

# Installation, Operation and Maintenance Manual

## *System 4 Sensible Cooler/ Low Noise Unit*

SLC-ESC-3E 271631 - 01.97

ENVIRONMENTAL CONTROL



**Liebert**

Keeping Business in Business



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## Notice

*Legislation now exists in many countries with regard to the disposal and recycling of materials, some of which may be used in Liebert products.*

*Please contact your relevant National Authority for guidelines.*

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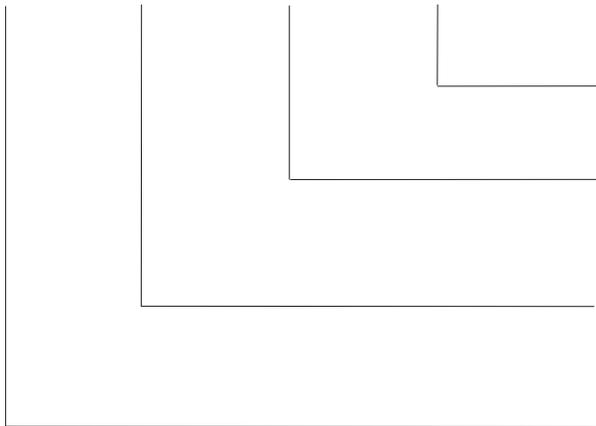
*While every precaution has been taken to ensure accuracy and completeness in this manual, Liebert assumes no responsibility and disclaims all liability for damages resulting from the use of the information contained herein or any errors or omissions.*



**Introduction**

**System nomenclature**

**L D/N 31 C**



**System type:**  
C = Chilled water

**Model number:**  
Nominal capacity  
in kW

**Air pattern:**  
D = Downflow Sensible Cooler Unit  
N = Downflow Low Noise Unit

**Liebert**

In total there are 7 models of the System 4, Sensible Cooler and 7 of the System 4, Low Noise Unit.

LD031C	LD041C	LD061C	LD071C	LD081C
LD091C	LD101C	LN022C	LN032C	LN042C
LN052C	LN062C	LN072C	LN082C	



Model shown - System 4 Low Noise Unit

## Installation



Follow all instructions marked or supplied with this product  
Only trained personnel to operate/service  
Isolate power before opening any panel

### ***Preliminary considerations***

#### ***Critical space preparation***

The room should be well insulated and must have a sealed vapour barrier. The vapour barrier in the ceiling can be a polyethylene film type. Concrete walls and floors should be painted with a rubber or plastic base paint. Doors should not be undercut or be fitted with grilles.

Ingress of outside (or fresh) air should be kept to an absolute minimum, as this adds to the heating, cooling, humidifying and dehumidifying loads of the equipment. It is recommended that outside air entry be kept below 5% of the total air circulated in the computer room.

#### ***Equipment inspection***

Upon arrival of the unit, inspect all items for transit damage. Any damage discovered should be immediately reported to the carrier and a damage claim filed. The units should only be lifted/moved when fully supported under the base. The units should be kept upright and level at all times and evenly supported at all four corners. Failure to handle properly may result in serious damage to the unit.

#### ***Equipment location***

The unit can be positioned on an accessible elevated flooring system, but it may be necessary to furnish additional pedestal supports below the unit to ensure maximum structural support.

A separate floorstand (independent of the elevated floor) can be used as a support, and installed prior to the flooring system. A turning vane can be incorporated to improve airflow.

Provide 700 mm service clearance in front of the unit .

Avoid locating units in an alcove or at the extreme end of a room which has a high aspect ratio (long narrow room).

#### ***Piping considerations***

All piping fitted below an elevated floor must be located so that it offers the least resistance to air flow discharging from the system. Careful planning of the piping layout below the elevated floor is required to prevent the air flow being blocked from any portion of the room. When installing subfloor piping, it is recommended that the pipes be mounted side-by-side on support brackets rather than stacked one above the other and, whenever possible, the pipes should be run parallel to the air flow. All condensate and unit drain lines should be trapped and pitched a minimum of 3.2mm per 0.30m.

It is recommended that manual shut-off valves be installed in the supply and return lines to each unit. This will provide for routine maintenance or emergency isolation of the unit. Refer to the Dimensional data section for unit pipe sizes.

On large multi-unit installations, it is essential to incorporate balancing valves in the chilled water supply lines to ensure uniform chilled water availability to each unit.

Consideration of the minimum water temperature to be supplied from the chiller will determine if the need exists to insulate the supply and return lines. Insulation will prevent condensation on the supply and return lines.

Wet traps and, if required, a 'free-water' detection system such as the Liebert Liqui-Tect alarm, should be installed below the raised floor to drain water leaks and prevent sub-floor flooding.

