IMPORTANT: READ AND SAVE THESE INSTRUCTIONS
THIS MANUAL TO BE LEFT WITH EQUIPMENT OWNER

Nortec®

WHEN YOU NEED HUMIDITY

MAINTENANCE AND TROUBLESHOOTING MANUAL

condair®

NCH SERIES CEILING HUMIDIFIERS

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NORTEC CEILING HUMIDIFIER – NCH
MAINTENANCE & TROUBLESHOOTING MANUAL

MAINTENANCE

Warning

The plumbing and electrical compartments contain high voltage components and wiring. Access should be limited to authorized personnel only.

When to Replace the Steam Cylinder

The steam cylinder is designed to be disposable and must be replaced at end of cylinder life. Cylinder life is dependent on water supply conditions and humidifier usage. **Failure to replace the cylinder at the end of cylinder life may result in unit damage. NORTEC is not responsible for any damages resulting from, or attributable to, the failure to replace a used cylinder (see Manufacturer's Warranty).** A serviceable cylinder is optional and available. Contact your local NORTEC representative for more information. There are many indications, each of which signifies the end of cylinder life:

After a period of operation (not on initial start-up), the water level will approach the top of the cylinder. (Life varies from 500 to 2000 operating hours, as illustrated in the next figure.) Consult Table 1 for signal light status. There will be reduced output in spite of a 100% capacity setting and/or an unsatisfied call from the on/off humidistat for more humidity.

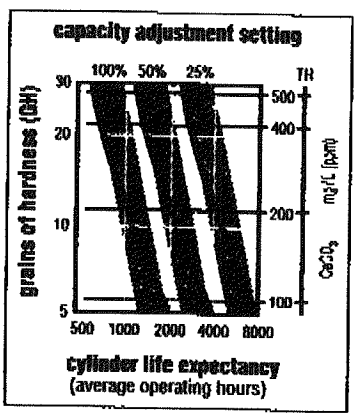


FIGURE 1
WATER CONDITIONS VS. CYLINDER LIFE

Interpreting the Wall Control Module Messages

1. Each ceiling humidifier control module has red, yellow and green status lamps, and a buzzer for unit operation status.

2. The red, yellow and green status lamps are to be viewed as a group. This way, they convey five messages, as summarized in Table 1.

TABLE 1
SIGNAL LIGHT STATUS

RED	YELLOW	GREEN	
Off	Off	Off	Unit off
Off	Off	On	Power on
Off	On	On	Unit humidifying
On	On	On	Replace cylinder OR normal start up operation
On	Off	On	Service

3. When the red, yellow and green status lamps are on, the water level is detected as being at the top of the cylinder. This is normal on start-up, but as the contained water concentrates, the water will stabilize at a lower water level and the yellow lamp will be off.

4. When the cylinder is fully used, the water will have returned to the top of the cylinder. Since there is no longer any clean electrode surface available at end-of-cylinder-life, the required steam output rate can no longer be maintained.

5. At this stage, the red, yellow and green lamps are all on again, telling the user that the cylinder must now be replaced.

How to Remove the Steam Cylinder

(NOTE: It is advisable to keep a spare cylinder in stock throughout the humidification season.) When ordering a replacement steam cylinder, always quote the cylinder number on the label applied to the cylinder or quote the unit's serial number, model and voltage located on the spec label (nameplate).

Procedure:

1. Turn off water supply to unit.

2. The used cylinder must be drained completely before removal. If the water has just been boiling, allow the cylinder to cool before draining. Push the ON/OFF/DRAIN switch located on the wall control module to the DRAIN position. Leave it in this position just long enough to drain the cylinder.

3. When completely drained, push the main ON/OFF/DRAIN switch back to the OFF position.

4. Once drained, open the main electrical disconnect during the entire cylinder change operation.

5. Remove the plumbing access panel to expose the cylinder.

6. Cylinder plugs are attached to the primary voltage cylinder wires. (The plugs remain attached to the wires unless they have to be replaced due to damage.) The plugs are spring loaded to press-fit over the electrode pins protruding from the top of the cylinder. Remove cylinder plugs from cylinder by pulling vertically. NOTE: If plugs are loose fitting, replace immediately.

7. Using a slot screwdriver, loosen the steam hose clamp and pull steam hose off vertically.

8. Using a small slotted screwdriver, depress tab on the re-usable tie wrap around the middle of the cylinder. This will allow the tie wrap to come apart for re-use later on.

