

READ AND SAVE THESE INSTRUCTIONS

DRI-STEEM **Model LTSTM** **and LTS-DITM** **LIQUID-TO-STEAM HUMIDIFIERS**

For Commercial, Institutional,
and Industrial Applications
With a Hot Water Steam Boiler

Installation Instructions
and
Maintenance Operations Manual

DRI STEEM[®]
HUMIDIFIER COMPANY

©1990 DRI-STEEM HUMIDIFIER COMPANY, Inc.

 Printed on Recycled Paper

TABLE OF CONTENTS

TO THE PURCHASER AND THE INSTALLER

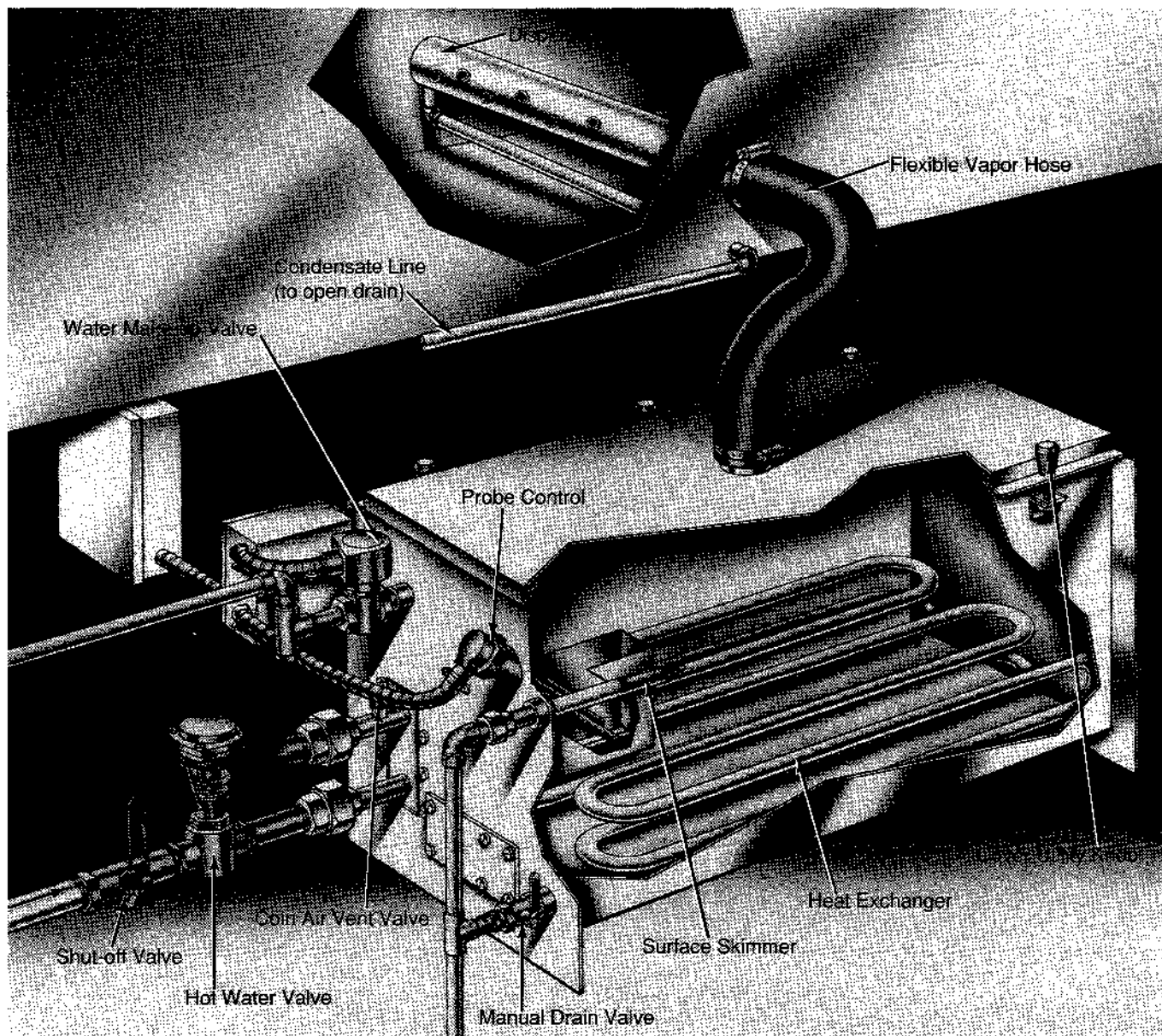
Thank you for deciding to purchase a DRI-STEEM LTS Series Humidifier. We have applied our best efforts to design and build this equipment to give you total satisfaction and many years of trouble free service. Avoiding certain pitfalls during installation and observing proper operating practices thereafter will assure you of achieving that objective. We therefore respectfully urge you to familiarize yourself with the contents of this bulletin.

DRI-STEEM Humidifier Company, Inc.

LTS Diagram	3
Installation	
Selecting the Location	4-5
Mechanical Specifications	6
Mounting Methods	7-9
Piping Methods	10-14
Electrical	
Wiring Diagrams	15-16
Operation	
Probe Control	17
Timer Operated Drain/Flush LW320	17
Startup and Checkout Procedures	18
Maintenance Procedures	19
Trouble-Shooting Guide	20
LTS Replacement Parts	21-22
Maintenance Service Record	23
Warranty	24

Please Note: Preferably this humidifier should be supplied with softened water. However its probe type level control system requires water conductivity of 100 micromhos/cm (2 gr/gal) minimum to function and therefore will not operate on water treated by the reverse osmosis or deionizing process. Special design LTS DI humidifiers are available for use with these water types.

LTS DIAGRAM



INSTALLATION

Selecting the Location

To put LTS humidifiers to work, you need just four things: available tap water (preferably softened), available electricity, available high temperature hot water and a drain system. LTS humidifiers are not built to fit rigid, set situations, but are made to adapt to any existing physical condition.

When selecting the location, first consideration should be given to rapid, thorough absorption of the steam. *The warmest air will most readily absorb the 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, the distance steam will travel within a given airstream is predictable and can be determined using the VAPORSTREAM catalog. If this has already been done, the travel distance should be specified; if not, consult the VAPORSTREAM catalog.

A. It is very important that the humidifier be located where the water vapor being discharged will be carried off with the air stream and will not cause condensation or dripping from the duct.

B. In general, the LTS evaporative 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 in an outside air intake unless air is tempered with a preheat coil.

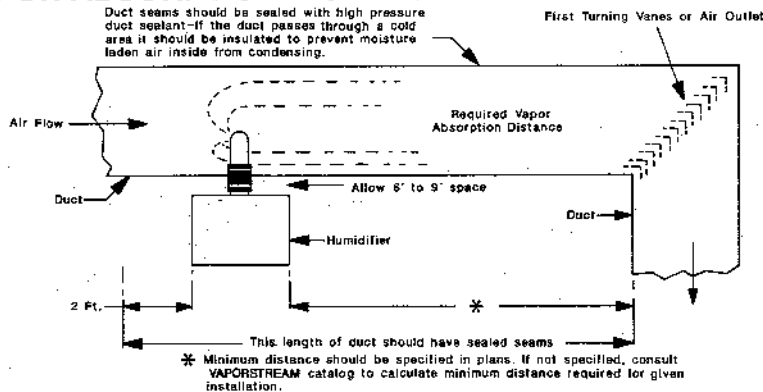
D. Do not place the unit too near to the intake of a high efficiency filter. The filter will remove the visible moisture and become waterlogged.

E. Do not place unit where discharged vapor will impinge on a metal surface.

F. Do not place the unit too close to a spilt in the duct. The unit may put more moisture in one branch than the other.

When adequate absorption distance is not available, a rapid absorption tube bank should be used. Refer to the VAPORSTREAM catalog or contact DRI-STEEM or your DRI-STEEM representative.

VAPOR ABSORPTION DISTANCE

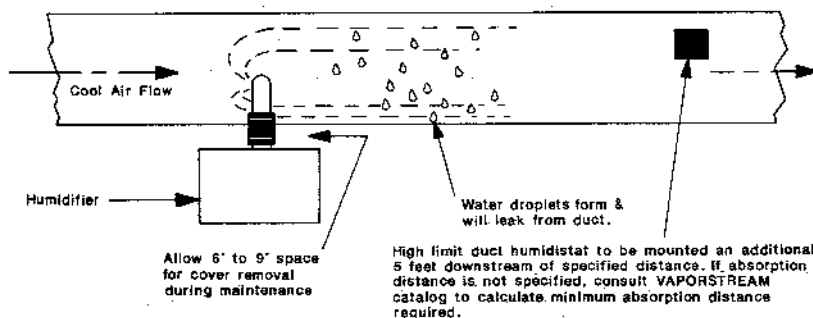


A distance of air travel is required for the steam to "disappear" or go into the gaseous state.

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

Fig. 4-1

INSTALLATION IN COLD AIR STREAM



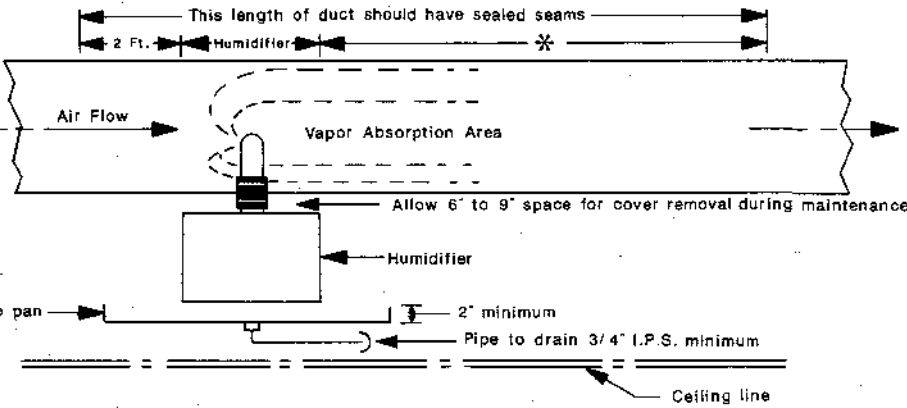
When a humidifier is installed in a duct that will carry cold air periodically, the dew point temperature should be determined.

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

Fig. 4-2

INSTALLATION

INSTALLATION ABOVE VALUABLE EQUIPMENT



* Minimum distance should be specified in plans. If not specified, consult VAPORSTREAM catalog to calculate minimum distance required for given installation.

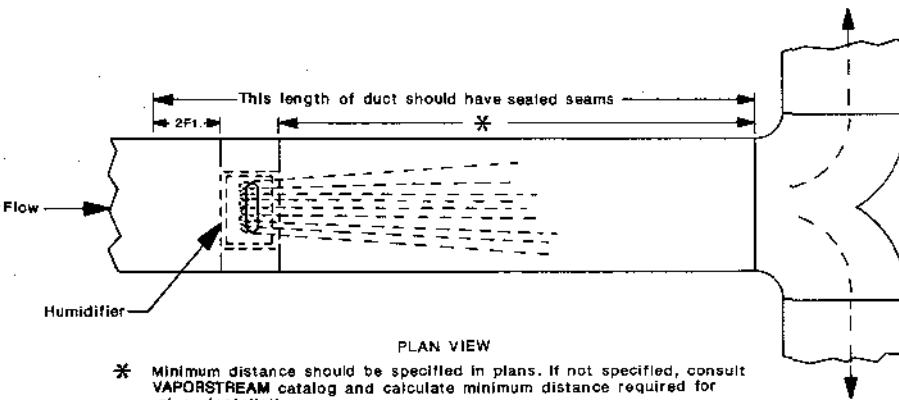
Water piping and humidifiers should not be installed above expensive apparatus or equipment. A broken water pipe, leaking valve gland, condensation or other water leaks may occur causing serious damage and costly repairs to the equipment below.

