

READ AND SAVE THESE INSTRUCTIONS

VAPORSTREAM®

ELECTRIC STEAM HUMIDIFIERS

For Commercial, Institutional,
Industrial and Large Residential Applications
Without a Steam Boiler

Installation Instructions and Maintenance Operations Manual



UL LISTED

LR 52511



CSA APPROVED

DRI STEEM®
HUMIDIFIER COMPANY

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TO THE PURCHASER AND THE INSTALLER

Thank you for deciding to purchase VAPORSTREAM equipment. 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.

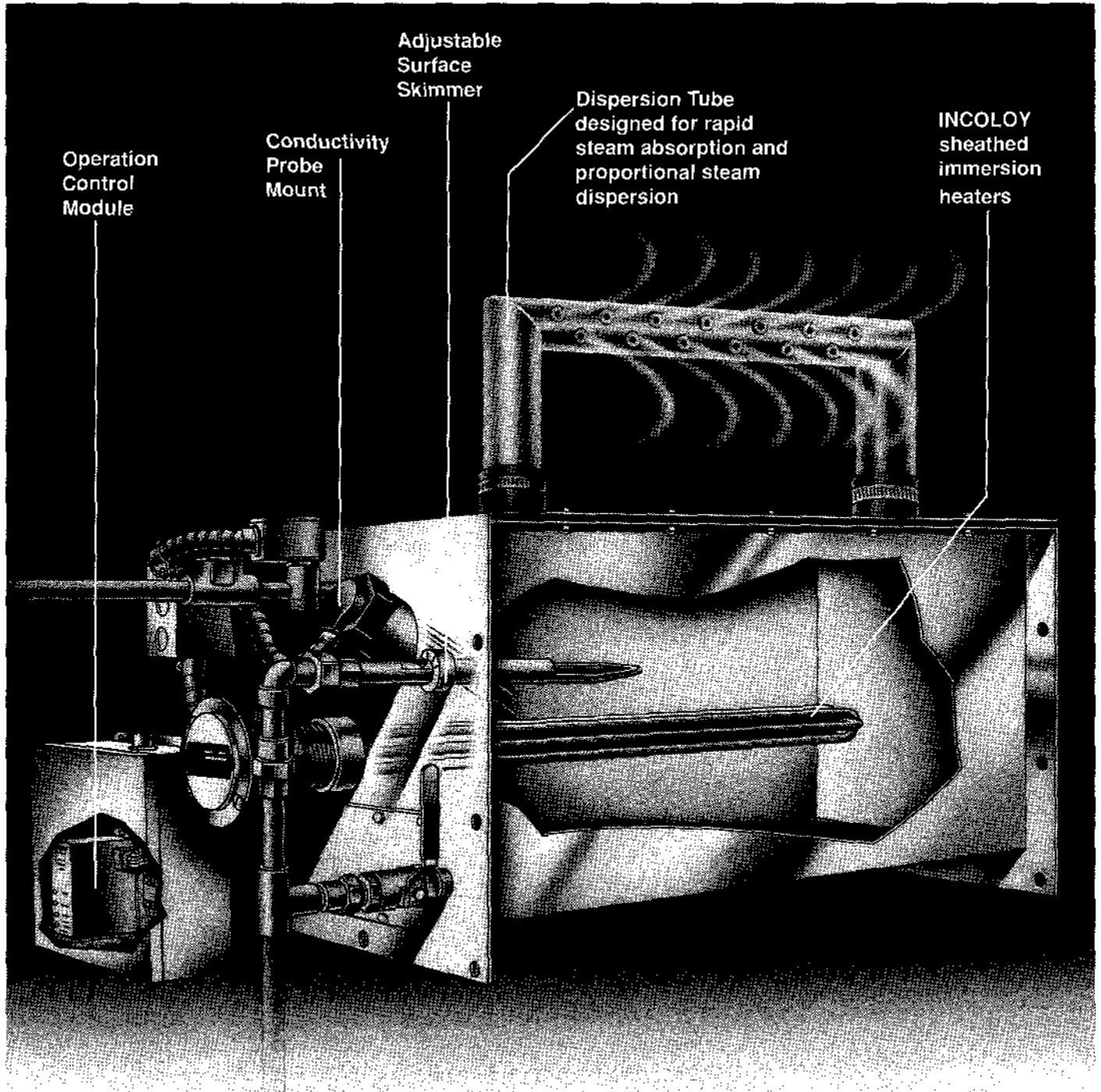
DRI-STEEM Humidifier Company

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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 VAPORSTREAM humidifiers are available for use with these water types.

VAPORSTREAM DIAGRAM

**Sophisticated state-of-the-art technology
in a simple, low maintenance humidifier.**



INSTALLATION

Selecting the Location

To put VAPORSTREAM humidifiers to work, you need just three things: available tap water (preferably softened), available electricity and a drain system. VAPORSTREAM 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.

B. In general, the electric 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.

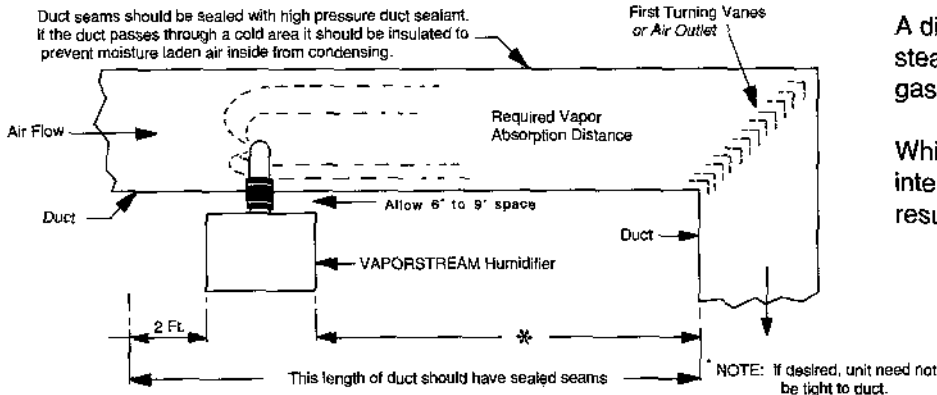
E. Do not place unit where discharged vapor will impinge on a metal surface.

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

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.

When adequate absorption distance is not available, a rapid absorption tube bank should be used. Refer to pages 12 - 15 in the regular product catalog VSH-R4-0189 or contact DRI-STEEM or your DRI-STEEM representative.

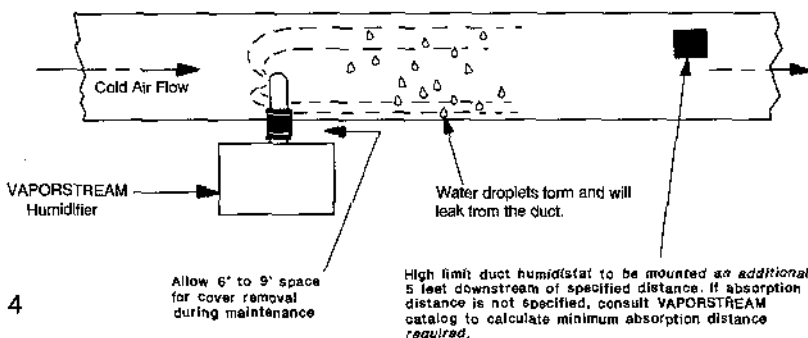
VAPOR ABSORPTION DISTANCE



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.

INSTALLATION IN COLD AIR STREAM

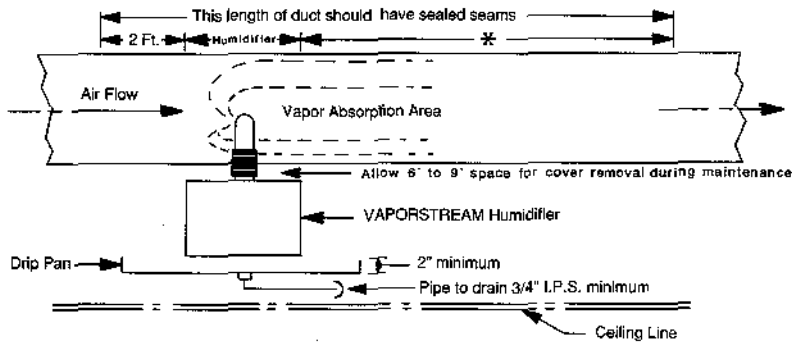


When a humidifier is installed in a duct that will carry cold air periodically, the dew point temperature should be determined.

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.

INSTALLATION

INSTALLATION ABOVE VALUABLE EQUIPMENT



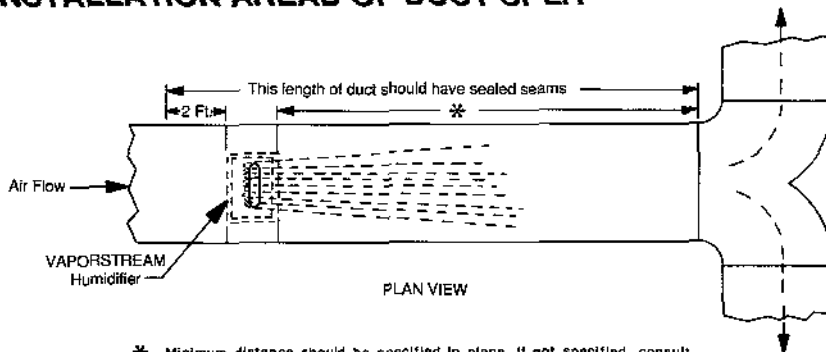
* Minimum distance should be specified in plans. If specified, consult VAPORSTREAM catalog to calculate minimum distance required for given installation.

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 VAPORSTREAM should be piped to a floor drain rather than the drip pan.

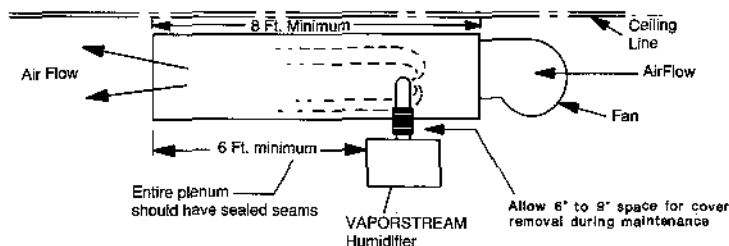
INSTALLATION AHEAD OF DUCT SPLIT



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

When a VAPORSTREAM 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.

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 VAPORSTREAM 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.

