

# **CO<sub>2</sub> Incubator**



## **Instruction Manual**



**Model : LCI-600C**

**Please read this manual carefully before using the instrument**

**Labnics Equipment**

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## SAFETY CAUTION

- **LABNICS** provides basic service information within this manual but expects that ALL servicing is only carried out by Suitably Qualified Personnel.
- Before performing any servicing on any part of this enclosure, turn off the power and remove the power cord from the wall socket and the mains input socket.
- If the top cover is removed make sure to replace the earth strap fitted at the inside left rear of the top cover.
- Ensure that the CO<sub>2</sub> supply is turned off at the bottle before any service is performed.
- **Electrostatic Precautions:** Electronic components are used in this enclosure that is susceptible to Electrostatic Damage.

Service personnel should follow standard electrostatic precautions when servicing these parts.

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## CHAPTER 1. DEFINITION OF TERMS

For the purpose of our manufacturing specifications the following definitions shall apply.

### **WORKSPACE:**

**LABNICS** define this as the space above the lowest shelf and not less than 50mm from any wall including the roof.

### **ENCLOSURE TEMPERATURE:**

The temperature as indicated by the temperature display.

### **INSTANTANEOUS TEMPERATURE VARIATION:**

The difference at any moment between the highest and lowest of the temperatures at all relevant sites within the workspace.

### **TEMPORAL VARIATION:**

The maximum value of the temperature variation at any point in the workspace.

### **TEMPERATURE DRIFT:**

The expected long term change in the enclosure temperature during continuous operation.

### **TEMPERATURE OVERSHOOT:**

Maximum amount by which the measured temperature at the approximate centre of the workspace goes beyond the desired operating temperature after any change in the operating conditions.

### **OVERALL TEMPERATURE VARIATION:**

The difference between the maximum and minimum measured temperatures during the enclosure performance test.

## CHAPTER 2. SPECIFICATIONS

All specifications are quoted for an enclosure temperature of +37°C With an ambient Temperature of +20°C for Standard and Tropicool cabinets and for an enclosure temperature of +20°C for cooled cabinets.

### MECHANICAL:

**Construction:** High quality stainless steel interior, fibreglass insulation, with NO-JAR magnetic door catch and corrosive resistant epoxy powder coated exterior. Tropicool units are fitted with a Peltier cooling device and Cooled units are fitted with a standard refrigeration system.

**Safety:** Fitted with an independent adjustable Hi-Limit temperature thermostat completely separate from normal controls.

**Air circulation:** All units are fitted with a controlled air circulation system

**Electronic control:** LABNICS ZP22 Controller.

**Mains Operating Voltage:** 210-250VAC 50Hz

### OPERATING SPECIFICATION:

MODEL		LCI-600C
Nominal Range	Standard	+5°C to +50°C
	Tropicool	-5°C to +50°C
	Cooled	+15°C to +50°C
Temporal variation		(30 minutes) ±0.2°C
Spatial Temperature Variation		± 0.3°C
Temperature Overshoot		+1.0°C
Temperature Drift		± 0.2°C
Temperature Resolution		0.1°C
Ambient Operating Temperature		+10°C to +35°C
Relative Humidity		80% RH OR > 37.0°C
Carbon Dioxide		Applies to both thermal conductivity and Infra-red CO <sub>2</sub> detector options
Resolution		0.1%
Control Range		0.5 – 20.0%
Control Variation		±0.2%
Accuracy		±0.5% CO <sub>2</sub>

## 2.1 Special Feature:

### Temperature and CO<sub>2</sub>

- Temperature and CO<sub>2</sub> on separate LED displays.
- Separate set point selection for each parameter.
- Tropicool and Cooled cabinets are fitted with cooling systems to allow operation at lower temperatures.

### Alarms

- Both VISUAL and AUDIBLE alarms
- Diagnostic alarm codes.
- Automatic Setting of Hi Limit Alarm to 2°C above Set Point.

### Condensation and Atmosphere Control

- Heated glass inner door.
- Hermetically welded stainless steel interior.
- Removable, flexible and autoclavable door seal provides a seal for the enclosure.
- Outer door fitted with a DOOR AJAR switch which turns off the circulation fan and heating element to minimize changes in operating conditions, especially during door openings.

## CHAPTER 3. OPERATING INSTRUCTIONS

### 3.1 UNPACKING AND PREPARATION

- 1 Visually check the outer container for any signs of damage looking for any holes or dents.
- 2 Carefully remove the outer container and covers. In the event of damage please notify the Carrying Company immediately. Failure to notify the carrier may invalidate the carrying insurance.
- 3 If there is no discernible damage, remove the manual and accessory pack and put aside.
- 4 Remove the plastic outer cover, the polystyrene corner protectors and carefully lift the enclosure from the carrying pallet.
- 5 Mount the enclosure in its final place ensuring that adequate space is allowed for the door to open. The enclosure may be placed on the floor or a bench.

