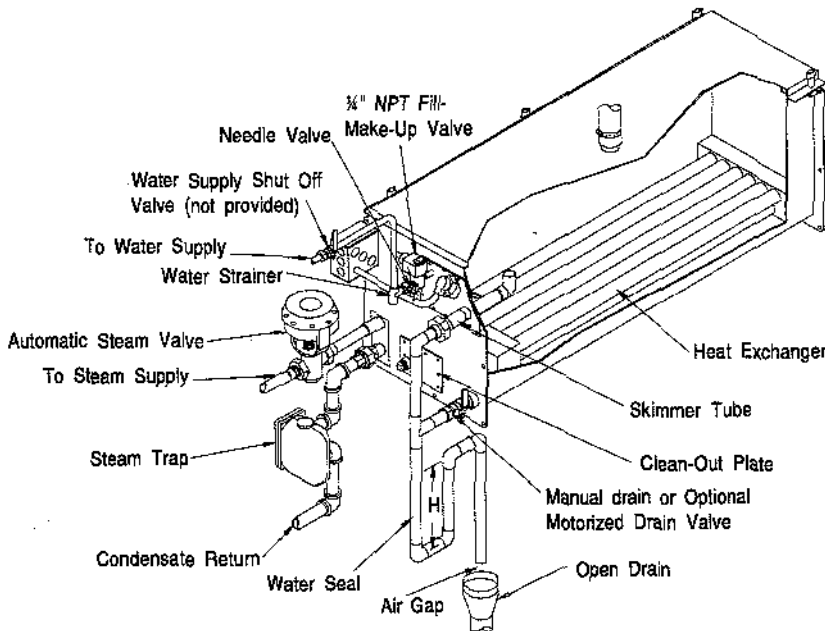


Figure 16-2



PIPING DIAGRAMS: STEAM, WATER AND DRAIN

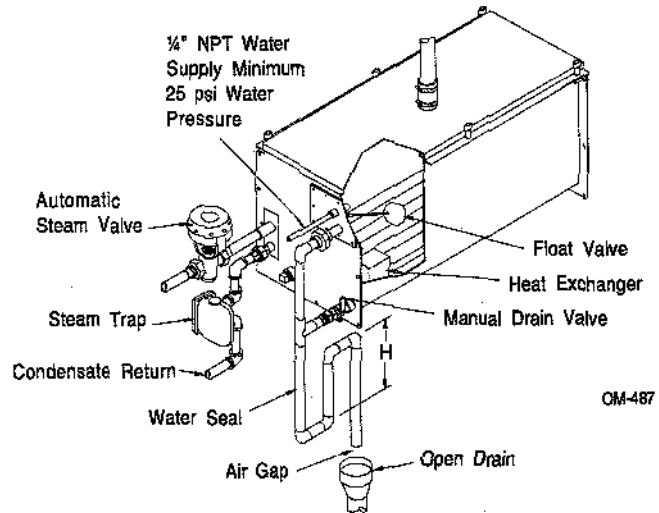
Figure 17-1: Standard STS®



Note: Refer to governing codes on drain pipe sizing requirements.

OM-471

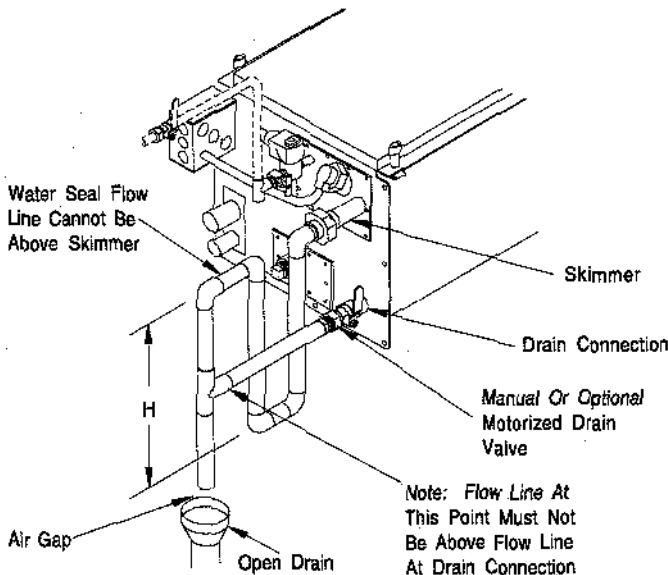
Figure 17-2: Standard STS-DI



OM-487

Note: Drain piping material must be suitable for 212°F (100°C) water.

Figure 17-3: Alternate Water Seal and Valve Piping
Used when water seal must be elevated above flow line of drain connection (Humidifier near floor). Water seal height recommendations refer to table 17-1.