9. Cylinder is now ready to be lifted out of the unit. **CAUTION: Cylinder and any undrained water might still be HOT.**

Mandatory Cleaning of the Drain Valve

NOTE: Always clean the drain valve before installing a new cylinder since the valve port is likely to be as dirty as the used cylinder.

1. Remove old cylinder as described above.

2. NOTE: The ring terminal for drain valve green ground wire is to be sandwiched between the drain valve body and drain pan when reinstalling the drain valve assembly.

3. Remove two screws securing drain valve body to drain pan. Pry loose the two slip-on terminals from the two tabs on the (24 VAC) drain valve coil.

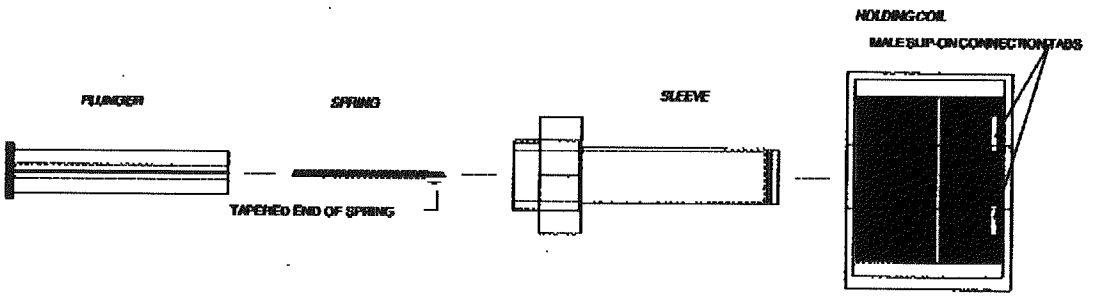
4. Remove the hose clip from the hose connection on the drain valve body.

5. Drain valve assembly is now free to be taken to a sink for disassembly and cleaning.

6. Remove snap-fit red cap from coil assembly and slide coil off the actuator.

7. Loosen actuator with a wrench and screw it out of the plastic valve body.

8. **Clean the exposed core, spring and plastic drain valve port.**



Drain Valve Assembly Diagram
FIGURE 2

9. Important: Tapered end of the spring must be installed toward the solenoid. Reassemble, tighten actuator 1/4-turn past hand-tight, be careful not to cross thread the actuator into the plastic body when reassembling. Replace coil assembly and fasten with red plastic cap.

10. Clean out the end of the hose, then reconnect it to the drain valve body with the clamp.

11. Fit mounting screws through the drain valve body, one screw also goes through the ring terminal on green ground wire.

12. **WARNING: To prevent the possibility of electrical shock the green ground wire must be reinstalled before power is restored.**

13. Push the two slip-on electrical terminals back onto the two tabs on the coil. The terminals, although not identical, are reversible.

How to Install the Replacement Cylinder

1. Reverse the procedure to install the new cylinder. Main disconnect is to be left open until cylinder is completely installed and reconnected.

2. Inspect the o-ring in the drain valve body, replace if required.

3. Ensure that cylinder is secured properly by the re-usable tie wrap and mounting brackets within the unit.

4. The cylinder plug wires are color-coded in accordance with colored dots beside the electrode pins on top of the cylinder.

5. **This color-coding must be adhered to when replacing cylinder plugs on pins.**

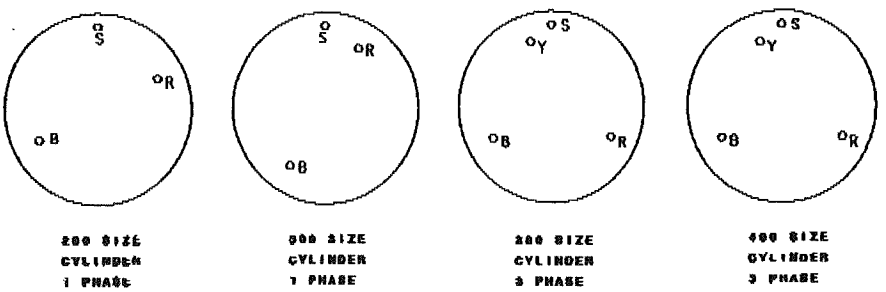


FIGURE 3
TOP VIEW OF CYLINDER

6. **The white cylinder plug on all units is for the sensor electrode which always goes on the single pin surrounded by a plastic shoulder.**

