



Installation and Maintenance

Series EHU-700 Humidifiers

Please Read And Save These Instructions

The Armstrong Series EHU-700 humidifier is an electronically controlled, non-pressurized steam-generating humidifier, with its vapor discharged into a duct of an air handling system or through a fan package. The Armstrong Series EHU-700 consists of three models: The EHU-701, 703 and 704. The maximum capacity of the series is 240 lbs/hr.

To allow the Series EHU-700 humidifier to function to its full capability, be certain to install it in accordance with the following Armstrong recommendations. For further assistance, please contact your local Armstrong representative for the video tape, "Armstrong Series EHU-700 Humidifiers: Installation, Operation and Maintenance".



DANGER
ELECTRICAL SHOCK HAZARD
HIGH VOLTAGES EXIST INSIDE THE HUMIDIFIER

To protect yourself and others from accidental shocks:

1. Keep the humidifier locked during normal operation and store the key in a safe location away from the humidifier.
2. **ALWAYS DISCONNECT THE POWER SUPPLY AT THE CIRCUIT BREAKER OR SAFETY SWITCH BEFORE OPENING ANY COVERS!**
3. Before servicing the humidifier, learn where the high voltage parts are. **KEEP HANDS AND METAL TOOLS AWAY FROM THESE AREAS!**

Figure 2-1

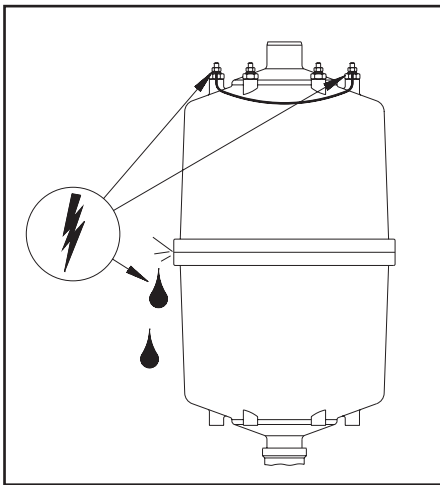


Figure 2-2

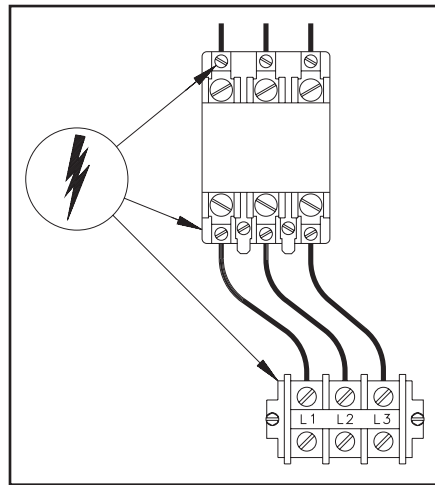


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PRE-INSTALLATION

1) CHECK SHIPMENT

A claim should be filed with the transportation company (and reported to Armstrong) if any items are missing or damaged. Your shipment will arrive in two or three cartons.

One carton holds the humidifier with the steam generator installed, the control humidistat and sensing element, two short steam hoses, hose clamps, mounting plate and lag screws, and a clear drain hose. If you have ordered a duct pressure switch or a high limit stat, these too will be in the humidifier carton.

The steam dispersion tube(s) and fittings are contained in another carton (two for the EHU 704).

Two complete sets of installation instructions have been shipped with your unit. One is for the installer's use. The second is for the owner's files.

2) CHECK LOCAL CODES

Series EHU-700 humidifiers should be installed in accordance with **ALL** applicable building, plumbing, and electrical codes.

3) SITE SELECTION

Electronic steam humidifiers must be installed in locations that allow routine inspection and accessibility for maintenance operations. See Figures 4-1 & 4-2 for access space.

Do not place electronic steam humidifiers in locations where unusual instances of malfunction of the humidifier or the system might cause damage to non-repairable or un-replaceable, or priceless property.

Figure 4-1. EHU-701

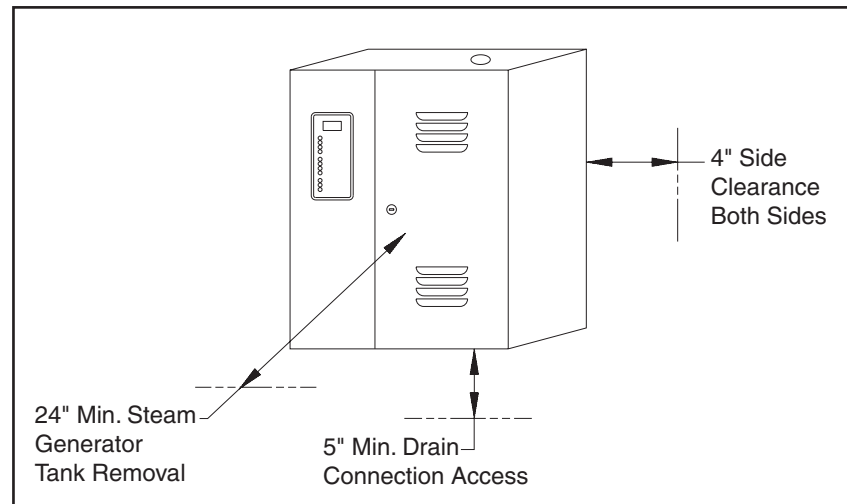
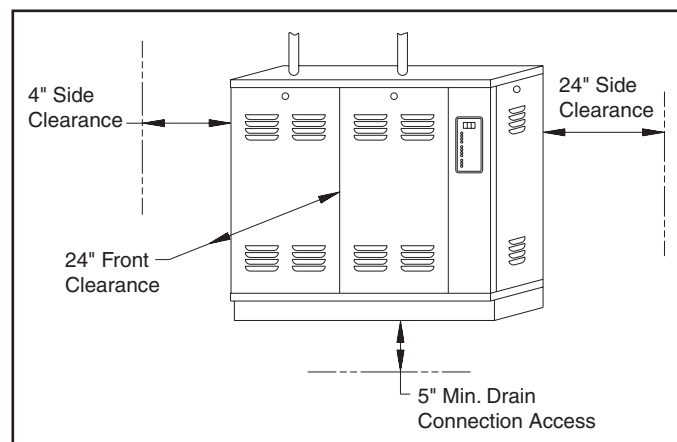


Figure 4-2. EHU-703/704



The mounting surface should be a wall capable of supporting the maximum humidifier weight. The maximum operating weight is:

Model Unit	Water	Total
701	60 lbs. + 20 lbs. =	80 lbs.
703	83 lbs. + 30 lbs. =	113 lbs.
704	95 lbs. + 60 lbs. =	155 lbs.

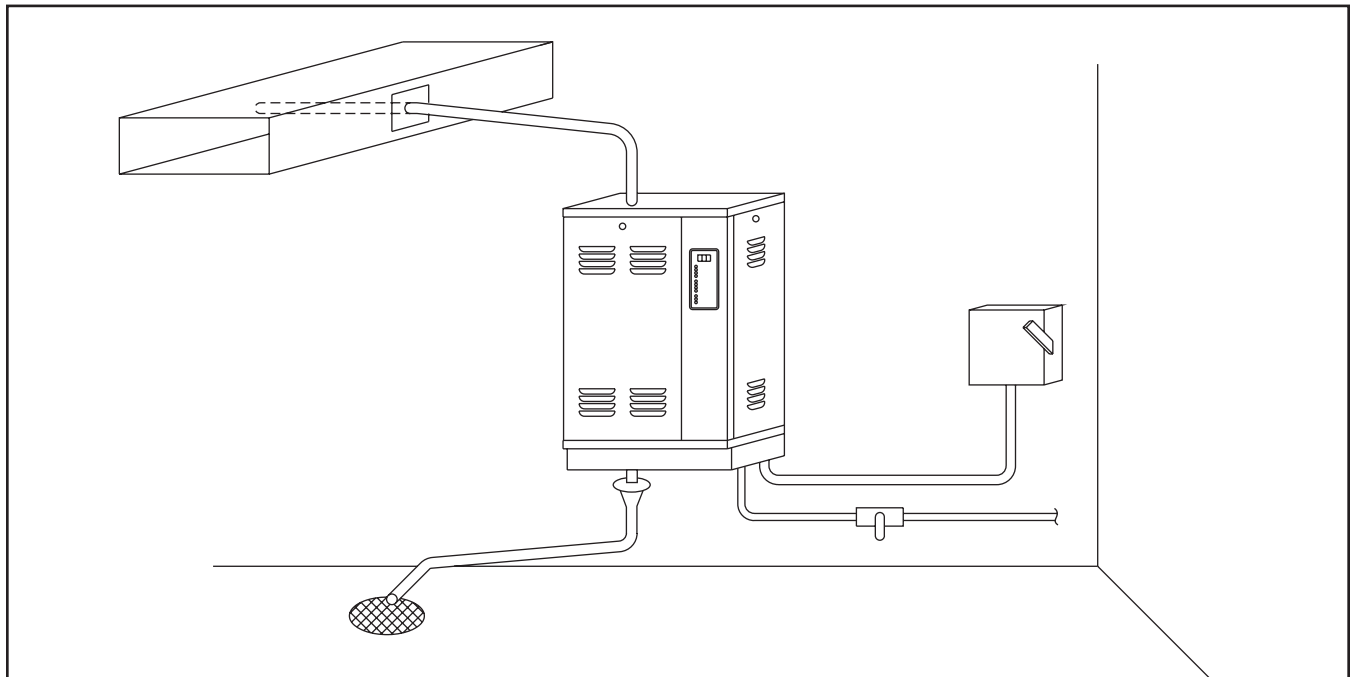
The location chosen should be inside with a minimum ambient temperature of 40°F. and a maximum of 100°F. The humidifier should not be mounted on hot surfaces.

The location should be close enough to the air duct so that the length of steam pipe is as short as possible. A length of 10 ft. or less is ideal; the maximum recommended length for running distribution piping is 40 feet of equivalent run. The number of piping elbows in the installation should be minimized (see Pages 7 and 8 for more information.)

The unit should have ready access to electrical service, a supply of ordinary tap water, and a sewer into which the drain line can discharge hot waste water. (Figure 5-1)

NOTE: Please contact factory for duct applications offering high static pressure (>4" WC).

Figure 5-1



INSTALLATION

4) MOUNTING THE HUMIDIFIER

MODEL EHU-701: Making sure the unit is level, hold it against the mounting surface and mark the hole pattern. Attach the units to studs or other sturdy structure with the two 3/8" x 1 1/2" lag screws provided.

MODELS EHU-703 & 704: Making sure the mounting bracket is level, attach it to studs or other sturdy structure with the two 3/8" x 1 1/2" lag screws provided. Hang the humidifier on the mounting bracket.

5) ELECTRICAL SERVICE WIRING

Refer to the nameplate on the unit for recommended fuse size. Table 6-1 relates the fuse size to the appropriate branch size. A complete wiring diagram shown in Figure 12-1 is located inside the door of the humidifier.

IMPORTANT: Please observe the following:

- Make certain there is a manually operated interlocking circuit breaker or safety switch (not furnished) in the electric service ACCESSIBLE TO AND WITHIN SIGHT OF THE HUMIDIFIER.
- USE ONLY WIRE WITH COPPER CONDUCTORS RATED 90°C OR HIGHER FOR HIGH VOLTAGE AND GROUNDING.
- Pass high voltage ground lead through provided ferrite core (AN) between where it enters the cabinet and where it connects to ground lug.
- Ground the humidifier cabinet; a ground lug is provided in the wiring compartment.

Table 6-1. Series EHU-700 Capacities and Electrical Ratings

Nom Amp Rating	Current Module	Recommended Branch Circuit		Output Per Hour @ Voltage Shown																									
				Single Phase												Three Phase													
		Wire	Circuit Breaker	120		208		240		277		208		240		346 ¹		380		415 ²		480		600					
lb	kg			lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg				
EHU-701 Humidifier (One Small Steam Generator)																													
7	CM 7	14	15	2	0.9	4	1.8	5	2.3	6	2.7	7	3.2	8	3.6	12	5.4	13	6	15	6.8	17	7.7	21	9.5				
12	CM 12	14	15	4	1.8	7	3.2	8	3.6	10	4.5	12	5.4	14	6.3	21	9.5	23	10.4	25	11.3	29	13.2	36	16.3				
14	CM 14	12	20	5	2.3	8	3.6	10	4.5	11	5	15	6.8	17	7.7	24	10.9	27	12.2	29	13.2	34	15.4	42	19				
16	CM 16	12	20	6	2.7	10	4.5	11	5	13	6	17	7.7	19	8.6	28	12.7	30	13.6	33	15	38	17.2	—	—				
20	CM 20	10	25	—	—	12	5.4	14	6.3	16	7.3	21	9.5	24	10.9	35	15.9	38	17.2	42	19	—	—	—	—				
24	CM 24	10	30	—	—	14	6.3	17	7.7	19	8.6	25	11.3	29	13.2	42	19	—	—	—	—	—	—	—	—				
32	CM 32	8	40	—	—	19	8.6	22	10	26	11.8	33	15	38	17.2	—	—	—	—	—	—	—	—	—	—				
40	CM 40	8	50	—	—	24	10.9	28	12.7	32	14.5	42	19	—	—	—	—	—	—	—	—	—	—	—	—				
EHU-703 Humidifier (One Large Steam Generator)																													
20	CM 20	10	25	—	—	12	5.4	14	6.3	16	7.3	21	9.5	24	10.9	35	15.9	38	17.2	42	19	48	21.8	60	27.2				
24	CM 24	10	30	—	—	14	6.3	17	7.7	19	8.6	24	11.3	29	13.2	42	19	46	20.9	50	22.7	58	26.3	72	32.7				
32	CM 32	8	40	—	—	19	8.6	22	10	26	11.8	33	15	38	17.2	55	24.9	61	27.7	66	29.9	77	34.9	96	43.5				
40	CM 40	8	50	—	—	24	10.9	28	12.7	32	14.5	42	19	48	21.8	69	31.3	76	34.5	83	37.6	96	43.5	120	54.4				
48	CM 48	6	60	—	—	29	13.2	33	15	39	17.7	50	22.7	58	26.3	86	37.6	91	41.3	100	45.4	115	52.2	—	—				
EHU-704 Humidifier (Two Large Steam Generators)																													
40	CM 20	8	50	—	—	24	10.9	28	12.7	32	14.5	42	19	48	21.8	69	31.3	76	34.5	83	37.6	96	43.5	120	54.4				
48	CM 24	6	60	—	—	29	13.2	33	15	39	17.7	50	22.7	58	26.3	83	37.6	91	41.3	100	45.4	115	52.2	144	65.3				
64	CM 32	4	80	—	—	39	17.7	45	20.4	51	23.1	67	30.4	77	34.9	111	50.3	122	55.3	133	60.3	154	69.8	192	87.1				
80	CM 40	3	100	—	—	48	21.8	56	24.4	64	29	83	37.6	96	43.5	138	62.6	152	68.9	166	75.3	192	87.1	240	108.8				
96	CM 48	2	125	—	—	58	26.3	67	30.4	77	34.9	100	45.4	115	52.2	166	75.3	182	82.5	199	90.2	230	104.3	—	—				

NOTES: ¹ 346 Volt units require 346/200 volt 4-wire system.