OM-489

Table 17-1: Water Seal Height Recommendations

Water Seal Height (H)	
Unit Output	H (inches)
5-138	12
139-183	15
184 and higher	18

ELECTRICAL

The electrical supply is 120 volt, single phase. The control cabinet should be mounted in a location for service. All wiring must be in accordance with all governing codes and the STS® wiring diagram. A wiring diagram is inside the control cabinet. The wiring between the control cabinet and the humidifier must be 105°C rated wire.

The basic water level control circuit displayed is common to all STS standard series humidifiers. The STS standard humidifier is designed for use with either softened or unsoftened water. The probe type level control system requires water conductivity of 100 micromhos/cm

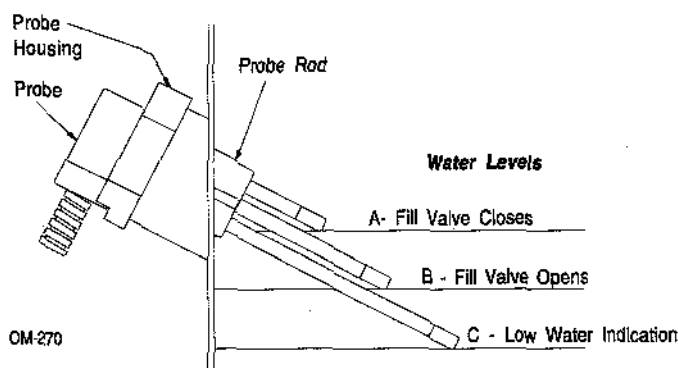
(2 grains per gallon) minimum to function, and therefore will not operate with water treated by the reverse osmosis or deionizing process. However, special design STS-DI humidifiers are available for use with these water types.

Caution: Only qualified electrical personnel should perform installation and start-up procedures.

If the humidifier is supplied with VAPOR-LOGIC®₂ or VAPOR-LOGIC® microcontrollers, please refer to the installation and operations manual for the respective product.

START-UP AND OPERATION

Figure 19-1: Reliable Electronic Probe Control Maintains Water Level



A simple three-probe conductivity sensor cycles a solenoid-operated water fill valve to maintain the proper water levels.

The STS® humidifier is available with either the standard LW 415 Electronic Water Level Control Module or the optional VAPOR-LOGIC² microprocessor control system. If the system is equipped with the VAPOR-LOGIC² system, see the *VAPOR-LOGIC² Installation and Operations Manual* for more information. Then continue reading this manual beginning at the maintenance section on page 20.

LW415 Electronic Water Level Control Module

When the power is activated the solenoid-operated water fill valve will open, filling the evaporating chamber. Filling will continue until water reaches level A, at which time the fill valve will close. To ensure that the water seal is filled with water, disconnect probe plug and cable from probe rod assembly (located on face plate), allowing the fill valve to re-energize and overfill humidifier tank. This process will take only seconds; probe plug and cable must then be reconnected.

Water Refill

During operation, the water line will drop to level B. At this level the fill valve opens, and remains open until the water line returns to level A.

Adjustable Surface Skimmer

Each time the evaporating chamber refills, the upper ¼" of water is immediately drained off through the skimmer. This carries away the mineral residue formed during the previous evaporating cycle. This skimming action effectively removes most of the mineral concentration in much the same way as the surface blowdown does in a steam boiler. This simple device greatly reduces the frequency of cleaning the evaporating chamber.

Note: Preferably this humidifier should be supplied with softened water. However, the probe type level control system requires water conductivity of 100 micromhos/cm (2 grains/gal) minimum to function and may not operate in water treated by the reverse osmosis or deionizing process. Specially designed STS Model DI humidifiers are available for use with these water types.

Drain/Flush Feature

This control module contains an integral electronic timer which tracks the humidifying time of the unit. When this accumulated time reaches what has been set in the timer, the drain/flush cycle is activated. Upon activation, the following sequence occurs:

1. The drain valve opens and begins to drain surface water and minerals from the evaporating chamber.
2. When the height of the water drops to the REFILL level, the fill valve opens.
3. The drain and fill valves remain open for ten more minutes, thus flushing the chamber.
4. The drain valve then closes, the chamber refills, and the fill valve closes. The timer begins to track the time as the unit resumes normal operation.

The electronic timer comes factory-set for drainage after 40 hours of operation time. Alternate settings of 20 hours and 80 hours can be made. See wiring diagram(s) attached to the unit for timer board location and instructions for changing the timer setting.

START-UP AND OPERATION

Test Cycling the Drain/Flush System

The timer board contains four pairs of terminal pins which are marked 20, 40, 80 and "T" (TEST). To test:

1. Pull the pin block off the pair of pins in use, move it to the "T" pair, and push it on.
2. Set the humidistat high enough so that unit will remain "on call" for at least one hour.
3. After about 35 minutes of operation, a drain/flush cycle will take place.
4. Once the test cycle is completed, move the pin block back to the desired pair of pins. Failure to do so will result in a drain/flush cycle every 35 minutes.