7. **Ensure that the cylinder plugs are very snug on the pins.**

8. **If cylinder plugs become loose, obtain a new replacement plug immediately. Consult factory.**

Extended Shutdown

Any time that the unit is going to be shut down for an extended period of time, including summer shutdown, ALWAYS drain the cylinder contents before disconnecting power. Otherwise, the electrodes are subject to harmful corrosion which drastically shortens cylinder life. Do NOT leave the ON/OFF/DRAIN switch in the DRAIN position indefinitely as the drain coil may overheat and burn out. Leave the switch in the OFF position and "open" the main external fused disconnect to stop power to the humidifier. Close the external water supply shut off valve feeding the humidifier.

Blower Maintenance

REMOTE MOUNTED BLOWER PACKS (RMBPs)

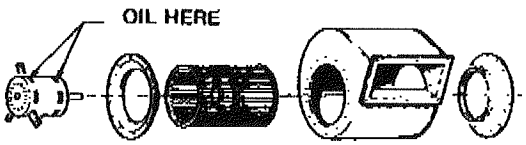


FIGURE 3
WHERE TO OIL

FAN MOTOR OILING: The blower fan motor requires very occasional maintenance of the sealed motor bearings. If required, disconnect primary power and remove side access panel exposing the blower, remove the motor and follow the lubrication instructions on the motor housing.

Prerequisites for Unit Operation

1. Water supply must be on (visually inspect for leaks at connection points).

2. Main power supply must be on (ensure it corresponds with the nameplate rating).

3. **ON/OFF/DRAIN** switch must be "on", green lamp should be illuminated (located on wall control module).

4. On/off humidistat must be calling for humidity, yellow lamp should be illuminated (located on wall control module).

NOTE: Red lamp illuminated and/or buzzer activated on the wall control module are indications of abnormal operation. Consult troubleshooting section for a more detailed explanation.

TROUBLESHOOTING

Starting Point

If nothing is working, ensure unit has correct primary voltage supply corresponding to the spec label. Check that 24 VAC is present on secondary side of transformer, check that all control fuses are good, and verify control wiring. (USE CAUTION, PRIMARY VOLTAGES PRESENT.)

The conductivity of the water contained in the cylinder must be controlled, in order for the humidifier to function properly. **The fill and drain rates must be maintained.** Filling too quickly can cause over-amping and automatic shutdown or blown fuses. Filling too slowly can cause insufficient steam output and humidity levels. Water supply pressure should be between 30 and 80 psig, ideally 55 to 60 psig. Draining too quickly can cause dangerous arcing and corrosion. Draining too slowly can cause over-concentration and possible malfunction due to foaming.

Fill rates of suspect units should be checked. **Open the main fused disconnect to cut off all power in the humidifier before reaching inside.** One of the 24 VAC wires to the primary voltage contactor holding coil should be temporarily disconnected for this test. (Caution, primary voltage present at contactor, disconnect power first.) No boiling occurs during this test so as not to detract from the fill rate. Fill rates should measure nominally at one inch vertical rise in water level (1"/min) in the cylinder in one minute.

If filling too quickly, look to mistakenly oversized fill valve body orifice (consult factory) or excessively high supply water pressure (over 80 psig). If filling too slowly, look to probable causes described under "MAX. FILLING TIME" later in this manual.

Manual drain rates of suspect units should be checked using the following as reference times.

CYL. SIZE (SERIES)	PROPER TIME TO DRAIN MANUALLY → FROM SEAM TO EMPTY ←
400	2 minutes and 13 seconds ± 5 sec.
300	1 minute and 4 seconds ± 2 sec.
200	37 seconds ± 1 sec.

A Clogged strainer and/or clogged drain valve will cause shortened cylinder life. But start by determining what caused the strainer and/or drain valve to clog in the first place. In line water filters may be justified in heavy sediment areas to pre-filter water supplied to the unit.

Clean the drain valve; start with a fresh cylinder. Then measure the manual drain time. Is something else external impeding flow? Is the internal condensate pump ejecting water?

The ceiling humidifier is continually checking the status of the electrical circuits to the fill valve, drain valve, primary voltage contactor, high water sensor and steam cylinder. The manual capacity setting, if reduced, is taken into consideration. When problem symptoms are found, the ceiling unit will, if necessary, respond by shutting itself down until the problem is rectified.