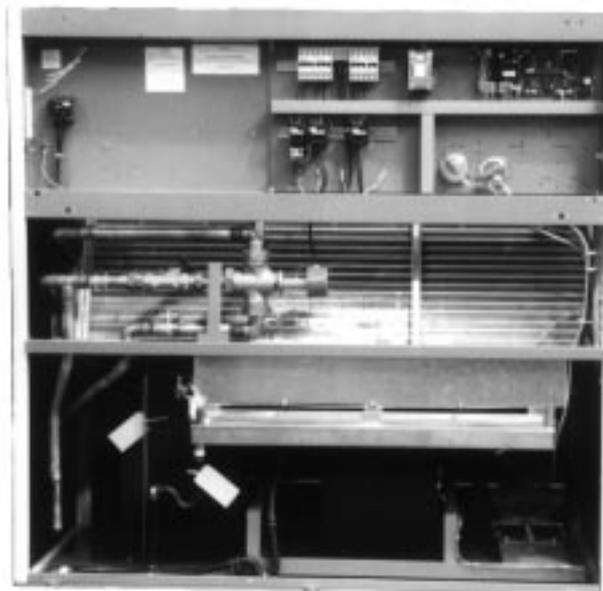


Figure 1 - Internal view of Sensible Cooler/Low Noise unit

**Installation (continued)**

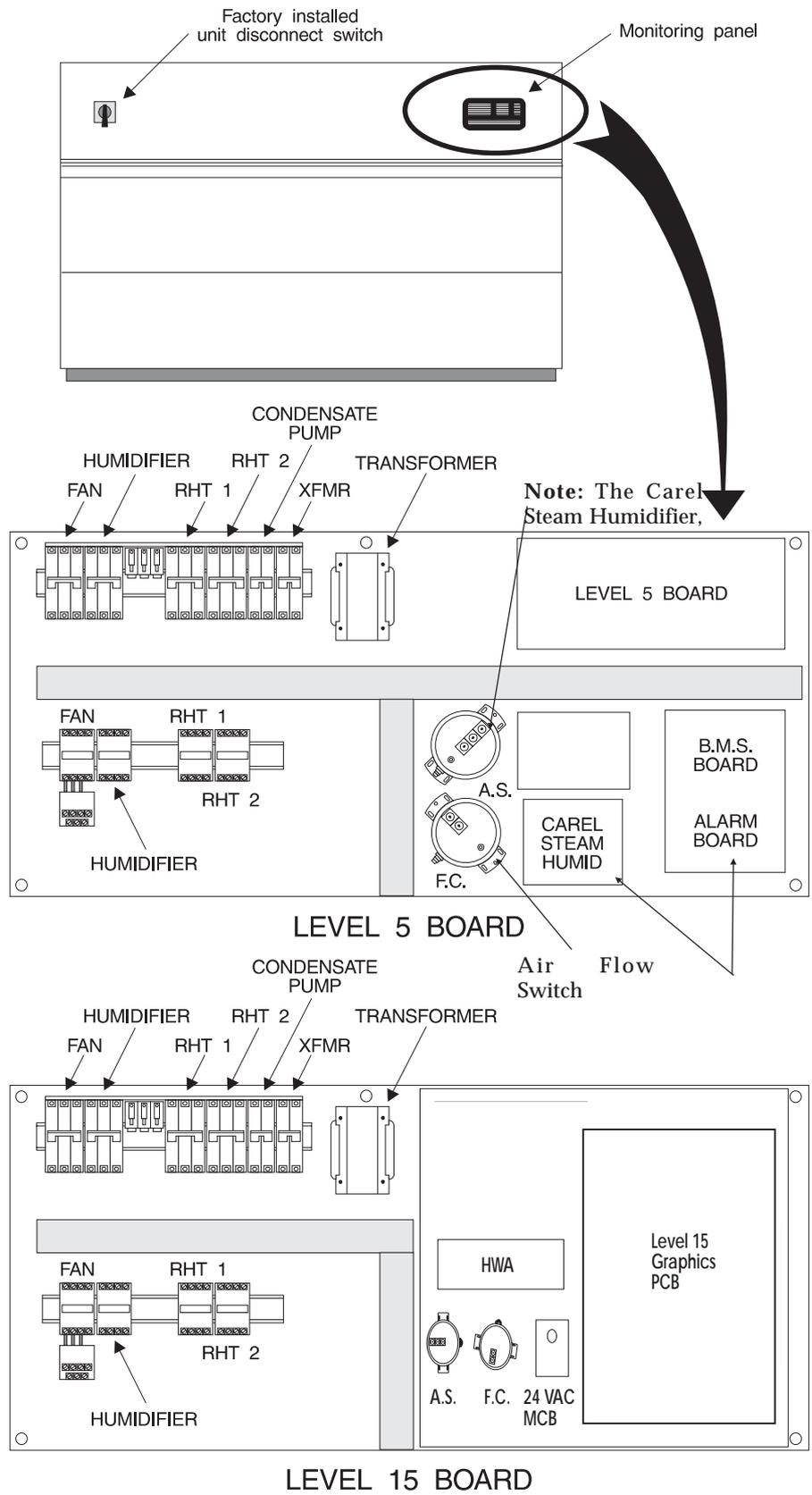


Figure 2 - Typical electric panel layouts

## Installation (continued)

### Pump selection

Ensure that the chilled water circulating pump is of sufficient capacity (flow rate and head) to overcome the maximum likely pressure drop in the system.

### Electrical connections

Three phase and ground electrical service is required for all models at 380/415 volts, 50 hertz. Electrical services should conform to both national and local electrical codes.

A manually operated electrical disconnect switch should be installed within 1.6m of the unit in accordance with local/national codes. A factory supplied locking disconnect switch is mounted on the front panel of the unit. It can be converted to the non-locking type by use of a special key.

### Air volume adjustment - (direct drive Sensible Cooler assembly only)

The air volume can be varied by moving the baffle adjustment bar and fixing it at the required setting. The bar is an integral part of the fan assembly and can be adjusted from fully open to the minimum setting in 10 mm increments, see figures 5, 6 and 7.

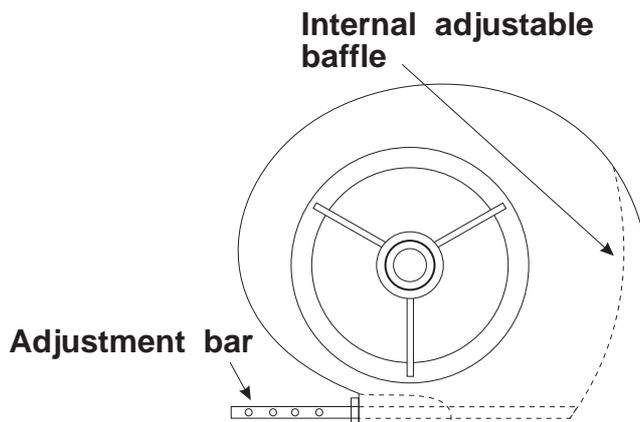


Figure 3 - Air flow adjustment, Sensible Cooler

*Note: The adjustable baffle is not a standard feature on the LD101C or Low Noise Units - they are belt drive as standard.*

### Balancing the air distribution

Liebert models are designed for constant air delivery; hence, any unusual restrictions within the air circuit must be avoided. Select the air supply grilles and perforated panels for the raised floor to ensure minimum loss of pressure in the circuit. Units may be provided from the factory with duct collars. See the Dimensional Data section.

### Recommended free area m<sup>2</sup> for grilles at output velocities of 2.8 and 3.1 m/s

Model number	2.8 m/s	3.1 m/s
LD031C/LN022C	0.89/0.69 m <sup>2</sup>	0.81/0.63 m <sup>2</sup>
LD041C/LN032C	0.89/0.69 m <sup>2</sup>	0.81/0.63 m <sup>2</sup>
LD061C/LN042C	1.43/1.1 m <sup>2</sup>	1.29/0.98 m <sup>2</sup>
LD071C/LN052C	1.38/1.1 m <sup>2</sup>	1.25/0.98 m <sup>2</sup>
LD081C/LN062C	2.12/1.68 m <sup>2</sup>	1.91/1.52 m <sup>2</sup>
LD091C/LN072C	1.83/1.44 m <sup>2</sup>	1.65/1.29 m <sup>2</sup>
LD101C/LN082C	2.23/1.74 m <sup>2</sup>	2.02/1.57 m <sup>2</sup>

### Liqui-tect/water detection sensor LT400 & LT 400S (optional)

The sensor should be located 2 to 3 metres from the environmental control unit in a wet trap, or near a floor drain. (Refer to Figure 4) It should not be mounted directly under the unit. Wire the sensor to the unit using cables designated HO5VV-F to IEC 53. Connect the cables to terminals 24 and 50 on the Level 5 PCB and terminals 24 and 50 - 56 on the Level 15 PCB.

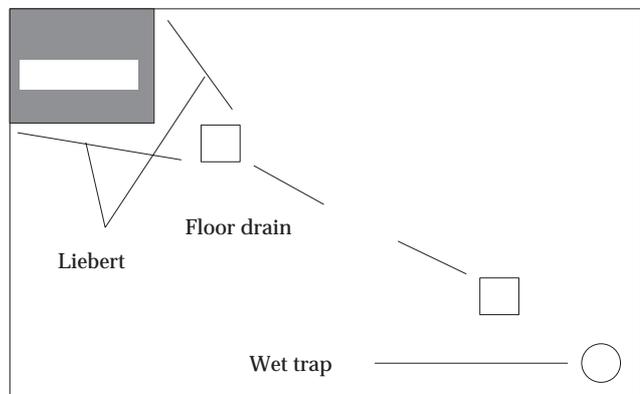


Figure 4 - Recommended location

Recommended Liqui-Tect location

### Top hat section - Low Noise unit

Low Noise units are supplied with a special acoustic panel - the top hat section. This panel is mounted on the top of the unit using the mounting brackets provided - refer to the Dimensional Data section of this manual.

This panel is shipped loose for field fitting.