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

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

Fig. 5-1

INSTALLATION AHEAD OF DUCT SPLIT

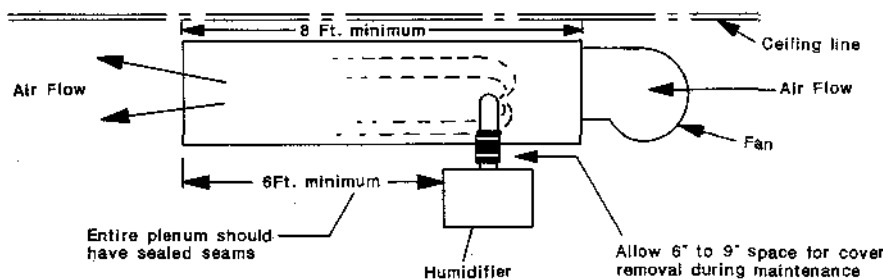


* Minimum distance should be specified in plans. If not specified, consult VAPORSTREAM catalog and calculate minimum distance required for given installation.

When a LTS humidifier is installed upstream of a duct split, the humidifier should span most of the duct width or be centered upon it to equalize the humidifying effect between the two branches.

Fig. 5-2

RECIRCULATION UNIT

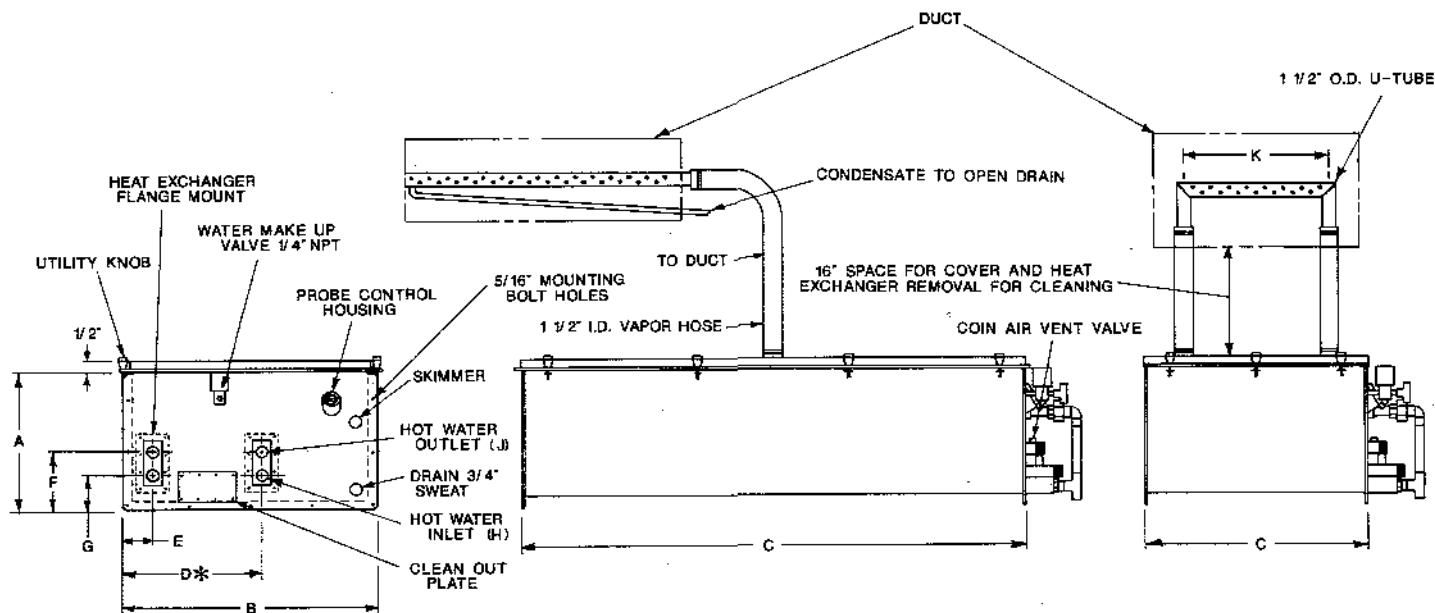


In an application where no duct system exists, or if the duct air is too cool for proper humidity absorption, a recirculation fan can be used. The fan circulates room temperature air across the LTS humidifier and discharges humidified air into the space. The point of discharge should be carefully selected to avoid condensation on surfaces of the building or equipment.

Fig. 5-3

* The distance steam will travel within a given airstream is predictable and can be determined using the VAPORSTREAM catalog. If this has already been done, the travel distance should be specified; if not, consult the VAPORSTREAM catalog.

MECHANICAL SPECIFICATIONS



*These connections used only on LTS 200

DRI-STEEM Standard LTS AND LTS-DI Mechanical Specifications														
Model No.	Dimensions (Inches)										Required Flow (GPM)	Head Loss (Feet)	Min. Water Temp.	Hot Water Connections NPT
	A	B	C	D*	E	F	G	H	J	K				
LTS 25	15-1/2	14-3/4	24	-	3-1/4	7	3-3/8	3/4	3/4	20-1/2	10	20	240°	3/4"
LTS 50	15-1/2	19-1/4	40	-	3-1/4	7	3-3/8	1	1	32-1/2	10	15	240°	1"
LTS 100	15-1/2	19-1/4	40	-	3-1/4	7	3-3/8	1	1	32-1/2	20	20	240°	1"
LTS 200**	15-1/2	28-1/4	55	15-1/2	3-1/4	7	3-3/8	1	1	32-1/2	40	20	240°	1"

Output Capacities (lbs/hr) @ 240°F*** Supply							
Model No.	Untreated Water (Using Skimmer)	Deionized Water (No Skimmer)	Operating Weight Lbs.	Shipping Weight Lbs.	Max. Op. Pressure (psi)	Standard Qty of U-tubes Supplied, Depending on Output (K)	Recommended Minimum Qty of Vapor Hose Kits
LTS 25	16	20	115	75	125	1	1 - up to 60 pph 2 - up to 120 pph 3 - over 120 pph
LTS 50	30	36	315	100	125	1	
LTS 100	60	72	315	100	125	1 to 2	
LTS 200	130	160	780**	175	125	2 to 3	

**Duct mounting is not recommended due to operating weight of unit.

***Higher operating temperatures available if necessary - consult factory.

LTS Control Cabinet: (shipped loose)
 Dimensions: 12" w x 12" h x 6" d
 Weight: 20 lbs.

- NOTES:**
1. A supply water temperature lower than 240°F. will reduce the above stated outputs.
 2. Typically, scale tends to form on the heat exchanger. When it becomes about 1/16" thick, steam forms under the scale and pops it off. With a lower than 240°F. temperature, scale shedding is not quite as efficient.
 3. The use of softened water reduces scale significantly.
 4. For water temperatures above 250° F. consult the DRI-STEEM factory.
 5. Electrical supply 120 v, 1 ph, 50/60 hz, .6 amps, 24 vac control circuit. Note: No electrical on DI models
 6. Contact factory or your local DRI-STEEM representative regarding jacketed steam dispersion tubes and/or multiple tube (rapid absorption) applications.

MOUNTING METHODS

Mounting Procedures

For proper operation of the electrode probe water level control and the skimmer system the humidifier should be mounted level.

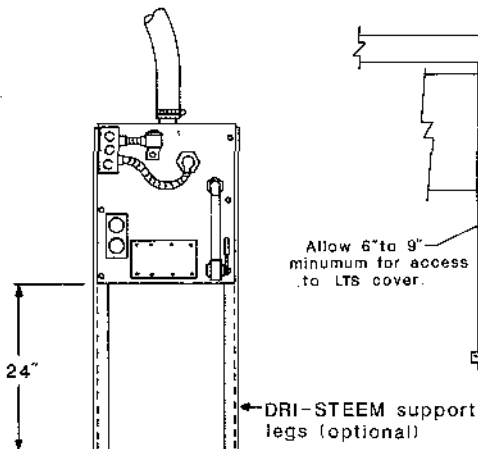
Access for periodic removal of the top cover is recommended. In most cases, scale that forms on the heating elements continuously flakes off as it forms and the loose scale that settles to the bottom can be raked or flushed

out through the front face cleanout opening. However, removal through the top cover is easier.

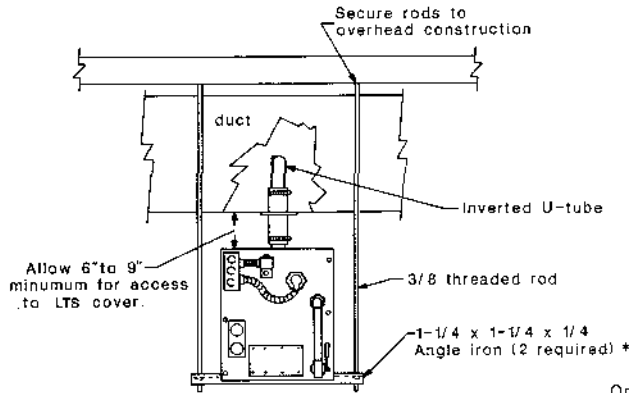
If the LTS is to be installed above expensive materials or devices, a drain pan of sufficient size and depth to retain rapid or sudden drainage of the contents of the humidifier should be provided. The drain pan should be drained to a sanitary waste.

Mounting Support Methods

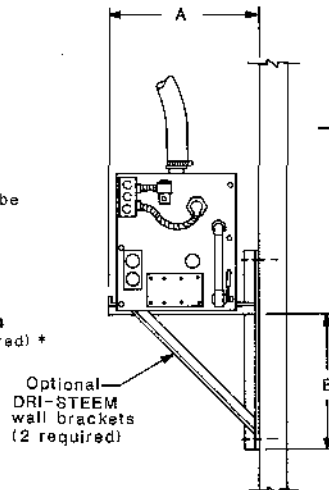
Floor Stand Method



Trapeze Hanger Method



Bracketed to Wall Method



DIMENSIONS

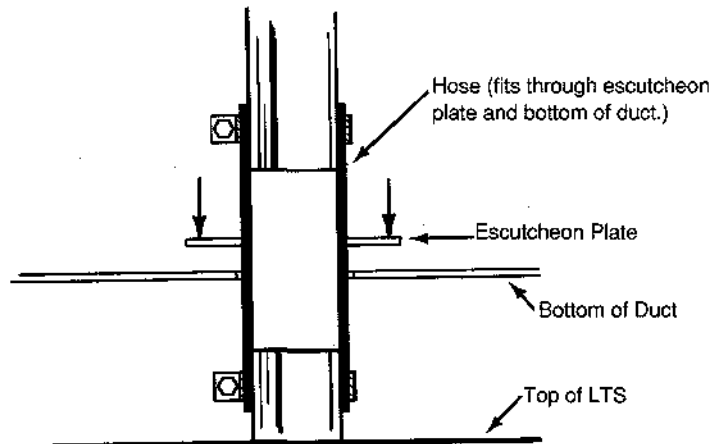
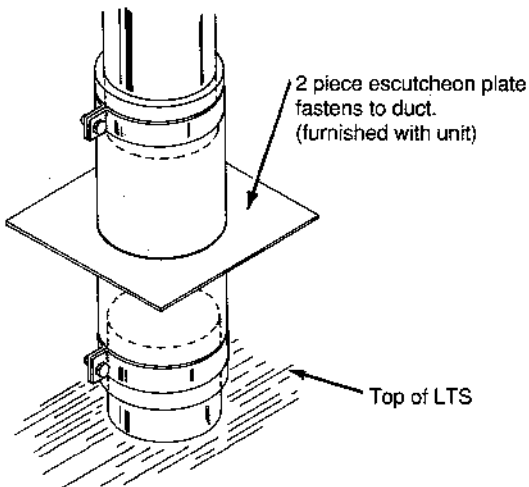
Unit	A	B
LTS 10	15-1/4"	26"
LTS 25	15-1/4"	26"
LTS 50/100	24-3/4"	50"
LTS 200 **		

**NOT RECOMMENDED

* Due to the size and weight of the LTS 200, the trapeze hanger method is not recommended.