Table 20-1: Recommended Hours of Operation

Grains/Gallon	Hours of Operation Time*
5	80
10	40
17	20

*Note: Due to various waters, these are starting points. Field adjustments may be made to suit a particular water condition.

RECOMMENDED MAINTENANCE

Caution: Allow unit to cool before performing any maintenance. Manually open the drain valve and the fill valve will be energized. Let the fill water run until the tank is cooled then shut off the contractor/field installed supply water valve.

STS® is designed to deal with dissolved minerals in one of two ways depending on the degree of hardness. For light to moderate hardness (up to 10 grains per gallon) the surface skimmer action plus periodic cleaning is usually adequate. For high mineral content water (above 10 grains per gallon) a time clock and motorized ball type "dump" valve are recommended in addition to the surface skimmer, and along with periodic cleaning. If the STS was originally purchased without a timer and drain valve they can be added in the field. Consult factory (1-800-328-4447) for details.

The frequency of cleaning will be dictated by water condition and evaporation load.

Note: When performing maintenance on the STS always turn off electric power to control panel. Close steam supply and water make-up valves.

Seasonally or as Required

1. Cleaning Tank

Remove loose scale in humidifier tank before the build-up reaches the underside of the heat exchanger.

2. Cleaning Probes

Remove cap assembly and unscrew the probe holder from the STS unit. The scale will easily flake off from the sensing probes. The sensing portion (bottom 3/8") of the probe should be brushed clean with stainless steel wool. Re-install the probe holder with arrows up and "top" marking at the top.

3. Cleaning Skimmer Tube

Remove the elbow section of the skimmer and rotate tube so that loosened material will drop out. Loosen deposits with a long tool such as a screwdriver or section of small diameter pipe and reassemble elbow. Skimmer drainage should be verified by visual inspection once per week. Some water should drain from skimmer drain pipe after each fill cycle.

4. Inspect Gaskets

Replacement procedures are provided with new gaskets.

RECOMMENDED MAINTENANCE

Summer Maintenance

After the humidification season, a complete inspection and cleaning of the heat exchanger, probe control, skimmer, and water chamber is recommended. After cleaning, the unit should remain empty until humidification is required.

On units with TEFLON® coated heat exchangers, do not use a sharp object when cleaning. Cuts or scratches on the heat exchanger will impair its ability to shed scale during operation, and could cause the TEFLON to separate from the metal surface.

Adjusting the Surface Skimmer

The elevation of the lip of the skimmer elbow in respect to the water line; determines the quantity of "skimming" that takes place with each fill cycle. The height is field adjustable by a small amount of rotation of the tube.

As evaporation takes place, a portion of the dissolved minerals precipitate (come out of solution) and float on the water surface. Each time the STS® refills, it fills to an elevation above the lip of the skimmer tube. A portion of the refill water then flows to drain, carrying the floating material with it. This action constantly reduces the mineral concentration thereby reducing the frequency of cleaning needed.

The heated water that flows to drain is a cost of operation. Cleaning the humidifier is also a cost, as well as an inconvenience. It is therefore recommended that the user, at the time of the initial start-up, observe and adjust the skimming quantity. By doing so, a balance between minimized mineral build-up and water conservation can be achieved.

The quantity of skimming water drained off per fill cycle is adjusted by rotation of the skimmer tube which alters the height of the overflow lip. It is factory set to skim about 5-10% of the total evaporating capacity of the unit.

To adjust, loosen the union nut and rotate the tube to the desired percentage of skimming rate.

Allow the STS to operate five or ten days and then inspect it. If a mineral build-up is evident, increase the skim amount. If not, it should be reduced. Repeat the above process several times or until it is felt the proper adjustment has been attained.

Adjusting the Surface Skim Bleed-Off Quantity (VAPOR-LOGIC®₂ microprocessor control option only)

The skim time determines the quantity of water skimmed with each fill cycle. The skim time is field adjustable using the VAPOR-LOGIC₂ keypad.

Model STS®-DI Only

The humidifier should be inspected for leaks at least annually. All safety devices in the control cabinet should be cycled on and off to verify that they are functioning.