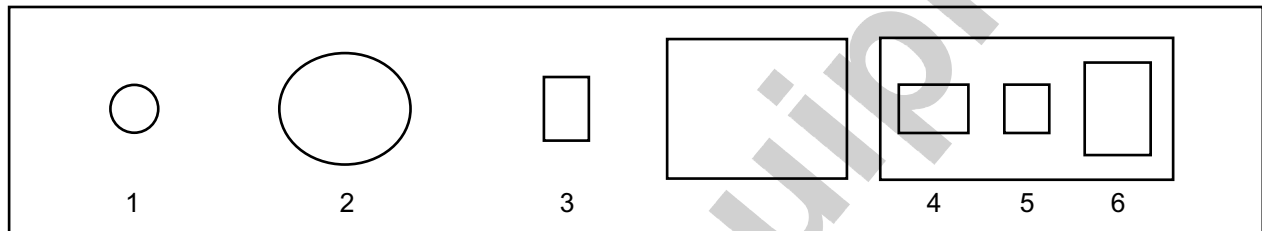
**NB:** On **Tropicool** and **Cooled** units ensure a space of at least 150mm is allowed at the rear of the cabinet for air circulation - On **Tropicool** units ensure that the unit can not be pushed too close to a rear wall locate the two stainless perforated "butterfly wings" at the rear sides of the **Tropicool** unit and gently bend to an angle of 90°.

- 6 To ensure safe operation the three-pin plug supplied must ONLY be inserted into a standard three-pin power outlet which is effectively earthed through the normal building wiring. For best results an independent power outlet is recommended, with a rating at least equal to that shown on the **Identification Data Plate**. This is especially important if the cabinet is to be operated in an electrically noisy environment.
- 7 Connect a bottle of **DRY FOOD GRADE CO<sub>2</sub>** fitted with a two stage Pressure Regulator set at **25kpa (5psi)** to the **Hosetail No. 1** at the rear of the enclosure.

- 8 If the enclosure is fitted with the automatic **CO<sub>2</sub> CHANGEOVER** option fit the second gas bottle to **Hosetail No. 2**. This bottle will automatically be selected when bottle No. 1 is empty.
- 9 Install the shelf guides in the desired positions. Slide the shelves into guides.
- 10 On cooled units a large stainless steel tray is used to both provide and collect water from the refrigeration system evaporator. Ensure this tray is pushed firmly against the rear wall of the cabinet. If elevated humidity conditions are desired partially fill the tray with distilled or demonized water.

### 3.2 POWER CONTROL AND HI-LIMIT PANEL (RIGHT HAND SIDE).

The Power Control and Hi-Limit Panel is fitted at the top right hand side of the enclosure. This panel contains the ON/OFF Switch, FUSE and user adjustable Temperature HI-LIMIT thermostat.



#### 1. CO<sub>2</sub> SAMPLE PORT

This fitting allows the user to SAMPLE the atmosphere inside the cabinet. The fitting cover **MUST** be fitted after sampling to minimize CO<sub>2</sub> loss.

**Note:** A sample should NOT be taken within 5 seconds of the CO<sub>2</sub> INJECT LED coming on.

#### 2. TEMPERATURE HI LIMIT THERMOSTAT

This is a mechanical thermostat which directly monitors the temperature of the enclosure. If the temperature exceeds this setting the power to the element will be switched off and the associated Hi-Limit (3) neon will illuminate when the controller applies power to the element. This can be observed by watching the HEAT LED on the front panel. This thermostat should be set to operate just above the set point temperature. See Setting Hi-Limit Thermostat below.

#### 3. HI-LIMIT NEON

This RED neon lights whenever the Hi-Limit Thermostat is activated.

Whenever the neon is illuminated no power is being supplied to the enclosure heating elements (this is an additional safety against inadvertent enclosure overheating).

#### 4. ON/OFF SWITCH

This turns the power on or off. The fitting also contains an electrical noise filter.

#### 5. FUSE: The fitting contains a 5AMP fuse.

6. **POWER LEAD SOCKET:** The power lead plugs into this socket.
7. **RCD:** Some units are fitted with a RESIDUAL CURRENT DEVICE, if this device trips the cause **MUST** be investigated. Do **NOT BYPASS** this device.

### SETTING THE HI LIMIT THERMOSTAT:

Turn the HI-LIMIT knob fully clockwise. Set the enclosure at the desired operating temperature and leave it for at least 6 hours to stabilize. With the cabinet stabilized at the set point temperature, slowly turn the HI-LIMIT anticlockwise until the HI-LIMIT neon comes on. Slowly advance the HI-LIMIT clockwise until the neon just extinguishes. Turn the HI-LIMIT a fraction more clockwise. To check what temperature the HI-LIMIT will be activated, change the set point temperature 5 degrees higher than its present setting. By monitoring the Temperature Display, note when the HI-LIMIT neon is activated. The neon will stay on until the temperature of the enclosure drops slightly and the neon will then extinguish. Adjust the HI-LIMIT until you are satisfied with the HI-LIMIT activation temperature.

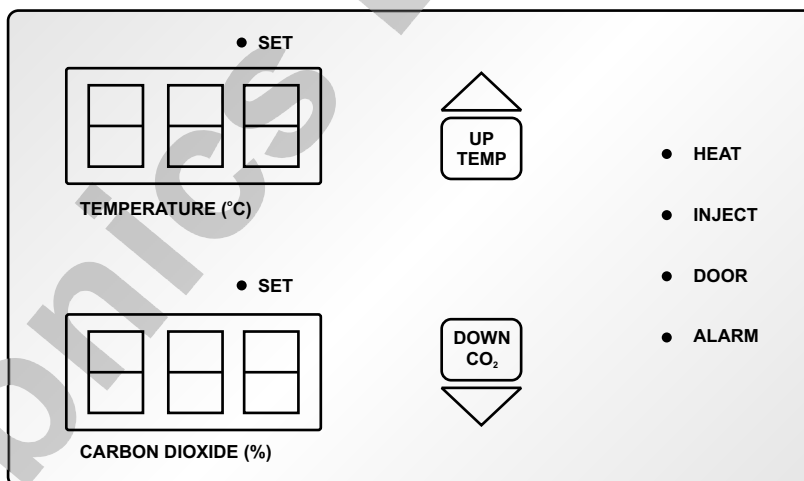
### IMPORTANT:

The successful operation of this incubator is dependant on following the installation procedures set down in the operation manual. Please **ENSURE** these have been carried out correctly.