Mounting Unit on Underside of Duct

Manufacturer recommends mounting humidifier 6" below duct to facilitate cover removal (see note on page 8).



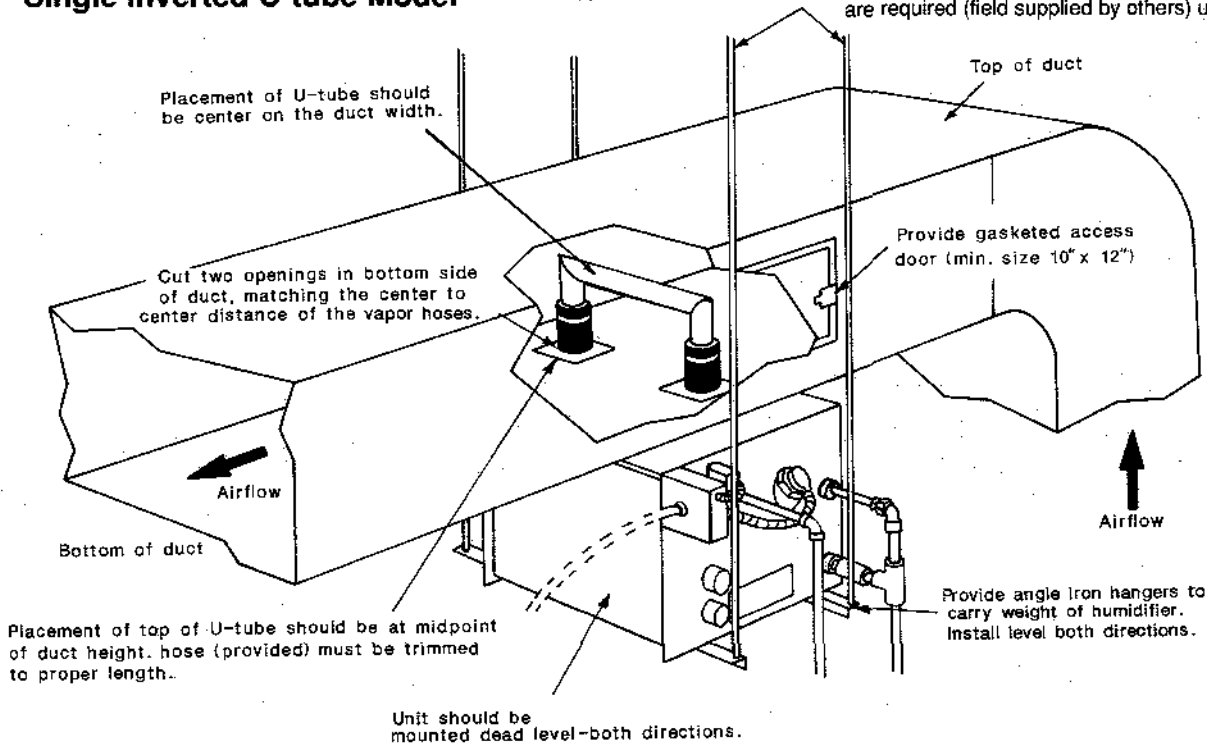
(Continued on next page.)

MOUNTING METHODS

Mounting Unit on Underside of Duct (continued)

Single Inverted U-tube Model

Support rods to structure

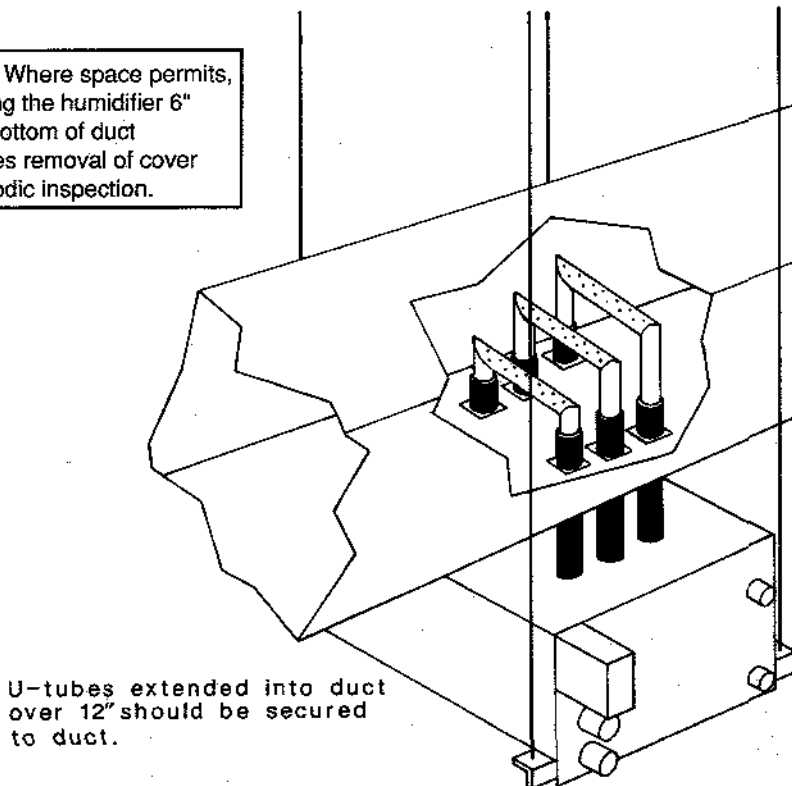


As an option, units ordered with U-tube or L-tube covers may be shipped with one set of trapeze type mounting brackets. Each bracket set comes with 4 rods 3 feet in length, trapeze bars, nuts and washers. When longer length mounting rods are required (field supplied by others) use 3/8" material.

Multiple Inverted U-Tubes

Improves Absorption in "tall" air streams.

NOTE: Where space permits, mounting the humidifier 6" below bottom of duct facilitates removal of cover for periodic inspection.



Recommendation For Improved Absorption	
Duct Height	Number of Tubes
Up to 24" tall	One Tube
24" - 48"	Two Tubes
Over 48"	Three Tubes

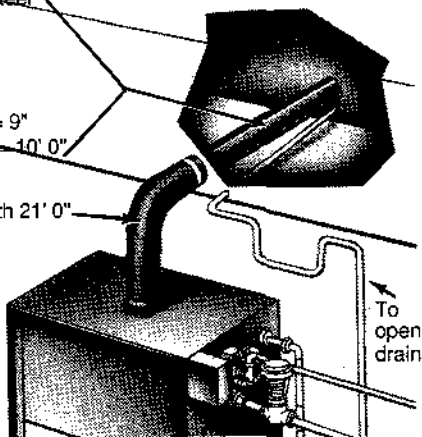
MOUNTING METHODS

Mounting Units by Use of Vapor Hose

1-1/2" O.D. stainless-steel dispersion tube in middle of duct. Pitch back 2" per foot.

Minimum tube length = 9"
Maximum tube length = 10' 0"

Maximum length 21' 0"



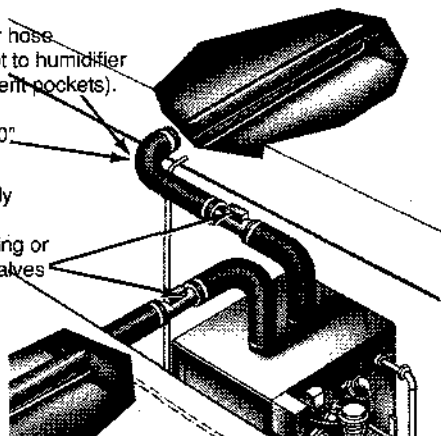
Humidifier should be mounted level - both directions.

Mounting Single Unit Humidifying Two or More Ducts

1-1/2" I.D. vapor hose (pitch back 2" per foot to humidifier with supports to prevent pockets).

Maximum length 21' 0"

Butterfly type balancing or zone valves



Humidifier should be mounted level - both directions.

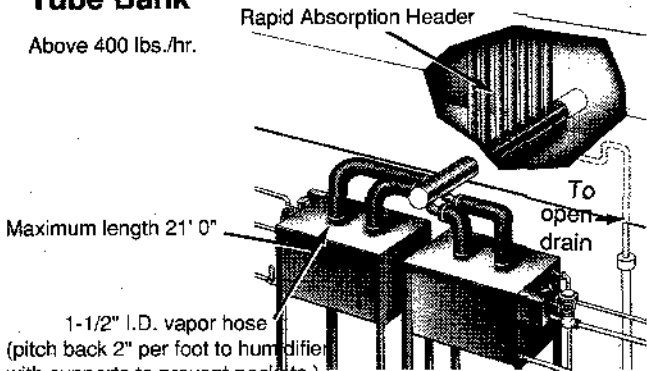
Mounting Two or More Humidifiers to One Tube Bank

Above 400 lbs./hr.

Rapid Absorption Header

Maximum length 21' 0"

1-1/2" I.D. vapor hose (pitch back 2" per foot to humidifier with supports to prevent pockets.)



Humidifiers should be mounted level - both directions.

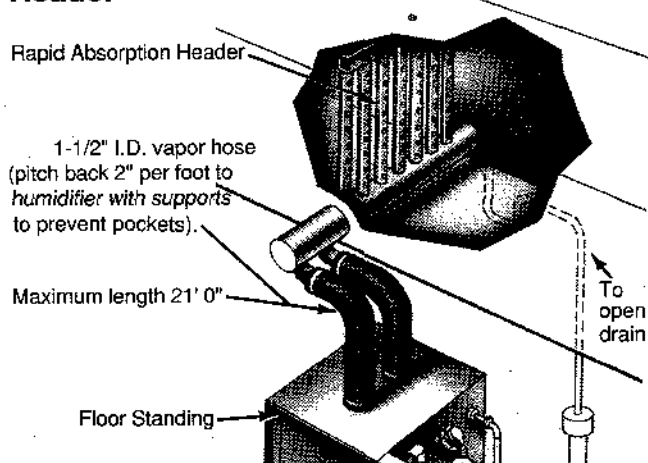
Mounting Multiple-Tube Rapid-Absorption Header

Rapid Absorption Header

1-1/2" I.D. vapor hose (pitch back 2" per foot to humidifier with supports to prevent pockets).

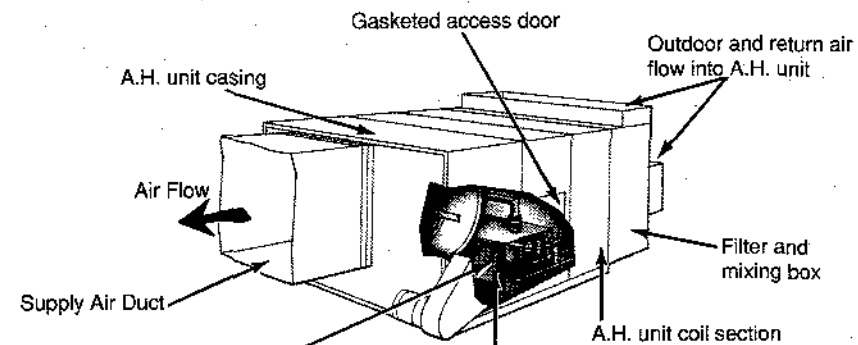
Maximum length 21' 0"

Floor Standing



Humidifier should be mounted level - both directions.

Mounting in Air Handling Unit



Set unit level both directions. Locate unit so that inverted U-tube is in the most active part of the air stream.

Humidifier centered in A.H. unit

All callouts for mounting unit shown in above examples apply.

PIPING METHODS

Hot Water Supply

The heat exchanger in the LTS standard humidifier is designed for a maximum hot water pressure of 30 psi. Valve and strainer are shipped loose for field installation.