**Installation (continued)**

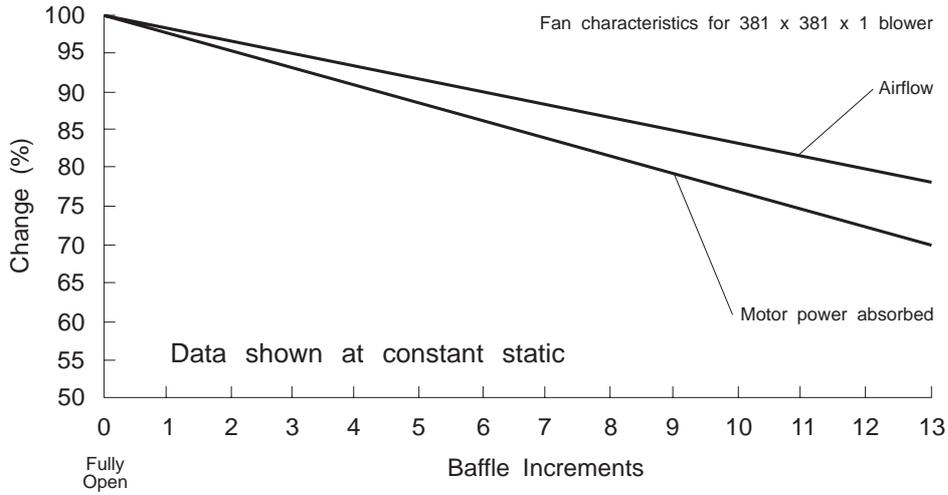


Figure 5 - Fan baffle curves - LD031C and LD041C

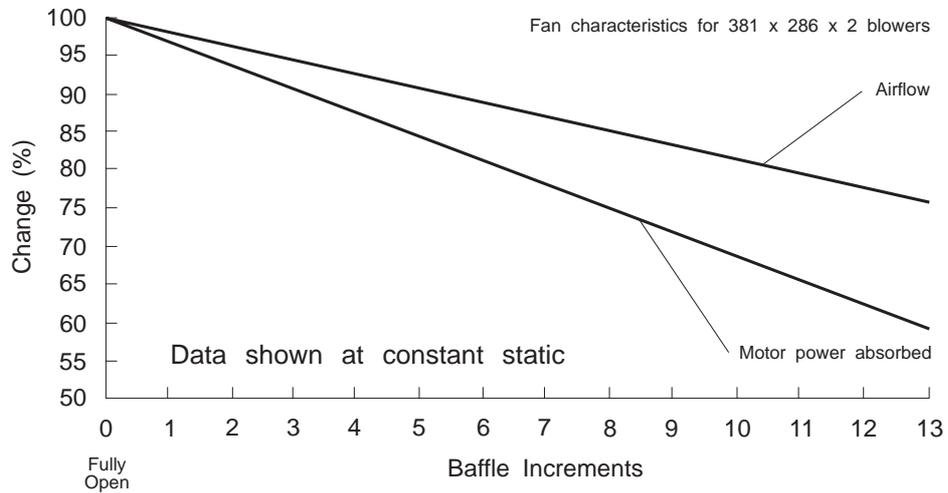


Figure 6 - Fan baffle curves - LD061C and LD071C

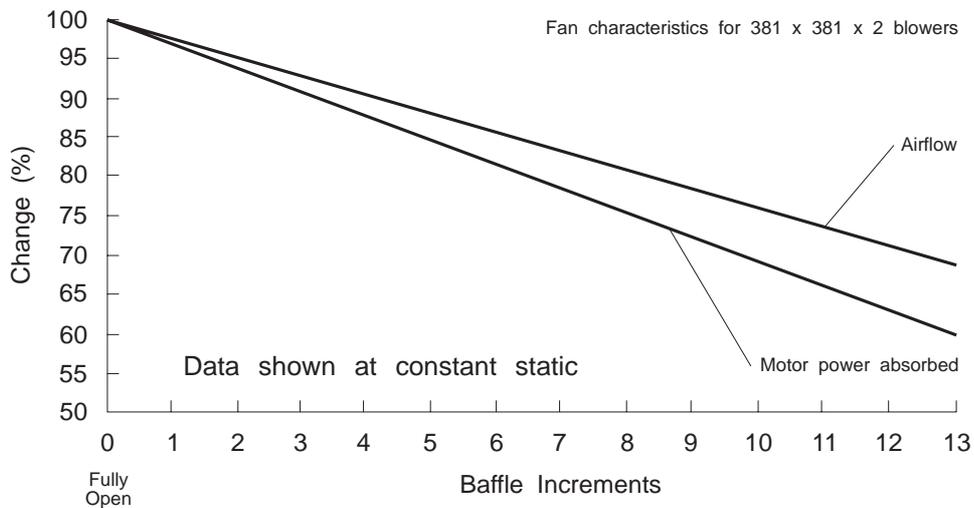


Figure 7 - Fan baffle curves - LD081C and LD091C

## Installation (continued)

### Liqui-tect/water detection sensor LT450S (optional)

The LT450S is a supervised zone detection system that uses a flexible Liebert water sensing cable and provides detection in hard to reach areas that require protection against water damage (refer to Figure 8). It can be located up to 3.5 metres from the environmental control unit. Wire the sensor to the unit using cables designated HO5VV-F to IEC 53. Connect the cables to terminals 24 and 50 on the Level 5 PCB and terminals 24 and 50 - 56 on the Level 15 PCB.

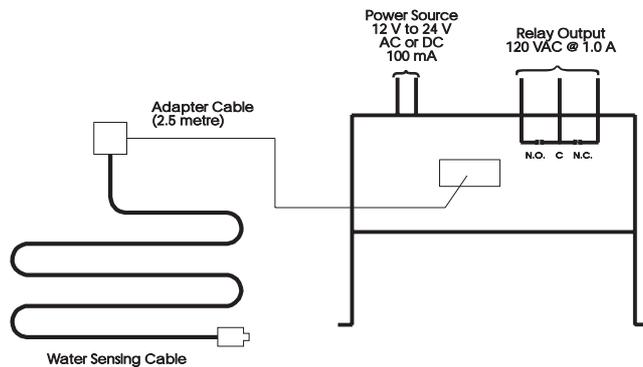


Figure 8 - LT 450S Zone Detection System

### General commissioning procedure

Before beginning, make certain that the unit has been installed in accordance with the installation instructions. All exterior panels must be in place with the front accent panel open.

#### **WARNING**

*Potentially lethal voltages exist within this equipment during operation. Observe all cautions and warnings in this manual. Failure to do so could result in serious injury or death. Only qualified service and maintenance personnel should work with this equipment.*

1. Disconnect all power to the environmental control unit.
2. Tighten all electrical wiring connections which may have loosened during transit.
3. Open/isolate all line voltage MCBs on the electric panel, except for the main fan MCB and the control voltage MCB.
4. If the critical space has a fire suppression system, turn off or bypass the system during the start-up procedure. Dust may have collected on the reheat elements during storage, whilst in transit or on the job site. When this dust burns, it can trigger the smoke or fire detectors and set off the fire suppression system.

5. Turn ON the main breaker and check the line voltage at the main unit disconnect switch. The line voltage must be within 10% of the nameplate voltage.
6. Turn ON the main unit disconnect switch and check the secondary voltage at transformer T1. The voltage from T1 must be  $24V \pm 2.5V$  AC and  $17.5 \pm 1.8V$  AC.
7. Push the ON button. The blower will start and the ON lamp will light.
8. Air movement will cause the air flow switch to energise thus allowing other components to activate.
9. Set the temperature and humidity setpoints and sensitivities, alarm parameters and other control functions. Refer to the Level 5 (or Level 15, if applicable) Controller Operations Manual.
10. Set the Filter Clog switch, see below.
11. Turn OFF the main unit disconnect and the main breaker. The unit ON button should be set to OFF.
12. Close all MCBs that were opened in Step 3.
13. Restore power to the unit; turn ON the main unit disconnect switch.
14. Push the ON button - putting the unit into operation.
15. Check the current draw on all high voltage components and confirm with the serial tag ratings.
16. Reset the fire suppression system after the unit has been running for approximately half an hour with all stages of reheat having been powered for at least 5 minutes or, after the room has cleared.