* 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/ELECTRICAL SPECIFICATIONS

| Mechanical Specifications | | | | | | | Electrical Specifications | | | | | | | | | | Capacities-Hr. | | | | |
|---------------------------|----------|-------|----------|-------|---|----|---------------------------|----------|--------------|-------|-----------|-----------|-----------|-----------|-----------|-----------|----------------|----|----------|-------------|--------|
| 1 | 2 | | 3 | | 4 | 5 | 6 | | 7 | | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |
| | Dim. "A" | | Dim. "B" | | U | HK | Wt. Empty | Wt. Full | Single Phase | | | | | | | | | | | Three Phase | |
| Model | in. | cm | in. | cm | ● | ■ | lbs. | kg | lbs. | kg | 120V Amps | 208V Amps | 240V Amps | 480V Amps | 208V Amps | 240V Amps | 480V Amps | KW | Cabinets | Lbs. | KG |
| VPC-2 | 8 | 20.32 | x | x | 1 | 1 | 26 | 12.4 | 50 | 22.7 | 16.6 | 9.6 | 8.3 | 4.2 | 5.5 | 4.8 | 2.4 | 2 | S | 5.7 | 2.59 |
| 3 | 8 | 20.32 | x | x | 1 | 1 | 28 | 12.4 | 50 | 22.7 | 25.0 | 14.4 | 12.5 | 6.3 | 8.3 | 7.2 | 3.6 | 3 | S | 8.5 | 3.86 |
| 4 | 8 | 20.32 | x | x | 1 | 1 | 28 | 12.4 | 50 | 22.7 | 33.3 | 19.2 | 16.7 | 8.3 | 11.1 | 9.6 | 4.8 | 4 | S | 11.4 | 5.17 |
| 5 | 16 | 40.64 | 10.5 | 26.67 | 1 | 1 | 36 | 16.3 | 79 | 35.8 | 41.6 | 24.0 | 20.8 | 10.4 | 13.9 | 12.0 | 6.0 | 5 | S | 17.0 | 7.71 |
| 6 | 16 | 40.64 | 10.5 | 26.67 | 1 | 1 | 36 | 16.3 | 79 | 35.8 | | 28.9 | 24.9 | 12.5 | 18.6 | 14.4 | 7.2 | 6 | S | 14.2 | 6.44 |
| 7 | 16 | 40.64 | 10.5 | 26.67 | 1 | 1 | 36 | 16.3 | 79 | 35.8 | | 33.7 | 29.1 | 14.6 | 19.4 | 16.9 | 8.45 | 7 | S | 19.9 | 9.03 |
| 8 | 16 | 40.64 | 10.5 | 26.67 | 1 | 1 | 37 | 16.8 | 80 | 36.3 | | 38.5 | 33.3 | 16.7 | 22.2 | 19.2 | 9.6 | 8 | S | 22.7 | 10.30 |
| 9 | 24 | 60.96 | 20.5 | 52.07 | 1 | 1 | 47 | 21.32 | 112 | 50.8 | | 43.2 | 37.5 | 18.8 | 25.0 | 21.7 | 10.8 | 9 | S | 25.5 | 11.57 |
| 10 | 24 | 60.96 | 20.5 | 52.07 | 1 | 1 | 47 | 21.32 | 112 | 50.8 | | 48.0 | 41.7 | 20.8 | 27.7 | 24.1 | 12.1 | 10 | S | 28.4 | 12.88 |
| 12 | 24 | 60.96 | 20.5 | 52.07 | 1 | 1 | 47 | 21.32 | 112 | 50.8 | | | | 25.0 | 33.3 | 28.9 | 14.5 | 12 | S | 34.1 | 15.47 |
| 14 | 40 | 101.6 | 32.5 | 82.55 | 1 | 1 | 54 | 25.0 | 162 | 73.5 | | | | 29.2 | 38.8 | 33.7 | 16.9 | 14 | S | 39.7 | 18.01 |
| 16 | 40 | 101.6 | 32.5 | 82.55 | 1 | 1 | 54 | 25.0 | 162 | 73.5 | | | | 33.3 | 44.4 | 38.5 | 19.3 | 15 | S | 45.4 | 20.59 |
| 18 | 40 | 101.6 | 32.5 | 82.55 | 1 | 1 | 54 | 25.0 | 162 | 73.5 | | | | | | 43.9 | 21.7 | 18 | S | 51.1 | 23.18 |
| 20 | 40 | 101.6 | 32.5 | 82.55 | 1 | 1 | 55 | 25.0 | 163 | 73.9 | | | | | | 48.0 | 24.1 | 20 | S | 56.8 | 25.76 |
| VPC-2-2 | 8 | 20.32 | x | x | 1 | 1 | 35 | 15.9 | 62 | 28.1 | 33.2 | 19.2 | 16.6 | 8.4 | 11.0 | 9.6 | 4.8 | 4 | M | 11.4 | 5.17 |
| 3-3 | 8 | 20.32 | x | x | 1 | 1 | 35 | 15.9 | 62 | 28.1 | 50.0 | 28.8 | 25.0 | 12.6 | 16.6 | 14.4 | 7.2 | 6 | M | 17.0 | 7.71 |
| 4-4 | 8 | 20.32 | x | x | 1 | 1 | 35 | 15.9 | 62 | 28.1 | 66.6 | 38.4 | 33.4 | 16.6 | 22.2 | 19.2 | 9.6 | 8 | M | 22.7 | 10.30 |
| 5-5 | 16 | 40.64 | 10.5 | 26.67 | 1 | 1 | 46 | 20.9 | 100 | 45.4 | 83.2 | 48.0 | 41.6 | 20.8 | 27.8 | 24.0 | 12.0 | 10 | M | 28.4 | 12.88 |
| 6-6 | 16 | 40.64 | 10.5 | 26.67 | 1 | 1 | 46 | 20.9 | 100 | 45.4 | | 57.6 | 49.8 | 25.0 | 33.2 | 28.8 | 14.4 | 12 | M | 34.1 | 15.47 |
| 7-7 | 16 | 40.64 | 10.5 | 26.67 | 1 | 1 | 46 | 20.9 | 100 | 45.4 | | 67.4 | 58.2 | 29.2 | 38.8 | 33.8 | 16.9 | 14 | M | 39.7 | 18.01 |
| 8-8 | 16 | 40.64 | 10.5 | 26.67 | 1 | 1 | 48 | 21.78 | 102 | 46.3 | | 77.0 | 66.6 | 33.4 | 44.4 | 38.4 | 19.2 | 16 | M | 45.4 | 20.59 |
| 9-9 | 24 | 60.96 | 20.5 | 52.07 | 1 | 1 | 56 | 25.4 | 137 | 62.1 | | 86.4 | 75.0 | 37.6 | 50.0 | 43.4 | 21.7 | 18 | M | 51.1 | 23.18 |
| 10-10 | 24 | 60.96 | 20.5 | 52.07 | 1 | 1 | 56 | 25.4 | 137 | 62.1 | | 96.0 | 83.4 | 41.7 | 55.4 | 48.2 | 24.1 | 20 | M | 56.8 | 25.76 |
| 12-12 | 24 | 60.96 | 20.5 | 52.07 | 1 | 2 | 56 | 25.4 | 137 | 62.1 | | | | 50.0 | 66.6 | 57.8 | 28.9 | 24 | M | 68.2 | 30.94 |
| 14-14 | 40 | 101.6 | 32.5 | 82.55 | 2 | 2 | 77 | 34.9 | 212 | 96.2 | | | | 58.4 | 77.6 | 67.4 | 33.7 | 28 | M | 79.5 | 36.06 |
| 16-16 | 40 | 101.6 | 32.5 | 82.55 | 2 | 2 | 77 | 34.9 | 212 | 96.2 | | | | 66.6 | 88.8 | 77.0 | 38.5 | 32 | M | 90.9 | 41.23 |
| 18-18 | 40 | 101.6 | 32.5 | 82.55 | 2 | 2 | 77 | 34.9 | 212 | 96.2 | | | | 75.0 | | 86.6 | 43.3 | 36 | M | 102.0 | 46.27 |
| 20-20 | 40 | 101.6 | 32.5 | 82.55 | 2 | 2 | 79 | 35.8 | 214 | 97.1 | | | | 83.4 | | 96.0 | 48.0 | 40 | M | 113.6 | 51.53 |
| VPC-2-2-2 | 8 | 20.32 | x | x | 1 | 1 | 44 | 20.0 | 83 | 37.6 | 49.8 | 28.8 | 24.9 | 12.6 | 16.5 | 14.4 | 7.2 | 6 | M | 17.0 | 7.71 |
| 3-3-3 | 8 | 20.32 | x | x | 1 | 1 | 44 | 20.0 | 83 | 37.6 | 75.0 | 43.2 | 37.5 | 18.9 | 24.9 | 21.6 | 10.8 | 9 | M | 25.5 | 11.57 |
| 4-4-4 | 8 | 20.32 | x | x | 1 | 1 | 44 | 20.0 | 83 | 37.6 | 99.9 | 57.6 | 50.1 | 24.9 | 33.3 | 28.8 | 14.4 | 12 | M | 34.1 | 15.47 |
| 5-5-5 | 16 | 42.64 | 10.5 | 26.27 | 2 | 1 | 62 | 28.1 | 140 | 63.5 | 124.8 | 72.0 | 62.4 | 31.2 | 41.7 | 36.0 | 18.0 | 15 | M | 42.6 | 19.32 |
| 6-6-6 | 16 | 42.64 | 10.5 | 26.27 | 2 | 1 | 62 | 28.1 | 140 | 63.5 | | 86.4 | 74.7 | 37.5 | 49.8 | 43.2 | 21.6 | 18 | M | 51.1 | 23.18 |
| 7-7-7 | 16 | 42.64 | 10.5 | 26.27 | 2 | 1 | 62 | 28.1 | 140 | 63.5 | | 101.1 | 87.3 | 43.8 | 58.2 | 50.7 | 25.3 | 21 | M | 59.6 | 27.83 |
| 8-8-8 | 16 | 42.64 | 10.5 | 26.27 | 2 | 2 | 64 | 29.0 | 142 | 64.1 | | 115.5 | 99.9 | 50.1 | 66.6 | 57.6 | 28.8 | 24 | M | 68.2 | 30.94 |
| 9-9-9 | 24 | 60.96 | 20.5 | 52.07 | 2 | 2 | 72 | 32.7 | 188 | 85.3 | | 129.6 | 112.5 | 56.4 | 76.0 | 65.1 | 32.4 | 27 | M | 76.7 | 34.79 |
| 10-10-10 | 24 | 60.96 | 20.5 | 52.07 | 2 | 2 | 72 | 32.7 | 188 | 85.3 | | 144.0 | 125.1 | 62.4 | 83.1 | 72.3 | 36.1 | 30 | M | 85.2 | 38.65 |
| 12-12-12 | 24 | 60.96 | 20.5 | 52.07 | 2 | 2 | 72 | 32.7 | 188 | 85.3 | | | | 75.0 | 99.9 | 86.7 | 43.2 | 36 | M | 102.0 | 46.27 |
| 14-14-14 | 40 | 100.6 | 32.5 | 82.55 | 2 | 2 | 96 | 43.6 | 290 | 131.5 | | | | 87.5 | 116.4 | 101.1 | 50.7 | 42 | M | 119.3 | 54.11 |
| 16-16-16 | 40 | 100.6 | 32.5 | 82.55 | 2 | 3 | 96 | 43.6 | 290 | 131.5 | | | | 99.9 | 133.2 | 115.5 | 57.8 | 48 | M | 136.3 | 61.83 |
| 18-18-18 | 40 | 100.6 | 32.5 | 82.55 | 3 | 3 | 96 | 43.6 | 290 | 131.5 | | | | 112.5 | | 129.9 | 65.0 | 54 | M | 153.3 | 69.54 |
| 20-20-20 | 40 | 100.6 | 32.5 | 82.55 | 3 | 3 | 98 | 44.9 | 293 | 132.9 | | | | 125.1 | | 144.0 | 72.3 | 60 | M | 170.4 | 77.29 |
| VPC-14-14-14-14 | 40 | 100.6 | 32.5 | 82.55 | 3 | 3 | 110 | 49.9 | 347 | 157.4 | | | | 116.8 | 155.2 | 134.8 | 67.6 | 56 | L | 159.0 | 72.11 |
| 16-16-16-16 | 40 | 100.6 | 32.5 | 82.55 | 3 | 3 | 110 | 49.9 | 347 | 157.4 | | | | 133.2 | 177.6 | 154.0 | 77.2 | 64 | L | 181.8 | 82.46 |
| 18-18-18-18 | 40 | 100.6 | 32.5 | 82.55 | 3 | 3 | 110 | 49.9 | 347 | 157.4 | | | | 150.0 | | 173.2 | 86.8 | 72 | L | 204.0 | 92.53 |
| 20-20-20-20 | 40 | 100.6 | 32.5 | 82.55 | 4 | 3 | 114 | 51.7 | 351 | 159.2 | | | | 166.8 | | 192.0 | 96.0 | 80 | L | 227.2 | 103.06 |