Make-up Water Piping

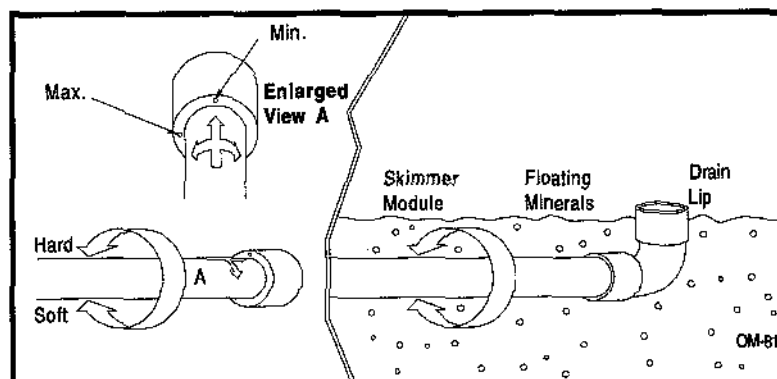
Either cold or hot make-up water may be used. If the water pressure is above 60 psi and/or water hammer would be objectionable, a pressure-reducing valve or shock arrester should be installed. Although the STS-DI humidifier has an internal 1" air gap, some local codes may require a vacuum breaker.

Caution: Minimum water supply pressure is 25 psi.

Cleaning the Evaporating Chamber

As long as mineral-free water is used in the STS-DI humidifier, no cleaning or flushing of the evaporating chamber should be necessary.

Figure 21-1: Surface Skimmer (not used in DI models)



By rotating the skimmer tube, the height of the drain lip is adjusted. This alters the amount of the bleed-off that occurs with each refill.

STS-DI START-UP AND RECOMMENDED MAINTENANCE

Introduction

After the system has been properly installed and connected to both electrical and water supplies, it may then be started.

Mounting

Check mounting to see that unit is level and securely supported before filling with water.

Piping

Verify that all piping connections have been completed as recommended and that steam and water pressures are available.

Electrical

Verify that all wiring connections have been made in accordance with the STS® wiring diagram.

Control System

For your particular humidifier control system, refer to the Operations and Maintenance Manual enclosed with the product shipment (LW415 control module, or VAPOR-LOGIC₂®).

Control Circuits

- a) Adjust humidistat to "call" setting.
- b) Open shut-off valve on water supply line. Water should flow through float valve.
- c) Turn electric power on to control cabinet.
- d) Fill the water seal in drain line by manually opening drain valve for a few seconds.
- e) Open steam stop valve. Steam should be heard passing through the automatic steam valve into the humidifier heat exchanger.
- f) Check out function of field installed air flow switch, high limit duct humidistat, and controlling humidistat to ensure that they are in control of steam valve.

Recommended Maintenance-STS-DI System (deionized water)

The STS-DI humidifier does not require regular maintenance. A periodic visual inspection is recommended to identify gasket or piping leaks. Control circuit and safety switches should be checked to verify they properly control the steam valve.

Caution: Overtightening cover will cause leaks.

All cover knobs are turned down at the factory until the bottom of the knob makes contact with the flange, then one half turn further. If more compression is required, turn all knobs a half turn more. Do not turn knobs more than a half turn before identifying that a leak still exists.