### Filter clog switch adjustment

The Filter Clog switch, located in the electric panel, is a differential pressure switch which sets the maximum allowable pressure drop across the filter. When the measured pressure drop across the filter exceeds this level, the "Change Filter" alarm is activated on the front panel.

The switch should be adjusted when the unit is first installed and each time a new filter is fitted. It is adjusted as follows:

1. With the main fan running, turn the adjustment screw counter-clockwise until the alarm light and sound are just activated (the panels should be in place and closed to accurately find this position).
2. Turn the adjusting screw a  $\frac{1}{2}$  turn clockwise from this position (each turn equals approximately 240 Pa).

# Operating Instructions

## Controls

The standard Sensible Cooler/Low Noise unit is fitted with the Level 5 Microprocessor Controller. Full details of the control functions and their operation are provided in the Level 5 Controller Operation Manual (SLC-ELV5-2E) supplied with the unit. If the optional Level 15 Graphics Controller has been requested, the manual supplied will be the Level 15 Graphics Controller Operation Manual (SLC-ELV15-2E). Refer to these manuals for all operating instructions.

## Infrared humidifier

The standard infrared humidifier is controlled via the Level 5 or Level 15 Graphics (optional) Controller. For operating instructions, refer to the relevant manual.

## Steam generating humidifier (optional)

### Caution

**Care should be taken when working near the steam humidifier and the outlet pipe. These can remain hot for some time after the unit is shut down.**

The electrode boiler steam humidifier has an independent controller mounted in the electric panel. Incorporated in the controller is a push-button which allows the selection of 30%, 50%, 75% and 100% of total steam production capacity. Two different capacity models are available (dependent on the EEPROM supplied):

- 2.4 to 8 kg/h
- 3.9 to 13 kg/h

**Note:** These humidifiers should only be used where the supply water has a conductivity between 125 and 1250  $\mu\text{S}/\text{cm}$ .

### Introduction

Water, provided it contains even a small quantity of salts in solution, is a conductor of electricity. This means that if two or more metal elements - the electrodes - are put into a container containing undistilled water and a potential difference is applied to them, an electric current passes between them. The water then behaves like an ordinary electric resistance and, like it, transforms power into heat, raising its own temperature.

As opposed to an ordinary resistive element, however, the temperature of water can never exceed a well-defined limit - boiling point - and when this is reached the electric power supplied is entirely used to create steam. The quantity of dissolved salts in the water, if within normal limits, does not influence the process of boiling and its regulation. However, if water with a strong concentration of salts is used, the electrodes become encrusted and the boiler cannot be used. This process is slowed down by maintaining salt concentrations within defined limits by draining and topping up with water.

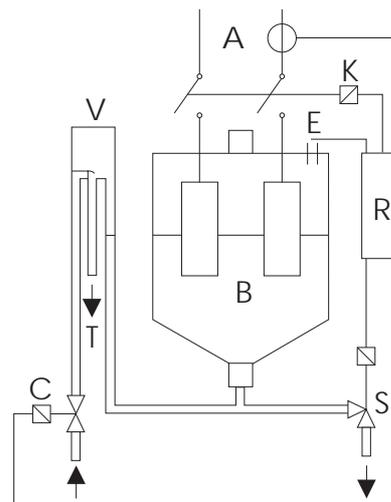
Steam production can be controlled by adjusting the flow of electric current by varying the depth of immersion of the electrodes. The depth of immersion is varied by pumping in or draining water from the boiler.

### System description

When a call for humidification occurs, the Liebert controller sends a signal to the humidifier controller. This controller in turn activates the humidifier contactor supplying power to the boiler cylinder electrodes. The electric power dissipated in the boiler is kept constant by measuring the amount of current flow on one phase using a current transformer (TAM).

As evaporation proceeds, the controller opens the fill valve allowing water to enter the cylinder via a filter and a capacity regulator to the filling cup, and from there, by gravity, to the boiler. When the water level is so high that it touches the electrodes at the top of the boiler, the fill valve is closed and the excess water is drained through the overflow tube.

The drain valve opens periodically to drain water and reduce salt concentration in the boiler. It is also used to drain the humidifier completely under alarm conditions.



- |                      |                    |
|----------------------|--------------------|
| A = Power Sensor     | R = Controller PCB |
| B = Boiler           | S = Drain Valve    |
| C = Fill Valve       | T = Overflow Tubes |
| E = Level Electrodes | V = Filling Cup    |
| K = Contactor        |                    |

**Figure 9 - Electrode boiler steam humidifier schematic**

## Operating instructions (continued)

### Humidifier controller

The humidifier controller PCB is mounted in the Liebert unit's electrical panel. The individual components of the controller and their use are described below.

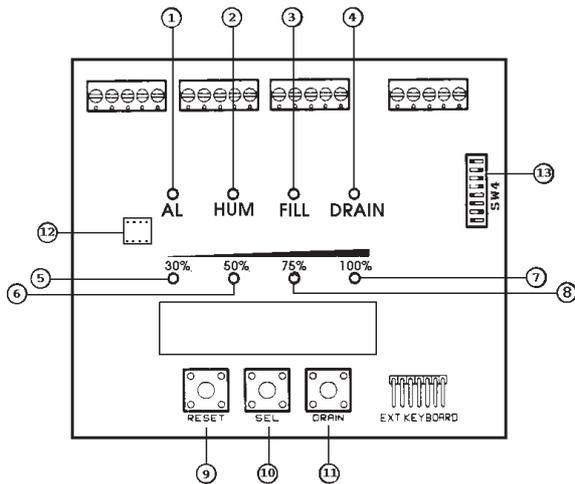


Figure 10 - Humidifier controller PCB

1. **Alarm LED** - when lit, it indicates an alarm condition.
2. **Humidifier LED** - when lit, it indicates active humidification.
3. **Fill LED** - when lit, it indicates filling of the cylinder with water.
4. **Drain LED** - when lit, it indicates draining of water from the cylinder.
5. **30% LED** - when lit, it indicates the humidifier is configured to produce 30% of the total steam capacity (the total steam capacity is dependent on the EEPROM supplied, see point 12 below).
6. **50% LED** - when lit, it indicates the humidifier is configured to produce 50% of the total steam capacity.
7. **75% LED** - when lit, it indicates the humidifier is configured to produce 75% of the total steam capacity.
8. **100% LED** - when lit, it indicates the humidifier is configured to produce 100% of the total steam capacity.
9. **Reset button** - resets the controller
10. **Selection button** - used to select the percentage of steam output.
11. **Drain button** - activates a manual drain cycle
12. **EEPROM** - determines the total steam capacity and rated voltage of the system. The humidifier EEPROM's are coded as follows:  
 $EpcvvdCDx$  where  
 $p$  is the number of phases  
 $cc$  is the capacity in kg/hr

$v$  is the rated voltage

$x$  is a mnemonic which specifies the type of regulation,  
 $x = C$  for ON/OFF regulation  
 $x = P$  for Modulating regulation

e.g. If the code on the EEPROM is E308415CDC, then it is intended for use with a 3 phase, 415 V supply with ON/OFF regulation and the maximum steam production is 8 kg/hr.

13. **Dip-switch** - dip-switch 1 to 7 are used to select the type and range of the input signal to the humidifier controller (for connection to Liebert units, these dip-switches are configured for ON/OFF regulation).

Dip-switch 8 is used to select the type of washing cycle (to prevent excessive salt build-up inside the boiler by draining the boiler and refilling it with water). In the ON position, the washing cycle will only occur while the humidifier is active (when its contactor is pulled in) at intervals determined by the humidifier controller on the basis of conductivity of the feed water and cumulative time of humidification.

In the OFF position, the washing cycle occurs at time intervals determined by the controller regardless of whether the humidifier is active or not.