x = L-tube

- = Number of U-tubes furnished with standard unit.
- = Recommended minimum quantity of vapor hose kits (when used).
- = Alternate voltages available upon request.

Dimensions and specifications subject to change without notice.

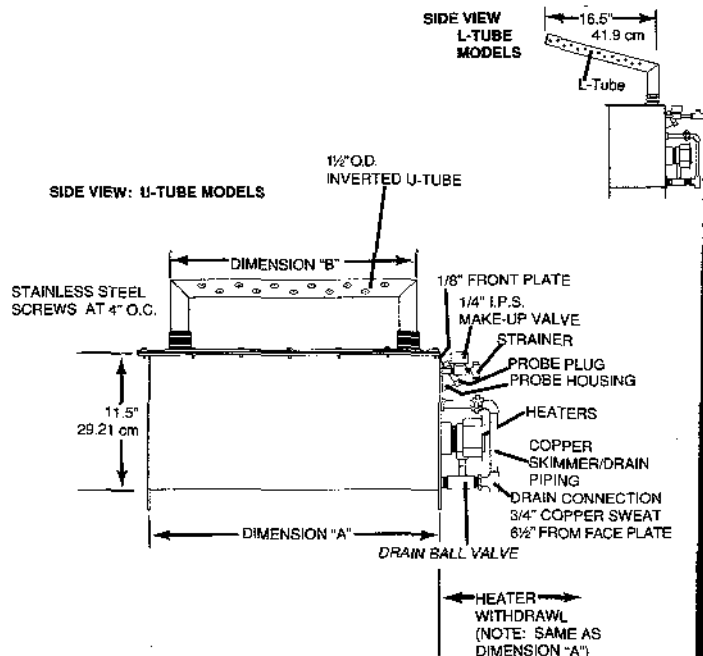
| Control Cabinets | | | | |
|------------------|-------------------|--------------------------|--------------|---------|
| | Inches | cm | Shipping Wt. | |
| Series S | 12"W x 12"H x 6"D | 30.8W x 30.8H x 15.24D | 24 lbs. | 11 kg |
| Series M | 14"W x 16"H x 6"D | 35.56W x 40.64H x 15.24D | 32 lbs. | 14.5 kg |
| Series L | 20"W x 20"H x 6"D | 50.8W x 50.8H x 15.24D | 55 lbs. | 25 kg |

NOTE: The control panel may be larger than specified depending on the electrical options selected.

Notes: Capacities - Approximately 172 BTU's are required to raise the temperature of one pound of water from 40°F to 212°F. An additional 970 BTU's are required to change this one pound of water to water vapor.

A factor to consider when calculating humidifier capacity is the heat loss from the humidifier chamber to the air surrounding it. This will vary with air temperature and velocity. Calculations show that for a condition of 70°F. air and 1500 feet per minute velocity, the loss will be about 5%.

The addition of 3/4" of rigid foam insulation on all surfaces except front of vaporizing tank will cut this loss to about 1%.



MECHANICAL SPECIFICATIONS

| | Back View | Front View |
|--------------------|-----------|------------|
| One Heater Units | | |
| Two Heater Units | | |
| Three Heater Units | | |
| Four Heater Units | | |

MOUNTING METHODS

Mounting Procedures

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

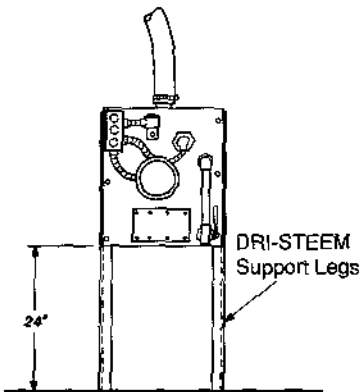
Access for periodic removal of the top cover is recommended. In most cases, scale that forms on the heating elements continuously flakes off as it forms and the loose scale that settles to the bottom can be raked or flushed

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

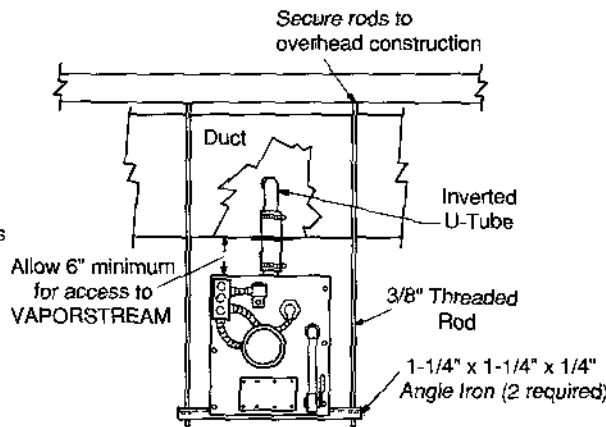
If the VAPORSTREAM is to be installed above expensive materials or devices, a drain pan of sufficient size and depth to retain rapid or sudden drainage of the contents of the humidifier should be provided. The drain pan should be drained to a sanitary waste.

Mounting Support Methods

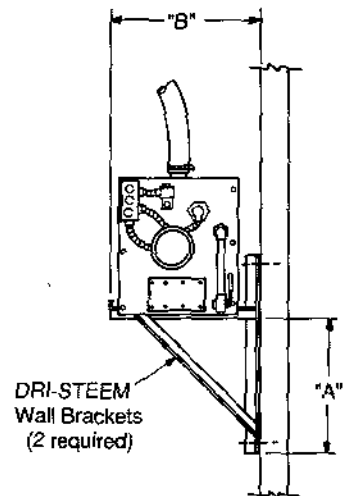
Floor Stand Method



Trapeze Hanger Method (Furnished as Standard)



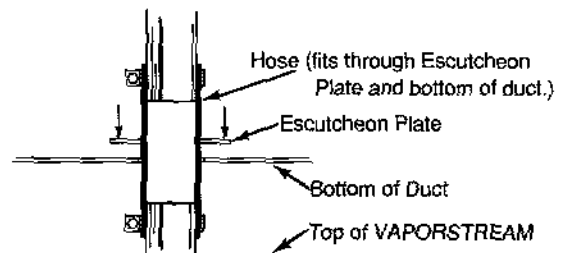
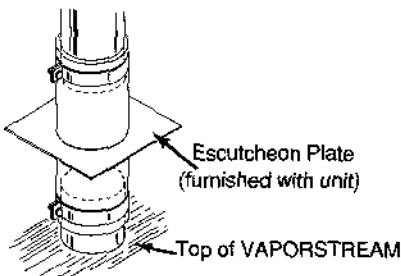
Bracketed to Wall Method



| Unit | Dimensions | |
|---------------|------------|---------|
| | "A" | "B" |
| Single Heater | 15" | 13" |
| Double Heater | 19" | 15-1/2" |
| Triple Heater | 21" | 21" |
| Quad Heater | 40" | 25" |

Mounting Unit on Underside of Duct

Manufacturer recommends mounting humidifier 6" below duct to facilitate cover removal (see note on page 9).