Do **NOT** clean the stainless steel interior or fittings with any compounds containing iodine, chlorine, bleach or other halogens, as they cause pitting and oxidation to the surface of the steel.

## 3.3 OPERATING CONTROL PANEL

The Control Panel on the outer door is used to access the operating conditions for the enclosure.



### UP/TEMP

This button is used to increase the parameter value, to display the enclosure Temperature and the Temperature set point. This will sometimes be referred to as the **TEMP** or the **UP** button.

### DOWN/CO<sub>2</sub>

This button is used to decrease the parameter value, to display the CO<sub>2</sub> set point and the Relative Humidity (Non INFRARED Models ONLY). This will sometimes be referred to as the **CO<sub>2</sub>** or the **DOWN** button.



## SET

These LED's indicate if the Temperature or CO<sub>2</sub> displays are in **SET MODE**.

## HEAT

Indicates when power is being supplied to the heating element. This will remain steady when large changes in conditions are occurring eg warming up or if the door has been opened. When the enclosure is at the temperature set point, the LED will pulse.

## INJECT

Indicates when CO<sub>2</sub> is being injected. This will usually be accompanied by an audible click of the CO<sub>2</sub> inject solenoid.

## DOOR

Indicates that the outer door is open. If the door is opened a door switch is activated, the internal fan, heater and CO<sub>2</sub> solenoid are disabled until the door is closed. Leaving the outer door ajar for prolonged periods will affect the internal control of the cabinet atmosphere.

## ALARM

Indicates when an ALARM condition has been triggered. The alarm will be accompanied by a beep and will display the Alarm Code in the Temperature Display.

### 3.4 SETTING OPERATING CONDITIONS

This example will demonstrate how to set the cabinet for the following conditions:

Temperature = 37.0°C      Carbon Dioxide = 5.0%

#### TO SET TEMPERATURE

Press and hold the **TEMP** button. The display will blank for **2** seconds, release the button. The **SET** LED above the temperature display will turn on indicating that this parameter is now in the temperature set mode and the current set point will be displayed. Use the **UP** and **DOWN** buttons to adjust the Set Point to **37.0°C**.

When the adjustment is complete the controller will return to normal operation if the buttons are not pressed. This is indicated by the **TEMP SET** LED going off.

#### TO SET THE CO<sub>2</sub> CONCENTRATION

Press and hold the **TEMP** button. The display will blank for 2 seconds, release the button. The **SET** LED above the temperature display will turn on indicating that this parameter is now in the temperature set mode and the current set point will be displayed. Use the **UP** and **DOWN** buttons to adjust the Set Point to 37.0°C.

When the adjustment is complete the controller will return to normal operation if the buttons are not pressed. This is indicated by the **TEMP SET** LED going off.

**HEPA FILTER (If Fitted):** To change the HEPA Filter, undo the two knurled nuts holding the filter to the inside top tray and withdraw the filter.

### **RELATIVE HUMIDITY**

There is no electronic control of humidity in these enclosures; the humidity is maintained either by placing a small plastic tray of water in the tray support and attaching this to a vacant shelf ladder near the bottom of the cabinet or by partially filling the large stainless tray on cooled units. The humidity level will usually equilibrate to a relative humidity of above 80%. (typically 60% - 70% on **Tropicool** and **Cooled** units)

**To display the Relative Humidity (Non INFRA-RED Models ONLY):** Press the CO<sub>2</sub> button momentarily and the CO<sub>2</sub> display will indicate the %RH. After a few seconds the display will return to displaying the CO<sub>2</sub> reading.

### **CONDENSATION:**

**It is normal for a small amount of condensation to appear on the side walls and glass door(s) when operating with humidities above 85% RH. Any water accumulating on the floor of the cabinet should be removed at regular intervals.**

### **CONFIRMATION OF OPERATING PARAMETERS**

**LABNICS** check the Temperature, and CO<sub>2</sub> calibration in the factory in the final testing stages. For your confidence it is advisable to obtain your own calibration so as to ensure the enclosure is operating to your satisfaction. This must be carried out in the enclosures final operating environment. A full procedure for calibrating the enclosure is given in the **CALIBRATION** Chapter.

### **TROPICOOL UNITS:**

This type of cabinet is fitted with **LABNICS's** 'Tropicool' peltier cooling option. The Tropicool unit uses a peltier cooling device to obtain lower temperatures, typically allowing operation to 5°C below ambient. The 'Tropicool' unit runs continuously.

### **COOLED UNITS:**

This type of cabinet is fitted with a special refrigeration unit, the lowest temperature of which is factory set via a 'evaporator pressure regulator' to minimize the dehumidifying effect of the cooling coils. The minimum attainable temperature will be about +15°C. The refrigeration unit runs continuously.