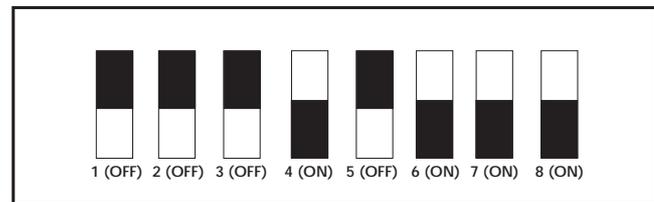


Figure 11 - Dip-switch setting

**Note:** If factory installed the dip-switches will already be set. If the humidifier is field fitted, set the dip-switches as shown in Figure 11.

### Commissioning

1. Check both the high voltage and control voltage wiring to the controller and steam cylinder.
2. Check the water inlet and discharge connections.
3. Check the steam pipe between the steam cylinder and the distributor.
4. Check that the correct EEPROM is fitted for the rated voltage of the Liebert unit and the required total steam output.
5. Select the required percentage of steam production by depressing the selection button until the relevant LED (LED's 5 to 8 in Figure 10) illuminates.
6. Select the type of washing cycle required by positioning dip-switch 8. (The default setting is dip-switch 8 to ON).
7. Activate a call for humidification from the Liebert controller, refer to the relevant Liebert controller manual, if necessary.

## Operating instructions (continued)

8. The Humidifier LED on the humidifier controller will then illuminate, causing the fill valve to open. The FILL LED illuminates and remains lit until the current reaches the required value to provide the requested steam output.

### Alarms

When a call for humidification is sent to the humidifier controller, it may respond by signalling a pre-alarm or an alarm condition. These pre-alarms/alarms are indicated by the illumination of the red Alarm LED and a combination of the 4 percentage steam production LED's (LED's 5 to 8 in figure 10). The combination of the 4 percentage steam production LED's denotes a specific Error code, the meaning of which is given in the table overleaf.

Pre-alarms are transient alarms and will normally reset themselves, alarms indicate that a malfunction/error has occurred which requires action to be taken to correct it.

In the case of one or more pre-alarms occurring, the four LED's show a steady light for 6 seconds to indicate the percentage of steam production selected followed by a flashing light for 2 seconds to indicate the alarm code.

**Start-up with feed water having a conductivity value between 1000 and 1250  $\mu\text{S}/\text{cm}$**

The humidifier reaches its steady state working condition immediately and goes on working until the current reaches the necessary value to produce the selected quantity of steam.

**Start-up with feed water having a conductivity value between 125 and 1000  $\mu\text{S}/\text{cm}$**

The humidifier starts in a "soft cycle" and reaches its steady state working condition slowly. It may take some time for the water in the cylinder to reach the required level of conductivity and during this phase, a high level pre-alarm (E05) and a reduced operation pre-alarm (E02) may occur. These pre-alarms do not affect the normal operation of the humidifier and should reset themselves.

## Operating instructions (continued)

Pre-Alarm Conditions				
LED's Lit	Error Code	Reason	Possible Cause	Check/Remedy
● ○ ○ ○	E01	<b>High current</b> - the current has exceeded the safety threshold	- very conductive feed water	- if the situation does not resolve itself, an E06 alarm condition will result
○ ● ○ ○	E02	<b>Reduced operation</b> - cannot reach the required steam output	- water conductivity too low - the boiler cylinder needs attention	- if the situation does not resolve itself, an E08 alarm condition will result
● ● ○ ○	E03	<b>Foaming of boiling water</b> - poor steam production	- caused by some abnormal characteristic of the water	- if the situation persists, check the water conductivity level
● ○ ● ○	E05	<b>High water level</b> - water level reaches maximum capacity	- water conductivity too low - the boiler cylinder needs attention - foaming of boiling water	- if the situation does not resolve itself, an E08 alarm condition will result
Alarm Conditions				
○ ● ● ○	E06	<b>Current too high</b> - current exceeds safety threshold	- buildup of mineral deposits between the electrodes - leaking feed water valve	- clean or replace the cylinder - check the feed water valve
● ● ● ○	E07	<b>Current too low</b> - current remains below the required value	- feed water pressure inadequate - feed water valve obstructed - leaking discharge valve	- check the water pressure - check the discharge valve - check the feed valve
○ ○ ○ ●	E08	<b>Boiler cylinder exhausted</b> - poor steam production	- Build up of mineral deposits on the grid	- clean or replace the cylinder
● ○ ○ ●	E09	<b>Lack of water</b> - the feed valve remains open for 20 minutes without circulation of current	- lack of water in the system - blocked feed valve	- check for presence of water - check the feed valve - check the filter
○ ● ○ ●	E10	<b>Lack of current</b> - when the transformer does not register current circulation and the level electrodes are immersed in water	- electrode(s) malfunction - transformer malfunction - contactor defective	- check the line fuses - check the electrical connections - check the transformer - check the contactor
● ○ ● ●	E13	<b>Drain malfunction</b> - when the solenoid valve remains open for 20 minutes without lowering the water level	- drain valve blocked - cylinder filter blocked	- check the drain valve - check the filter and the cylinder
○ ○ ● ●	E14	<b>Conversion error</b> - when there is a faulty conversion of the analogue input values from the TAM, conductivity meter etc.	- wiring fault - incorrect dip-switch setting	- check the wiring connections - check the dip-switches
● ● ● ●	E32	<b>Self-test failure</b>	- defective hardware	- replace EEPROM or controller - <b>DO NOT PRESS RESET</b>
Key: ● indicates LED illuminated;				

## Maintenance

### WARNING

*Isolate the unit power supply before opening the doors and carrying out any of the following procedures.  
Lethal voltages are present when the unit is energised.*

### Preventive maintenance

#### Fan deck - examine

### WARNING

*Under no circumstances should personnel work inside the unit with the fan assembly operating. Switch the fan MCB OFF before working on the fan assembly.*

1. Remove the unit front panels and inspect the fan motor for any loose electrical connections and tighten as necessary.
2. Inspect the fan deck, motor and casing for signs of defects, damage or corrosion. Correct any defects found and restore the surface finish where corrosion has occurred.

#### Fan impellers

1. Inspect the fan impellers and remove any debris.
2. Check that the fan impellers are securely mounted on the motor shaft. Rotate the impellers and ensure freedom of movement.
3. Rock the pulley and test for movement in the motor shaft. If excessive movement is noticed the motor must be renewed.

*Note: If records show motor life to be shorter than expected, investigate the cause of the wear and carry out the necessary corrective maintenance.*

#### Drive belt (if fitted) - inspection

1. Check the drive belts monthly for signs of wear and proper tension. Pressing on the belts midway between the sheave and pulley should produce approximately 12.5 mm of movement. Belts that are too tight can cause excessive bearing wear.

#### Drive belt (if fitted) - re-tensioning

1. Correctly tension the belts by adjusting the fan motor slide base as necessary.

*Note: If belts appear cracked or worn, they should be renewed with matching belts (identically sized). Both belts should be renewed at the same time. With proper care, belts should provide a long service life.*

2. After adjusting or renewing the belts, always check that the motor mounts are tight. Loose mounts will produce vibration that may damage the unit.

### Completion

1. Refit the unit front panels and restore the electrical supply to the unit.
2. Measure and record the phase current.
3. Record and report any defects found during the inspection.

### IMPORTANT

*After renewal of any drive components, bearing, motor, pulley or belts, you should confirm dynamic balance.*

#### Air flow switch - examine

1. Open the unit front accent panel and inspect the air flow switch on the electric panel for any loose electrical connections and tighten as necessary.
2. Ensure that the switch mounting bolts are tight.
3. Examine the pressure sensing tube between the switch and the fan casing for defects, damage and loose connections. Renew the tube if necessary.
4. Close the unit front accent panel and restore the electrical supply to the unit.
5. Record and report any defects found during the inspection.