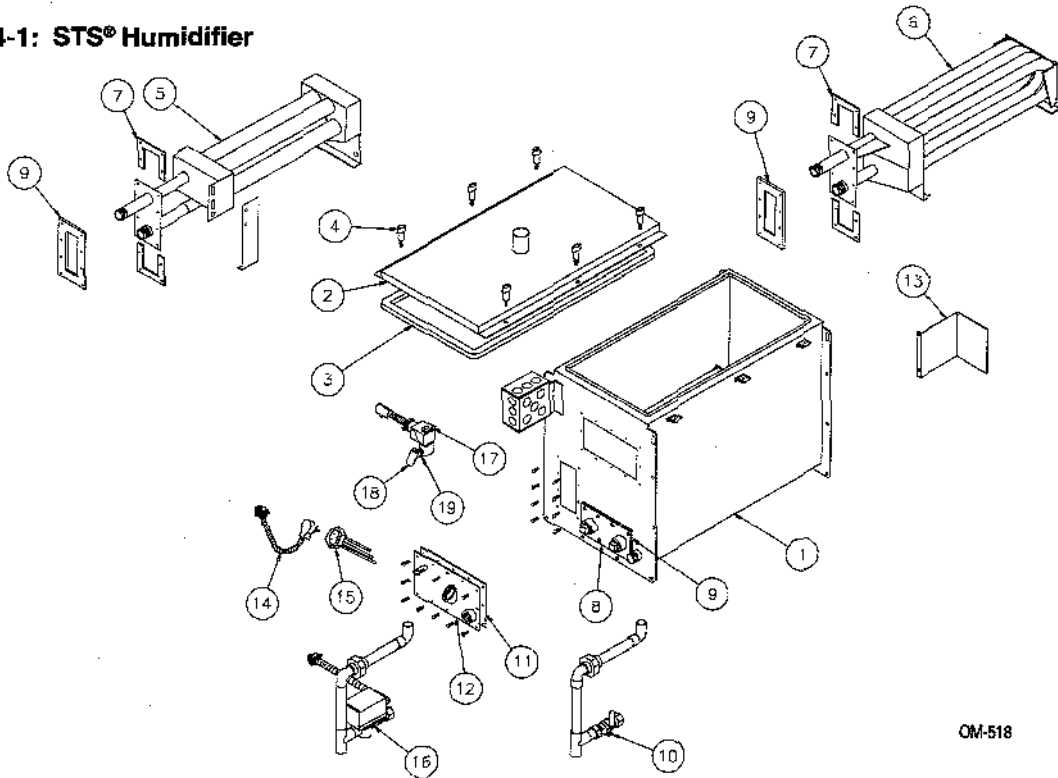
TROUBLE SHOOTING GUIDE

Symptom	Possible Cause	Recommended Action
Humidifier Will Not Heat	<p>No control transformer output. Humidistat is not calling.</p> <p>Safety controls open (high limit, air proving, etc...)</p> <p>Faulty control board.</p> <p>Probe corrosion. Steam stop valve closed. Steam trap plugged. Low or no steam. Steam strainer plugged.</p>	<p>Verify control voltage. Set humidistat to "call". Inspect for faulty humidistat.</p> <p>Check safety controls.</p> <p>Verify control voltage and probe. Wires are connected correctly.</p> <p>Replace probes*. Verify valve is opened. Clean trap body. Verify steam is present. Clean strainer.</p>
Humidifier Will Not Fill	<p>No water pressure.</p> <p>Faulty water fill valve.</p> <p>Plugged water strainer. Plugged valve. Faulty control board.</p>	<p>Verify manual water supply valve is open.</p> <p>Verify action of fill solenoid valve, verify control voltage present at coil. Audible click should be heard as solenoid operates.</p> <p>Open strainer. Clean valve. Verify control voltage.</p>
Humidifier Does Not Stop Filling	<p>Lack of tank-to-probes continuity. Water conductivity less than 100 micromhos/cm minimum (2 grains per gallon)</p> <p>Manual drain is not fully closed.</p> <p>Fill valve is stuck open.</p> <p>Fill valve installed backwards.</p>	<p>Jumper terminals 1 & 3 if water sops, verify tank ground to term 3; check water supply conductivity; then consult factory.</p> <p>Close manual ball valve.</p> <p>Check valve for foreign matter.</p> <p>Check for correct water flow, through valve, note arrow.</p>
Low Output	<p>Automatic drain valve not seating.</p> <p>Manual drain is not fully closed.</p> <p>Excessive skimming amount.</p> <p>Fill valve is stuck open.</p> <p>Low supply steam pressure.</p> <p>Steam valve inoperable.</p> <p>Steam trap blocked.</p> <p>Scale coated heat exchanger.</p>	<p>Clean ball and seat of valve.</p> <p>Close manual ball valve.</p> <p>Reduce skimmer or skim time.</p> <p>Check valve for foreign matter.</p> <p>Check steam supply pressure.</p> <p>Not opening fully.</p> <p>Not passing condensate.</p> <p>Clean heat exchanger.</p>
Makeup Water Valve Short Circuits	<p>Electrode probes may be incorrectly wired.</p> <p>Probes are scale coated.</p>	<p>Confirm that wiring agrees with diagram.</p> <p>Clean probes.</p>

*Although the three stainless steel electrode probes will eventually erode due to corrosion they are usually functional for up to approximately 5000 hours of operation.

REPLACEMENT PARTS

Figure 24-1: STS® Humidifier



OM-518

Table 24-1: STS Humidifier

No.	Description	Part No.
1	Tank, STS-25	164404-025 *
1	Tank, STS-50	164404-050 *
1	Tank, STS-100	164404-100 *
1	Tank, STS-200/400	164404-400 *
1	Tank, STS 800	164404-800 *
2	Cover, STS-25	165359 *
2	Cover, STS-50	165360 *
2	Cover, STS-100	165365 *
2	Cover, STS-200/400/800	165369 *
3	Gasket, Cover, STS-25	160690-224 *
3	Gasket, Cover, STS-50	160690-240 *
3	Gasket, Cover, STS-100	160690-340 *
3	Gasket, Cover, STS 200/400/800	160690-200 *
4	Knob, T-Handled Utility	700725
5	Heat Exchanger, STS-25S	164420-101 *
5	Heat Exchanger, STS-50S	164420-102 *
5	Heat Exchanger, STS-100S	164420-103 *
5	Heat Exchanger, STS-200S	164420-104 *

* Specify humidifier model and serial numbers when ordering.