The ceiling unit communicates its findings to the user by way of the unit's status lamps located on the control wall module.

The signals for remote indication come in response to the following symptoms.

NORTEC CEILING UNIT EXPLANATION OF AUTOMATIC SHUTDOWNS

Cylinder Spent

Response:

UNIT CONTACTOR	UNIT STATUS LAMPS		
	RED	YELLOW	GREEN
ON	ON	ON	ON

Symptom(s) Diagnosed: Water has reached the top of the cylinder and activated the high water sensor circuit.

Cause: (A) Cylinder used up — Replace cylinder, end of cylinder life. As pure steam is produced from tap water, most minerals are drained by the auto-adaptive control system. However, it is inevitable that minerals will build-up on the electrodes and strainer inside the steam cylinder. It is unavoidable and the cylinder is intended to be disposable. Serviceable cylinders are available as an option, consult your local NORTEC representative for more information.

(B) Initial start-up — Allow to operate & concentrate the water. If the cylinder is new, it is normal on start-up for the water to reach the top of the cylinder. This can last for several hours until the cylinder reaches optimum contained water conductivity, at which point the water level will not activate the high water sensor again until the cylinder has expired.

Unit Takes Self-Corrective Action?: The humidifier will continue to operate with a gradually decreasing capacity, giving the user notice by responding as shown above. Fill valve will not energize when high water sensor circuit activated (red lamp).

Excess Current

Response:

UNIT CONTACTOR	UNIT STATUS LAMPS		
	RED	YELLOW	GREEN
OFF	ON	OFF	ON

Symptom(s) Diagnosed: Current in steam cylinder increases beyond the fill off and emergency drain on triggers. Current reaches 150% of FLA (i.e. 134% of fill off rated amps; i.e. 134% of amps on spec. label) for 1 second.

Probable Cause(s): Blocked drain system due to a blocked cylinder strainer, blocked drain valve, blocked external drain line, faulty condensate pump, no drain valve at emergency drain on trigger, power remains on fill valve at fill off trigger, wrong steam cylinder (too conductive), wrong fill valve (orifice too big), wrong supply voltage (too high), supply water too conductive, or contained water too conductive. If 100% softened supply water is used, it is often too conductive. Measure conductivity and report findings to factory if suspected.

Unit Takes Self-Corrective Action?: The unit will have already tried to control current with fill off and emergency drain on drain triggers to reduce the amperage draw to the cylinder by reducing the amount of concentrated contained water. It then responds as indicated above.

Maximum Filling Time

Response:

UNIT CONTACTOR	UNIT STATUS LAMPS		
	RED	YELLOW	GREEN
OFF	ON	OFF	ON

Symptom(s) Diagnosed: The fill valve has been "on" for a longer time than is normally required for non-zero current to flow between the electrodes or for water level in the cylinder to reach the high water sensor pin.

Probable Cause(s): Blocked drain due to blocked cylinder strainer or blocked drain valve preventing water from entering the cylinder. Drain valve leaking due to dirt in seal. High water sensor circuit not responding due to sensor plug not connected or defective high water sensor PC board or wiring error or defective main PC board. Water supply rate too low or zero due to too low pressure or line restriction or clogged built-in strainer. Too low supply water conductivity. DI (de-

ionized) or RO (reverse osmosis) supply water has almost no conductivity. Measure conductivity and report findings to factory if suspected. Fill valve not energizing properly. Normal fill rates are typically 1' min. vertical cylinder rise.

NORTEC CEILING HUMIDIFIER EXPLANATION OF SYMPTOMS WITHOUT AUTOMATIC SHUTDOWN

No Current Between Electrodes but Red Lamp (High Water Sensor) On

Symptom(s) Diagnosed: High water level in the steam cylinder is detected, yet no current is detected in the steam cylinder.

Probable Cause(s): Sensor plug connected to wrong cylinder pin. High water sensor PC board defective (activates with no water). Main PC board defective (activates high water circuit without sensor PC board). Monitored leg of three phase power supply is dead. Main PC board defective (does not sense current when current is present in monitored leg).

No Current but Humidistat Calling

Symptom(s) Diagnosed: For a few minutes, no current is detected in the steam cylinder, despite a demand for humidity. (Current is not expected to be zero when there is a demand for humidity.)

Probable Cause(s): Drain valve is leaking, so water never reaches the electrodes. Water supply is obstructed. Contactor is not activated. Potable water supply is "pure" without conductivity. Fill valve is blocked. Fill valve is not being activated. Supply water pressure is too low (less than 30 psig). Wrong orifice in fill valve.