## **CHAPTER 4.CALIBRATION**

It is important to note that the calibration of this enclosure is valid only when it is calibrated in its final operating environment. **LABNICS** calibrates the enclosure **to our internal standards** in the final testing stages of manufacture. This means that when the enclosure arrives at the customer site, the calibration carried out in the factory may no longer be valid. **LABNICS** wishes to make it clear that calibration is a CUSTOMER responsibility. **LABNICS** has ensured that a complete acceptable calibration procedure is available for the customer to follow.

Calibration of the enclosures is achieved by checking the enclosure temperature display against a **customer supplied calibrated thermometer and CO<sub>2</sub> monitoring device**. It is important that the calibration is carried out at the temperature of interest.

The temperature sensor that is used by the electronic thermal control system is also used to indicate the control temperature. This sensor is in the duct of the air circulation system and is not directly in the work space, therefore it is necessary to adjust any offset between the work space and the indicated temperature. Calibration entails adjusting the CALIBRATION FACTOR so that the work space temperature matches the indicated temperature. The CALIBRATION FACTORS are stored in an **Electrically Erasable Read Only Memory (EEROM)**. EEROM retains its stored memory even with the power off.

#### 4.1 TEMPERATURE CALIBRATION

1. Place a calibrated reference thermometer that has been checked to the customers satisfaction into the enclosure. The usual place for this is in the centre of the work space. Place it so that it is able to be read without opening the glass inner door.
2. Ensure the enclosure has stabilized at the temperature of interest for at least 6 hours.
3. Press and hold the TEMP button until the display momentarily blanks, this will access the SET POINT mode and the SET LED above the temperature display will be on.
4. Press both TEMP and CO<sub>2</sub> buttons at the same time. The temperature display will show [Cal] for 2-3 seconds and then show the current temperature.
5. Adjust the value displayed to read the same as your reference thermometer.
6. Release all buttons. After about 3 seconds the temperature display will show [---] then a HEXIDECIMAL number for about 2 seconds (This number may be noted as a reference to the current calibration) then another [---] and beep. The enclosure will now begin to adjust itself so that the reference thermometer temperature matches the SET POINT temperature. The indicated temperature will show a temperature offset from the SET POINT Temperature immediately after the calibration. This is normal as the controller is now endeavoring to match the SET POINT to the work space reference thermometer.

The procedure may need to be repeated to obtain the best final calibration.

#### 4.2 CO<sub>2</sub> CALIBRATION - THERMAL CONDUCTIVITY SENSOR

There are two modes of calibration for the THERMAL CONDUCTIVITY CO<sub>2</sub> system. An AUTO-CALIBRATION (**AUTO-CAL**) and MANUAL CALIBRATION (**MAN-CAL**). Both types perform the same operation. **AUTO-CAL** enables the enclosure to perform the calibration at 'quiet' times of operation, whereas **MAN-CAL** is used when the cabinet has been empty of CO<sub>2</sub> for a long period. Both require the enclosure to be stabilised at the desired set Temperature.

##### **AUTO-CAL**

The normal method of calibrating the CO<sub>2</sub> concentration is by using the AUTO CAL facility. To force the controller to carry out an AUTO CAL the following procedure is recommended.

- 1 Change the Temperature Set Point by 0.1°C (eg. if your normal operating Temperature Set Point is 37.0°C change it to 36.9°C).
- 2 The CO<sub>2</sub> display should now be **flashing**, this indicates that the CO<sub>2</sub> is now out of calibration. Note that the operation of the CO<sub>2</sub> gas inlet solenoid(s) will be inhibited while the CO<sub>2</sub> display is flashing.
- 3 **OPEN** both the outer and inner incubator doors, and leave them open for at least 30 seconds. (This is to flush the enclosure of CO<sub>2</sub> gas).
- 4 **CLOSE** both doors.
- 5 **CHANGE** the Temperature Set Point back to your normal setting, ie. 37°C
- 6 **LEAVE** the enclosure (preferably without opening the doors) until the CO<sub>2</sub> display stops flashing. This indicates that normal CO<sub>2</sub> control has returned.

#### MAN-CAL

- 1 Flush the enclosure of CO<sub>2</sub> by opening the doors for at least 30 seconds.
- 2 Press and Hold the CO<sub>2</sub> button until the CO<sub>2</sub> display momentarily blanks.
- 3 Press both the **TEMP** and **CO<sub>2</sub>** buttons together until the display shows [Cal].
- 4 Release all buttons and wait. The display will show [---] and beep. The CO<sub>2</sub> display will automatically reset itself to **[0.3%]** when the current temperature next reaches the Temperature Set Point.

**NOTE:** AUTO-CAL and MAN-CAL will assume that there is no CO<sub>2</sub> in the enclosure when the calibration sequence begins.

#### CO<sub>2</sub> SPAN CALIBRATION

As there is no facility to adjust the span of the CO<sub>2</sub> display, it is necessary to check the CO<sub>2</sub> concentration by independent means and if necessary REPEAT the AUTO-CAL procedure until satisfactory calibration is achieved. **LABNICS** recommends a FYRITE is used to check the CO<sub>2</sub> concentration. Any other means that is satisfactory to the customer may be substituted.

- 1 Let the enclosure stabilize at its operating conditions for at least 6 hours.
- 2 Monitor the CO<sub>2</sub> level via the **CO<sub>2</sub> SAMPLE PORT** with the independent CO<sub>2</sub> monitor ensuring that the CO<sub>2</sub> injection solenoid does not operate during the sampling time. Note the reading of the independent monitor.
- 3 If the **MONITOR** value is within ±0.5% of the **DISPLAYED CO<sub>2</sub>** reading no further action is necessary.
- 4 Repeat the **AUTO-CAL** calibration procedure until a satisfactory result is achieved.