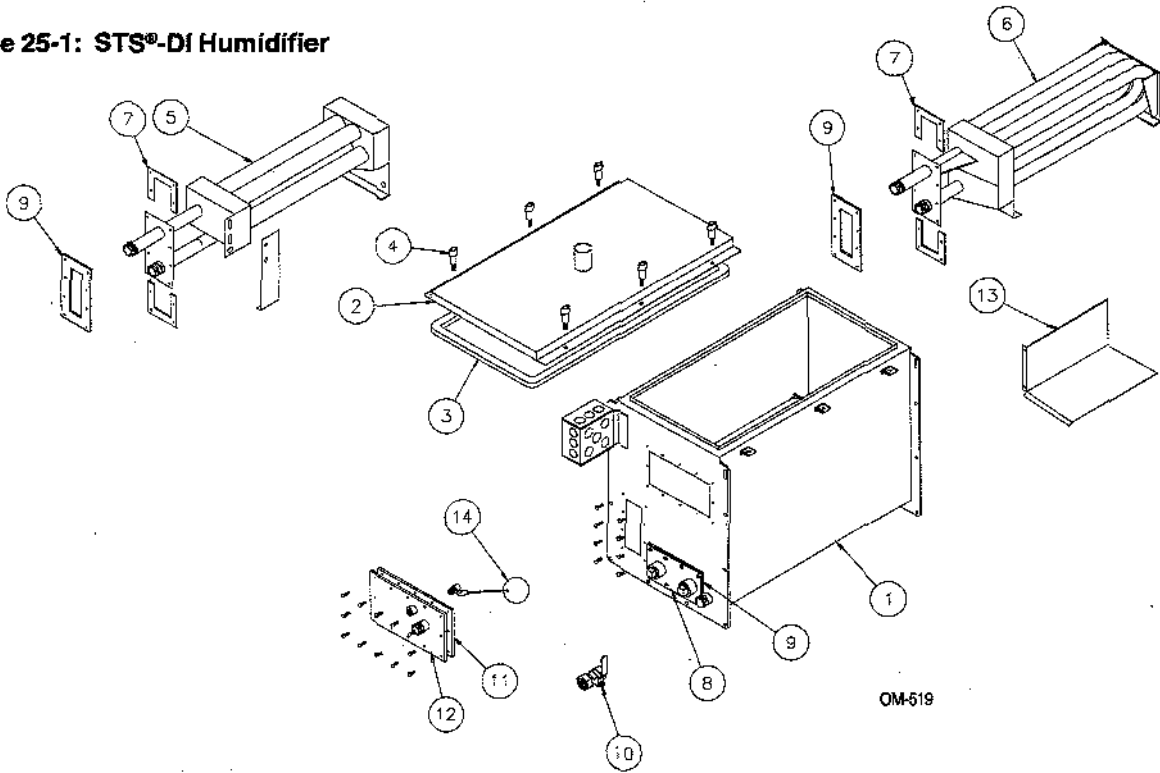
Table 24-1: continued

No.	Description	Part No.
6	Heat Exchanger, STS-25C	164436-101 *
6	Heat Exchanger, STS-50C	164436-102 *
6	Heat Exchanger, STS-100C	164436-103 *
6	Heat Exchanger, STS-400/800C	164436-104 *
7	Support, Heat Exchanger Mtg Plate	124437
8	Clean Out Plate	165470
9	Gasket, Clean Out and Mtg Plate	308220
10	Valve, 3/4" Ball (Manual Drain)	505011
11	Gasket, Probe/Float Plate	308220-001
12	Probe Plate, STS-25/50/100	164411
12	Probe Plate, STS-200/400/800	164411-002
13	Baffle, Probe Plate	124443
14	Probe Plug	406050-002
15	Probe Assembly	406060
16	Valve, 3/4" Electric (Auto Drain)	505400-001
17	Fill Valve, 1/4" Solenoid, .125, STS-25, 50, 100	505084
17	Fill Valve, 1/4" Solenoid, .281, STS-400, 800	505085
18	Strainer, 1/4" Sediment	300050
19	Valve, Needle 1/4"	505070-001

* Specify humidifier model and serial numbers when ordering.

REPLACEMENT PARTS

Figure 25-1: STS®-DI Humidifier



OM-519

Table 25-1: STS-DI Humidifier

No.	Description	Part No.
1	Tank, STS-25	164404-025 *
1	Tank, STS-50	164404-050 *
1	Tank, STS-100	164404-100 *
1	Tank, STS-200/400	164404-400 *
1	Tank, STS 800	164404-800 *
2	Cover, STS-25	165359 *
2	Cover, STS-50	165360 *
2	Cover, STS-100	165365 *
2	Cover, STS-200/400/800	165369 *
3	Gasket, Cover, STS-25	160690-224 *
3	Gasket, Cover, STS-50	160690-240 *
3	Gasket, Cover, STS-100	160690-340 *
3	Gasket, Cover, STS 200/400/800	160690-200 *
4	Knob, T-Handled Utility	700725
5	Heat Exchanger, STS-25S	164420-101 *
5	Heat Exchanger, STS-50S	164420-102 *
5	Heat Exchanger, STS-100S	164420-103 *
5	Heat Exchanger, STS-200S	164420-104 *

* Specify humidifier model and serial numbers when ordering.

