

This Replacement Kit, Part Number H-690-0051/0058 replaces previous circuit board H-690-2398.

1. Remove analog controller
 - Disconnect all electric power to humidifier.
 - Remove fuse panel cover plate from top of cabinet and disconnect all wiring from external controls (humidistats, air flow switch, etc.).
 - Disconnect wiring harness(es) and two red overflow sensor wires from analog control board.
 - Loosen four screws on top of cabinet and remove analog controller module.
 - Remove cover panels from electrical compartment.

2. Replace overflow sensor
 - Locate the overflow sensor board. It is covered with black shrink tubing and has six wires, including the two red wires previously disconnected.
 - Disconnect the two blue wires from the wiring harness.
 - Disconnect the two white wires from the T-probe mounted in the overflow hose below the fill cup.
 - Remove the overflow sensor board.
 - Loosen the three hose clamps and remove the T-probe and short hose stub from the overflow line.
 - Using the hose clamps and 5/8" male connector provided, install the new sensor between the overflow line and fill cup.

3. Replace current-sensing transformer(s) (if necessary)

If your humidifier uses conventional rectangular-framed current-sensing transformers, you must replace with the circular transformers supplied. To prevent wiring errors, complete the full removal, replacement, and rewiring of each transformer one at a time before proceeding to the next.

 - For each transformer, disconnect the two 20 ga signal wires.
 - Loosen the appropriate screw at the power distribution block and unwind the single loop of 10 ga power wire.
 - Unscrew and remove the rectangular-framed transformer.
 - Using the plastic clamp supplied, screw the circular transformer to the backplane.
 - Making a **single pass only**, route the 10 ga power wire through the circular transformer and re-secure at the power distribution block.
 - Reconnect the two 20 ga signal wires.
 - Repeat for each additional transformer.

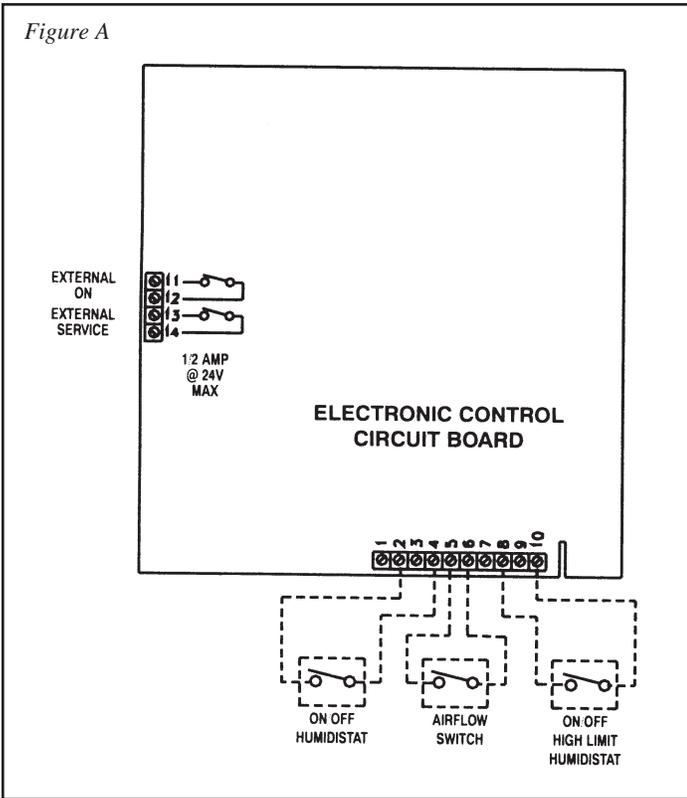
4. Install adaptor harness(es)
 - Ensuring proper match-up of wire colors, connect the 14-pin and 4 pin (if supplied) connectors on the adaptor harness to the respective connectors on the cabinet harness.
 - Secure the connectors using the 5" cable tie(s) provided.
 - Route the black coaxial overflow sensor cable following the same path as the two white sensor wires previously removed.
 - Connect the black coaxial cable to the overflow sensor previously installed.
 - Replace electrical cover panels and fuse panel cover plate.