## **Notes on Calibration Procedures**

- The CO<sub>2</sub> SET POINT can be left as it is for the duration of the AUTO-CAL and MAN-CAL calibration sequences. Once the CO<sub>2</sub> display has stopped flashing the controller will adjust the workspace CO<sub>2</sub> level to the SET POINT.
- AUTO-CAL is best done last thing at night as the calibration usually takes from 1 to 4 hours to complete.
- **LABNICS** recommends that AUTO-CAL is carried out at least every two months OR if a Temperature Calibration has taken place.
- The temperature should be recorded on a daily basis by placing a thermometer in the work space so that it can be read without opening the inner glass doors and the long term temperature performance can then be plotted to give an assurance of correct temperature performance. Similarly, the CO<sub>2</sub> should be checked and monitored regularly using the independent monitor. Record these for long term assurance.

## **CO<sub>2</sub> CALIBRATION - INFRA-RED CO<sub>2</sub> SENSOR(IR)**

There are two modes of calibration for the infra-red CO<sub>2</sub> system.

1. Zero Offset Calibration (This should never require adjustment)
2. Span calibration (This may require a slight adjustment if the CO<sub>2</sub> calibration is incorrect)

**NB:** These adjustments do not calibrate the accuracy of the CO<sub>2</sub> concentration measurement, but only adjust the output to match the measuring device.

Before carrying out these procedures insure that the cabinet has been allowed to stabilise for at least 6 hours.

### **CO<sub>2</sub> ZERO OFFSET CALIBRATION**

To adjust the ZERO of the CO<sub>2</sub> display, it is necessary to proceed as follows:

- 1 Connect a voltmeter to the CO<sub>2</sub> sensor board output terminals.
- 2 With JP5 OPEN, connect the shorting jumper onto pins of JP4, use the 'UP' or 'DOWN' buttons on the CO<sub>2</sub> PCB to adjust the voltmeter to read 0.005 volts DC. (The cabinet display will read about 0.2% CO<sub>2</sub>)
- 3 REMOVE the shorting jumper from pins of JP4.

### **CO<sub>2</sub> SPAN CALIBRATION**

To adjust the SPAN of the CO<sub>2</sub> display, it is necessary to proceed as follows:

- 1 Connect a voltmeter to the CO<sub>2</sub> sensor board output terminals (V0 & COM).
- 2 With JP5 CLOSED, connect the shorting jumper onto pins of JP4, use the 'UP' or 'DOWN' buttons on the DCS-300 INFRA-RED CO<sub>2</sub> PCB to adjust the voltmeter to read 0.650 volts DC. (The cabinet display will read about 16.5% CO<sub>2</sub>). This value may be raised or lowered to achieve the exact CO<sub>2</sub> calibration result. ('Normal' range is from 0.550 – 0.750). If the cabinet display is reading too high when the CO<sub>2</sub> concentration is compared with a test instrument ('Fyrite' etc) then the reference voltage should be adjusted slightly DOWN. Just press either the 'UP' or 'DOWN' button VERY briefly and then WAIT for the meter reading to change as the reading will lag the button press by several seconds.
- 3 REMOVE any shorting jumpers from pins of JP4 & JP5. Recheck calibration if necessary.

### Notes on Calibration Procedures

- The temperature should be recorded on a daily basis by placing a thermometer in the work space so that it can be read without opening the inner glass doors and the long term temperature performance can then be plotted to give an assurance of correct temperature performance. Similarly, the CO<sub>2</sub> should be checked and monitored regularly using an independent monitor (such as a 'Fyrite' CO<sub>2</sub> tester). Record these for long term assurance.

## CHAPTER 5. THEORY OF OPERATION

Power to the enclosure is supplied through a proprietary combination fused, filtered, and switched input module.

The controller board incorporates an onboard step-down transformer that supplies the necessary low voltages for the board. A further transformer is utilised to provide 12v AC for the door heater. CO<sub>2</sub> inject solenoids, enclosure heater, door heater and fan motor make up the other controlled devices within the enclosure.

The versatility of the enclosure is based on the **LABNICS** ZP22 microprocessor control system. Multiplexed analog inputs that sense the Temperature and CO<sub>2</sub> are used to interface the sensor circuitry to the controller.

The analog inputs are amplified and filtered by conventional circuitry before being multiplexed to an eleven channel Analogue to Digital converter. The microprocessor selects each input in turn and the signal is converted to digital form. The information obtained is then used to up date the display, control heaters, solenoids, etc. This sequence of events is repeated continuously unless interrupted by a special event or by user intervention, eg. selecting a set point. Each parameter is measured approximately every 0.6 seconds.

All off board controlled devices are interfaced via optically isolated triac modules. A proximity switch is incorporated in the front panel to sense the status of the outer door. The motor and heater are deactivated whenever the door is open.

The temperature in the enclosure is sensed by a solid state temperature sensor. The microprocessor supplies PID controlled heater outputs that control the temperature conditions of the enclosure. Carbon dioxide sensing is by EITHER Thermal Conductivity OR by an INFRA-RED sensor.

After first turning on power to the unit a RESET operation is performed, this operation tests the condition of retained data in the EEROM which contains any set points or correction factors and then by computing a CHECKSUM determines if the data has been corrupted.