² 415 volt require 415/240 volt 4-wire system.

KW rating = humidity output (lbs/hr) x 0.345 (for energy calculations only; not for branch circuit sizing).

6) WATER FILL SUPPLY

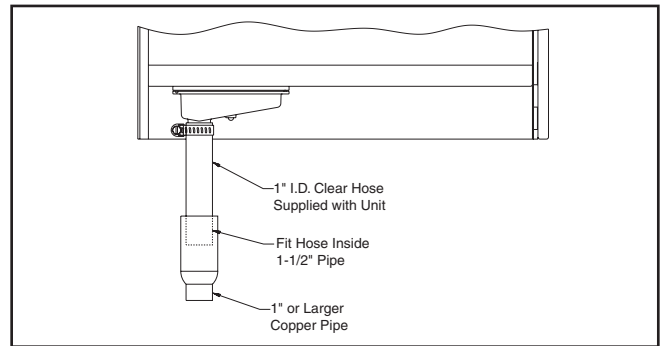
Connect the unit to the building water supply (25 to 125 psig pressure). Install a shut-off valve near the humidifier. Connect the water supply to the 3/8" tube compression fitting on the fill valve adaptor.

NOTE: ORDINARY (POTABLE) TAP WATER IS RECOMMENDED. IF POTABLE WATER IS NOT AVAILABLE, CONSULT THE FACTORY (SEE "WATER QUALITY AND TREATMENT SECTION OF THIS MANUAL, PAGE 23, FOR MORE INFORMATION). DO NOT USE BRACKISH OR CONTAMINATED WATER.

7) CONNECT DRAIN

Connect to a suitable waste draining system. Use the clear drain hose provided and a 1" copper pipe (Figure 7-1), pitched 1" per foot. The drain water may be as hot as 160°F. Drain it where it will not present a hazard to personnel. An air gap to prevent backflow is required if drain water is required to be less than 140°F, use of Temp-R-Drain will be required.

Figure 7-1



8) INSTALL THE STEAM

DISPERSION TUBE *NOTE: Please contact factory for duct applications offering high static pressures (>4"WC).*

- a. Verify that the proper length and type of steam dispersion tube has been selected: See Chart 7-1 for proper dispersion tube lengths. The low capacity dispersion tube (Figure 7-2) is sloped toward the generator to allow for gravity drainage. On applications where the humidifier output capacity is greater than 40 lbs/hr, a high capacity tube with a 1/2" O.D. drain tube must be used (Figure 7-3). Drain tube must have minimum 6" water seal (see Fig. 8-3).
- b. Select a location on the duct that provides adequate length for vapor mixing and the shortest connection length for vapor mixing and the shortest connection length to the humidifier. Preferably the location should be 6" downstream and/or 10 feet upstream from any dampers, vanes, bends in the duct, or controllers (i.e. high limit stat). See page 10 for details. Do not install the dispersion tube into ducts in which airflow exceeds 2,000 fpm. Do not restrict airflow in ducts with a depth of 8 inches or less. Avoid placing manifold in downward, high velocity air flow as dynamic air pressure will restrict steam flow.

Chart 7-1. Selecting Proper Steam Dispersion Tube

Steam Disp. Tube Model No.	Steam Disp. Tube Length		Duct Width				Weight	
			Min.		Max.			
			in	mm	in	mm	in	mm
D-1	12	304	11	279	16	406	3	1.4
D-1.5	18	457	17	432	22	559	3	1.4
D-2	24	609	23	584	34	864	4	2
D-3	36	914	35	889	46	1168	6	3
D-4	48	1219	47	1194	58	1473	8	3.6
D-5	60	1524	59	1499	70	1778	9	4
D-6	72	1829	71	1803	82	2083	10	4.5
D-7	84	2133	83	2108	94	2388	11	5
D-8	96	2438	95	2413	106	2693	12	5.5
D-9	108	2743	107	2718	118	2998	13	6
D-10	120	3048	119	3023	130	3302	14	6.4

Figure 7-2

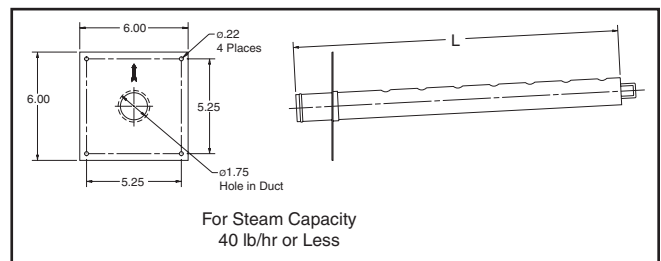
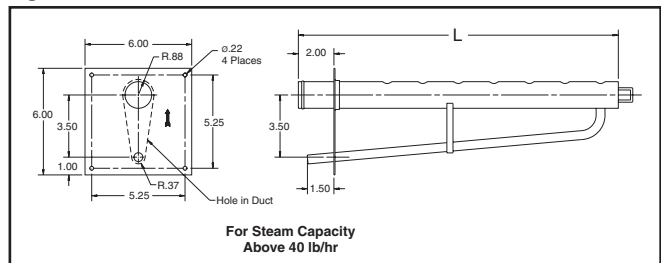


Figure 7-3



c. Use the template provided to cut installation holes in the duct for the dispersion tube as in Figure 7-2 (and optional drain tube, Figure 7-3).

d. Insert the dispersion tube into the duct so the holes face upward. Fasten the mounting plate to the outside of the duct with sheet metal screws. If the dispersion tube is 36" long or more, support the far end with threaded rod or similar means.

e. Connect the dispersion tube to the steam generator using 1/4" (EHU-701) or 1 1/2" (EHU-703,704) nom. size hard copper tube (customer supplied) and the two short hoses supplied with the humidifier (Figure 8-1). Pipe size may need to be increased to 1 1/2" or 2" when piping runs are long or back pressure in duct is high, see Figure 9-2. If piping plus duct back pressure exceeds 4" WC, please consult factory. In addition, a short length of nominal 1 1/2" threaded black iron pipe and a copper tube to female pipe thread adaptor must be supplied by the customer for attaching the piping to 703 or 704 tanks (Figure 8-2). A 1 1/2" to 1/4" reducer will be required to connect the dispersion tube to the steam pipe of Models EHU-703/704 (Figure 8-5).

Figure 8-1. EHU 701

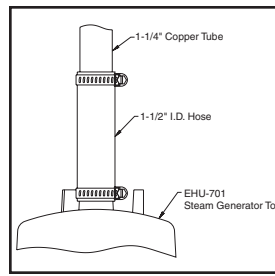


Figure 8-2. EHU 703/704

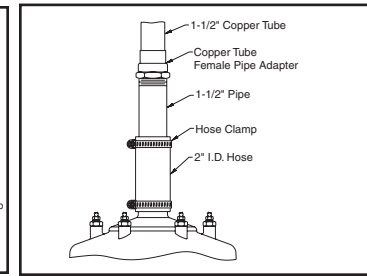
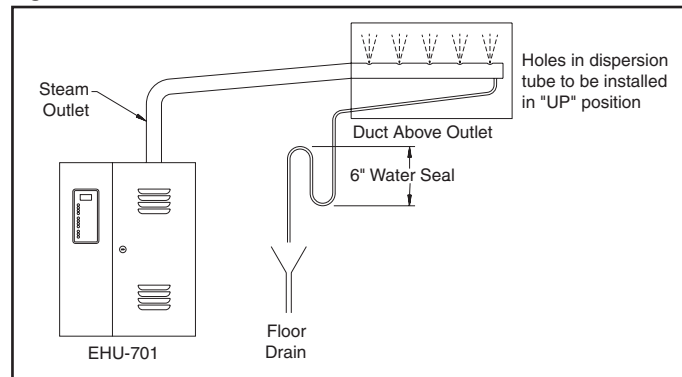


Figure 8-3



The steam pipe must be free of kinks and sags to allow for gravity drainage of condensate. (Provide pitch of 1" per foot towards the unit.) Pipe supports may be required to accomplish this. Insulate the copper tube to minimize condensation.

The preferred installation of the dispersion tube is above the humidifier with a maximum piping run of 20 feet or less (Figure 8-3).

Figure 8-4 shows the correct installation when:

- 1) You cannot achieve a 1" per foot reverse slope of the piping.
- 2) Piping runs range from 20 to the maximum of 40 feet of equivalent run.
- 3) Elbows or vertical risers must be placed in the piping.
- 4) The steam dispersion tube **MUST BE** below the humidifier. For this installation use a 1/4" copper tee for the drain connection of an EHU-701 or a 1 1/2" copper tee for EHU-703 or 704 (Figure 8-5).

Figure 8-4

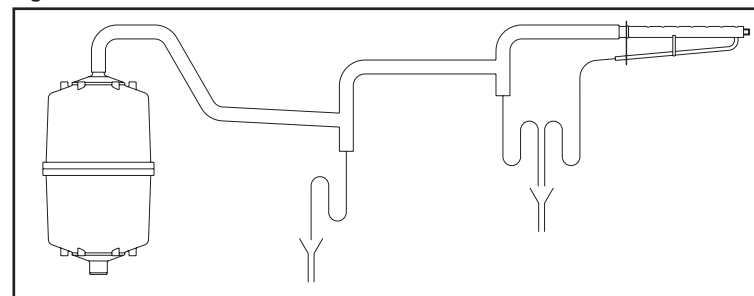
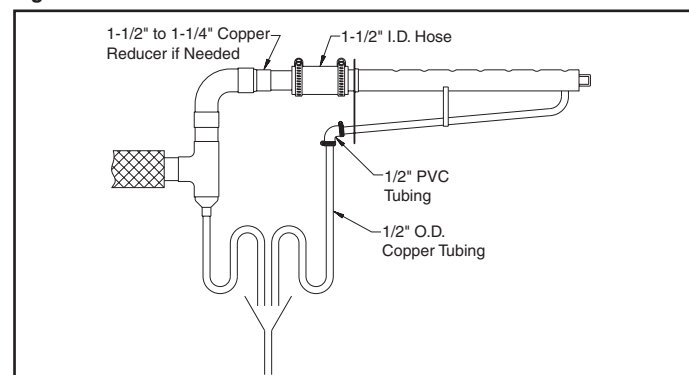


Figure 8-5



CONTROL WIRING

NOTE: Wiring to the low-voltage controls should not run in the same conduits as the power supply wiring because faulty signals could result.

The use of either a metal conduit or shielded wire is required for all the control and / or safety wiring. When using metal conduit, the conduit must extend the entire length of the wire, and the conduit must be grounded at the humidifier cabinet. If the conduit does not extend the entire length of the control wire, the wiring must be shielded and the following guidelines must be used:

1. The wire shields and all unused conductors must be grounded externally to the humidifier cabinet.
2. Ensure a good connection between the shields / conductors and the metal bar of the humidifier cabinet.

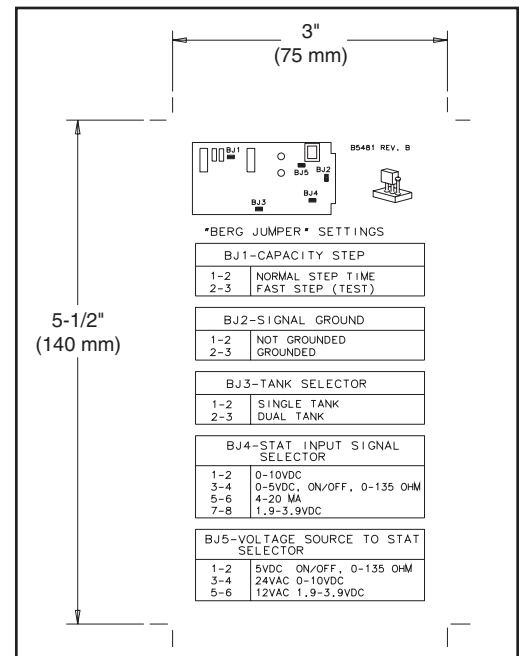
Additionally, a supplied ferrite core must be installed around the control wiring between where the wire enters the humidifier cabinet and the low voltage terminal block.

9) CONTROL HUMIDISTAT

The Series EHU-700 is capable of accepting controls signals with the following characteristics:

- a. 0-10 Vdc Humidistat
(Part No. A18609 and A18610) (H200 or H270 series)
- b. 1.9-3.9 Vdc Humidistat
(Part No. C1471 or C1472)
- c. 4-20mA, 250 Ω input impedance.
- d. 0-10 Vdc, 50 k Ω input impedance.
- e. 0-5 Vdc.
- f. 0-135 ohms.
- g. on/off

Figure 9-1



To adapt the EHU-700 to these different types of control humidistats, jumper BJ4 and BJ5 on the printed circuit board (Figure 9-1) must be manually changed and the humidistat must be wired to the appropriate connections of terminals 1, 2 & 17. Refer to Figure 9-1 or the sticker on the inside of the cabinet for proper jumper locations.