#### Front accent panel - examine

1. Open the unit front accent panel and examine the panel for any obvious defects or damage.
2. Ensure that the gas struts provide controlled accent panel opening.
3. Examine the gas strut mounts for defects or damage.
4. Close the unit front accent panel. Ensure that the Dzus fasteners hold the panel securely in the closed position and restore the electrical supply to the unit.
5. Record and report any defects found during the inspection.

## Maintenance (continued)

### WARNING

*Isolate the unit power supply before opening the doors and carrying out any of the following procedures.  
Lethal voltages are present when the unit is energised.*

#### **Infrared humidifier - examine**

1. Remove the unit front panels and inspect the humidifier for any loose electrical connections and tighten as necessary.
2. Examine the water supply pipe, drain pipe and make-up valve for any signs of defects or damage.
3. Examine the bottom and sides of the humidifier pan for build-up of mineral deposits. If deposits are present, clean out the pan.
4. Check the overflow stand-pipe for scale deposits.
5. Unscrew the brass nut under the fill valve filter body and examine/clean the filter.

*Note: The humidifier pan is easily removed for cleaning by disconnecting the drain coupling and removing the retaining screw at the right hand end of the humidifier.*

#### **Caution**

*Before removing the pan, ensure that the water in the humidifier pan is no hotter than lukewarm.*

6. Remove scale on the sides and bottom of the pan by loosening with a stiff brush. Flush with water and refit the pan to the humidifier.
7. Refit the unit front panels and restore the electrical supply to the unit.
8. Record and report any defects found during the inspection.

#### **Chilled water valve - examine**

1. Remove the unit front panels.
2. Visually inspect the valve for damage and ensure that the connections are not leaking.
3. Ensure that the valve and the controller are securely mounted in position.
4. Refit the unit front panels and restore the electrical supply to the unit.
5. Record and report any defects found during the inspection.

#### **Cooling coils - examine**

1. Remove the unit front panels and inspect the slab coil for defects, damage and corrosion.
2. Check that the coil fins are in good condition. If they are found to be bent, they should be carefully straightened using a proprietary fin comb.

*Note: Fin combs are available from distributors or any reputable environmental products supplier.*

3. Refit the unit front panels and restore the electrical supply to the unit.
4. Record and report any defects found during the inspection.

#### **Electric panel - inspection and functional checks**

##### **General**

1. Open the unit front accent panel. Inspect the electric panel for any damage, re-tighten all electrical connections.

*Note: The functioning of all control circuits can be tested by actuating each of the main functions (by adjusting the set points).*

##### **Cooling functional test**

1. Select a set point for a temperature of 6°C below room temperature.
  - a) A call for cooling should be observed and the chilled water valve should open.
  - b) A high temperature alarm may annunciate. Disregard it.
2. Return the set point to the desired room temperature.

##### **Reheat functional test**

1. Select a temperature set point for 6°C above the room temperature.
  - a) A call for heating should be observed.
  - b) Both heating contactors should energise, and the heating elements should begin to heat.
  - c) Disregard the low temperature alarm.
2. Return the set point to the desired room temperature.

## Maintenance (continued)

### WARNING

*Isolate the unit power supply before opening the doors and carrying out any of the following procedures.  
Lethal voltages are present when the unit is energised.*

#### Humidification functional check

1. Set the humidification to 10%RH above the room humidity reading.
  - a) For infrared humidifiers, the solenoid valve and contactor should energise and the infrared element should come on.
  - b) For a steam generating humidifier, you will immediately hear clicks as it energises. After a short delay, the pan or canister will fill with water. The water will heat and steam will be produced.
2. Return the humidity setting to the desired room relative humidity setting.

#### Dehumidification functional check

1. Set the humidification set point to 10%RH below the room humidity reading. Make sure that the temperature set point is at or above room temperature.
2. The chilled water valve should open and the system should begin to cool/dehumidify. The air bypass flap should open (if fitted).
3. Return the humidity setting to the desired room relative humidity setting.

#### Completion

1. Close the unit front accent panel and restore the electrical supply to the unit.
2. Record and report any defects found during the inspection.

#### Firestat (optional) - examine

1. Open the unit front accent panel and inspect the firestat on the electric panel for any loose electrical connections and tighten as necessary.
2. Examine the firestat for any obvious defects or damage.
3. Close the unit front accent panel and restore the electrical supply to the unit.
4. Record and report any defects found during the inspection.

#### Cabinet - examine

1. Examine the cabinet exterior for any obvious defects or damage and repair as necessary.
2. Remove the front panels and examine the cabinet interior for signs of damage or corrosion. Repair any damage found and restore the surface finish where corrosion has occurred.

3. Refit the front panels and restore the electrical supply to the unit.
4. Record and report any defects found during the inspection.

#### Steam generating humidifier (optional) - examine

1. Remove the unit front panels and examine the humidifier for any loose electrical connections. Tighten any loose connections.

### Caution

*Care should be taken when working near the steam outlet pipe. This can remain hot for some time after the unit is shut down.*

2. Examine all pipes and connections for defects, damage and security of attachment.
3. Ensure that the steam generating canister is properly secured to the unit frame.
4. Refit the unit front panels and restore the electrical supply to the unit.
5. Record and report any defects found during the inspection.

#### Liqui-Tect/water detection sensors (optional) - examine

1. Remove the unit front panels.
2. Identify the water detection sensors. These are located below raised floors next to wet traps and floor drains, and in drainage channels.
3. Inspect the sensors for damage, defects and corrosion. Ensure that the sensors are securely mounted.
4. Examine the electrical connections at the unit for security and tighten if necessary. Ensure that the wiring insulation is sound and that the wires are correctly routed.
5. Refit the unit front panels and restore the electrical supply to the unit.
6. Record and report any defects found during the inspection.

## Maintenance (continued)

### WARNING

Isolate the unit power supply before opening the doors and carrying out any of the following procedures.  
Lethal voltages are present when the unit is energised.

### Corrective Maintenance

#### Air filters - renewal

To maintain efficient operation, the air filters should be checked monthly and renewed as required. Because renewal intervals may vary with environmental conditions and filter type, each unit is equipped with a filter clog switch which warns of restricted air flow through the filter compartment by activating the 'Change Filter' alarm.

1. Remove the unit front panels and remove the filters from the inside of the unit.
2. Fit new filters, refit the unit front panels and restore the power supply.

**Note:** When the filters have been renewed, reset the filter clog switch as follows:

- a. Turn the adjusting screw on the filter clog switch counter clockwise until the 'Change Filter' alarm annunciates.
- b. With the fan running, all panels fitted and the door closed, turn the adjusting screw until it just activates the alarm with clean filters.
- c. Turn the adjusting screw a  $\frac{1}{2}$  turn clockwise from this position (each turn equals approx. 240 Pa).

#### Steam generating humidifier - boiler cleaning and renewal (see Figure 12)

**Note:** Regular maintenance is limited to descaling or renewing the boiler. This is necessary when scale on the active surfaces of the electrodes prevents sufficient passage of electrical current.

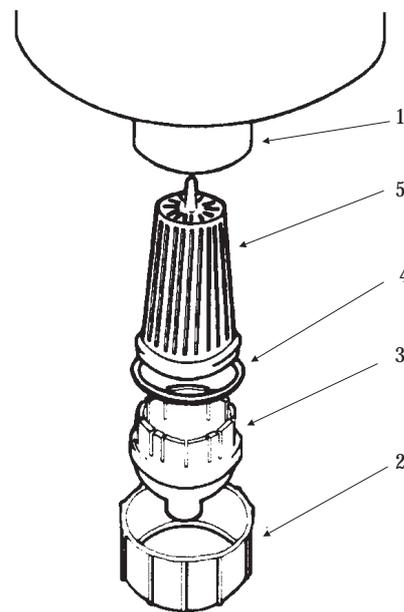


Figure 12 - Bottom filter

#### Dismantling the boiler

1. Drain the water completely by pressing the drain button on the humidifier control panel.
2. Disconnect the power supply to the equipment.
3. Unscrew the steam pipe from the boiler.
4. Disconnect the wiring to the main electrodes and the level electrodes.
5. Unhook the holding spring and unscrew the boiler by rotating it anti-clockwise on its axis.
6. Remove the boiler.