If the data is found to have been corrupted, all the control points are set to factory preset values and all calibration factors are reset to their defaults.

Every 10 milliseconds after initial turn on a timer interrupt occurs, this signal is derived from the internal clock and is used for timekeeping functions.

Relative Humidity is sensed by a capacitive sensor probe. The humidity is not controlled in the enclosure but the value of the current enclosure RH can be accessed via the CO<sub>2</sub> button. The RH is used to correct the CO<sub>2</sub> algorithm for humidity interferences.

**NB:** A relative humidity sensor is **NOT FITTED** on INFRA-RED Models as these do not require any correction for humidity.

## CHAPTER 6. ALARMS

There are TWO types of alarm used in the **LABNICS LCI-600C**. **Standard Alarms** and **Special Alarms**.

### STANDARD ALARMS

[1-.-] [2-.-] [4-.-] [5-.-] [6-.-] [7-.-] [8-.-] [11-.-] [12-.-]

These alarm numbers indicate a problem with cabinet control, ie. over-temperature, faulty sensor, etc.

To **CANCEL** all the alarms except [2-.-] Press and Hold the **TEMP** button until the temperature display **blanks**. To cancel the [2-.-] alarm, press and hold the **CO<sub>2</sub>** button until the **CO<sub>2</sub>** display blanks. To assist any service enquiries later please note the number of the alarm and what was done to eliminate the cause.

### SPECIAL ALARMS

[3-.-] [9-.-]

These alarms can **ONLY** be cancelled by using the procedure outline below. These alarms indicate that the cabinet may have lost some of its settings [3-.-], OR that Electrical Interference [9-.-] has corrupted the cabinets internal operating system.

To cancel the [3-.-] or [9-.-] alarms it is necessary to go into **SET MODE** and check both Temperature and CO<sub>2</sub> set points. Once the set points of the CO<sub>2</sub> and Temperature and the Temperature calibration has been checked the alarms will cancel.

## 6.1 ALARM CODES

These codes will be shown on the temperature display, the **ALARM LED** will come on and an intermittent beep will sound.

**[1--] Under/Over Temperature**

The enclosure is operating more than  $\pm 2^{\circ}\text{C}$  from the set point. The alarm will stop when the temperature is back within  $\pm 2^{\circ}\text{C}$  of the set point. Cancelled by pressing **TEMP** button.

**[2--] Low CO<sub>2</sub> in enclosure**

The CO<sub>2</sub> concentration is too low for too long. Not enough CO<sub>2</sub> to maintain CO<sub>2</sub> set point. Check there is CO<sub>2</sub> in the bottle, turned on and sufficient pressure (25kpa). Slightly higher pressures (upto 50 kpa) may be required at very high CO<sub>2</sub> settings. Check hose connections. Check INJECT LED is coming on. Faulty solenoid.

Cancelled by pressing CO<sub>2</sub> button.

**[3--] Enclosure running on factory Preset values**

If preset values are your working values, cancel alarm. Otherwise reset set points and check calibration. (See **CALIBRATION**)

Cancelled by pressing **TEMP** button.

**[4--] Main Temperature Sensor broken**

Main sensor broken or damaged. Call Service.

Cancelled by pressing **TEMP** button.

**[5--] Wet, broken or damaged Humidity Sensor (NOT on Infra-red)**

Humidity sensor wet, broken or damaged. Remove water tray from enclosure and run for at least 24 hours while opening the doors for 1 minute every hour or so to flush the humid air from the enclosure. This will dry the enclosure and sensor. If still not operating correctly, call Service.

Cancelled by pressing **TEMP** button.

**[6--] Low Humidity - Water tray out of water. (NOT on Infra-red)**

Check tray water level and refill as necessary.

**[7--] CO<sub>2</sub> Sensor damaged, broken or out of calibration**

CO<sub>2</sub> damaged or broken or out of calibration. Recalibrate.

If still not operating correctly, call Service.

Cancelled by pressing **TEMP** button.

**[8--] Moderate Electrical Noise on mains power supply**

Interference has affected the microprocessor. This should occur only rarely. If persistent, check mains for Electrical Noise.

Cancelled by pressing **TEMP** button.

**[9--] Severe Electrical Noise on Mains**

As above for [8--] but more serious, check mains wiring and earthing. Look for outside interference. Turn off, turn on, Check Set points and recalibrate. Cancelled by pressing **TEMP** button.



## 6.2 CO<sub>2</sub> CHANGEOVER

If the **CO<sub>2</sub> CHANGEOVER** option has been purchased it will allow the cabinet to automatically change from the current bottle (when empty) to the next bottle in the sequence No.1 No.2 No.1 No.2 No.1 etc. The detection of a bottle being empty is determined from the recovery time to reach the CO<sub>2</sub> set point.

There is one alarm associated with the CO<sub>2</sub> control. [2--].

Alarm [2--] is associated with the controller being unable to detect a rise in the CO<sub>2</sub> level in the cabinet even though it is attempting to inject CO<sub>2</sub>. It will usually be due to the CO<sub>2</sub> bottle being empty.

## CHAPTER 7. TROUBLE SHOOTING

All fault alarms are displayed on the **TEMPERATURE LED** display. The appropriate fault alarm can be identified in the Alarm Code list.