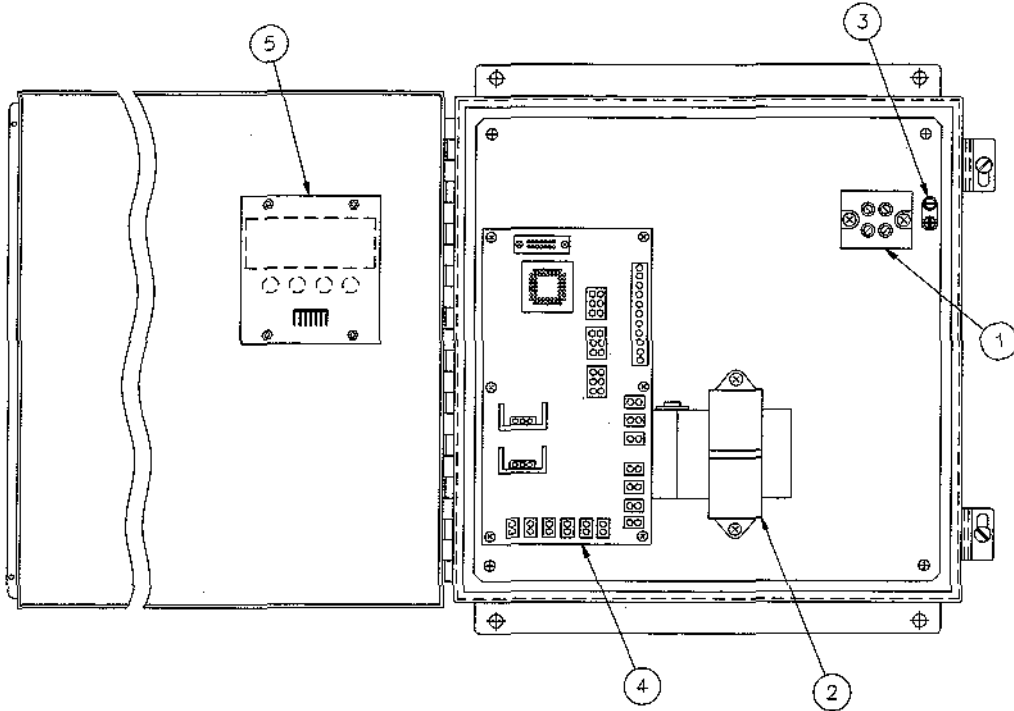
Table 25-1: continued

No.	Description	Part No.
6	Heat Exchanger, STS-25C	164436-101 *
6	Heat Exchanger, STS-50C	164436-102 *
6	Heat Exchanger, STS-100C	164436-103 *
6	Heat Exchanger, STS-400/800C	164436-104 *
7	Support, Heat Exchanger Mtg Plate	124437
8	Clean Out Plate	165470
9	Gasket, Clean Out and Mtg Plate	308220
10	Valve, 3/8" Ball (Manual Drain)	505011
11	Gasket, Probe/Float Plate	306220-001
12	Float Plate, STS-25/50/100	164410
12	Float Plate, STS-200/400/800	164410-002
13	Baffle, Probe Plate	124442
14	Float Valve Assembly STS 25-400	505210
14	Float Valve Assembly STS 25-800	505300

* Specify humidifier model and serial numbers when ordering.