5. Install digital controller
 - Remove the S-shaped metal clip from the flange on the left edge of the cabinet and replace with the new S-clip supplied (flat side facing outward).
 - Insert the lower left edge of the hinge on the digital controller module into the S-clip and position the support bracket inside the front upper left corner of the cabinet.
 - Secure using two screws through the top of the cabinet.
 - Swing the controller door open and connect the 6-pin connector from the adaptor harness to the right side of the control board.
 - Disconnect or cut the wire which runs from the output terminal of the 24VAC transformer to the backplane of the humidifier.
 - Connect the two red wires at the upper right corner marked "24VAC".
 - Connect the other 4-pin connectors at the lower left corner marked "Current Transformers".
 - Connect the black coaxial cable at the upper left corner marked "Hi-Water".
 - Reconnect the external controls as described in following sections.
 - Swing the controller door closed and secure to the cabinet flange at 3/4" square hole using the U-shaped metal clip supplied.

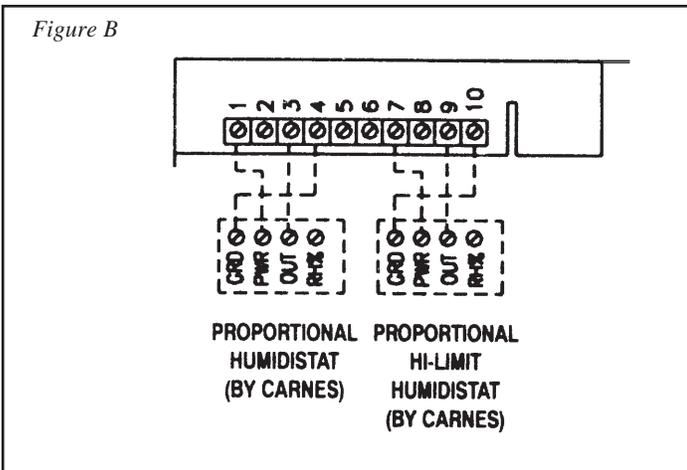
CONTROL CONNECTIONS

Two cylinder humidifiers may be wired for simultaneous or separate operation. Controls should be connected to the terminals on the electronic circuit board as shown below using No. 18 AWG wire. Avoid running control wiring near high voltage primary wires.

CONTROL CONNECTION TERMINALS



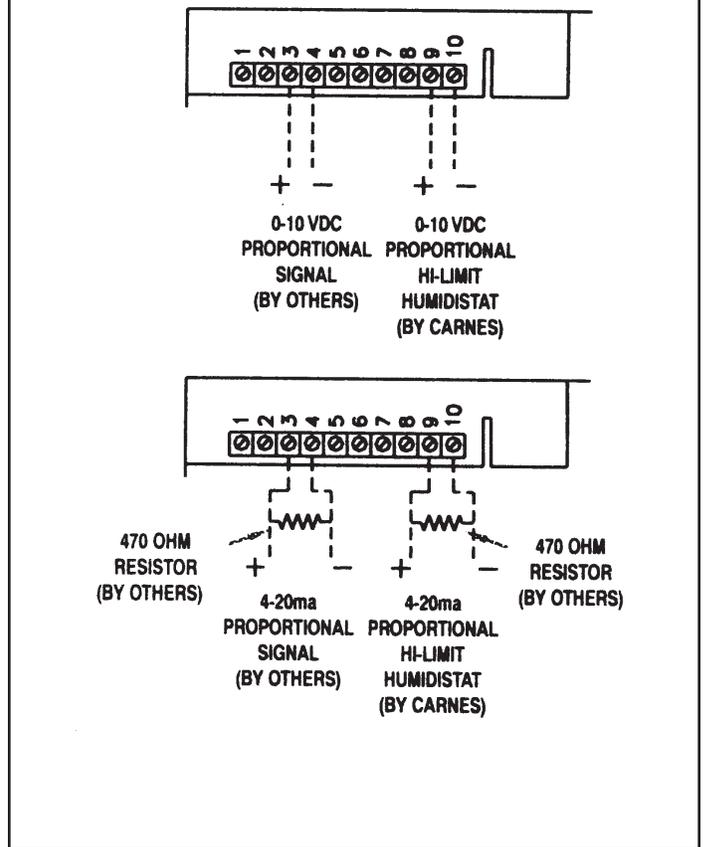
Connections shown in Figure A are for typical on-off controls. For Carnes proportional controls see the diagram below. Models HXHAG and HXHAH cannot be used with this circuit board.



EXTERNAL DDC CONTROL SIGNALS

Carnes humidifiers can also accept a 0-10 volt DC signal to modulate the output of the humidifier. Polarity must be observed. Input impedance is 20K ohms. If a 4-20 mA input signal is provided to the humidifier a 470 ohm 1/4 watt resistor must be installed as shown below.