### NO DISPLAY WHEN MAINS SWITCH TURNED ON.

- |                                    |                      |
|------------------------------------|----------------------|
| - Cabinet not plugged in           | Plug in.             |
| - Input Fuse blown (5AMP)          | Replace.             |
| - Check power at electrical outlet | Turn on wall socket. |
| - ZP22 PWR PCB fuse blown (2AMP)   | Replace.             |
| - None of the above is at fault    | Call Service         |

**NB:** Unplug cabinet from wall socket before checking or replacing any fuses.

### DISPLAY ON BUT FAN MOTOR STOPPED

- |                   |   |
|-------------------|---|
| - Outer Door Open | Check DOOR LED. Close door.<br>Call Service |
|-------------------|---|

### HI-LIMIT NEON COMING ON AND CABINET NOT UP TO TEMPERATURE.

- |                                |                 |
|--------------------------------|-----------------|
| - Hi-Limit thermostat tripping | Reset Hi-Limit. |
|--------------------------------|-----------------|

### ENCLOSURE WILL NOT HEAT/COOL TO TEMPERATURE

- |                          |                             |
|--------------------------|-----------------------------|
| - Door open              | Check DOOR LED. Close door. |
| - Faulty heater element  | Call Service                |
| - Already at temperature | Wrong set point entered     |

### TEMPERATURE CONTROL NOT TIGHT ENOUGH

- |                           |                         |
|---------------------------|-------------------------|
| - Circulation Fan stopped | Check/change fan motor. |
| - Sensor faulty           | Call Service            |

### INACCURATE READINGS ON ANY PARAMETER

- |                            |              |
|----------------------------|--------------|
| - Not correctly calibrated | Calibrate    |
| - Faulty sensor            | Call Service |
| - Component failure        | Call Service |

### NO CO<sub>2</sub> COMING INTO CABINET No Alarm

- |  |                                 |
|--|---------------------------------|
| - Outer door open                                      | Check DOOR LED. Close door      |
| - CO <sub>2</sub> set point set too low (possibly 0.0) | Reset CO <sub>2</sub> setpoint. |

### DISPLAY PRESENT BUT CONTROLLER WILL NOT OPERATE CORRECTLY

- |                     |                                  |
|---------------------|----------------------------------|
| - Data corrupted    | Switch off for ten seconds       |
| - Component failure | Check set points and calibration |
|                     | Call Service                     |

### DISPLAY ON BUT SHOWING RUBBISH!

The only power supplied to the display PCB is from the 5 volt supply on the controller board. If the LED displays are illuminated it is a good indication that the 5v power supply is present.

- |                |                                 |
|----------------|---------------------------------|
| - Faulty Reset | Turn Mains power off for 10 sec |
|                | Call Service                    |

## 7.1 DETAILED MINOR SERVICING

### Replacing Main Fuse

Unplug power lead from the wall and enclosure socket. With a small screw driver gently pries the fuse holder from the fitting.

Replace with a **5 AMP fuse ONLY**

### Replacing Controller Board Power Supply Fuse

1. Unplug the power lead from the wall and enclosure socket.
2. Undo the 2 allen head retainers that hold the top panel in place. These are found at the front of the panel. Lift the top off, carefully removing the earth connection at the left rear.
3. The Power Supply fuse is situated on the controller board under a clear perspex fuse holder.
4. Gently pries the fuse holder lid off and remove the fuse and replace it **[2AMP]**.
5. Put the perspex lid back on the fuse holder, replace the top ensuring the earth strap is reattached, push down the retaining clips, plug in and switch on.

## Checking the Heart-Beat LED on the Controller Board

1. If the controller does not appear to be operating but the display is on. It is useful to check if the **Heart-Beat** watch dog circuit is operating.
2. Unplug the power lead from the wall and enclosure socket.
3. Undo the 2 allen head retainers that hold the top panel in place. These are found at the front of the panel.
4. Lift the top off, carefully removing the earth connection at the left rear.
5. Plug the power lead back into the wall and enclosure sockets and turn on the enclosure.
6. The **GREEN Heart-Beat LED** is situated on the controller board next to the largest integrated circuit. It should pulse with one second intervals.  
If the heart-beat is operating, switch off and unplug the power lead.
7. Replace the top with the earth strap and switch on.
8. Attempt the procedure as described for cancelling ALARM [9-.-]
9. If controller is still not working correctly, call Service.

## Motor Shaft Seal or Fan Motor Replacement

The following procedure describes how to replace the fan motor or motor shaft seal.  
Unplug the power lead from the wall and enclosure socket before commencing.

### Procedure in interior of the enclosure:

1. Undo the 2 knurled nuts that hold the element and fan cover to the inside of the enclosure. Carefully lower the cover and remove from enclosure. Note the slots at the rear of the interior that the element cover slots into. Ensure these are engaged on assembly.
2. Undo the 3 knurled nuts (or 3/16" S/S nuts and washers) around the fan shroud and remove fan shroud.
3. Remove the fan rotor - nut is Left Hand Thread.

**NOTE:** The washer goes on the shaft before the rotor. This ensures that the rotor sits square on the shaft. Carefully pry off the circlip from the motor shaft.

### Now move to the exterior top of the enclosure

- 1 Undo the 2 allen head retainers that hold the top panel in place. These are found at the front of the panel.
- 2 Lift the top off, carefully removing the earth connection at the left rear. Remember to reattach this connection on assembly.
- 3 Remove wires from motor, undo 3 nuts holding motor to its mount and carefully lift motor off the threaded screws and place to one side.