REPLACEMENT PARTS

Figure 26-1: STS® Control Cabinet with VAPOR-LOGIC®₂ Controls

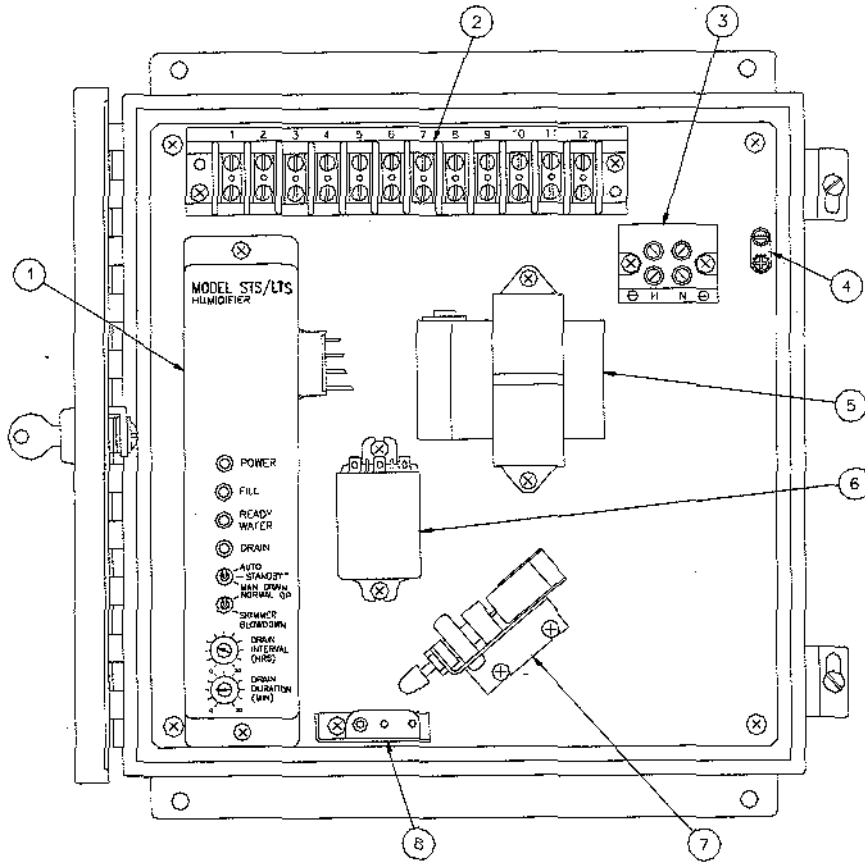


OM-1044

No.	Description	Part No.
1	Power Block	408300-001
2	Transformer	408960
3	Ground Lug	409250-017
4	LW430, Microprocessor Board	408641
5	LW440, Display Board	408651

REPLACEMENT PARTS

Figure 27-1: STS® Control Cabinet with LW320 Controls



OM-520

No.	Description	Part No.
1	LW320 Level Control Board	408520-001
2	Terminal Block, 12 pt.	408250-005
3	Power Block	408300-001
4	Ground Lug	409250-017
5	Transformer	408960
6	Relay	407900-001
7	Pneumatic Electric Switch	408100
8	Interlock Switch	408470

TWO-YEAR LIMITED WARRANTY

DRI-STEEM Humidifier Company ("DRI-STEEM") warrants to the original user that its products will be free from defects in materials and workmanship for a period of two (2) years after installation or twenty-seven (27) months from the date DRI-STEEM ships such product, whichever date is the earlier.

If any DRI-STEEM product is found to be defective in material or workmanship during the applicable warranty period, DRI-STEEM's entire liability, and the purchaser's sole and exclusive remedy, shall be the repair or replacement of the defective product, or the refund of the purchase price, at DRI-STEEM's election. DRI-STEEM shall not be liable for any costs or expenses, whether direct or indirect, associated with the installation, removal or re-installation of any defective product.

DRI-STEEM's limited warranty shall not be effective or actionable unless there is compliance with all installation and operating instructions furnished by DRI-STEEM, or if the products have been modified or altered without the written consent of DRI-STEEM, or if such products have been subject to accident, misuse, mishandling, tampering, negligence or improper maintenance. Any warranty claim must be submitted to DRI-STEEM in writing within the stated warranty period.

DRI-STEEM's limited warranty is made in lieu of, and DRI-STEEM disclaims all other warranties, whether express or implied, including but not limited to any IMPLIED WARRANTY OF MERCHANTABILITY, ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, any implied warranty arising out of a course of dealing or of performance, custom or usage of trade.

DRI-STEEM SHALL NOT, UNDER ANY CIRCUMSTANCES BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, REVENUE OR BUSINESS) OR DAMAGE OR INJURY TO PERSONS OR PROPERTY IN ANY WAY RELATED TO THE MANUFACTURE OR THE USE OF ITS PRODUCTS. The exclusion applies regardless of whether such damages are sought based on breach of warranty, breach of contract, negligence, strict liability in tort, or any other legal theory, even if DRI-STEEM has notice of the possibility of such damages.

By purchasing DRI-STEEM's products, the purchaser agrees to the terms and conditions of this limited warranty.

DRI-STEEM[®]
HUMIDIFIER COMPANY



14949 Technology Drive • Eden Prairie, MN 55344
Phone: (612) 949-2415 • Fax: (612) 949-2933
E-Mail: sales@dristeem.com • Web: www.dristeem.com
International Office:
Bell Place, Bell Lane • Syresham, Brackley • NN13 5HP, U.K.
Phone: +44 1280 850122
Fax: +44 1280 850124
E-Mail: 106277.1443@compuserve.com



Printed on recycled paper with
agri-based inks. Minimum 10%
Post Consumer Waste.



Continuous product improvement is a policy of DRI-STEEM Humidifier Company therefore, product features and specifications are subject to change without notice.

DRI-STEEM, RAPID-SORB, STS, VAPOR-LOGIC and VAPOR-LOGIC₂ are Registered Trademarks of the DRI-STEEM Humidifier Company.
TEFLON is a Registered Trademark of Dupont.