Figure C



EXTERNAL MONITORING

Terminals 11 and 12, shown in Figure A are provided for indicating operation of the humidifier at a remote location. When the unit is operating terminals 11 and 12 are closed. Terminals 13 and 14 are provided to indicate the need for service. When the output of the humidifier is less than 50% of setpoint terminals 13 and 14 are closed. Each set of terminals are capable of switching 1/2 amp at 24 volts maximum.

CONTROL CONNECTIONS

IMPORTANT: TURN OFF POWER AT EXTERNAL DISCONNECT BEFORE MAKING ANY CONNECTIONS TO PREVENT POSSIBLE DAMAGE TO ELECTRONIC BOARD.

If an air flow switch or high limit humidistat is not used jumpers must be installed before the humidifier will operate.

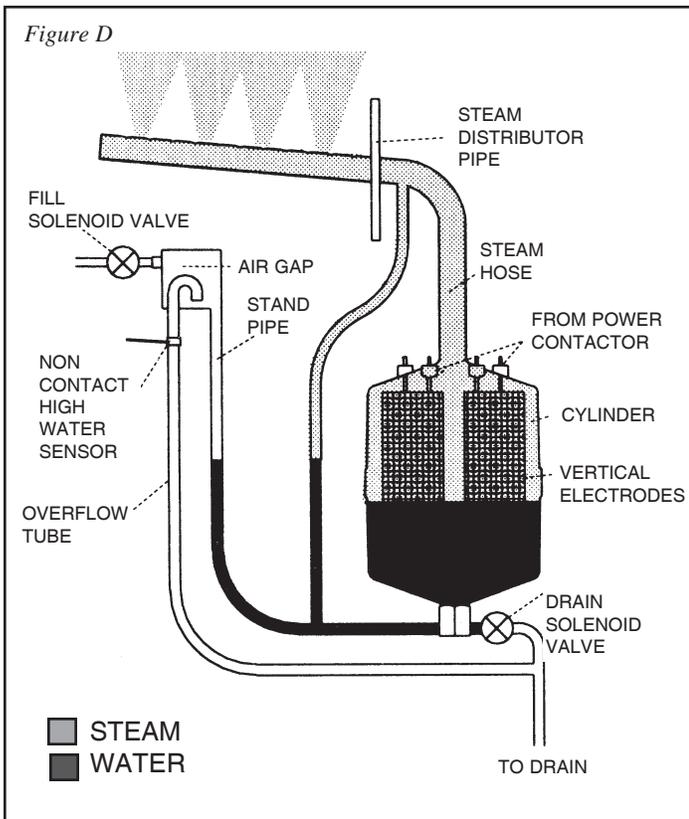
OPERATION

Upon a signal from external controls the circuit board opens a fill solenoid valve, allowing water to flow across an air gap into a standpipe. The standpipe provides a column of water to be fed into the cylinder using gravity. The air gap prevents back flow into the water supply and prevents the cylinder from becoming a pressure vessel. The steam cylinder operates at a pressure of approximately 1/2 psi.

The circuit board also closes a power contactor allowing current to flow to vertical electrodes sealed inside the cylinder. Current flows between the electrodes using minerals in the water as a conductor. The water is heated to boiling and converted to steam which leaves the cylinder through the flexible hose which is connected to the steam distributor pipe.

The circuit board reacts to current flow between the electrodes and automatically opens the fill solenoid valve when more water is required to maintain the desired output rate, and closes when the desired rate is reached. The operation of the drain solenoid valve is automatically controlled by the circuit board which responds to any changes in water conditions and drains the required quantity of water to provide stable operation and long cylinder life.

As mineral deposits build up within the cylinder the water level will slowly rise to uncover electrode surfaces to maintain the desired steam output rate. When mineral deposits have covered all available electrode surface areas, current flow will be reduced to a level where the desired steam output cannot be reached and the service light will signal the need for maintenance. When the cylinder is filled with minerals it is easily changed in less than five minutes.

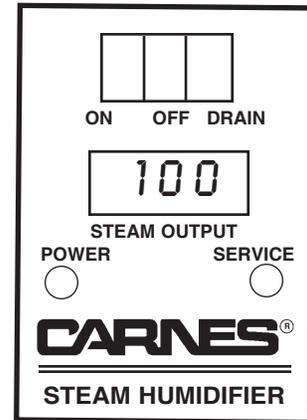


DISPLAYS AND INTERNAL CONTROLS

FRONT PANEL DISPLAYS & CONTROLS

The display on the front panel of the humidifier cabinet contains the “On-Off-Drain” switch, the LCD digital display and the “Power” and “Service” LED’s.