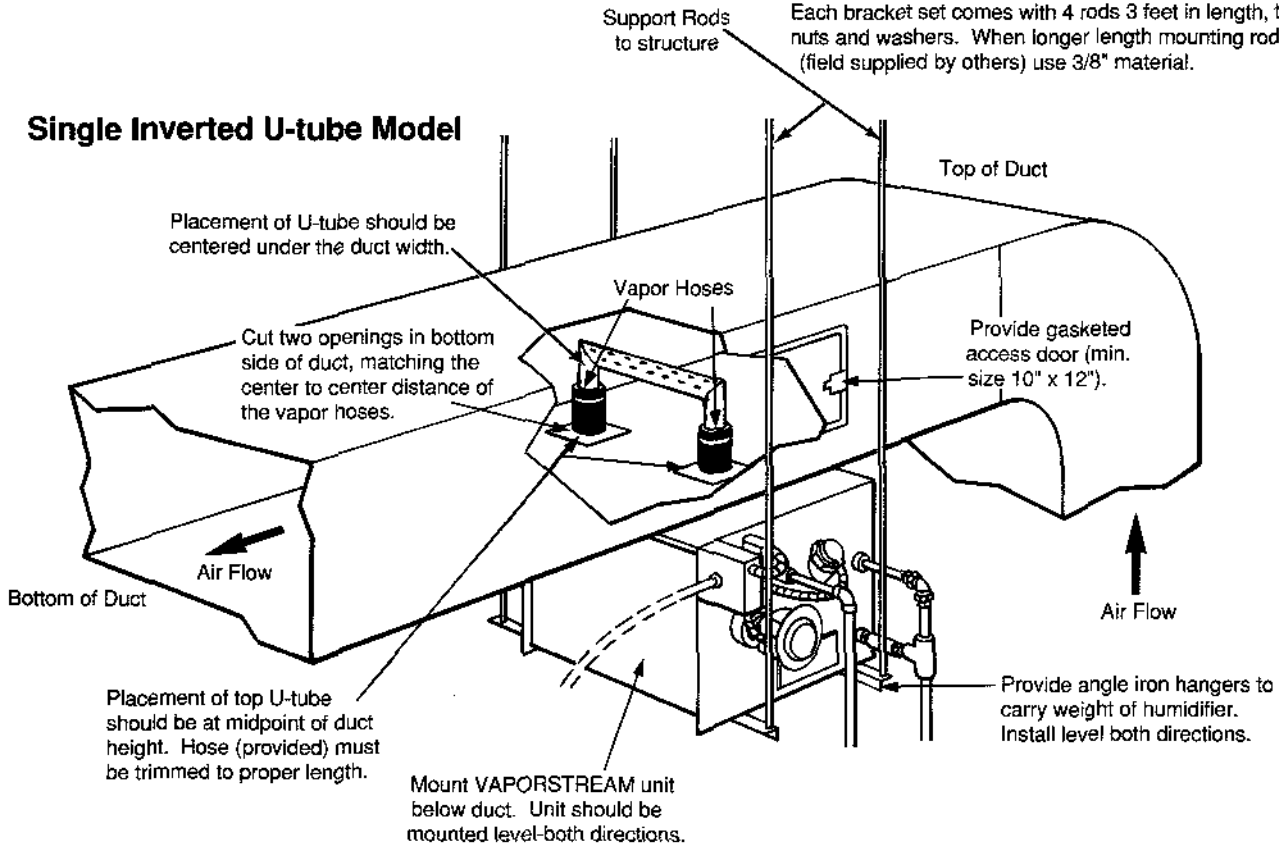
(Continued on next page.)

MOUNTING THE HUMIDIFIER

Mounting Unit on Underside of Duct (continued)

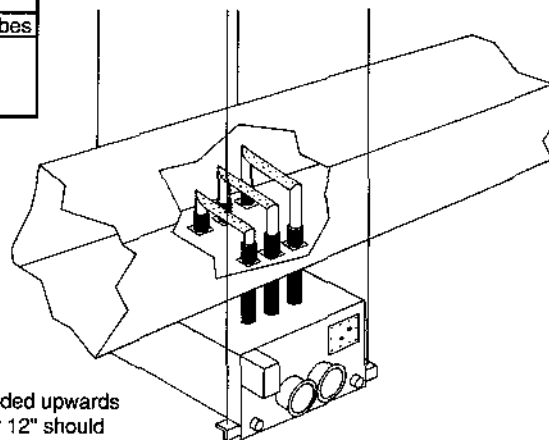
All units ordered with U-tube or L-tube covers are shipped with one set of trapeze type mounting brackets. Each bracket set comes with 4 rods 3 feet in length, trapeze bars, nuts and washers. When longer length mounting rods are required (field supplied by others) use 3/8" material.

Single Inverted U-tube Model



Multiple Inverted U-Tubes For "Tall" Air Streams

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

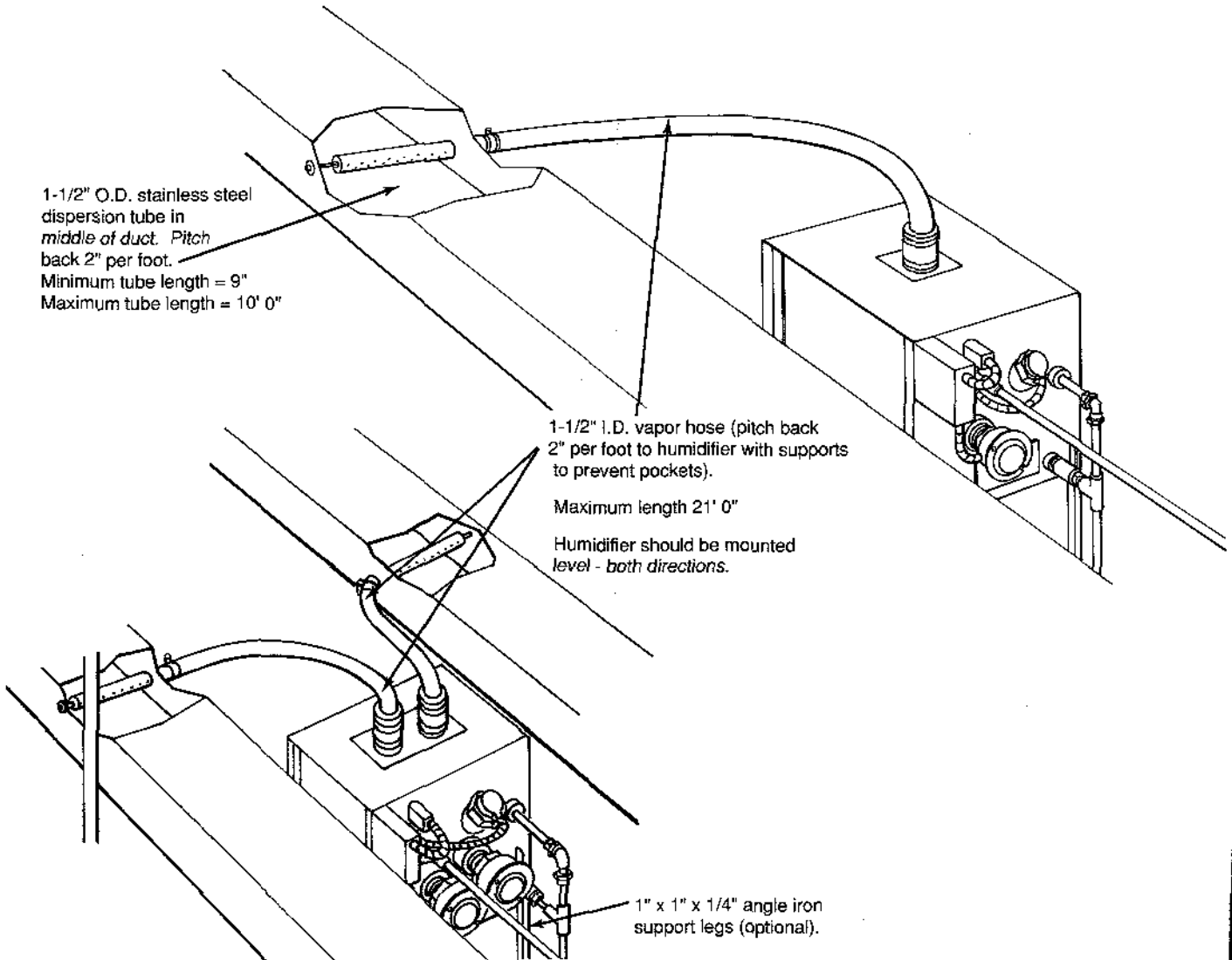


U-tubes extended upwards into duct over 12" should be secured to duct.

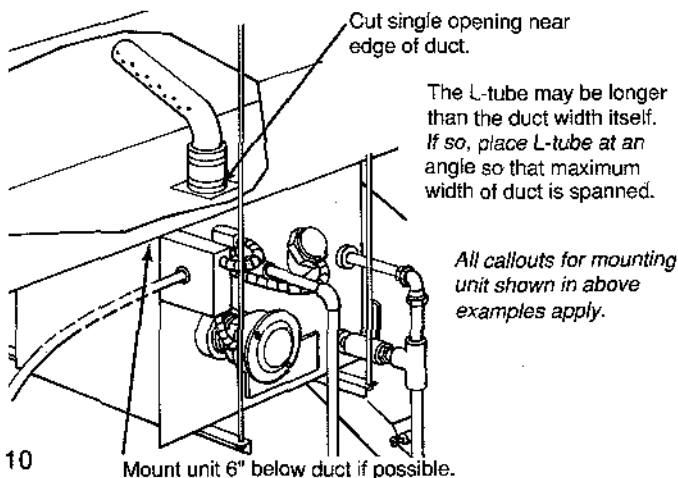
NOTE: Where space permits, mounting the humidifier 6" below bottom of duct facilitates removal of cover for periodic inspection.

MOUNTING METHODS

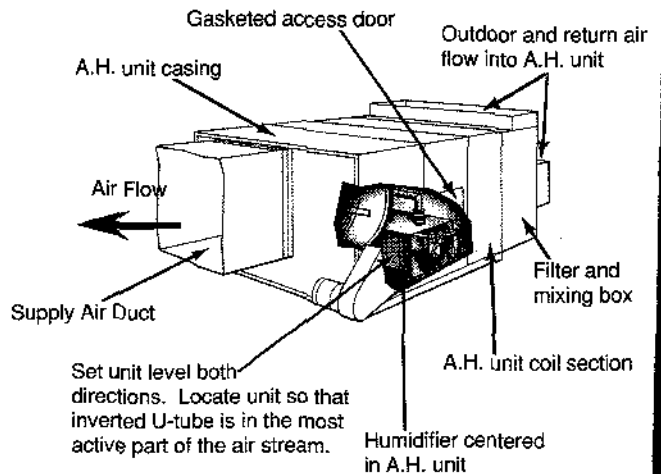
Mounting Units Away from Duct(s) by Use of Vapor Hose



Mounting L-Tube Under Duct



Mounting In Air Handling Unit



PIPING METHODS

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 from 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 table on page 12.

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 VAPORSTREAM 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.