**Note:** The boiler may generally be used again after descaling.

## Maintenance (continued)

### WARNING

Isolate the unit power supply before opening the doors and carrying out any of the following procedures.  
Lethal voltages are present when the unit is energised.

- Unscrew the ring nut (1) and extract the bottom filter (4). Remove any scale and calcareous deposits under a jet of water and clean the grids mechanically or chemically with a commercially available cleaner.

**Note:** When electrode wear is such that regeneration is insufficient, the boiler must be renewed. Exchange the body of the boiler (5) and the 'O' ring (3). The ring nut (1), connection piece (2) and filter (4) do not deteriorate with use.

- Reassemble the boiler in the reverse sequence after checking and if necessary, renewing the washer between the threaded connection and the discharge group.

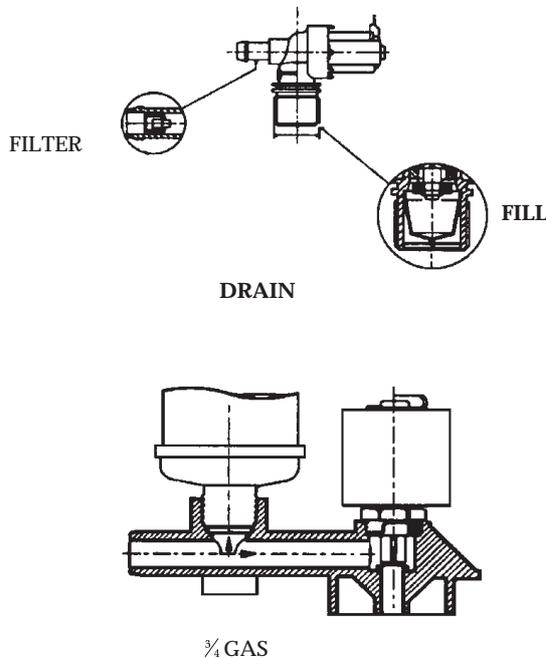


Figure 13- Fill and drain groups

### Cleaning

Depending on local water conditions, it will be necessary from time to time to clean the humidifier assembly completely.

- Drain the water from the boiler by pressing the drain button on the humidifier control panel and isolate the power supply.
- Dismantle and wash the water intake valve and check that the intake filter is clean.
- Dismantle the drain group (Figure 13). Clean conduits and nozzles and remove any solids from the base of the siphon.

- Inspect the water intake, drain, steam and condensation pipes, and renew them if they are worn or fragile.

### Infrared humidifier - lamp renewal

- Remove the unit front panels.
- Remove the humidifier pan by disconnecting the drain coupling and removing the retaining screw at the right hand end of the humidifier.
- Remove the lamp brackets under the lamps.
- Remove the high voltage compartment cover.
- In the high voltage compartment, locate the burned-out bulb with a continuity tester.
- Loosen the two screws securing the bulb wires to the junction block.
- Pull the bulb straight down.

### Caution

Do not handle the quartz lamps with bare hands; any oily deposits (finger prints) will severely reduce bulb life. Use clean cotton gloves at all times.

- Fit a new bulb making sure that the lamp wires are secure in the junction block. Trim off excess lamp wire.
- Reassemble, reversing steps 1 to 6 above.
- Refit the unit front panels and restore power to the unit.

## Troubleshooting

Fault	Indication	System response
<b>Temperature sensing alarm</b>		
Indicates a failure of the temperature sensing function (loss of signal)	Level 5: Simultaneous High & Low Temperature alarms, accompanied by dashes on the numeric read-out for temperature	Activates 100% cooling
	Level 15: Indicates ALARMS	Activates 100% cooling
<b>Humidity sensing alarm</b>		
Indicates a failure of the humidity sensing function (loss of signal)	Level 5: Simultaneous High & Low Humidity alarms, accompanied by dashes on the numeric read-out for humidity	Deactivates humidification and dehumidification
	Level 15: Indicates ALARMS	Deactivates humidification and dehumidification
Symptom	Possible cause	Check or remedy
<b>Blower</b>		
Blower will not start	No main power	Check L1, L2 and L3 for rated voltage
	MCB tripped	Check the main fan MCB. Check the control voltage manual reset breakers
	Air flow switch	Check the operation of the air flow switch
	Overloads tripped	Push the reset button on the main fan overload. Check the amp draw
	No output voltage from T1 transformer	Check for 24V AC between TB2-1 and TB2-3 (Level 5). If there is no voltage, check the primary voltage of the transformer
	Circuit breaker KM1 tripped	Check for 24V AC between TB2-1 and TB2-3 (Level 5). If there is no voltage, check for a short and reset the breaker KM1
Blower runs but controls will not operate	ON/OFF switch not working	Check the ribbon cable to the display
	Remote shutdown operating	Check to see if the remote shutdown is connected (Terminals 37 and 38 - Level 5). If they are not in use, link both terminals together.
<b>Chilled water valve</b>		
HP chilled water valve not opening	Motor operates but the valve will not open	Check the linkage for adjustment and ensure that it is tight on the valve
	No 24V AC power to the motor	Check for 24V AC on the actuator
	No signal from the controller	Check the control voltage to the actuator (refer to electrical schematics for more details). 2 - 10 V DC = 0 - 100% valve opening.  If the valve still does not open, even with voltage present, then renew the modulating motor
Standard pressure chilled water valve not opening	Motor operates but the valve will not open	Check the linkage for adjustment and ensure that it is tight on the valve
	No 24V AC power	Check for 24V AC control signals

## Troubleshooting (continued)

Symptom	Possible cause	Check or remedy
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### *Chilled water valve (continued)*

No signal from controller	Check for 24V AC control signals on the actuator (up and down). Check the position feedback potentiometer. (Refer to the electrical schematic for more details.)  If voltages are present but motor does not operate then renew the valve modulating motor.
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### *Dehumidification*

No dehumidification	Control not calling for dehumidification	Check to see if a call for dehumidification is indicated on the display  Check the bypass damper linkage and it's operation (if fitted). Check that the chilled water valve is fully open
	MCB tripped	Check the line voltage after the MCB and contactors

### *Humidifier - infrared*

No humidification	Humidifier pan not filling	Check the water supply (should be   2 litres/min.)  Check auto-flush and pan size setting (Refer to the Controller Manual)
	Humidifier water fill	Check the drain  Check for a clogged water strainer in the chilled water valve
	Control not calling for humidification	Check to see if a call for humidification is indicated on the display
	Humidifier contactor not pulling in	Check visually. If the contactor is made, check the line voltage after the contactor and the MCB, check the phase current  Check for an open humidifier safety stat.
	Humidifier bulb burned out	Renew

### *Humidifier - steam generating*

If the humidifier controller does not respond to a call for humidification from the Liebert unit:

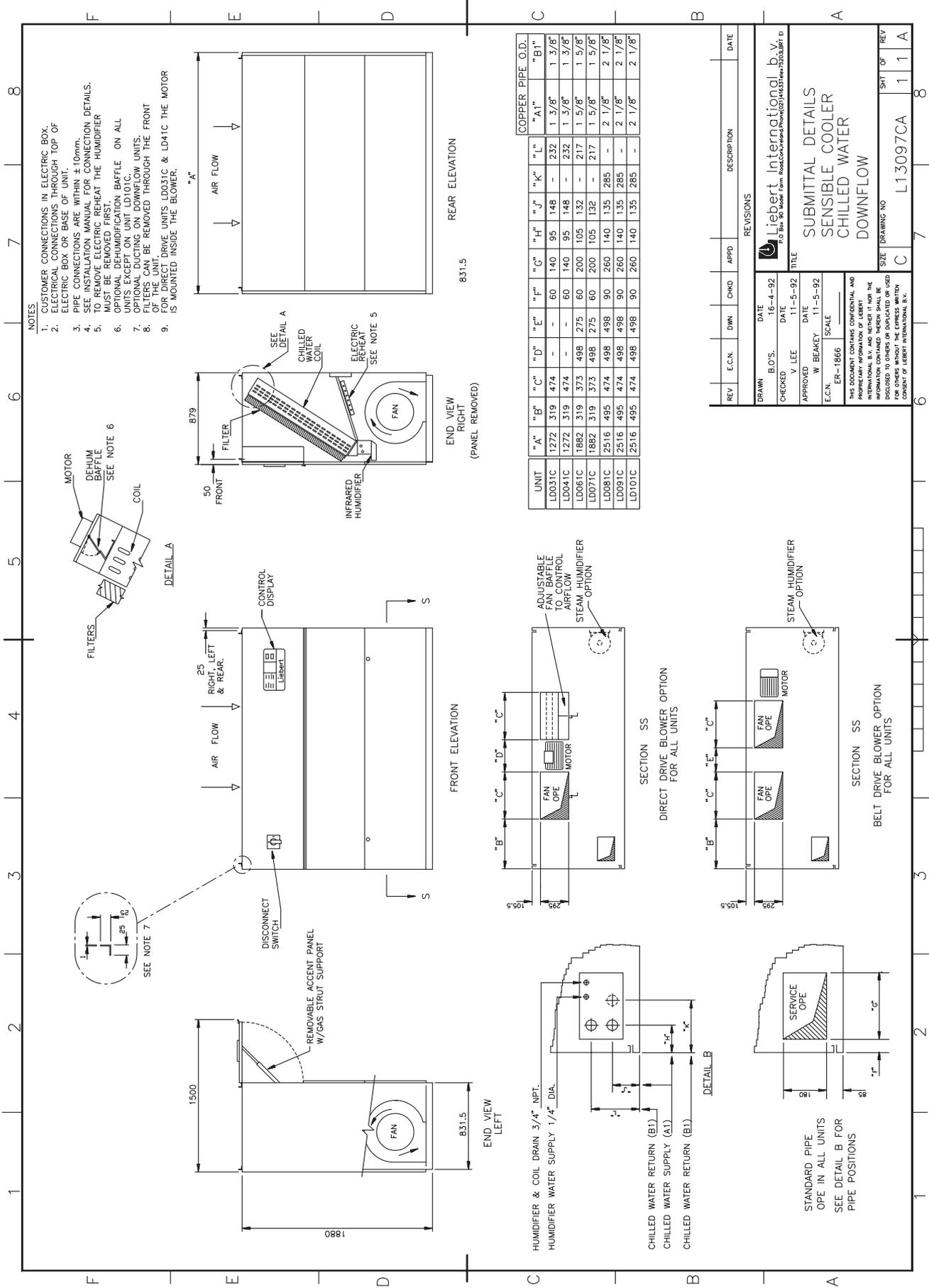
- Check the supply and control voltage to the humidifier (There should be 24V AC between terminals 7 & 8 (Level 5))
- Check the electrical connections at the humidifier terminal block
- Check the dip-switch settings

If the humidifier controller signals an alarm condition, refer to page 10, for the appropriate action to be taken.

### *Reheat*

Reheat will not operate; contactor not pulling in	Control not calling for heat	Check the control to see if a call for heating is indicated on the display
	Reheat safety stat open	Check the reheat safety stat
Reheat not operating; contactor pulling in	Re-heat element burned out	Turn off the power and check the heater resistance with an ohm meter  Renew the element if faulty

# Dimensional data - Sensible Cooler





# MONTHLY MAINTENANCE INSPECTION CHECKLIST

**DATE:** \_\_\_\_\_

**PREPARED BY:** \_\_\_\_\_

**MODEL NO:** \_\_\_\_\_

**SERIAL NO:** \_\_\_\_\_

***Filters***

- Check filters
- Check for restricted air flow
- Check the filter clog switch
- Wipe the return air section clean

***Blower section***

- Impellers free of debris and move freely
- Check adjustable baffle bar fixing
- Check belt tension and condition (if fitted)
- Bearings in good condition
- Check air flow switch operation
- Check pulleys (if fitted) and motor mounts
- Check motor condition
- Check motor cables

***Steam generating humidifier (optional)***

- Check canister for deposits
- Check condition of steam hoses

***Infrared humidifier***

- Check drain pan for blockages
- Check humidifier lamps
- Check pan for excessive mineral deposits

***Air distribution section***

- Restriction in grille free area
- Dehumidification motor and baffle operation

***Controller***

- Check the setpoints
- Check the chilled water valve operation
- Check the controller supply voltage 17.5/24 V AC.

**NOTES:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# ANNUAL MAINTENANCE INSPECTION CHECKLIST

DATE: \_\_\_\_\_

PREPARED BY: \_\_\_\_\_

MODEL NO: \_\_\_\_\_

SERIAL NO: \_\_\_\_\_

## **Filters**

- Restricted air flow
- Check filter switch
- Wipe the return air section clean

## **Blower section**

- Impellers free of debris and move freely
- Check adjustable baffle bar fixing
- Check belt tension and condition (if fitted)
- Bearings in good condition
- Check air flow switch operation
- Check pulleys (if fitted) and motor mounts

## **Steam generating humidifier (optional)**

- Check canister for deposits
- Check condition of steam hoses
- Replace bottle, if required
- Measure and record the phase current

## **Infrared humidifier**

- Check drain pan for blockages
- Check humidifier lamps
- Clean humidifier pan and drain lines
- Measure and record the phase current

## **Reheat**

- Check reheat elements
- Check reheat safety devices

## **Air distribution section**

- Restriction in grille free area
- Dehumidification motor and baffle operation

## **Electric panel**

- Check MCBs operate freely
- Check and retighten all electrical connections

## **Controller**

- Check setpoints and DIP switch settings
- Check the operation of the chilled water valve
- Check all optional devices and safety interlocks
- Check the controller supply voltage 17.5/24 V AC.

NOTES:

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SIGNATURE:

MAKE PHOTOCOPIES OF THIS FORM FOR YOUR RECORDS

# Warranty Claim Tag

## WARRANTY CLAIM TAG

ONE TAG MUST BE ATTACHED TO EACH PART RETURNED

UNIT MODEL NO \_\_\_\_\_ DISTRI BUT OR NAME \_\_\_\_\_  
UNIT SERIAL NO \_\_\_\_\_ REAS ON FOR RET URN \_\_\_\_\_  
PART NO \_\_\_\_\_  
LIEBE RT REP LACE MENT ORDE R NO \_\_\_\_\_  
DISTRI BUT OR REP LACE MENT ORDE R NO \_\_\_\_\_

TO BE COMPLETED BY LIEBER T INTERNATIONAL B.V.

DATE RECE IVED \_\_\_\_\_  
MANUFACTURE RS NAME \_\_\_\_\_  
MANUFACTURE RS WARRANTY YES  NO   
REP AIR  SCRAP  VENDOR  INSPE CTION

PART RETURN AUTHORITY  
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