Figure 9-2

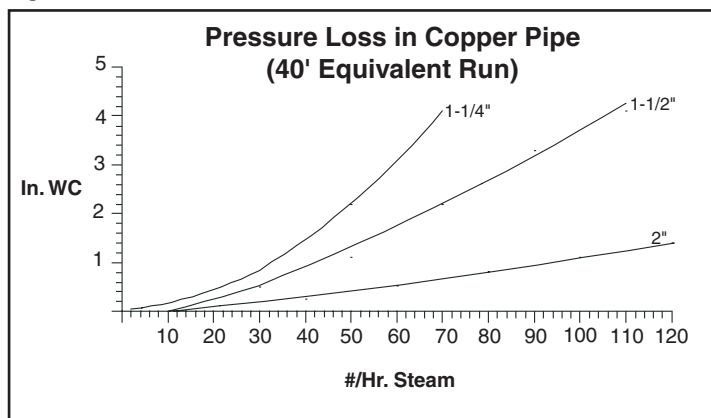
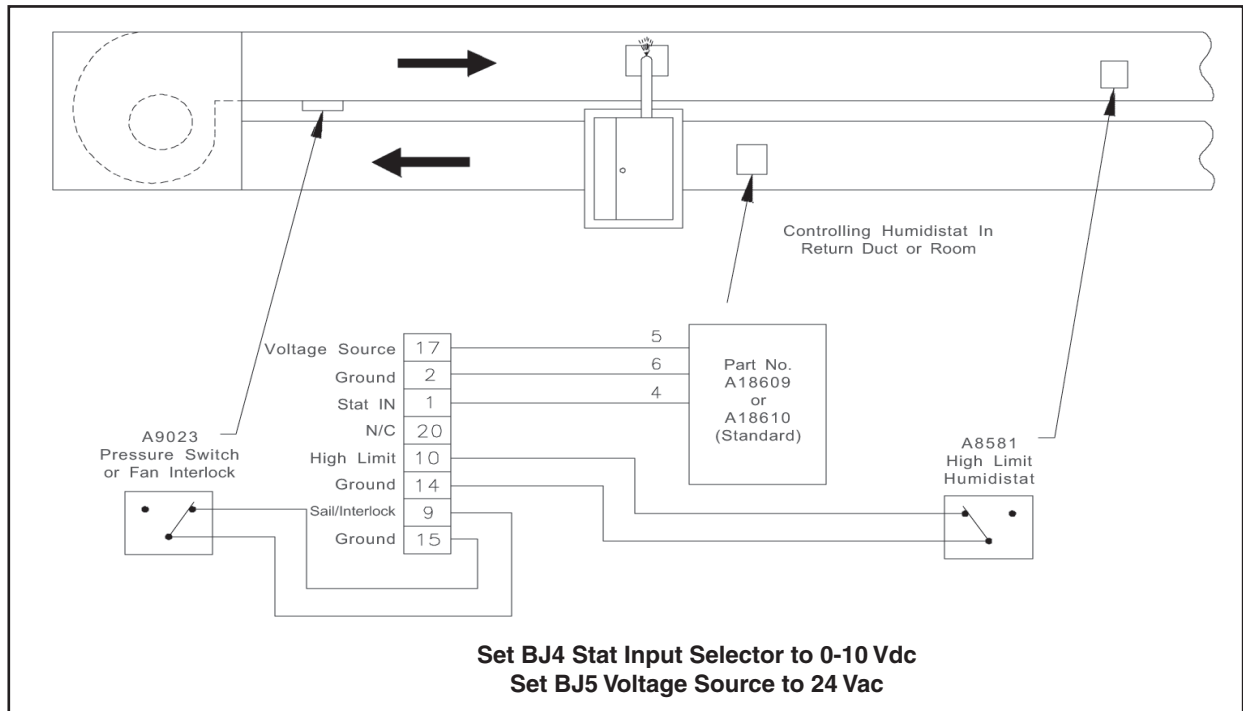


Chart 9-1

Feet of Equivalent Copper Pipe for Copper Pipe Fittings			
Fitting	1-1/4	1-1/2	2
45° Elbow	1.0	2.2	2.8
90° Elbow	2.5	4.3	5.5
90° Long Elbow	1.5	2.7	3.5
Tee	5.0	9	12

Figure 10-1

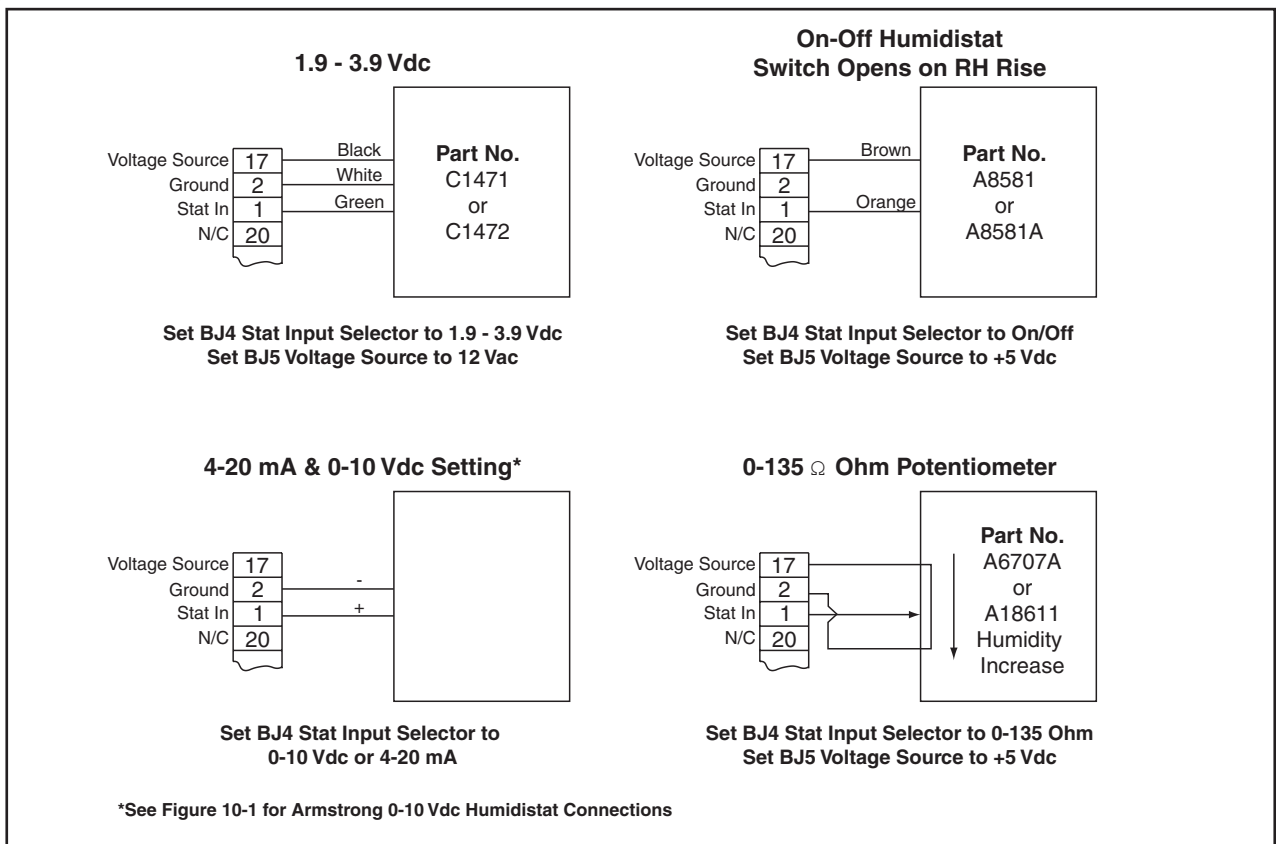


Wall Mounted Control Humidistat:

Wall-mounted humidistats are usually installed 4 ft. to 5 ft. above floor level. Often, the best location is beside a thermostat that controls temperature in the same space that is to be humidified, if that location meets the following criteria:

- The control humidistat should be located where it will be exposed to the average air condition of the space to be humidified.
- Avoid areas of restricted air circulation, or locations where the sensor will be subjected to air drafts, localized heat, or moisture sources.
- Locations near coffee machines, computer blower outlets, doors to other rooms, or windows that can be opened are not suitable.

Figure 11-1



Duct Mounted Control Humidistat:

Duct-mounted control humidistats are also available for installation where sensing and control of return air or exhaust air ducts is preferable. (Figure 10-1)

Please refer to manufacturer’s recommendations for further information on the location, mounting, and operation of the various control humidistats.

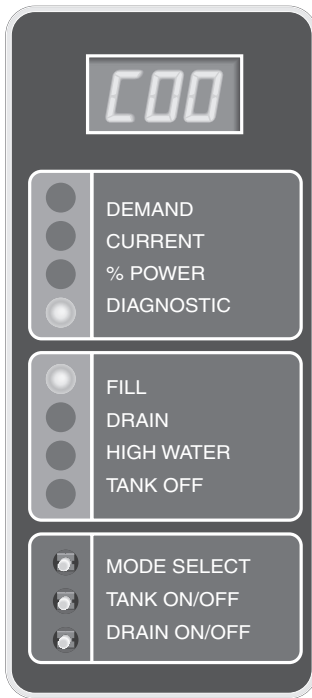
10) HIGH LIMIT DUCT HUMIDISTAT

Remove the jumpers tab from terminals 10 & 14 and wire the high limit stat between these terminals. Refer to Figure 10-1 and Figure 11-1 (the overall wiring diagram) for more information. A duct mounted high limit humidistat is recommended to prevent over-saturation of the duct air. Use an on-off controller that opens on fault (high humidity). Humidistat should be set for a maximum of 90% RH. Alternately, a modulation high limit humidistat may be used on applications such as variable air volume (VAV). Locate the high limit humidistat approximately 10’ (3m) downstream of the dispersion manifold. If 10’ (3m) is not available, consult the factory.

11) AIRFLOW SWITCH

An airflow switch is recommended to deactivate the humidifier when there is insufficient air flow in a duct system. A duct pressure switch is preferred as an airflow sensor. The pressure switch should open on insufficient airflow (opens on fault). Airflow switch should be mounted in supply air duct upstream of humidifier dispersion. Remove the jumper tabs between terminals 9 & 15 and wire the airflow sensor between these terminals. See Figure 11-1 and Figure 12-1 (the overall wiring diagram) for more information. Complete installation and wiring instructions are contained in the duct pressure switch package.

NOTE: LIMIT SWITCHES (HIGH LIMIT AND AIRFLOW SWITCHES) OPEN ON FAULT.



MODE BUTTON, INDICATOR, and DISPLAY

The Mode select button is depressed for approximately ½ second to switch both the “display mode selected” indicator and the 3 digit display between:

- DEMAND**- % of humidistat control range.
- CURRENT**- actual current in amps.
- % POWER**- ratio of current draw to the nominal rating of the unit.
- DIAGNOSTIC MODE**- readout of diagnostic codes.

Leaving the display in the diagnostic mode for 10 seconds initiates the input/output diagnostic routine (see Diagnostics pg. 20).

The 3 digit display also exhibits a diagnostic code in the event that the unit has shut down automatically.

FILL LIGHT

Indicates when the fill valve is energized to add water to the steam generator.

DRAIN LIGHT

Indicates when the drain valve is energized to drain water from the steam generator.

HIGH WATER LIGHT

Indicates that the water level in the generator has risen to the high water level.

TANK OFF LIGHT

Indicates when power to the generator has been interrupted (tank contactor open).

TANK ON/OFF

Depressing the tank on/off button for ½ second will open the tank contactor. The tank off light and the diagnostic light will be on and the display will show the message CO8. The unit will stay in this mode until the button is pressed again.

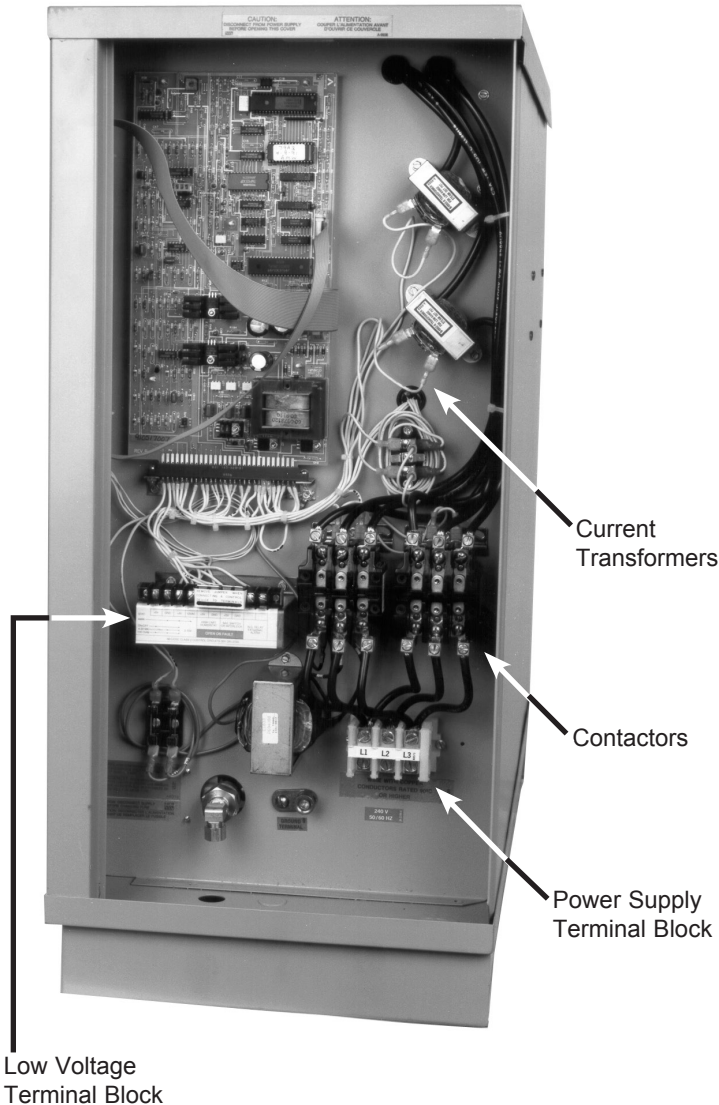
MANUAL DRAIN BUTTON

Depressing the manual drain button for ½ second will open the drain valve. The tank will continue to drain until the button is pressed again.