Figure E



“ON-OFF-DRAIN” SWITCH”

In the “On” position the humidifier will operate if all controls are calling for humidity. The “Off” position is used for seasonal shut down if desired. The “Drain” position is used to drain the water from the steam cylinder for maintenance. The fill solenoid valve will be on whenever the drain is activated to reduce the drain water temperature.

DIGITAL DISPLAY

This LCD display shows the steam output rate during normal operation. The display is factory set for pounds per hour but may be reset for kilograms per hour by the switch on the electronic control circuit board.

“POWER” LED

The “Service” is on whenever actual steam output is less than 50% of setpoint.

Both “Power” and “Service” may be monitored remotely if desired. See “External Monitoring” on page 2.

DIAGNOSTIC DISPLAY PANEL - Figure F (See Page 4)

PUSHBUTTONS

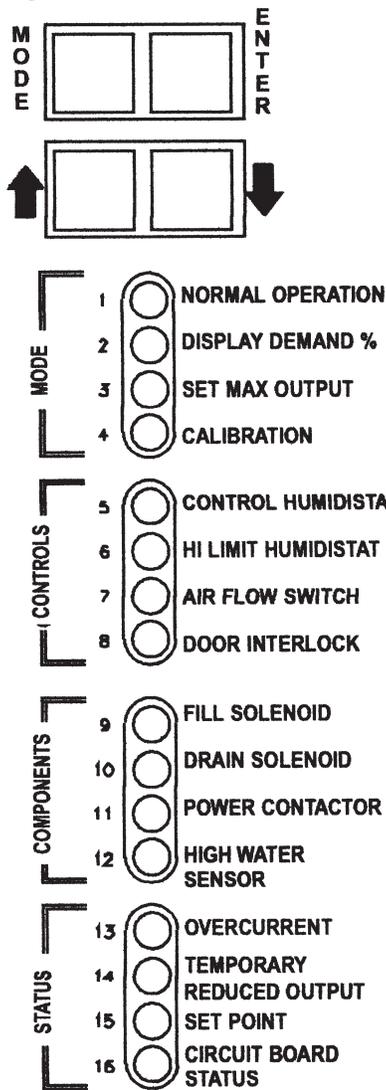
“Mode” button switches between “Normal Operation”, “Display Demand %”, “Set Max Output” and “Calibration” functions. “Enter” button is used with “Mode” button to reset maximum steam output values. Up ↑ and Down ↓ buttons are used to increase or decrease maximum steam output when mode is in the “Set Max Output” function.

“MODE”:

“Normal operation” function shows steam output rate in pounds per hour on digital display. Kilograms per hour may be selected by pulling up the button on the “Kg/Hr” switch on the circuit board.

“Display Demand %” function is selected by pressing the “Mode” button once. The digital display will then show the % demand from the humidistat connected to terminals 1, 2, 3 or 4 on the electronic circuit board. If an on-off type humidistat is used the display will read approximately “100”. If a proportional humidistat or DDC controls are used the display will then show the percent demand from 0 to 100%. For example if the input voltage between terminals 3 and 4 is 8 volts DC the display would indicate “80”.

Figure F



“Set Max Output” function is selected by pressing the “Mode” button once from “Display Demand %” function. The steam output may be set to a new maximum limit by first pressing “Enter” and then pressing the UP or DOWN buttons. When the desired maximum rate is shown on the digital display pressing the “Enter” button again sets the value into the memory of the circuit board. The steam output is normally left in the factory set maximum capacity and only limited to prevent condensation in the duct if necessary.

“Calibration” function is selected by pressing the “Mode” button once from the “Set Max Output” function. The digital display then shows a four-digit code indicating the voltage and maximum capacity of the humidifier. Pressing “Mode” again returns to “Normal Operation”. The function will automatically return to “Normal Operation” from any function after approximately five minutes.

“CONTROLS”:

Separate LED’s indicate that a signal is being received by the humidifier to operate. An unlit LED indicates that the specific control is not calling for humidity. All four LED’s must be on before the humidifier will operate.

“Control Humidistat” LED lights if an on-off humidistat terminals 2 and 4 is calling for humidity. It will also be on if voltage from a proportional humidistat or DDC control is connected to terminals 3 and 4 and the signal is above 3 volts DC. A 10 volt DC signal will call for maximum output and modulate proportionally down to 2 volts DC. The humidifier will be off below 2 volts DC.