### Motor Shaft Seal

Use a small screwdriver to pry the **black shaft seal** from white plastic holder (Note the orientation of the seal face - smooth side to top). Replace the seal with a new one (7.00mm). The seal should be given a light coating of silicone grease.

### Fan Motor replacement

Disconnect earth wire from motor, replace motor with new one and **reconnect** earth wire, then **reverse** the above disassembly procedures, ensure motor is free to turn **before** reapplying any power to cabinet.

- To reassemble follow the above procedure in reverse.
- **Ensure motor and rotor turn freely after assembly.**

### REFRIGERATION SYSTEM (COOLED CO<sub>2</sub> units ONLY)

The refrigeration compressor is of the low starting torque type and may not start immediately if the power supply is disconnected. After approximately 3-5 minutes the internal refrigeration pressures will have equalized and the compressor will start up as normal.

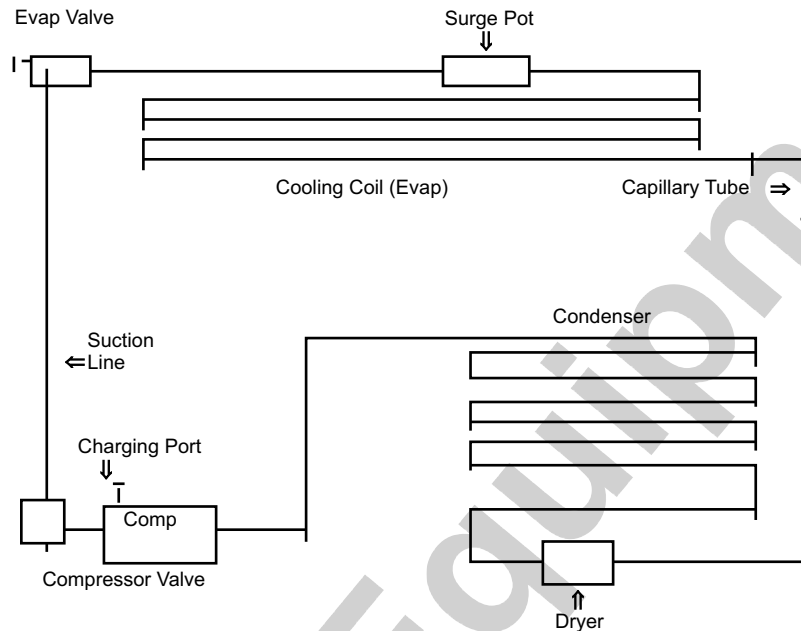
The cooling coil under normal operating conditions does not build up frost. This is due to the setting of the special evaporator pressure regulator which prevents the coil from getting too cold.

The condensate water from the cooling coil drains back into the water tray on the internal floor of the cabinet so that any condensed water is recirculated.

The refrigeration system condenser located on the External rear of the cabinet is cooled by natural convection, therefore, it is important to ensure no obstructions are placed to prevent normal circulation around the cabinet. The condenser will slowly collect a layer of dust, therefore, it is recommended that once a year it is brushed clean with a small broom.

This refrigeration unit is optimized to provide best result when the cabinet is operated at or near +20°C. The minimum attainable temperature in a +20°C ambient will be approximately +15°C. Operating the cabinet at higher temperatures (I.E 30 – 37°C) will result in lower relative humidities inside the cabinet and therefore, greater drying effect on samples.

### REFRIGERATION SCHEMATIC DIAGRAM



### COMPONENT LOCATION

Inside Cabinet behind False Back: Cooling Coil, Surge Pot

External Back of Cabinet: Compressor, Compressor cooling fan, Condenser, Dryer, Evap Valve, Compressor Valve.

### REFRIGERATION UNIT DATA (Cooled Units ONLY):

MODEL	LCI-600C
Compressor	Electrolux GL45AA
Condensor	S20/21
Cooling Coil	G10/21
Evap Valve	Danfoss KVP12
Compressor Valve	Sporlan CRO
Refrigerant	R134a
Refrigerant Control	Capillary Type 6/044
Dryer	Sweat Type 245/XH9
Comp Cooling Fan	SUNON 2/23HTB

## SERVICE REPORT

Customer's Address : _____ _____	Tel.No.: _____ Fax No.: _____ Weekly Off.: _____
Contact Person / Designation : _____	Dept.: _____

Date	Time		System Configuration	Model	Serial No.	Date :	SR. No.	
	From	To					Status : OK <input type="checkbox"/>	Not OK <input type="checkbox"/>
							Installation <input type="checkbox"/>	Warranty <input type="checkbox"/>
							Demonstration <input type="checkbox"/>	
							Maintenance <input type="checkbox"/>	Contract <input type="checkbox"/>
							Repairs <input type="checkbox"/>	
							Application <input type="checkbox"/>	Billable <input type="checkbox"/>
							Calibration <input type="checkbox"/>	
							Validation <input type="checkbox"/>	Courtesy <input type="checkbox"/>

Nature of Problem : \_\_\_\_\_  
\_\_\_\_\_

Observation & Action Taken : \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Customer's Remarks : \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Parts Replaced : \_\_\_\_\_  
\_\_\_\_\_

Parts Recommended / Action Required : Yes <input type="checkbox"/> No <input type="checkbox"/>		Requisition Number :
Service Engineer's Name & Signature	Customer's Name, Signature, Date & Stamp	



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