Drain Piping

A drain line should be extended from the skimmer connection to a sanitary waste or suitable drain. If non-metallic pipe or hose is used it must be capable of withstanding 212°F temperature.

To prevent steam from escaping from the drain line, a water seal must be provided in the drain line of sufficient height to contain the pressure developed within the humidifier. This pressure is the sum of the flow resistance in the dispersion tube and hose plus the static pressure of the duct system. Without this water seal, steam will escape into the drain line. 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. See pg. 11.

Makeup Water Piping

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 (minimum) to function and therefore will not operate on water treated by the reverse osmosis or deionizing process. However, special design LTS humidifiers are available for use with these water types.

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.

Either cold or hot water can be used for makeup. 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.

The LTS has a one inch internal "air gap". However, local codes may require a vacuum breaker.

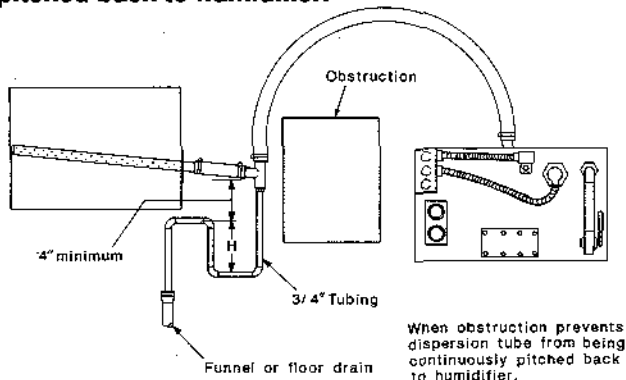
Vapor Hose Piping

When the vapor hose and stainless steel dispersion tube are used they should be pitched back to the humidifier. A gradual slope of 2" per foot of length (min.) with no "low spots" is recommended. When this is not possible due to duct elevation or an obstruction, alternate arrangements may be used as shown.

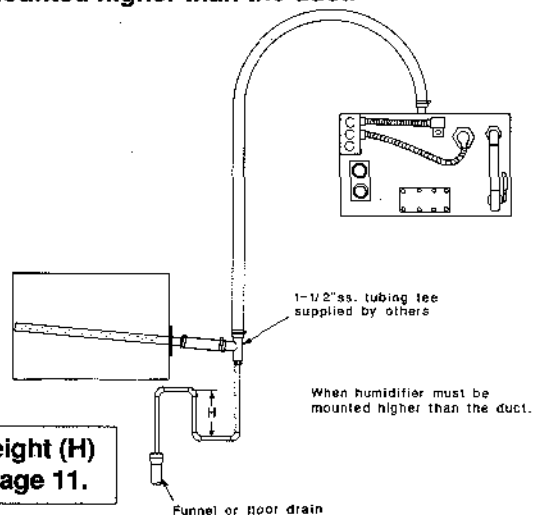
However, the condensate that forms in the vapor hose must be removed. Preferably it should be returned to an open drain with a water seal of sufficient height to contain the duct static pressure, as shown on page 13.

When the condensate must be returned to the LTS two methods are shown on pg. 14, funnel drain or air vent arrangements. Both methods do require a water seal and an air gap to prevent back pressure from the LTS tank effecting condensate returning below the LTS water line.

Piping method recommended when obstruction prevents dispersion tube from being continuously pitched back to humidifier.

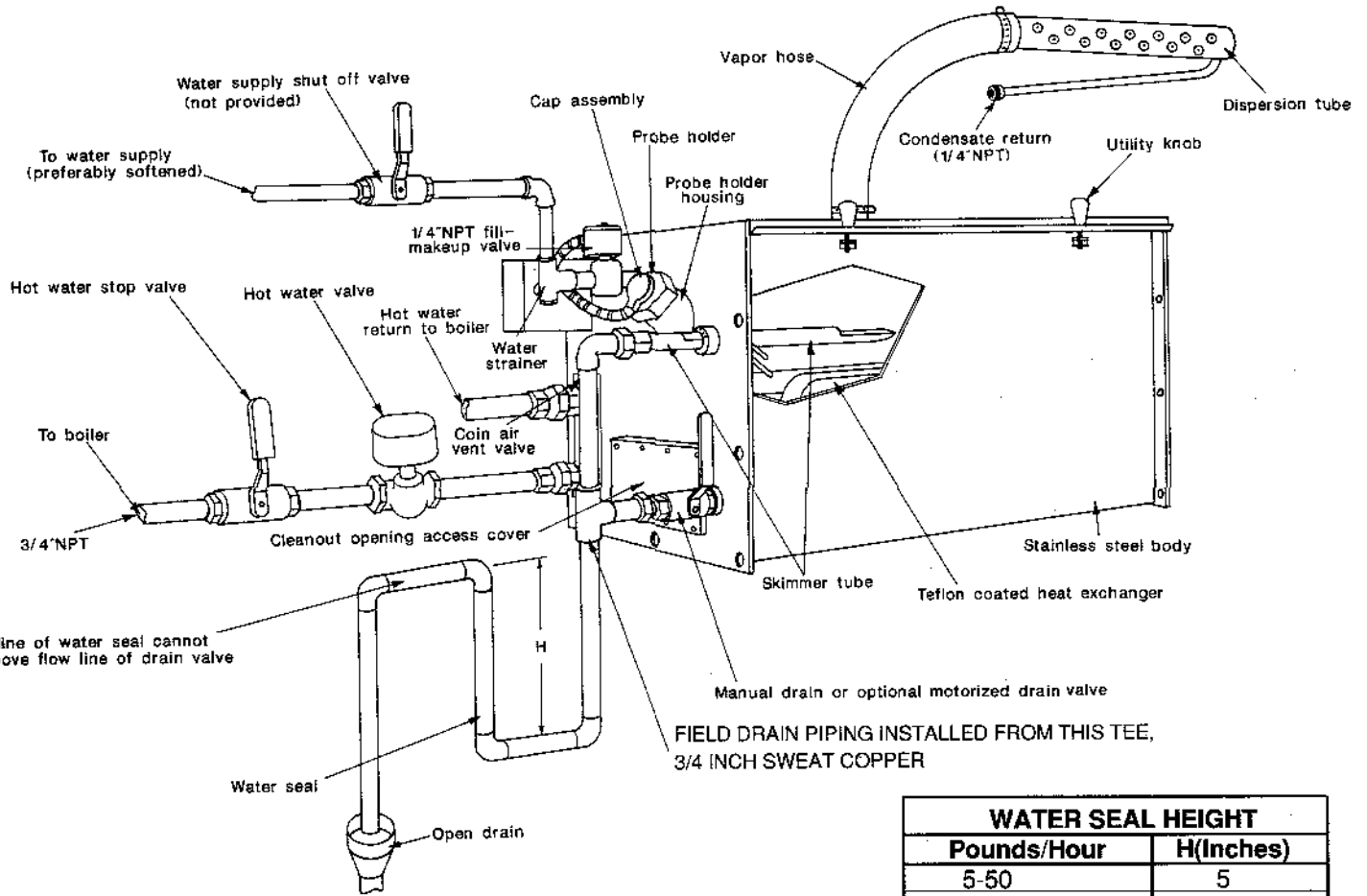


Piping Method recommended when humidifier must be mounted higher than the duct.



For water seal height (H) follow chart on page 11.

PIPING METHODS

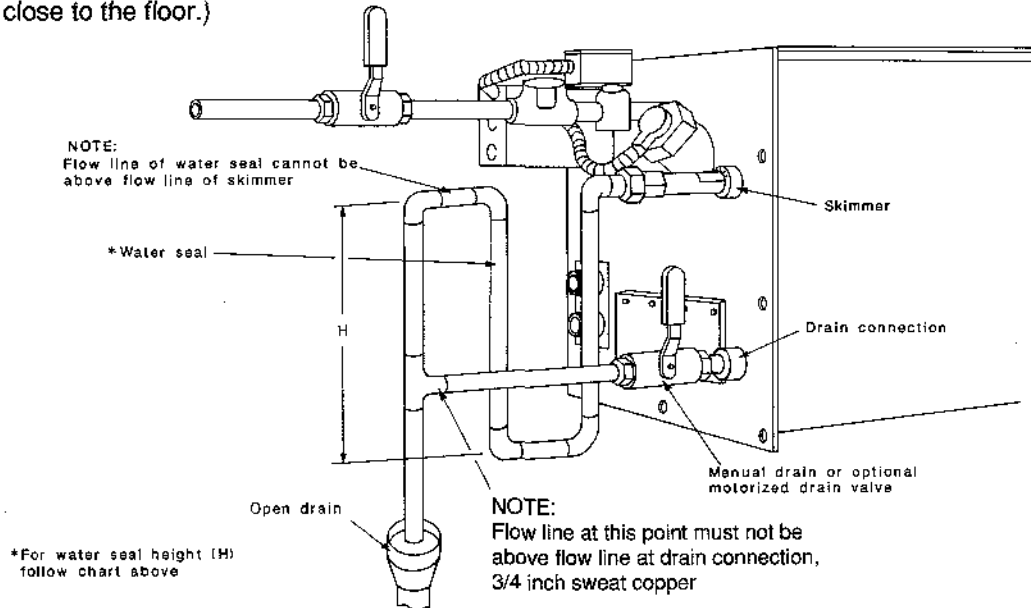


FIELD DRAIN PIPING INSTALLED FROM THIS TEE,
3/4 INCH SWEAT COPPER

WATER SEAL HEIGHT	
Pounds/Hour	H(Inches)
5-50	5
51-94	7
95-138	10
139-183	14
184-227	18

Alternate Water Seal and Valve Piping

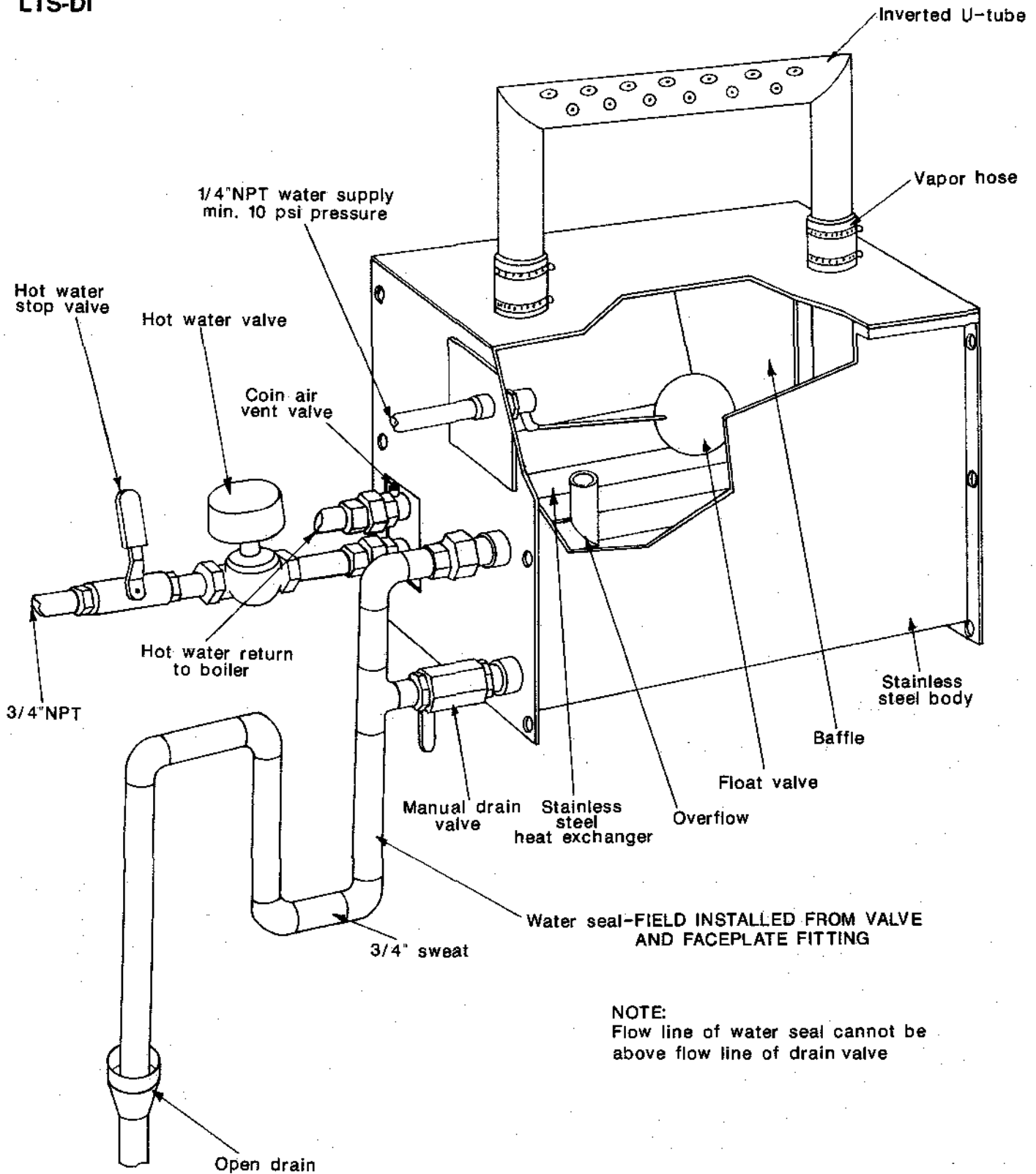
This piping method is used when the water seal must be elevated above the flow line of the drain connection. (i.e. LTS is close to the floor.)