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

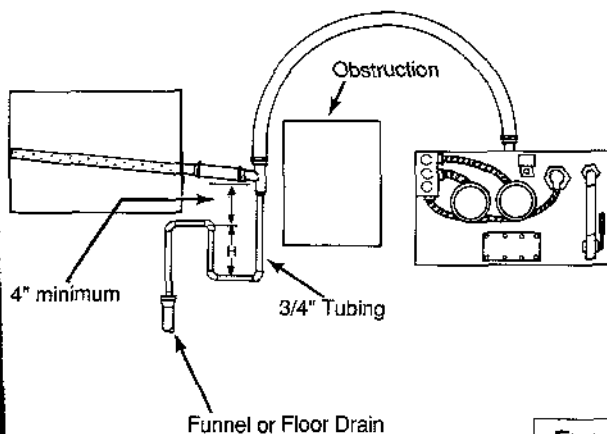
Vapor Hose Piping

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.

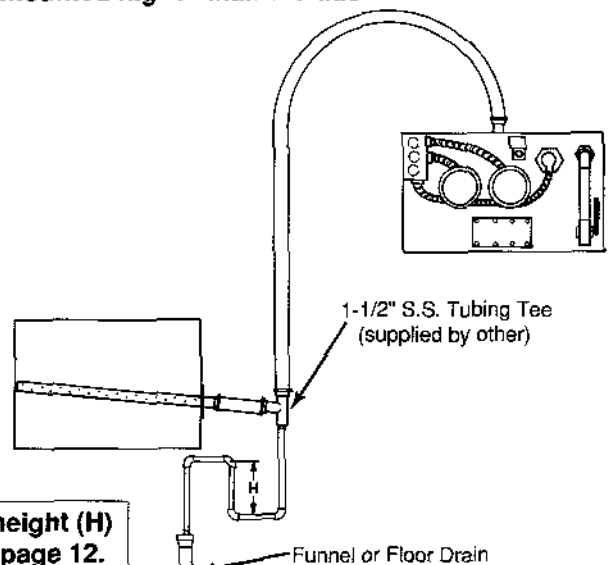
However, the condensate that forms in the vapor hose must be removed. Preferably it should be returned to an open drain with a water seal of sufficient height to contain the duct static pressure, as shown on page 13.

When the condensate must be returned to the VAPORSTREAM two methods are shown on page 13, funnel drain or air vent arrangements. Both methods do require a water seal and an air gap to prevent back pressure from the VAPORSTREAM tank effecting condensate returning below the VAPORSTREAM water line.

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

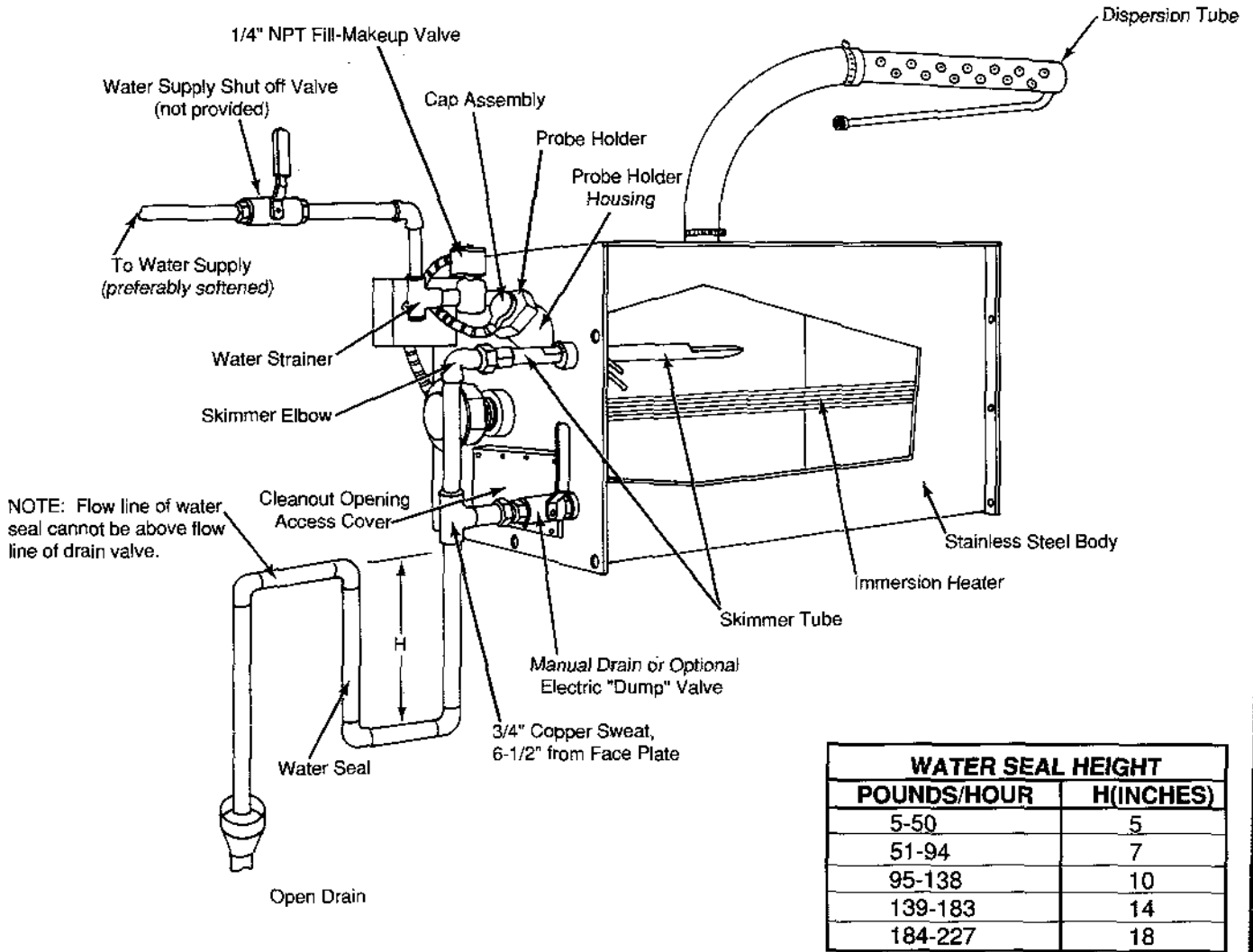


Piping Method recommended when humidifier must be mounted higher than the duct.



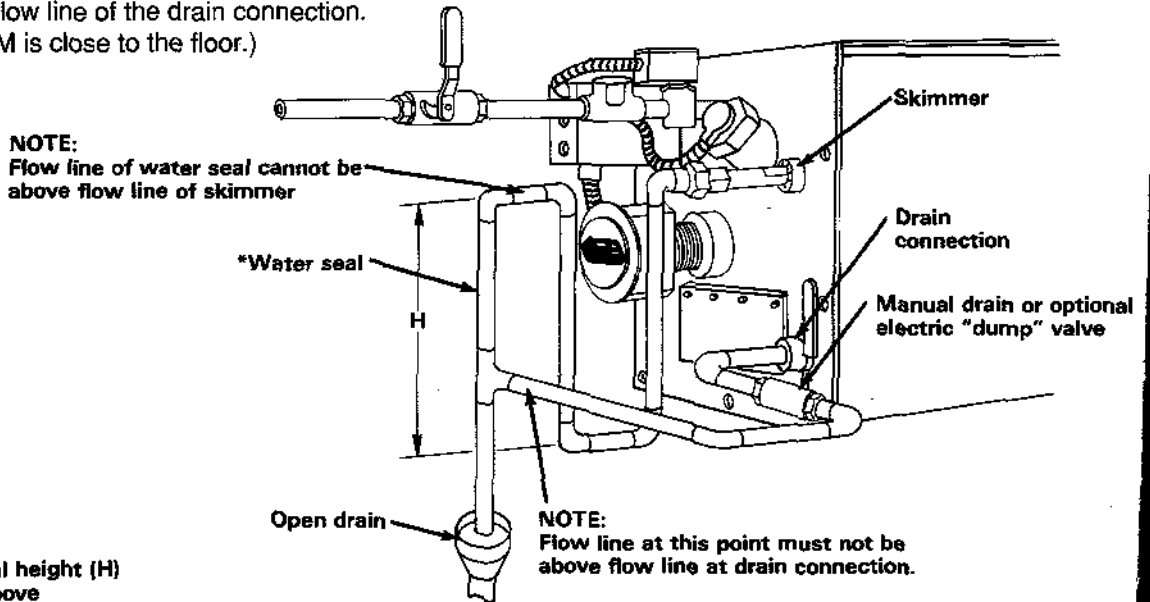
For water seal height (H) follow chart on page 12.

PIPING METHODS



Alternate Water Seal and Valve Piping

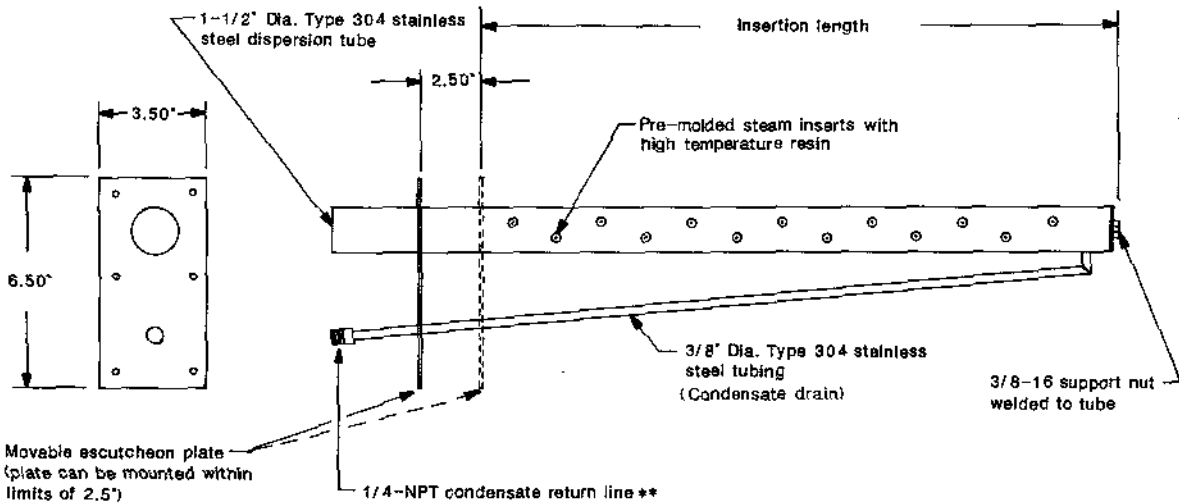
This piping method is used when the water seal must be elevated above the flow line of the drain connection. (i.e. VAPORSTREAM is close to the floor.)