“Hi Limit Humidistat” LED lights if an on-off limit humidistat is connected to terminals 8 and 10 and is allowing the humidifier to operate. It will also be on if a voltage from a proportional high limit humidistat or DDC control is connected to terminals 9 and 10 and the signal is above 3 volts DC. A 10 volt DC signal will call for maximum output and modulate proportionally down to 2 volts DC. The humidifier will be off below 2 volts DC. If a high limit humidistat is not used a jumper must be installed between terminals 8 and 10.

“Air Flow Switch” LED lights if an air flow switch is connected to terminals 5 and 6 and is allowing the humidifier to operate. If an air flow switch is not used, a jumper must be installed between terminals 5 and 6.

“Door Interlock” LED lights if the door interlock has been activated by pulling the button out for temporary manual operation or closing the door.

“COMPONENTS”:

“Fill solenoid” LED lights whenever the circuit board is sending 24 volts AC to the fill solenoid valve. The fill solenoid valve will cycle as necessary to provide the proper amount of water to operate. The fill solenoid is also open whenever the drain solenoid is activated to mix cooler water to lower the drain water temperature.

“Drain Solenoid” LED lights when the circuit board is sending 24 volts AC to the drain solenoid valve. The drain valve will operate when high water conductivity is reached in the steam cylinder. The valve is opened to drain some of the high mineral content water from the cylinder and replace it with fresh incoming water. This is not a preset repetitive cycle but is automatically determined by measurements made by the circuit board and only occurs when necessary to maintain proper conductivity in the steam cylinder. The drain solenoid also will open if the circuit board detects that high current is flowing to the steam cylinder. Opening the drain solenoid will lower the water level in the cylinder and reduce the current.

“Power Contactor” LED lights when the circuit board is sending 24 volts AC to the power contactor to supply primary voltage to the cylinder electrodes.

“High Water Sensor” LED lights when water has been detected by the sensor located on the overflow tube. This sensor detects water flowing through the tube by measuring a change in capacitance without making physical contact with the water. When overflow is detected, the fill solenoid valve is prevented from opening for approximately 10 minutes. The setpoint is temporarily reduced to prevent water from reaching the steam cylinder. The LED labeled “Temporary Reduced Output” will come on. This cycle may be repeated several times if the incoming water is very low in conductivity. As minerals build up in the water in the cylinder increasing its conductivity the setpoint will gradually increase until the full output capacity is reached. The length of this process will vary depending on the conductivity of the incoming water and may require several hours under certain conditions.

“STATUS”:

“Overcurrent” LED lights when the circuit board has detected a series of over current situations in the steam cylinder and has been unable to reduce the current by operating the drain solenoid valve. The humidifier is placed in a standby mode to prevent operation. The “Service” LED on the front panel will also be on to signal this condition. The “Overcurrent” LED is usually an indication that the drain solenoid valve or related plumbing is restricted and requires cleaning. A defective valve could also cause this failure.

“Temporary Reduced Output” LED is described in the “Components” section of this manual. This light may also be on with the “Service” LED at the end of steam cylinder life.

“Setpoint” lights whenever the actual steam output is at or above the setpoint of the humidifier or when the demand from a proportional humidistat or DDC control is reached. This light will be on and off during the normal operation cycle of the humidifier as water fills into the steam cylinder and is boiled away and filled again.

“Circuit Board” LED pulsing is normal and indicates that the microprocessor on the circuit board is functioning.

START UP & OPERATION

INITIAL START UP

While the external disconnect switch is off, be sure that the terminal connectors on top of the cylinder are firmly secured and pushed completely down over the pins in the cylinder.

1. Open all water supply valves external to the humidifier.
2. Turn external disconnect switch on.
3. Turn optional circuit breakers if present.
4. For safety, door interlock disconnects power to cylinder(s) when door is opened. Humidifier may be operated for service purposes by pulling out white button.

CAUTION: HIGH VOLTAGES ARE PRESENT.

5. Turn “On-Off-Drain” switch to “On” position. Green “On” LED should now be on.
6. Unit will now begin to operate if external controls are calling for humidity. See “Controls” on page 4 for details.
7. As water slowly fills into cylinder the digital display will begin to increase when water contacts electrodes.
8. The “Service” LED may come on until sufficient water has entered cylinder to provided 50% of setpoint.
9. Water will continue to fill until output is 10% above setpoint. If water reaches top of cylinder before setpoint is reached “High Water Sensor” will be activated and fill will stop. See “High Water Sensor” on page 4.
10. When starting with a new cylinder and fresh water the fill and drain solenoid valve may cycle for brief periods until water has come to a complete boil.
11. In areas with low conductivity water full output may not be reached until humidifier has conditioned the water by repeated cycles of filling, boiling and refilling. The length of this process will vary but may require several hours under certain conditions.