*For water seal height (H) follow chart above

PIPING METHODS

LTS-DI

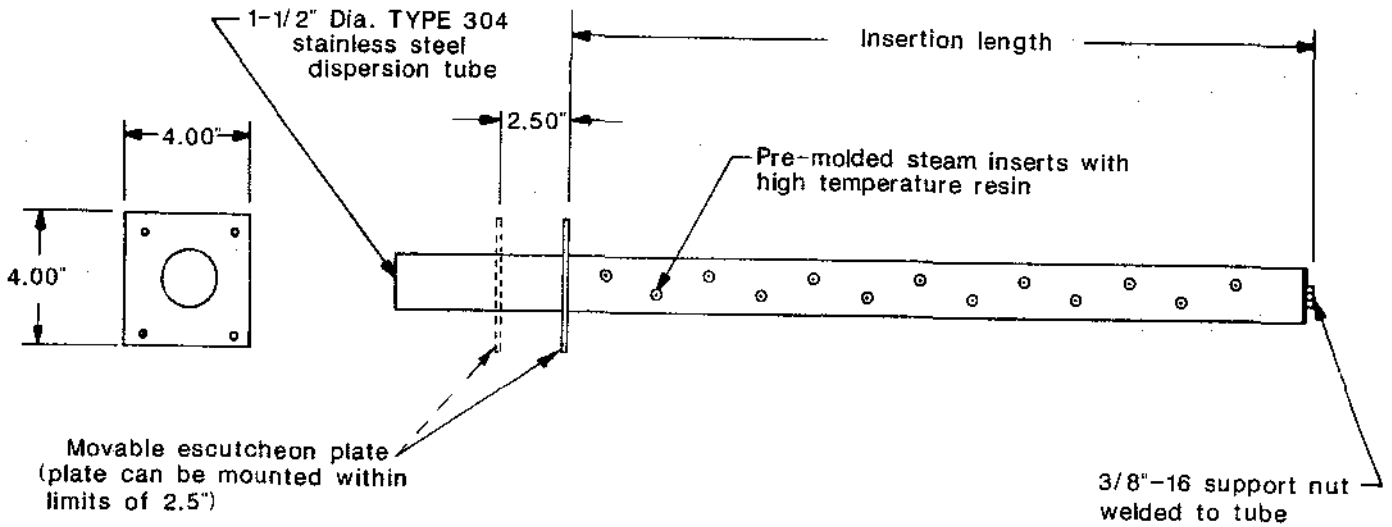


NOTE:
Flow line of water seal cannot be above flow line of drain valve

NOTE:
Drain piping material must be suitable to handle 212° F (100°C) water.

PIPING METHODS

LTS Dispersion Tube Installation



DISPERSION TUBE / HUMIDIFIER INTERCONNECTION

*** 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

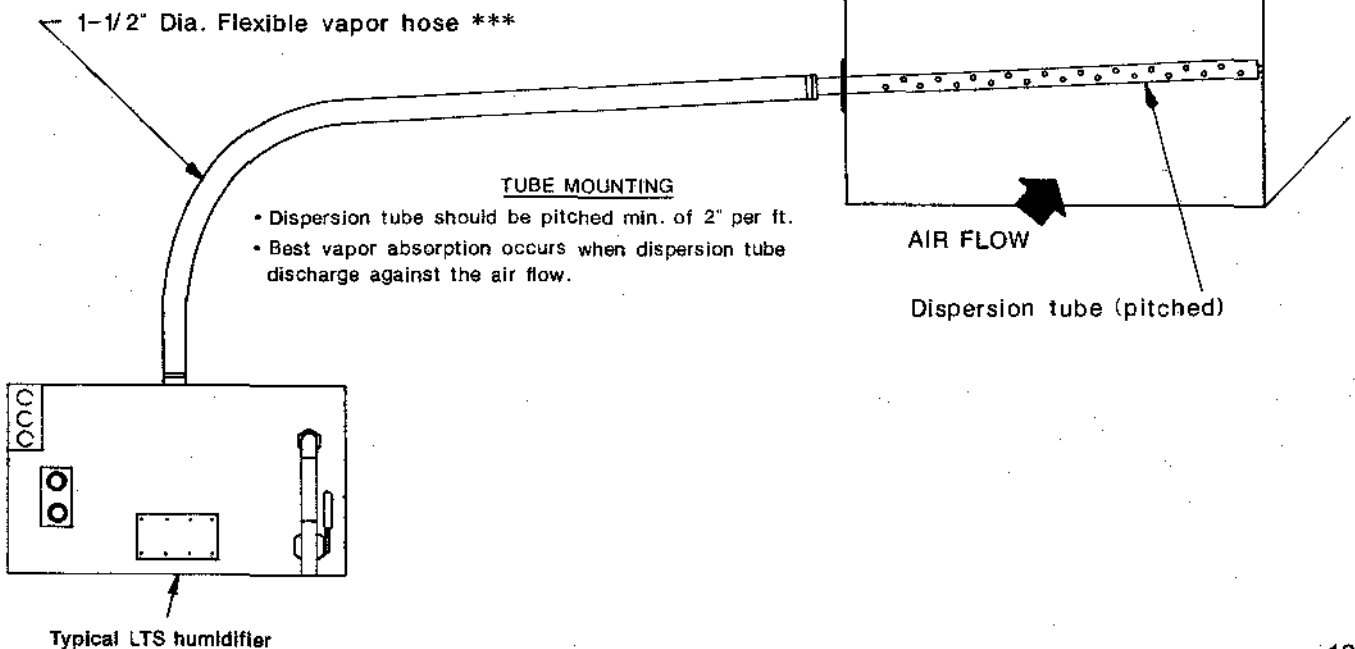
BOTH METHODS

- Insulating the vapor hose or rigid piping will reduce the loss in output caused by condensation
- When mounting the humidifier above the level of dispersion tube, consult appropriate operation and maintenance manual for details.

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 distances between humidifier and the dispersion tube(s) exceed 20 feet, consult factory for special recommendations.

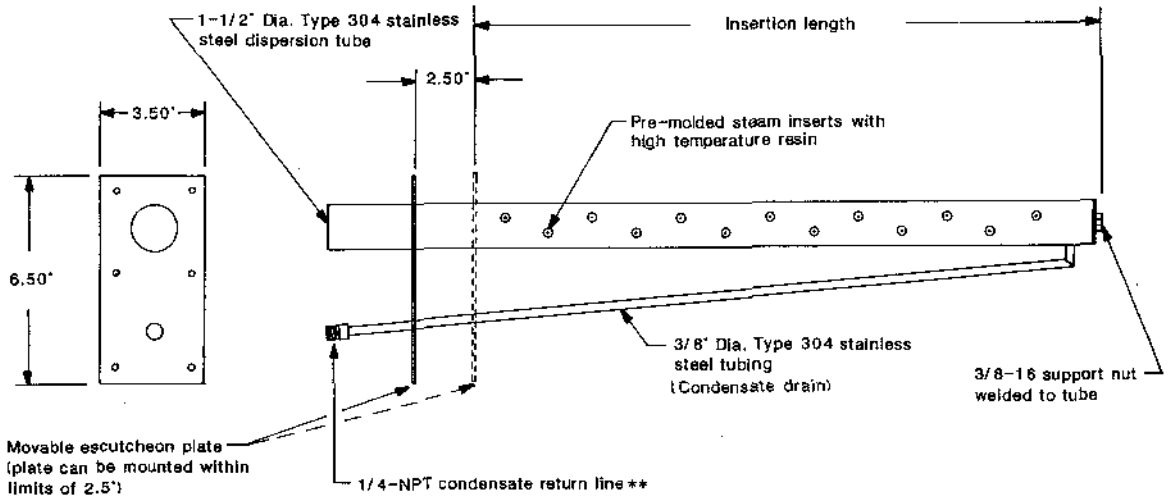
VAPOR RIGID PIPING (WHEN USED)

- 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 steam loss than heavy wall pipe.



PIPING METHODS

LTS Dispersion Tube Installation with Condensate Drain



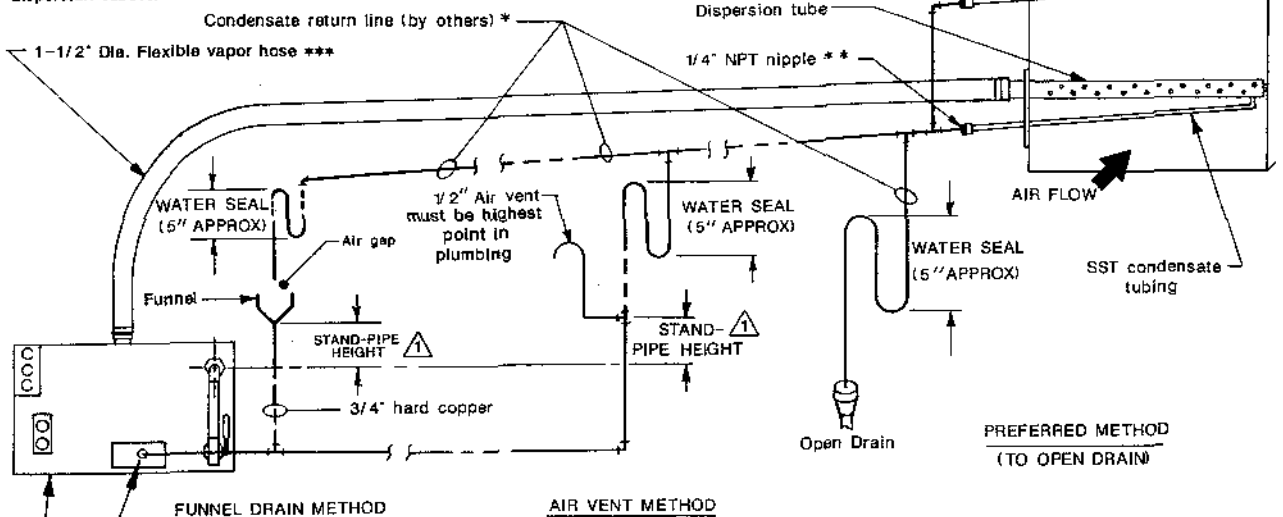
DISPERSION TUBE / HUMIDIFIER INTERCONNECTION VAPOR RIGID PIPING (WHEN USED)

- *** 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
 - Insulating the vapor hose or rigid piping will reduce the loss in output caused by condensation
 - When mounting the humidifier above the level of dispersion tube, consult the appropriate operation and maintenance manual for details.
- BOTH METHODS**
- 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 steam loss than heavy wall pipe.