*For water seal height (H) follow chart above

PIPING METHODS

VAPORSTREAM Dispersion Tube Installation with Condensate Drain



DISPERSION TUBE / HUMIDIFIER INTERCONNECTION

VAPOR RIGID PIPING (WHEN USED)

TUBE MOUNTING

*** 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

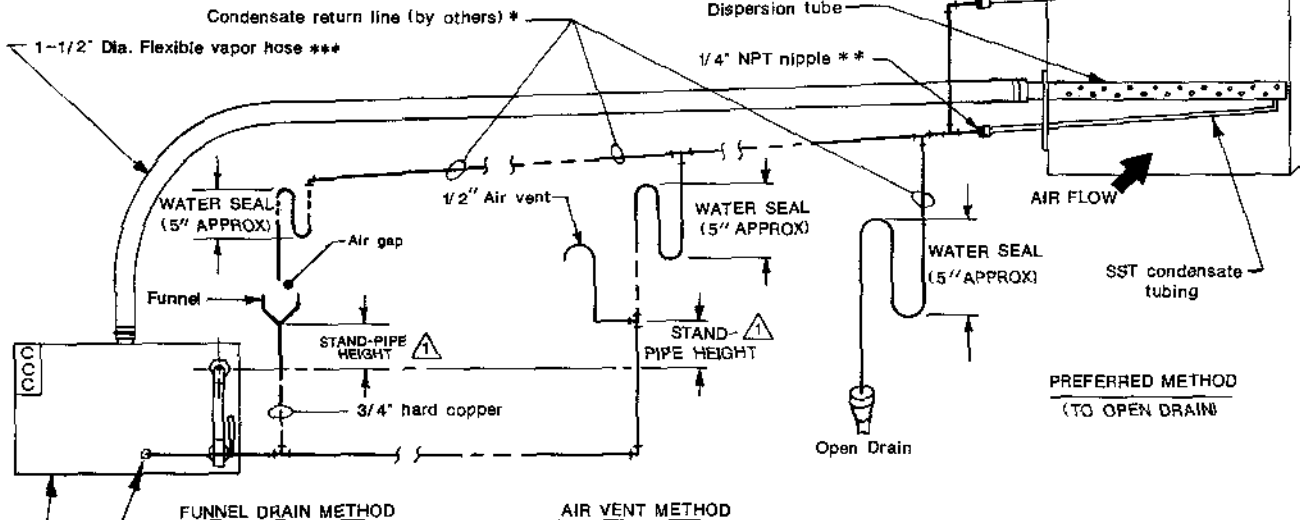
BOTH METHODS

- 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 the appropriate operation and maintenance manual for details.

- 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.

- 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) spitting, 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)

| STAND-PIPE HEIGHT | |
|-------------------|-----------------|
| Pounds/ Hour | Height (inches) |
| 5 - 50 | 5 |
| 51 - 94 | 7 |
| 95 - 138 | 10 |
| 139 - 183 | 14 |
| 184 - 227 | 18 |

■ 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 12 KW (34#/HR) OR LESS PER DISPERSION TUBE.

REVISED 1-17-90

ELECTRICAL

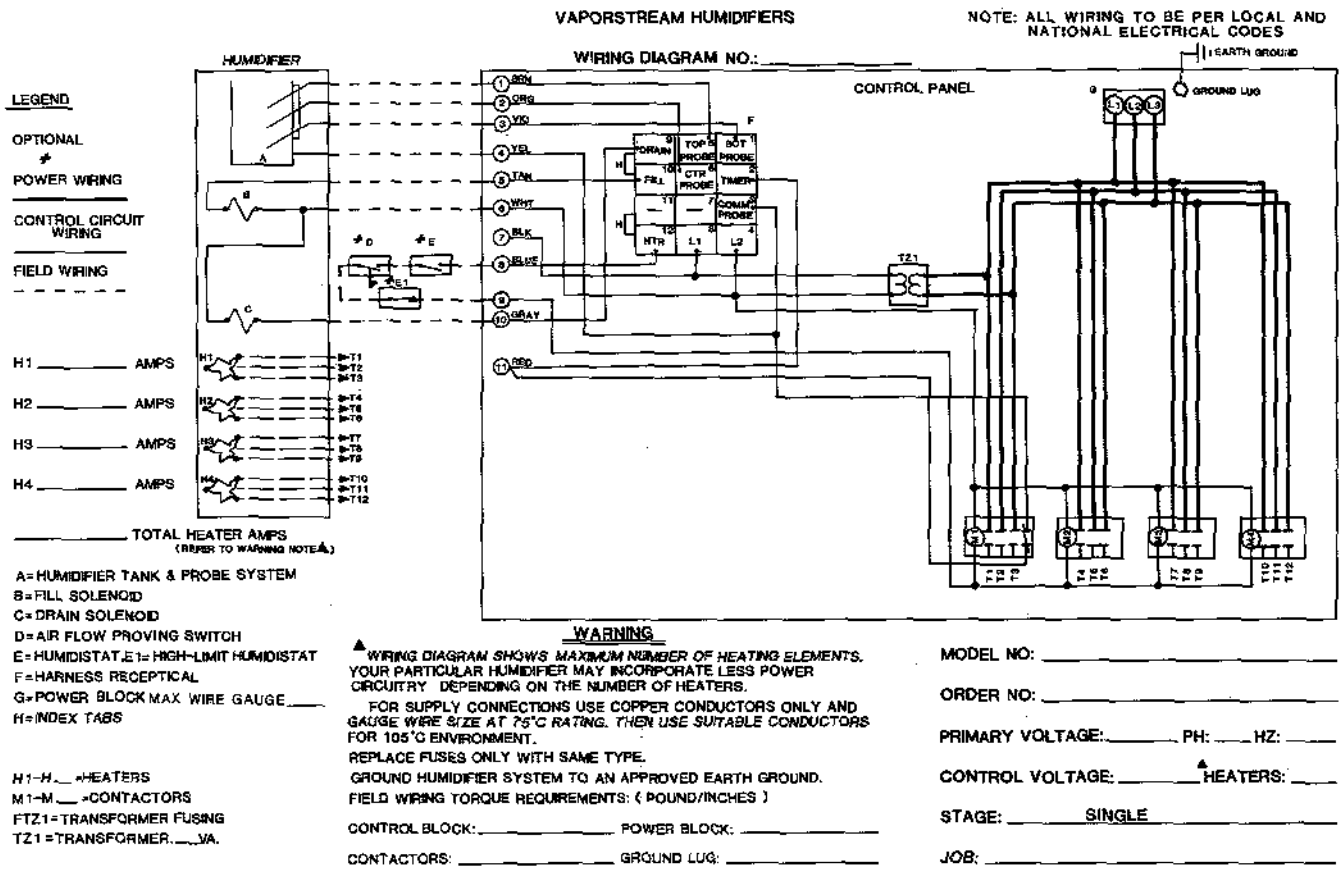
Electrical

The current characteristics, and capacity requirements should be checked against the nameplates. The control cabinet should be mounted in a location convenient for service. All wiring must be in accordance with all governing codes and the VAPORSTREAM 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 VPC model VAPORSTREAM humidifiers.

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

VAPORSTREAM Electric Humidifier Wiring Diagram Multiple Heater - Single Stage - Timer Drain



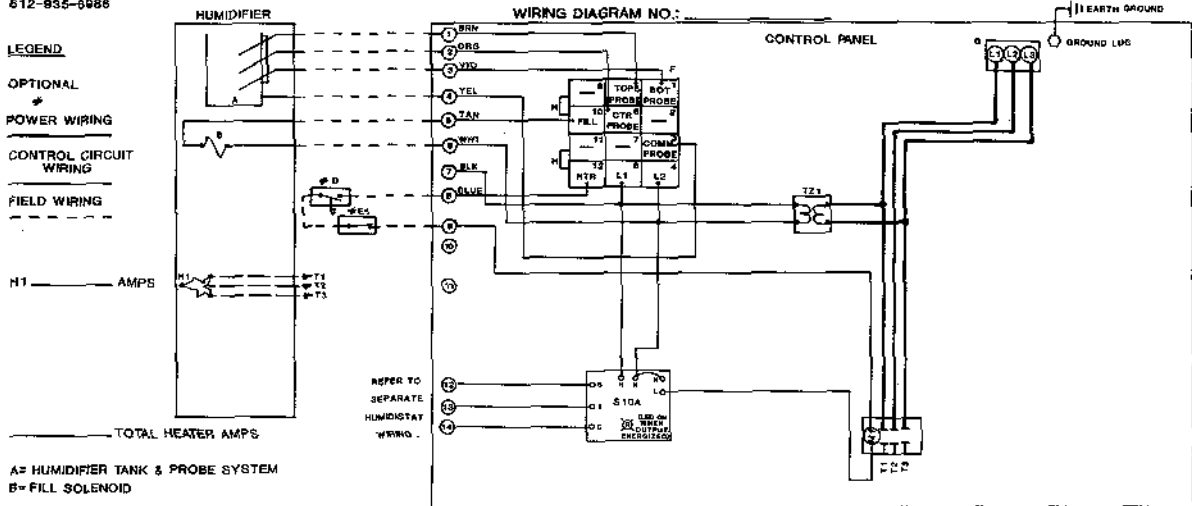
ELECTRICAL

VAPORSTREAM Electric Humidifier Wiring Diagram Single Heater - TP Modulation

DRI-STEEM HUMIDIFIER CO.
BOX 621 WOPKINS, MN. 55343
612-835-9888

VAPORSTREAM HUMIDIFIERS

NOTE: ALL WIRING TO BE PER LOCAL AND NATIONAL ELECTRICAL CODES.