AUTOMATIC DRAIN CYCLE

The electronic circuit board automatically controls the operation of the drain solenoid valve to react to two situations:

CONTROLLING MINERAL CONTENT

1. When current reaches 10% above setpoint the fill solenoid valve closes and water gradually boils away in the cylinder. Because the quantity of water cover electrode surface is being reduced current slowly falls.
2. A timer in the electronic circuit board starts when current drops 95% of setpoint.

3. The timer runs for a predetermined time or until 90% of setpoint is reached.
4. If current changes to rapidly during the drop from 95 to 90% it indicates that a drain is necessary to reduce the mineral concentration of the water.
5. If current changes slowly it indicates that mineral concentration is satisfactory and a drain not necessary.
6. Measurements are made during each cycle and a drain only occurs when necessary thereby maximizing energy efficiency.
7. The circuit board opens to refill the cylinder to the proper level.

REDUCING OVERCURRENT

1. If current to any of the electrodes in the cylinder reaches more than 20% above the setpoint the drain solenoid valve opens.
2. Draining water from the cylinder reduces current by covering less electrode surface
3. If current is successfully reduced to acceptable levels normal operation continues.
4. If current is not reduced because of mineral blockage in the drain lines or solenoid valve the power contactor will be opened for approximately 15 seconds while the drain valve remains open.
5. If current is successfully reduced normal operation continues.
6. If current is not reduced the cycle is repeated 8 more times. If still unsuccessful unit is placed in standby mode and “Overcurrent” LED lights. See “Status” on page 5.

ADJUSTING STEAM OUTPUT RATE

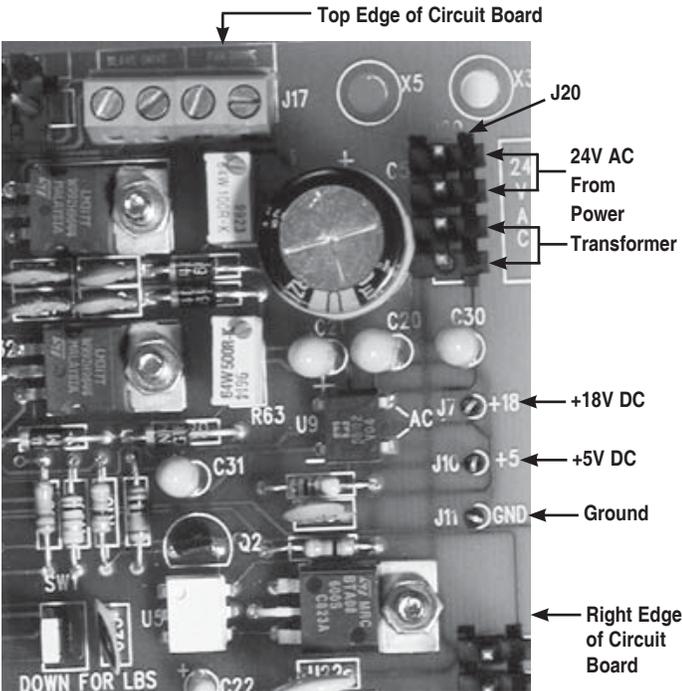
See “Set Max Output” on page 4 for additional details. To reset the maximum output value from the factory preset maximum follow the steps below:

1. Press “Mode” button until “Set Max Output” LED lights.
2. Press “Enter” once.
3. Press either UP ↑ or Down ↓ buttons until desired new maximum setting is shown on the digital display.
4. Press “Enter” once.
5. Press “Mode” until “Normal Operation” LED lights.