TUBE MOUNTING

- Mount dispersion tube dead level.
- Best vapor absorption occurs when dispersion tube discharges against the air flow; specify right or left hand discharge (right hand shown).

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) splitting, lost water seals or leaking gaskets. When distance between humidifier and the dispersion tube(s) exceeds 20 feet, consult factory for special recommendations.



PREFERRED METHOD (TO OPEN DRAIN)

Typical LTS humidifier

STAND-PIPE HEIGHT	
Stand-Pipe Height	Height (inches)
5 - 50	5
51 - 94	7
95 - 130	10
131 - 160	14

■ HEIGHT REQUIRED TO OVERCOME HUMIDIFIER INTERNAL PRESSURE.

*NOTE: Return line piping material must be suitable for 212°F (100°C) water.

Minimum condensate return line sizing:

- One or Two tubes - 1/2" I.D.
- Three or more tubes - 3/4" I.D.

*** 3/8" DIA. CONDENSATE TUBING IS NOT NEEDED AND NOT PROVIDED WHEN STEAM FLOW IS 34#/HR OR LESS PER DISPERSION TUBE.

ELECTRICAL

Electrical

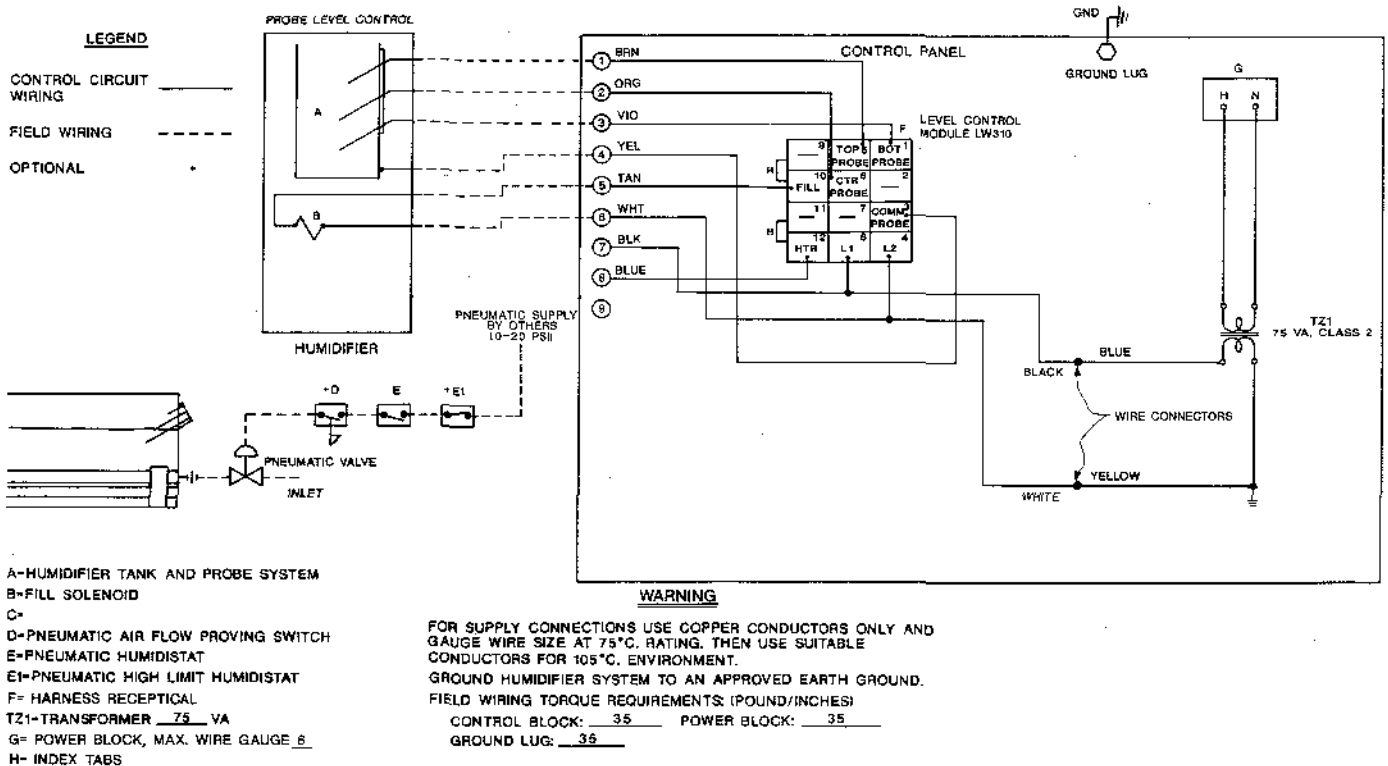
The electrical supply is 120 volt, single phase. The control cabinet should be mounted in a location convenient for service. All wiring must be in accordance with all governing codes and the LTS wiring diagram. The diagram is inside the control cabinet. The wiring between the control cabinet and humidifier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

The basic water level control and low water protection circuit found below is common to all LTS standard series humidifiers.

The LTS 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 LTS-DI humidifiers are available for use with these water types.

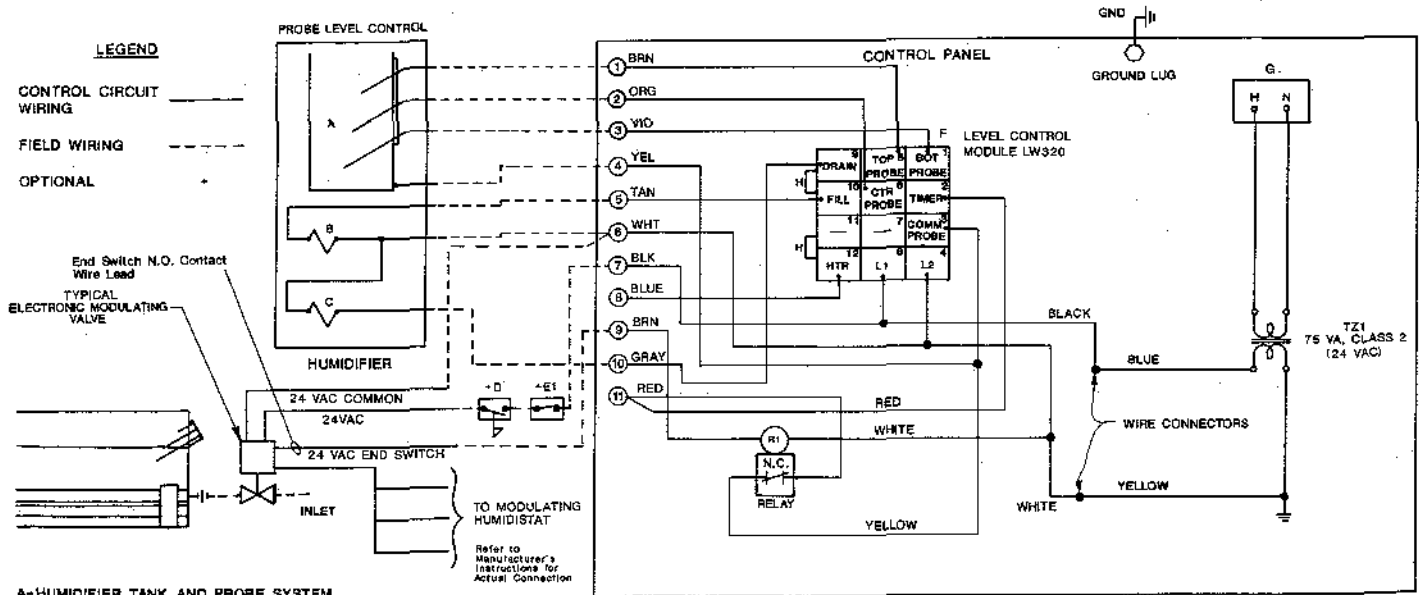
Caution: Only qualified electrical personnel should perform installation and startup procedures.

LTS Humidifier Pneumatic Hot Water Valve Wiring Diagram



ELECTRICAL

LTS Humidifier Electronic Modulating Hot Water Valve Wiring Diagram



- A-HUMIDIFIER TANK AND PROBE SYSTEM
- B-FILL SOLENOID
- C-DRAIN SOLENOID
- D-ELECTRIC AIR FLOW PROVING SWITCH
- F- HARNESS RECEPTICAL
- E1-ELECTRIC HIGH LIMIT HUMIDISTAT
- G- POWER BLOCK, MAX. WIRE GAUGE 6
- TZ1-TRANSFORMER 75 VA
- H- INDEX TABS

WARNING

FOR SUPPLY CONNECTIONS USE COPPER CONDUCTORS ONLY AND GAUGE WIRE SIZE AT 75°C. RATING. THEN USE SUITABLE CONDUCTORS FOR 105°C. ENVIRONMENT.

GROUND HUMIDIFIER SYSTEM TO AN APPROVED EARTH GROUND.

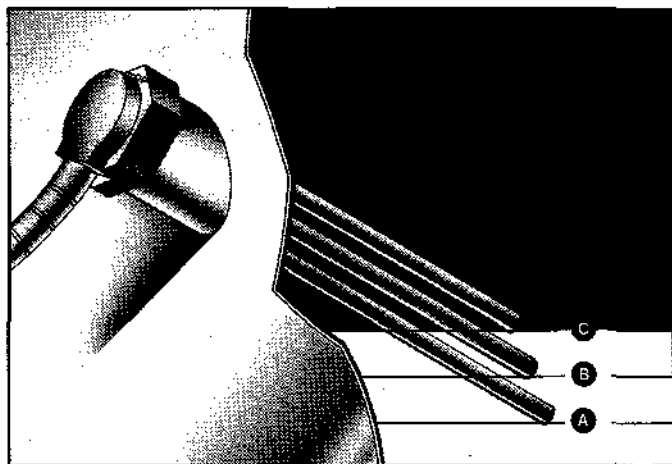
FIELD WIRING TORQUE REQUIREMENTS: (POUND/INCHES)

CONTROL BLOCK: 35 POWER BLOCK: 35

GROUND LUG: 35

OPERATION

Reliable Electronic Probe Control Maintains Water Level



The *exclusive* LTS probe system consists of 3 stainless steel probes, molded in a thermoset plastic threaded plug. The stainless steel probes are TEFLON® coated for easy cleaning. Both the probe mounting fixture and the plug are indexed for proper and easy remounting after cleaning.

The 3 probe sensors perform all of the necessary functions of water level control. Probe A indicates a low water condition. Probes B and C perform the functions of maintaining proper operating water level. The level of probe B signals the water valve to open and fill to probe C level. Upon reaching probe C level, the solenoid is closed. A 1" airgap is provided between the top probe and the water inlet.

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

Optional: Timer-Operated Drain/Flush Operation

This option, in addition to the features of the standard control module, provides a drain and flush sequence at preset intervals. This feature effectively reduces the frequency of cleaning associated with LTS humidifiers. It is recommended when the water supply contains a large quantity of dissolved minerals.

An integral electronic timer accumulates the "on" or "humidifying" time of the unit. When this accumulated time reaches the hours pre-selected by the user (field adjustable between 5 and 50 hours), an electronic programmer automatically activates the drain/flush cycle.

Then this cycle, which is also field adjustable (between 1 and 30 minutes), is activated the drain valve opens, beginning the drain-off of the humidifier water. When 50% of the pre-set drain duration time has elapsed the fill valve opens for the remainder of the time, completing the flushing action.