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: _____ POWER BLOCK: _____
CONTACTORS: _____ GROUND LUG: _____

MODEL NO: _____

ORDER NO: _____

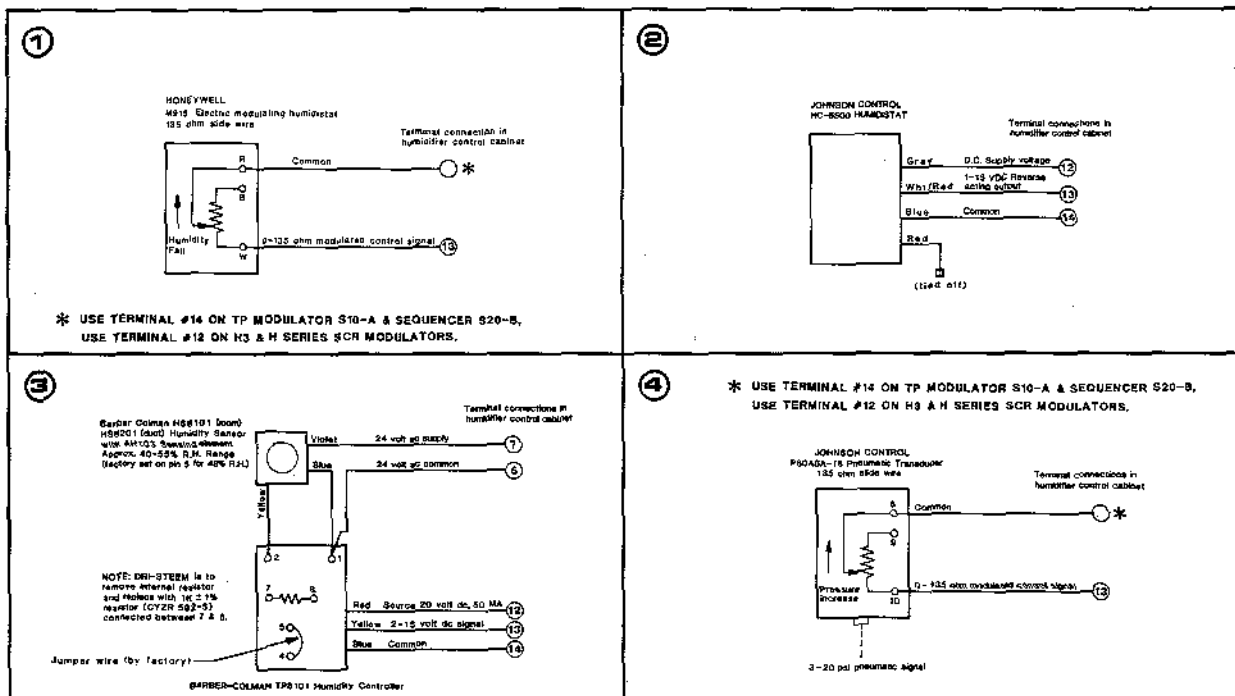
PRIMARY VOLTAGE: _____ PH. _____ HZ. _____

CONTROL VOLTAGE: 24 HEATERS: 1

STAGE: MODULATING

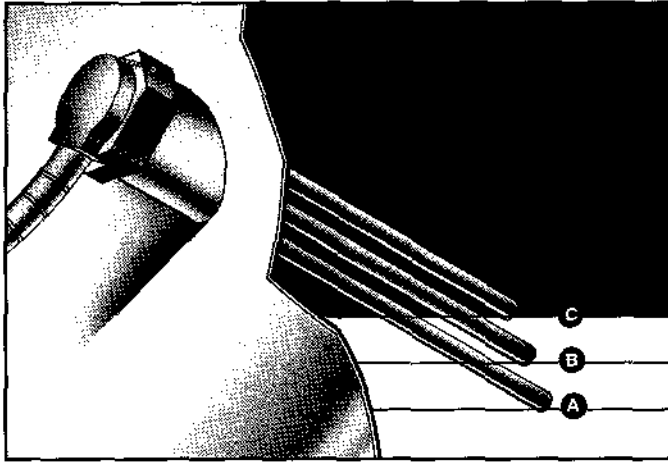
JOB: _____

Electric Modulating Controller Typical Wiring Diagram



OPERATION

Reliable Electronic Probe Control Maintains Water Level



The *exclusive* VAPORSTREAM 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 provides low water protection for the heating element(s). When the water level is below Probe A no conductivity is established thus preventing the heater(s) from being energized.

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 micromhos/cm (2 gr/gal) minimum to function and may not operate in water treated by the reverse osmosis or deionizing process. Specially designed VAPORSTREAM humidifiers are available for use with these water types. Specify VSDI 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 VAPORSTREAM 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 17-1 on page 17 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 water pressure is available.
3. **Electrical** - Verify that all wiring connections have been made in accordance with the VAPORSTREAM wiring diagram.
4. **Control circuits**
 - a) Adjust humidistat to "call" setting.
 - b) Open shut off valve on 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 4), the "ready water" lamp should light and the heating elements (contactors) should pull-in. 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 "fill" lamp will light; when water level drops past lowest electrode "ready water" light will go out and the heating element contactor(s) will drop 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, fan proving switch; contactor(s) should drop out when proving switch is "open".
 - j) Check heater draw by testing and recording voltage and amperage in each phase. Readings should match nameplate readings - nameplate is located on the humidifier housing.
 - k) Inspect installation for leaks by operating the VAPORSTREAM. 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.

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 16. 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 electric heaters (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 VAPORSTREAM 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 17-1

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

MAINTENANCE PROCEDURE

Recommended Maintenance

VAPORSTREAM 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 VAPORSTREAM 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 VAPORSTREAM, always place control module switch in "standby" or place main disconnect in "off" position and close manual water shut-off valve.

Monthly or as Required

1. Cleaning Probes - Disconnect the plug and cable assembly and unscrew the probe holder from the VAPORSTREAM 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 stainless 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

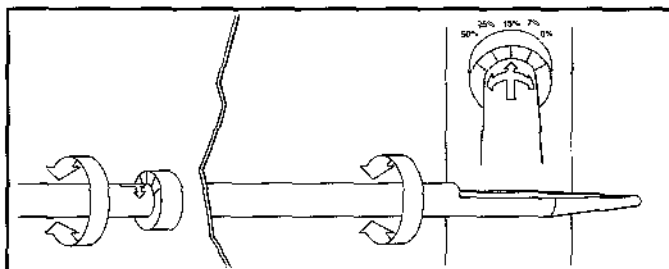
The elevation of the lip of the skimmer tube in respect to the water line, determines the quantity of "skimming" that takes place with each fill cycle. The height is field adjustable by rotation of the tube.

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

Each time the VAPORSTREAM 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 15% of the total evaporating capacity of the unit. For example: a Model VPC 10-10 having an output capacity of 56.8 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 VAPORSTREAM 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.

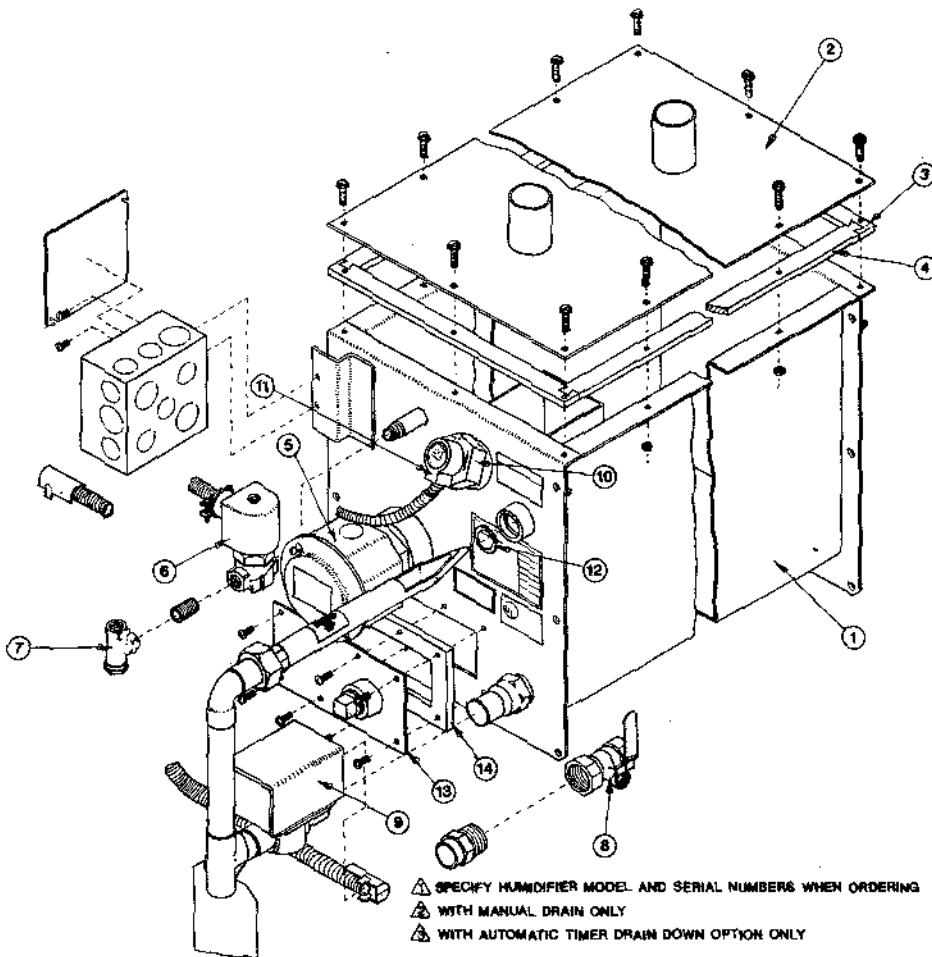
TROUBLE-SHOOTING GUIDE

| PROBLEM | CONTROL MODULE LIGHTS | | | POSSIBLE CAUSE | RECOMMENDED ACTION |
|----------------------------------|-----------------------|------|---------------------------|---|---|
| | POWER | FILL | READY WATER | | |
| Humidifier will not heat | Off | Off | Off | Control transformer | Verify control voltage across terminals 6 & 7. |
| | On | Off | On | Humidistat is not calling | Set humidistat to call. Inspect for faulty humidistat. |
| | | | | Safety controls open | Check safety controls. |
| | | | | Faulty contactor(s) | Jumper terminals 8 & 9 contactor should pull in. |
| | | | | Faulty control module | Verify control voltage between terminals 6 & 8. |
| | | | Probe head deterioration* | Replace probe head. | |
| Humidifier will not fill | On | On | Off | No water pressure valve. | Check manual water supply. |
| | | | | Faulty water fill valve | Verify action of fill solenoid valve by turning control module switch from standby to normal op. Audible click should be heard as solenoid operates. |
| | | | | Plugged strainer | Check strainer. |
| | | | | Plugged valve | Check valve. |
| | | | | Faulty control module | Verify control voltage across terminals 5 & 6. |
| Humidifier does not stop filling | On | On | Off | Lack of tank to probes continuity. Water conductivity 100 micromhos/cm (2 gr/gal) minimum | Jumper terminals 1 & 4. If water stops, verify tank ground to terminal 4; check water supply conductivity; then consult factory. |
| | | | | Fill valve is stuck open holding valve open | Check valve for foreign matter. |
| Low output | On | Off | On | Electric drain valve not seating | Clean diaphragm and seat valve. |
| | On | Off | On | Too much skimmer/drain | Reduce skimmer drain amount. |
| | | | | Fill valve is stuck open | Check valve for foreign matter. |
| Unit short cycles | | | | 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.