Output Too Low

Symptoms(s) Diagnosed: For a few minutes, current does not increase in the steam cylinder, despite the fill valve being activated. (Current is expected to increase soon after the fill valve is activated.)

Probable Cause(s): Drain valve is partially open, so fill rate maintains non-zero but non-increasing current. Continual overflow because high water sensor circuit did not respond to full cylinder. Supply water insufficiently conductive. Fill valve is partially restricted due to dirt, pinched supply line, or wrong orifice. Steam supply line is obstructed so back pressure causes continual overflow. Supply water pressure is too low (less than 30 psig).

No Lamps Illuminated on Wall Module, Alarm Buzzer Activated

Symptom(s) Diagnosed: Red, yellow and green lamps are all off, unit **on/off/drain** switch has no effect and alarm buzzer is activated.

Two Possible Causes: (A) Water level inside the drain pan has risen to an unacceptably high level causing the drain pan float switch to activate, which then latches off the unit until the drain system problem is corrected. NOTE: The primary power disconnect must be switched off then back on to reset the unit.

(B) Air pressure switch has detected unacceptable restricted inlet air flow. This will latch out the unit until the inlet filter has been replaced or cleaned. If using the optional electronic air filter, disconnect power before changing the filter. NOTE: The primary power disconnect must be switched off then back on to reset the unit.

USING THE WIRING DIAGRAM

Fixed to the inside of the electrical access door is a wiring diagram showing all internal and external wall module wiring details. No additional external wiring diagrams are required.

The following is a more detailed explanation of how the ceiling humidifier operates. Direct reference is made to the wiring diagram. Reviewing the proper function and detail will make it easier to troubleshoot if something goes wrong.

A primary-to-24 VAC 75 VA transformer tapped from the primary, uninterrupted by the contactor, powers the 24 VAC control circuit. One leg of the secondary is connected to the ground and terminal 6 on the electronics. The "hot leg" finds its way to the electronics via the following: Into 11 common max water level latching relay to N.C. 3 to 10 pcb and common on on/off/drain switch through on/off stat back in 8 low voltage strip to 8 on pcb. An on board 3.15 amp glass fuse protects the circuit. 24 VAC should be present between pcb 6 and 10 at all times and between pcb 6 and 8 when the unit is switched on and a call for humidity is present.

The primary voltage circuit is what turns the water in the cylinder to steam for humidification. When the 24 VAC coil is powered, the contactor "makes". One primary leg is routed through the core of the linear Hall Effect current sensing circuit on the electronics, then it goes to the cylinder. The high water sensor board has a primary voltage side. One leg connects to the primary leg; one leg connects to the short sensor pin in the top of the cylinder. A potential, somewhat less than primary, is picked up by the sensor at high water level, which "makes" the red/black circuit on the low voltage side. This creates a "jumper" across terminals 2-4 on the electronics which stops the fill valve until water boils down below the sensor pin.