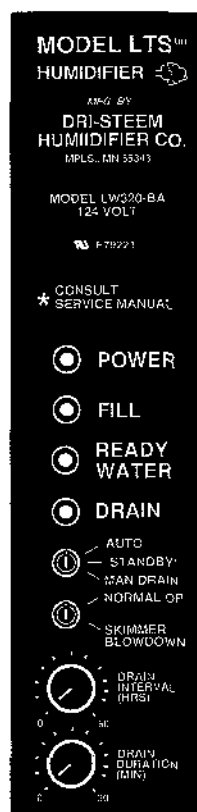
At the end of the flushing time the control module closes the drain valve, keeps the fill valve open which refills the unit, restarts the cumulative timer and allows the humidifier to resume operation normally.

When draining the humidifier prior to servicing, the "manual drain" feature of this control module is used. Placing the three-position switch in the "manual drain" position deactivates the fill valve and opens the drain valve.

The chart below shows recommended hours of operation for various water hardness. Refer to table 18-1 on page 18 for recommended drain duration settings.

Grains/Gal	Hours of Op. Time*	Grains/Gal	Hours of Op. Time*
14	24	24	14
16	22	26	13
18	19	28	12
20	18	30	11
22	16	32	10

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



OPERATION

Startup and Checkout Procedures

1. **Mounting** - Check mounting to see that unit is level and securely supported before filling with water.
2. **Piping** - Verify that all piping connections have been completed as recommended and that boiler hot water and make-up tank water pressures are available.
3. **Electrical** - Verify that all wiring connections have been made in accordance with the LTS wiring diagram.
4. **Control circuits**
 - a) Adjust humidistat to "call" setting.
 - b) Open shut off valves on hot water supply from boiler and make-up water supply line.
 - c) Set control module switch to "standby" position.
 - d) Set main disconnect switch to "on" position; control module "power" lamp should now light.
 - e) Set control module switch in "normal op." position. For unit with LW320, set module switches to "auto" and "normal op." positions. The "fill" lamp should now light and the makeup valve should now open.
 - f) When water level reaches point A (see figure on page 17), the "ready water" lamp should light. Filling should continue until the uppermost electrode (point C) has been in water contact for two seconds. At that point, the "fill" lamp should go out.
 - g) Check low water cut off circuit:
 1. Close manual stop valve on water supply.
 2. Open ball valve and start draining unit. For units equipped with automatic drain down, open "dump valve" to drain unit as follows: Open valve by transferring dump valve lever to manual position and back in place.
 3. As water level drops past center electrode (point B) "fill" lamp will light; when water level drops past lowest electrode "ready water" light will go out.
 4. When step 3 has been satisfactorily completed, close manual drain valve or return dump valve lever to automatic position and refill unit as in step "e".
 - h) Fill water seal in drain line by setting control module switch in "skimmer blowdown" position until water flows from drain pipe, reset to "normal op." and unit is ready to operate.
 - i) Check out function of field installed safety controls such as high limit humidistat and fan proving switch.
 - j) Check to see if hot water is circulating through heat exchanger. Bleed any air trapped in heat exchanger by opening the coin air vent valve.
 - k) Inspect installation for leaks by operating the LTS. Any steam or air leaks should be sealed.

Optional LW320 Start Up

Setting the Drain Interval Timer

Your humidifier was shipped from the factory with the "drain interval" timer set for 20 hours. This means that at the end of 20 hours of actual humidifying time the unit will go through its drain/flush cycle.

If you know the hardness of the water being supplied to your

humidifier, you should reset the "hours" dial in accordance with the grains/gallon table found on page 17. If you can't get this information leave it set at 20 hours for now. Because of the many variables involved, trial and error may be the next most reliable means of arriving at the proper "hours" setting for your particular humidifier installation.

Trial and error means simply inspecting the humidifier at two week intervals. If the sides of the tank are building up with lime, lower the hours to 15. If after two more weeks it is continuing to build up, lower it to 10, etc. If, on the other hand, no build up is evident, increase the hours to 25, etc.

The objective is to make sure the drain/flush cycle does the job, but does it without wasting water. It should drain/flush often enough to keep the unit free of rapid build-up, but no more often. The drain/flush cycle may not totally eliminate mineral build-up.

Note: After a week or two of operation, loose scale will begin to accumulate on the floor of the humidifier chamber. This is scale that forms on the heat exchanger. When it gets thick enough (3/32") it flakes off. This is normal and need not be removed until the top of the accumulation approaches the underside of the heat exchanger (usually once per season). The use of softened water will greatly minimize the rate at which scale formation occurs.

Setting the Drain Duration Timer (Minutes)

This setting is determined by the size (gallons capacity) of each LTS model. Large units require more drain time and vice versa. This setting is made before the humidifier leaves the factory. It is always a good idea to check and make sure the setting of your unit agrees with the "drain duration" table found below.

Testing the Drain/Flush System

As a part of final checkout the installer should always verify the operation of the (optional) drain/flush system. To test:

1. Set the "drain interval" timer dial to "0" hours.
2. Set the "drain duration" timer dial to "10" minutes. In 30 to 45 minutes (varies) the drain valve should open, 5 minutes later the fill valve should open which creates the flushing action. After an additional five minutes the drain valve should close. The fill valve should remain open until the unit is refilled to the level of the top probe and then close.

If all of the above takes place as described, the drain/flush system is functioning correctly. The drain interval timer dial (hours) should be returned to 20 hours and the drain duration timer dial (minutes) should be set to agree with the table below. The unit will then be ready to resume humidifying.

Table 18-1

Total KW	Drain Duration (minutes)
2-8	5
9-24	10
28-40	15
42-60	20
64-80	25

MAINTENANCE PROCEDURES

Recommended Maintenance

The LTS humidifier 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 annual cleaning is usually adequate. For high mineral content water (above 10 grains per gallon) an electronic timer and solenoid "drain" valve is recommended in addition to the surface skimmer, along with annual cleaning. If the LTS was originally purchased without a timer and drain valve they usually can be easily added in the field. Consult factory for details.

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

Note: When performing maintenance on the LTS always place control module switch in "standby" or place main disconnect in "off" position and close manual hot water and make-up water shut-off valves.

Monthly or as Required

1. Cleaning Probes - Disconnect the plug and cable assembly and unscrew the probe holder from the LTS unit. The scale will easily flake off from the TEFLON® coated sensing portion. The uncoated sensing portion (bottom 3/8") of the probe should be brushed clean with steel wool. Reinstall the probe holder with arrows up and "top" marking at the top.

2. 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 screwdriver or section of small diameter pipe and reassemble elbow. Skimmer drainage should be verified by visual inspection once per week. Water should drain from skimmer drain pipe after each fill cycle.

Summer Maintenance

At the conclusion of the humidification season a complete cleaning of the heaters, probe control, skimmer, and water chamber is recommended. After cleaning the unit should be left unfilled until such time when humidification is required again.

Adjusting the Surface Skimmer

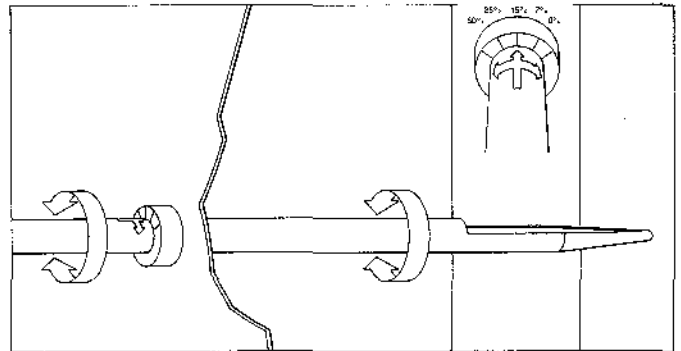
The elevation of the lip of the skimmer tube in respect to the water line, determines the quantity of "skimming" that takes place with each fill cycle. The height is field adjustable by rotation of the tube.

As evaporation takes place, a portion of the dissolved minerals precipitate (come out of solution) and remain on the water surface.

Each time the LTS 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 mineral 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 in inconvenience. It is, therefore, recommended that the user, at the time of initial startup, observe and adjust the skimming quantity. By doing so, a balance between minimized mineral build-up and conservation of waste water 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 11% of the total evaporating capacity of the unit. For example: a LTS 100 having an output capacity of 60 pounds per hour would skim about 8.5 pounds (one gallon) per hour.



Surface Skimmer

To adjust, loosen the union nut and rotate the tube to the desired percentage of skimming rate. Markings on the unit indicate the following:

50% 25% 15% 7% 0%

Allow the LTS to operate five or ten days and then inspect it. If a mineral buildup 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.

Note: In those cases of extremely high mineral content where the surface skimmer will not control mineral build-up a timer and "drain" valve are recommended.