VAPORSTREAM REPLACEMENT PARTS

VAPORSTREAM Tank



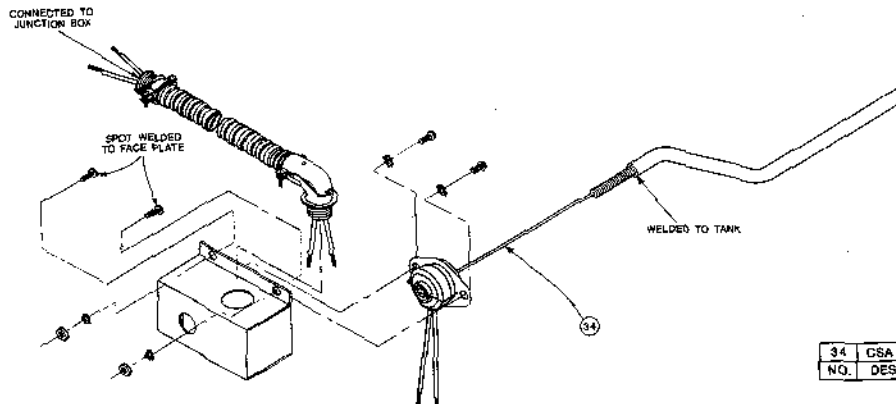
NOTES:

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

| | | |
|-----|----------------------------|------------|
| 14 | CLEAN-OUT PLATE GSKT. | 308220 |
| 13 | CLEAN-OUT PLATE | |
| 12 | O-RING | 300400-005 |
| 11 | PROBE PLUG | 400050 ⚠ |
| 10 | PROBE ASSEMBLY | 400060 |
| 9 | 3/4" ELEC. DRAIN VALVE | 505400 ⚠ |
| 8 | 3/4" BALL VALVE | 505010 ⚠ |
| 7 | 1/4" NPT SEDIMENT STRAINER | 300050 |
| 6 | 1/4" NPT FILL VALVE | 505080 ⚠ |
| 5 | IMMERSON HEATER | ⚠ |
| 4 | SIDE COVER GASKET | 308400 ⚠ |
| 3 | END COVER GASKET | 308300 ⚠ |
| 2 | COVER | ⚠ |
| 1 | TANK | ⚠ |
| NO. | DESCRIPTION | PART NO. |

- ⚠ SPECIFY HUMIDIFIER MODEL AND SERIAL NUMBERS WHEN ORDERING
- ⚠ WITH MANUAL DRAIN ONLY
- ⚠ WITH AUTOMATIC TIMER DRAIN DOWN OPTION ONLY

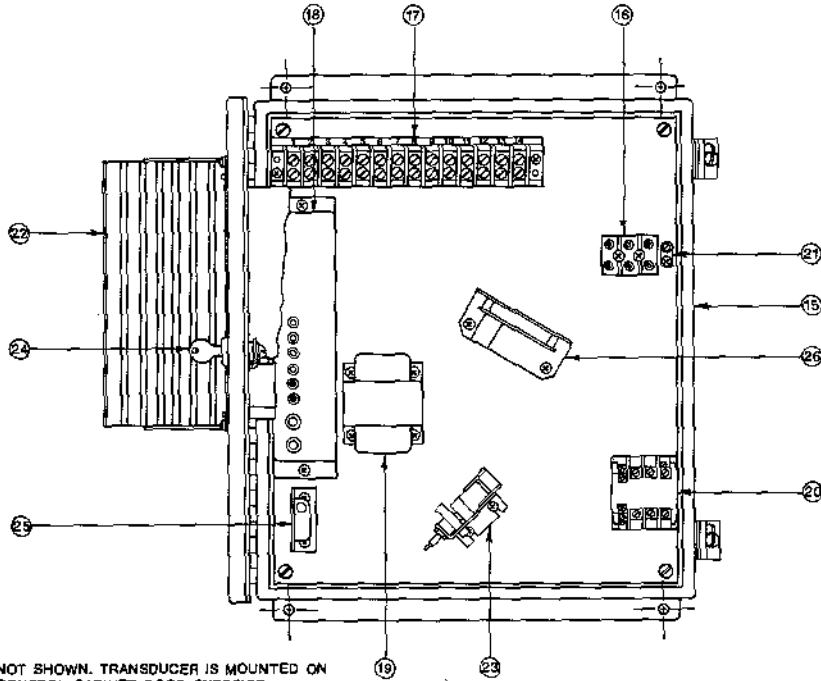
Additional Replacement Part for CSA VAPORSTREAM



| | | | |
|-----|-----------------|-------|----------|
| 34 | CSA THERMO-TRIP | 1 | 401200 |
| NO. | DESCRIPTION | REQ'D | PART NO. |

VAPORSTREAM REPLACEMENT PARTS

VAPORSTREAM Single Heater Control Cabinet



NOTE: WHEN ORDERING SPECIFY HUMIDIFIER MODEL AND SERIAL NUMBERS.

⚠ NOT SHOWN. TRANSDUCER IS MOUNTED ON CONTROL CABINET DOOR EXTERIOR AT SCR LOCATION.

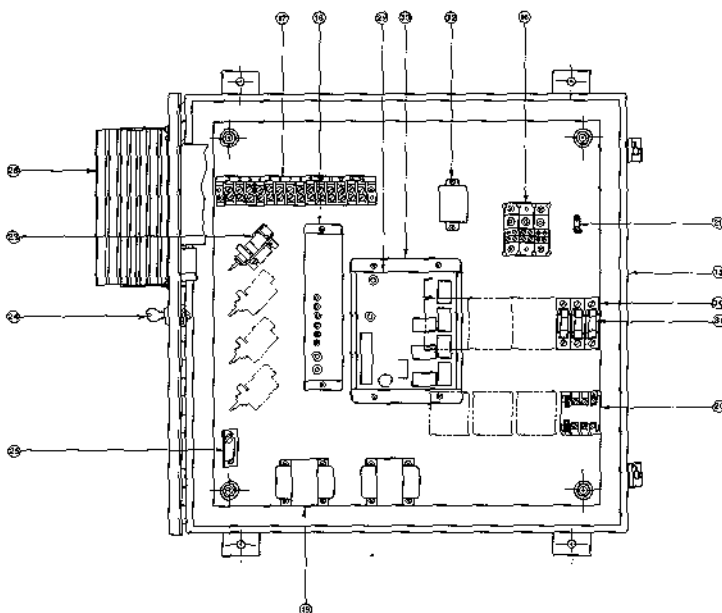
⚠ SPECIFY COMPONENT PART NUMBER WHEN ORDERING.

⚠ OPTIONAL

⚠ VARIES WITH SPECIFIC ORDER.

| NO. | DESCRIPTION | PART NO. |
|-----|----------------------------|------------|
| 27 | PNEUMATIC TRANSDUCER ⚠⚠ | 501490 |
| 26 | B-10 TP MODULATOR BOARD ⚠⚠ | 408680 |
| 25 | DOOR INTERLOCK SWITCH ⚠ | 408470 |
| 24 | KEYLOCK ⚠ | 407100-009 |
| 23 | P.E. SWITCH ⚠ | 408100 |
| 22 | SCR MASTER ⚠⚠ | ⚠ |
| 21 | GROUND LUG ⚠ | 409250-017 |
| 20 | CONTACTOR | 407000 |
| 19 | TRANSFORMER ⚠ | ⚠ |
| 18 | LEVEL CONTROL BOX ⚠ | ⚠ |
| 17 | TERMINAL STRIP | 408250 |
| 16 | POWER BLOCK ⚠ | ⚠ |
| 15 | CONTROL CABINET ⚠ | ⚠ |

VAPORSTREAM Multiple Heater Control Cabinet



NOTE: WHEN ORDERING SPECIFY HUMIDIFIER MODEL AND SERIAL NUMBERS.

⚠ NOT SHOWN. TRANSDUCER IS MOUNTED ON CONTROL CABINET DOOR EXTERIOR AT SCR LOCATION.

⚠ SPECIFY COMPONENT PART NUMBER WHEN ORDERING.

⚠ OPTIONAL

⚠ VARIES WITH SPECIFIC ORDER.

⚠ SPECIFY S-20, S-71, S-81 OR DG-810A.

⚠ SUPPLIED WITH SOME OPTIONS AND HIGH CURRENT OUTPUT CONDITIONS.

⚠ TWO SUPPLIED WHEN CONTROL LOAD EXCEEDS RATING OF ONE TRANSFORMER.

| NO. | DESCRIPTION | PART NO. |
|-----|-------------------------|------------|
| 33 | S20 SEQ. BRACKET | 165600 |
| 32 | RELAY ⚠ | 407900 |
| 31 | FUSES | ⚠ |
| 30 | FUSE BLOCK | 406750 |
| 29 | SEQUENCER ⚠⚠⚠ | ⚠ |
| 28 | SCR SLAVE ⚠⚠ | ⚠ |
| 27 | PNEUMATIC TRANSDUCER ⚠⚠ | 501490 |
| 25 | DOOR INTERLOCK SWITCH ⚠ | 408470 |
| 24 | KEYLOCK ⚠ | 407100-009 |
| 23 | P.E. SWITCH ⚠ | 408100 |
| 21 | GROUND LUG | 409250 |
| 20 | CONTACTOR | 407000 |
| 19 | TRANSFORMER ⚠ | ⚠ |
| 18 | LEVEL CONTROL BOX ⚠ | ⚠ |
| 17 | TERMINAL STRIP | 408250 |
| 16 | POWER BLOCK ⚠ | ⚠ |
| 15 | CONTROL CABINET ⚠ | ⚠ |

WARRANTY

The VAPORSTREAM 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

Box 128, 11300 West 47th Street
Hopkins, Minnesota 55343

Telephone: 1-800-328-4447
In MN: (612)935-6986
Fax: (612)935-4831