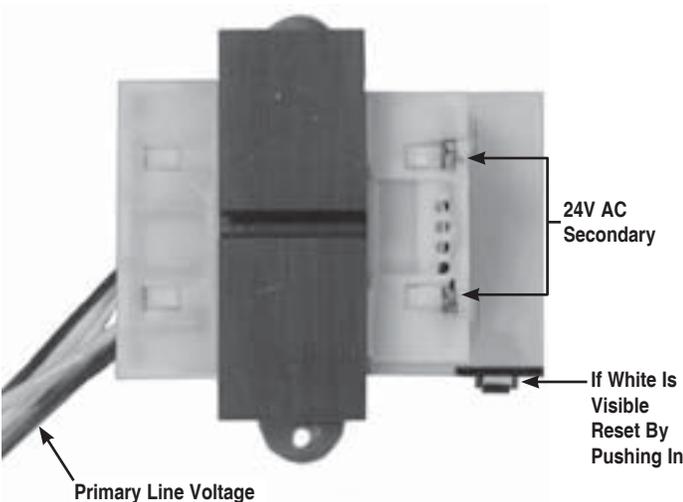
TROUBLE SHOOTING

SYMPTOM: NONE OF THE LIGHTS ARE ON

1. Verify that voltage being supplied to unit is same as listed on rating label on left hand side of cabinet.
2. If unit is three phase verify that all legs have power.
3. If unit has optional internal circuit breakers they must be on.
4. Verify that 24V AC is being supplied by power transformer by taking voltage reading at terminal strip J20 on two red wires coming from secondary of transformer. J20 is located on the top right hand corner of the electronic circuit board.



5. If 24V AC is not present reset the overload located on the transformer and recheck. If the transformer in your humidifier does not have a integral overload breaker as shown below, check the inline fuse in the adaptor harness. If necessary replace with type 2AG - 3 amp (slow blow).



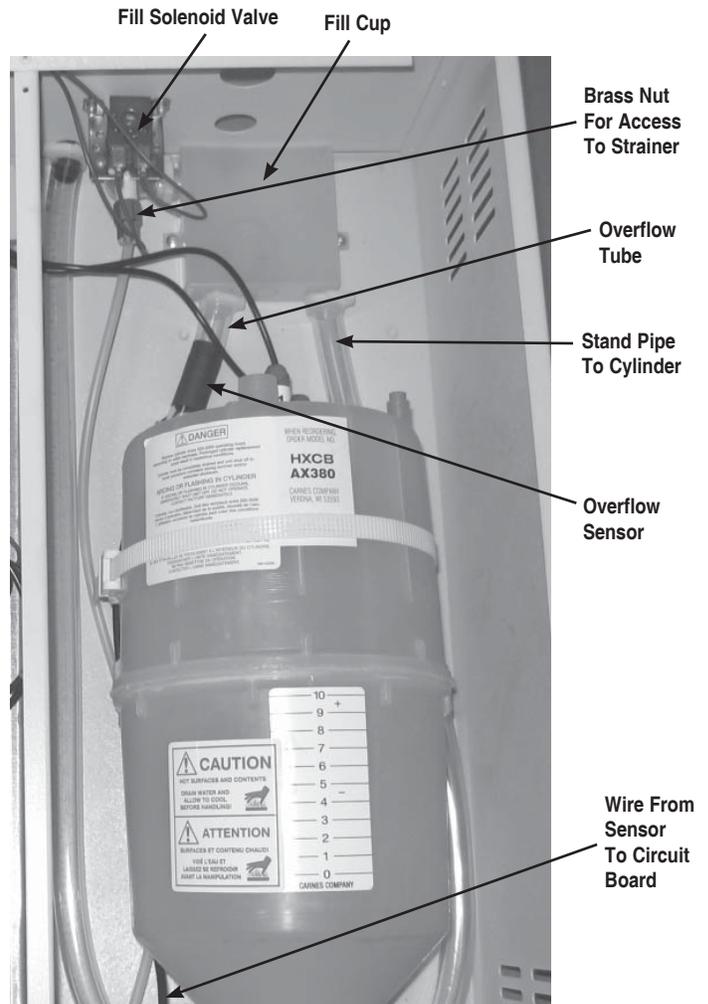
6. If 24V AC is present the electronic control board may be defective.

SYMPTOM: "SERVICE" LIGHT IS ON

Normal reason is time for steam cylinder replacement caused by gradual mineral build up on electrodes inside plastic cylinder. Water gradually rises to cover unused electrode surfaces until output begins to decline. If cylinder has been operating for an extended period of time and water is high replace with new cylinder.

If cylinder is not at end of life other items to be checked:

1. Check "Overcurrent" LED. If on, switch "On-Off-Drain switch to "Drain". Verify water is draining freely from cylinder. Clean internal drain lines and drain solenoid valve if necessary.
2. If "Overcurrent" LED is off, check "Fill Solenoid" LED. If on, verify that water is flowing from fill solenoid valve to fill cup and then into standpipe connected to bottom of steam cylinder. If water is not flowing verify that all shut off valves ahead of unit are open. Check water strainer and clean if necessary.
3. If water is flowing though fill solenoid, fill cup and standpipe but not into the steam cylinder check to determine if drain solenoid valve is partially open.
4. If water is not flowing check "High Water Sensor" LED. If on, wait a minimum of ten minutes to check operation. Every 10 minutes the high water sensor resets and rechecks for water flow through the overflow tube.
5. If water is flowing through the overflow tube it can be caused by an obstruction blocking the inlet to the cylinder fitting. If water is low in the cylinder but overflow is occurring cleaning of the plumbing is recommended.
6. If water is near top of the cylinder and overflow is occurring the cylinder may be in need of replacement.



READ AND SAVE THESE INSTRUCTIONS

ADDENDUM (1) TO FORM #'S - 16799, 16828, 16789, 16831

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

In an attempt to improve quality and ease of maintenance, certain performance enhancements have been added to the Microprocessor chip, located on the back side of Circuit Board H-690-0080.

“SET-POINT” LED: (Current Version)

Flashing LED indicating an error condition where the drain valve is stuck open, typically due to large flakes or chunks of solid mineral deposits broken free from the cylinder and lodged within the valve body. This program will attempt corrective action and, if unsuccessful, will shutdown the unit and signal user.

CORRECTIVE ACTION TO TAKE: Clean or replace solenoid valve.

“OVER-CURRENT” LED: (Current Version)

Steady LED indicating an inoperative drain system, due to plugging with mineral deposits or inoperative drain valve mechanics. Flashing LED will no longer be included in fault indications.

CORRECTIVE ACTION TO TAKE: Clean or replace drain solenoid valve and/or clean out drain plumbing.

“HIGH WATER” LED: (Current Version)

Flashing LED distinguishes between overflows caused by abnormal operating conditions (excessive back-pressure, drain valve stuck closed, aged cylinder) versus overflows caused by normal, allowable conditions (start-up with low conductivity water).

CORRECTIVE ACTION TO TAKE: If cylinder has been in use for a period of time, replace cylinder. Check and clean or replace as necessary the drain solenoid valve. Check and clean as necessary the drain plumbing.

If cylinder is new, check the following and take corrective action as shown. Back-pressure can be fixed by removing any elbows or sags in hoses, or reduce the length of hose between humidifier and distribution pipe by moving them closer together.

OTHER PROGRAM CHANGES: (Current Version)

The fill delay at each overflow detection for past and current microprocessor version is as follows: 1.1 version is 1 minute, 1.2 version is 10 minutes & 1.3 version is 5 minutes. All subsequent versions are 5 minutes and will now be the version of all “G” model design series. It can also replace any previous versions as necessary.

DISPLAY DEMAND % FOR CONTROL HUMIDISTAT & HIGH LIMIT HUMIDISTAT: (Current Version)

To display demand from High Limit Humidistat, in addition to control humidistat, which previous version did not provide. When user selects Display Demand % mode, the following will be displayed as XX.YY: XX = Demand from control humidistat in %, YY = Demand from high limit humidistat in %. (the highest value that the control humidistat or high limit humidistat will show is 99. 99 will be defined as 100% value. 2 is the maximum characters available for each control value on the digital LCD).

FEATURES OF THE CURRENT VERSION:

1. More closely monitors over-current situations. The current version provides sensitivity parameters which allow for better decision-making in the self correcting/adjusting action of the electronics, so there is no premature shutdown of the unit preceded by the blinking over-current light on the diagnostic panel.
2. In conjunction with #1, a pulsing mechanism has been added to any corrective drains that occur during operation. This has been seen to improve the performance of the humidifier by more easily allowing calcium blockage to clear from internal plumbing. All units will have this feature in place and turned “ON” from the factory. The system is accessible to turn this feature “OFF” if desired. Since this feature pulses the drain solenoid, a little additional noise will be associated with the function. Please contact factory technical representative for turn “OFF”/“ON” instructions.
3. For all humidifiers that will include an Air Distribution Unit, mounted or remote. Whenever a unit automatically shuts down due to the loss of humidity requirement signal, the fan in the Air Distribution Unit will continue to run for an additional 3 minutes. This additional run time will discard any remaining steam or condensation that may have formed and to prevent build up.
4. Automatic Drain: If there is no demand signal for humidity for 72 hours, the unit system will automatically drain the cylinder. The system will remain in standby condition until there is another demand signal, at which time the unit will start filling and go into normal operation. All new units will default to this operation. If you prefer not to have this feature in place, please contact factory technical representative for shutoff instructions. You may choose to simply turn unit off if you have a seasonal operation.