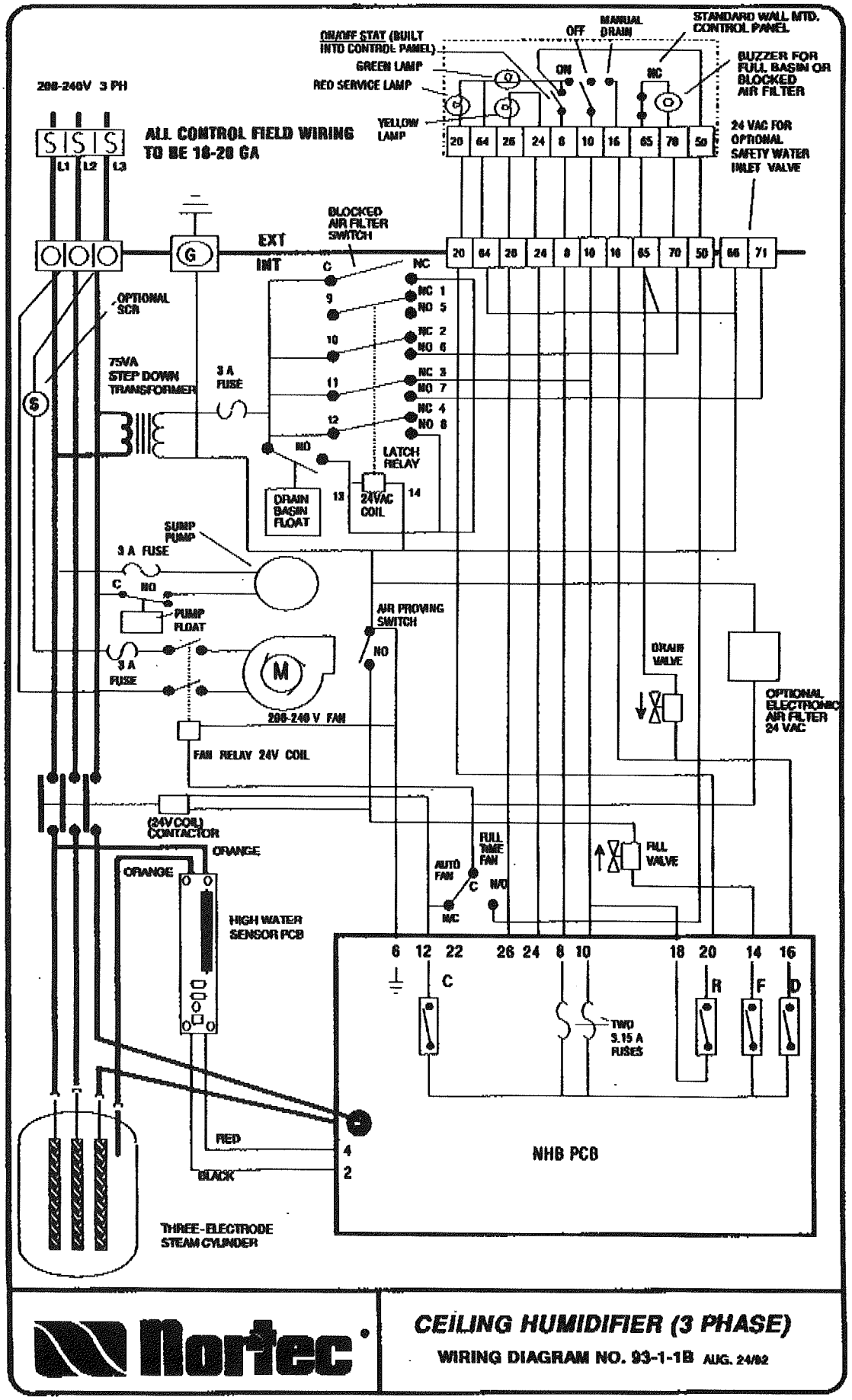
An internal blower and condensate pump receive their primary voltage from inside the humidifier. This way only one external power source has to be connected to the equipment. Both the blower and condensate pump are rated for 208 - 240 VAC operation.

The optional 24 VAC electronic air filter is wired to run in conjunction with the blower and can be configured to run full time. An air proving is standard on all units. The air proving provides 24 VAC to the fan relay before the fan motor will "make". Only when the fan blows sufficient air will the air proving switch "make", completing the ground leg circuit for the contactor and fill valve in the humidifier. This safety feature prevents steam from being produced if/when the blower is not blowing air. A second air proving switch is present which will latch out the unit if a too restricted inlet air flow is detected. Unit power must be disconnected to reset.

Back at the electronics, the contactor receives its "hot leg" from terminal 12. The fill receives its "hot leg" from terminal 14. The drain receives its "hot leg" from terminal 16. Unlike the contactor and fill, the drain gets its "ground leg" directly from the transformer. It does not depend on the air proving switch to activate.

Another very important feature of the ceiling unit is the drain pan float switch and latching relay. If for some reason the internal condensate pump fails to eject the drain water, the float switch is activated latching the relay on. This in turn provides 24 VAC to 65 and 70, activating the alarm buzzer. It also interrupts the hot legs to 8 and 10 so the unit can not operate. It further provides 24 VAC 1 amp output to points 66 and 71 on the terminal strip for an external device by others, ie., relay, lamp, etc. (66 being ground, 71 being hot). Important: Once the drain pan float has been activated, the unit must be serviced and the problem corrected. Once this is done, the primary power disconnect must be turned off and back on to reset the circuit and restore normal operations.

By studying in detail how the humidifier is designed to work, as described above, troubleshooting should be easy.



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CEILING HUMIDIFIER (3 PHASE)

WIRING DIAGRAM NO. 93-1-1B AUG. 24/92