START-UP PROCEDURE FOR ARMSTRONG SERIES EHU-700 HUMIDIFIERS

The following steps should be performed on all newly installed Series EHU-700 Humidifiers to ensure that the humidifier and the entire humidification system functions correctly.

Figure 14-1



BEFORE TURNING ON THE POWER

- 1) Examine the wiring and the components in the electrical compartment.
- 2) Check for any loose wires or quick-connect terminals that may have been pulled loose.
- 3) Using a screwdriver, **TIGHTEN ALL SCREW TERMINALS** on the power supply terminal block, ground lug, and contactor (Figure 14-1).

Make sure all steam generator tank connections are tight. Remember, a loose joint is a **HOT** joint and could be a fire hazard!

- 4) Locate the low voltage terminal block (Figure 14-1).

Verify that an airflow switch is connected between terminals 9 and 15 or that there is a jumper installed. If an airflow switch is installed, ensure that there is airflow.

Verify that a high limit stat is connected between terminals 10 and 14 or that a jumper is installed.

- 5) Turn on the water supply - Check for leaks.

TURN ON POWER AT THE CIRCUIT BREAKER

6) The following should happen:

- a) The Demand Mode and Tank Off lights will be illuminated. The stat demand will be displayed.
- b) If the stat demand displayed is greater than 35%, the Tank Off light will go out and a few seconds later the Fill Light will go on. The unit will begin to fill.

-
- If the stat demand display is greater than 35% and the unit does not begin filling, press the mode select button three times and the diagnostic mode indicator will light. Note the diagnostic message and refer to the diagnostics information in the troubleshooting section of this manual (page 20).
- c) If the stat demand is less than 35%, force a 100% humidity demand by setting humidistat dial to 95% RH. Alternately, a 100% demand can be simulated by setting BJ4 jumper to position 3-4 (on/off), set BJ5 to position 1+2 (5 VDC) and installing a jumper between terminals 17+1 of the low voltage terminal block inside humidifier.
- 7) Let the unit continue to fill and allow the water to boil.
 - a) If the water level reaches within 4" of the Steam Generator Tank top, the High Water Float Switch will block the fill and illuminate the High Water light momentarily. This is normal on relatively pure water. Pressing the mode button to check the diagnostic display will result in an indication of C01. To complete the start-up testing in this instance, push the Drain switch to drain 1/2 of the tank. Next, turn off power at the breaker or safety switch and add one pinch (1/2 teaspoon) of Epsom salts to the Fill Cup (See Part #25 on Page 28). This should allow the water to boil by increasing the water's conductivity. (See "Water Quality and Treatment for EHU Humidifiers" in the troubleshooting section on page 23.) Reapply power to energize the humidifier.
 - 8) On typical beginning fill, after the fill stops, press the mode button until percentage of maximum power is indicated. The numerical display should read a few points above 40%.
 - 9) Press the Drain switch. Verify that the unit is draining freely.
 - 10) Inspect the steam outlet piping. Verify that there are no un-trapped low spots. Also verify that the piping is insulated and properly sloped (See Step 8 on Page 7).
 - 11) If the Dispersion Tube is equipped with a drain fitting, verify that is working.
 - 12) Verify operation of high limit humidistat and or air proving switch, if used.
 - a) If high limit is used, turn dial to minimum setting, 10%. Display of unit should read CO4 and unit should stop steam production. Turn humidistat dial to maximum of 90% and unit should return to normal operation.
 - b) If pressure switch is being used, verify airflow condition in duct or air handler.
 - If air flow is present, unit should be in normal operation. Disconnect wire from terminal 15 at humidifier. Display should show CO3, and unit will stop operation. Reconnect wire to terminal 15, and unit should return to normal operation.
 - If Air Flow is not present in Duct or Air Handler, unit should be sitting IDLE and Display should be showing CO3. Turn fan on and verify duct or Air handler now has airflow present. Unit should return to normal operation.
 - 13) While humidification is being demanded, turn humidistat dial down to near zero. The following should happen:
 - a) The stat demand reading will decrease to zero.
 - b) The unit will shut down, lighting the Tank Off light.
 - 14) Turn humidistat dial to the desired value.
-

-
- 15) Verify that all of the input/output circuits are functioning properly by entering the input/output diagnostics mode. Press the mode button until the diagnostics indicator lights and wait ten seconds. The unit will do a complete self-diagnostic check. See CO in the diagnostics section of this manual (page 20) for more information.
 - 16) Turn power off, if humidification is not needed.
 - 17) Close and lock the doors, and store the key away from the unit.

CAUTION!: Disconnect the electric power supply at the circuit breaker or switch whenever the unit is to be inspected or serviced. DO NOT USE THE TANK ON/OFF SWITCH ON THE HUMIDIFIER BECAUSE THIS SWITCH DISCONNECTS THE STEAM GENERATOR TANK ONLY.

PRINCIPLE OF OPERATION - AN OVERVIEW

The Armstrong Series EHU-700 electronic steam humidifier converts ordinary tap water to steam and distributes it within the air being humidified to bring the relative humidity up to the desired level.

The humidity demand is sensed by the humidistat. A microcontroller converts this demand signal into an amperage requirement. If humidistat demand is above 35%, the internal power contactor closes, applying voltage to the electrodes, and the fill valve opens to begin filling the tank. Water enters the bottom of the steam generator tank and rises until it reaches the electrodes. Upon contact, electrical current flows through the water, causing it to boil and produce steam (Figure 17-1).

As the water level rises (Figure 17-2) increased electrical current flows through the water, producing more steam. This increase will continue until the desired current level (i.e. required steam output) is reached. At this point, the fill valves will cycle off and on to maintain the desired amperage $\pm 5\%$. The desired current level is a function of the nominal current rating, humidistat demand, and the automatic capacity adjustment feature.

When the humidistat senses the added moisture in the air, the demand for humidity begins to drop. As the demand drops, the output of the unit is modulated down by boiling away water and not filling. This allows the amperage to decrease, thereby reducing the steam flow. The fill valve can then cycle at the lower steam output (current) requirement. When the humidistat demand signal drops below a minimum 25% demand, the contactor is de-energized, and steam output stops (Figure 17-3).

Steam output may also be stopped by a duct high-limit humidistat or a fan interlock switch. These devices prevent excess moisture and condensation in the duct by opening the tank contactor if there is too much humidity or insufficient airflow within the duct.

Figure 17-1

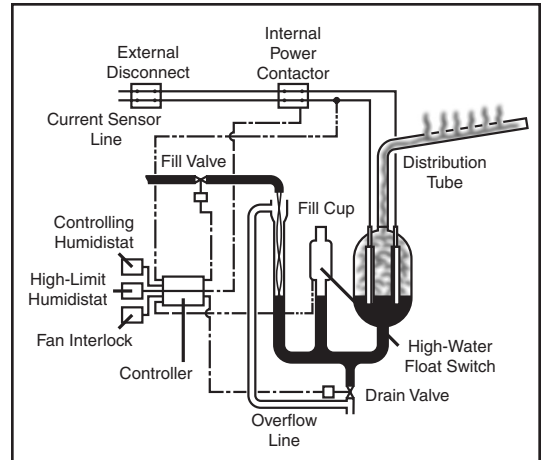


Figure 17-2

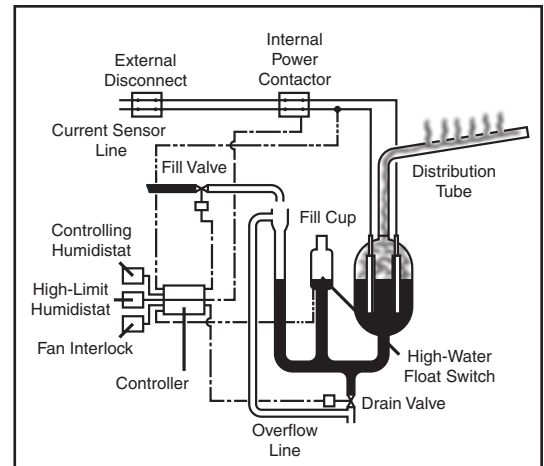
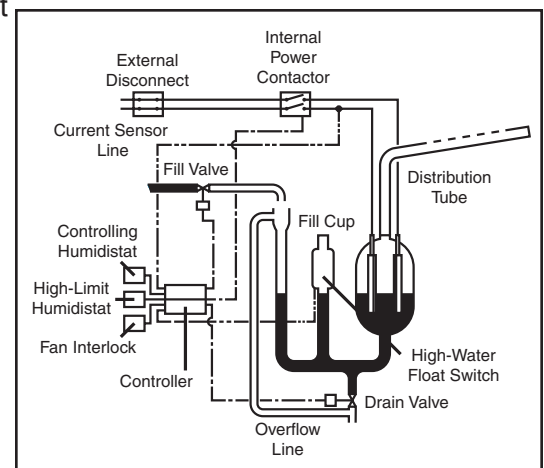


Figure 17-3



A high-water float switch prevents water carry-over into the duct due to an excessive water level in the tank. When the high water limit is reached the HIGH WATER light comes on and the fill valve is blocked until some water is boiled away and the water level drops. This is common during startup. If the high water light comes on and the water level is in the lower half of the steam generator, contact the factory for assistance. This is due to high static pressure. Installation of fill cup extension kit could be required.

If an overcurrent situation is detected, the overcurrent protection circuit will drain water from the tank to reduce current flow. If the overcurrent persists, the contactor will be de-energized to stop all current flow.

The Series EHU-700 patented automatic capacity adjustment feature eliminates manual adjustment and improves humidity control. This feature automatically adjusts maximum output up or down depending on the humidity demand history. When the unit is first turned on the maximum output is 40%. If the demand stays high, the unit automatically steps up the maximum output and will reach 100% maximum output after one hour. For test purposes, or for special operating situations, this feature can be easily over-ridden by changing the position of jumper BJ1 on the printed circuit board from pins 1 and 2 to pins 2 and 3.

An automatic drain cycle blows down mineral-laden water to increase steam generator life and reduce maintenance requirements. The frequency and duration of the drain cycle will vary with supply water conductivity, steam output, and humidistat demand history. When it is initiated automatically, the drain valve cycle occurs at the beginning of a fill cycle. The incoming cold water tempers the drain water to less than 160°F after 72 hours of no demand, the unit will initiate an “End-of-Season” drain to remove stagnant water.

OPERATIONAL GUIDELINES

This section describes the conditions and indications you should expect to find in a normally operating humidifier.

Tank Contactor Operation:

The microcontroller will de-energize the contactor, turning off the current to the electrodes if **ANY** of the following occur:

1. The control humidistat demand signal is less than 25%.
2. The fan interlock circuit is open.
3. The high limit humidistat circuit is open.
4. The tank current is greater than the over-current limit.

Conversely, the microcontroller will energize the contactor, turning on the current to the electrodes, only if **ALL** of the following occur:

1. The control humidistat demand signal is greater than 35%.
2. The fan interlock circuit is closed.
3. The high limit humidistat circuit is closed.

There is a time delay of fifteen seconds in the contactor operating circuitry to prevent it from cycling too rapidly after it has been turned off.

Monitoring Stat Demand:

Indicates the demand for humidity in relationship to the control range of the humidistat. 0% indicates that the humidity requirement has been exceeded. 100% indicates that the humidistat is calling for full humidifier output. In general, a reading of around 50% indicates that the set point has been met.

Monitoring Current:

While the unit is filling, the current should increase. As the current approaches the maximum rating of the unit, it increases more slowly, especially in higher capacity units. With the tank on, and the fill and drain circuits idle, the current should fall slowly. When the unit is draining, the current should decrease at a moderate rate.

Monitoring % Power:

The percentage power equates to the percentage of maximum steam output. The percentage power reading will increase and decrease proportionally to the current draw. Overcurrent protection circuitry starts initiating drain cycles as the % power reading approaches 110%. The overcurrent failure routine is initiated at about 120%.

Automatic Drain Operation:

The microcontroller will energize the drain valve at the beginning of the fill cycle to reduce the conductivity and mineral build-up in the tank. It will vary in drain duration to adjust for changes in water quality, demand history, and steam output.

Manual Drain Mode:

If the manual drain button is pushed while the tank circuit is energized, the fill valve will also open to temper the drain water. If the tank is off, only the drain valve will open.

THE Series EHU-700 has built in diagnostics to detect system problems early, before they become severe. If possible, the diagnostic routine performs corrective measures. If necessary, the unit is shutdown and a dry contact is closed to enable a remote alarm.

The diagnostic messages that result in the unit being shutdown are displayed automatically. The other messages are displayed when the diagnostic display mode is selected with the mode switch. If the display mode selection is left in the diagnostic mode for 10 seconds, the Input/Output circuit diagnostic check will begin.

DIAGNOSTIC DISPLAY MESSAGES

C00 = NORMAL OPERATION
C01 = HIGH WATER
C02 = TANK NEEDS CLEANING*
C03 = INTERLOCK CIRCUIT
C04 = HIGH-LIMIT CIRCUIT
C05 = DRAIN SYSTEM FAILURE*
C06 = FILL SYSTEM FAILURE*
C07 = OVERCURRENT FAILURE*
C08 = MANUAL TANK SHUT-OFF
C09 = I/O DIAGNOSTICS

* Automatic shutdown and Alarm contact closure.

C00: NORMAL OPERATION

C01: HIGH WATER:

A high-water float switch prevents water carry-over into the duct due to too high a water level in the tank. When the high water limit is reached the HIGH WATER light comes on and the fill valve is blocked until some water is boiled away and the water level drops. This is not uncommon on startup. The diagnostic display mode will indicate C01.

NOTE: the high water light goes off as soon as the high water condition is cleared but the operation on the fill valve does not resume until after a fifteen second delay period. If C01 is displayed and the water level is in the lower half of the steam generator, high static pressure exists, contact the factory for assistance.

C02: TANK NEEDS CLEANING:

If the HIGH WATER light is on continuously during normal service (i.e. after initial startup) and the current is not increasing, the tank probably needs cleaning (refer to the maintenance section of this manual). If this condition persists without being serviced, the display panel will display diagnostic message C02. The unit will shutdown and the dry contact will close to activate the remote alarm. **NOTE:** False C02 messages may occur if incoming water is very pure ($< 100 \mu\text{Mhos}/\text{cm}^2$). Please consult factory.

C03: INTERLOCK CIRCUIT:

The fan interlock circuit may be a sail switch or (preferably) a duct pressure switch. When air flow in the duct is not present, the interlock circuit should open and the microcontroller will de-energize the contactor. The diagnostic mode will display the message C03 and the fill solenoid is blocked.

C04: HIGH LIMIT CIRCUIT:

When the humidity in the duct reaches the high limit stat set-point, the circuit will open and the microcontroller will de-energize the contactor. The diagnostic mode will display the message C04 and the fill solenoid is blocked.

C05: DRAIN SYSTEM FAILURE:

This routine checks for a failure to reduce current if the drain valve is energized for more than five seconds. If the actual current does not decrease when the microcontroller demands a drain cycle, the unit will go into a diagnostic routine. This routine will try twice to correct the drain system failure by cycling the drain valve rapidly. If the failure is not corrected, the unit will shut down. The tank off indicator will light, the numerical display will show C05 (the drain valve failure message), and the dry contact will close to activate the remote alarm.

Drain system failure can be due to a plugged drain valve, drain valve solenoid failure, scale buildup in the tank, or drain piping problems. **Refer to the maintenance section of this manual for resolution of these problems.**

C06: FILL SYSTEM FAILURE:

After start-up, if the fill valve is on and has been on for more than four minutes, the diagnostic routine will check the fill valve operation. If the actual amp signal is less than the current when the fill valve was opened, the unit will go into a diagnostic routine. If the problem cannot be corrected, a fill system failure will be triggered and the unit shut down. The three digit display will show C06 to indicate this condition, and the dry contact will close to activate the remote alarm.

Fill system failure can be due to excessive or insufficient inlet water pressure, a failed fill valve solenoid, a plugged fill valve failed open, or a backflow preventer. **Refer to the maintenance section of this manual for resolution of these problems.**

C07: OVERCURRENT FAILURE:

The overcurrent limit (OCL) is 20% above the nominal amp rating of the unit. When the actual current reaches the OCL, the microcontroller will de-energize the contactor and energize the drain valve for 15 seconds. Then the contactor will be re-energized to see if the drain valve has corrected the overcurrent condition. This procedure is repeated 5 times.

If the overcurrent still exists, an overcurrent failure indication of C07 is displayed, the unit is shut down, and the dry contact will close to activate the remote alarm. The unit will have to be manually reset and the overcurrent condition addressed by the maintenance personnel.

An overcurrent failure can result from the cold startup of a tank that was previously running at a high load, resulting in the tank water becoming too conductive for start-up. If this is suspected, manually drain the tank for 15-30 seconds, then try to restart the system. If the overcurrent failure repeats, the drain system could be partially plugged, or the tank may be in need of cleaning. **Refer to the maintenance section of this manual for resolutions to these problems.**

C08: MANUAL TANK SHUT-OFF:

The tank on/off button will de-energize the tank contactor. The tank off light and the diagnostics indicator will be on and the display will show the message C08. The unit will stay in this condition until the button is pressed again. In the tank off mode, the manual drain button is still active, but the mode select button is not.

C09: I/O DIAGNOSTICS

If the display mode selection is left in the diagnostic mode for 10 seconds, the Input/Output circuit diagnostic check will begin. The display will show the message C09, the tank will be off, and the diagnostics mode light will remain on.

Output Circuits: The diagnostics will first check all the output circuits: fill valve, drain valve, and tank contactor to make sure they are working. When a light comes on, you will hear the corresponding valve or contactor circuit energize for about 2 seconds. Each circuit is checked twice before proceeding to the next circuit.

Input Circuits: Next the microcontroller checks the status of all input circuits, beginning with the control stat. the 3 digit display will show 0% Demand, then the actual stat demand. It will do this twice. The input diagnostics continues by checking the fan interlock switch, high limit duct humidistat, and high water switch. The display will now show C09 followed by any additional messages that indicate problems with the input circuits.

When the I/O diagnostic check is finished, the demand mode light will be on, the display will show the control stat demand and the unit will return to normal operation. The complete I/O diagnostic check lasts less than 2 minutes.

GENERAL

Series EHU 700 electronic humidifiers use ordinary tap water in their operation. The quality of this water affects both the operation and the maintenance of the humidifier.

How the EHU works:

The EHU is an electrode boiler. When no water is present, the electrodes are separated by air, an insulator, so no current flows. When tap water contacts the electrodes it conducts current between the electrodes, heating the water.

How much current passes between the electrodes is dependent on the conductivity of the water, which is measured in micromhos/cm ($\mu\text{Mhos/cm}$). EHUs can operate effectively with water conductivity in the range of 50 (low) to 800 (high) μMhos . For conductivity greater than 800 μMhos , please consult factory. The optimum incoming water conductivity level is 200-400 $\mu\text{Mhos/cm}$. the greater the conductivity of the water, the lower its level will be in the tank in order to draw a given current. In general, the EHU-700 Series will adjust its drain cycle to maintain the water level around 1/3-1/2 full in the tank.

What affects conductivity?

The minerals (mainly calcium) dissolved in the water. Pure water is **NOT** conductive and can't be used exclusively in an EHU without special procedures. This includes distilled, de-ionized and reverse osmosis diffusion treated water. Most tap water is conductive however, so it will work in an EHU. If tap water is not available, consult with the factory.

How does this affect maintenance?

Generally, the more conductive the water is, the more minerals there are dissolved or suspended in it. As the water is boiled away these minerals can be left as a deposit on the electrodes, tank, and fittings. Any deposits that build up can block valves, diminish the internal volume of the tank, and form an insulating barrier on the electrodes (Figure 23-1).

Figure 23-1. Tank filled with mineral buildup.



The EHU automatic drain cycle:

All Series EHU humidifiers have a built in blow down circuit to intermittently purge excess mineral accumulations from the water. The drain cycle should automatically adjust for variations in water quality. Eventually, however, minerals will accumulate in the steam generator, and have to be removed (see tank cleaning in the maintenance section of this manual).

Water treatment guidelines for the EHU:

Generally, the EHU will work with any potable water source. If you are experiencing problems with your installation, however, the following suggestions may be helpful in identifying and rectifying your difficulty.

WHEN WATER CONDUCTIVITY IS TOO LOW

Indicators:

- Unable to reach humidity set point in space.
- High water level in tank
- Low current draw and low % power reading even though the stat demand remains at 100%.
- Consistent drain cycles of two seconds or less.

Results:

- Excessive time needed to reach set point during star-up.
- Poor humidity control.

Remedy:

- Add 1/2 teaspoon of Epsom salts to the fill cup. After start-up the automatic drain program should maintain the unit at full capacity.
- If problem persists, contact the factory.

WHEN WATER CONDUCTIVITY IS TOO HIGH**Indicators:**

- Water level just touching tip of electrodes.
- Arcing and foaming in the tank.
- Frequent drain cycles (every time the fill valve opens) that last up to 10 seconds.

Results:

- Tank frequently needs cleaning.
- Poor control because of excessively low water level.
- Electrode destruction.

Remedies:

-If you have pure water available such as: de-ionized water, Reverse Osmosis diffusion water, or distilled water, they can be blended with tap water to reduce the total mineral content. Pure water **alone** is not conductive enough to pull current. The water is too pure when the "Tank Full" light comes on excessively. Consult a water purification equipment vendor for the proper blending equipment or the Armstrong factory for more information regarding use of purified water. The blended water conductivity should be in the 200-400 $\mu\text{Mhos/cm}$ range.

-Softened water is not recommended for use with the Series EHU-700 Humidifiers. Water softeners replace the calcium ions in the water with sodium ions. As softened water boils, the sodium ions stay in solution causing the conductivity of the water in the tank to increase rapidly.

CAUTION: Soft water may increase the tank's water conductivity and does not allow a protective coating to form on electrodes. Also, as salts stay in solution more drainage will be needed to maintain correct water conductivity in the tank. Please consult factory for softened water analysis, if softened water source is available, before proceeding. Expect to replace electrodes more frequently. Discontinue service if continuous arcing or foaming occurs in the tank.

EHU-701, -703, -704 Series Electronic Steam Humidifier Repair Parts

Steam Generators Complete

Item	Part No.	Description	Used On
*1A	D4417	1 Ph Low Voltage 120,208,240,277 Volts	701
*1B	D4418	1 Ph High Voltage w/Barrier 380,480,600 Volts	701
*2A	D4415	3 Ph Low Voltage (208, 240, 277 volts)	701
*2B	D4416	3 Ph High Voltage w/Barrier (380, 480, 600 volts)	701
3A	D262A	3 Ph/1 Ph Low Voltage (120, 208, 240, 277 volts)	703,704
3B	D262	3 Ph High Voltage w/Barrier (380, 480, 600 volts)	703,704

Note: A replacement generator comes with a spare drain adaptor "O" Ring.

Steam Generator Parts

Item	Part No.	Description	Used On
† *4A	D4422	Tank Assembly Less Electrodes - 1 Phase	701
† *4B	D4423	Tank Assembly Less Electrodes - 3 Phase	701
† 6	D263	Steam Generator Bottom Half-Less Drain Screen	703,704
† 6	B3968	Steam Generator Top Half- Holes Drilled	703,704
*7A	B3038	Electrode Replacement Assembly 1 Ph High & Low Voltage	701
*7B	A10077	Electrode Replacement Assembly 3 Ph	701
8	A9745	Electrode Replacement Set (Includes 6 ea. electrodes, O-Rings, 1/4" Nut & 1/2" Nut) 1 Ph/3 Ph	703,704
*9A	A9742	Drain Screen for Low Voltage (120, 208, 240, 277)	701
*9B	B2413D	Drain Screen/Barrier Assembly For High Voltage 1 Ph	701
*9C	C1965	Drain Screen/Barrier Assembly For High Voltage 3 Ph	701
10	C2053	Drain Screen	703,704
11	A9746	Tank Barrier Assembly	703,704
12A	A21374	O-Ring for Steam Generator	701
12B	A21375	O-Ring for Steam Generator	703,704
*13	C1839	V Band Tank Clamp	701
14	B2822	Tank Retainer Clip	703,704

*Item Not Shown.

† These parts are furnished as a convenience to our customers. Part dimensions may change in service.

Armstrong cannot guarantee that new parts will fit your used parts.

See Drawings on Page 28

Valves and Mechanical Parts

Item	Part No.	Description	Used On
15	B2717	Drain Valve Assembly w/ Hose & (2) Clamps	701,703,704
16A	B2582A-1	Float Switch Assembly	701,703,704
16B	B2582A-2	Float Switch Assembly (Far Tank)	704
17A	A23519	Fill Valve w/Flow Washer & Straight 3/8" Compression Fitting	701
17B	B4480	Fill Valve w/Flow Washer & 90 Degree 3/8" Compression Fitting	703
17C	B4481	Fill Valve Assembly Less Flow Washer	704
18A	A8608	O-Ring for Tank Drain Adapter	701
18B	A9617	O-Ring for Tank Drain Adapter	703,704
19A	C2042	Tank Drain Adapter Less O-Ring	701
19B	C2078	Tank Drain Adapter Less O-Ring	703, 704
20	D248	Drain Cup	701,703,704
21	A9571	Screw, Drain Cup #10-32 (2" Long)	701,703,704
22	B2859	Gasket, Drain Cup	701,703,704
23	C1838A	Fill Cup	701,703,704
*24	B2929	Mounting Bracket, Fill Cup	703,704
25	A9016A-12	Tube, Fill Valve to Fill Cup 27-1/2" x 3/8"	701,703
*26	A9016-2	Tube, Fill Valve to Fill Cup Tee, 1-1/2" x 3/8" (Reinforced)	704
*27	A9016A-9	Tube, Fill Cup Tee To Cup #1, 21" x 3/8"	704
*28	A9016A-13	Tube, Fill Cup Tee To Cup #2, 38" x 3/8"	704
29A	A8567-18	Tube, Fill Cup Overflow 19" x 5/8"	701
29B	A8567-17	Tube, Fill Cup Overflow 31" x 5/8"	703,704
30A	A8567-19	Tube, Fill Cup to Tee, 9-1/2" x 5/8"	701
30B	A8567-11	Tube, Fill Cup to Tee, 14" x 5/8"	703,704
31A	A9016A-8	Tube, Tee to Float Switch, 10-1/2" x 3/8"	701
31B	A9016A-2	Tube, Tee to Float Switch, 17" x 3/8"	703,704
32A	A8567-19	Tube, Tee to Adapter, 9-1/2" x 5/8"	701
32B	A8567-16	Tube, Tee to Adapter, 12-1/4" x 5/8"	703,704
33	A8567-10	Tube, Adapter to Drain Valve, 1-3/4" x 5/8"	701,703,704
34	A9620-1	Tube, Tank/Cabinet Drain, 18" x 1"	701,703,704
*35	B2740	Flow Control Tee (Fill Cup Tee)	704
*36	B2578	Float Switch Chamber Bracket	701,703,704
*37	A9472	Fill Tubing Tee	701,703,704
*38	B2250	Steam Hose, ID 1-1/2" x 9-5/8"	701,703,704
*39	B2851	Steam Hose, ID 2" x 12"	703,704
40A	B2716-11	3/8" Tube Flat Hose Clamp used at Float Switch/Fill Valve	701,703,704
40B	B2716-15	3/8" Tube Flat Hose Clamp used at Fill Tee/Fill Cup	701,703,704
*41	B2716-18	5/8" Tube Flat Hose Clamp	701,703,704
42	B2911-8	Drain Valve Hose Clamp	701,703,704
*43	A8433-5	1-1/2" Steam Hose Clamp	701,703,704
*44	A8433-10	2" Steam Hose Clamp	703,704
*45	B2911-6	7/8" Fill Cup Tee Hose Clamp	704
*63	A9472	Pipe Tee 5/8" x 5/8" x 3/8"	703,704

* Item Not Shown

See Drawings on Page 28

Electrical Parts

Item	Part No.	Description	Used On
46	C2059	Display PC Board	701,703,704
47A	A22925	Control PC Board Less Current Module	701
47B	A22926	Control PC Board Less Current Module	703,704
48A	B2895-7	CM-7 Current Module	701,703,704
48B	B2895-12	CM-12 Current Module	701,703,704
48C	B2895-14	CM-14 Current Module	701,703,704
48D	B2895-16	CM-16 Current Module	701,703,704
48E	B2895-20	CM-20 Current Module	701,703,704
48F	B2895-24	CM-24 Current Module	701,703,704
48G	B2895-32	CM-32 Current Module	701,703,704
48H	B2895-40	CM-40Current Module	701,703,704
48I	B2895-48	CM-48 Current Module	701,703,704
49	B1992B	Current Transformer	701,703,704
50	B2721	Elec Contactor 50 Amp	701,703,704
51	A10094	Fuse, 3 Amp, Set of 2	701,703,704
52A	C1833	Power Transformer (120v)	701,703,704
52B	C1833F	Power Transformer (208v)	701,703,704
52C	C1833G	Power Transformer (240v)	701,703,704
52D	C1833C	Power Transformer (277v)	701,703,704
52E	C1833H-1	Power Transformer (346v)	701,703,704
52F	C1833D	Power Transformer (380v)	701,703,704
52G	C1833H-2	Power Transformer (415v)	701,703,704
52H	C1833B	Power Transformer (480v)	701,703,704
52I	C1833A	Power Transformer (600v)	701,703,704
53	B2857	Cable Assy-Hex Display	701,703,704
54	B2856	Cable Assy-LED Display	701,703,704
55A	D348	Wire Harness	701
55B	D296	Wire Harness	703,704
56A	B2419	Tank Power Lead w/Terminal 19-1/2"	701
56B	B2853-13	Tank Power Lead w/Terminal 36"	703,704
56C	B2853-14	Tank Power Lead w/Terminal 50"	704
57A	B2334-11	Contactor Power Lead 12-1/2"	701
57B	B2854-1	Contactor Power Lead 5-1/2"	703,704
*58A	B2925-1	Tank Jumper Lead 10" 1 Ph	703,704
58B	B2925-2	Tank Jumper Lead 14-1/2" 3 Ph	703,704
*59	B2718-1	Wire Ext. for Contactor #2	704
*60	B2718-3	Wire Ext. for Drain Valve #2	704
61	A8649	Fuse Block	701,703,704
62	B2414-3	Quick Disconnect 3 Terminal Block	701,703,704

*Item Not Shown

See Drawings on Page 28

- A23168 lock and key set for cabinet 701, 703, 704

Figure 28-1. EHU-700 Parts List

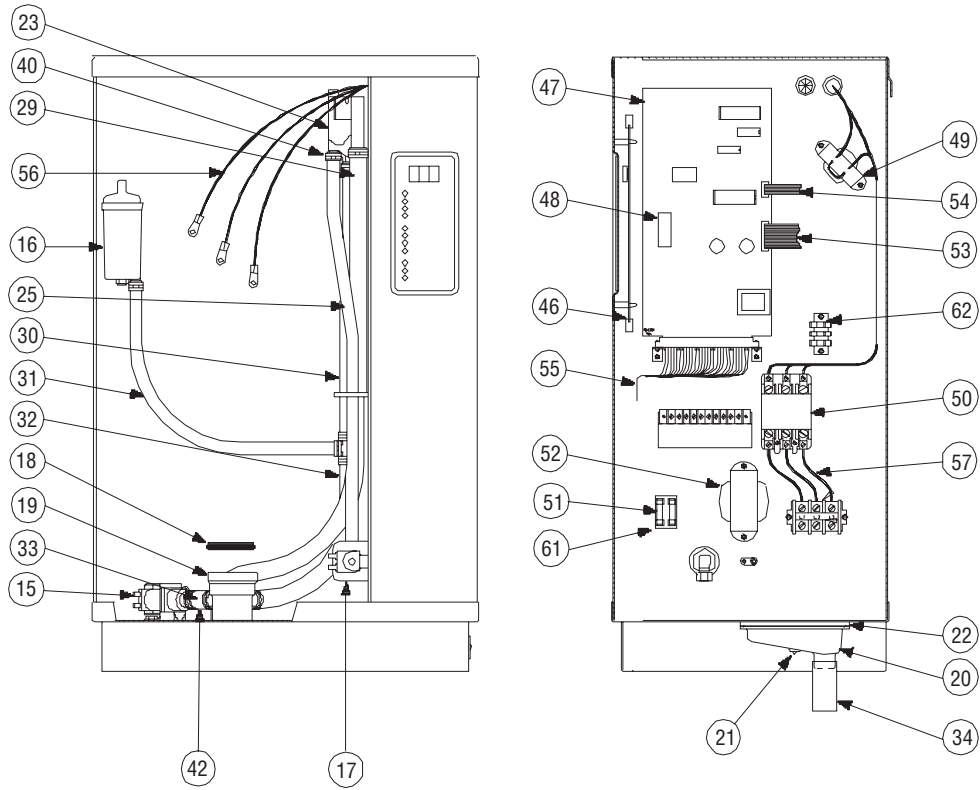
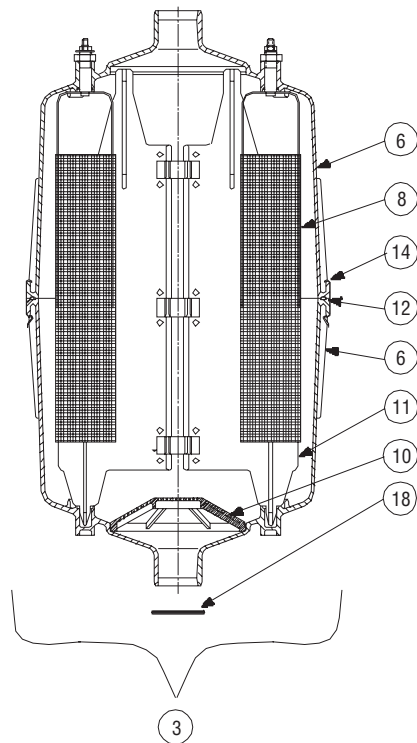


Figure 28-2. EHU-700 Steam Generator Repair Parts List



RECOMMENDED MAINTENANCE SCHEDULE

1 TO 2 DAYS AFTER START UP

- 1) Check unit operation.
- 2) Look in drain pan for leaks.
- 3) Check steam piping for leaks.
- 4) Observe duct low points for signs of poor humidity distribution.
- 5) Be sure unit is draining freely by pushing the manual drain button (the manual tank off button should not be depressed).

1 MONTH TO 1 YEAR

- 1) Repeat the 5 steps outlined above.
- 2) Clean, repair, or replace steam generator.

STEAM GENERATOR MAINTENANCE

General:

The steam generator is basically the only part of the EHU that requires regular maintenance. This maintenance may include cleaning or replacing the tank itself or the electrodes. We recommend substituting a spare generator in order to minimize downtime and labor requirements. The replaced generator may then be serviced when it is convenient.

Tank Cleaning:

As the water in the steam generator boils away, the minerals in that water come out of suspension and are deposited on the walls of the tank and on the electrodes. This process leaves the tank walls coated with a white or light brown colored mineral buildup. This buildup may be anywhere from soft and chalky to rock hard. The automatic drain cycle will minimize mineral buildup but, eventually, the tank will need cleaning.

Tank cleaning is indicated when:

- a) The unit has been in service for a period of time, a solids buildup is visible through the tank walls, and the "normal" water level in the tank is rising, or;
- b) The tank cleaning message (C02) is displayed.

TO CLEAN THE TANK, PLEASE REFER TO THE "TANK REMOVAL AND REPLACEMENT" AND THE "STEAM GENERATOR CHEMICAL CLEANING PROCESS" SECTIONS OF THIS MANUAL. (PAGE 30)

Tank Replacement:

Tank replacement is indicated if the tank body becomes deformed in any way, as this could cause leakage around the o-ring.

TO REPLACE THE TANK, PLEASE REFER TO THE "TANK REMOVAL AND REPLACEMENT" SECTION OF THIS MANUAL. (Page 30)

Electrode Replacement:

Electrode disintegration generally starts due to high conductivity water being present in the steam generator. Electrode disintegration sometimes occurs as a result of a combination of the following factors:

- a) High voltage (especially 480 and 600 volts);
- b) Hard water (in excess of 20 grains/gal.);
- c) **Any** unit with a malfunctioning drain system;
- d) Softened water.

If the electrodes begin to disintegrate, the tank may turn black or red, and arcing or flashing may be visible inside the tank while it is operating. IF YOU NOTICE EXCESSIVE ARCING, SHUT THE UNIT OFF AND CALL THE FACTORY BEFORE RE-STARTING UNIT.

To replace the electrodes, please refer to the “Tank Disassembly and Electrode Replacement” Section of this manual. (Page 33)

RECOMMENDED PROCEDURE FOR STEAM GENERATOR TANK AND ELECTRODE REMOVAL, CLEANING, REPAIR AND REPLACEMENT

TANK REMOVAL AND REPLACEMENT - ALL MODELS

- 1) Turn steam generator tank off by pressing tank off button.
- 2) Drain the tank by pressing the drain button. It may take five minutes for a full tank to completely drain.
- 3) Once the tank is completely empty, turn off the power at the main disconnect or breaker.
- 4) Disconnect the steam hose from the top of the steam generator tank by loosening the hose clamp with a screwdriver or 5/16” nutdriver. **BE CAREFUL!** The tank may still be hot to the touch, and some steam may still be condensing in the tank.
- 5) Disconnect the power leads at the steam generator with a 7/16” wrench (three leads for 3-phase units, two leads for single phase). See wiring diagram, Figure 12-1, for more details.
- 6) Remove the tank from the cabinet by lifting it out of the drain adaptor. **BE CAREFUL!** The tank may still contain hot steam or condensate.
- 7) It is preferable that you replace the tank with a new or rebuilt unit and take the current tank to the shop for servicing.
- 8) Install the tank into the EHU by lowering it into the drain adaptor. A small amount of high temperature grease or silicone lubricant may be used on the drain adaptor o-ring to help it seal properly. After a couple of tank replacements the o-ring should be replaced as well.
- 9) Connect power leads and, on EHU-703 and 704, the loose end of the jumper wires to electrode studs using a 7/16” wrench (three leads for 3-phase units, two for single phase). Refer to the wiring diagram in your unit for specific information.
- 10) Connect the steam hose to the top of the steam generator with the hose clamp.
- 11) Check all wiring connections at the main power, contactor, and control voltage terminal blocks (Figure 14-1), as well as on the generator itself. Energize the circuit breaker or main disconnect. Refer to Start-up Section if you encounter any problems when restarting the unit.

STEAM GENERATOR CHEMICAL CLEANING PROCEDURE

This procedure is intended as a guide only for the chemical cleaning of the generator in all EHU models. Read and follow label directions on any cleaning product. Check local codes before disposing of chemicals.

Caution: Muriatic acid can cause severe chemical burns if not handled properly. Wear rubber gloves and eye protection when using. Read and follow carefully the safety procedures on the package.

- 1) Obtain several gallons of muriatic acid. Muriatic acid is the name for commercial hydrochloric acid. It is available in most hardware, pool chemical, or farm supply outlets.
- 2) Remove the tank, following the "Tank Removal" directions in this manual.
- 3) Let the steam generator tank cool after removal from the EHU unit.
- 4) Split the tank, referring to the directions on page 33 of this manual, and examine the inside of the tank and the electrodes.
 - a. If the tank is black or dark brown, the electrodes may have disintegrated and chemical cleaning may not be effective. The tank can be cleaned with the following process, but the electrodes may need to be replaced.
 - b. If tank and electrodes have a white/tan/grey mineral accumulations and/or the tank is partially filled with loose lime accumulations, proceed with chemical cleaning.
- 5) Empty any loose deposits from the bottom tank half. Both tank halves and the barrier assembly, if present, can be cleaned using a scraper, a stiff bristle brush, and water spray as required. Refer to the directions on page 33 of this manual for details on removing the drain screen for further cleaning, if necessary.
- 6) Remove the electrodes from the upper tank half, following the directions on page 33 of this manual. Loose and/or soft deposits should be scraped from the exterior of the electrodes before chemical cleaning.
- 7) Prepare the chemical cleaning solution as per manufacturer's recommendations and fill a plastic bucket to a sufficient level to soak the electrodes. Be certain not to submerge the electrodes beyond the level of the screen.
- 8) Let the cleaning action take place for 15 minutes. Remove the electrodes from the bucket and rinse them thoroughly with a clean water spray.
- 9) Observe the electrodes to determine if another treatment is necessary.
- 10) It is not necessary for the electrodes to be cleaned down to bare metal. Removal of major accumulations is the only requirement.
- 11) Helpful Hints:
 - * Check the drain valve for proper operation & good flow when the tank is drained prior to removal.
 - * With the tank removed, inspect the drain adaptor and hose from adaptor to drain valve to ensure that it is free from deposits which may interfere with proper drainage.

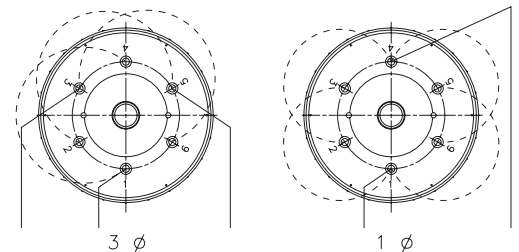
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- 12) Reassemble tank. Make sure o-rings are still on electrode terminals. Also check condition of steam generator o-ring. After a couple cleanings, it will need to be replaced. Make sure o-ring is sealed in its groove and not pinched when halves are put together. Do not over-tighten nuts that hold electrodes in place. This is an o-ring seal so nuts should be “snug”.
 - 13) Re-install the steam generator tank. Check out for proper operation.

TANK DISASSEMBLY, CLEANING, AND ELECTRODE REPLACEMENT

MODELS EHU-703 AND 704, SINGLE AND THREE PHASE

- 1) Using a 7/16" wrench, disconnect the jumper wires from the steam generator.
- 2) Remove 24 metal clips by pushing gently on top of each clip with a screwdriver while cupping the clip with the other hand.
- 3) Lift the top half of the tank free of the bottom half and rest it on the electrodes. Use a 3/4" wrench to loosen and remove the nuts from the six electrode studs.
- 4) Lift the top tank half from the electrodes. Remove the o-ring from the lower tank half o-ring channel and put it aside for re-use. On high voltage units, lift the barrier assembly out of the bottom tank half.
- 5) Clean the tank halves and the barrier assembly (Figure 35-1), if applicable, using a scraper, stiff bristle brush, and/or water spray. Rinse the unit with clear water. If necessary, the drain screen may be removed for cleaning by removing three screws and pushing up through the bottom tank connection with a screwdriver handle or other blunt object. The drain screen snaps back into place and is SECURED BY THE 3 SCREWS after cleaning. **BOTH THE BARRIER ASSEMBLY AND THE DRAIN SCREEN SHOULD BE REPLACED WITH NEW PARTS IF THEY ARE UNSERVICEABLE.**
- 6) Install one electrode in the top tank half. Make sure the small o-ring is located at the bottom of the electrode stud. Push the electrode through one of the holes in the upper tank half. Slowly turn the electrode until it locks in place. Thread a nut, finger tight, onto the electrode stud. Repeat this process with the other five electrodes.
- 7) Turn the tank top half upright and rest it on the electrodes. Tighten the nuts on all the electrode studs with a 3/4" wrench, so they are just snug.
- 8) Install the electrode jumper wires to the studs at the top of the tank. Fasten one end of the jumper wire with a washer and a 1/4" hex nut, using a 7/16" wrench. There are three jumpers on a three-phase unit, and four jumpers on a single phase unit. On a single phase unit you should have only two loose ends (Figure 34-1).
- 9) Install the o-ring in the bottom tank half o-ring channel. A third hand or weight may be needed to hold one end of the o-ring in place while the other end is being installed.
- 10) Install the barrier assembly in the bottom tank half.
- 11) Lower the top tank half onto the bottom tank half. Line up the marks on the rim of the top and bottom tank halves to properly center the electrodes.
- 12) Look trough the top connection to make sure the o-ring is still in place.
- 13) Snap a metal clip over the flanges of the tank halves, midway between two alignment marks. Position another clip on the opposite side of the tank. Install all 24 clips in this manner.

Figure 34-1.



MODEL EHU-701, SINGLE AND THREE PHASE

- 1) Remove 24 metal clips by pushing gently on top of each clip with a screwdriver while cupping the clip with the other hand.
- 2) Clean the inside of the steam generator thoroughly using a scraper, stiff bristle brush and/or water spray and rinse with clear water.
- 3) High voltage units are supplied with a barrier/drain screen assembly in the lower tank half to increase tank life. Inspect the barrier/drain screen assembly and replace if necessary.
- 4) Place a flat washer and O-ring on each $\frac{1}{4}$ " electrode stud and push the studs through the holes in the upper tank half (Figure 35-2).
- 5) The mounting hole on each electrode is attached to the tank top with a slotted self-tapping screw.
- 6) From the outside, install a flat washer and $\frac{1}{4}$ " hex nut on each electrode stud. Tighten these with a $\frac{7}{16}$ " wrench so they are just snug (Figure 35-2).

Figure 35-1

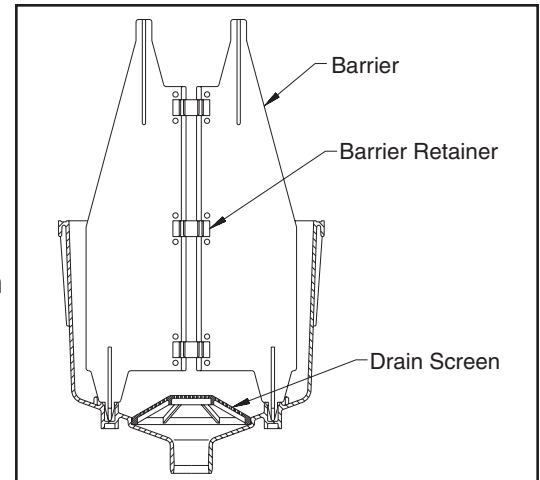
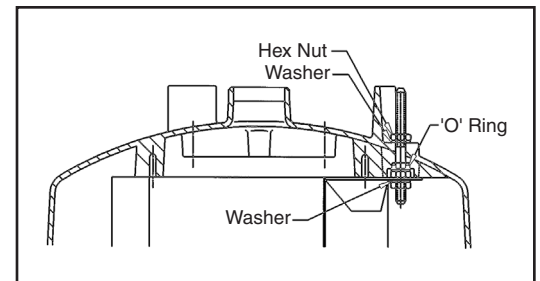


Figure 35-2



FILL AND DRAIN SYSTEM REPAIR

General:

In the event of a "drain system failure" (C05) or a "fill system failure" (C06) indication on the three digit numerical display, perform the following steps to identify and correct the fault.

Drain System Failure:

Check for drain valve operation. With the unit on; press the tank on/off button, turning off the tank contactor (tank off light illuminated). Press the manual drain button. The drain light should go on and you should hear the drain valve operate with a sharp click. Repeatedly activate the manual drain button to determine if the valve is operating.

- 1) If the drain valve does not operate but the drain light is on, check for 24 VAC between the two leads on the drain valve (Figure 28-1, 28-2). After checking, **TURN THE POWER OFF**.
 - a) If 24 VAC was **NOT** found, check wiring continuity to the circuit board. Repair broken wires as necessary. If wires are intact, call the factory for assistance.
 - b) If 24 VAC **WAS** found, measure the coil resistance of the drain valve with the leads disconnected. The coil resistance should be 10 ohms; if it is not, replace the drain valve.
- 2) If the drain valves can be heard to operate but no water drains out, **TURN THE POWER OFF** then:
 - a) Check for a plugged drain valve and/or plugged drain adaptor. It is often possible to see an accumulation of solids in the inlet to the drain valve or in the neck of the steam generator. If this is the case, remove the generator and clean out the drain valve and tank drain adaptor. See tank removal section on Page 33.

-
- b) While the tank is out, look into the lower end of the tank. Make sure the drain screen is in place. Also check for accumulations of lime at the bottom of the tank. Refer to “Steam Generator Disassembly” and “Cleaning Procedure” sections to rectify these problems.
 - 3) If the tank drains well when the water level is high but poorly or not at all when it is low, check the duct pressure where the dispersion tube is mounted. A **negative** duct pressure can cause drainage problems. While this is relatively rare, it has been known to happen.
 - 4) If the water backs up into the drain pan inside the unit, check for a blocked drain cup under the pan. If the drain cup is OK, check the drain piping for an accumulation of solids. Clean as required and increase the pitch of the drain piping if necessary. If long runs of horizontal drain pipe cannot be avoided, it may be necessary to develop some kind of drain flushing system. An air gap in between drain piping and drain hose from the EHU will allow “burping” of air from drain piping.

Fill System Failure:

Make sure the drain valve is not leaking. A leaking drain valve may appear to the humidifier as a fill system failure.

Check to see that the fill valve is operating. While the fill light is on, disconnect one of the fill valve leads (Figure 28-1, 28-2), then momentarily touch the lug to the coil terminal. You should be able to hear the valve operate.

- 1) If the fill light is on, but the valve is not operating, check for 24 VAC between the valve lead wires. After checking, **TURN OFF THE POWER.**
 - a) If 24 VAC **WAS NOT** found, check the continuity of the wires back to the circuit board. Repair broken wires as necessary. If wires are intact, call the factory for assistance.
 - b) If 24 VAC **WAS** found, disconnect the fill valve leads and check the coil resistance. It should be 18 ohms. Replace the coil if necessary.
- 2) If the fill valve is operating but the unit fills too slowly, check for either low water pressure (less than 25 psi) or a partially plugged screen inside the inlet fitting. If the screen tends to plug too easily, it may well be removed and replaced by a larger filter in the water line external to the unit. (**NOTE:** the nominal flow rate valve should be 0.31 gal/min. for each tank. The flow rate is regulated by a flow washer in the valve inlet or on the EHU-704 by flow washers in the brass tee immediately downstream of the fill valve.)
- 3) If the valve makes humming or buzzing noises but fails to open:
 - a) Check for high water pressure (over 125 psi).
 - b) If a backflow preventer is used, crack open a fitting between the backflow preventer and the fill valve. If this causes the fill valve to open, remove the backflow preventer from the system. Backflow preventers are not needed as the Series EHU-700 incorporates a 1 inch air gap as an anti-siphon feature.

For additional information on Armstrong Series EHU-700 Humidifiers, contact your Armstrong Representative and request Bulletin No. 596.

AUTOCAL PROCEDURE

1. Measure the room humidity near the humidistat with an accurate hygrometer.
2. Turn the humidistat set point dial to match the reading of the hygrometer.
3. Push and hold the Autocal button for more than 3 seconds or until the internal red light turns On and Off.

SENSOR FAILURE PROTECTION

The sensor is the most sensitive part of the humidistat and also the most exposed. In the case of a sensor failure in humidification mode, the humidistat will automatically assume a fail-safe output of 0%.

SPECIFICATIONS

Operating Conditions: 5°C to 50°C (32°F to 122°F)

- Control: 0% to 95% R.H. non-condensing
- Sensor: 0% to 100% R.H. (see Note 1.)

Resolution: ± 0.1 %

Repeatability: 0.5 %

Accuracy and sensor interchangeability:
± 2% R.H. from 0 to 100% R.H.

Range: 10% to 90% R.H. for 5 to 50°C
(41°F to 122°F)

Temperature effect: 0.05% / °F

Outputs: Isolated Triac: 30 Vac at ½ A max.*
0 to 5 VDC into 1 KΩ resistance min.
0 to 10 VDC into 2 KΩ resistance min.
0/5 VDC at 20 mA max. for both outputs.

Power: 24 VAC -15%, +10%; 50/60 Hz; 2 VA

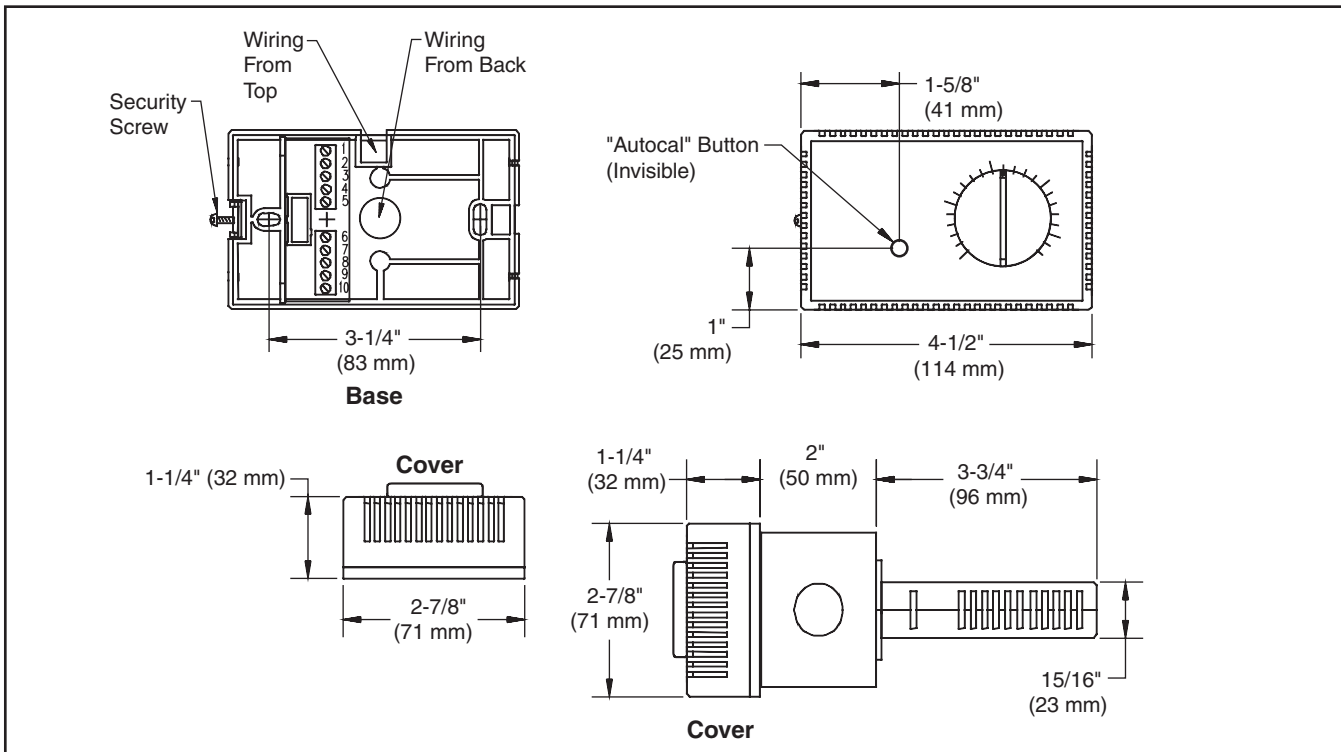
Base and casing: Off-white; self extinguishing ABS plastic

* Triac outputs can only switch AC loads. Use relays when switching dc loads.

Note 1. Humidity sensor: Solid state humidity sensor. Suitable for normal, clean air. Not to be used in corrosive or harmful environment.

DIMENSIONS

Figure 37-1. Dimension drawing. Duct Humidistat



Note: Specifications and equipment are subject to change without prior notice.

TABLE 5: SENSOR CHARACTERISTICS

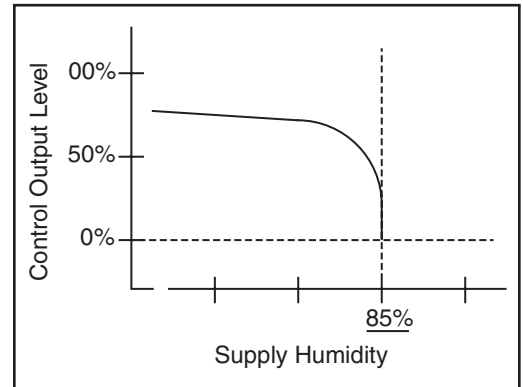
Voltage between black and white wire, terminals #6 and #7

HUMIDITY	SENSOR OUTPUT
0%	1.05 V
5%	1.19 V
10%	1.34 V
15%	1.48 V
20%	1.63 V
25%	1.77 V
30%	1.92 V
35%	2.06 V
40%	2.20 V
45%	2.35 V
50%	2.49 V
55%	2.64 V
60%	2.78 V
65%	2.93 V
70%	3.07 V
75%	3.21 V
80%	3.36 V
85%	3.50 V
90%	3.65 V
95%	3.79 V
100%	3.94 V

AIR SUPPLY HIGH LIMIT HUMIDITY SENSOR

The A 17898 (H270) includes a high limit circuit. This allows the use of a second humidity in the supply air. Input signal goes to terminals #8 on the humidistat. High limit set point is preprogrammed at 85%. It can be readjusted using the A19517 service tool. **If you don't use the high limit feature, connect a 1 Meg Ω , 1/4 watt resistor between terminals 8 and 10 (supplied with the humidistat). Remember: this high limit function is not a safety device. For critical situations, provide installation with normal protections required to ensure a safe operation.**

Table 4: Example showing proportional high limit override signal in supply duct.



HUMIDITY SET POINT RESET BY OUTSIDE TEMPERATURE

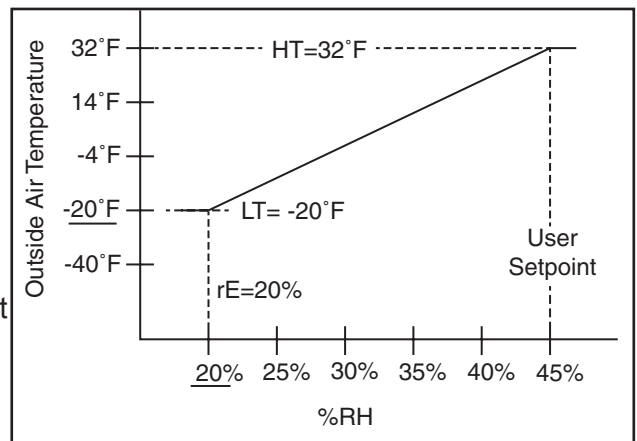
The A17898 (H270) humidistat has an optional outdoor temperature sensor. This sensor is used to reset the humidity set point during the cold season to minimize condensation on windows and building structures.

When the outdoor temperature falls below the selected high temperature, parameter **HT** (32°F in the example Figure 41-2), the humidity set point will start to decrease. The lowest humidity set point will be reached at selected low temperature, parameter **LT** (-20°F).

The set point decrease from original set point down to the lowest set point determined by the parameter **rE**.

In example, Figure 41-2, **rE** was set to 20%, therefore the humidity set point dropped from 45% to 20%.

Figure 38-1



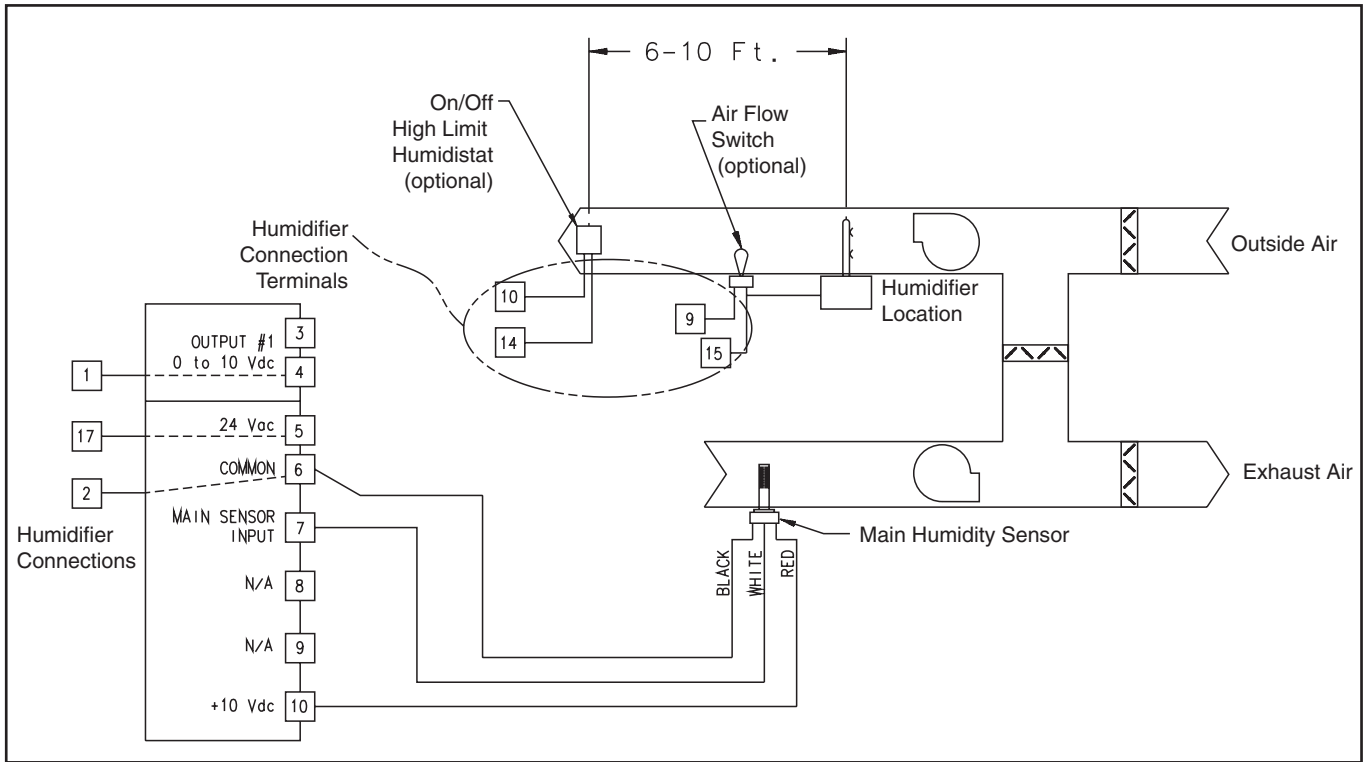
If you don't use the outdoor reset feature, put a jumper between terminals 6 and 9 (supplied with the humidistat).

APPLICATION EXAMPLE

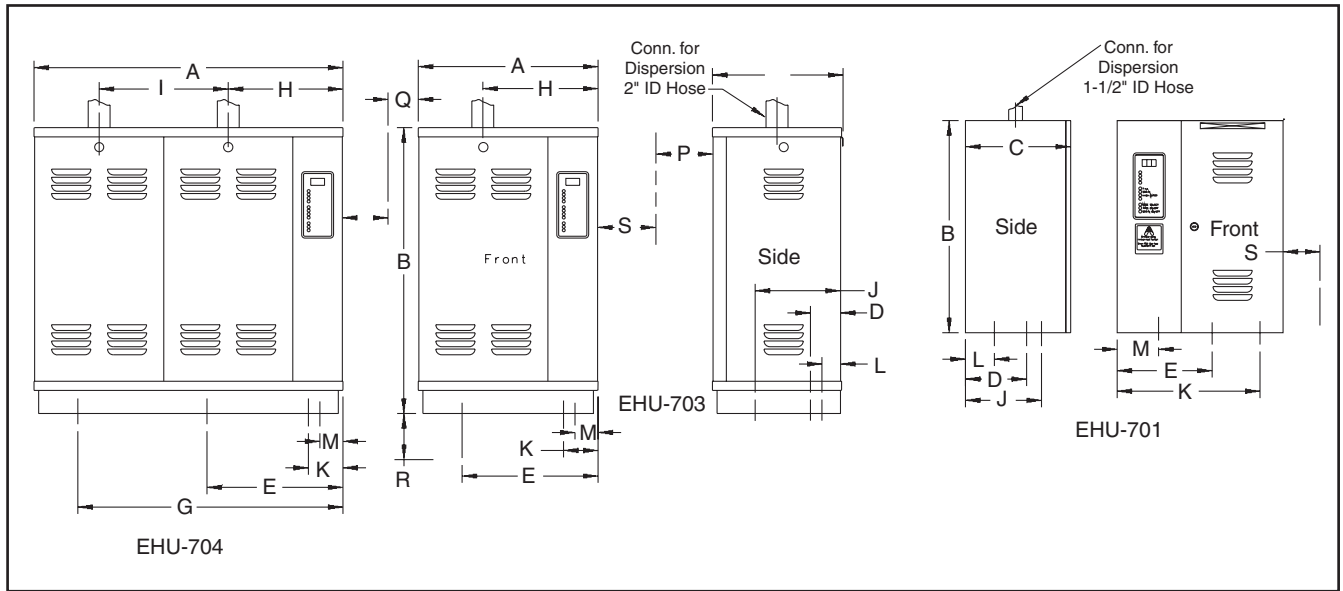
Steam humidification system controlled by a 0 to 10 Vdc valve wired to output #1. Remote humidity display using 0 to 5 Vdc signal is wired to output #2. The humidity sensor is located in the return air duct. A proportional high limit humidity sensor is installed in the supply duct. An outdoor temperature sensor is installed in the fresh air duct.

Humidistat model number: H270-69-13-10-31

Figure 39-1. Alternative Humidistat Wiring A17898 (H270)



DIMENSIONAL INFORMATION



Dimensions	EHU-701		EHU-703		EHU-704	
	in	mm	in	mm	in	mm
"A" Width	18	457	19-1/2	495	33-1/2	851
"B" Height	23	584	31	784	31	784
"C" Depth	11-1/2	292	14	356	14	356
"D" Tank Drain - Side	6-5/8	168	3-1/4	83	3-1/4	83
"E" Tank Drain - Front	10-5/16	262	14-3/4	375	14-3/4	375
"G" Tank #2 Drain - Front	—		—		28-3/4	730
"H" Steam Outlet #1	12-1/2	318	12-1/2	318	12-1/2	318
"I" Steam Outlet #2	—		—		14	356
"J" Water Supply - Side*	8-1/4	210	9-1/4	235	9-1/4	235
"K" Water Supply - Front*	15-1/2	394	3-3/4	95	3-3/4	95
"L" Electric Supply - Side	3-1/8	80	2	51	2	51
"M" Electric Supply - Front	4-1/2	114	2-1/2	64	2-1/2	64
"P" Clearance - Front	18	457	24	610	24	610
"Q" Clearance - Left	4	102	4	102	4	102
"R" Clearance - Bottom	5	127	5	127	5	127
"S" Clearance - Right	4	102	24	610	24	610

*Water supply connection 3/8" compression. (701 & 703: fill rate 0.31 gpm, 704: fill rate 0.62 gpm)

Unit is designed to mount on 16" centers.

2 Lag screws & Bracket are provided for EHU-703 & EHU-704.

Drain connection use 1" ID Hose. (Supplied) Drain rate 3 gpm.

LIMITED WARRANTY AND REMEDY

Armstrong International, Inc. ("Armstrong") warrants to the original user of those products supplied by it and used in the service and in the manner for which they are intended, that such products shall be free from defects in material and workmanship for a period of one (1) year from the date of installation, but not longer than 15 months from the date of shipment from the factory, [unless a Special Warranty Period applies, as listed below]. This warranty does not extend to any product that has been subject to misuse, neglect or alteration after shipment from the Armstrong factory. Except as may be expressly provided in a written agreement between Armstrong and the user, which is signed by both parties, Armstrong DOES NOT MAKE ANY OTHER REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

The sole and exclusive remedy with respect to the above limited warranty or with respect to any other claim relating to the products or to defects or any condition or use of the products supplied by Armstrong, however caused, and whether such claim is based upon warranty, contract, negligence, strict liability, or any other basis or theory, is limited to Armstrong's repair or replacement of the part or product, excluding any labor or any other cost to remove or install said part or product, or at Armstrong's option, to repayment of the purchase price. As a condition of enforcing any rights or remedies relating to Armstrong products, notice of any warranty or other claim relating to the products must be given in writing to Armstrong: (i) within 30 days of last day of the applicable warranty period, or (ii) within 30 days of the date of the manifestation of the condition or occurrence giving rise to the claim, whichever is earlier. IN NO EVENT SHALL ARMSTRONG BE LIABLE FOR SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOSS OF USE OR PROFITS OR INTERRUPTION OF BUSINESS. The Limited Warranty and Remedy terms herein apply notwithstanding any contrary terms in any purchase order or form submitted or issued by any user, purchaser, or third party and all such contrary terms shall be deemed rejected by Armstrong.

Special Warranty Periods are as follows:

Series EHU-700 Electric Steam Humidifier, Series HC-4000 HumidClean Humidifier and GFH Gas Fired Humidifier with Ionic Beds:

Two (2) years after installation, but not longer than 27 months after shipment from Armstrong's factory.

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