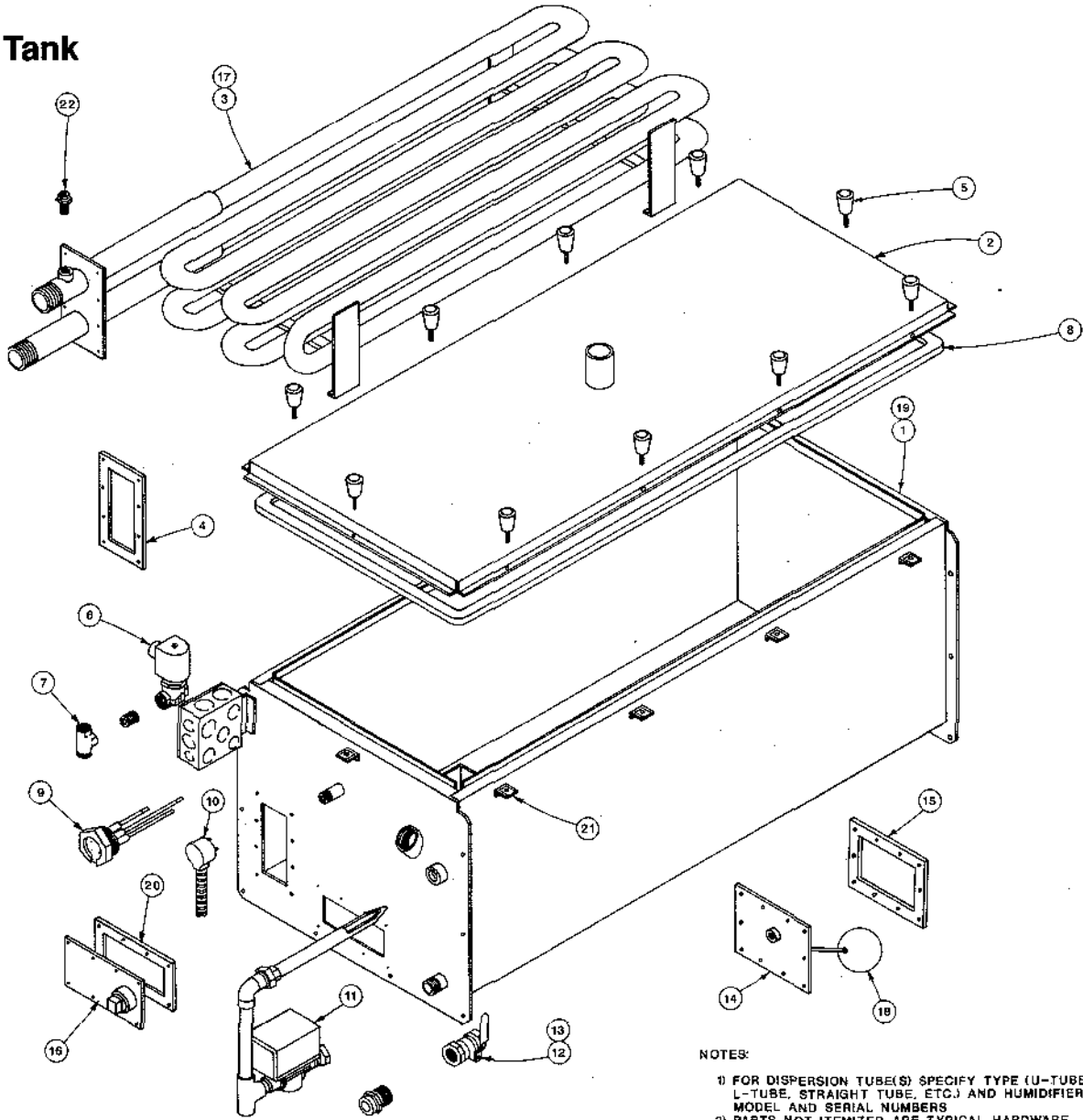
TROUBLE-SHOOTING GUIDE

PROBLEM	CONTROL MODULE LIGHTS			POSSIBLE CAUSE	RECOMMENDED ACTION
	Power	Fill	Ready Water		
Humidifier will not heat	Off On	Off Off	Off On	Control transformer. Humidistat is not calling. Safety controls open. Faulty control module. Probe head deterioration*. Hot water valve closed. Low or no hot water. Water strainer plugged.	Verify control voltage across terminals 6 & 7. Set humidistat to call. Inspect for faulty humidistat. Check safety controls. Verify control voltage between terminals 6 & 8. Replace probe head. Verify valve is opened. Verify hot water is present Clean strainer
Humidifier will not fill:	On	On	Off	No water pressure at valve. Faulty water fill valve. Plugged strainer. Plugged valve. Faulty control module. Fill valve installed backwards.	Check manual water supply. Verify action of fill solenoid valve by turning control module switch from standby to normal op. Audible click should be heard as solenoid operates. Check strainer. Check valve. Verify control voltage across terminals 5 & 6. Check for correct water flow, through valve, note arrow.
Humidifier does not stop filling	On	On	Off	Lack of tank to probes continuity. Water conductivity 100 micromhos/cm (2 gr/gal) minimum. Fill valve is stuck open holding valve open. Low water temperature. Water valve. Mineral coated heat exchanger. Heat exchanger vapor locked.	Jumper terminals 1 & 4. If water stops, verify tank ground to terminal 4; check water supply conductivity; then consult factory. Check valve for foreign matter. Check water supply temperature Not opening fully Clean heat exchanger Bleed air from exchanger
Low output	On On	Off Off	On On	Electric drain valve not seating. Low boiler hot water temp. Too much skimmer/drain. Fill valve is stuck open. Air in heat exchanger.	Clean diaphragm and seat valve. Raise boiler temperature. Reduce skimmer drain amount. Check valve for foreign matter. Open coin air valve to bleed air.
Unit short cycles	On	On/Off	On/Off	Probes may be incorrectly wired or need cleaning.	Confirm that unit is wired per diagram. Clean probe rod tips with steel wool.

*Probe rod corrosion or probe head material aging may cause level control system failure. This generally does not occur in the first two years of operation.

LTS REPLACEMENT PARTS

LTS Tank



NOTES:

- 1) FOR DISPERSION TUBE(S) SPECIFY TYPE (U-TUBE, L-TUBE, STRAIGHT TUBE, ETC.) AND HUMIDIFIER MODEL AND SERIAL NUMBERS
- 2) PARTS NOT ITEMIZED ARE TYPICAL HARDWARE STOCK ITEMS

▲ ONLY ON DI UNITS

▲ ONLY ON STANDARD UNITS

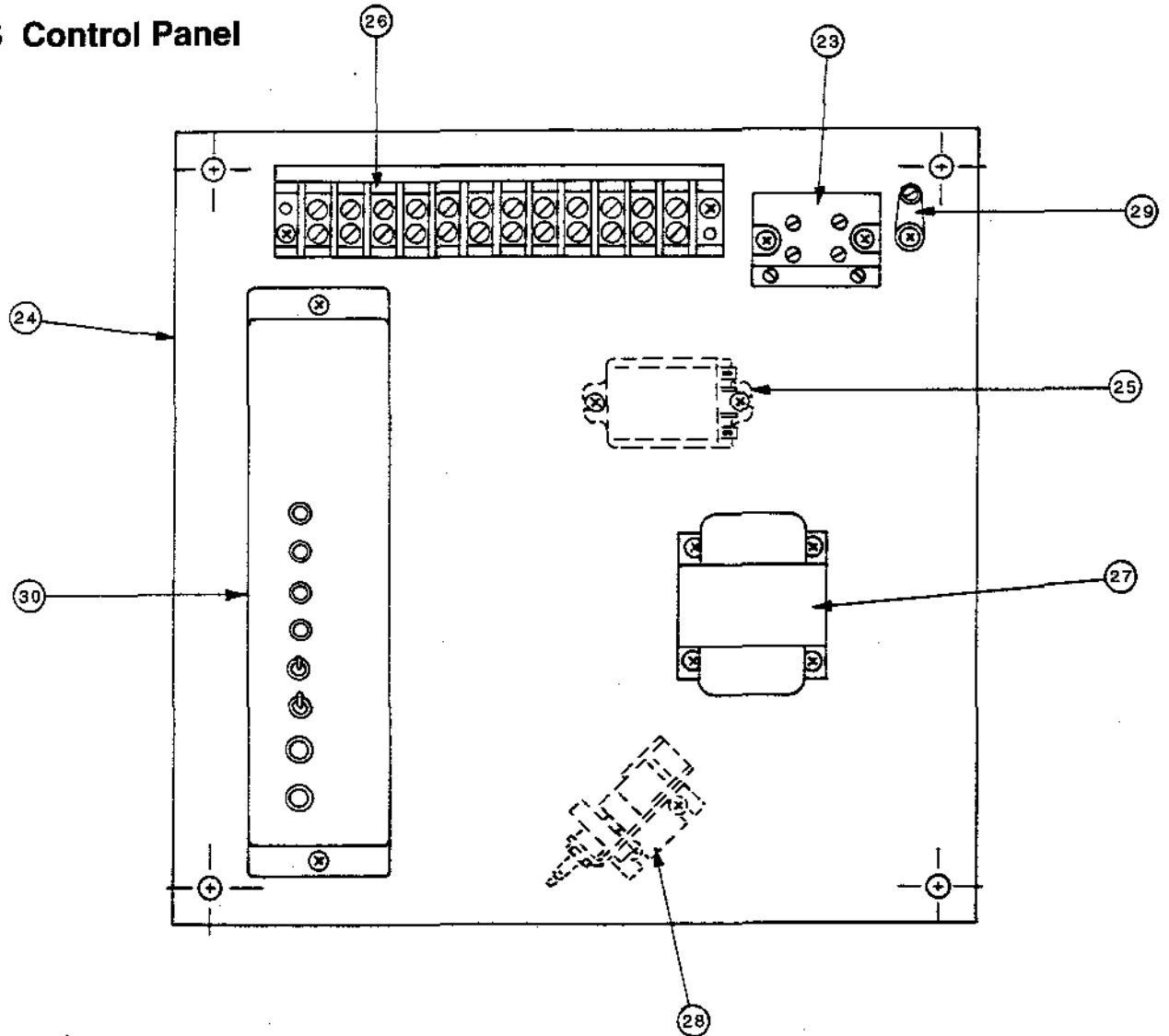
NO.	DESCRIPTION	MATERIAL	REQ'D	PART NO.
10	PROBE PLUG	▲	1	406850
9	PROBE ASSEMBLY	▲	1	408050
8	COVER GASKET		1	309955
7	1/4" NPT SEDIMENT STRAINER	▲	1	300050
6	1/4" NPT FILL VALVE	▲	1	505080
5	UTILITY KNOB/LTS-25		6	700725
5	UTILITY KNOB/ LTS-50/100		8	700725
5	UTILITY KNOB/LTS-200		10	700725
4	HEAT EXCHANGER GASKET		1	308220
3	LTS-25 HEAT EXCHANGER-TEFLON	▲	1	164440-101
3	LTS-50/100 HEAT EXCHANGER-TEFLON	▲	1	164440-102
3	LTS-200 HEAT EXCHANGER-TEFLON	▲	2	164440-103
2	LTS-25 COVER		1	164416
2	LTS-50/100 COVER		1	164417
2	LTS-200 COVER		1	164416
1	LTS-25 TANK	▲	1	164405-001
1	LTS-50/100 TANK	▲	1	164405-002
1	LTS-200 TANK	▲	1	164405-004
NO.	DESCRIPTION	MATERIAL	REQ'D	PART NO.

22	COIN AIR VALVE/LTS- 25,50,100		1	203540
22	COIN AIR VALVE/LTS-200		2	203540
21	1/4-20 NUT RETAINER/LTS-25		6	700550
21	1/4-20 NUT RETAINER/LTS-50/100		8	700550
21	1/4-20 NUT RETAINER/LTS-200		10	700550
20	CLEAN OUT PLATE GASKET	▲	1	308220
19	LTS-25 TANK-DI	▲	1	164406-001
19	LTS-50/100 TANK-DI	▲	1	164406-002
19	LTS-200 TANK-DI	▲	1	164406-004
18	FLOAT VALVE	▲	1	505210
17	LTS-25 HEAT EXCHANGER-SST	▲	1	164440-001
17	LTS-50/100 HEAT EXCHANGER-SST	▲	1	164440-002
17	LTS-200 HEAT EXCHANGER-SST	▲	2	164440-003
16	CONDENSATE RETURN/CLEAN OUT PLATE	▲	1	165470
15	FLOAT PLATE GASKET	▲	1	308260
14	FLOAT PLATE	▲	1	164409
13	3/4" SST BALL VALVE	▲	1	505000
12	3/4" BALL VALVE MANUAL DRAIN	▲	1	505010
11	3/4" ELECTRIC DRAIN VALVE	▲	1	505400

LTS REPLACEMENT PARTS

LTS REPLACEMENT PARTS

LTS Control Panel



⚠ VARIES WITH SPECIFIC ORDER

NOTE: SPECIFY HUMIDIFIER MODEL AND
SERIAL NUMBERS WHEN ORDERING.

30	LW320 LEVEL CONTROL ⚠	408520
30	LW310 LEVEL CONTROL ⚠	408510
29	GROUND LUG	409250-017
28	PNEUMATIC ELECTRIC SWITCH ⚠	408100
27	TRANSFORMER	408960
26	TERMINAL BLOCK (9 OR 12)	408250
25	RELAY ⚠	407900-001
24	11" x 11" SUBPANEL	165720-002
23	POWER BLOCK	408300-001
NO.	DESCRIPTION	PART NO.

MAINTENANCE SERVICE RECORD

DATE INSPECTED	PERSONNEL	OBSERVATION	ACTION PERFORMED

The LTS Warranty

1. Warranty. DRI-STEEM Humidifier Company (the "Company") guarantees its products to be free of defects in materials and workmanship under the service for which they are intended. The Company will repair or replace without charge except for labor charges, products or parts which are found to be defective within one year from the date of shipment, or, at the option of the Company, will refund the purchase price.

2. Exclusions of other warranties. The warranty described in the above paragraph shall be IN LIEU OF any other warranty, express or implied, including but not limited to any implied warranty of MERCHANTABILITY or fitness for a particular purpose.

3. Limitation of Remedies. By purchasing the Company's products, the purchaser agrees with the Company that the purchaser's sole and exclusive remedy shall be for the repair or replacement of defective parts or products, without charge except for labor charges, as described in paragraph 1, above. The purchaser agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available to him.

DRI STEEM[®]
HUMIDIFIER COMPANY

14949 Technology Drive, Eden Prairie, MN 55344
PH: 1-800-328-4447 • In MN: (612)949-2415
Fax: (612)949-2933

Your DRI-STEEM representative is: